



Global Test Range

Toward Airborne Sensor Webs

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NASA Dryden Flight Research Center



ScMD/SSP/Earth Science Capabilities Demonstration Project
ARMD/FA/SFW/Advanced Experimental Systems Project
ARMD/AvSP/Integrated Vehicle Health Management Project

Earth System Science



Sun- Earth
Connection

7 science disciplines
12 application domains

Climate Variability
and Change

Carbon Cycle
and Ecosystems

Earth Surface
and Interior

Atmospheric
Composition

Weather

Water &
Energy
Cycle

Agricultural efficiency
Air quality
Aviation
Carbon management
Coastal management
Disaster management

Ecological forecasting
Energy management
Homeland security
Invasive species
Public health
Water management

Future = Layered Sensor Web Architecture



Our “business” is sensor web R&D

- Emerging technology experiments
- Rapid prototyping/Spiral development
- Includes design/build/fly airborne Linux computers
- Includes network-computing capabilities
- Not mission essential infrastructure

Both airborne asset and terrestrial user are remote from DFRC

Three “zones”

- The Linux gateway (embedded computer) on the aircraft
- A core network to manage communication w/ aircraft & lab
- An extranet DMZ to isolate services routinely accessed by remote project participants

Global Test Range is a lab developing trustworthy services for airborne instruments - a specialized Internet Service Provider

We “operate” prototype capabilities, but still years from “operational”



REVEAL: Brief History

Focus: Network Test/Measurement (2000-2003)

- Need tool for sensor webs, onboard computing, network data mgmt

Focus: Suborbital Science Needs (2004-present)

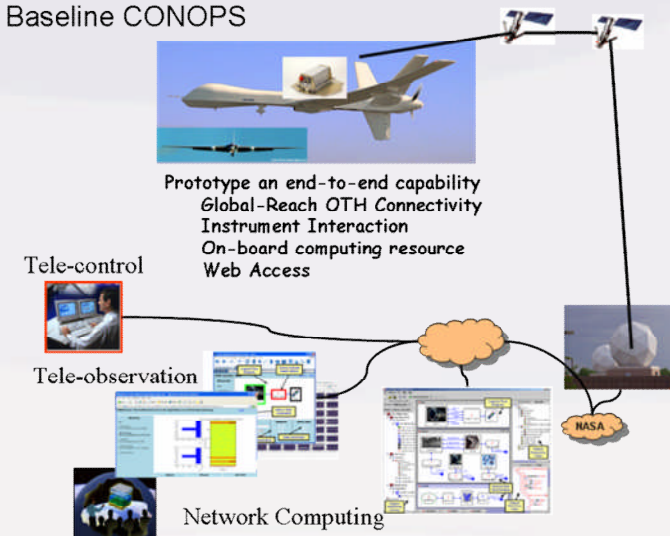
- The future demands better capabilities; greater capacity to do useful work on UAVs
- Network-centric approaches to payload integration, monitoring, CONOPS, etc. must emerge
- Squeeze more value out of every flight hour

REVEAL Solution Approach

- Vehicle-independent interface for science instruments lowers costs and reduces risks
- Software is important: Build on open standards; dynamically reconfigurable; design for broad class of sensor web and airborne instrument communication R&D applications.
- A vehicle-independent network-savvy instrumentation & processing system
- Deliver traditional airborne laboratory support items in a small package (~10 lbs)
- Add affordable satcom for global-reach near realtime situational awareness
- Add affordable terrestrial infrastructure for web access and distributed computing (not just the airborne stuff)



