

## Probabilistic weather avoidance routes for medium-term storm avoidance (‘PSA-Met’)

### Summary

PSA-Met is framed in the context of ‘TBO-Met’ (SESAR funded project, H2020-SESAR-2015-1, Grant Agreement 699294), and is fully aligned with the challenge *Efficient provision and use of meteorological information in ATM* of the Engage Knowledge Transfer Network (thematic challenge 3), as described next.

In TBO-Met, a probabilistic approach to en-route sector demand prediction at tactical level subject to thunderstorm activity was presented. The methodology developed requires the use of a storm-avoidance tool, in particular DIVMET (property of MeteoSolutions GmbH); this algorithm is deterministic. Since this methodology follows an ensemble-based approach, in TBO-Met an ensemble of deviation trajectories for each flight was obtained, using the deterministic DIVMET algorithm several times. Note that DIVMET did not provide a unique avoidance route that took into account the uncertainty information about the storm cells available.

Hence, the goal of PSA-Met is to develop a probabilistic version of DIVMET (named DIVMET-P), capable of generating probabilistic weather avoidance routes. This new weather avoidance tool will then be needed in a TBO-Met’s follow-up project, where the main objective will be to develop a Medium-Term Storm Avoidance (MTSA) tool intended to enhance air traffic control efficiency.

The required input for DIVMET-P will be a probabilistic Nowcast, providing information about the uncertainty of the convective cells, and a risk level, which is an adjustable parameter intended to define the avoidance strategy. By properly choosing the risk level one can obtain safer and more efficient, intermediate solutions between underreacting and overreacting to the weather information. The output will be a unique avoidance route, that takes into account the uncertainty of the convective cells, obtained for the given risk level.

The methodology proposed has three steps: 1) concept development, 2) software development, and 3) concept assessment (via simulation). Additionally, there will be meetings with stakeholders (air traffic controllers) to help align the development of DIVMET-P to their uses and needs.

This project is intended to be a new step for the development of tools that integrate the uncertainty of meteorological disruptive events, with the aim of increasing the safety, efficiency, and predictability of operations. From the point of view of air traffic controllers and pilots, the expected benefit of this project is the possibility of being informed, some time before facing the thunderstorm, as to the best/safer avoidance strategy (improved situational awareness; anticipated and better-informed decision-making).

From the point of view of air traffic flow management, there is great interest in the probabilistic analysis of demand and capacity of en-route sectors when affected by adverse weather. With the development of DIVMET-P we take a step forward, towards enhancing the predictability of each individual flight and, thus, the predictability of the demand.



This project has received funding from the SESAR Joint Undertaking under the European Union’s Horizon 2020 research and innovation programme under grant agreement No 783287.