



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



Revolutionize Aviation

Weather Information Communications

We Put the Weather in the Cockpit

Developing advanced data link communications between space, air, and ground platforms.



Satellite and ground-based data link technologies are being developed for high capacity access to timely graphical information for operations anywhere in the national airspace.

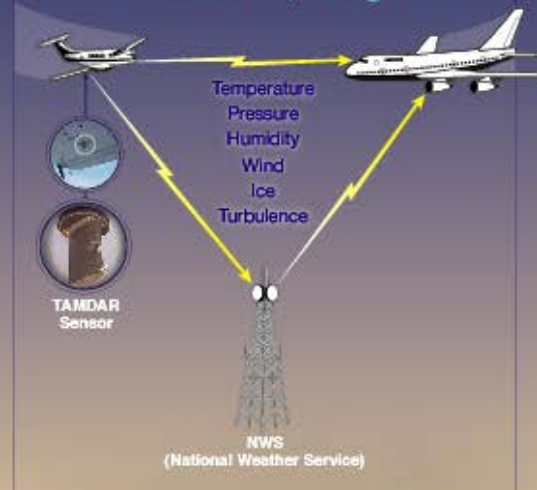


Revolutionize Aviation

TAMDAR

Tropospheric Airborne Meteorological Data Reporting

Automated Airborne Weather Reporting



Revolutionize Aviation

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.



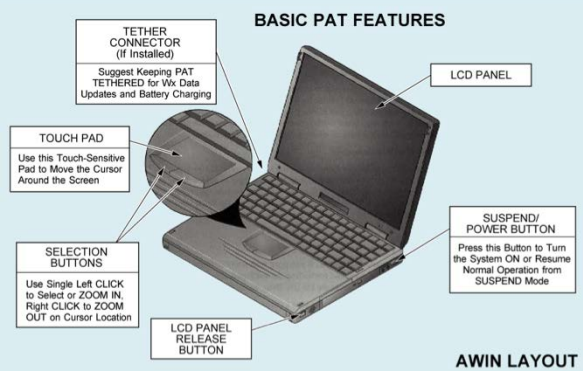
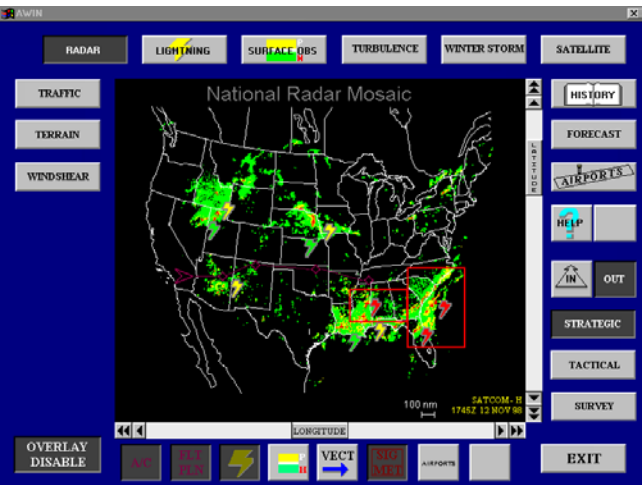
Panel Mounted



