

Exploring Obstacles to Collaborative Weather Rerouting/ Congestion Management

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FAA/MOIE

**MITRE
Technology
Program**

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Problem

- **General philosophical agreement exists on high-level concepts for FAA/air carrier collaborative congestion management.**
- **Progress has been made (e.g., Collaborative Convective Forecast Product, Strategic Planning Office).**
- **Current efforts focus on near-term (next 2-3 year) mitigation strategies.**
- **Longer-term (5-10 year) capabilities and procedures are needed, unconstrained by current capabilities.**

Background

**FY 1999
Weather Rerouting
Research**



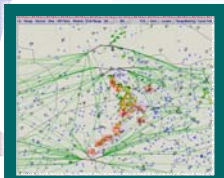
**Feasibility of aircraft/weather conflict
detection**

**FY 2000
Weather Rerouting
Research**



**Requirements on weather forecasting for
air traffic management applications**

**FY 2001
Automated Weather
Problem Resolution
Research**



**Algorithms for equitable allocation and
volume management**

**FY 2002
Issues in Congestion Management
Research**

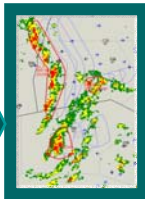


Problem Space

- Information
- Infrastructure
- Operational Capabilities

Solution Space

- Increase Capacity
- Manage More Efficiently
- Offer Economic Incentives
- Offer Service Options



**FY 2002
Automated Capabilities
for Congestion
Management
Outcome 4**

Automated weather flow constrained areas

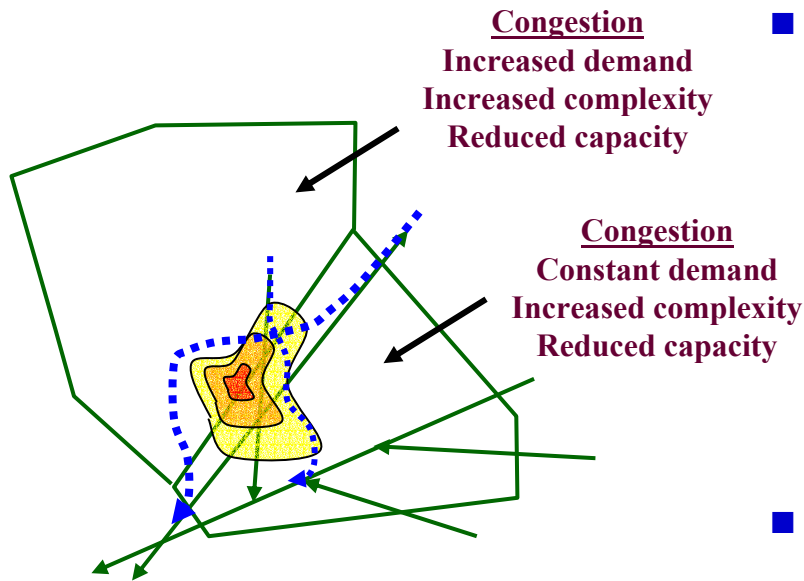
Objective

- **Identify congestion management issues and opportunities**
- **Investigate alternative philosophies for congestion management**
- **Define/recommend potential research for future procedures and tools**

Activities

- **Characterize congestion management philosophies from FAA and international initiatives, solicited input, other disciplines**
- **Establish best estimates of future technological capabilities/limitations**
- **Identify congestion management issues and postulate mitigation approaches**
- **Co-sponsor second workshop on aviation weather for air traffic management: requirements, metrics, state-of-the-science**
- **Identify/propose future research ideas**

