



# ***Progress in Cockpit-based Product Dissemination/Display***

2002 Friends/Partners in Aviation Weather Forum  
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# Panel



- Gus Martzaklis – NASA
- Clyde Jones – FAA
- Gary Stuteville – Honeywell
- Tenny Lindholm - NCAR

# Issues Identified



- Get improved weather information to the cockpit for safer and more efficient operations. Is enough being done?
- Get timely, accurate, pertinent thunderstorm hazard information from the WFO to the cockpit in real-time.
- Get nowcasts of oceanic turbulence and convection to the cockpit in real-time.
  - High datalink costs identified as key issue last year

# NASA Research & Technology



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- Datalink Cockpit Weather Information Systems
  - General Aviation systems
  - Commercial Air Transport systems
- Focused research in specific areas:
  - User interface:
    - Presentation
    - Decision aiding
    - Flight planning tools
  - Information acquisition & conditioning:
    - Information fusion
    - Enhanced on-board radar
  - Communications technologies
    - Portable avionics, adaptation of non-Wx comm

# Commercial Transport Systems



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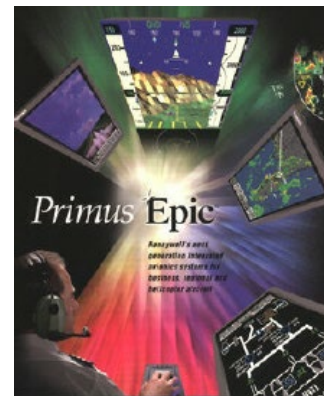
## Honeywell Weather Information Network Cooperative Research:



NASA Evaluation of AWIN System on NASA B-757



In-Service Evaluation by United Airlines on Airbus

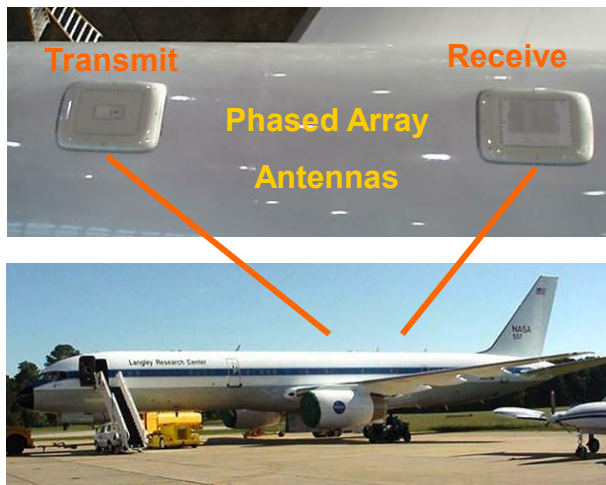


WINN selected for Honeywell Epic Avionics

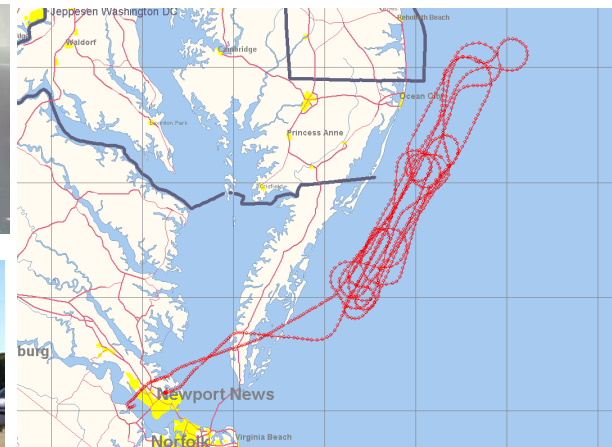
## Boeing Broadband Satellite Communications Research:



Airborne Equipment Rack



Antenna Installation on NASA B-757

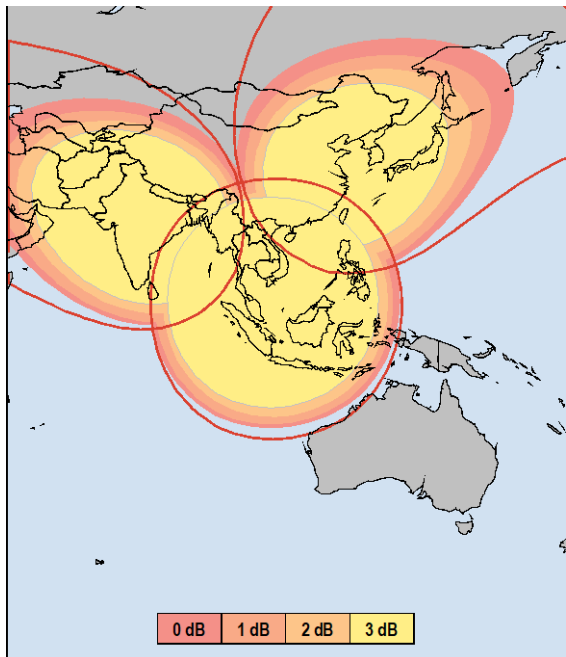


Flight Track (from Spring 2002)

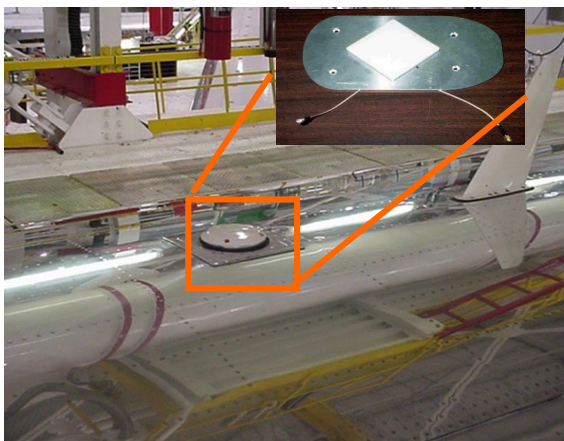
# Commercial Transport Systems



Rockwell Satellite Weather Information Service (SWIS) Research:

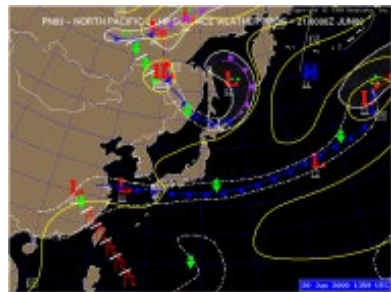


AsiaStar Antenna Beam Coverage

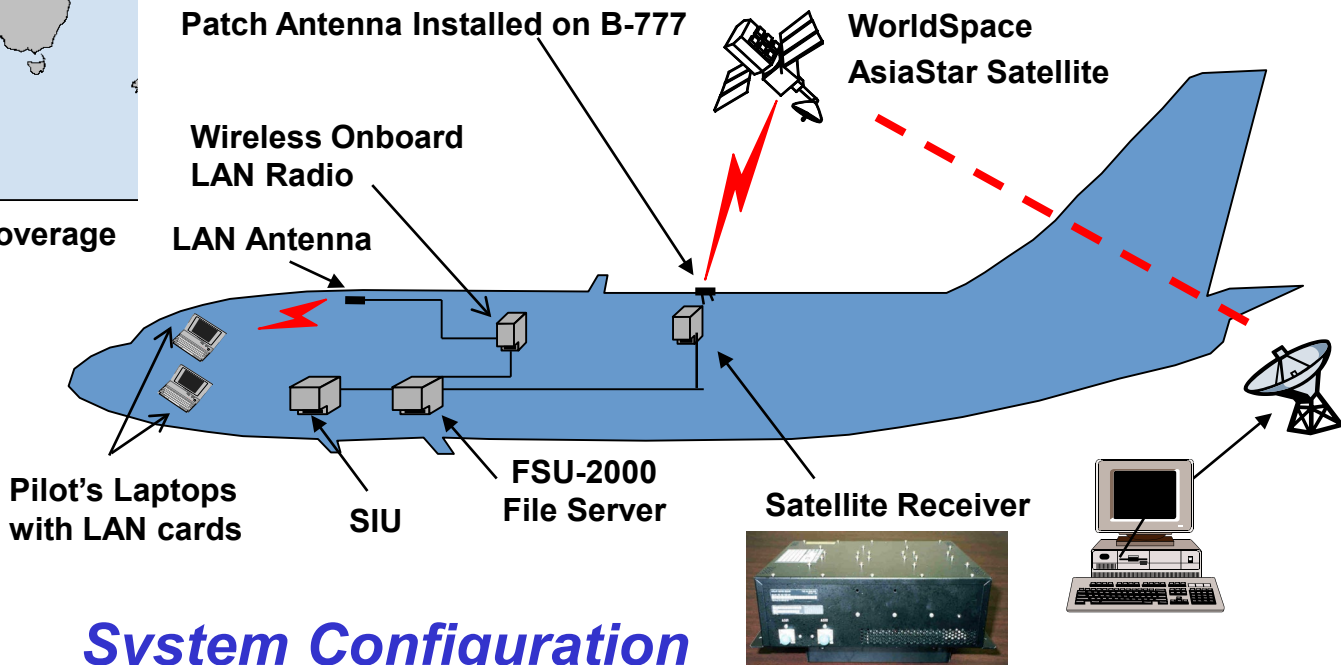


Patch Antenna Installed on B-777

- Completed In-Service Evaluations on NOPAC routes with two American Airlines B-777s
- Demonstrated good link performance
- Favorable crew feedback
- Major concern: high comm costs



Sample Weather Image



**System Configuration**



# General Aviation Systems



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## ViGYAN Small Business Innovative Research:



2000-2001: Initial Flight Evaluation under NASA SBIR Contract



Antenna Aircraft Installation



Summer 2002: WSI InFlight Product

## Cooperative Research with ARNAV and Honeywell/Bendix-King:



Summer 2000 - NASA AWIN General Aviation System Research on NASA B-200 King Air



Summer 2000 - ARNAV General Aviation Data Link Weather Information System



December 2001 - Bendix/King General Aviation Data Link Weather Information System

# Commercialization



- AirCell
- FlyTimer
- ARNAV Systems Inc.
- Garmin
- Avidyne
- Goodrich
- Baron
- Honeywell/Bendix-King
- ControlVision
- SATELLINK Technologies
- Echo Flight
- WSI



# User Interface Research

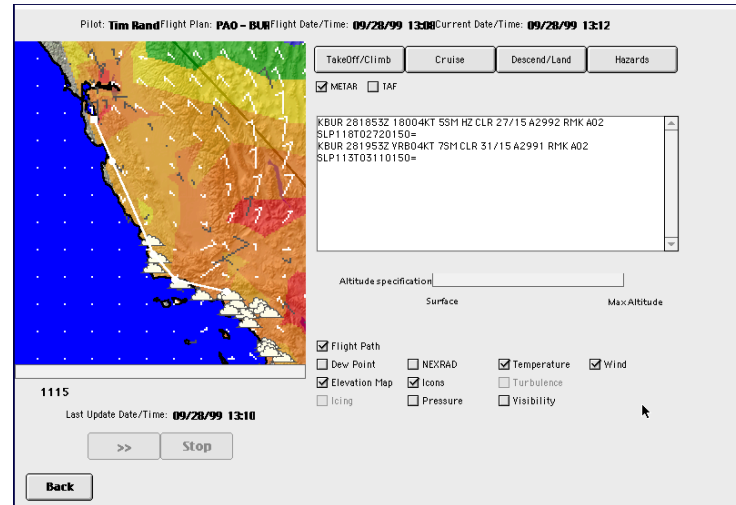


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Enhanced Weather Radar: Integrating on-board & uplinked Radar



