Weather Technology in the Cockpit (WTIC) Program—Program Update

USHST Infrastructure Summit
February 16, 2017
Agenda

• Program Overview
• Program Objective
• Helicopter Research Overview
• Highlight Current Research Potentially Applicable to Helicopter Operations
• FY17 Planned Projects - New
• Questions
WTIC Program Overview

- Portfolio of research projects to develop, verify, and validate recommendations to incorporate into Minimum Weather Service (MinWxSvc) standards and guidance documents
- We define MinWxSvc as:
  - Minimum cockpit meteorological (MET) information
  - Minimum performance standards/characteristics of the MET information
  - Minimum information rendering standards
  - Enhanced MET training
WTIC Program Objectives

- Enhance General Aviation (GA) safety by identifying and resolving risks before they become accidents
- Enhance FAR Part 121 safety and efficiency by identifying and addressing Met information gaps and operational shortfalls
- Incorporate MinWxSvc recommendations into standards and other guidance documents
  - Enables NextGen operations and benefits, and pilot roles
- Resolve operational (current and NextGen) inefficiencies associated with adverse weather
- Enhance pilot MET-training to enable effective and consistent adverse weather decision-making

*WTIC is not building cockpit applications so outreach to industry is necessary for implementing MinWxSvc(s).*
WTIC Program Overview

• MinWxSvc Recommendation Template
  ✦ Detail operational shortfall and associated MET information gap(s)
  ✦ Identify key stakeholders for recommendation (industry, consumers/users, standards writers, guidance and publication writers, etc)
  ✦ Provide clear and compelling case for the recommendation
    • Benefits can only be realized by stakeholder actions
  ✦ Include sufficient detail for stakeholder use/implementation
  ✦ Include summary of overall research process and results, and references to associate reports with brief descriptions
WTIC Program – Helicopter Overview

- Helicopter and Special GA operations to be addressed by Part 91 MinWxSvc recommendations
- Planning to perform gap analyses for helicopter and special GA operations in FY18
- Elements of Part 91 research are relevant to helicopter operations though focus has been primarily basic GA operations
  - Preliminary looks at high volume helicopter operations such as Gulf of Mexico
WTIC Project Highlights – Timestamping

• Investigate the timeliness/latency of current capabilities across industry providers of NEXRAD weather radar mosaic imagery:
  ✦ Processing
  ✦ Delivery
  ✦ Overall Age
  ✦ Symbology (timestamp, age parameters, or warnings)
  ✦ User cues for old or missing data

• Investigate methods of timestamping

• Investigate communication of mosaics refresh
WTIC Project Highlights – Timestamping

• Develop NEXRAD and timestamping model for fast track simulation
  ✤ Use real archived data
  ✤ Produce “truth” value to quantify timestamping delays

• Use Simulation To
  ✤ Provide insight on affects of different radar volume scan start and end times (realistic idea of general age of mosaics)
  ✤ Determine how refresh timing contributes to the timestamping of the NEXRAD data

• Timestamping recommendations based on results
The term is used for 2 broad concepts:

1. **Crowd as Processor**: Enlisting the contributions of a large number of networked participants in solving problems for which human intelligence performs better than automation
   - a) **Volunteers** with an interest in the problem being solved
   - b) **Inadvertent “Volunteers”** who perform the desired task for their own purposes (e.g., the “CAPTCHA’s” used on web sites to verify that they are being accessed by humans)
   - c) **Persons paid** a small amount per decision to perform the task (e.g., the Amazon Mechanical Turk web service)

2. **Crowd as Sensor**: Gathering anonymous data from a large number of networked platforms for (e.g., inferring city traffic congestion from cell phone tracking data)
WTIC Project Highlights – Crowd Sourcing

• Successfully conducted feasibility demonstration
  ✤ Produced accurate visibility information using Amazon Mechanical Turk, Alaska webcams, WTIC-developed algorithms for QA and solution convergence
  ✤ “Workers” compare current video webcam image to clear day image with markers and input assessment of visibility
  ✤ Crowd and algorithm output visibility
  ✤ Numerous lessons learned
  ✤ Identified potential benefits
  ✤ Part task and simulator demos planned
WTIC Project Highlights – Crowd Sourcing

- Prototype interface used for demonstration

Prototype interface of conditions and trends

Current Webcam Synoptic View
WTIC Project Highlights – Active Reminder

• Adverse Weather Active Reminder
  ✩ Implementation tested for convection and low visibility
  ✩ Provides visual notification of preset distance to adverse condition
  ✩ Addresses shortfalls of pilots flying too close to convection and inadvertent IMC
  ✩ Demonstration scenarios set reminder to 20 nmi from areas of convection and reduced visibility
  ✩ Initial results showed credible impact reducing flights into 1 nmi visibility by approximately 50%
  ✩ Data analysis of demonstration still ongoing
  ✩ Preliminary analysis showing active reminder assists pilots in determining distance to adverse weather conditions
  ✩ Evaluated use of vibratory notifications versus test/audible
Active Reminder (AR) Demonstration Video

Two video segments; first is convection and second is low visibility. Blue line popping up is the active reminder.
WTIC Project Highlights – FY17 Projects

• Crowd Sourcing Follow-On

• Incorporate crowd sourced wind information using cameras, analytics, and wind socks
  - May enable crowd sourced visibility forecasts
  - Crowd sourced forward looking radar images
  - Potential benefit to helicopter operations in Gulf of Mexico
  - Resolve gaps identified in demo (interface, dropouts, etc)
  - Investigate blended solution of human inputs and automation (edge detection)
  - Pursue paths to implementation
WTIC Project Highlights – FY17 Projects

• Voice Enabled Interfaces
  - Evaluation of voice enabled user interfaces of cockpit weather applications to reduce pilot workload and errors in the cockpit

• Automated PIREPS
  - Assess user inputs to producing automated PIREPs, current products/apps with potential for automated PIREPs, and estimates of potential benefits
QUESTIONS

• Steve Abelman, Manager of Weather Research Branch, will be available during the Friday session to address additional questions and those related to new weather products and scientific research
• Feel free to contact me by phone or email with WTIC questions or to request research reports
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