New mathematical model for extended arrival management capabilities

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Abstract The Extended arrival management (E-AMAN) concept is based on starting the arrival traffic sequencing earlier than is the case by the arrival management (AMAN). The E-AMAN extends the horizon at which to start sequencing from the airport terminal area further upstream, to enable more smooth traffic management through speeding up, or slowing down arriving flights. Current application of E-AMAN at Heathrow, with the horizon at 350NM reduces delay, operational costs, CO2 emission and smooths delivery of arrival traffic to the runways.

Here we propose an E-AMAN model that extends to 500NM. More specifically, the model incorporates three horizons: Tactical Horizon (100NM), Command Horizon (500NM), and Data Horizon (600NM). When a flight enters Data Horizon, the flight intentions are sent to the E-AMAN. When a flight enters Command Horizon, the optimizer is run to find optimal slot for that flight at the runway. Compared to previous optimisation processes, the E-AMAN takes into account the cost of delay and fuel for the airline instead of delay alone, and uses information on the distribution time of arrival to manage uncertainty (e.g. due to wind). Based on the optimal slot assigned, the E-AMAN issues a command to the flight, that can be to maintain initial speed, to speed up, or to slow down. It also assigns minutes of holding if delay cannot be absorbed during cruise.

We will present some evidence of the efficiency of the optimisation process, in particular compared to a baseline scenario where the E-AMAN takes only delay into account and no uncertainty. We will show how this efficiency changes in different conditions, in particular relative to wind uncertainty.

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