Friends & Partners of Aviation
Weather

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Outline

• NASA collaborations with FAA, NOAA, academia, and industry partners
• Advanced General Aviation Transport Experiments (AGATE 1996-1999)
• Aviation Safety Program (AvSP 1999-2011)
• Aviation Operations and Safety (AOSP 2011-present)
AirVenture 1994
AGATE 1994-1999

- NASA, FAA, Universities, Industry goal to revitalize GA
- Create Small Airplane Transportation System
- 1996 Atlanta Olympics used as testbed
- Six technical areas including integrated cockpit systems

1999 Demo of AGATE equipped Bonanza
1999-2006 AvSP WxAP

Weather Information Communications
We Put the Weather in the Cockpit
Developing advanced data link communications between space, air, and ground platforms.

Revolutionize Aviation

TAMDAR
Tropospheric Airborne Meteorological Data Reporting
Automated Airborne Weather Reporting
Temperature
Pressure
Humidity
Wind
Ice
Turbulence

Aviation Weather Information Systems
Making timely aviation weather products available
Intuitive Graphical Displays of Weather Information

NASA has teamed with industry, academia, and other government agencies to develop innovative cockpit weather information technologies that will significantly improve situation awareness and increase safety and efficiency.

Satellite Broadcast
Ground Based Broadcast

Panel Mounted
Panel Mounted

Aviation Weather Information’s innovative technologies will provide world-wide sensing, forecasting, and communication systems to pilots, air traffic controllers, and Irvine operators.
Pilot Access Terminal

Stowed in Canister

Oceanic Convective Nowcasting Demonstration

High-Resolution OCND Weather Product
GA Cockpit Display of Weather Information

Multi-Function Display Installation in General Aviation Cockpit

National NEXRAD Weather Product

Icing Probability Weather Product
2000 FAA Capstone Partnership

FAA Capstone Avionics
2000 Prototype Bendix-King handheld Weather Display
2000 WINN Project NASA
Boeing B757

2001 United Airlines WINN In-Service Evaluation
2001 NASA Usability Evaluation

Initial recommendations defined for future AWIN display systems’ software and hardware

CT-1000  FliteVue 640  StratoCheetah  Flight Manager III  Nav-2000  Polaris GPS 990

Software packages
Jeppesen’s FliteMap
Echo Flight’s EchoMap

Input devices
Bezel buttons  Touch pad
Alphanumeric keyboard  Arrow keys  Mouse keys
Touch screen
2002 WARP Display NASA
Cessna C-206H
2003 AirVenture FAA Outreach
2003 AirVenture
2004 TAMDAR equipped Mesaba Airlines Saab 340
TAMDAR
Great Lakes Fleet Experiment

NWS Forecaster Resources

- TAMDAR Data - FSL (Java required)
- Sounding Availability Maps
- Forecaster Forum - hosted by FSL
- Aircraft-RUC Statistics NEW
- Data Quality & Network Questions
- Recent Examples
- Training
- Participating NWS Offices
- Obtaining Data
- Customization of Data on AWIPS
- Contact Information

General Information About TAMDAR and the GLFE

- Why Do We Need TAMDAR?
- Purpose of the GLFE
- Development of TAMDAR
- TAMDAR and NWP
- History of Aircraft Weather Data
- Frequently Asked Questions
- References NEW

Saab 340 Aircraft

On-line presentations designed for Internet Explorer.
Evaluation of Next Generation Cockpit Weather Information, Communications, Airborne Weather Reporting, and Turbulence Prediction and Warning Technologies

Delta Air Lines B-737 used for E-Turb Radar and TAPS In-Service Evaluations

RMS $g \geq 0.153g$ (seat belt on, avoid if poss.)

Two-Level Cockpit Advisory Display

E-Turb Radar Certification Tool

Radar Simulation

Delta Air Lines Dispatchers’ Display Modified to Show TAPS Reports

Transport Display

GA Display

TAMDAR sensor and signal processor

Data Link Test Configuration on LearJet 25 and Display of Weather Information, Atmospheric Data & Traffic

Lear Jet 23 and Lear Jet 25 used for data link flight tests
Aviation Safety Program 2007-2011

• Reduced emphasis on flight deck
• Single sensor – multiple hazard
• NRA and SBIR funded research
• Some examples:
  – Icing Remote Sensing (Ground Based RADAR, LIDAR, Ceilometer Fusion)
  – On-board Near IR LIDAR Development (Air Data System)
  – Near IR Imaging LIDAR Development (Image through Fog/Haze)
  – Dual Polarized Array RADAR (Hydrometeor discrimination and classification)
Aviation Safety 2007-2011

• Sensor NRA examples, cont.
  – Engine & Airframe Icing Characterization and Simulation
  – Narrow Beam Scanning Radiometer (On-board Icing Detection)
  – Forward Looking Interferometer (Turbulence, Volcanic Ash, Wind Shear, Wake Turbulence, RVR, Icing)
• Sensor NRA examples, cont.
  – Doppler LIDAR for Wake Vortex Detection (Fiber Laser Coherent LIDAR)
  – Multi-frequency RADAR Development (Airborne Icing remote sensing)
  – Hazard and Integrity Monitoring (Detect and assess external and internal threats)
Aviation Operations and Safety (AOSP) 2011-Present

- Emphasis on increasing capacity and efficiency for NextGen
- Three main thrusts: Global Aviation Operations, System Wide Safety Assurance, and Autonomous Aircraft
- Weather related efforts are all NRA and SBIR funded research with universities and companies