



# Airborne Science Newsletter



Spring 2010

## What's Inside...

- Note from the Top **2**
- Global Hawk **2**
- Operation Ice Bridge **3**
- ASP 6 Month Schedule **3**
- ASP Upcoming Events **4**
- Platform Capabilities **4**

## In Brief...

### FAA UAS Conference

The 5th Annual FAA Unmanned Aircraft Systems (UAS) Conference was held February 23-25 in San Diego. Presentations given included COA process and updates, FAA research activities on UAS, NextGen, and reports for users in the community. Several NASA folks attended and a session on complex COAs highlighted the GloPac mission.

### GRC Aircraft

GRC S-3B completed pylon wiring modifications and flew a successful functional check flight in February. It's now able to carry a variety of pylon mounted sensors for science missions. Flight demonstrations of the UAVSAR and MAST pods are proposed for later this year.

### GlobalHawk Update

The NASA Global Hawk has recently undergone extensive modifications including new payload mounts in fourteen compartments and the installation of a new Airborne Payload C3 System that utilizes new network-enabled interface and control units, six Iridium antennas, and a payload-dedicated Ku-band Satcom dish.

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## UAVSAR Missions to Hawaii, Haiti, and Central America

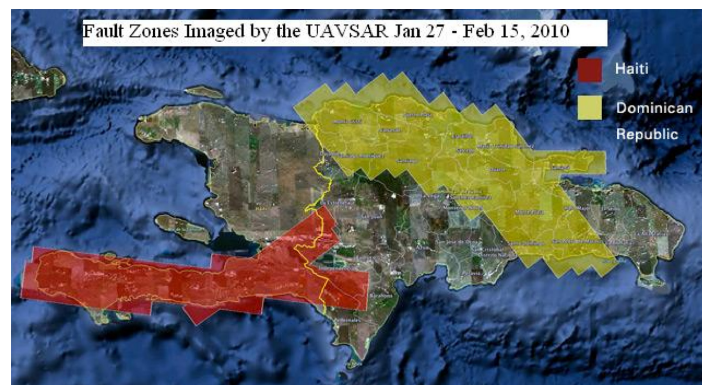
NASA's G-III UAVSAR has had a very productive start to 2010 with deployments to Hawaii, Haiti, and Central America while conducting local missions from its base in Palmdale California, as well. These included imaging mudslides in the recently fire-scarred San Gabriel Mountains following the heavy rains that hit Southern California. The UAVSAR sensor is an L-band synthetic aperture radar (SAR) specifically designed to acquire airborne repeat track data for differential interferometric measurements. Currently operating on the piloted G-III platform, the UAVSAR is intended to fly ultimately on an uninhabited aerial vehicle (UAV). Using precision real-time GPS and a sensor-controlled flight management system, the G-III aircraft is able to fly repeatedly within a 10-meter-diameter tube above the desired flight track.

From January 4 to 11, the G-III UAVSAR deployed to Hawaii to conduct repeat pass interferometric imaging of the volcanoes on the Big Island including the most active volcano, Kilauea. Additional objectives included

estimating biomass in some of the forested regions and obtaining baseline imaging to conduct ground deformation/ground movement studies on the islands of Maui, Molokai, and Oahu.

On January 25, the G-III UAVSAR platform began a science campaign that included radar imaging over nine nations. Initially the deployment was planned to cover Central America and the U.S. Gulf Coast and started with coastal subsidence studies near New Orleans and monitoring of the Mississippi River levees en route to Aguadilla, Puerto Rico. However, in response to the disaster in Haiti, NASA added a series of science flights over earthquake fault zones in Haiti and the Dominican Republic. This 22-day mission included 19 flights and successfully obtained 153 science data lines in 92 flight hours. Three sets of repeat pass images were obtained of the Haitian Enriquilla-Plantain Garden Fault, which ruptured on Jan 12. Each pass was separated by about one week. Baseline imaging on the Septentrional Fault Zone in the northern Dominican Republic was also acquired for future repeat-pass observations.

*Continued on page 3*



*Fault zones imaged by the UAVSAR, Jan. 27-Feb. 15, 2010.*

## Global Hawk

### A new tool in NASA's Airborne Science Program

Starting this month, NASA now has a new tool in its fleet for airborne research, the Global Hawk (GH). It is the first fully autonomous, high altitude, long endurance UAS that will carry large payloads to remote regions of the atmosphere and remain there for long durations collecting key measurements. GH has a flight duration of more than 30 hours, a maximum altitude of 65,000 ft, a range of 11,000 nm, and a payload capability of more than 1,500 lbs of scientific instruments. No other manned or unmanned aircraft can match these capabilities.

