



# Global Test Range

Toward Airborne Sensor Webs

Dr. Thomas H Mace  
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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

Agricultural efficiency  
Air quality  
Aviation  
Carbon management  
Coastal management  
Disaster management

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

Water &  
Energy  
Cycle

# Future = Layered Sensor Web Architecture



Directorate

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)

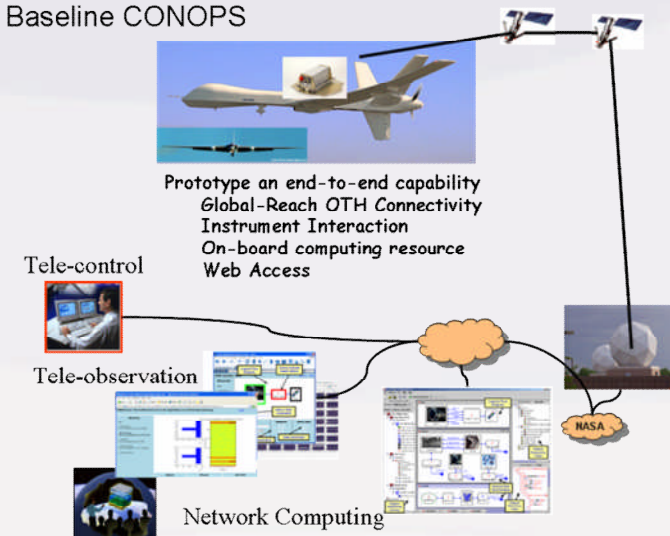
- The future demands better capabilities; greater capacity to do useful work on UAVs
- Network-centric approaches to payload integration, monitoring, CONOPS, etc. must emerge
- Squeeze more value out of every flight hour

