What's Inside...

A productive summer for the DC-8

NASA's DC-8 flying laboratory, based at Armstrong Flight Research Center's aircraft facility in Palmdale, California, has had a busy 2015 so far.

Following some local instrument testing activity, the DC-8 aircraft began a series of science flights based out of Keflavik Iceland, aimed at studying Arctic polar winds. The Polar-Winds mission was led by PI Michael Kavaya, with goals to provide current wind data for use in pre-existing weather models and to collect pre-launch calibration and validation data in support of the European Space Agency's (ESA) Atmospheric Dynamics Mission Aeolus satellite, or ADM-Aeolus. The DC-8 logged nearly 70 hours of flight time during Polar-Winds, returning from Iceland on May 28.

The DC-8 and crew did not skip a beat as they moved from studying polar winds to supporting the annual Student Airborne Research Program (SARP) from June 21 to 23. SARP is highlighted below.

During the months of July and August, the aircraft supported the Plains Elevated Convection at Night (PECAN) and High Water Ice Content (HIWC) missions. The PECAN mission was based in Salinas, Kansas, where the aircraft conducted overnight missions to study why mesoscale convective systems (MCSs) form at night in the Midwest as opposed to during the day like most other areas of

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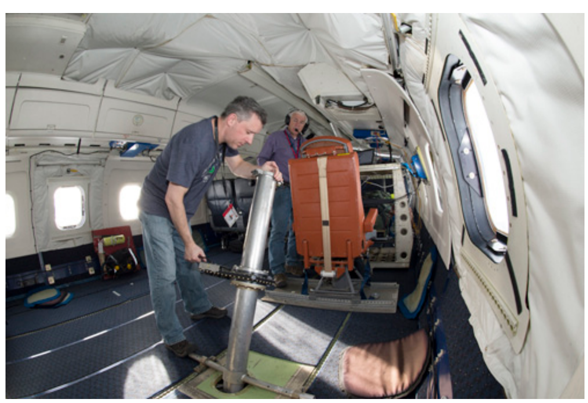


Kevin Godwin (foreground) of Simpson Weather Associates releasing a dropsonde purchased from Yankee Environmental Systems as Polar Winds Science PI, Dr. G. David Emmitt (background), Simpson Weather Associates, looks on.

Call for Content

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

Contact Susan Schoenung (650/329-0845, susan.m.schoenung@nasa.gov) or Matt Fladeland (650/604-3325, matthew.m.fladeland@nasa.gov).

DC-8 *(continued from page 1)*

the country. PI was Richard Ferrare, and the mission included nearly 57 hours of flight time.

The HIWC mission, based from Fort Lauderdale, Florida, and flying primarily around Puerto Rico, focused on demonstrating an improved aircraft weather radar to help pilots better identify potentially hazardous icing conditions at high altitude. HIWC flew over 87 hours.

Looking ahead, the aircraft crew has begun preparations to support the Olympic Mountain Experiment (OLYMPEX), a collaborative ground validation mission with University of Washington, taking place from Nov. 10 to Dec. 22. The mission aims to collect data to validate the data being received by Global Precipitation Measurement (GPM) satellite.

Contributed by Kate Squires

Directors' Corner

Welcome to the ASP newsletter. I hope you find the information in it useful as well as entertaining. As I sit down to write this, I can't believe it has been a little over 5 years since I started. How time flies when you are having fun! What's more amazing is that I get to work with the people who make ASP great. Your hard work, dedication, and resolve in the face of the many challenges is why this program is as good as it is. You are the ones who turn the funding into actual science discovery and I'm proud to be a part of it and glad that NASA allows me to do it. As all can see in this issue, and if they go to the website, we are having another exciting year of flying, including for the first time flying both the Arctic and the Antarctic at the same time. We have two Earth Venture Suborbital -1 missions still flying while we stand up six more as well as doing calibration and validation for satellite missions (GPM, HysIRI, SMAP to name a few). All told we've flown over 3400 hours to date this FY. Not a record year but not bad! As I've continually stated and mean, please remember that the success of the program rests with you, so be safe in whatever you are doing and find the time to enjoy the holidays coming up. As always, if you have any feedback about this newsletter or the Program – good or bad – please let me and Randy know.

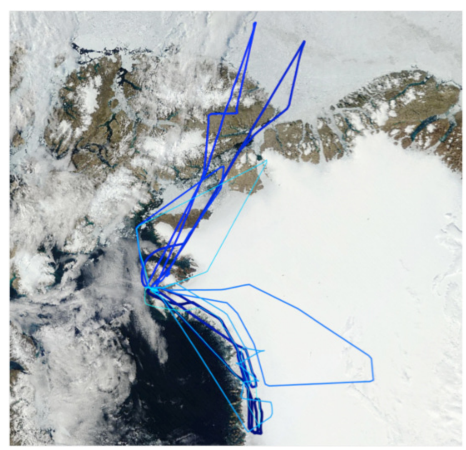
Bruce Tagg and Randy Albertson
Airborne Science Program

ICESat-2 Support: Two B-200s fly to Greenland

While Operation IceBridge is a gap-filler as the science community waits for the launch of the Ice, Cloud, and land Elevation Satellite-2 (ICESat-2), other airborne efforts support geophysical algorithm development for the ICESat-2 payload. ICESat-2 will carry the Advanced Topographic Laser Altimeter System (ATLAS), which will be a six-beam photon-counting laser altimeter using 532-nm wavelength pulses. Previous airborne lidar campaigns have included a series of flights on high-altitude aircraft using Multiple Altimeter Beam Experimental Lidar (MABEL), including surveys over ice sheets and sea ice in winter conditions (based in Keflaik, Iceland, April 2012), and glaciers and sea ice in melting conditions (based in Fairbanks, Alaska, July 2014).

To further refine the ICESat-2 geophysical algorithms, NASA recently conducted a coordinated airborne campaign designed with the primary goal of addressing how both green- and infrared-wavelength light beams are affected by water or melt on the ice surface, and with a secondary goal of determining how snow-grain size may affect the propagation of green-wavelength light. These science goals dictated the timing of the mission (August 2015) and the base of operation (Thule Air Base, Greenland).

To address the first science goal, NASA Goddard Space Flight Center's Slope Imaging Multi-polarization Photon-counting Lidar (SIMPL) was deployed on a NASA Langley Research Center B-200 King Air. To address the second science goal, NASA Jet Propulsion Laboratory's Airborne Visible/Infrared Imaging Spectrometer – Next Generation (AVIRIS-NG) was deployed on a B-200 King Air operated by Dynamic Aviation. Specific science targets to meet these goals included the dry interior of the Greenland ice sheet, melt ponds near the edge of the ice sheet, and melting sea ice in



Coordinated flight lines from Thule Air Base for the two aircraft.

