REDAC / NAS Ops

Review of FY 2018 Proposed Portfolio

Weather Technology in the Cockpit (WTIC)

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Weather Technology in the Cockpit (WTIC) - Program Description

- **Research projects to develop, verify, and validate requirements for incorporation into Minimum Weather Service (MinWxSvc) standards**
  - FAR Part 121, OPERATING REQUIREMENTS: DOMESTIC, FLAG, AND SUPPLEMENTAL OPERATIONS (i.e. commercial operations)
  - FAR Part 135, OPERATING REQUIREMENTS: COMMUTER AND ON DEMAND OPERATIONS AND RULES GOVERNING PERSONS ON BOARD SUCH AIRCRAFT (i.e. commuter, on demand, and air taxi operations)
  - FAR Part 91, GENERAL OPERATING AND FLIGHT RULES (includes General Aviation operations)

- **The MinWxSvc is defined as:**
  - Minimum cockpit meteorological (MET) information
  - Minimum performance standards (e.g. accuracy) of the MET information
  - Minimum information rendering standards
  - Enhanced weather training
  - Minimum cockpit technology capability recommendations

WTIC Program Overview

Purpose

- Identify causal factors for weather-related General Aviation (GA) safety risks/hazards
- Identify causal factors for Part 121/135 adverse weather safety risks/hazards and NAS operational inefficiencies (current and NextGen)
- Recommend MinWxSvc to resolve/reduce identified safety risks and NAS inefficiencies
- Recommend enhancements to pilot MET-training to resolve training shortfalls

Budget

FY15 (funded)	FY16 (funded)	FY17 (request)	FY18 (request)
$3.1M	$3.2M	$3.2M	$3.2M

WTIC Program Overview

Benefits

- Enhanced safety by resolving/reducing adverse-weather safety risks before they result in an accident/incident

- Enhanced NAS efficiency and increased capacity resulting from cockpit MET information that allows for consistent and predictable pilot adverse weather decision making due to established cockpit minimum weather service(s)
  - Reduced emissions due to enhanced efficiency
  - Reduction in flight delays

- Enhanced safety resulting from the resolution of pilot MET-training shortfalls

WTIC Program Overview

How do we know the program is working:

- MinWxSvc recommendations incorporated into FAA and commercial standards and other guidance documents
- Industry incorporates MinWxSvc recommendations
- Reduction/resolution of identified MET information in the cockpit gaps
  - Potentially measured benefits with associated operational shortfalls (i.e. less injuries due to turbulence encounters)
- Specific outcomes:
  - Enabled data linked near-real time turbulence information to the cockpit
  - Harmonized data linked service capabilities, technologies, and interoperability of MinWxSvc information services globally
  - Wind and temperature requirements to support NextGen 4-D navigation operations

WTIC - Contractors and Labs

- **Part 91 Projects**
  - Tech Center Contractors and AWDE Lab
  - NCAR/UCAR
  - PEGASAS
  - Rockwell Collins
  - ATSC
  - ERAU
- **Part 121/135 Projects**
  - SE2020
  - NCAR/UCAR
  - MITRE
  - MITLL
  - ATAC – METRON Inc.

Part 121/135 Projects – Recent Accomplishments (Partial List)

- Tactical Turbulence Notification
  - Human Over the Loop #2 demonstration of benefits in cabin crew preparation and coordination, and initiation of route change communication
  - Latency acceptable

- Convective Weather Notification
  - Human in the Loop (HITL) demonstration of more timely adverse weather avoidance decisions especially with Boeing pilots (versus Airbus)
  - Anecdotally EFB weather with ownship caused decreased trust in onboard weather radar due to differences in displayed information

Part 121/135 Projects – Recent Accomplishments (Partial List)

- Phase 4 Wind Study research plan
  - Developing additional interval management (IM) and advanced IM trade spaces
  - Assessing impacts of increasing FMS wind altitudes from 4 to 9
  - Assessing accuracy of available “truth winds” for future wind analyses
- Identified numerous gaps of cockpit MET information supporting operations in oceanic airspace
  - Need to quantify impacts of gaps and benefits pool