## 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

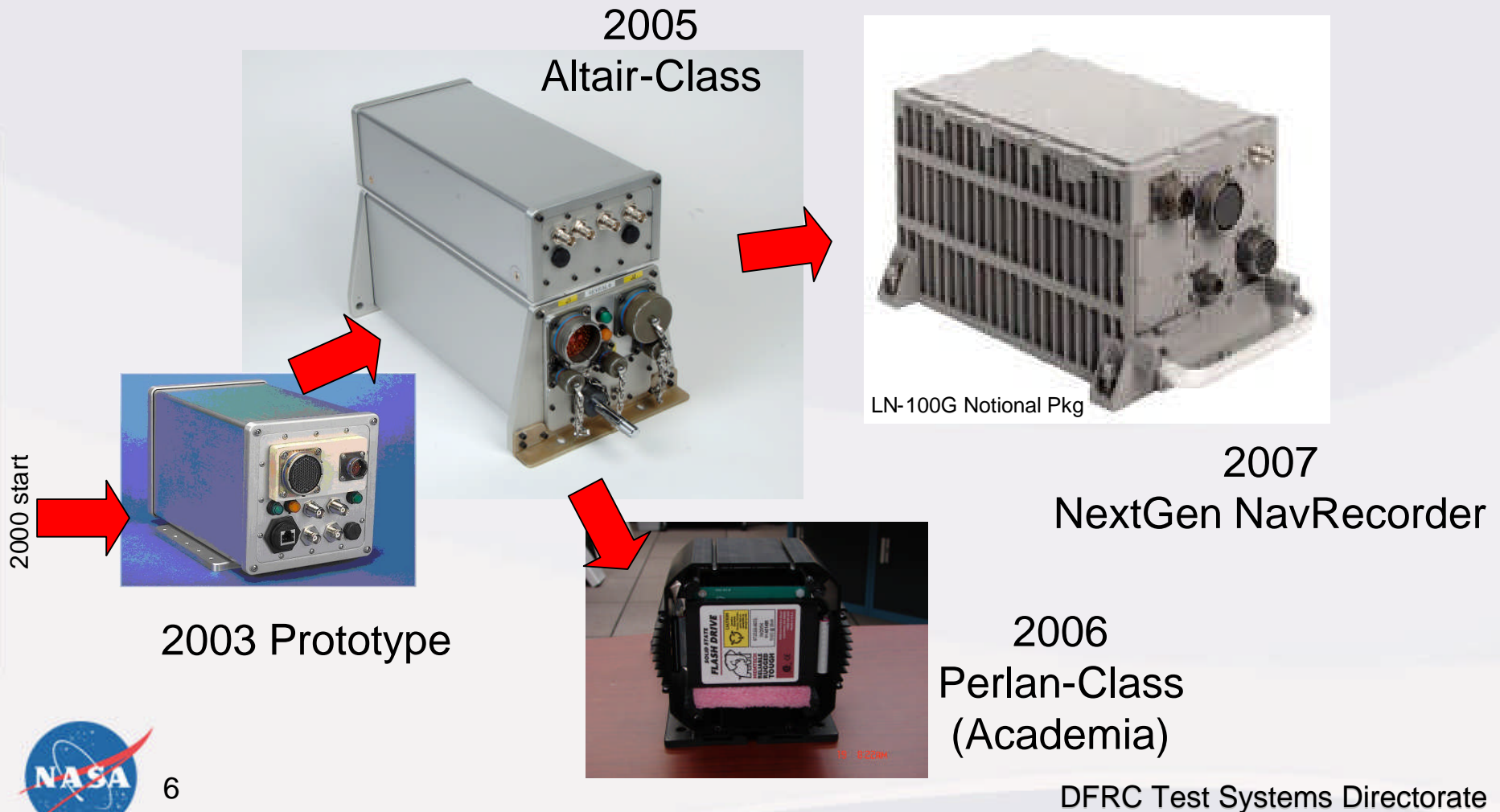


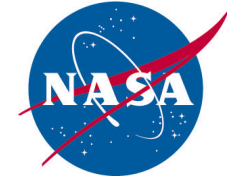
