MET enhanced ATFCM

Executive summary

Adverse weather conditions are the first cause of traffic delay: the European Network Manager reported 4,8 million minutes of En-route weather delay in 2018, corresponding to 25% of total delayed En-route air traffic.

Forecasting weather hazards with 1-hour horizon and its extension to 3-hours horizon are currently covered by aeronautical existing forecast products, while strong unreliability on usual meteorological (MET) products can be observed beyond this period. The air traffic control declares the ability to absorb the expected traffic with 6 hours of anticipation, therefore it is necessary to consider accurate and high-precision meteorological data for a better decision-making. Expected benefits are an increase of the safety level and an improvement of the overall ATM system performance thanks to a more precise departure slot allocation (Calculated Take-Off Times or CTOTs).

France Aviation Civile Services (FRACS) and MetSafe addressed the "Thematic challenge 3: Efficient provision and use of meteorological information in ATM" with the design and validation of a R&D convection product dedicated to enhanced ATFCM, with the 6 hours' time-horizon as a target.

Two complementary domains of expertise were combined through this MET Enhanced ATFCM (Air Traffic Flow and Capacity Management) project. FRACS, the coordinator, brought its experience on air traffic control operations, concept design and operational validation through a collaboration with Reims Upper Area Centre (UAC). As a MET expert, MetSafe mastered the model-based convection product design and technical validation activities.

The research plan and associated activities were based on a pragmatic and agile approach:

- Step 1: Operational context description and analysis
- Step 2: Model-based convection product definition
- Step 3: Algorithm and SWIM webservice design
- Step 4: Technical and operational validation

The designed MET Enhanced ATFCM algorithm considers several convection parameters from different weather models and provided convection information, which has been integrated into a "general information" screen for Flow Management Positions and displayed through an HMI developed by Reims UAC.

In a traffic shutdown context due to the COVID-19 crisis, several technical and operational validation sessions have been led between May and June 2020, in collaboration with 18 air traffic controllers at Reims UAC. From an operational point of view, the very first objective of increasing weather situational awareness has been fulfilled with the MET Enhanced ATFCM tool. Indeed, accurate, updated and precise convection information was delivered continuously to Flight Management operators in phase with their ATFCM time-horizon. The results of operational validation sessions highlighted also the pertinence of the tool for the definition of ATFCM measures from 6 hours to 3 hours of anticipation based on convective information. Other results concerned the false alarm and no-detection events, which have to be further addressed from a technical but also operational point of view.

Considering the outputs and positive results of this R&D project, the integration of the tool in an industrial and operational product can be easily envisaged. The convection product will be integrated into the Vigiaero algorithm developed by MetSafe to address the weather impact assessment, without ATM flows. Vigiaero will be made available to Reims UAC during the summer to pursue validation activities.

Additional improvements of the MET Enhanced ATFCM tool can be developed in the future, as the integration of traffic flows and the provision of weather impact on ATM operations. Findings of the current project and future Weather Impact Prediction on ATM (WIPA) activities (the latter launched by MetSafe and FRACS as a second wave Engage catalyst fund project) will then contribute to SESAR actions related to MET and SWIM development.

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