Panel Mounted

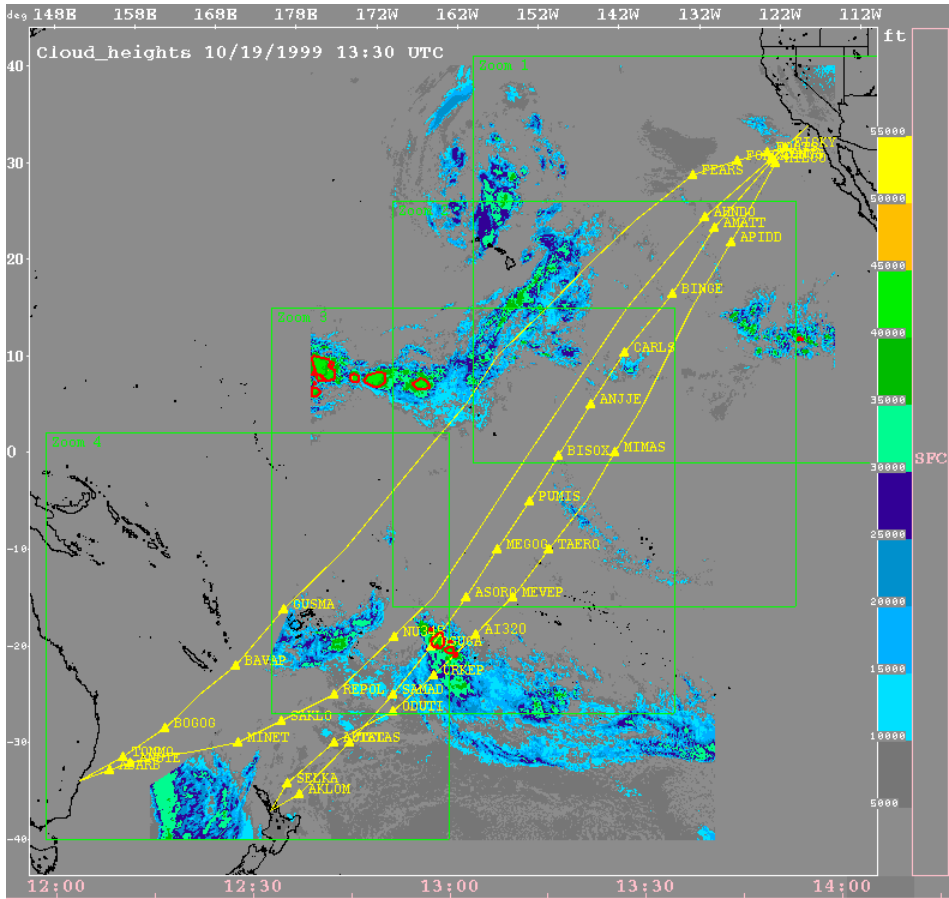
Aviation Weather Information's innovative technologies will provide world-wide sensing, forecasting, and communication systems to pilots, air-traffic controllers, and airline operators.