DFRC Test Systems Directorate



# REVEAL Evolution

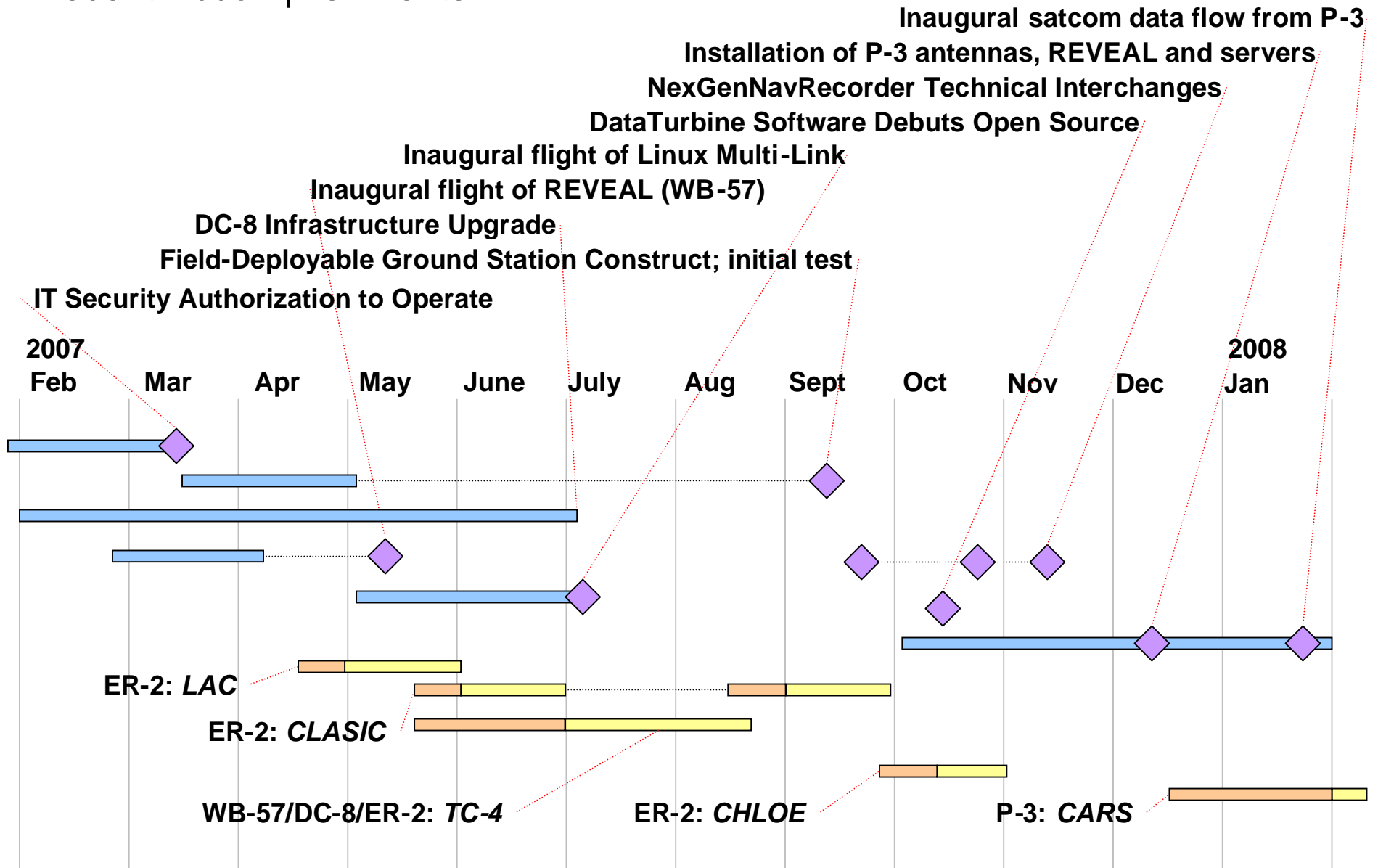
REVEAL: Research Environment for Vehicle-Embedded Analysis on Linux

