

RADAR and Integration

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Why - The Delay Cost



- ATA numbers

- 86.5 million delay minutes
- \$6.2 billion direct operating costs for airlines (exceeds projected 2005 industry losses!)
- Social Productivity cost

Weather Basics

- Drivers – Safety, Capacity, Efficiency/Emissions
- Primary Players - Meteorologist, Dispatcher, Pilot, & Controller
- Hazards – Turbulence, Lightning, Ice, Ash
- Solution Components
 - Forecast = BEFORE
 - Tactical/Now cast = DURING
 - Reporting = AFTER

Current State

- Weather causes a significant % of delays
- Weather impact - broadly defined
- Confusion between Display and weather hazards
 - Radar Color vs. Hazard
 - Inferred vs. Measured hazards
- Subjectivity
 - PIREPS (Wright Brothers)
 - Weather interpretation
- Greater hazard is probably economic and passenger delays since Safety Rules

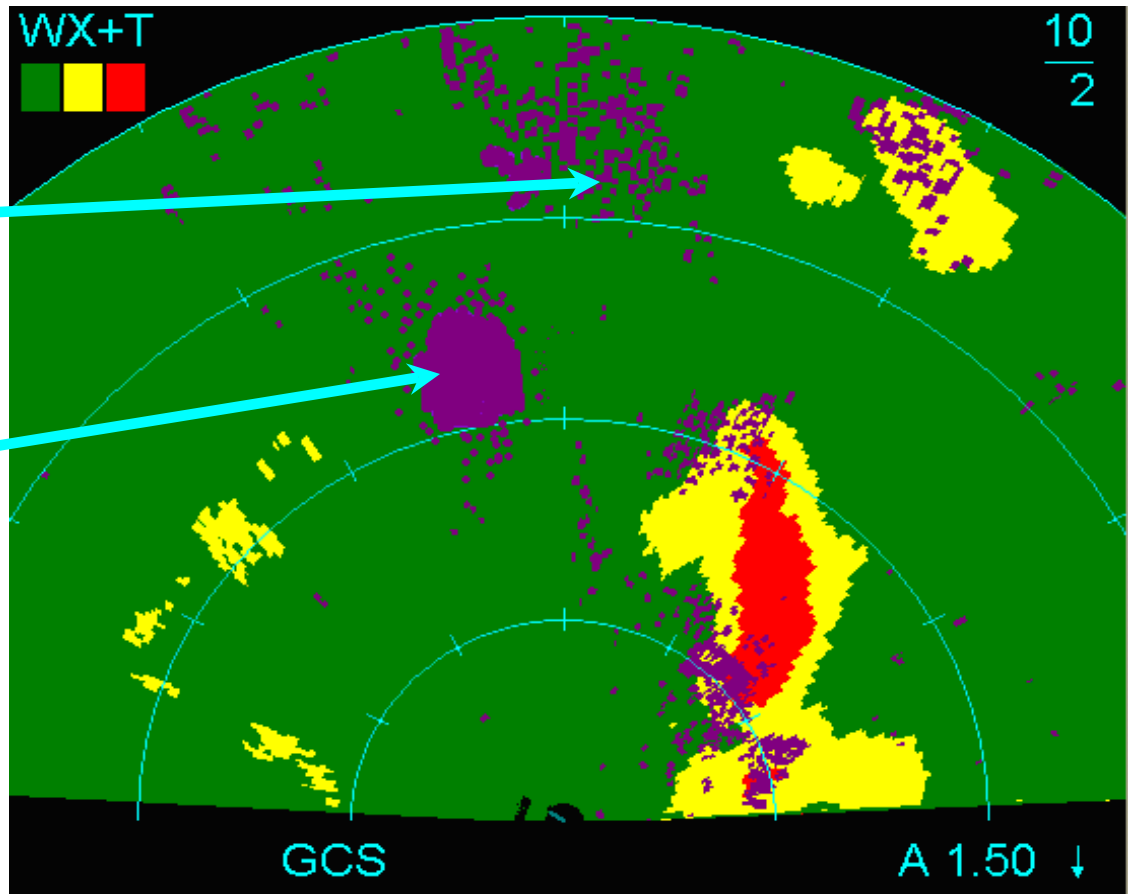
Background – NASA/NCAR

- NASA/Delta Program
 - Enhanced Radar
 - Automated Turbulence Reports (Aircraft Response)
- NCAR/DAL/UAL Program
 - Robust forecast (GTG)
 - NEXRAD Turbulence Detection Algorithm (NTDA)
 - Automated Turbulence Report (Atmospheric State)