The Global Hawk Pacific Mission (GloPac) will be the first Earth science mission to use the GH UAS. Scheduled for March and April 2010, GloPac will consist of four or five science flights that will take the aircraft over the Pacific south to the equator, north to the Arctic and to the west past Hawaii. GloPac is conducted in support of NASA's Aura and A-Train Earth Observation System satellite constellation. The payload consists of 10 science instruments that will collect a wide range of atmospheric data including trace gases and aerosol composition, as well as meteorological parameters. These observations are important for understanding processes that control ozone-depleting substances, greenhouse gases that contribute to climate change, and air pollution.

There are over 100 people working on the GloPac mission. This includes managers, pilots, scientists, engineers, aircraft ground crew, and other support staff from NASA, NOAA, and several universities. GH funding comes from a collaborative effort between NASA's Airborne Science Program, the Northrop Grumman Corporation, and NOAA. For more information on the GloPac mission, see: <http://www.espo.nasa.gov/glopac/>

*Contributed by Mike Craig*

## Call for Content

Working on something interesting, or have an idea for a story? Please let us know, we'd love to put it in print.

Contact Steve Wegener (650/604-6278, [s.wegener@nasa.gov](mailto:s.wegener@nasa.gov)) or Matt Fladeland (650/604-3325, [matthew.m.fladeland@nasa.gov](mailto:matthew.m.fladeland@nasa.gov)).

## Note from the Top



It seems I was writing the last version of this article just the other day. Time is flying by way too fast. Maybe it's because of the amount of work being accomplished. For six of our team, the Earth Venture Initiative proposal evaluation was a major effort. I'd be very surprised if the panel members spent less than 24 hours each week reviewing, evaluating, and discussing proposals. Others supported the Airborne Instrument Technology Transition evaluation panel. The American Recovery and Reinvestment Act processing took more effort than anyone imagined, but it looks like the corner has been turned and the funding is in places where it will do some real good for a long time. The Global Hawk completed its latest mods and by the time you're reading this Glo Pac, its first science mission, should have started. The P-3B completed a special structural inspection and is uploading instruments for its portion of Operation Ice Bridge (OIB) Greenland, while the DC-8 finished its maintenance phase and is now on-site for its contributions to OIB. The WB-57 completed the taxi test series following the gross weight increase mod, flying a few instrument flights and is expected to complete flight test and certification flights this week. The G-III has flown UAVSAR missions over Hawaii, Costa Rica, as well as diverting to collect data over devastated Haiti. And those were just the highlights. Now the team also engages in the annual budget process as well as presenting its annual program review leading into the summer season. Everyone on the program team should take well deserved pride in what we've accomplished this past quarter and the foundations laid for some more very exciting work to come. Thank you and keep them flying.

*Randy Albertson  
Acting Airborne Science Program Director*

## In Brief (continued from page 1)

### ARRA Update

ASP American Recovery and Reinvestment Act (ARRA) efforts continue to progress. Avery Partners, LLC, teamed with GE on wing support and was awarded and completed a maintenance action related to an airworthiness directive on the DC-8 engines. CSC was awarded an effort to build replacement ailerons for the WB-57, and an effort to build a Sensor Net was awarded to U.C. Santa Cruz. Ice Bridge efforts at the University of Kansas and Columbia University were also funded through ASP stimulus funding.

### ISPRS Commission I

The next meeting of the ISPRS Commission I (Image Data Acquisition: Sensors and Platforms) will be held in Calgary, Canada, June 16-18.

This will be the first major meeting of the new Working Group I/1 that was established last April at the ISPRS meeting in Stresa, Italy. This working group, Standardization of Airborne Platform Interface, consists of 11 sub-committees or TORs (Terms of Reference). Each of the TORs has a lead and co-lead from Europe and the United States.

All are encouraged to attend the meeting in Calgary. Approximately 15 papers will be presented by members of WG I/1 and will cover topics from communications issues, operation of UASs to education and outreach. Please see these ISPRS websites for more information.

<http://www.geoconf.ca/>  
<http://www.commission1.isprs.org/>

## ASP Liaison with FAA

The Program is seeking applicants to serve as liaison to the FAA Unmanned Aircraft Program Office in Washington, DC. This position is critical to ensuring that NASA UAVs have

access to airspace. Please send your note of interest or your nomination to Randy Albertson ([randal.t.albertson@nasa.gov](mailto:randal.t.albertson@nasa.gov)).

# Operation IceBridge

Operation Ice Bridge completed a phenomenal year in 2009. The NASA P-3 flew out of and over Greenland and the Arctic in the Spring while the NASA DC-8 flew out of Punta Arenas, Chile to cover vast portions of the Antarctic continent in the Fall.

