

Weather Technology in the Cockpit (WTIC) Program Overview

Presented to: CGAR Annual Meeting

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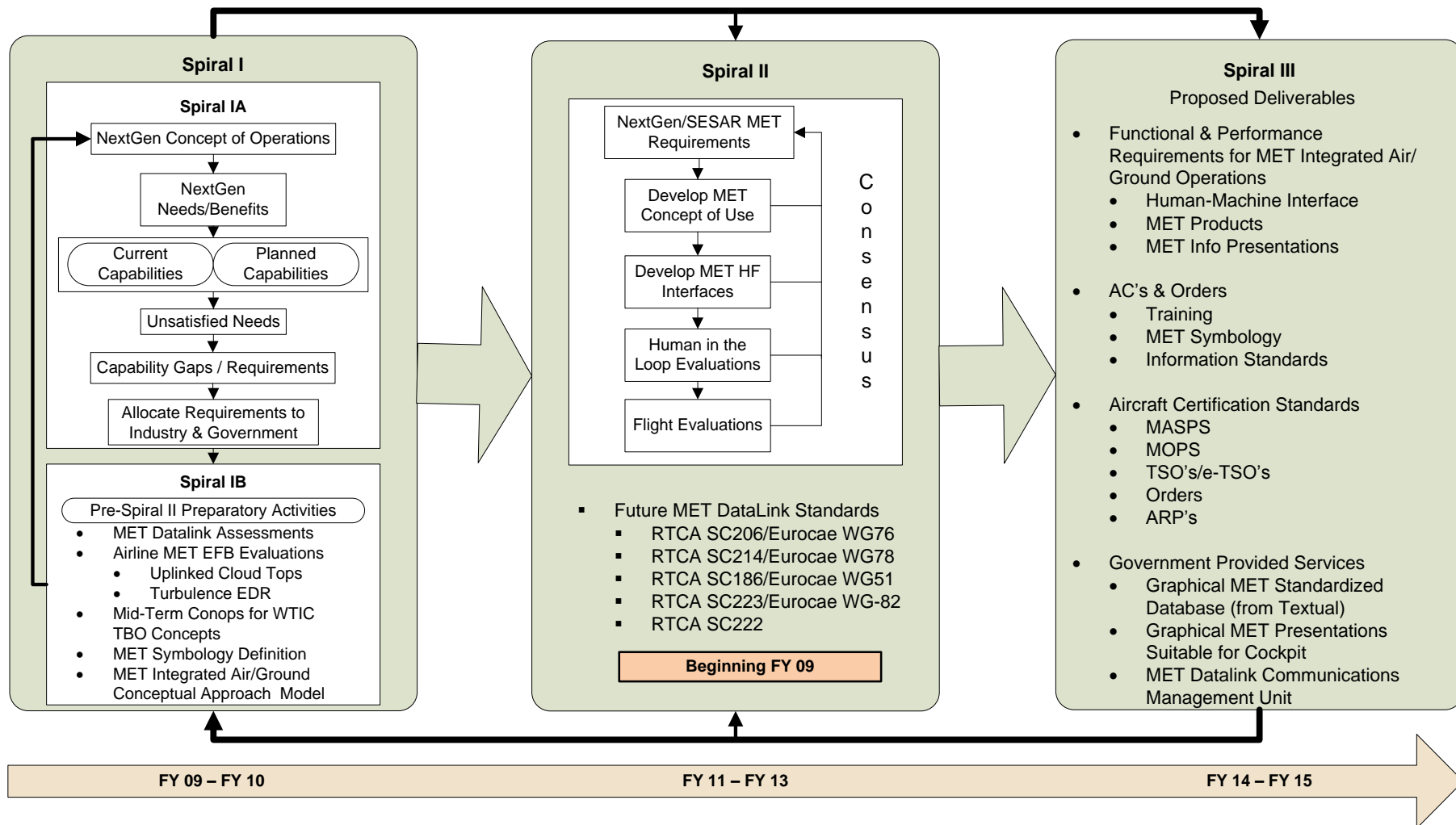
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Federal Aviation
Administration



WTIC Program Overview



Cross-Cutting Activities

- JPDO NextGen WGs
- SESAR Efforts
- NBAA
- NASA
- RTCA Committees
- SAE Committees

Programmatics

- OTA's
- Interagency Agreements
- University Grants
- MOA's
- Partnership Initiatives
- Contracts



