Andrew J. Ryan October 12, 2000

PaperTitle: *Assessing the Benefits of Collaborative Decision Making in Air Traffic management*

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Air Transportation -- Dr. Donohue

This paper takes a look at the benefits of (Collaborative Decision Making (CDM) in air traffic management (ATM). Interestingly, the authors were all major players in designing and implementing the paradigm of CDM that is in use today. Of particular note is that Mike Wambsganss was so involved with CDM that he has been dubbed the 'Mother of CDM.' By definition, CDM is an effort to improve air traffic management through information exchange, procedural improvements, tool development, and common situational awareness. To date, the main focus of CDM has been Ground Delay Program Enhancements (GDP-E). In January of 1998 prototype operations went into effect in San Francisco (SFO) and Newark (EWR) where the use of the Flight Schedule Monitor (FSM) was used by the ATSCC to monitor airport demand and to conduct ground delay programs (GDPs). Airlines and controllers alike have found FSM (the CDM decision support tool) to be extremely helpful in improving the execution of GDPs and providing accurate information which helps airlines react in an optimal manner. Both parties note that the on-going meetings between the FAA, airlines, and FSM developers have aided in making the tool so effective.

In an attempt to quantify the effectiveness of FSM (and CDM in general), the authors defined a few metrics. The first one examined was the Integrated Predictive Error (or IPE). IPE is a weighted average of the errors in a stream of predictions made over time for a single event. The data shows that over a 30 - month period (January 1997 to June 1999), during GDP days, the average error in departure prediction d*ropped* progressively from beginning to end.

A second measure was done for timeliness of flight cancellation messages. This basically looks at how long it takes for an airline to notify the ATCSCC of a flight cancellation.[1] Using the times listed in the Official Airline Guide (OAG), the authors investigated the difference between cancellation times in two cases: (a) with CDM messages and (b) without CDM messages at SFO and EWR between January 1998 and May 1999. It revealed that the average cancellation notice was received 29 minutes *after* the departure time noted in the OAG without CDM, but 48 minutes *before* the departure time in the OAG with

[1] Before CDM, there was no automated mechanism for this to occur.

CDM. Moreover, these numbers are considered conservative figures since the normal default time for an inactive flight to be set to 'cancelled' is 120 minutes.

Outside of the quantitative measures above, CDM has also fostered positive gains in GDP planning which ultimately results in more effective GDPs. We will discuss a few of these CDM benefits.

- *Compression Benefits*: the compression algorithm (which is unique to CDM) eliminates vacant slots and reduces overall delay. Before compression, airlines would receive a double penalty if they were not able to make their assigned arrival slot.
- *User reported benefits*: CDM provides each airline with greater capability to control the allocation of unavoidable delay among their flights. Airlines have canceled flights at their hub in a response to a predicted GDP which have then eased arrival demand and making the GDP inessential.
- *Rate Control Index* (RCI): This is a new metric which measures the flow of air traffic into an airport and compares it to the targeted flow that was set by the traffic flow managers at the ATCSCC during a ground delay program. RCI figures from April 1997 to March 1999 have shown promise, but are still statistically insignificant due to small sample size.
- *Miscellaneous Added benefits*: Capabilities falling under this category include GDP revisions, near term GDP cancellations and impact on overall airline decision making. Each of these areas has been improved due to CDM.

Moving forward, a synergy has been realized between CDM and en-route airspace management. Tools are now being prototyped and tested to leverage CDM experience into this area.

Personal Comments:

This was the best paper of the section. It provides in depth analysis with an economic angle. It also reveals ‘insider’ information on how both the airlines and the ATCSCC use CDM. Finally, the paper also includes current information on future developments and on-going research.