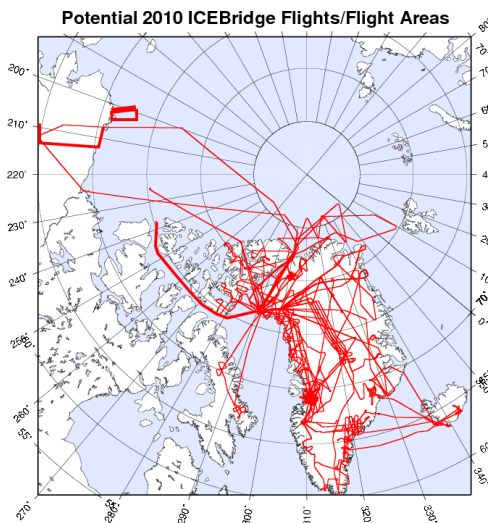
Now the focus is on the island of Greenland and the Arctic with the NASA DC-8 and the P-3 flying Spring 2010. The DC-8 will fly out of Thule Greenland starting March 22nd. The OIB scientists have a total of 105 science flight hours to help gain a better understanding of the current conditions of the ice and glaciers. First on the agenda is a round trip to Fairbanks to measure the arctic sea ice. In addition, the DC-8 will provide measurements for early spring glacial outflows and snow depth.

The NASA P-3 will start its portion of Operation Ice Bridge on May 1st. The P-3 has been allotted 100 flight hours and will fly out of Kangerlussuaq and Thule, Greenland. Primary focus of the P-3 mission is to observe and measure the snow and ice depth of specific parts of the Greenland ice sheet to the bedrock of the island. In addition the P-3 will

also measure the glacial thinning and movement of many of Greenland's coastal glaciers.

This illustration depicts the potential flight lines OIB hopes to accomplish this Spring in Greenland.

*Contributed by Kent Shiffer*



# UAVSAR

(continued from page 1)

The Central America campaign was based in San Jose, Costa Rica, and included imaging over Guatemala, Honduras, El Salvador, Nicaragua, Costa Rica and Panama. Primary objectives included measuring biomass in the rain forests, monitoring volcanoes and locating Mayan archeological sites. A short mission was also conducted in an attempt to locate an Argentinean aircraft presumed lost in the thick Costa Rican forest in 1965.

The G-III's ability to provide rapid access to regions of interest and short repeat flight intervals and the UAVSAR's high resolution and variable viewing geometry continues to make this system a powerful tool for studying ongoing Earth processes.

More information can be found on the UAVSAR website at <http://uavsar.jpl.nasa.gov/>

*Contributed by Tim Moes*

## NASA SMD ESD Airborne Science Program 6-Month Schedule

	March	April	May	June	July	August
<b>WB-57</b>	GW & Superpods test HIWRAP/HIRAD/DLH					GRIP
<b>P-3</b>		Operation Ice Bridge				
<b>DC-8</b>	Operation Ice Bridge - Greenland		Hyabus re-entry	SARP/ASCENDS	DAWNAIR 1	GRIP
<b>ER-2</b>	AVIRIS AirMSPI	SANDIA BOEING SANDIA	LAC AVIRIS SANDIA	AVIRIS SANDIA	AVIRIS SANDIA	AVIRIS SANDIA
<b>G-III</b>	UAVSAR - Local Science		Canada/Yellowstone	Alaska	UAVSAR - Local Science	
<b>G.Hawk</b>	FitTest	GloPac FitTest	GRIP Upgrades/dropsonde	Pre-GRIP	GRIP	
<b>B-200</b>	Calipso V&V		CalNex - CARES		Calipso Caribbean	
<b>UC-12</b>			AID for ASCENDS III			
<b>Lear 25</b>	Solar Cell		CO2 Sounder			
<b>SIERRA</b>			GPSAR/USFS/USGS		AK - Shell	
<b>T-34</b>			Flight Test		HAMSR	Pre-GRIP
<b>S-3</b>			UAVSAR POD FitCheck			
<b>C-206</b>						

WB-57
ER-2
UC-12
 Maintenance
 P-3
B-200
G-III
G.Hawk
Cessna
S-3
DC-8
Lear25
T-34
SIERRA
T-34
C-206