Continued on page 3

B-200s in Greenland *(continued from page 1)*

Group photo of SIMPL/AVIRIS-NG participants, from NASA GSCF, JPL, LaRC, and Dynamic Aviation. (Photo: Kelly Brunt).

the Arctic Ocean. The mission, called SIMPL/ AVIRIS-NG Greenland 2015, conducted 9 coordinated science flights based out of Thule, for a total of 37 flight hours. The total mission, including local data flights at NASA Langley and the transit flights to and from Greenland, required 73.1 flight hours on the NASA aircraft.

Contributed by Kelly Brunt

SARP 2015

The seventh annual NASA Student Airborne Research Program (SARP) took place June 14-August 7 at the NASA Armstrong Flight Research Center and the University of California, Irvine. The program was designed to expose advanced undergraduates majoring in the sciences, mathematics, and engineering to all aspects of a NASA Airborne Science research campaign.

The thirty-two students represented thirty-two different colleges and universities from twenty-one states and Puerto Rico. The program began at the Armstrong Flight Research Center in Palmdale, CA with introductory lectures by university faculty members, NASA scientists, and NASA program managers designed to prepare students for their flights on the DC-8. The students then participated in instrument integration and flight planning. Each student had the opportunity to fly at least two times on the DC-8. Students in the remote sensing of the ocean and land groups took ground-truth validation measurements from a research vessel in the Santa Barbara Channel and from a forest in the Sierra Nevada Mountains during a DC-8 overflight.

After the DC-8 flights, the students returned to UC Irvine for six weeks of data analysis and interpretation. The program culminated with the students' formal presentations of their results and conclusions. Twelve students submitted first-author conference abstracts on their SARP research to the American Geophysical Union Fall Meeting in San Francisco.

Contributed by Emily Schaller

SARP 2015 participants pose in front of the NASA DC-8 on June 23, 2015 (Photo: Jane Peterson/NSERC)

Operation IceBridge

Operation IceBridge has had numerous successful campaigns since kicking off in 2009, while also continuing to evolve to meet the demands of the science community, adapt to new instrumentation, and operate on a variety of aircraft platforms. In 2015 IceBridge conducted four separate campaigns on four different aircraft to study the large changes presently taking place in the polar regions.

NASA C-130 parked outside the Thule aircraft hangar. (Photo: Jeremy Harbeck, NASA GSFC)

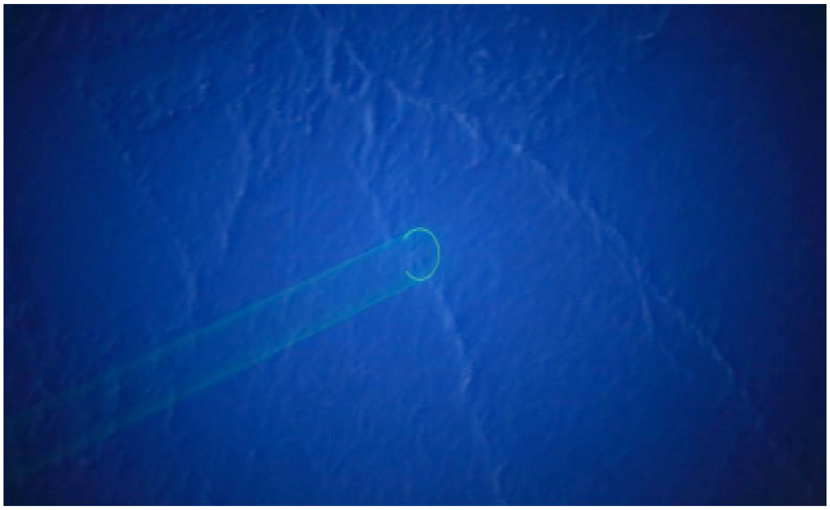
The Arctic spring campaign was conducted using a C-130 aircraft logging 33 science flights (traveling a total distance equivalent to 36% of the distance to the moon) over Greenland and the Arctic Ocean. Highlights of the campaign included numerous international cooperative efforts such as an overflight of an ice-bound Norwegian ship which served as the home base for a group of researchers taking ground measurements under the IceBridge flight track. Other international efforts included the release of several quick look data sets to aid in the planning of Greenland field activities, as well as a data product to support seasonal sea ice forecasts of the Arctic Ocean. IceBridge also engaged in a broad level of outreach activities including hosting media personnel from the New York Times and National Geographic. IceBridge also participated in a number of in-flight classroom chat sessions with students in grades 1-12 through an Iridium satellite data link, reaching 723 students in 11 states and three countries.

In the summer of 2015, IceBridge utilized a DHC-2 Single Otter aircraft carrying a laser altimeter for its Alaska campaign. The melting of Alaskan glaciers is contributing a substantial portion of the Earth's measured sea level rise, and these results from IceBridge work in Alaska were used during President Obama's speech at the recent Anchorage conference of ministers and officials from Arctic nations.

To wrap up the year, IceBridge is (as of this writing) conducting an exciting and historic first for the project in undertaking simultaneous collection of data from both the Arctic and Antarctic. Both surveys are from high altitude with the Arctic campaign utilizing a HU-25C Falcon aircraft and the Antarctic campaign utilizing an NCAR Gulfstream-V aircraft. These campaigns will build on the long-running time series of data collected from the mission.

After six years, PI Mike Studinger and Project Manager Christy Hansen have moved on to other responsibilities. The new PI is Nathan Kurtz and the new PM is John Woods, both of NASA GSFC.

Contributed by Nathan Kurtz



An image from the NASA DMS instrument during the Arctic spring campaign. The green reflection is from the NASA Airborne Topographic Mapper (ATM) laser altimeter, which takes measurements of the surface height.

Earth Venture Suborbital Update

Preparing for EVS-2

Earth Venture Suborbital, a program of the Earth Science Pathfinder Program, is completing EV-1 projects, just as EVS-2 projects are ramping up. Completing activities in 2015 are CARVE and AirMOSS, as described briefly below. Just getting underway are NAAMES and OMG. AToM has completed site visits and ActAmerica is assembling payloads. The latest addition to the EVS-2 awards, CORAL, is described separately below.

The Earth Science Project Office (ESPO) at NASA Ames Research Center is managing two of the EVS-2 projects, Atmospheric Tomography (ATom) and ObseRvations of Aerosols above CLouds and their intEractionS (ORACLES). ATom is managed by Dave Jordan and Deputy Project Manager Erin Czech. The ATom Principal Investigator is Steve Wofsy from Harvard University. ORACLES is managed by Bernadette Luna and Deputy Project Manager Kent Shiffer. The ORACLES Principal Investigator is Jens Redemann of NASA Ames Research Center.

