A General Approach to Equity in Traffic Flow Management and its Application to Mitigating Exemption Bias in Ground Delay Programs

Thomas Vossen, Michael Ball, Robert Hoffman, and Michael Wambgsanss

A primary objective of the FAA’s ATM functions is to provide fair and equitable access to the National Airspace System. Traditionally, the FAA has interpreted fairness as prioritizing flights on a “first-come, first-served” basis. The allocation procedures introduced under Collaborative Decision Making (CDM), however, represent a departure from this paradigm: allocations are based on carriers’ original flight schedules. The concept of fairness under CDM is largely left implicit in the procedures. Different and even conflicting concepts are sometimes used to describe these procedures. Moreover, the achievement of equitable allocations is often complicated by practical considerations. This paper describes a general framework for equitable allocation procedures within the context of ATM, and illustrates its use in reducing certain systematic biases that exist under current procedures. We also discuss other applications of this approach, and summarize practical considerations and implementation issues.

The Impact of Voice, Data Link, and Mixed Air Traffic Control Environments on Flight Deck Procedures

Sandy Lozito, Savita Verma, Lynne Martin, Melisa Dunbar, and Alison McGann

A simulation was conducted at the NASA Ames Research Center to compare how crews handled voice and data link air traffic control (ATC) messages in a single medium versus a mixed voice and data link ATC environment. The interval between ATC messages was also varied to examine the influence of time pressure. Results indicated that for messages sent via voice, transaction times were lengthened in the mixed media environment for closely spaced messages. The type of environment did not affect data link times. However, message times were lengthened in both single and mixedmodality environments under time pressure. Closely spaced messages also increased the number of requests for clarification of voice messages in the mixed environment and review log use for data link messages. Thus, when time pressure is introduced, the mix of voice and data link does not necessarily capitalize on the advantages of both media. These findings emphasize the need to develop procedures for managing communication in mixed voice and data link environments.
Reducing Severe Weather Delays in Congested Airspace With Weather Decision Support for Tactical Air Traffic Management

James Evans, Michael Robinson, Bradley Crowe, Diana Klingle-Wilson and Shawn Allan

Reducing congested airspace delays due to thunderstorms has become a major objective of the FAA due to the recent growth in convective delays. In 2000 and 2001 the key new initiative for reducing these convective weather delays was “strategic” traffic flow management (TFM) at time scales between 2 and 6 hours in advance using collaborative weather forecasts and routing strategy development. This “strategic” approach experienced difficulties in a large fraction of the weather events because it was not possible to forecast convective storm impacts on routes and capacities accurately enough to accomplish effective traffic flow management. Hence, we proposed in 2001 that there needed to be much greater emphasis on tactical air traffic management at time scales where it would be possible to generate much more accurate convective weather forecasts.

In this paper, we describe initial operational results in the very highly congested Great Lakes and Northeast Corridors of using weather products from the ongoing Corridor Integrated Weather System (CIWS) concept exploration. Key new capabilities provided by this system include very high update rates (to support tactical air traffic control), much improved echotops information, and fully automatic 2-hour convective forecasts using the latest “scale separation” storm tracking technologies. Displays were provided at major terminal areas, en route centers in the corridors, and the FAA Command Center. Substantial reduction in delays has been achieved mostly through weather product usage at the shorter time scales. Our studies of operational benefits in these congested corridors have raised several interesting questions about the conceptual framework for traffic flow management.

A Phased Approach to Increase Airport Capacity Through Safe Reduction Of Existing Wake Turbulence Constraints

Steven Lang, Anand D. Mundra, Wayne W. Cooper, Jr., Benjamin S. Levy, Clark R. Lunsford, Arthur P. Smith III, and Jeffrey A. Tittsworth

Previous wake turbulence research has suggested that using knowledge of wake turbulence behavior to develop candidate arrival and departure procedures would increase capacity at a variety of United States airports. This paper outlines the operational issues involved as well as the process through which the Federal Aviation Administration (FAA) and The MITRE Corporation’s Center for Advanced Aviation System Development (MITRE/ CAASD) analyzed an evolving set of candidate procedures. This work is part of the broader effort to implement an FAA/National Aeronautics and Space Administration (NASA) Wake Turbulence Research Management Plan (RMP).

We describe in detail two candidate procedures, their operational variations and the expected capacity benefits at selected airports. The first procedure is a near-term proposed change to the 2500 foot runway centerline separation minimum for dependent approaches to two Closely Spaced Parallel Runways (CSPR). When visual separation can not be provided, the current FAA rule requires parallel runways spaced less than 2500 ft to be treated as a single runway. While in-trail wake separation standards are dependent on wake categories of the generating and encountering aircraft, this rule is not. This paper shows that, by refining this standard to reflect the wake generation differences of different weight classes, substantial capacity benefits may be possible. Variations on this procedure are analyzed to explore the sensitivity of the capacity benefits to the underlying assumptions.

The second procedure is a mid-term proposed change to reduce wake constraints for departures from parallel runways spaced closer than 2500 ft using a short-term prognosis of crosswinds at and near the area of aircraft rotation. A brief outline is provided of activities planned during 2004 to advance towards the specific design and implementation of these procedures. Once such activity is additional wake data collection at St. Louis (STL).