Mitigation of Terminal Delay Through En-Route Speed Control

James C. Jones, David J. Lovell and Michael O. Ball

jonesjc1@umd.edu

University of Maryland

Abstract

In recent years heavy demand for air travel coupled with limited airport capacity has led to significant delays within the terminal airspace surrounding many airports across the country. Weather fluctuations introduce additional capacity constraints that exacerbate the issue. In the U.S. there is no operational coordination of the arrival times of flights, until the traffic management advisor (TMA) system exercises control in the general vicinity of the airport (starting approximately 250 nmi out). As a result, flights often accelerate their routes to make their scheduled arrivals times only to be vectored off in terminal airspace to temporarily stem the flow of traffic into the destination airports.

In this talk, we present an approach for transferring delay away from the terminal to the en route phase of flight. We propose a multi-objective integer programming model designed to assign delays to flights well in advance of the terminal. The IP model weights an objective of fuel savings and throughput to assign controlled times of arrival to flights 500 nmi from the airport. A series of trade studies is performed to evaluate our concept. First, the model is tuned by developing a Pareto Frontier to identify weight factors on our objective function. We demonstrate that the model can effectively transfer delay en route. This transfer holds up even with relatively moderate carrier compliance. We go on to demonstrate that this delay transfer yields significant fuel savings benefits on a per flight basis.