Baseline CONOPS

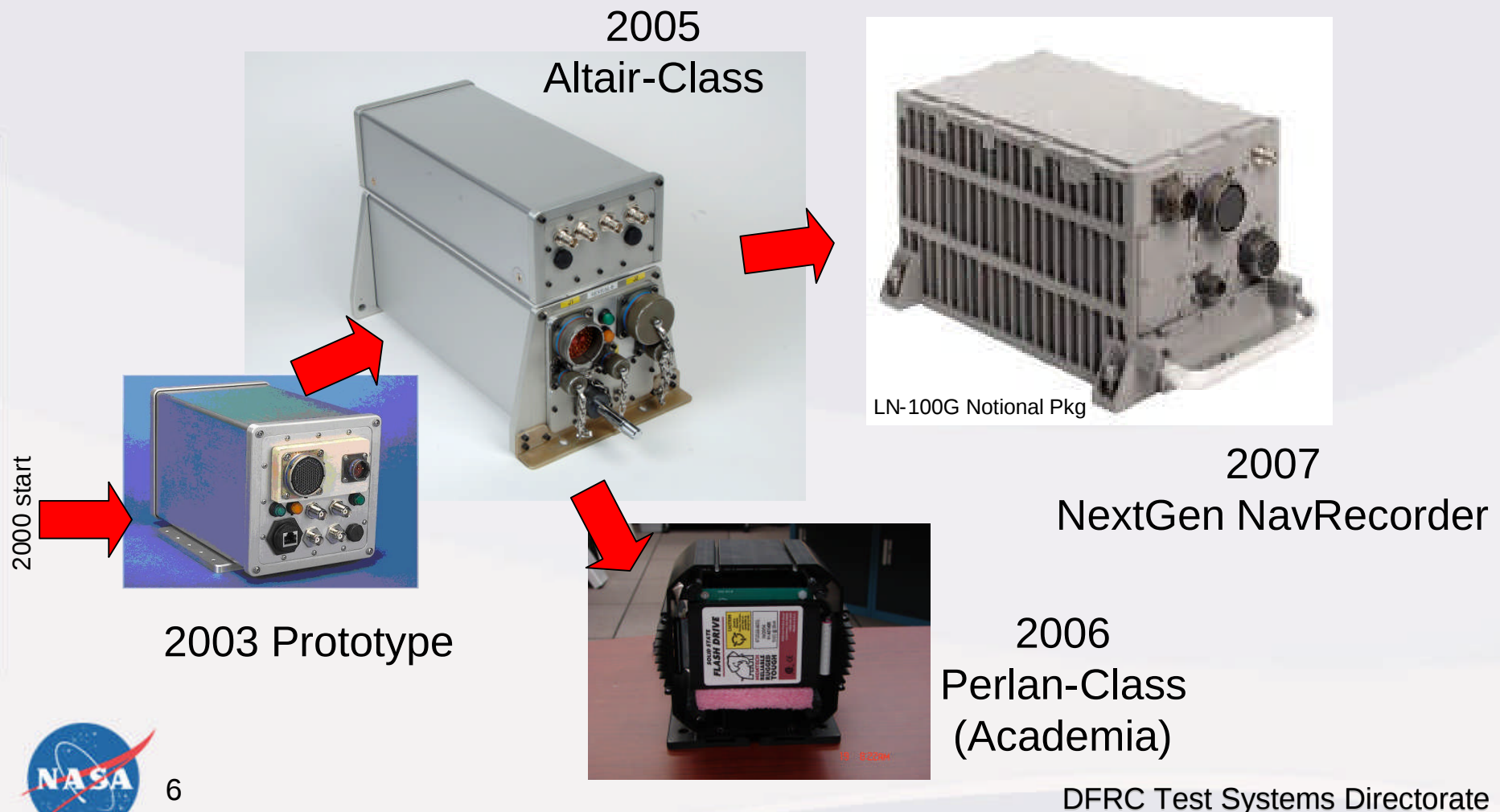


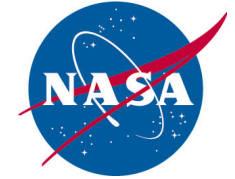
DFRC Test Systems Directorate