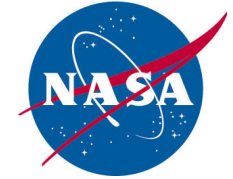




# Suborbital Telepresence

## Recent Accomplishments



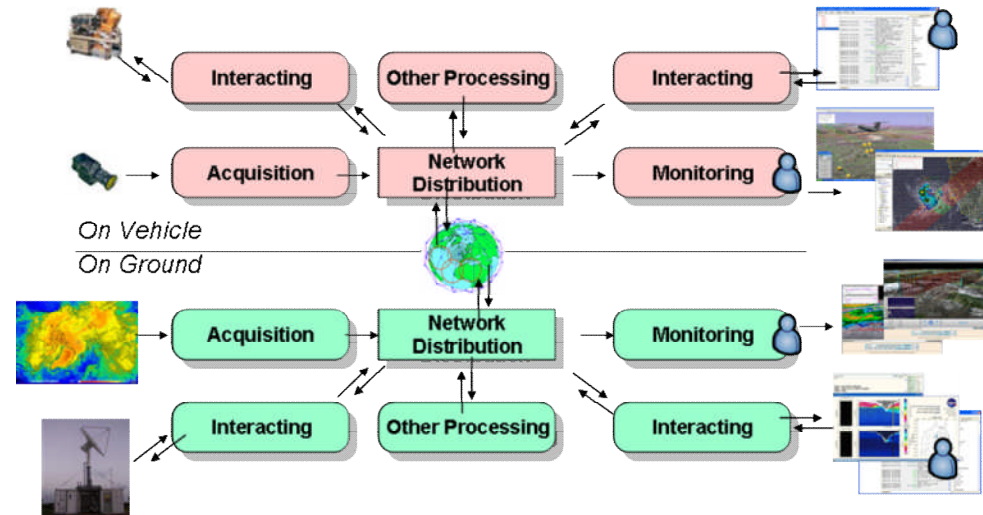


# Suborbital Telepresence Tools & Techniques

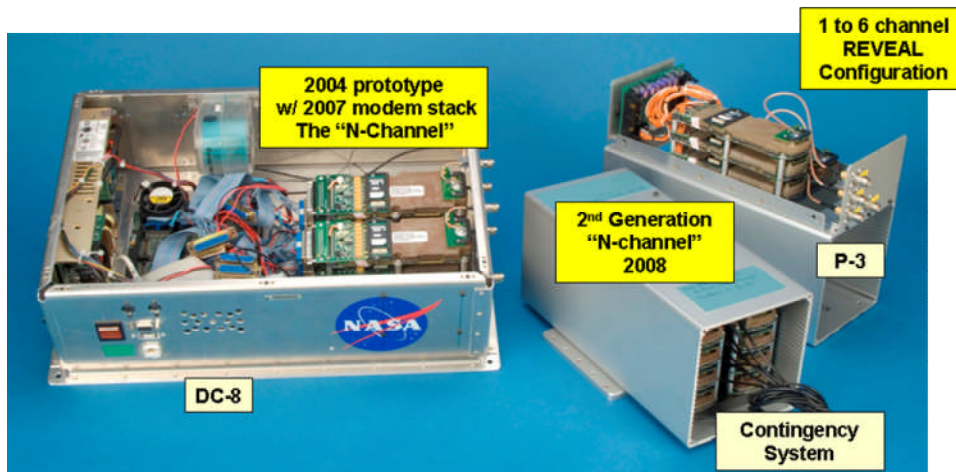
Field-Deployable "Contingency System" Prototype