Highlight

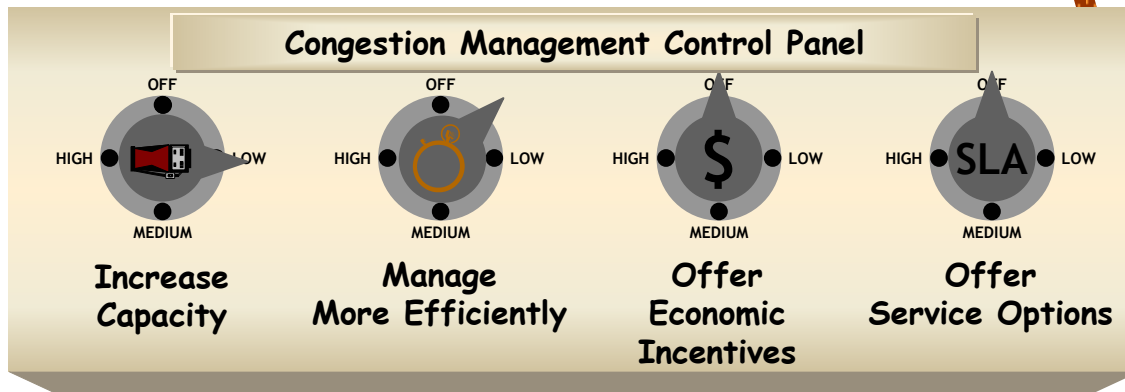
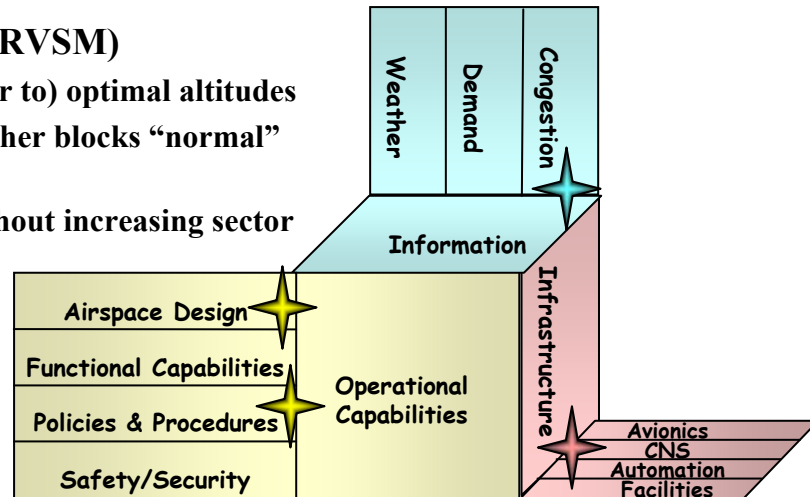


- Capacity is the maximum number of aircraft that can safely occupy a sector
 - Conforming to flows defined by sector design and procedures
 - During fair weather
 - With a certain staffing level (controller positions and qualifications)
 - When communications, navigation and surveillance (CNS) capabilities and computer automation are completely operational.
- The real capacity of a sector is effectively reduced when any of these assumptions are violated.
- Congestion occurs when demand exceeds real capacity:
 - Traffic flows conform to sector design but the volume of traffic exceeds capacity.
 - A significant amount of traffic does not conform to sector design, thereby increasing complexity and reducing capacity; even typical demand volume exceeds real capacity.
 - An event, such as severe weather or an equipment outage, reduces capacity, and demand exceeds the resulting real capacity.

Demonstration

- **Reduced Vertical Separation Minima (RVSM)**

- Can increase user flexibility to fly (closer to) optimal altitudes
- Can increase usable airspace when weather blocks “normal” altitudes
- BUT can increase sector complexity without increasing sector capacity
 - Sector controller cannot automatically handle 2 X traffic volume
 - Special complexity at boundary between RVSM and non-RVSM



Impacts

- **Influence CAASD/FAA work and research programs in**
 - **Alternate approaches to congestion management**
 - **Requirements and metrics for weather products for air traffic management decision support systems**

Future Plans

- Workshop on requirements and metrics for weather products for air traffic management decision support systems
- Issue papers
 - Problems
 - Proposals
- Recommendations for further research and development