REVEAL Evolution

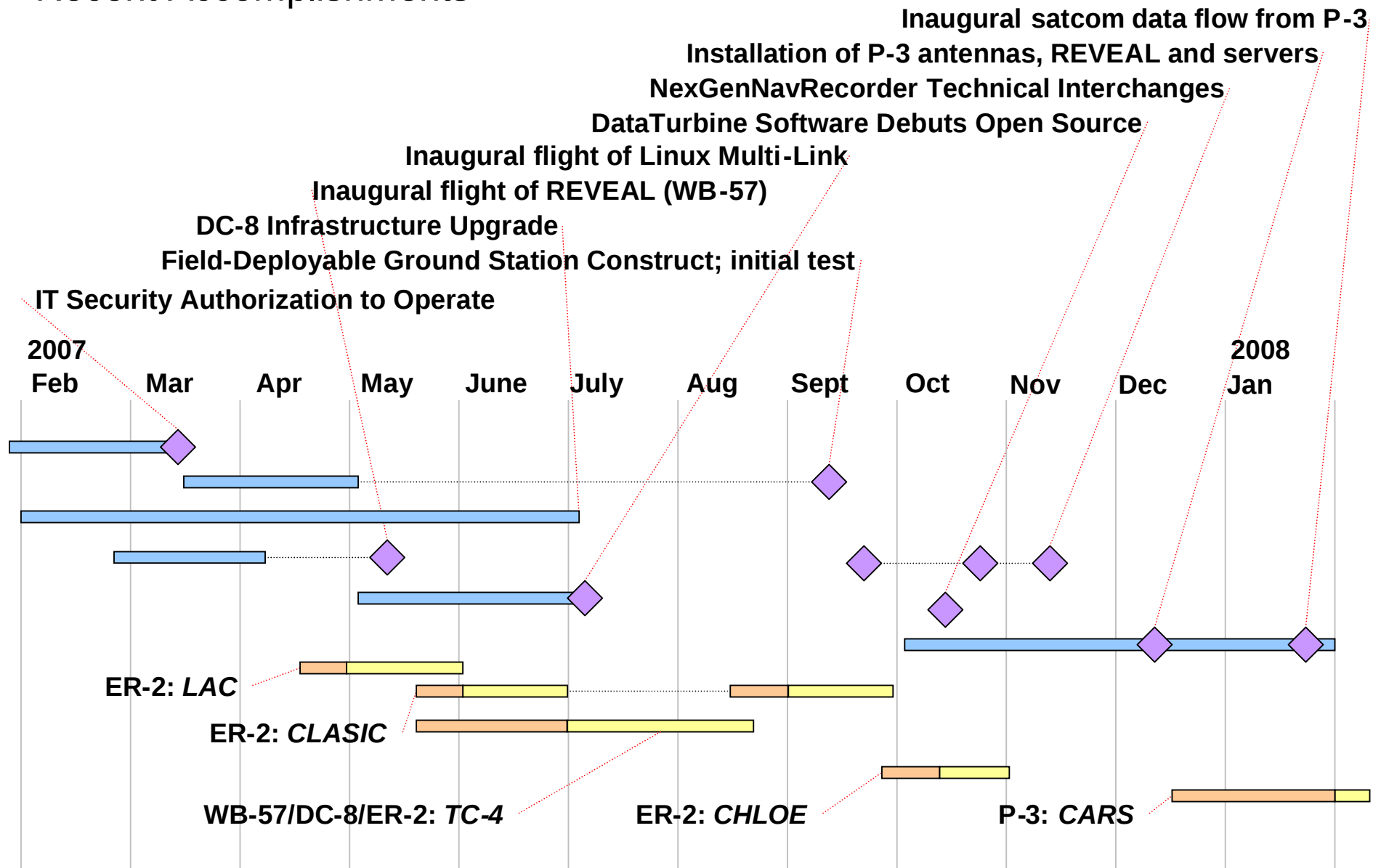
REVEAL: Research Environment for Vehicle-Embedded Analysis on Linux

