ANG The Future of the NAS Starts Here

FAA Office of NextGen (ANG)

REDAC / NAS Ops

Review of FY2023 – 2026 Proposed Portfolio

Weather Technology in the Cockpit (WTIC)

BLI Number: A12c

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Weather Technology in the Cockpit (WTIC) Program Overview

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
- Identification of essential pilot weather-related tasks and roles to ensure they are safely incorporated into autonomous vehicles, and potential to mature weather-related automation functions with pilots in the loop (**REDAC Seaplane suggestion implemented**)

Weather Technology in the Cockpit (WTIC) Program Overview

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 Association (AOPA), Air Line Pilots Association (ALPA), and National Association of Flight Instructors (NAFI)
- Benefits analyses using model simulations and demonstration/operational data
- Tangible reduction in avoidable delays and aircraft accidents/incidents/risks due to weather

Weather Technology in the Cockpit (WTIC) Program Support

Program Manager

Gary Pokodner

Subject Matter Experts:

Ian Johnson (Human Factors),

Eldridge Frazier (Engineering Lead)

Contract Support:

Joe Bracken (AvMet)

Collaborations

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)
  - Future Flight Services
- NASA - Ames
- NTSB
- NCAR

Airlines

- Delta
- United
- American

Publishers

- Routledge

Standards Bodies

- RTCA
- ASTM

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
- ALPA
- Others (via GAJSC)
- NAFI

