

Task 6: Weather in the Cockpit Baseline and Assessment (Beringer)

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Project Start Date: FY08

Anticipated End Date: FY10

Requirements Statement

Operational Shortfall or Knowledge Gap

Adverse weather is both a challenge for safe flight operations and a significant limiting factor for airspace capacity. In air transport operations, numerous takeoff and landing accidents have followed encounters with convective weather and winter precipitation. Predicting and avoiding weather and determining when conditions have deteriorated sufficiently to increase risk requires a great deal of attention from air transport pilots and airline operation centers.

Adverse weather continues to be the leading cause of general aviation (GA) fatalities in the U.S. Both the pattern of occurrence of these accidents (primarily en route as opposed to takeoff and landing) and previous research documenting a range of pilot use of weather products and providers in flight planning suggest that such accidents are at least in part information-driven. GA aircraft on cross-country flights travel at speeds that expose them to the limits of pre-departure forecasting. They are exposed to changing weather conditions over extended space and time. En route information is available from Flight Watch, but the extent of its use by GA pilots varies widely. Systems and products making weather information consistently available to GA pilots are expected to be a key part of the solution and such systems are beginning to make their way into the cockpit.

At the same time, the Joint Program Development Office (JPDO) has begun to articulate a vision for the Next Generation Air Transportation System (NextGen). This vision expects a greater degree of collaboration between pilots and controllers in weather-related decision making and presumes a degree of shared situation awareness beyond current systems. Pilots and controllers will need consistent understandings of the weather situation to collaboratively resolve challenging flight conditions. As cockpit and air traffic weather systems and products enter the airspace system, they should facilitate both near-term and future operations. It is not clear to what degree information required by airborne and ground-based operators overlaps, or how much the formatting and presentation can be standardized across platforms and tasks given the types of weather data packages available, the hardware on which it is presented, and the modes in which it appears (graphics, text, etc.).

Benefit in Closing the Shortfall or Gap

This project will assemble information on near-term and envisioned weather information requirements for the air transport and GA cockpit and for airline operations center (AOC) personnel who support air transport operations, assess the current weather products available or entering the marketplace, document the maturity and use of these products, and identify gaps between product capabilities and information needs. In addition, CAMI and contractor personnel will identify key requirements for integration or connection between cockpit and dispatch needs and products.

Description of the Desired Product

The product will be a report detailing the weather information requirements for AOCs as derived from data

collected from AOCs. The report will also compare and contrast the information needs of the flight deck with those of dispatchers and other potential users as seen now and as envisioned for the NextGen environment.
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<p>Schedule</p> <p>Data collection is expected to begin in Q3 of 2009, with completion in Q4, and final reporting in Q4.</p>

Research Objective

Document pilot weather information needs for near term and envisioned NextGen scenarios and assess weather products available or entering the marketplace for the cockpit, to identify potential gaps in information and points requiring integration with ground-side products. Extend weather needs and product assessment to AOC personnel, including flight dispatchers, weather analysts, equipment coordinators, and system operations control managers. Document current and projected weather information needs and assess gaps in current and projected products. Products will be assessed by identifying the system, type of information provided, sources of data used to assemble the information, interactivity of the system with the user, integration with other systems and technologies (GPS, ADS-B, etc.), quality of information, likely users, and limitations.

Background

Better availability and use of weather information will likely be a key element in the reduction of GA fatalities. In many fatal GA accidents in which weather is cited as a causal or contributing factor, investigators are unable to document that the pilot received a weather briefing or obtained updated weather information. The majority of these accidents occur en route. Knecht (2006) has documented variability in intentions concerning preparation for flight in the vicinity of challenging weather and intention to obtain weather updates once airborne. Weather information is becoming increasingly available on the ground and its quality is improving. Aviation Digital Data System (ADDS), developed by the National Weather Service for the FAA epitomizes the improvement in information quality and availability pre-flight. A number of manufacturers are developing systems to make weather information available in the cockpit and to alert pilots about developing conditions. In air transport operations, high quality information is available to the dispatcher for communication to the cockpit, though cockpit weather displays are typically limited to onboard radar. The FAA needs to ensure that the information provided appropriately addresses pilots' weather information needs and to identify any gaps in near-term operational needs or those envisioned under NextGen. To date, airline investments in weather information have focused on weather analysts and flight dispatchers, who can in turn communicate a broader picture to the cockpit. Technologies providing this information are evolving, but their alignment with NextGen concepts of operations, which envision a common awareness of weather and traffic among service providers, pilots, and AOCs is not known.

Previous Activity on this Task

Previous activity identified weather information needs and desired prioritizations of that information for general aviation pilots, and identified parallel needs, from a previous forum on weather information needs, for other potential users of the information. Data were collected from several AOCs, and were awaiting combination with data from a final AOC for reporting in FY10.

Proposed or Planned Research

The planned research will complete the current baselining effort by assessing current use of weather information by AOCs and Part 121 pilots. This will be done through observation of operations at several AOCs and structured interviews with AOC personnel and Part 121 pilots.

Research Question(s)

- 1) What information is needed by GA and air transport pilots to operate safely in the range of expected weather conditions?
- 2) How will these needs change under NextGen?
- 3) What cockpit weather information products are available and entering the marketplace?

- 4) What weather information sources available from commercial sources, specialized contracts, or internal sources are in use by AOCs?
- 5) What are the limitations of current systems?
- 6) What information that is currently delayed could be delivered more timely?
- 7) What information is available, but not in a usable format?
- 8) What information is desirable but not available?
- 9) What additional weather information will be required for NextGen to provide common awareness among the various users of the system?
- 10) What needs do these emerging products address and what gaps remain?
- 11) What additional needs and gaps emerge from the perspective of envisioned operations under NextGen?

Technical Approach

Current Year

CAMI and contractor personnel will interview operations personnel at the final AOCs, to complete that sample. This survey will make use of both findings from Cockpit weather baselining and the 2007 NASA-sponsored workshop on avoidance of convective weather. CAMI and contractor personnel will use the NextGen Concept of Operations to assess additional needs that may result from transition from rules-based to performance-based operations and expectations of common position and intention information and projections of weather and traffic. CAMI and contractor personnel will complete a market survey to identify AOC weather information products available or nearing the marketplace and will accomplish gap analyses for both near-term and envisioned NextGen operations. CAMI personnel will also conduct interviews of Part 121 pilots at a scheduled carrier's hub location to complete the set of data on weather information needs. The effort will conclude in recommendations for further development of weather information systems, sources, and functionality.

Out-Years

TBD

Air Traffic Resources Required

None

Information Technology Resources Required

Possible contracts support

Calibration

None

FY10 Milestone Schedule

Description	Proposed Start Date	Proposed Completion Date
Submit draft AOC report to approval process	FY10 Q1	FY10 Q2
Initiate additional interviews with Part 121 pilots	FY10 Q2	FY10 Q2
Draft overview document with AOC and Pilot data	FY10 Q3	FY10 Q4

FY10 Deliverables		
Description	Proposed completion date	Actual completion date
Report on data AOC interviews	FY10 Q2	
Progress report on Part 121 observations/interviews	FY10 Q2	
Draft final report	FY10 Q4	