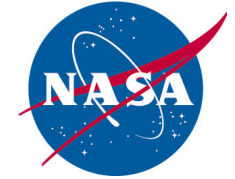




Suborbital Telepresence

Recent Accomplishments



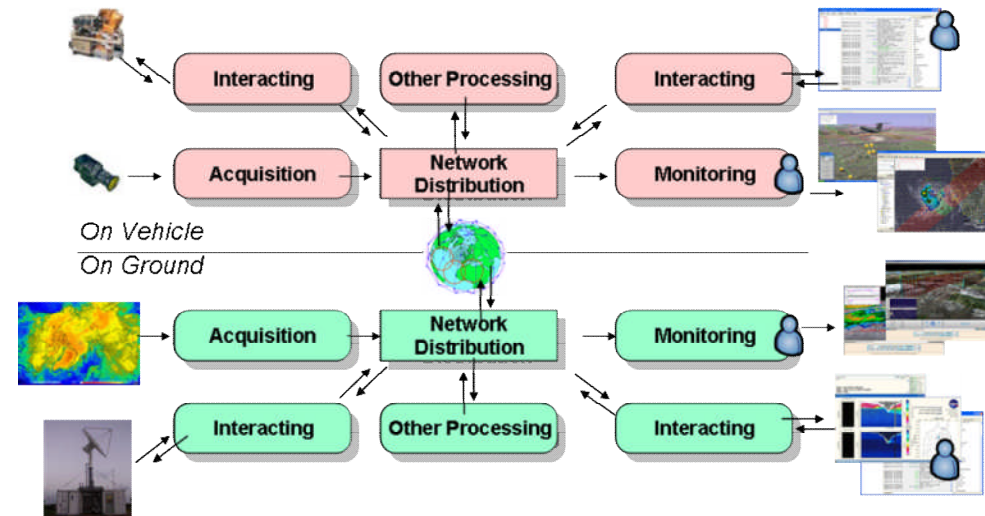


Suborbital Telepresence Tools & Techniques

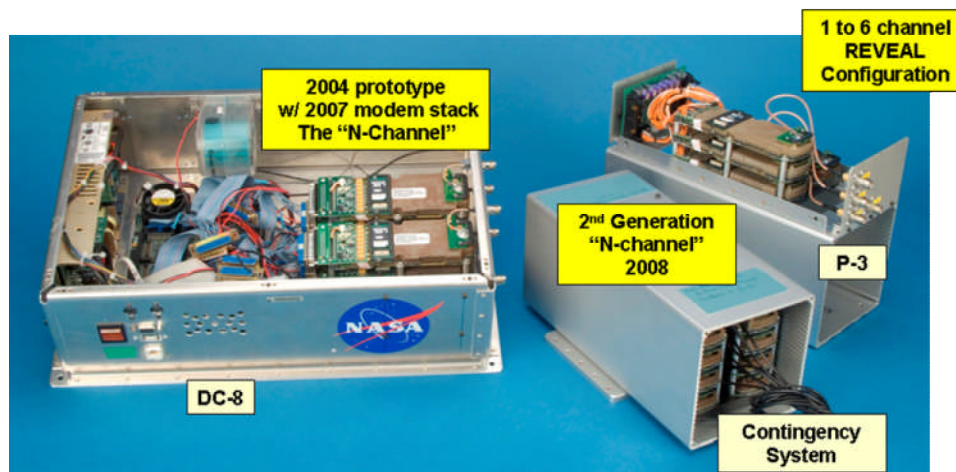
Field-Deployable "Contingency System" Prototype