FY18 - WTIC Part 121/135 MinWxSvc

Research Requirement

- FAA goals to enhance NAS efficiency, safety, and capacity, and to reduce greenhouse emissions
- Research Question: What gaps in MET information in the cockpit are safety risks or causal factors in reducing NAS efficiency or capacity?
- Requirement is to identify and resolve operational inefficiencies (current and NextGen)and safety risks attributable to MET information in the cockpit gaps
- Sponsors/Collaborations : AFS, AVS, NextGen

Outcome and Implementation

- **Outcome supported**: FAA goal to increase NAS operational efficiency and capacity in current and NextGen operations, and to enhance overall safety
  - Develop recommendations for a Part 121/135 MinWxSrc that resolves MET information in the cockpit gaps
- **Benefits resulting:** Resolution of MET information in the cockpit gaps contributes to enhanced NAS efficiency and capacity, and resolves safety risks attributable to the information gaps

FY18 Outputs

- Plan for flight demonstration of tactical turbulence notification and method of selecting notified aircraft
- Identification of cockpit technology advancements with potential to enable NAS efficiency increases
- Updated functional analysis using updated ConOps and assessment of impacts of NextGen far term concepts on Version 1 MinWxSvc recommendations
- Demonstrated integration of Nav and flight (inc Wx)) information into pilot decision support tools
- MinWxSvc recommendations to resolve selected oceanic airspace gaps
- Support RTCA SC-206 document updates to harmonize AI and MET services with EUROCAE
- Identification of benefits pool for providing MET uncertainty information in the cockpit

FY18 Planned Expenditures

•Approximately $2.3M

Part 91 Projects – Recent Accomplishments (Partial List)

- Flight Standards formally accepted 100 MET questions for inclusion in the pilot written exam
- Project plan for Phase 2 research to demonstrate crowd source processing and cloud technology
  - Identified Bayesian algorithm for determining crowd size(s)
  - Identified candidate cameras for images to process
- Phase 2 research on gaps and causal factors of inadvertent flight into IMC
  - Generic weather training provided no measurable benefit
  - Shortfalls identified included over-reliance on technology, time to decide, and misperception of risks

Part 91 Projects – Recent Accomplishments (Partial List)

- Evaluation of weather forecast uncertainty information in the cockpit impacts on pilot decision making
  - No benefit in pilot decision making was demonstrated
  - Risk assessment tool used to convey uncertainty outperformed pilots indicating tool has potential to provide a benefit
    - Cumulative risk/uncertainty difficult to mentally calculate
  - Rendering of tool and insufficient training on tool may have impacted demonstration results
- Developed database of accident reports for performing detailed trend analysis on extensive list of keywords
  - Developed initial immersive training for selected trend items

Part 91 Projects – Recent Accomplishments (Partial List)

- Completed development of PC-based latency trainer and associated training materials
  - Plan to use at Sun ‘N Fun Fly In and Expo
  - Trainer being provided to Embry Riddle Aeronautical University (ERAU)

FY18 - WTIC GA MinWxSvc

Research Requirement

- FAA goal is to lower the GA accident/incident rate
- Research Question: What gaps in MET information in GA cockpits and shortfalls in GA pilot MET training are safety risks?
- Requirement is to define a minimum weather service for GA cockpits to resolve MET information gaps identified as safety risks, and to resolve shortfalls in pilot weather training and test questions
- Sponsors/Collaborations: AFS, AIR, AVS, NextGen, GA JSC, NTSB, AOPA

Outcome and Implementation

- **Outcome Supported**: FAA goal is to reduce the overall GA accident and incident rate by resolving safety risks before they become causal factors in GA accidents
  - Develop recommendations for a GA minimum weather service that resolve MET information in the cockpit gaps and pilot MET training shortfalls that have been identified as safety risks
- **Benefits Resulting** : More effective and consistent adverse weather decision making by GA pilots enhances GA safety and the defined minimum weather service resolves MET information gaps identified as safety hazards

FY 18 Outputs

- Training modules and additional test questions
- MinWxSvc recommendations for latency demonstrator capability and associated training, rendering to resolve selected gaps (i.e. change blindness), and initial crowd sourced information applications.
- Trade studies to resolve unique safety risks for special GA operations (HEMS, Alaska, etc)
- MET uncertainty information trade studies per roadmap
- Service analyses as necessary
- MinWxSvc recommendations for selected causal trends

FY18 Planned Expenditures

•Approximately $1M