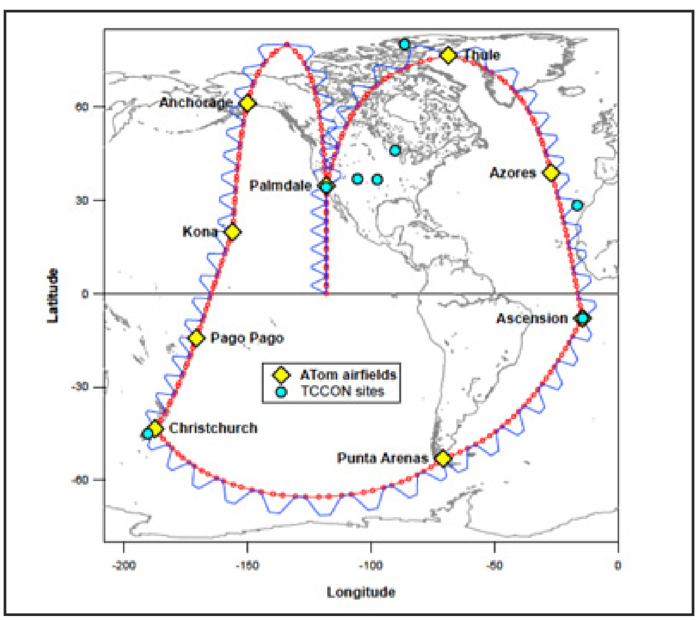
ATom will study the impact of human-produced air pollution on greenhouse gases and on chemically reactive gases in the atmosphere. Airborne instruments will look at how atmospheric chemistry is transformed by various air pollutants. ATom deploys an extensive gas and aerosol payload on the NASA DC-8 aircraft for systematic, global-scale sampling of the atmosphere. The ATom project officially began on April 1, 2015 and flights will occur in each of the four seasons over a three-year period. The deployments will involve flying to eight locations, as shown, while collecting data between locations.

ATom ESPO project management has conducted site surveys of the four Pacific deployment stopover locations (Anchorage, Alaska; Kona, Hawaii; Pago Pago, American Samoa; and Christchurch, New Zealand). The ESPO management team received enthusiastic responses from government and airport officials and made many contacts with providers of aircraft support services and lodging. The ESPO management team is scheduled to begin site surveys of Ascension Island and the Azores in October.

The ORACLES study area in the southeast Atlantic is influenced by biomass-burning (BB) aerosols from neighboring southern Africa that account for almost one-third of the Earth's BB emissions. These emissions produce optically thick aerosol layers which are routinely transported across the entire South Atlantic basin. The southeast Atlantic is home to one of the Earth's three semi-permanent subtropical stratocumulus cloud decks and plays a key role in the energetic balance of the region. NASA's P-3 will deploy to Namibia over three summers and will be joined by NASA's ER-2 on one deployment.

ORACLES officially began February 1, 2015. Since then the leadership team has visited Namibia several times to introduce the project to the US Embassy and to scientific, academic and Namibian government officials; to evaluate the target airfield in Walvis Bay, Namibia; and meet other potential partners who could support the team during deployments in 2016-2018.

Contributed by Bernie Luna



Global locations of AToM airfields and TCCON sites.

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AirMOSS participates in SMAPVEX15 and completes EV mission

The Airborne Microwave Observatory of Subcanoy and Subsurface (AirMOSS) EVS-1 mission started its third and final year of flight operations in February 2015, completing the campaign year and all mission flights at the end of September 2015. The campaign year consisted of approximately 300 flight hours and 20 science campaigns. As in the previous years, the campaigns were designed to optimize seasonal coverage at a wide range of ecosystems in north America, while ensuring that the G-3 primary Astronaut Direct Return Mission remains intact. A total of over 1200 flight hours have been flown for the AirMOSS EVS-1 mission since October 2012, which include science, engineering, and calibration flights.

Continued on page 6

EVS update *(continued from page 5)*

The principal instrument of the AirMOSS mission is a P-band synthetic aperture radar (SAR), built by JPL, operates in the 420-440 MHz band aboard the NASA Johnson Space Center Gulfstream 3 (G-3) airplane. The flights are flown at 41,000 ft (12.5 km) altitude. The radar data are used to retrieve maps of soil moisture profiles under the surface and under vegetation canopies to enable more accurate estimates of net ecosystem exchange (NEE) in North America. Reducing uncertainties in the estimate of NEE, and therefore the estimates of how much CO2 is released into the atmosphere, is essential for better understanding of global climate change.

In August 2015, AirMOSS expanded one of its science campaigns to participate in the NASA Soil Moisture Active Passive (SMAP) Validation Experiment (SMAPVEX'15) at Walnut Gulch, Arizona. This site is one of the primary AirMOSS study sites and is also one of the core validation sites for SMAP. AirMOSS successfully underflew the SMAP satellite 6 times during the peak of the monsoon season between August 8 to September 1, collecting data that were later used by USC to generate soil moisture profile maps and to show the dynamics of soil moisture at high spatial resolution (~90 m). The figure below shows the change in soil moisture at the surface and at 30 cm below the surface.

AirMOSS is led by Mahta Moghaddam at University of Southern California and managed by Yunling Lou of JPL. The AirMOSS flight operations are carried out at JSC.

Contributed by Mahta Moghaddam

WFF and C-130 Modifications

Among the EVS-2 airborne responsibilities, three are being supported by Wallops Flight Facility (WFF), beginning in FY16. The first campaign, North Atlantic Aerosols Marine Ecosystems Study (NAAMES), is scheduled to depart on 11/9/15 for St. John's, Canada on the WFF C-130 Hercules aircraft (N439NA) for the first of two FY16 deployments. The second deployment will occur in the spring 2016. Due to the size of the instruments being flown on the aircraft the experimenter power system and the 55-inch nadir port plate are being modified to accept larger instruments and

