

Weather Technology in the Cockpit Program (WTIC) BLI Number: A12.c

REDAC / NAS Ops Review of FY 2021 Proposed Portfolio August 13, 2019 Gary Pokodner – WTIC Program Manager, ANG-C61

WTIC Program Budget line – A12.c

What are the benefits to the FAA

- Enhanced safety by resolving/reducing adverse-weather safety risks before they result in an accident/incident
- Enhanced NAS efficiency and increased capacity resulting from 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 flight routing in and around adverse weather
- Enhanced safety resulting from the resolution of pilot MET-training shortfalls
- Reduced usage of Flight Service Station voice services by General Aviation pilots due to enhanced Wx-related automation

WTIC Program Budget line – A12.c

What determines program success

- Number of standards released incorporating WTIC MinWxSvc recommendations
- Number of transitions of WTIC MinWxSvc recommendations into commercial products or operations
- Number of transitions of WTIC training materials to use in courses, textbooks, guidance, Wings Credit Courses, FAA pilot exam questions, and commercial training products
- Number of MinWxSvc recommendations incorporated by pilots and other stakeholders into practice, guidance, or endorsements by representative groups such as Aircraft Owners and Pilots Assoc (AOPA), Air Line Pilots Association (ALPA), and National Assoc of Flight Instructors (NAFI)

WTIC Program / BLI Number: A12.c Overview Capabilities -Stakeholders

Project Team

- Randy Bass (Branch Manager)
- Gary Pokodner (Program Manager)
- Eldridge Frazier (Lead Engineer)
- Ian Johnson (Human Factors Pyschologist)

Government

- FAA
 - Flight Standards Service
 - Test questions AFS-630
 - NEXRAD Online Course AFS-850
 - ASRS report AFS-430
 - Aircraft Certification
 - Small Aircraft Directorate
 - Office of Aviation Safety
 - Human Factors Research & Engineering
 - William J. Hughes Technical Center(WJHTC)
 - Civil Aerospace Medical Institute (CAMI)
- NASA Ames
- NTSB
- NCAR

International

• Eurocontrol, EASA

Airlines

- Delta
- United
- American

Academia

- Embry-Riddle Aeronautical University
- Florida Institute of Technology
- Georgia Institute of Technology
- Iowa State University
- Purdue University
- Texas A&M University
- The Ohio State University
- University of Oklahoma
- Western Michigan University
- Virginia Tech

Professional Societies

- AOPA
- GAMA
- RTCA
- ALPA
- Others (via GAJSC)
- Royal Aeronautical Society
- NAFI

Industry

- Lockheed Martin (via PEGASAS)
- Frasca (via PEGASAS)
- Mindstar Aviation (via PEGASAS)
- Fly8Ma (vis PEGASAS)
- WebManuals (via PEGASAS)
- Foreflight (via AOPA)

Remote Oceanic Meteorological Information Operational (ROMIO): Interim benefits analysis and draft final report completed end of July 2019.

FY20 - Demo period extended through the end of the year to incorporate additional satellites for global oceanic coverage for more complete benefits assessment. Final report due July 2020.

Nulling NEXRAD Latency: Method completed May 2018. Development of assessment was paused to obtain inputs from other research. Static radar images and initial training documents were developed to support assessment.

FY20 – Run assessment to evaluate nulled latency impacts on pilot decision making and develop MinWxSvc recommendations based on results.

VFR Not Recommended Study: Completed final report on VNR and submitted for publication. Began development of cognitive walk-through to develop recommended thresholds. Preliminary design concept developed (see below).

FY20 – Perform research to identify thresholds for use in automated VNR



Prototype VNR Enhancement – Ongoing Research

Pilot Reports (PIREP) Modernization: Completed analysis of "screens study" and comparison of PIREP dissemination flow charts.

FY20 - Prototype capabilities selected by pilot in "screens study" and evaluate impacts on pilot PIREP submittals. Working with Flight Standards to host a PIREP conference to coordinate all PIREP work.

Time to Contact HITL: Developed and received Independent Review Board (IRB) approval of plan to evaluate impacts of providing a time indicator for encroachment on 20 miles of separation from severe convective activity.

FY20 – TBD based on progress and results in FY19



Augmented Reality: PEGASAS (Western Michigan University) signed a contract to write a book on aviation weather using augmented reality and a second contract to provide an augmented reality chapter for a book called Next Generation of Aviation Professionals and will include WeatherXplore examples and other WTIC references. Identified industry partner, Aspen Avionics, to use augmented reality to supplement user manuals with Wx information tutorials.

FY20 – Release initial production version of WeatherXplore including tutorials based on Aspen Avionics inputs for selected avionics manuals.

ADS-B Turbulence Study: Completed kickoff meeting, research plan, and two quarterly reviews on trade study of methods to get turbulence observations from ADS-B Inertial Vertical Velocity (IVV). Focus areas included analyses of Scaled Standard Deviation (SSD) approach to Eddy Dissipation Rate (EDR) estimation, implementation of a maximum likelihood (ML) approach, and the implementation of a wavelet filter as a preprocessing step. Results of ML EDR estimation approach and wavelet filtering on IVV data were "quite good."

FY20 – Complete current study. Follow-on research and possible demo based on results of current project.