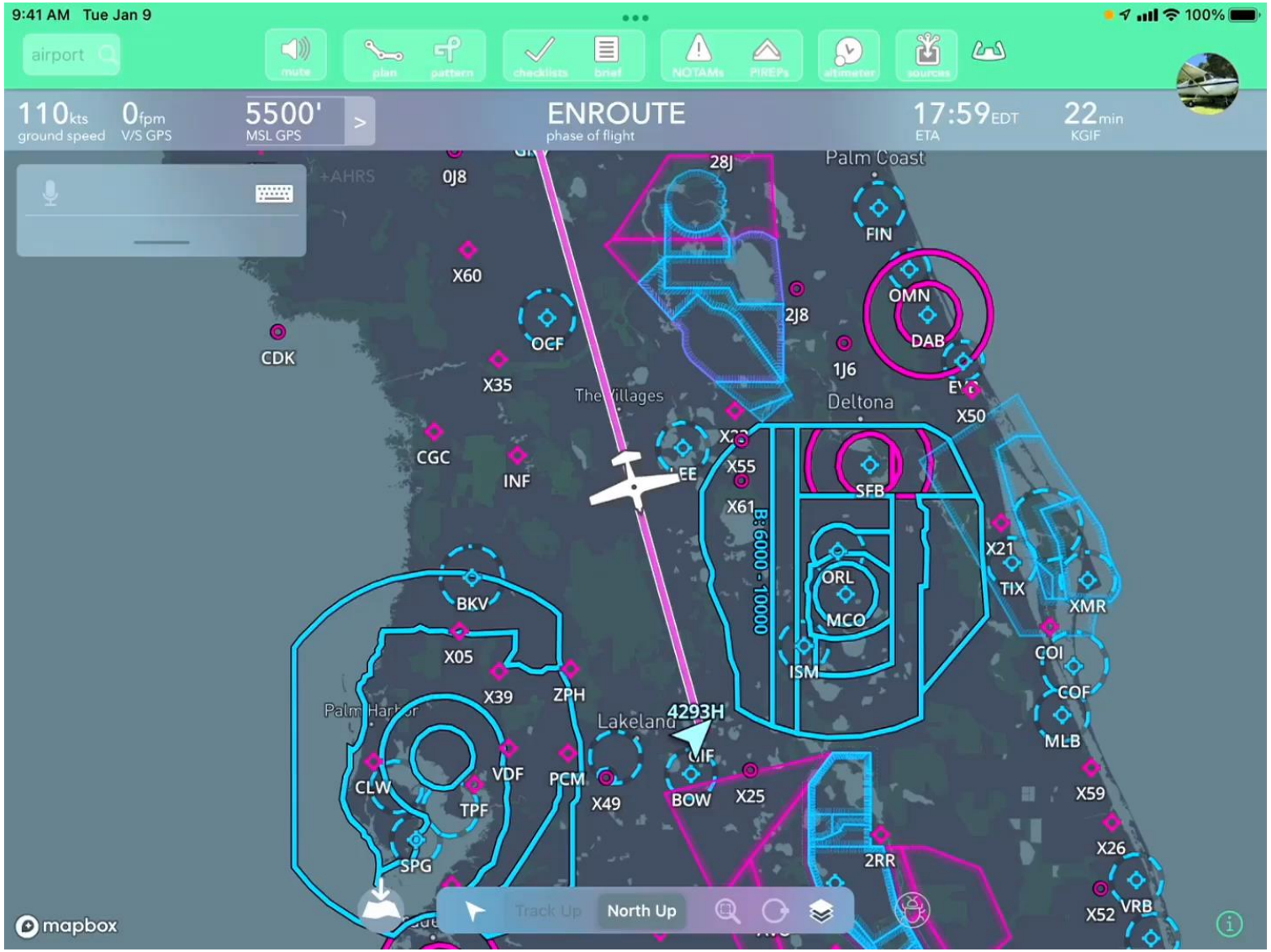
Industry

- Lockheed Martin (via PEGASAS)
- Frasca (via PEGASAS)
- Mindstar Aviation (via PEGASAS)
- Fly8Ma (vis PEGASAS)
- WebManuals (via PEGASAS)
- Aspen Avionics (via PEGASAS)

Current FY23 Accomplishments

- Preparations for feasibility and benefits assessment of the initial weather functions selected for Digital Copilot nearing completion
  - Prepared brief video to outreach the research project at fly-ins and for the assessment
  - Feedback at fly-ins extremely positive on objectives of the projects
  - Demo video on next slide shows one weather function incorporated into the prototype Digital Copilot

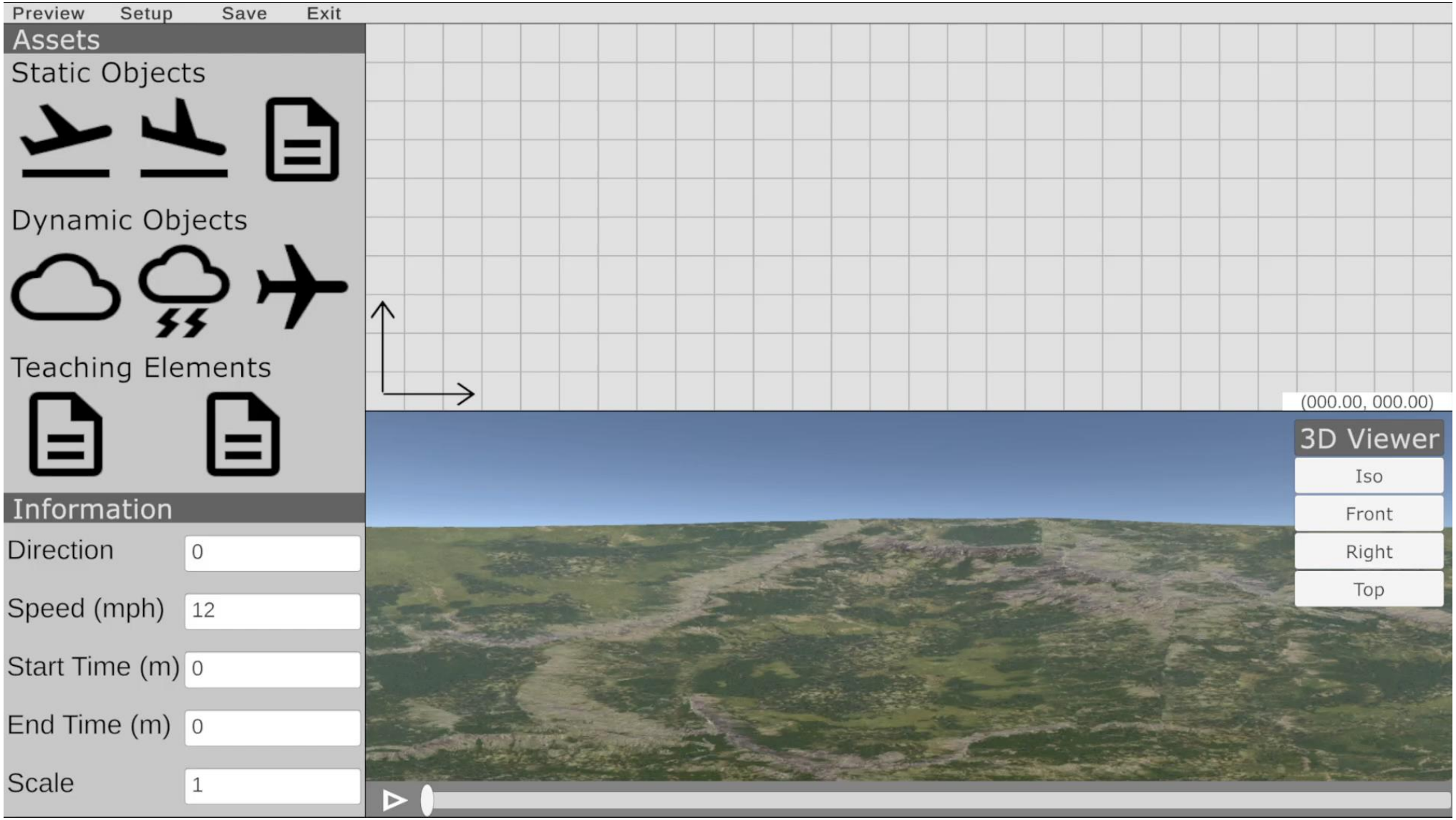
FY23 Accomplishments - Digital Co-Pilot Demo Video



