

RESEARCH BRIEF

INCREASING FAIRNESS AND EFFICIENCY WITH DISTANCE-BASED GROUND DELAY PROGRAMS

The potential

Available distance-based ground delay program has the potential to enhance the efficiency and equitability of current ground delay programs, further reducing flight arrival delays in the U.S.

The challenge

In recent years, air traffic has experienced a dramatic increase, which has not been accompanied by corresponding development of airports and related systems. As a consequence, both the European Airspace System and the United States National Airspace System (NAS) are suffering from increased congestion.

A short-term strategy for reducing or eliminating air traffic congestion is delay in the form of ground delay. The Ground Delay Program (GDP) is a mechanism used to decrease the rate of incoming flights into an airport when it is projected that arrival demand will exceed capacity.

In a GDP, take-off is delayed beyond a flight's schedule departure time. The reasoning is that as long as a delay is unavoidable, it is safer and cheaper for the flight to absorb this delay on the ground rather than in the air. Under a GDP, a set of flights destined for a single airport is assigned ground delays.

Starting in 1998, GDPs have been planned and controlled using the Collaborative Decision Making (CDM) framework. CDM is based on the belief that air traffic flow management can be improved if there is a closer collaboration between the FAA and the airlines and other airspace users, with large benefits for all parties.

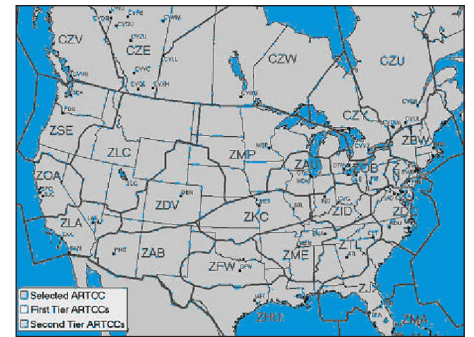
This collaboration takes the form of mutual exchange of data and more flexible and efficient collaborative procedures.

The user community does not consider the current GDP program as efficient and equitable as it could be. It is based on an inflexible, fixed boundary geo-

graphic tier system. This is a legacy system originally created for organizational structure purposes.

The distance-based ground delay program

Modern information technology allows the creation of more flexible communication and control strategies. The concept of a "distance-based GDP" has emerged from the CDM working group. Average delay, as well as maximum delay, decreases with distance, while unrecoverable delay has an increasing trend.



The National Airspace System is divided into 20 centers. A distance-based ground delay program is one that only applies to flights whose origin airports are less than a prescribed distance, d , from the destination airport.

Under a distance-based GDP, only flights whose origin airports are less than a prescribed distance, d , from the destination airport are included in the program (i.e. are eligible to receive a ground delay). *ISR researchers have developed an optimization model that sets this d parameter.*

The research

The different distance-based GDP options are defined by drawing a circle around the GDP airport and including all enclosed airports in the program. All flights whose departure airport is within the circle and whose arrival time is within the GDP time period might be assigned a ground delay.

Alternative programs may be obtained by increasing or reducing the radius of the circle. Increasing the radius of the circle (including more airports in the program) enlarges the pool of flights that receive ground delay and leads to a decrease in airborne delay.

Beyond a certain distance, the airborne delay is almost constant. This level of airborne delay provides

a threshold on the set of feasible distances, since a program distance shorter than the point where airborne delay levels off is not allowed, because the amount of airborne delay is viewed as being unnecessarily high.

Status

ISR researchers' model and analysis have shown that the use of distance-based GDP can substantially improve GDP quality. This approach has been implemented and is being integrated into a future release of FSM, the CDM decision support tool.

Research team

Michael Ball (ISR/BGMT) and Guglielmo Lulli (University of Rome "La Sapienza")

Contact

Michael O. Ball

Professor
Robert H. Smith School of Business and ISR
4311 Van Munching Hall, University of Maryland,
College Park, MD 20742

Phone: 301-405-2227

Fax: 301-314-9920

Email: mball@rhsmith.umd.edu

Web: <http://www.isr.umd.edu/NEXTOR/index1.html>

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