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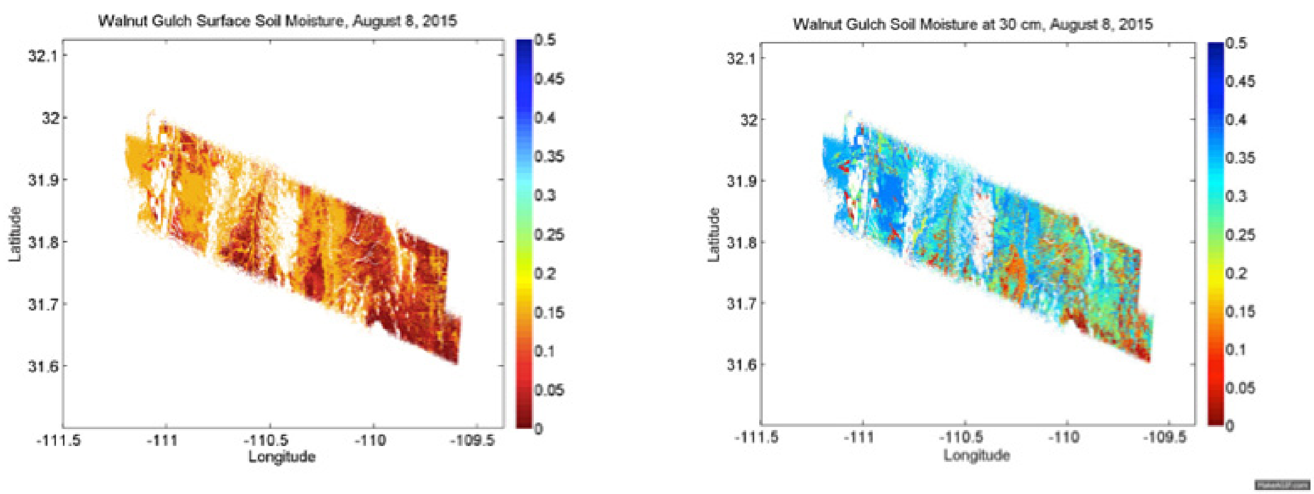

Maps of soil moisture at Walnut Gulch, AZ, derived from AirMOSS data, during the SMAPVEX15 campaign. (August 8, 2015) The color scale shows the volumetric soil moisture content in units of m3/m3. Left column is surface soil moisture; right column is soil moisture at 30 cm below surface.

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EVS update *(continued from page 6)*

provide for greater experimenter power output requirements. WFF has also designed new rack and seat mounts to allow for greater use of the cabin floor area for science installations.

The second EVS-2 mission to fly in FY16 on a WFF aircraft is the Atmospheric Carbon Transport – America (ACT-America) campaign. ACT-America will be conducting research flights from WFF, Iowa, and Louisiana beginning in July 2016. Due to schedule conflicts with overlapping EV deployments WFF acquired a second C-130 Hercules aircraft, formerly a US Coast Guard C-130, and is currently modifying the aircraft to support NASA science needs. The second NASA C-130, N436NA, is being modified to include three 16 inch diameter nadir ports; an experimenter power system capable of producing 115V 60Hz, 115V 400Hz and 28VDC power; a cabin interphone system for experimenters to talk to each other and the flight station; a cabin Iridium phone; an Airborne Science Program data system and a lavatory/galley area. N436NA modifications are scheduled to be completed in the fall 2015 with test flights of the science instruments planned for May 2016.

The third EVS-2 mission that WFF is supporting is ORACLES on the P-3 Orion (N426NA), as discussed above. Upon completion of the P-3 re-wing and autopilot upgrade efforts in the spring 2016, the aircraft will begin upload for a month long flight campaign to Walvis Bay, Namibia scheduled to depart August 2016. The NASA ER-2 along with other research aircraft from various countries will fly with the P-3 in support of ORACLES.

Contributed by Mike Cropper

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C-130 fitted with probes in the forward window for the NAAMES mission.

Newest C-130 beginning modified for science for ACT-America.

CARVE Mission Continues in Alaska

Alaska Governor Bill Walker visited the CARVE plane in Fairbanks on Aug. 5, 2015. (Photo: Seth Chazanoff)

The Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE), a 5-year Earth Ventures suborbital investigation has been acquiring airborne measurements of carbon dioxide (CO2), methane (CH4), carbon monoxide (CO) and key surface control variables in Alaska since 2012. CARVE 2015 flights began on April 2nd, and through September 15th had accumulated more than 240 science flight hours over a domain extending from the North Slope to the Gulf of Alaska and from the Canadian border to the tip of the Seward Peninsula on the Bering Sea coast. These flights have recorded signals from the near-record fires that burned more than 5 million acres in Interior Alaska this summer; measurements will be used to quantify the impacts of fire on the Alaska carbon budget. CARVE will fly through mid-November to capture the signals that persist into the early cold season. The C-23 will return to CONUS after that, signaling the end of the very successful CARVE mission.

Data from CARVE and subsequent observations from the upcoming ABoVE mission will enable scientists all over the world to understand how the Arctic carbon cycle and ecosystems are responding to changes in climate, disturbance, and society.

Contributed by Charles Miller

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EVS update *(continued from page 7)*

Where the glacier meets the sea. Greenland's southwestern coastline in August 2015 during the TerraSond / Cape Race Bathymetry survey.

OMG starts with ship-borne measurements

The EVS-2 mission Oceans Melting Greenland (OMG) began activities in August with ship-borne measurements needed to complement future airborne measurements. The MV Cape Race is using sonar to map the depth of water around Greenland's west coast. The ship's cruise is the initial phase of the six-year air and sea OMG campaign to probe interactions between Greenland's glaciers and the deep, narrow fjords where they come to an end.

When the aerial phase of OMG begins next year, NASA G-III aircraft will fly inland from the coast, taking measurements of slight changes in gravitational pull that can be used to produce low-resolution maps of the topography under both water and ice. OMG will fly the Glacier and Ice Surface Topography Interferometer (GLISTIN), a Ka-band SAR, to generate high resolution, high precision elevation measurements of Greenland's coastal glaciers during the spring. Annual surveys by GLISTIN will measure glacier thinning and retreat over the preceding season. A second aircraft campaign, also on a NASA G-III, will occur each year in the summer to deploy 250 temperature and salinity dropsondes along the continental shelf to measure the volume, extent, of warm, salty Atlantic Water. Analyzing that ice loss in light of the new topographical and oceanographic data will help researchers to determine where, and to what extent, deeper saltwater currents affect glaciers. The OMG Principal investigator is Joshua Willis, an oceanographer at NASA's Jet Propulsion Laboratory.

Contributed by Susan Schoenung

CPL and ACATS Validation Flights

During August 2015 the NASA ER-2 was used to fly the Cloud Physics Lidar (CPL) for validation of the CALIPSO satellite and the Cloud-Aerosol Transport System (CATS) instrument on the International Space Station (ISS). These flights also afforded an opportunity to further test the new Airborne Cloud-Aerosol Transport System (ACATS) simulator instrument. Obtaining an accurate assessment of cloud and aerosol properties and their transport remain a major challenge in understanding and predicting the climate system. The CATS, CPL, and ACATS data products have a wide range of applications to significant climate system issues, such as examining cirrus optical properties, assessing dust and smoke transport, and investigating cloud-aerosol interactions.

On all of the flights, underpasses of the CALIPSO satellite were the primary target, focusing on complex scenes of cirrus clouds and smoke from forest fires in the Pacific Northwest. On most of the flights it was also possible to intercept the ISS track for further validation of the CATS sensor. Preliminary examination shows good agreement between CATS and ACATS data sets.

