

NASA Airborne Science Program Platform Upgrades NSERC University of North Dakota



Outline

- Rationale for platform upgrades underway
- Onboard data display systems
- IRIDIUM and new INMARSAT satcom systems
- New Ground stations for remote/short deployments
- Upgrade of facility state parameter instrumentation
- Digital intercom system upgrades



Rationale for platform upgrades underway

A major goal of the Airborne Science Program is to provide a seamless environment to science investigators to maximize the science return from missions. Moving towards this goal will require the following:

- Standardization across the program
 - Instrument information requirements
 - Aircraft data systems
 - Data feed formats
 - Real time data displays (Current activities for the DC-8, P-3B, and GHOC)
 - Facility instrumentation
- Provide situational awareness to science investigators on board and on the ground
 - Google Earth like displays of aircraft position and satellite/instrument data
 - Xchat availability for science team communications from anywhere in the world

This requires reliable communications between aircraft and ground bases

- Multi-link IRIDIUM has provided limited communications in the recent past
- INMARSAT BGAN now appears to be a higher bandwidth option



Onboard data display systems

- In the last few years new onboard high speed network data display functionality has been implemented on the NASA DC-8. The system is based on the following:
 - Onboard GB fiber optic network with access points around the aircraft
 - Network time and data servers for applications and data archive
 - Xchat application for science team communications
 - A comprehensive Web Application for display of data
 - High resolution LCD touch screen displays for data selection
 - Digital video cameras, forward and nadir pointing
- A nearly identical system is currently being assembled for the P-3B which will be permanently installed sometime later this year



IRIDIUM satcom systems

Two 4 channel multilink IRIDIUM satcom systems were successfully deployed on the DC-8 and P-3B during the second half of the ARCTAS mission in 2008. Recently the DC-8 system has been upgraded to a 6 channel system. These systems are functional from pole to pole around the globe.

The systems provide near continuous 9.6 KB bandwidth for the following services:

- Xchat service for intra-aircraft, inter-aircraft, and aircraft-ground communications
- Reliable upload/download of weather, satellite, and instrument data
- Multilink systems can be upgraded to 6-12 channels in the future

New INMARSAT BGAN satcom systems

- New Chelton SwiftBroadband INMARSAT systems are now available with BGAN service allowing for bandwidths up to 432KB. Current INMARSAT coverage is global to ~72 degrees north and south limiting polar communications.
- New dual channel SwiftBroadband systems will be installed on the DC-8 and P-3B in the spring/summer 2009.
- Phoenix Avionics LLC will install systems to FAA standards, provide all drawings and documentation, test the systems, and train staff in operation of the systems.



New Ground stations for remote/short deployments

- The Earth Science Project Office at NASA Ames has been extremely efficient at providing internet services and investigator networks at deployment sites for many of the large NASA Airborne Science Program missions.
- These services have become invaluable for situational awareness and coordination of multiple platforms on large missions.
- There is an increasing need for this functionality on almost all missions, even smaller short duration missions where providing the extensive services may not be justified or remote location missions where internet service may not be available or reliable.

- To address this need, new portable ground stations have been designed and are being assembled in rack mount containers that could be shipped as aircraft cargo. These systems include the following components:
 - IRIDIUM receivers for communications with the aircraft or internet access
 - INMATSAT receiver for communications with the aircraft or internet access
 - Data and application servers with Web display application
 - Network switches for a ground based science investigator network
 - Large format displays for investigators on the ground



Upgrade of facility state parameter instrumentation

- Current facility instrumentation on the DC-8 and P-3B is aging and has been difficult to maintain in calibration. Recently new instrumentation have been acquired for both the DC-8 and P-3B including:
 - EdgeTech Hygrometers for relative humidity measurements
 - Heitronics Infrared Radiation Pyrometers for IR surface temperatures
 - Rosemount 102 temperature probes to Total and Static Air temperature
 - High accuracy cabin pressure transducers

New digital intercom systems

- The current analog interphone communication systems on the DC-8 and P-3B are outdated and have issues of high frequency interference.
- Avionics Engineering Services, a communications provider have been evaluating the current systems on the DC-8 and P-3B. They will soon provide a proposal to replace the current systems with systems that have the following features:
 - Fully digital systems with separate flight deck and cabin systems
 - Noise cancelling headphones and microphones
 - A limited number of wireless headsets for safety techs, mission directors, and mission scientists to allow movement in the cabin without loss of communication.



Questions

