Airborne Science Support of Decadal Survey Missions

Susan M. Schoenung and Mathew M. Fladeland, NASA Ames Research Center
susan.m.schoenung@nasa.gov mathew.m.fladeland@nasa.gov http://airbornescience.nasa.gov

Abstract:

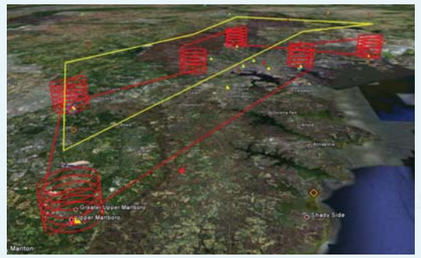
The overall objectives of NASA's Airborne Science Program (ASP) include 1) supporting satellite calibration and validation, 2) providing flight test opportunities for new sensor technologies for both satellite and aircraft, 3) participating in process studies to better understand the Earth system, and 4) fostering the development of the next generation of scientists and engineers. Considering these program objectives, ASP can support the upcoming Decadal Survey missions in a number of ways, including instrument flight testing, support for field studies to aid collection of data for pre-launch algorithm development, field campaigns to support satellite calibration and validation activities post-launch, and scientific process studies both large and small. In the case of GEO-CAPE. ASP plans to provide service for testing of instruments supported under ESTO IIP and AITT programs, as well as algorithm development opportunities through studies such as COAST. In addition, ASP supports the Earth Venture-1 DISCOVER-AQ mission providing useful data relevant to GEO-CAPE.

Accessing Airborne Science Capabilities

The use of NASA aircraft or facility sensors is arranged through an on-line **Flight Request** form. It is also used to initiate a new instrument integration, or for obtaining cost estimates for proposal purposes. Mandatory airworthiness and flight safety regulations apply to any NASA-funded flight activity, or when NASA instrumentation or personnel are flown for research purposes on any aircraft. (NASA Policy Directive 7900.4B.) Appropriate reviews are provided through this process. http://airbornescience.nasa.gov/sofrs/

DISCOVER-AQ

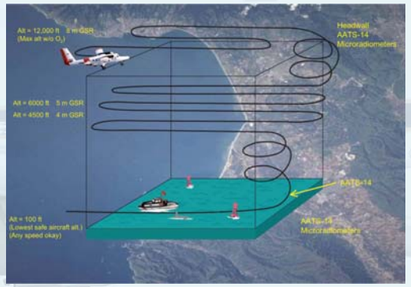
Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality



Conceptual flight patterns for B-200 and P-3B

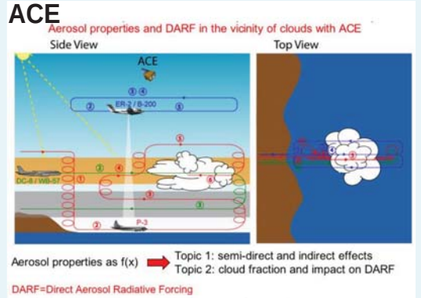
COAST

Coastal and Ocean Airborne Science Testbed



Conceptual illustration of aircraft flight patterns proposed for COAST.

ACE



Field Experiment Concept for ACE

Airborne Science Platforms

The NASA Airborne Science aircraft catalogue provides unique NASA and commercial aircraft that benefit the earth science community. These manned and unmanned aircraft carry the sensors that provide data to support and augment NASA spaceborne missions. For more information go to http://airbornescience.nasa.gov

Role: Remote sensing, Upper Tropospheric and Stratospheric *in situ* sampling
Altitude: 70,000 ft
Payload: 2,900 lbs
Range: 5,000 + Nmi

Role: Long duration high-altitude remote sensing; upper Tropospheric and Stratospheric *in situ* sampling; UAVSAR
Altitude: 65,000 ft
Payload: 1,500 lbs
Range: 11,000 Nmi

Role: Remote sensing, Upper Tropospheric and Stratospheric *in situ* sampling, vertical profiling
Altitude: 60,000 ft +
Payload: 7,500 lbs +
Range: 2,500 Nmi

Role: UAVSAR and mid-altitude remote sensing
Altitude: 45,000 ft
Payload: 2,610 lbs
Range: 3,400 Nmi

Role: Long duration mid-altitude remote sensing and *in situ* sampling; real-time disaster response imaging
Altitude: 52,000 ft
Payload: 3,000 lbs
Range: 3,500 Nmi

Role: Remote sensing, Upper Tropospheric and Stratospheric *in situ* sampling
Altitude: 45,000 ft
Payload: 3,200 lbs
Range: 1,200 Nmi

Role: Tropospheric *in situ* sampling, vertical profiles, remote sensing using radars, lidars & radiometers
Altitude: 41,000 ft
Payload: 30,000 lbs
Range: 5,400 Nmi

Role: Remote sensing, Upper Tropospheric and Stratospheric *in situ* sampling
Altitude: 40,000 ft
Payload: 12,000 lbs
Range: 2,300 Nmi

Role: Mid-altitude remote sensing and *in situ* sampling
Altitude: 35,000 ft.
Payload: 4,100 lbs
Range: 1,250 Nmi

Role: Remote sensing, Laser profiling, Tropospheric *in situ* sampling
Altitude: 30,000 ft.
Payload: 14,700 lbs
Range: 3,800 Nmi

Role: Low-altitude remote sensing and *in situ* sampling
Altitude: 25,000 ft
Payload: 5,000 lbs
Range: 500 Nmi

Role: Low altitude remote sensing and *in situ* sampling
Altitude: 12,000 ft
Payload: 100 lbs
Range: 550 Nmi

Decadal Survey Mission Support

The Airborne Science Program is supporting the upcoming Decadal Survey satellite missions by providing the suborbital platforms necessary to develop and validate this next generation of Earth observing sensor technologies. The airborne data collected on these precursor missions will also be used to develop the science algorithms for the future orbital instruments. These airborne instrument packages will eventually support the on-orbit calibration and validation of the Decadal Survey satellite measurements.

Platform and Sensor Package	CLARREO	SMAP	ICESat-II	DESDynI	HyspIRI	ASCENDS	SWOT	GEO-CAPE	ACE	LIST	GACM	3D-Winds
DC-8 Waveform Lidar, Column CO2 Lidars, Wind Lidars, O3 Lidar			■			●		●	▲			●
ER-2 Far-IR spectrometer, V/SWIR/TIR Imaging Spectrometers, Polarimeter, Doppler Radar, Radiometer	▲		■		■				● ▲			▲
WB-57 FTS simulator, MW limb sounder, Wind Lidar								●			●	●
P-3 MW Soil Moisture, Topo Lidar, Aerosol polarimetry		■	■	●				▲	▲			
G-III UAVSAR, Ka-band SAR			▲	■			▲					
Lear 25 Long-wave flux radiometers, CO2 sounder, swath mapping Lidar	●					●				●		
B-200 Column CO2 Lidar, Ka-Band Radar						■	●	■				
Global Hawk UAVSAR-GH; Waveform Lidar; Ka-Band SAR			■	●		●	■					
SIERRA L-band Soil Moisture Radar		■						■				
Twin Otter Waveform & Flash Lidar; VNIR & TIR Imaging Spectrometers				▲	●			■				

● Includes ESTO IIP-funded instruments ▲ Airborne Instrument Technology Transition AITT Funded