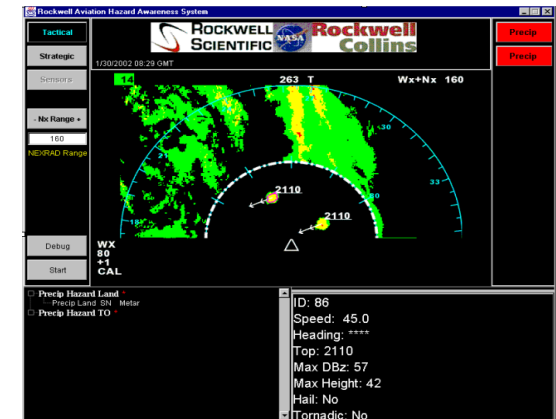
Preflight Planning: preflight probabilistic hazard analysis using text and graphic Wx information



Flight research on use of datalink weather in combination with other sources



Flight research on flying and accessing weather information (workload and relative position)



In-flight weather analysis tools considering Wx info and specific mission and equipment profile.

# Communications Research

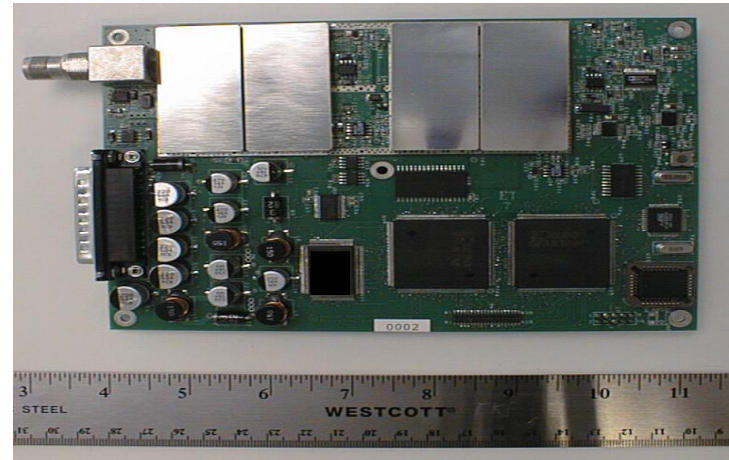


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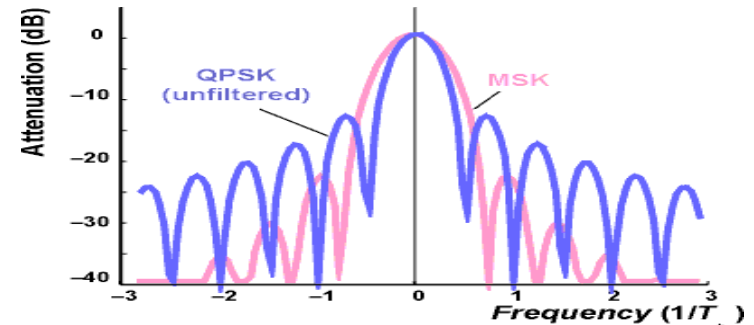
Low-cost, high performance antenna development



Miniaturized, portable avionics (System-on-a-Chip)



Adapting datalinks for weather applications



Efficient bandwidth/coding techniques

# Remaining Challenges



- Integration and display of multiple weather and non-weather info (terrain, traffic...)
- Cost-bandwidth communications problem
- Multiple sensor, datalink fusion
- Information, not data (don't increase workload)!
- International operations
  - Weather products
  - Communications

# NASA Future Plans



- Information fusion and decision aiding
- Optimal user interface guidelines
- Improved datalink efficiency
  - Compression techniques
  - Data formatting
- Communications cost reduction
  - Portable avionics (VDL on a chip)
  - Non-weather datalink adaptation
- Optimal FIS datalink architecture guidelines

# Announcement



*NASA Aviation Safety Program*

*Friends/Partners in Aviation Weather Forum*



## **3<sup>rd</sup> Annual NASA Aviation Weather Accident Prevention Review**

November 20-21, 2002  
MIT/Lincoln Laboratory  
Lexington, MA

<http://www.grc.nasa.gov/WWW/avsp/>

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