

# Weather Technology in the Cockpit (WTIC) Program Update

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Federal Aviation  
Administration



# Why WTIC Research?

- **Safety - Prevent Weather Accidents and Fatalities**
  - Weather largest cause of General Aviation (GA) fatalities in the US, 200 deaths annually
  - Weather is causal factor more than twice as often as any other factor in GA fatal accidents
- **Safety – Prevent and/or mitigate cabin injuries due to turbulence**
  - Turbulence avoidance
  - Early warning
- **NAS Delays**
  - 70% of National Airspace System (NAS) delays are attributed to weather
- **Efficiency – Aid in Selecting Most Cost-Effective Routes**
- **Support NextGen/Operational Evolution Partnership Goals**
  - Increase NAS capacity by reducing the impact of weather

# Why WTIC Research?

- Lack of standardized Meteorological (MET) information leads to:
  - Safety concerns
  - Lack of common situational awareness
  - WTIC support critical to MET / AIS symbology development (SAE - G10)

Differing color legends on two METARs displays



# Why WTIC Research?



**NTSB**

***SAFETY ALERT***

National Transportation Safety Board

## ★ Thunderstorm Encounters

***IFR pilots need to actively maintain awareness of severe weather along their route of flight***

### ***The problem***

- Recent NTSB investigations have identified several accidents that appear to be wholly or partly attributable to in-flight encounters with severe weather.
- These accidents have all involved aircraft operating under instrument flight rules and in contact with air traffic controllers.
- Investigations show that pilots were either not advised about areas of severe weather ahead or were given incomplete information.
- Each pilot had readily available alternatives that, if utilized, would have likely prevented the accident.
- ATC training and briefings to controllers have not been sufficient to ensure that pilots receive the weather advisories needed to support good in-flight weather avoidance decisions.

**Verbalizing a ground MET display to a pilot is subject to error!**



# Why WTIC Research?

- **Part 121 MET information typically presented in printed text**
- **Much of the information is extraneous**
- **Information can be difficult to interpret**
- **Latency issues exist**
- **Does not support pilot decision making**



# Why WTIC Research?

- FIS-B data not suited for intuitive in-flight pilot decision making
  - Data latencies and not high resolution
  - Data not temporally and spatially applicable to specific flights
  - Data susceptible to misinterpretation and ambiguity
  - Does not replace in-flight voice and printed text – not for primary use

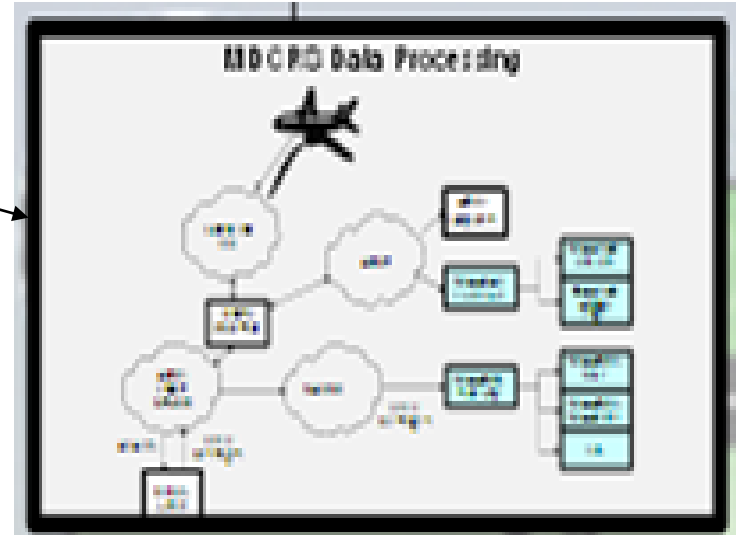


# Why WTIC Research?

- Global harmonization of MET/AIS Data Links
  - WTIC support important to RTCA SC206, SC214 & SC223

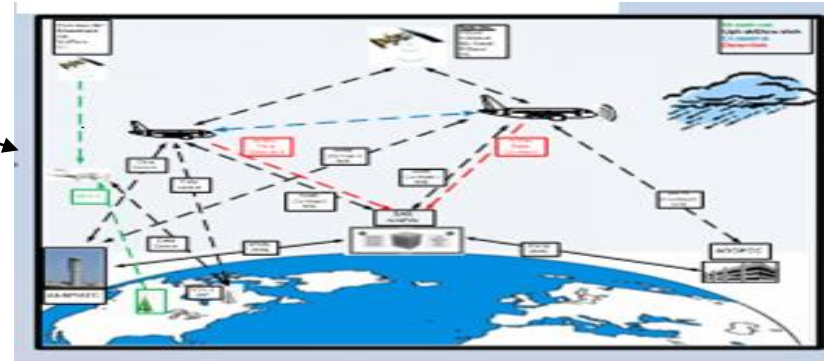
## Today

- Limitations outside NAS
- Lack of common MET data



## WTIC

- Aircraft a node in MET network
- Common MET data
- Reduce Data Link limitations outside NAS