Initial E-Turb Display

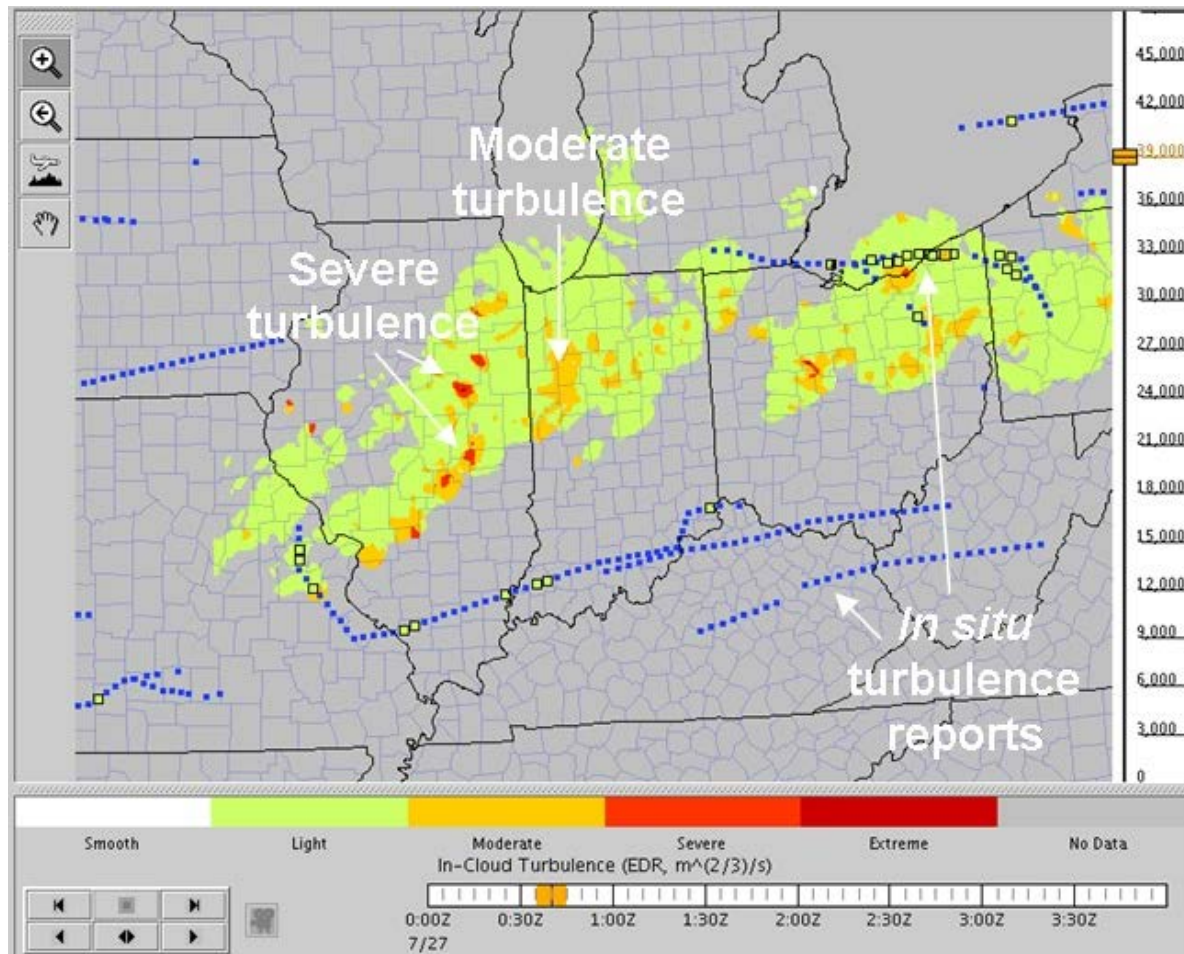
Two Levels of turbulence (magenta)

- Light-Moderate (speckled)
- Moderate + (solid)



NEXRAD Turbulence Detection Algorithm

NTDA



System Goals

- More & Better Data to drive enhancements in:
 - Safety
 - Capacity
 - Operational Efficiencies/Emissions
- Leveraged technology
 - Recognize Limits of Current State - ATC chat room
 - Integrate the tools
- Policies to support the goals

Potential Benefits

- Safety
 - IF EVERYONE IS STRAPPED IN WITH CARTS STOWED, NO ONE GETS HURT.
 - KEY IS NOT TO CRY WOLF & F/A IGNORE WARNINGS
- Efficiency/Emissions
 - Assumptions
 - Range of primary variables - %, Altitude, Time
- Capacity – FAA FOCUS
- Overall - The solutions for all 3 drivers might appear to conflict, but BETTER WEATHER KNOWLEDGE CAN DRIVE BETTER SOLUTIONS FOR ALL 3.

Solutions

- Forecasting
 - Better forecasting models
 - NWS, NCAR, NOAA Coordination
- “Now-Casting”/Tactical – 5-10 minutes
 - Better detection of hazards
 - Blended picture of hazards
- Reporting
 - Standards
 - Data clarification
- Blended solution - Sensors, Data link, & Displays

Future Path

- Avoid Distractions
 - Airline priority of the day – Mergers, Fuel, Economy
 - FAA vs. Airline Goals
- Employ Political Will
 - FAA – NextGen 4D Weather Cube
 - Airlines – Validate Benefits
- Decide on Products & Data Handling
 - Airline, Government, Commercial or Mix
 - Cost burdens
- Make a Decision—Champion Needed