The Impact of September 11, 2001 on United States Aviation

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By August of 2001 U.S. air travel was already in decline as a sluggish economy had dampened passenger demand. Then the events of September 11, 2001, like none before in aviation history, dramatically decreased air traffic activity in the weeks that followed. The sharp post-9/11 decline and the reasons for it were obvious and generally well understood. But what about long-term structural changes to patterns in National Airspace System (NAS) traffic flows? What were the post-9/11 changes and to what extent did the NAS return to pre-9/11 operation levels in the following six months?

Employing a variety of data sources, we found a 15% drop in air carrier airport operations (arrivals and departures) due to 9/11 through February 2002. We also found a 4% drop in air taxi operations, a 7% drop in general aviation operations, and a 9% drop in total operations. Air Route Traffic Control Center operations dropped 6% due to a 14% drop in air carrier operations. These reduction numbers have been discounted for both seasonal variations in traffic as well as the softening economy in 2001 prior to 9/11. Three initial observed responses in scheduled airport operations were elimination of the last bank, fewer operations throughout the day, and removal or shifting of banks throughout the day. Where the last bank was eliminated, March 2002 data indicated these were returning. Arrival delays initially fell to 30% of October 2000 levels and remained below half of the previous year’s rates through February 2002. There was also a significant reduction in both airborne and taxi times due to fewer flights and less airspace congestion. This study serves as a snapshot of the effects of 9/11 on U.S. aviation six months afterwards.


Simulation of IFR Helicopter Operations in the Gulf of Mexico Low-Altitude Airspace

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This paper describes a model and simulation of offshore Instrument Flight Rules (IFR) helicopter operations originating from Intracoastal City, Louisiana, into the Gulf of Mexico. The existing en route airspace structure of Houston Center’s Offshore Sector below 7,000 ft, and the instrument approaches at Intracoastal City, both based on Global Positioning System navigation, were modeled in detail. The established Air Traffic Control (ATC) procedures of Lafayette Approach Control (LFT) and Houston Center were modeled to ensure that the simulated traffic flows reflected those that are followed in actual IFR operations. Three scenarios were simulated, one scenario in the existing, predominantly non-radar environment, and two in hypothetical radar environments. The results of these simulations were used to evaluate the capacity improvements gained through introduction of radar and direct pilot/controller communication into the terminal and the en route areas of the Gulf of Mexico. The baseline scenario results indicate that there were significant delays attributable to capacity constraints at Intracoastal City. A large delay reduction was obtained by adding the terminal-area radar and a further reduction in delays was obtained by adding the en route radar.

Arrival Predictability Visualization

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In analyzing arrival predictability in the National Airspace System (NAS), it is essential to understand the complex relationships between the various processes involved. Taxi-out times, departure time, and delay propagation each have a compound effect on the actual arrival time of a flight. Arrival predictability is important to Traffic Flow Management (TFM) specialists whose responsibility it is to ensure maximum utilization of airport arrival capacity, which involves the accurate anticipation of future arrival demand. This paper presents a new visualization technique with which TFM specialists and Air Traffic Control Systems Command Center (ATCSCC) analysts will achieve a more detailed depiction of the variables that affect arrival predictability. This visualization technique supports three conclusions of our analysis. Foremost, arrival compliance depends heavily on the chosen definition for compliance. Secondly, when the control time of arrival (CTA) at departure is compared to the actual arrival time, arrival compliance depends almost entirely on departure compliance. Finally, en route uncertainties show little dependence on departure compliance.


Slot Swapping Applications for Collaborative Decision Making

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Collaborative Decision Making (CDM) is about improving the way different actors in the handling of air traffic (ATM service providers, airlines, airport authorities, pilots, etc.) cooperate at an operational level. In this paper, we consider slot swapping, one of the CDM applications for slot allocation. Slot swapping allows airlines to prioritise flights by exchanging the time slot of one flight with the time slot of another flight. This can, for example, take place when there is a commercially sensitive flight (e.g. with many transfer passengers) with a long delay and there is the possibility of advancing this flight by simultaneously delaying another flight.

The development of slot swapping in Europe is still in its initial phase. EUROCONTROL studies give a preliminary description of a slot swapping application based on the Most Penalising Regulation as well as a description of an application in which swaps can be performed on flights encountering exactly the same regulations in the same order. This paper addresses a more general way of slot swapping. Three different applications for slot swapping are presented: swap at departure time, swap at sector arrival time, and swap at load contribution. The swap at load contribution is the most general, which in fact includes the other applications. For each application, a formal description of feasible swaps is given, which then provides an algorithm for finding swaps. The three algorithms have been implemented in a prototype. The computational results obtained from this prototype look promising.