The data image (page 7, opposite) highlights the August 18 flight. On this day, the ER-2 flew under the CALIPSO satellite at 20:58 UTC, then turned and flew under the ISS track at 22:12 UTC. On the ISS underpass portion of the flight, extensive smoke from forest fires is observed, along with cirrus at 12-13 km altitude. The smoke from the fires appears to be generating pryo-cumulus above the top of the planetary boundary layer (~4 km altitude). On the CALIPSO underpass leg of the flight, the scene is similar although the cirrus clouds were less extensive at that time. John Yorks of GSFC managed the mission. Matt McGill is PI.

The ability to fly high, essentially above the atmosphere, provides the best The ability to

Continued on page 9

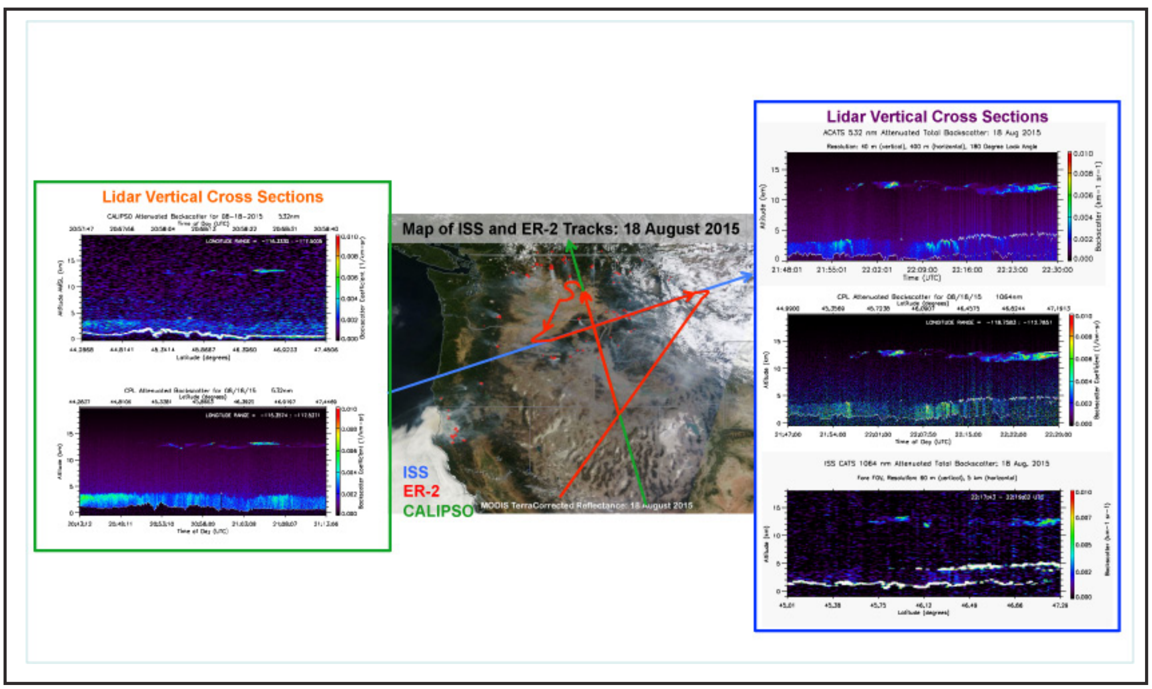
CPL and ACATS *(continued from page 8)*

fly high, essentially above the atmosphere, provides the best possible validation of the spaceborne sensors. Flying at 65,000 ft, the ER-2 is essentially enabling satellite-like measurements from top-of-atmosphere. The ER-2 platform remains a unique capability that is essential for NASA remote sensing applications.

Of note, this year marks the fifteenth year of operation for CPL. First flown in SAFARI-2000, CPL has participated in numerous field campaigns, accumulating over two thousand flight hours of data. For airborne instruments operating in demanding environments, 15 years is a long life. As a demonstration of high repetition rate photon-counting atmospheric lidar, CPL has developed a devoted base of science users. Happily, the proven CPL should continue operating on the ER-2 for the foreseeable future.

Contributed by Matt McGill

CPL personnel Andrew Kupchock and Scott Ozog installing the CPL and ACATS instruments on the ER-2 and preparing for flight.



Data image showing CPL, ACATS, CATS-ISS, and CALIPSO data from the same flight. The left panels show the CALIPSO and CPL data from the CALIPSO underpass. The right-hand panels show the CPL, ACATS, and CATS data from the ISS underpass track.

P-3 Update

The US Navy, along with L3 held a Program Management Review in early September to review progress on the P-3 re-wing and other upgrades. Highlights of the review:

•Phase Maintenance Inspection (PMI): The PMI inspection is complete

•All 3 wing ring fitting replacements have been completed

•Right wing is mated, left wing will be mated within the next couple days

•Empennage is complete, just need to mount and rig the elevators

•All nacelles are installed

•Center Wing Box is complete

•Bubble window replacement complete

•Floor board restoration in progress (repairing damaged cabin floorboards and recovering all cabin floor boards)

•Project completion date (not counting the autopilot work): 3/7/16

•Project completion date (including the autopilot work) : 5/15/16

Additional engineering work is underway at WFF to convert several standard P-3 pylons to science pylons and to develop adapters to hold a variety of science instruments on the wings. Upon completion of the re-wing effort the P-3 Orion service life will be extended, providing at least another 20 years of flight support to NASA and the airborne science community. The first activity scheduled for the P-3 upon return to service is the Earth Venture mission ORACLES.

Contributed by Mike Cropper

The P-3 Orion New Wing Installation Underway

SHOUT Continues Tropical Storm Monitoring with Global Hawk

The Sensing Hazards with Operational Unmanned Technology (SHOUT) mission is a NOAA-led project conducting research to improve forecasting for severe storms impacting the US. This first series of flights, scheduled to last five weeks, focused on flying over tropical cyclones using NASA's unmanned Global Hawk aircraft, which is based at Armstrong Flight Research Center (AFRC). NOAA plans to have a more extensive series of flights next summer targeting hurricanes and northern pacific storms.

The Global Hawk deployed to NASA's Wallops Flight Facility to conduct the first series of flights. SHOUT completed three 24 hour science flights of tropical cyclones Erika and Fred. Flight operations then moved to NASA AFRC on Sept. 8 to focus on eastern pacific storms.

NOAA uses real time data collected over the storms to feed directly into hurricane forecast models, which will help better predict hurricane intensity. This, in turn, will help with disaster preparedness. Post-mission data denial studies are planned to investigate the data impact. NOAA is also looking into the feasibility of the Global Hawk becoming an operational weather forecast tool.