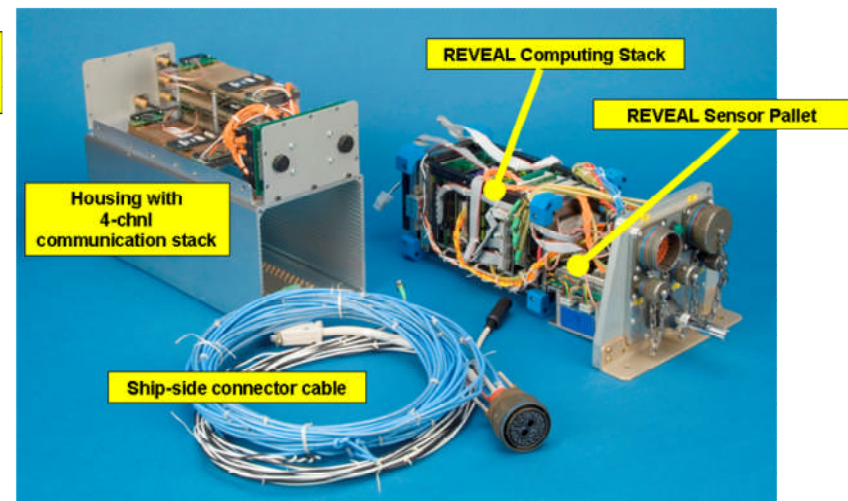
Functional Architecture



Multi-Channel Iridium Evolution



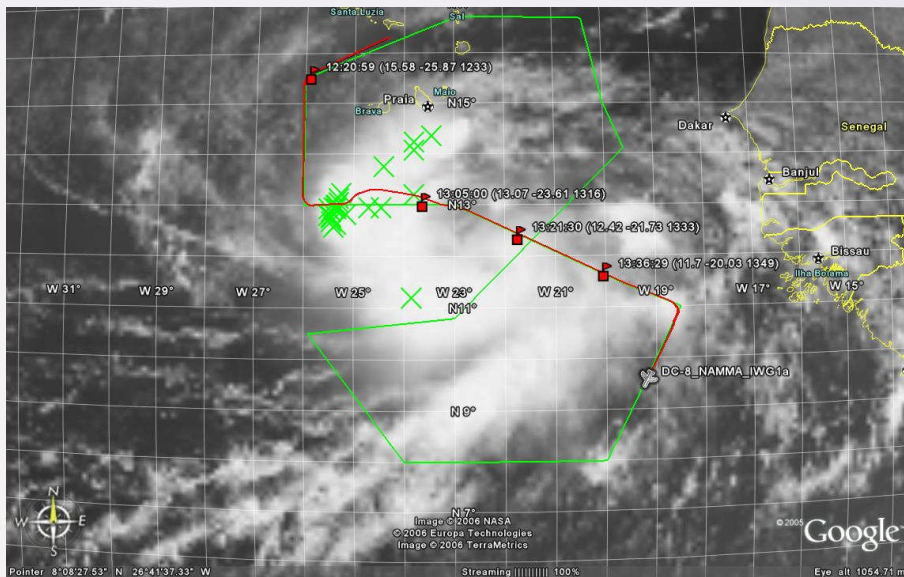
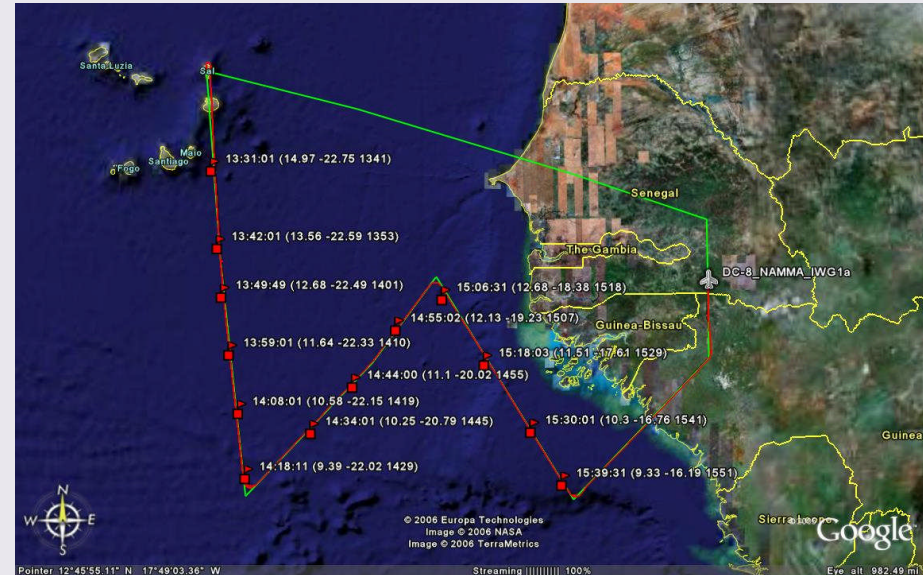
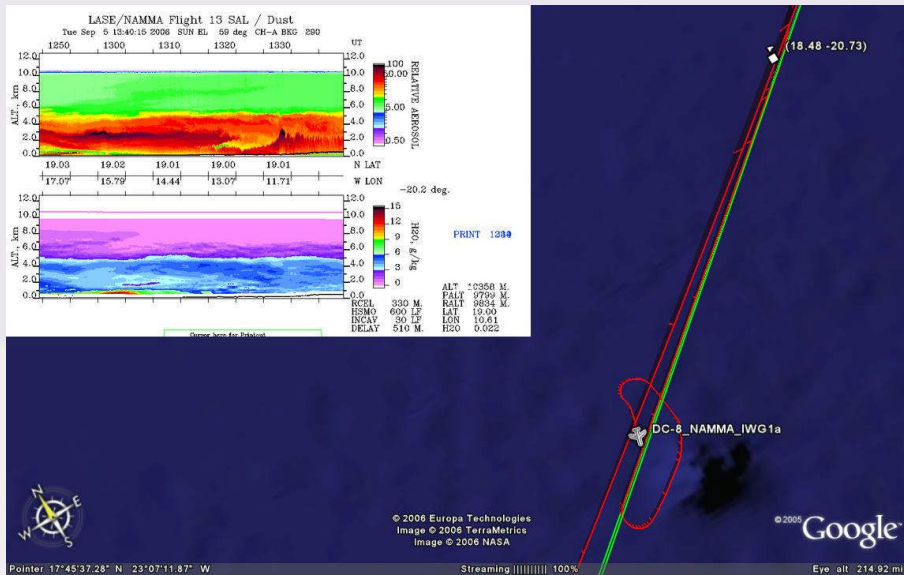
The P-3's REVEAL System: An Inside Look