Pilot Access Terminal



Stowed in
Canister

Oceanic Convective Nowcasting Demonstration

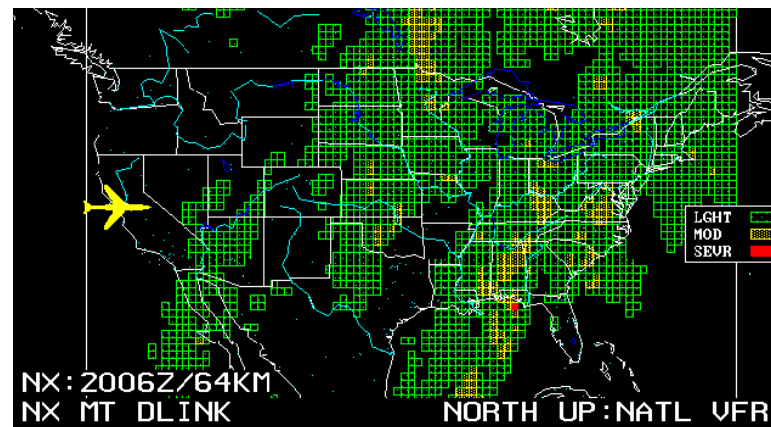


High-Resolution OCND
Weather Product

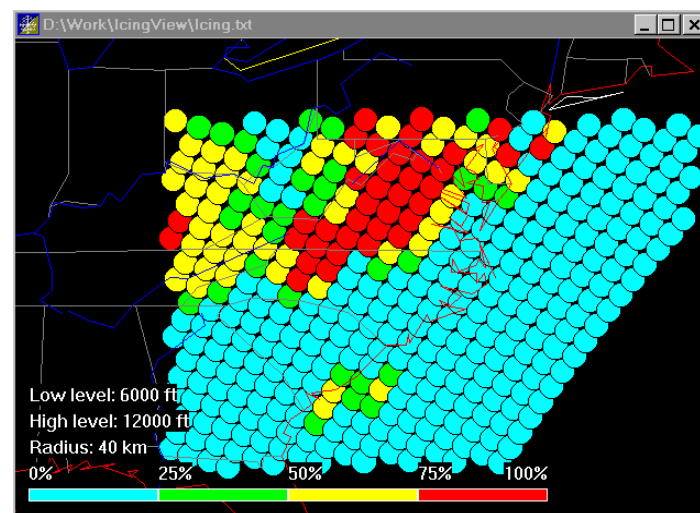
GA Cockpit Display of Weather Information



Multi-Function Display Installation in General Aviation Cockpit



National NEXRAD Weather Product



Icing Probability Weather Product



FAA Capstone Avionics

2000 FAA Capstone Partnership





2000 Prototype Bendix-King handheld Weather Display



2001 United Airlines WINN In-Service Evaluation

2000 WINN Project NASA
Boeing B757



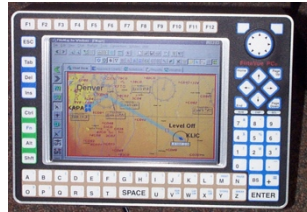
2001 NASA Usability Evaluation



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

KMD550 - First Public AWIN Demonstration



2003 AirVenture FAA Outreach





2003 AirVenture



2004 TAMDAR equipped Mesaba Airlines Saab 340





AIRDAT

MESABA AIRLINES
OPERATING AS NORTHWEST Airlink



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](#)



Saab 340 Aircraft

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**

On-line presentations designed for Internet Explorer.



Aviation Safety and Security Program Technical Accomplishment

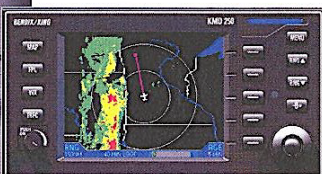
2005



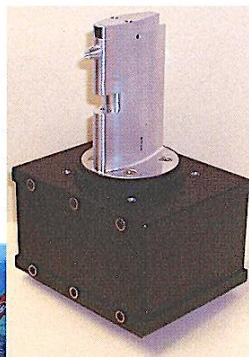
Evaluation of Next Generation Cockpit Weather Information, Communications, Airborne Weather Reporting, and Turbulence Prediction and Warning Technologies



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



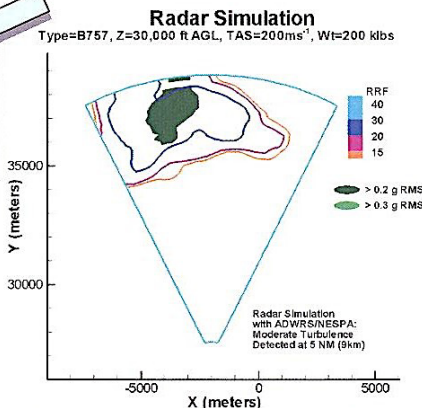
Delta Air Lines B-737 used
for E-Turb Radar and TAPS
In-Service Evaluations

$0.093g \leq \text{RMS } g < 0.153g$
(seat belt on)

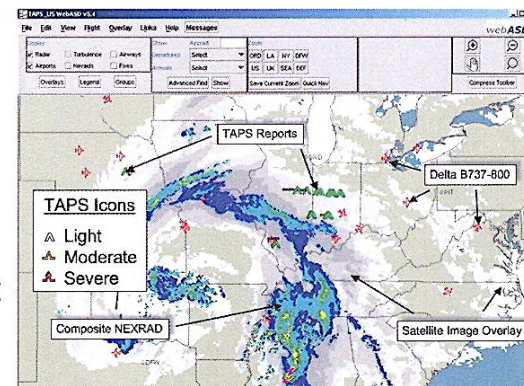


Two-Level Cockpit
Advisory Display

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



E-Turb Radar Certification Tool



Delta Air Lines Dispatchers' Display
Modified to Show TAPS Reports

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)

Aviation Safety 2007-2011



- 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