WTIC Framework

- **WTIC initial research will evaluate the overarching NextGen/SESAR Concept of Operations (ConOps) and requirements for NextGen/SESAR weather support on the flight deck**
- **Identify the current capabilities to meet NextGen/SESAR requirements and evaluate planned and funded development of new weather support capabilities**
- **Identify gaps between NextGen/SESAR requirements and current developing weather support capabilities**
- **Allocate gaps to commercial sector, government, or both and NextGen Solution Sets to identify implied functional and non-functional requirements**
- **Develop and execute the WTIC research program plan**



Preparatory Research Activities

Preparatory research activities for WTIC capabilities and evaluations are to enable development, validation and verification, and human-in-the-loop evaluations of proposed MET symbology, MET NextGen concepts, and MET Process Models

- **Human Factors human computer interface and human-in-the-loop evaluations enable the development and validation of MET information presentations and the human-machine interactions to support development of Advisory Circulars (AC) and Orders to support NextGen concepts.**
 - Human Factors research includes the verification and validation of the MET symbology as defined in the proposed SAE Aerospace Recommended Practice (ARP 5740) Cockpit Display of Data Linked Weather Information
 - HF research collaborate with the NAS HF Program Office to develop Airborne Decision Support Tools (DST) for collaborative decision making with the ground operations [Airline Operations Centers (AOC) or Flight Service Stations (FSS) and Air Traffic Management (ATM)] to support decisions made to mitigate adverse weather conditions safely and efficiently.



Research Activities

NextGen MET Capability Gaps/Requirements

- **Technical Performer:** AvMet Inc **Status:** Current

NextGen Aviation Weather Processing Technology Gaps Assessment

- **Technical Performer:** Atmospheric Technology Services Company (ATSC) LLC, Norman OK **Status:** Current

Datalink Assessment

- **Technical Performer:** KIHOMAC **Status:** Current

In-flight Display of Hazardous Weather for Transoceanic Aircraft

- **Technical Performer:** National Center for Atmospheric Research (NCAR) Boulder, CO **Status:** Planned

Mid Term WTIC Concept of Operations

- **Task Performer:** National Institute of Aerospace (NIA)/MITRE/University of Alaska (CGAR member) **Status:** Current

Human Factors Considerations

- **MET products generally provide information**
 - Little in terms of decision support
 - Differing content
- **Dynamic time sensitive MET info is in variety of forms and often need aircrew interpretation**
- **Part 91 may have highest technology level but is more fragmented**
 - Wider spectrum of FMS for Part 91 than Parts 121 & 135

Human Factors Framework

- **Human Factors & Human-Machine Interface**

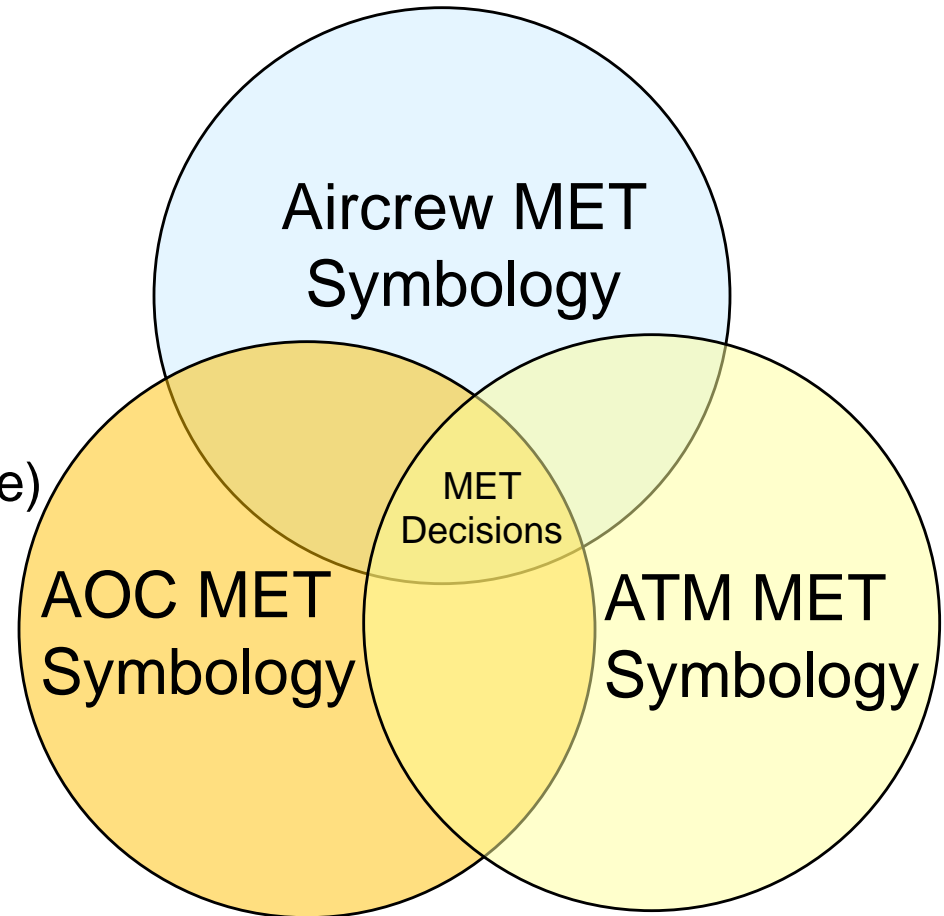
- Data Format & Latency
- Interface Design