# 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

Global Monitoring Division - Mozilla Firefox

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- Data Archive

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- Halocarbon/Trace Gases
- Observatory Operations
- Ozone & Water Vapor
- Surface Radiation

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- About GMD
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- Media Gallery

**Historic Flight of NOAA Instruments Operating on an Unmanned Aircraft**

31 October, 2006

Global Monitoring Division - ESRL-GMD

This story entered on 31st Oct, 2006 11:52:39 AM PST

Google Earth Pro

Alt: 13274 Lat: 37.65 Lon: -119.20  
NOAA\_Ozone=241.0  
NOAA\_Water\_Vapor=12.00

Happy Isles

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Streaming 100%

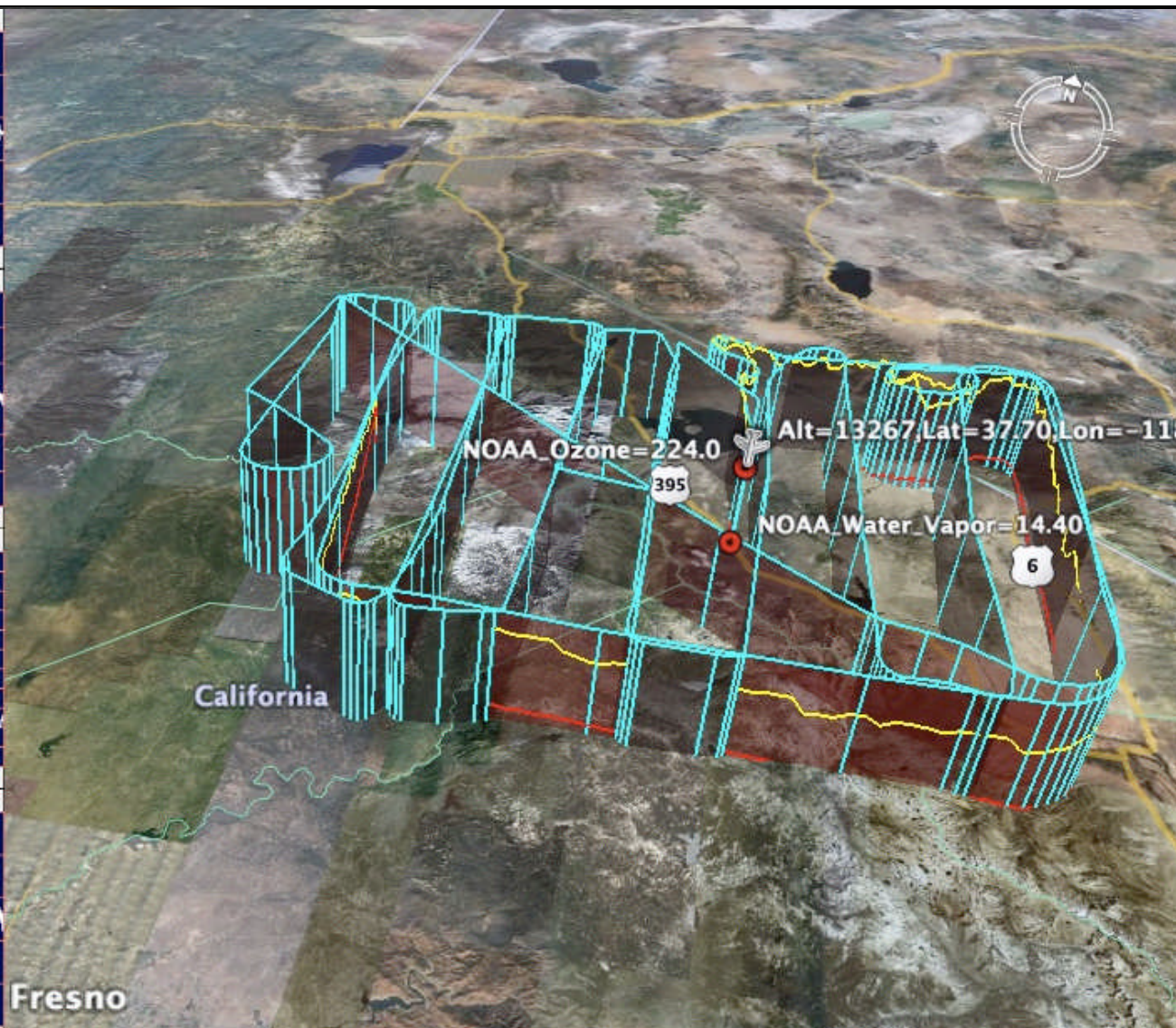
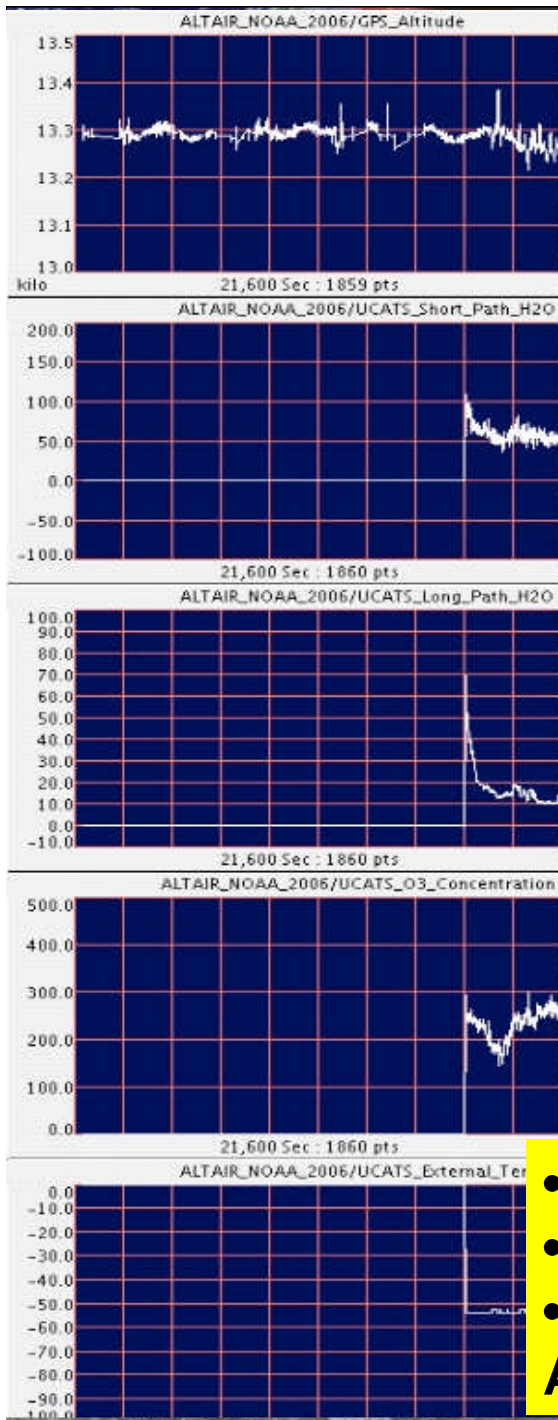
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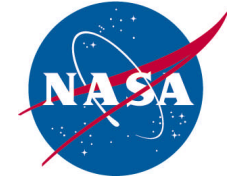
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Interval: 1hour

http://rdbb.net/TimeDrive/?t=1161372000&h=66400&play=live&rate=300





- 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