# Weather Technology in the Cockpit

## Program Description

- Mission Statement
  - Enable availability and enhance the quality and quantity of meteorological (MET) information available to the aircraft to enhance safety and efficiency in commercial and general aviation operations
- Program Goals
  - Reduced Pilot/Flight Crew/Air Traffic Management (ATM) workloads to support efforts to increase NAS capacity
  - Support NextGen and other near/mid/far term programs needs for the availability of enhanced MET information
  - Eliminate MET information gaps and meet user needs
  - More efficient use of existing data link bandwidth



# Weather Technology in the Cockpit

## Program Description (continued)

- Program Goals (continued)
  - Reduce ambiguity in transmitted MET information
  - Support increased efficiency via timelier decisions in adverse weather, and more optimum routes from enhanced wind and temperature information
  - Reduce the likelihood of recurrence of specific weather-related Aviation Safety Reporting System (ASRS) incidents
  - Enhanced use of internal laboratory facilities for proof of concepts



# Weather Technology in the Cockpit

## Program Success

- AVS and AFS adopt and invoke WTIC functional and performance requirements for Part 121, 135, and 91 aircraft
- Data Links - Ensure appropriate MET information is transmitted timely with capability and recommended formats demonstrated and verified
- Standardized presentation of impact and pilot oriented MET information
- Demonstrated enhanced common situational awareness, reduced MET data ambiguities, and availability of MET data to support current and NextGen operations

# Relation to NextGen Operational Improvements

<u>Solution Set</u>	<u>Operational Improvement</u>
Improve Collaborative ATM	Current NAS Status Advisory (103301)
Improve Collaborative ATM	Traffic Management Initiatives with Flight Specific Trajectories (105208)
Increase Arrivals/Departures at High Density Airports	Improved Management of Arrival/Surface/Departure Flow Operations (104117)
Increase Arrivals/Departures at High Density Airports	Enhanced Departure Flow Operations (104208)
Reduce Weather Impact	Initial Integration of Weather Information into NAS Automation and Decision Making (103119)
Reduce Weather Impact	Current Oceanic Advisory – Weather(103114)
Reduce Weather Impact	Current En Route Advisory - Weather (103107)
Reduce Weather Impact	Initial Improved Weather Information from Non-Ground Based Sensors (103116)
Reduce Weather Impact	Full Integration of Weather Information into NAS Automation and Decision Making (103123)
Reduce Weather Impact	Full Improved Weather Information and Dissemination (103121)
Reduce Weather Impact	Deploy FIS-B Nationally (103104 )

# Weather Technology in the Cockpit

## Supports NextGen Concepts

- Collaborative ATM Services philosophy to accommodate user preferences by tailoring reroutes to specific flight.
  - Standards and guidance for data linking MET data to the cockpit
- Enables the MET data exchange to/from the Weather Common Service\* and its infrastructure
  - For Time Base Metering En-route operations and mitigating operations during adverse weather
- Improved Surface Operations – Enhances the ability to react to changing airport conditions
- Optimized profile descents

# FY10 Accomplishments

- Gap analysis identified the need to aid in the development of standards for rendering MET information, to make available a reply/request MET capability, and to research methods to provide more intuitive presentations of MET information
- Completed, with industry, RTCA 206 Safety and Performance Requirements that showed a need for safety services and a data link architecture Minimum Aviation System Performance Standard (MASPS)
- MET information User Needs Statement for General Aviation (GA) aircraft based on pilot surveys and studies identified pilot preferences for obtaining MET information and the need to study the safety and performance of these preferences
- Analyzed bandwidth requirements for graphical turbulence and icing products to support WJHTC laboratory verification, and the development of recommended practices for utilization of existing data links for MET information

# Current Research Activities

## Transoceanic Human-Over-the-Loop (HOTL)

### Demonstration

- Performer: NCAR/NIEC

## MET Symbology(SAE G-10)

- Performer: Industry & Government

## User Needs Statement

- Performer: University of North Dakota (UND) **CGAR** member

## Research Minimum Pilot Training

- Performer: Embry-Riddle Aeronautical University (ERAU) **CGAR** member

## HITL Pilot decision making evaluation

- Performer: ATSC LLC,

## ASRS Weather “Callbacks

- Performer: NASA Ames

# Questions

