

Operations Management Seminar

Managing Air Traffic Disruptions Through Strategic Prioritization

Professor Douglas Fearing
Harvard University

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Abstract

The impacts of schedule disruptions in the U.S. air transportation system are substantial, with a recent study estimating the costs of congestion and delays at over \$30 billion for domestic operations in 2007. On the day of operations, if demand is expected to significantly outstrip available capacity (e.g., due to a severe storm), the Federal Aviation Administration implements air traffic flow management initiatives to safely resolve these imbalances. The most common measure enacted is a ground delay program, in which arrival slots into a congested airport are rationed to meet the projected capacity constraints. The assigned arrival slot determines the delay for each flight, which is realized as ground holding at the origin airport. The current approach for allocating arrival slots, ration by schedule, treats impacted flights equivalently regardless of the aircraft size, passenger load, mix of connecting passengers, etc. We extend this approach to develop a prioritized rationing scheme, *ration by prioritized schedule*, and show that significant benefits can be achieved through a prioritized allocation, even in the face of airline recovery responses. Subsequently, we develop a *strategic prioritization* game – a non-monetary, market-based scheme for allocating flight priorities that allows airlines to trade-off priorities across airports. In addition to demonstrating nice equilibrium properties, we show that our bidding and allocation scheme is capable of achieving some of the demand-management benefits of congestion pricing, which has been widely studied in the literature but has met with significant resistance in practice.

Speaker's biosketch:

Douglas Fearing is an Assistant Professor in Technology and Operations Management at the Harvard Business School. His research focuses on developing and applying analytical techniques for data-driven decision-making in the airline industry, sports management, and humanitarian logistics.

Douglas received his Ph.D. in Operations Research from the Massachusetts Institute of Technology in 2010, and his dissertation on air traffic flow management received the 2011 INFORMS Aviation Application Section Dissertation Prize. After earning his bachelor's degree in computer science at Carnegie Mellon University, Douglas spent five years at Trilogy, a software company in Austin, Texas, working on engagements with Ford, British Airways, and Goodyear. Building on his sports management research, he has consulted for Titleist and the Tampa Bay Rays.