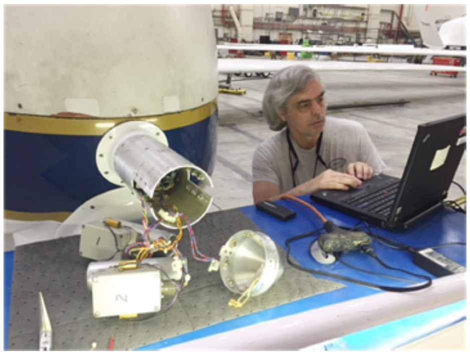
Close coordination with other aircraft flying tropical cyclones include U.S. Air Force 53rd Weather Reconnaissance Squadron WC-130J's, NOAA Aircraft Operations Center WP-3D's and G-IV, and NASA Ellington's WB-57.

SHOUT carries the following instruments to collect data during flights:

• NOAA's Advanced Vertical Atmospheric Profiling System (AVAPS) instrument releases dropsondes from the aircraft to profile temperature, pressure, wind speed and direction.

• NASA Goddard's High Altitude Imaging Wind and Rain Airborne Profiler (HIWRAP) measures precipitation and wind speed.

SHOUT *(continued from page 10)*



Jim Bailey of NASA MSFC preparing the LIP instrument, which is carried outside the nose of the aircraft.

- NASA JPL High Altitude MMIC Sounding Radiometer (HAMSR) instrument takes vertical profiles of temperature and humidity.

- NASA Marshal Lighting Instrument Package (LIP) measures the electric field of thunderstorms.

Principal Investigator Robbie Hood, NOAA UAS Program Director and Phil Kenul, SHOUT Project Manager, lead the management effort for SHOUT, while Mike Black of the NOAA Hurricane Research Division, Gary Wick of the NOAA Earth Systems Research Laboratory, and Jason Dunion of the Hurricane Research Division make up the lead science team.

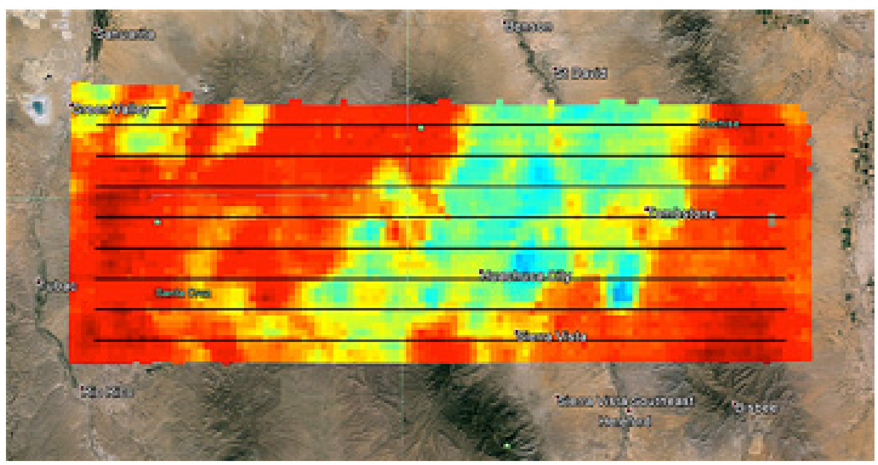
Contributed by Quincy Allison

NASA's SMAPVEX 15 Field Campaign Measures Soil Moisture Over Arizona

NASA's SMAP (Soil Moisture Active Passive) satellite observatory conducted a field experiment as part of its soil moisture data product validation program in southern Arizona on Aug. 2 - 18, 2015. The images here represent the distribution of soil moisture over the SMAPVEX15 (SMAP Validation Experiment 2015) experiment domain, as measured by the Passive Active L-band System (PALS) developed by NASA's Jet Propulsion Laboratory, Pasadena, California, which was installed onboard a DC-3 aircraft operated by Airborne Imaging, Inc. Blue and green colors denote wet conditions and dry conditions are marked by red and orange. The black lines show the nominal flight path of PALS.

The measurements show that on the first day, the domain surface was wet overall, but had mostly dried down by the second measurement day. On the third day, there was a mix of soil wetness. The heterogeneous soil moisture distribution over the domain is typical for the area during the North American Monsoon season and provides excellent conditions for SMAP soil moisture product validation and algorithm enhancement.

The images are based on brightness temperature measured by the PALS instrument gridded on a grid with 0.6-mile (1-kilometer) pixel size. They do not yet compensate for surface characteristics, such as vegetation and topography. That work is currently in progress.



PALS image from August 8, 2015, the same day as AirMOSS P-band data. Credit: Andreas Colliander

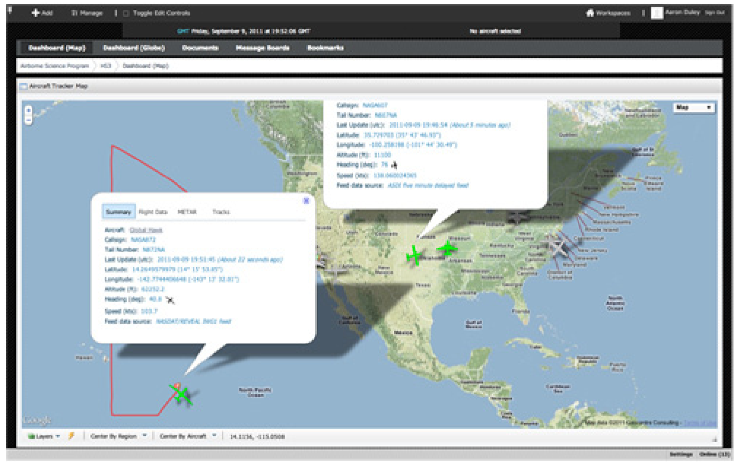
Mission Tool Suite

An evolution in capability

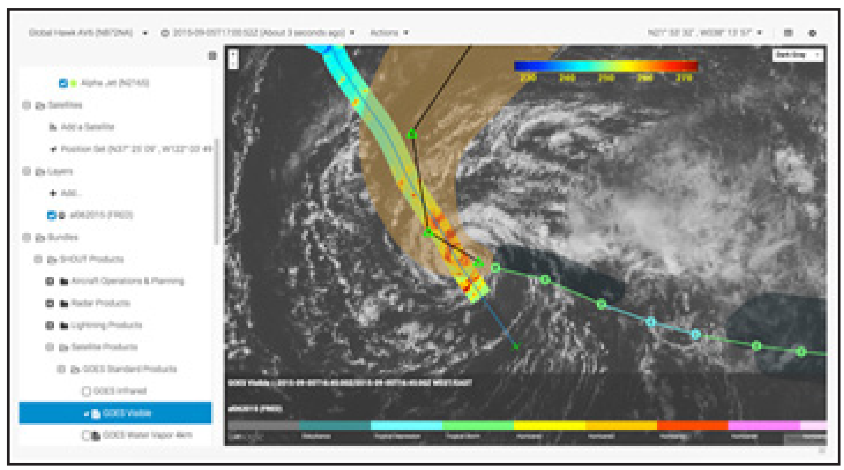
The Mission Tools Suite (MTS) is a decision-support product from the Airborne Science Program that provides a set of core capabilities for planning and executing airborne campaigns. In addition to web-based communication and collaboration tools such as document sharing and mission chat, the MTS supports a multitude of features such as tactical mission monitoring, mission planning, real time position and instrument status, access to low latency satellite, radar, and other meteorological and mission products. A primary goal of the MTS is to improve distributed team situational awareness and to improve the overall efficiency and effectiveness of flight missions for both single and multi-asset campaigns.

