Foreword
Air Traffic Management:
ATM-2005

This is the third time that the Air Traffic Control Quarterly has published the best papers from the continuing series of USA/Europe Seminars on Air Traffic Management Research and Development. This Foreword reviews the selection process, provides a thumbnail of the key contributions of each paper, and then concludes with a short editorial in the context of these papers.

The seminar, the sixth in the series, was held in Baltimore during June 2005. A total of 132 papers were submitted, and 69 of those papers were selected. The selected papers were divided into 10 tracks: Metrics and Performance Management, Airspace Management, Decision Support Tools, Safety, Airport Management, Environmental Impact and Mitigation, Innovative ATM Concepts, Air Ground Cooperation, Traffic Flow Optimization, and Human Factors.

The Symposium Program Committee that was responsible for paper review and selection picked the best paper in each track, which resulted in eleven best Seminar papers (a tie occurred in one track). Each of the best-paper authors was recognized at the Seminar. The best paper from the Airport Management track (Benefits of Advanced Surface Movement Guidance and Control Systems (A-SMGCS) by C. Meier, J. Jakobi, P. Adamson, S. Lozito, and L. Martin) was published in a special issue of the Quarterly on airports (volume 13, number 4), so it was not considered here.

Six members of Quarterly’s Editorial Board, along with the Guest Editor, then ranked the ten remaining papers. The top five were selected for consideration in the Quarterly. Each of these authors agreed to have their paper peer reviewed for possible publication. Authors submitted revisions based upon the reviews, and those papers are presented in this Special Issue. Those papers, the associated track, and a brief synopsis, are:

Safety track


A preliminary, fault-tree analysis was performed on a proposed method for using automation, instead of human controllers, to provide separation assurance in certain en route airspace. The combined risk of the four fault types examined was estimated to be 1.8E–12 per hour, which was considerably below the target design of 1.0E–9 per hour.
Environmental Impacts and Mitigation track


In this paper, it was found that predicting separation for a mix of decelerating and constant-speed aircraft might increase controller workload, which could result in offsetting throughput reductions. An analysis and experiment led to a suggestion of standardizing the deceleration profiles so that the associated intent could ease controller workload.

Air Ground Cooperation track


A simulation compared performance and workload differences among the conditions in which the cockpit or the ground were aided with tools to maintain spacing for arrivals on flight management system routes. Spacing accuracy improved when spacing tasks were delegated to the equipped cockpits. Controllers rated their workload higher when they delegated spacing tasks to the aircraft versus when they did not; however, it was suggested that additional tool maturity might allow for increased controller acceptance of airborne spacing.

Decision Support track

*Quantifying Convective Delay Reduction Benefits for Air Traffic Management Systems*, by J.E. Evans, M. Robinson, and S. Allan.

This paper presents the difficulties that have arisen to date on measuring how useful new operational weather systems have been in reducing flight delays. Based on the experience gained, recommendations to evaluate future weather system benefits include interviewing operational users followed by detailed case analyses, analyzing flight tracks before and after system installation, and normalizing delay statistics with a convective weather metric.

Airspace Management track


A workload model was derived from simulation data in two dissimilar airspace regions using a cross-sectional time-series analysis. Key components in the model were developed from interviews with controllers. It was found that variables that best predict controller
workload are different during peak traffic hours than during nonpeak traffic hours.

It is difficult to glean a particular research theme from these papers, as they were selected from a distributed set of tracks. However, readers will note that results based on analysis or simulation are provided in four of the five papers. This percentage is a reasonable sample of the Seminar, since results in 59 of the 69 papers were based on analysis or simulation. In the paper that used real-world operational data in an attempt to determine the benefits of technology introduced into the national airspace, the difficulty of determining cause-and-effect was highlighted. Often a controlled study is needed to overcome that difficulty, which can be a complicated proposition in air-traffic management.

Part of the predominance of analysis and simulation papers is due to the natural order of advanced system development; however, many would agree that prior to making the considerable investment to introduce those technologies, one or both of two avenues needs additional attention. The first avenue is to use high-fidelity simulation – higher than available today – to better inform decision makers. Many “unknown unknowns” are revealed today when concepts are taken from simulation to the real world. So, the attendant risk of simulation results needs to be reduced if additional reliance is placed on them for decision making. The second avenue is to conduct operational field trials. These trials are extensive undertakings, can be expensive, are often relatively inflexible (which could be challenging for evaluating significant paradigm shifts), but they inspire confidence.

The reader will note that this discussion of the relative reliance on simulation versus real-world testing is far from new in aerospace research and development. However, for dynamics as complex as those in the national airspace system, this is a matter requiring urgent consideration and careful thought if the objectives of a next-generation system are to be met in a timely manner. It is reasonable to expect that the recent joint planning efforts in both the U.S. and Europe will support the case for making the needed investments in either or both of these avenues.

Jeffery A. Schroeder
Guest Editor
Jeffery.A.Schroeder@nasa.gov