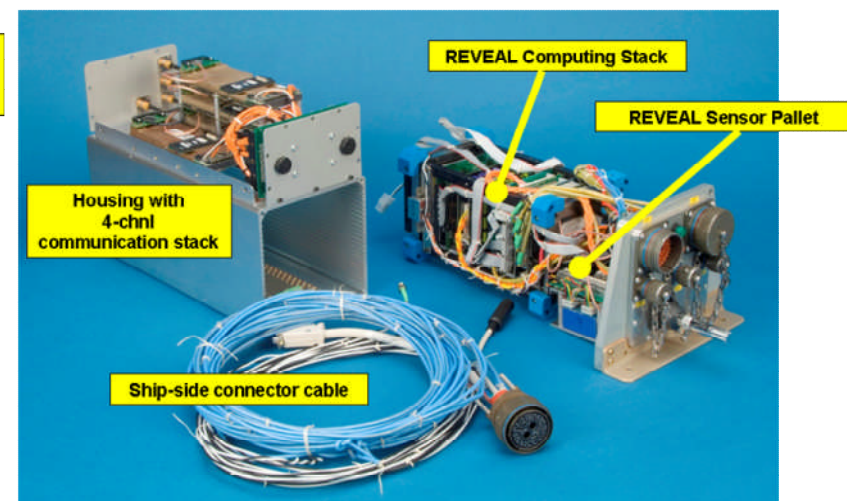
Functional Architecture



Multi-Channel Iridium Evolution