For each release since 2011 (see top figure opposite), the system's development priorities have been shaped largely from community feedback and have followed a similar cycle. That is, as new capabilities are requested and completed, existing capabilities are carefully reviewed, refined, consolidated, and in some cases removed entirely. The iterative nature of development has been successful to distill a host of functionality common across multiple stakeholders and airborne missions as a whole. As each campaign yields its own set of challenges and solutions, those capabilities are both refined and generalized for use by subsequent campaigns. A screen shot with both flight track and underlying storm features from the 2015 SHOUT mission is shown in bottom figure. Since 2014, the asset tracker has been available in a mobile version.

To date the MTS has been used in various capacity for over 20 different campaigns and the system now includes hundreds of features that span nearly second resolution of status on some platform aircraft, layer management and simplified product access and project distribution, tools for tactical operations, simple integrated tools for satellite prediction, unified payload monitoring and plotting, and a diverse set of airspace products.



Screenshot of the first MTS version, Sept. 8, 2011



MTS screenshot showing the NASA Global Hawk (N872NA) flight over Tropical Storm Fred for the Sensing Hazards with Operational Unmanned Technology (SHOUT) mission, Sept. 5, 2015. The aircraft had just passed over the storm center at approximately 59,000 ft. The storm center is located about 2,050 nautical miles southeast of Wallops Flight Facility (WFF).

The MTS is a resource available to any size mission where NASA airborne assets are utilized. For questions about the tool please contact Aaron R. Duley aaron.r.duley@nasa.gov or visit the website at http://mts.nasa.gov. To view the public tracker, visit the Airborne Science Website and click on the Asset Tracker link, or visit http://airbornescience.nasa.gov/tracker.

Contributed by Aaron Duley

Airborne Science Program 2015 Awards

Sustained Excellence
Adam Webster

For 10 years of highly insightful, responsive engineering support to the NASA DC-8 flying laboratory, all the while engendering long lasting positive relationships with stakeholders across the board.

Engineering
Caitlin Barnes

Excellence in Engineering the Global Hawk Ground Simulation Environment

Leadership
Rick Shetter

For contributions resulting in 50 percent more airborne science, education and outreach implemented in the past 7 years than was accomplished in the previous 10 years.

Leadership
Steve Hipskind

For co-conceiving and successfully launching the NASA Earth Science Project Office (ESPO) which supports major airborne science missions across the Agency and beyond. And for 20 years of dedicated service to airborne science culminating in his position as Chief of Earth Sciences at Ames Research Center. Steve retired at the end of July.

Certificates of Appreciation
Steven Todorov, Erin Justice, Sommer Beddingfield

For development of SOFRS v2.0 for adapting the Science Operations Flight Request System to support NASA -wide aviation requirement requests.

Continued on page 14

ASP Awards *(continued from page 13*

Career Sustained Excellence
Sue Tolley

In recognition of sustained and successful support of the Earth Science Project Office (ESPO) and the Airborne Science Program (ASP). Sue reitred in May after 26 years at NASA Ames.

Career Sustained Excellence
Bruce Coffland

For innumerable outstanding contributions to the success of the Airborne Science Program, over the course of a 35 year career at the Ames Airborne Sensor Facility.

ASP Upcoming Events

* UAVSAR Workshop and NISAR Applications Workshop
  October 13-15, 2015; NASA Ames
  http://nisar.jpl.nasa.gov/missionthemes/applications/2015appws/
  http://uavsar.jpl.nasa.gov/science/workshops/workshop2015.html

* 2015 NASA HyspIRI Science and Applications Workshop,
  13-15 October 2015, Caltech, Pasadena, CA
  http://hyspiri.jpl.nasa.gov.

* 2015 Unmanned Systems Canada Annual Conference
  3-5 November 2015; Halifax, Nova Scotia, Canada
  https://www.unmannedsystems.ca/content.php?doc=182

* 2015 UAS TAAC
  7-10 December 2015; Santa Ana Pueblo, NM
  https://taac.psl.nmsu.edu/

* American Geophysical Union (AGU) 2015 Fall Meeting
  14-18 December 2015: San Francisco, CA
  Registration Deadline: 12 November, 11:59 P.M., EDT
  http://fallmeeting.agu.org/2015/

* AIAA SciTech16
  4-8 January 2016; San Diego, CA
  http://www.aiaa.org/EventDetail.aspx?id=25168