Phase 7 Wind Study: Completed draft final report that included wind lexicon recommendations, and analyses of current and future Flight Management Systems (FMSs) capabilities to conduct Required Time of Arrival to significantly lower meter fix altitudes than previous studies

FY20 – TBD. Looking for stakeholders and additional wind study requirements

RTCA SC-206 Support - Current Terms of Reference two documents in works; Two modifications to DO-358 the Minimum Operational Performance Standards (MOPS) for flight Information Services Broadcast (FIS-B) data using Universal Access Transceiver (UAT) and Minimum Aviation System Performance Standards (MASPS) for Aeronautical Information / Meteorological Data Link Services

FY20 – Continue SC-206 support

Additional Research in FY20

- Next phases of research on:
 - Helicopter gap analyses and develop resolutions to selected gaps
 - Perform operational demonstration of crowd sourced visibility information using the hybrid system, and continue research using crowd sourcing for ceiling, forward looking radar, and wind information
 - Feasibility study to perform analyses to remove or relax precipitous terrain classifications
 - Assess the feasibility of Multi-Radar Multi-Scan (MRMS) to support a 3-D rendering of icing in the cockpit. If feasible, evaluate adapting the turbulence 3-D display to render the information.

Emerging FY 21 and FY22 Focal Areas

Potential New Research Areas in FY21 and FY22

- Developing weather training for new entrant pilots (ie, UAV)
- Resolving remaining complex VNR thresholds to enhance automation
- Gap resolution of special operation GA (non-helicopter)
- Develop and evaluate the notifications for the selected stakeholders (GA, UAS, etc.) and adverse Wx conditions (turbulence, icing, etc.) using the Tactical Turbulence notification methodology
- Assess and develop prototype Wx mosaic for Alaska using information from ROMIO products, crowd sourcing visibility, ceiling, wind, and cockpit radar, and polar satellites to enhance cockpit Wx information
- Capability assessment of remote weather sensors to support airborne observations and PIREPs, and support new entrants

WTIC Part 121 & 135 MinWxSvc

Research Requirement

- Develop Part 121/135 MinWxSvc recommendations for cockpit weather information and technology.
- Sponsored by ANG-C6, ALPA, AFS, industry, airlines, NextGen
- POC: Gary Pokodner, ANG-C61, 202-267-2786

Outputs/Outcomes

- Identification of gaps in Part121 MinWxSvc recommendations to support new entrants such as supersonic flight.
- Evaluation report of prototype 3D viewer demo and development of technical transfer package.
- RTCA standards as applicable
- MinWxSvc recommendations to resolve selected gaps from the Industry Perspective study.
- Adverse Wx notifications using Tactical Turbulence methodology

FY 2022 Planned Research

- Identify gaps in Part 121 MinWxSvc recommendations to support supersonic flight and other Part 121 new entrants.
- Phase 3 of developing 3-D cockpit viewer of icing using MRMS
- RTCA SC-206 technical support
- Research to resolve gaps identified in Industry Perspective research
- Develop selected notifications using Tactical Turbulence methodology

Out Year Funding Requirements

FY19	FY20	FY21	FY22
\$ 1.0M	\$0.3M	_	-



WTIC Part 91MinWxSvc

Research Requirement

- Develop Part 91 MinWxSvc recommendations for cockpit weather information and technology.
- Sponsored by ANG-C6, AOPA, AFS, industry, NAFI, Alaska and other remote areas
- POC: Gary Pokodner, ANG-C61, 202-267-2786

Outputs/Outcomes

- PIREP enhancement MInWxSvc recommendations
- Final MinWxSvc threshold recommendations to enhance automated VNR
- Identification of gaps in MinWxSvc recommendations to support new Part 91 entrants adverse Wx decision making and associated recommendations for sensor performance to fill information gaps.
- Preliminary criteria to assess autonomous (ie, air mobility) vehicle adverse weather avoidance decision making
- Feasibility of mosaic of crowd sourced Wx and satellite data for GA and Part 135 cockpits

FY 2022 Planned Research

- Complete assessments of recommendations for PIREP improvements
- Research VNR thresholds for complex scenarios to update recommendations for VNR automation
- Gap analyses of MinWxSvc recommendations for new entrants in Part 91 and develop recommendations for sensor performance to fill identified gaps.
- Develop criteria to assess autonomous (ie, air mobility) vehicle adverse weather avoidance decision making
- Assess feasibility of producing mosaics of crowd sourced Wx and satellite information for cockpits

Out Year Funding Requirements

FY19	FY20	FY21	FY22
\$1.0M	\$0.3M	-	-

WTIC Training

Research Requirement

- Develop enhanced pilot weather training including online courseware, instructor led training materials, augmented reality training materials, enhanced WeatherXplore capabilities, experiential training modules, and 3-D augmented reality for training on cockpit weather enhancements, new cockpit weather technology, and new entrant pilots.
- Sponsored by ANG-C6, NextGen, FAAST team, NAFI, ALPA, AOPA
- POC: Gary Pokodner, ANG-C61, 202-267-2786

Outputs/Outcomes

- Online training courseware to support new entrant pilots on Wx
- Augmented reality training materials that include 3-D (textbooks, guidance, manuals)
- Updates to WeatherXplore application based on feedback, new entrants, and cockpit Wx advancements.
- Wx questions for pilot exam for new entrant pilots

Look for the WeatherXplore



logo. Scan images with the demo app with your phone or tablet to see augmented reality made easy.



FY 2022 Planned Research

- Develop pilot Wx training and pilot exam questions for new entrant aircraft.
- Update pilot training to resolve gaps based on new NextGen operations and evolving cockpit Wx information and technology.
- Continue expanding the uses of augmented reality and experiential learning.

Out Year Funding Requirements

FY19	FY20	FY21	FY22
\$0.58M	\$0.3M	-	-