Current FY23 Accomplishments

- Authoring software prototype to enable flight instructors to prepare their own augmented reality (AR) weather training nearing completion
- Feedback on authoring software was extremely positive with flight instructors requesting access as soon as possible
- Demo video on next slide shows the flight instructor work area on top and viewer on the bottom, and then the simple scenario training as it would appear on a phone

FY23 Accomplishments – Self Authoring AR Training



Current FY23 Accomplishments

- Test plan for ADS-B Vertical Rate (VR) benefits assessment using Graphical Turbulence Guidance Nowcast (GTGN) provided to the GTGN team for execution
  - Target for conducting the assessment is August/September 2023
- Continued supporting and acting as the Government Authorized Representative for RTCA SC-206
- Industry Perspective Outreach project final report delivered and accepted
- Continued to address contract vehicle challenges to award the remaining two FY23 projects
- PEGASAS grant still in review; submitted in December 2022
  - Project is an amendment to the FY22 WTIC PLA

Anticipated Research in FY24

Planned Research Activities

- Phase 2 Digital Co-Pilot – Add additional selected weather decision support, based on Phase 1 inputs, into digital co-pilot and perform a benefits assessment using the prototype
- Complete the data analysis of the offline demonstration and conduct the online evaluation of ADS-B Vertical Rate
- Enhance Flight Profiler to use as a preflight weather briefing tool and evaluate is impacts on a pilot's mental model of adverse weather for an entire flight plan
- RTCA SC-206 technical support
- Evaluate potential options and the utility of providing more weather observation information to pilots through the use of weather sources that are not approved (ie, mesonet information)

Expected Research Products

- Prototype Digital Co-Pilot with selected weather decision support incorporated, completed assessment of its utility to pilots, and readiness to prepare a technical transfer package for a beta release
- Final report of ADS-B Vertical Rate Turbulence offline demo and data collection from the online demo
- Final report on Flight Profiler assessment
- Developing inputs for RTCA standards on turbulence and data linked weather information
- Final report on crowd sourcing weather information sources research, methods to tag its quality, and methods to use crowd sourcing to accept artificial intelligence and machine learning automation
- Final report on potential to provide more weather observation information to cockpits
- Beta release of AR self authoring tool to flight instructor associations

Anticipated Research in FY25

Planned Research Activities

- Prepare technical transfer package for MITRE Digital Co-Pilot with weather functions incorporated
- Perform data analysis of online demo of ADS-B VR
- Research methods of using automated tools that employ Artificial Intelligence and Machine Learning to provide an objective analysis of GA pilot weather decision making and roles (collaborate with Flight Safety)
- Update AR self authoring tool based on beta release feedback, implement updates, and develop a technical transfer package
- RTCA SC-206 technical support including turbulence working group

Expected Research Products

- Technical transfer package for MITRE Digital Co-Pilot with weather functions incorporated
- Final report on ADS-B VR online demo
- Final report on feasibility and utility of automated tools to assess GA pilot weather-related decisions
- Final report on performance of AR self authoring tool performance and a technical transfer package to enable industry to produce to tool and to provide full capability to flight instructors
- Draft turbulence Minimum Aviation System Performance Standard (MASPS) for turbulence observations

Emerging FY26 Focal Areas

- Weather Decision Support Tools and Emerging Technologies
  - Expand artificial intelligence and machine learning applications to support pilots (remote and cockpit)
- Integration / Fusion of Observation Weather Data
  - Continue evaluating innovative techniques to fuse weather data to enhance the quality and availability of weather information in remote areas
- Pilot, Automation, and Display Interfaces
  - Develop minimum weather service standards to enable human monitors of automation targeted for autonomous use, and to develop confidence in new automation
- Advancement of Global Meteorological Information Standards

Weather Programs - WTIC

Research Requirements

- Develop MinWxSvc recommendations for cockpit weather information and technology to enhance safety and efficiency, and reduce gaseous emissions
- Address the need for enhanced cockpit weather technology, information, and human factors principals to achieve NextGen objectives, and identify potential enhancements in a data centric national airspace system

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Outputs/Outcomes

- Technical reports
- Minimum weather service recommendations
- Technical transfer package(s) as applicable

FY 2026 Planned Research

- Weather Decision Support Tools and Emerging Technologies
- Integration / Fusion of Observation Weather Data
- Pilot, Automation, and Display Interfaces
- Advancement of Global Meteorological Information Standards

Out Year Funding Requirements – Estimated Totals

RE&D

FY23 (Enacted)	FY24 (President's Budget)	FY25 (CIP)
$ 4M	$3.9 M*	$3.9 M*

*Estimated total funding as program under Weather Programs