## Platform Capabilities

Available aircraft and specs

Airborne Science Program Resources	Platform Name	Center	Duration (Hours)	Useful Payload (lbs.)	GTOW (lbs.)	Max Altitude (ft.)	Airspeed (knots)	Range (Nmi)	Internet and Document References
Core Aircraft	ER-2	NASA-DFRC	12	2,900	40,000	>70,000	410	>5,000	<a href="http://www.nasa.gov/centers/dryden/research/AirSci/ER-2/">http://www.nasa.gov/centers/dryden/research/AirSci/ER-2/</a>
	WB-57	NASA-JSC	6	6,000	63,000	65,000	410	2,172	<a href="http://jsc-aircraft-ops.jsc.nasa.gov/wb57/">http://jsc-aircraft-ops.jsc.nasa.gov/wb57/</a>
	DC-8	NASA-DFRC	12	30,000	340,000	41,000	450	5,400	<a href="http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/">http://www.nasa.gov/centers/dryden/research/AirSci/DC-8/</a>
	P-3B	NASA-WFF	12	16,000	135,000	30,000	330	3,800	<a href="http://wacop/wff.nasa.gov">http://wacop/wff.nasa.gov</a>
	Gulfstream III (G-III) (mil: C-20A)	NASA-DFRC	7	2,610	45,000	45,000	459	3,400	<a href="http://airbornescience.nasa.gov/platforms/aircraft/g3.html">http://airbornescience.nasa.gov/platforms/aircraft/g3.html</a>
NASA Catalog Aircraft	DHC-6 Twin Otter	NASA-GSFS-WFF	7	5,000	12,000	25,000	160	500	<a href="http://www.twinotter.com">http://www.twinotter.com</a>
	King Air B-200 AND UC-12B	NASA-LARC	6.2	4,100	12,500	35,000	260	1250	<a href="http://airbornescience.nasa.gov/platforms/aircraft/b-200.html">http://airbornescience.nasa.gov/platforms/aircraft/b-200.html</a>
	DHC-6 Twin Otter	NASA-GRC	3.5	3,600	11,000	25,000	140	450	<a href="http://www.grc.nasa.gov/WWW/AircraftOps/">http://www.grc.nasa.gov/WWW/AircraftOps/</a>
	Learjet 25	NASA-GRC	3	3,200	15,000	45,000	350/.81 Mach	1,200	<a href="http://www.grc.nasa.gov/WWW/AircraftOps/">http://www.grc.nasa.gov/WWW/AircraftOps/</a>
	S-3B Viking	NASA/GRC	>6	12,000	52,500	40,000	450	2,300	<a href="http://www.grc.nasa.gov/WWW/AircraftOps/">http://www.grc.nasa.gov/WWW/AircraftOps/</a>
	Ikhana (Predator-B)	NASA-DFRC	30	3,000	10,000	52,000	171	3,500	<a href="http://airbornescience.nasa.gov/platforms/aircraft/predator-b.html">http://airbornescience.nasa.gov/platforms/aircraft/predator-b.html</a>
	Global Hawk	NASA-DFRC	31	1500	25,600	65,000	335	11,000	<a href="http://airbornescience.nasa.gov/platforms/aircraft/globalhawk.html">http://airbornescience.nasa.gov/platforms/aircraft/globalhawk.html</a>
New Technology	SIERRA	NASA-ARC	11	100	445	12,000	60	550	<a href="http://airbornescience.nasa.gov/platforms/aircraft/sierra.html">http://airbornescience.nasa.gov/platforms/aircraft/sierra.html</a>

## ASP Upcoming Events

- \* Third International Workshop “The Future of Remote Sensing”  
Antwerp, Belgium, Autumn 2010  
<http://isprs.vgt.vito.be/cms/>
- \* AIAA Infotech@Aerospace 2010  
April 20-22, 2010; Atlanta, GA  
<http://www.aiaa.org/content.cfm?pageid=230&lumeetingid=2358>
- \* AUVSI’s Unmanned Systems North America 2010  
Aug. 24-27, 2010  
Colorado Convention Center  
Denver, CO, USA  
<http://www.auvsi.org/events/>
- \* AGU 2010 The Meeting of the Americas  
Aug. 8-13, 2010  
Rafain Hotel and Convention Center, Brazil  
<http://www.agu.org/meetings/ja10/>
- \* IEEE IGARSS 2010  
July 25-30, 2010  
Honolulu, Hawaii  
<http://www.igarss10.org/>
- \* SPIE Remote Sensing 2010  
Sept. 20-23, 2010  
Centre de Congrès Pierre Baudis  
Toulouse, France  
<http://spie.org/x6262.xml>
- \* 2010 NASA Science Technology Conference (NSTC2010)  
June 15-17, 2010; College Park, MD  
<http://www.esdswg.org/softwareuse/Resources/events/nstc2010>
- \* ISPRS Technical Commission I Symposium 2010  
WG I/1: Standardization of Airborne Platform Interface  
June 16-18, 2010
- \* The 11th International Circumpolar Remote Sensing Symposium  
September 20-24, 2010  
Cambridge, United Kingdom  
<http://alaska.usgs.gov/science/geography/CRSS2010/index.html>
- \* ASPRS 2010 Annual Meeting “Opportunities for Emerging Geospatial Technologies”  
April 26-30 Town and Country Hotel  
San Diego, California  
<http://www.asprs.org/sandiego2010/index.html>
- \* ISPRS Technical Commission I Symposium 2010, WG I/1: Standardization of Airborne Platform Interface  
June 16-18, 2010, Calgary, Canada  
<http://www.commission1.isprs.org/wg1/>