Corridor Integrated Weather System

(CIWS)
Outline

- Example of Weather Impacting Air traffic
  - Impacts on worst delay day

- Ways to reduce delay
  - Improve forecasts
  - Aid traffic flow management
Aviation Delay Problem

Aviation Weather Delays

Causes of NAS Delays in 2004

- Closed Runway: 4%
- Equipment: 1%
- Other: 5%
- Weather: 76%
- Volume: 14%

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US Air Traffic Density

Thunderstorm Impacts

- Thunderstorms cause fatalities and severe injuries at a cost of $8.1M/yr
- Convection responsible for 40% of delay costs: $840 – 920 M/yr
- Approximately 40% of thunderstorm delay possibly avoidable ($336-368 M/yr)
FAA Corridor Integrated Weather System
Improving Tactical Convective Weather Forecasts for Aviation

Plan CIWS capability across CONUS by 2007
Identified CIWS Benefits in 2003

- Intensive benefits analyses in 2003 & 2005
  - Annual benefits estimates are from ’03
  - Increase expected based on ’05 analyses

Relative Frequency of Benefits Categories

- Improved Arrival Transition Area Management
- Routes Open Longer $89M
- Interfacility Coordination
- Situational Awareness
- Proactive Reroutes $37M
- Reduce Workload
Comparison of CIWS Product Usage in 2003 and 2005

Keeping Routes Open Longer

- Note increased use of Precip Forecast and importance of Echo Tops information
- Initial use of Echo Tops Forecast in 2005 surpasses use of Precip Forecast in 2003

Proactive, Efficient Reroutes
CIWS Benefits Comparisons
ARTCCs With and Without CIWS Displays in Areas

- Much higher benefits at ARTCCs with CIWS displays in TMU and Areas

  - ZMP ARTCC new CIWS ‘user’ in 2005
    - Benefits lagged other ARTCCs with CIWS in TMU and Areas as 2005 was first SWAP season with CIWS and user “burn-in” period was expected

- For ARTCCs with no CIWS in Areas, significantly more benefits realized at ZBW
  - Compensated for lack of CIWS in Areas through increased use in TMU
  - ZBW operational benefits still lagged benefits at ZDC and ZOB (ARTCCs with similar TMU CIWS experience, but CIWS also in Areas)

** Includes most significant CIWS en route delay reduction benefits categories + FAA staffing assistance category
Recipe for Bad NAS Delay Day

1. Impact NY TRACON directly
2. Disrupt E-W flow in Corridor
3. Impact DC and Atlanta simultaneously
4. Make the weather impact last for hours

- 13 July 2005 had all these ingredients!
  - Worst single day delay in FAA history
    - For 35 OEP pacing airports
      - 1624 delays recorded
      - 2017 total hours of delay
      - Average delay of 74 min per flight
    - Hurricane Dennis remnant in central US
    - Convective weather along east coast
Example of Air Traffic Impacts by Weather

Worst Delay – day in FAA history – 13 July 2005

Flights at or above 16,000 Feet
Western weather caused by remnant of hurricane Dennis
CIWS 1-hr Forecast Performance

Correct Forecasts  Failed to Forecast Decay  Failed to Forecast Growth

• All significant storm elements forecast very well
CIWS 2-hr Forecast Performance

- Correct Forecasts
- Failed to Forecast Decay
- Failed to Forecast Growth

- Large storms forecast less well - more growth & decay missed
Reducing Weather Impact Delays

• Recognize some delay is unavoidable
  – Develop model to calculate optimal routing given weather, traffic
  – Compare “actual” routing to “optimal” to fairly measure delay

• Improve forecast products
  – FAA Aviation Weather Research Program is
    Improving storm growth & decay in 0-2 hr tactical forecasts
    Developing automated 2-6 hr strategic forecasts
  – Research results directly improve CIWS products

• Aid traffic flow planning in complex weather scenarios
  – Provide common situational awareness
  – Couple forecasts with decision support tools
Ongoing Research to Improved Forecasts

**Enhanced Winter Forecast**

- 0-2 hr Precipitation Phase Forecast
- Snow Mix Rain

**Growth of New Storms**

- Use of Satellite Growth Evidence
- Knowledge of Frontal Forcing

CIWS Winter Mode Forecast