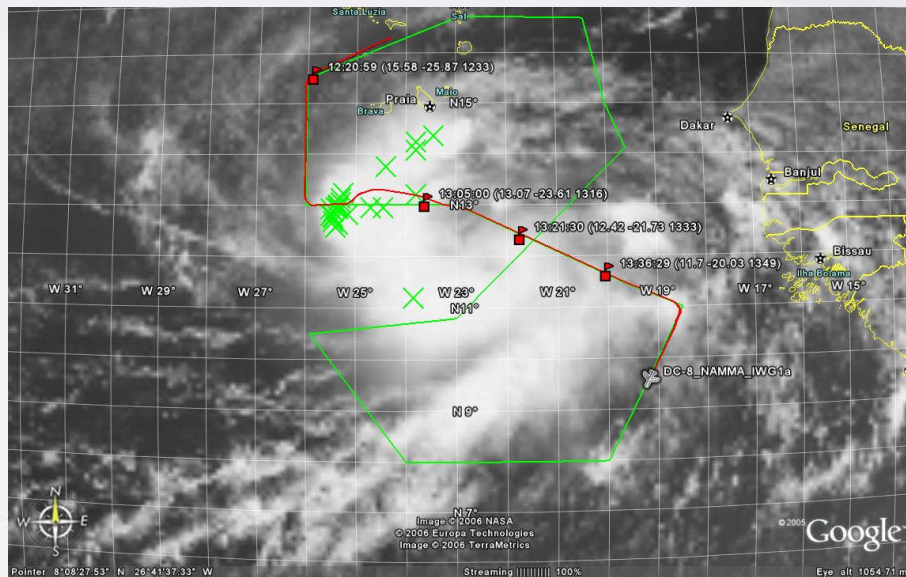
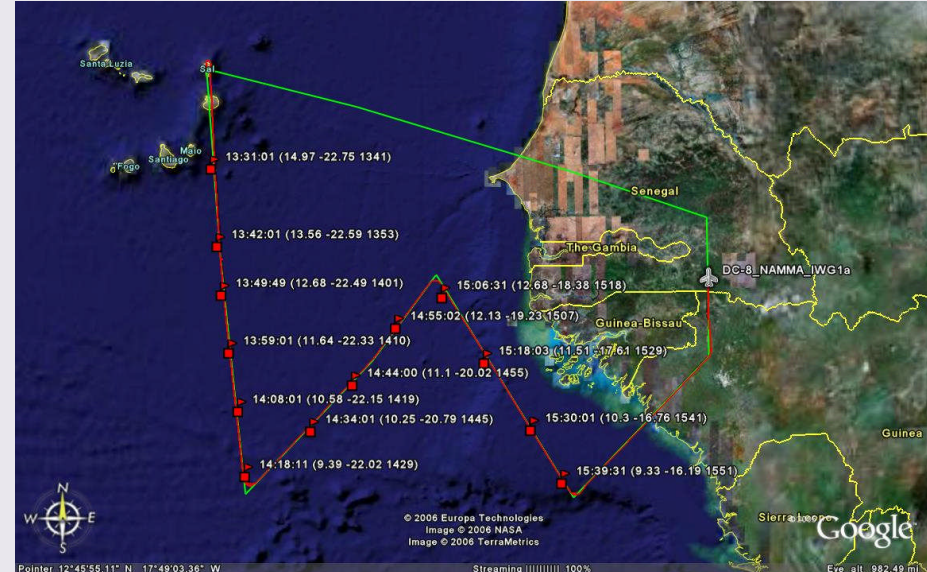
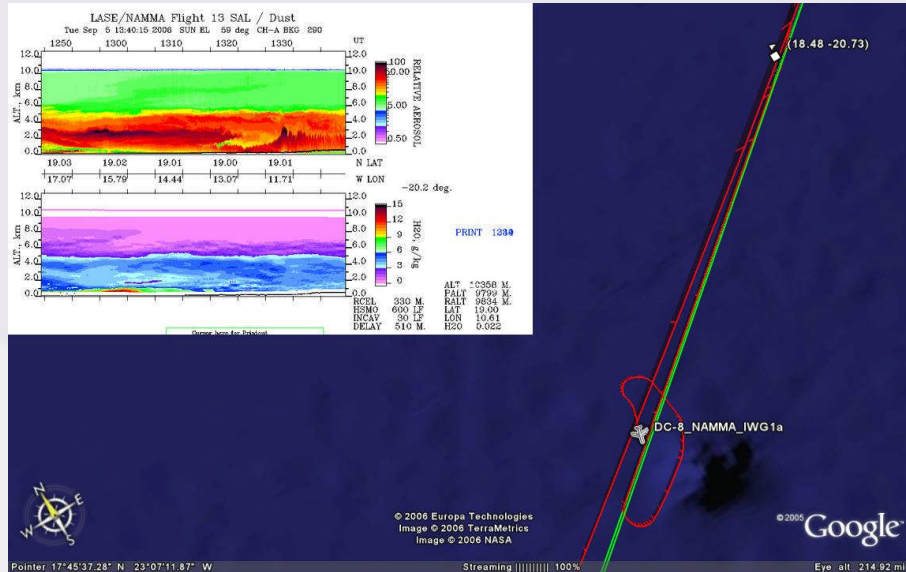


