Evaluation of an Integrated Traffic Flow Management Decision Making Approach

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An integrated traffic flow management decision-making approach that sequentially schedules and reroutes flights subject to actual and forecast weather induced airspace capacity constraints is presented, and used to conduct 80 fast-time simulation experiments. These experiments considered variations in the severity and location of en route convective weather, and the traffic flow management strategies implemented to mitigate these weather impacts. Strategic flight scheduling, in which pre-departure and airborne delays were assigned to individual flights, was found to be effective at alleviating capacity constraints in sectors and at airports. However, tactical rerouting was found to be more effective than flight scheduling at avoiding en route weather hazards when the scheduling algorithms used weather impacted sector capacities as a proxy for weather location. In general, the distribution of the delays amongst the users was found to be most equitable when scheduling flights using a heuristic scheduling algorithm, such as ration-by-schedule. On the other hand, equity decreased by 77% when using a scheduling algorithm that took into account the number of seats aboard each flight. Interestingly, traffic flow management solutions that included scheduling and rerouting increased the equity of the solutions by 9% to 18% over comparable solutions that involved flight scheduling alone. Finally, the modeled results were compared with actual levels of delay, sector congestion and the number of weather incursions under three historical convective weather scenarios. The agreement between the modeled and actual results was found to be strongly dependent on the weather scenario and the number of constraints that were binding in the scheduling algorithm.

Developments Towards Trajectory Based Operations in Arrival Management at Schiphol Airport

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Air Traffic Control the Netherlands (LVNL) supports the Single European Sky ATM Research (SESAR) in the implementation of Trajectory Based Operations (TBO). A key TBO-component for LVNL is to achieve more environmentally friendly arrivals by introducing Continuous Descent Approach (CDA) in the Terminal Area (TMA) during daytime along fixed Precision Area Navigation (P-RNAV) routes. Simulations and calculations demonstrated decreased controllers’ workload and reductions in noise nuisance for use of P-RNAV routes and in fuel burn for CDA operations.

To realize CDAs flown along P-RNAV routes, more predictable and stable arrival traffic flows are needed. Therefore, more accurate delivery of flights at the Initial Approach Fix (IAF) is required. LVNL is developing a decision support tool (Speed and Route Advisor - SARA) for controllers in the Area Control Centre. Simulations show that the reached accuracy of the target metering time window at the IAF can enable CDA along TMA P-RNAV routes.
Expanding Regional Airport Usage to Accommodate Increased Air Traffic Demand

Carl R. Russell

Small regional airports present an underutilized source of capacity in the national air transportation system. This study sought to determine whether a 50 percent increase in national operations can be achieved if demand growth at large hub airports is limited, as is current practice for a small number of airports in the United States. Instead, traffic levels were grown at the surrounding regional airports. This demand scenario for future air traffic was generated and used as input to a 24-hour simulation of the national airspace system. Results of the demand generation process and metrics predicting the simulation results are presented, in addition to the actual simulation results. The demand generation process showed that sufficient runway capacity exists at regional airports to offload a significant portion of traffic from hub airports. Predictive metrics forecast a large reduction of delays at most major airports when demand is shifted. The simulation results then show that offloading hub traffic can significantly reduce nationwide delays.

Deriving Ratios in Aviation Safety Analysis when Data Unavailability Precludes Probability Normalization

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Specifying rates or probabilities of safety events in aviation requires careful explication of the denominators or baseline numbers. Often the appropriate data are missing from the database that is used, and such data can be difficult to obtain. This can lead to stating rates and probabilities using inappropriate denominators for what is being implied, a problem well understood by statisticians. This paper uses runway incursion operational error data to illustrate this problem, and suggests how, though absolute probabilities may not be specifiable, nevertheless by using a simple contingent probability manipulation known as Bayes’ rule meaningful probability ratios can be derived.