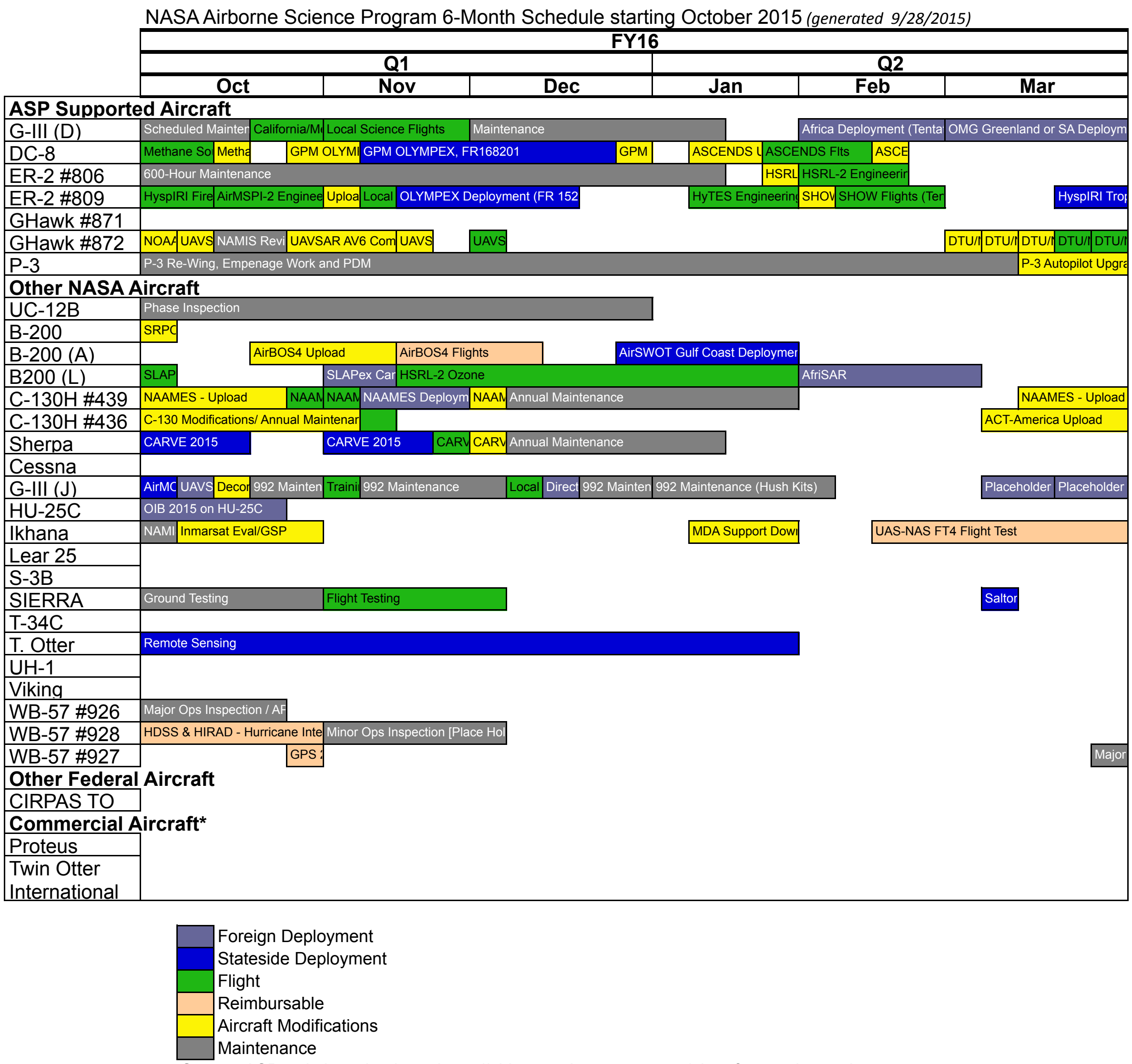
* American Meteorological Society Annual Meeting 2016
  10-14 January 2016; New Orleans, LA
  https://annual.ametsoc.org/2016/

* IEEE Aerospace Conference
  March 5-12, 2016; Big Sky, Montana
  http://www.aeroconf.org

* AGU Ocean Sciences Meeting, 2016
  21-26 February 2016; New Orleans
  http://osm.agu.org/2016/

* ICUAS'16: The 2016 International Conference on Unmanned Aircraft Systems
  June 7-10, 2016; Arlington, VA
  http://www.uasconferences.com/

NASA SMD ESD Airborne Science Program 6-Month Schedule



Source: ASP website calendar at https://airbornescience.nasa.gov/aircraft_overview_cal

For an up-to-date schedule, see
http://airbornescience.nasa.gov/aircraft_detailed_cal

Airborne Science Program

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
ASP Supported Aircraft*	DC-8	NASA-AFRC	12	30,000	340,000	41,000	450	5,400	http://airbornescience.nasa.gov/aircraft/DC-8
	ER-2 (2)	NASA-AFRC	12	2,550	40,000	>70,000	410	>5,000	http://airbornescience.nasa.gov/aircraft/ER-2
	Gulfstream III (G-III)(C-20A)	NASA-AFRC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_C-20A_-_Dryden
	Global Hawk	NASA-AFRC	26	1,500	26,750	65,000	335	9,000	http://airbornescience.nasa.gov/aircraft/Global_Hawk
	P-3	NASA-WFF	14	14,700	135,000	32,000	400	3,800	http://airbornescience.nasa.gov/aircraft/P-3_Orion
Other NASA Aircraft	B-200 (UC-12B)	NASA-LARC	5	2,000	13,500	28,000	220	1,000	http://airbornescience.nasa.gov/aircraft/B-200_UC-12B_-_LARC
	B-200	NASA-AFRC	5	1,700	13,420	28,000	270	1,400	http://airbornescience.nasa.gov/aircraft/B-200_-_DFRC
	B-200	NASA-LARC	5	2,000	13,500	28,000	220	1,000	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	B-200 King Air	NASA-WFF	6.0	1,800	12,500	28,000	275	1,800	https://airbornescience.nasa.gov/aircraft/B-200_King_Air_-_WFF
	C-130 (2)	NASA-WFF	12	36,500	155,000	33,000	290	3,000	https://airbornescience.nasa.gov/aircraft/C-130_Hercules
	C-23 Sherpa	NASA-WFF	6	7,000	27,100	20,000	190	1,000	http://airbornescience.nasa.gov/aircraft/C-23_Sherpa
	Cessna 206H	NASA-LARC	5	646	3,600	10,000	150	700	http://airbornescience.nasa.gov/aircraft/Cessna_206H
	Cirrus SR22	NASA-LARC	6.1	932	3,400	10,000	175	970	http://airbornescience.nasa.gov/aircraft/Cirrus_Design_SR22
	Dragon Eye	NASA-ARC	<1	1	6	1000	34	3	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	Gulfstream III (G-III)	NASA-JSC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_-_JSC
	HU-25C Falcon	NASA-LARC	4.5	2,000	32,000	36,000	350	1,600	http://airbornescience.nasa.gov/aircraft/HU-25C_Falcon
	Ikhana	NASA-AFRC	20	2,000	10,500	45,000	171	3,000	http://airbornescience.nasa.gov/aircraft/Ikhana
	Learjet 25	NASA-GRC	2	2,000	15,000	45,000	350	1,000	http://airbornescience.nasa.gov/aircraft/Learjet_25
	Learjet 35	NASA-GRC	2.5	4,200	19,600	45,000	350	2,300	
	S-3B Viking	NASA-GRC	6	12,000	52,500	40,000	350	2,300	http://airbornescience.nasa.gov/aircraft/S-3B
	SIERRA	NASA-ARC	10	100	400	12,000	60	600	http://airbornescience.nasa.gov/platforms/aircraft/sierra.html
	T-34C	NASA-GRC	3	100	4,400	25,000	150	500	http://airbornescience.nasa.gov/aircraft/T-34C
	Twin Otter	NASA-GRC	3	3,000	11,000	25,000	140	450	http://airbornescience.nasa.gov/aircraft/Twin_Otter_-_GRC
	UH-1	NASA-WFF	2	3,880	9,040	12,000	108	275	https://airbornescience.nasa.gov/aircraft/UH-1_Huey
	Viking-400 (4)	NASA-ARC	11	100	520	15,000	60	600	https://airbornescience.nasa.gov/aircraft/Viking-400
	WB-57 (3)	NASA-JSC	6.5	8,800	72,000	60,000+	410	2,500	http://airbornescience.nasa.gov/aircraft/WB-57