The P-3's REVEAL System: An Inside Look



NAMMA: Real Time Mission Monitor

Aug/Sep 2006



- Significant increase in number of integrated elements, + chat
- “Major step forward in our capabilities for doing real-time monitoring and direction of missions” – Dr. Ed Zipser
- Tropical meteorology students participated from Utah (8 Sep 06)

Fire Mission October 2006

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noaa research
Where Science Comes to Life

Historic Flight of NOAA Instruments Operating on an Unmanned Aircraft

31 October, 2006

OAR hot items archive help

Global Monitoring Division - ESRL-GMD
This story entered on 31st Oct, 2006 11:52:39 AM PST

Google Earth Pro

Altitude: 13274 ft Lat: 37.65 Lon: -119.29
NOAA_Ozone=241.0
NOAA_Water_Vapour=12.00

Happy Isles

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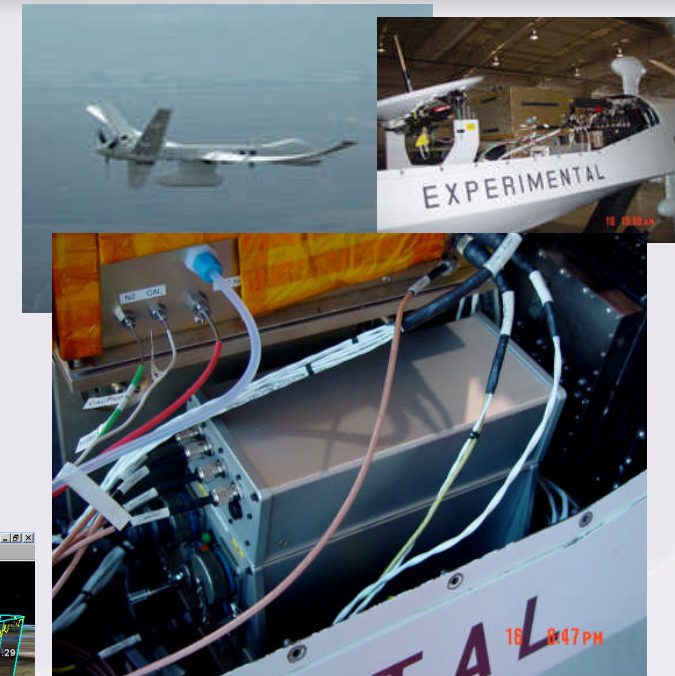
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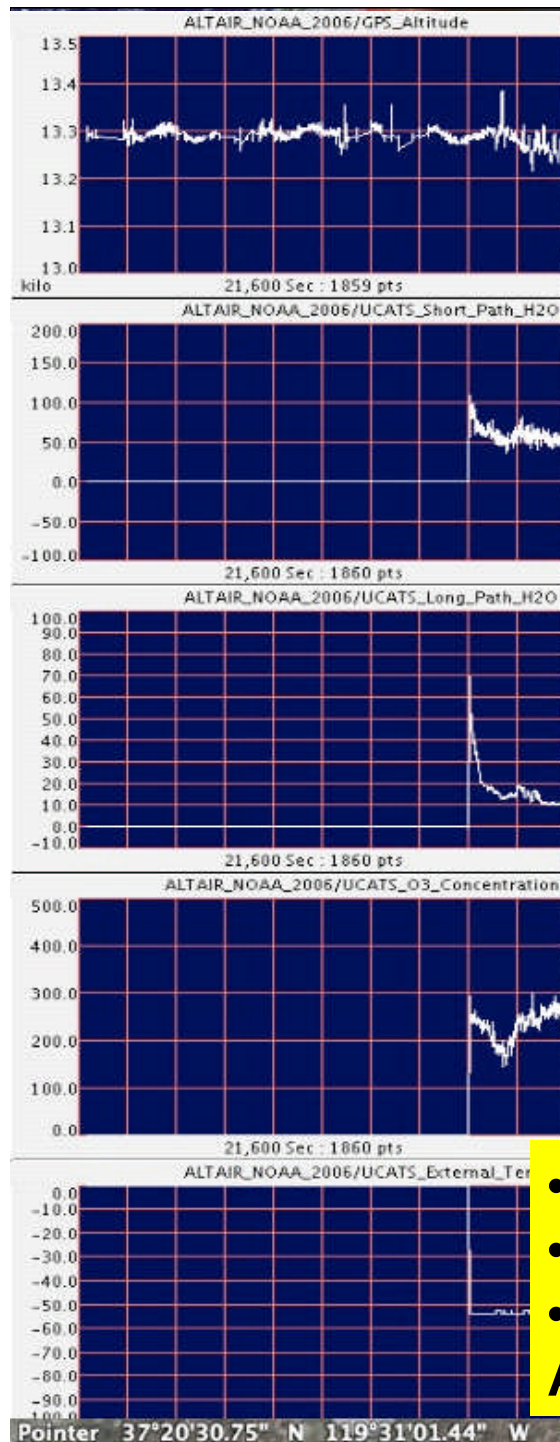
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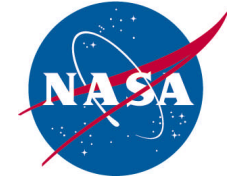
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10



- UAV flying in national airspace
- Repaired *in situ* instrument in flight
- Data Viewed Live at 34th Advanced Global Atmospheric Gases Experiment Meeting



ARCTAS Notional Implementation