- **Decision Making**

- Process Limitations (Decision Mode)
- Task Load & Time Stress (Phase of Flight)

- **Training**

- Knowledge of MET products
- Gaps & recommendations to education, training & guidance



Human Factors Research

Spiral 1B Activities

- MET Symbology Definition (SAE G10)
- Pilot Collaborative Decision Making Training Requirements (ERAU)
- User Needs Statement (UND)
- Air/Ground MET Conceptual Approach Model (ATSC)

Spiral 2 Research Areas:

- **Human Factors Interface**
 - Presentation of MET information
 - Human-in-the-Loop Verification & Validation of SAE G10 Symbology
- **Human-Machine Interface**
 - Aircrew-to-Machine interface
 - Human-in-the-Loop Verification & Validation
- **Conceptual Approach to sustain a “common weather picture”**
 - AOC/FSS and aircrew weather systems
 - Regulatory impacts of utilizing probabilistic forecasts
 - Identify FAA MET Regulations and Policies impacted by NextGen Concepts
 - Human-in-the-Loop Verification & Validation

Human Factors Research Activities

MET Symbology (SAE G-10)

- **Technical Performers:** Industry & Government (Boeing, Airbus, Jeppesen, Honeywell, WSI)

User Needs Statement

- **Technical Performer:** University of North Dakota (CGAR member)

Research Minimum Pilot Training

- **Technical Performer:** Embry-Riddle Aeronautical University (CGAR member)

Conceptual Approach to Sustain “Common Weather Picture

- **Technical Performer:** ATSC LLC, Norman, OK

ASRS Weather “Callbacks

- **Technical Performer:** NASA Ames

WTIC Outreach Partners

Universities

- University of Oklahoma
- National Institute of Aerospace
- Embry-Riddle Aeronautical University
- University of Alaska
- University of North Dakota

Professional Societies

- IEEE
- SAE

Government

- FAA Aircraft Safety
- NASA, Glenn
- NASA, Langley
- CAMI
- NCAR

International

- Eurocontrol
- RTCA

Air Carriers, OEMs, and Avionics Manufacturers – TBD

CGAR and WTIC Collaboration

The Center of Excellence for General Aviation Research (CGAR) Team contribution to the WTIC program is vital in addressing the needs of General Aviation operations in NextGen environment. The team expertise in:

- **Cockpit Technology (Current and Planned)**
- **Pilot Training Requirements**
- **General Aviation weather user needs**
- **Affiliation with the GA community**

Amplifies their ability to conduct the necessary research associated with the use of weather information in the cockpit

The WTIC team look forward to a continue relationship with CGAR as the program progresses.



Summary

- **Products derived from WTIC R&D activities will ensure the adoption of cockpit, ground, and communication technologies, practices, and procedures that will ultimately**
 - **Improve efficiency by reducing disruptions to the NAS by enabling timely aircrew and ground support decisions to mitigate weather hazards**
 - **Increase safety by enabling aircrew and ATM to make appropriate decision concerning conduct of the flight collaboratively**
 - **Provide common situational awareness of weather hazards between ground support and aircrew for dynamic user-preferred trajectories**

Questions

