

Air Traffic Control Quarterly Abstracts
Volume 13 Number 3

Effect of Surface Surveillance Data Sharing on FedEx Operations at Memphis International Airport

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Airlines can optimize surface operations using real-time surface surveillance data. The Federal Aviation Administration (FAA) Technology Development Office (formerly Safe Flight 21 and Surface Technology Assessment) began examining the operational impacts of surface surveillance data sharing in current and future FAA tools. This study investigates the operational impact of surface surveillance data provided to Federal Express (FedEx) at Memphis International Airport (MEM) through a joint FAA/ National Aeronautics and Space Administration (NASA) project. We first use an unexpected loss of surface surveillance data as an opportunity to gauge impacts. The analysis measures changes in taxi-out times, queue lengths, and departure rates before, during, and after the surveillance outage. We repeat the analysis comparing a baseline period before implementation of surface surveillance with a post-implementation period. Analyses of both data sets displays a reduction in taxi-out times and indicates an increase in effective departure capacity (approximately 5-10 aircraft per hour greater) during times when surveillance was available.

Estimating And Exploring Sources Of Temporal Deviations From Flight Plans

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We analyzed readily available Federal Aviation Administration (FAA) data on daily average flight times between major US airports. By subtracting out expected flight times and organizing the resulting deviations by origin and destination, we were able to identify unusual conditions and trace their sources. This approach facilitates detection of trends and anomalies in the National Airspace System (NAS) and opens up new possibilities for automated next-day analysis of operational problems. We arranged the deviations data as a two-way table and decomposed the average deviation in each cell as $\text{Deviation} = \text{System Effect} + \text{Origin Effect} + \text{Destination Effect} + \text{En route Effect}$. Least absolute deviations (LAD) estimation was chosen as the best method to analyze the FAA data. We studied the distributions of the four components of deviations as well as various relationships between them. This approach revealed some interesting phenomena, including the fact that certain airports work in a regime of being either a good origin or a good destination on any given day and the fact that geographically close airports track each other's problems in terms of their terminal effects.

A Hierarchical Probabilistic Approach for Risk Assessments of an Aviation Safety Product Portfolio

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Given the current accident rate, the number of fatal accidents is projected to increase in the next several years emphasizing the need for advanced aviation safety research. An initial attempt to develop a generic Aviation System Risk Model (ASRM) suggested that the modeling approach lacked a fully developed contextual domain. Following this initial ASRM, an operational/maintenance ASRM prototype was developed based on case studies of specific aircraft accidents. Past and current research efforts focus on multiple case designs in the context of an aviation accident category and consider case study models in isolation. As a consequence, each risk model yields its particular result and the aviation system risk is interpreted based on multiple different, yet isolated results. The approach adopted in this paper extends the conventional methodology used in previous research efforts and provides a higher-order model by considering the holistic nature of the aviation system. A new meta-case that combines different cases to obtain a single numerical value, termed the safety enhancement value, can be designed using this methodology. The approach suggested in this paper presents a novel application in the aviation safety domain and offers significant promise for risk assessments of an aviation safety product portfolio. While an aviation maintenance-related accident category is used for illustrative purposes, aspects of the modeling approach that connect with organizational factors in the Air Traffic Control (ATC) domain are also addressed.