National Aeronautics and Space Administration

Airborne Science Newsletter

Spring 2018

HysplRI HyTES Hawaii 2018 Campaign

In January 2017, a NASA ER-2 visited Hawaii with the MODIS-ASTER Airborne Simulator (MASTER), developed by NASA's Ames Research Center, and the Airborne Visible and Infrared Imaging Spectrometer (AVIRIS), developed by NASA's Jet Propulsion Laboratory (JPL), onboard to observe coral reefs and volcanoes. Good data were acquired, and a follow-up campaign was planned for 2018. One year later, with two additional instruments available, the ER-2 returned to gather additional data over the volcano and coral targets.

In January 2018 The instrument suite on the aircraft was expanded to include the Hyperspectral Thermal Emission Spectrometer (HyTES) and the Portable Remote Imaging Spectrometer (PRISM), both developed by JPL. The 2018 complement provided simultaneous optical imaging over the entire spectrum from thermal Infrared to ultraviolet, probably the most compete spectral coverage to date from an ER-2 campaign.

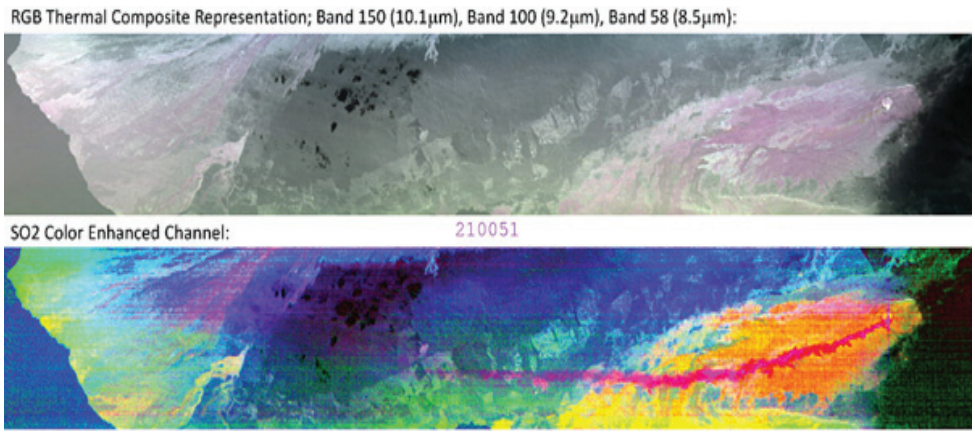
ER-2 at Marine Corp Base Hawaii (MCBH) Kaneohe Bay

From January 16 through February 20, the ER-2 with the updated instrument suite conducted an additional 56 hours of science flights. A pre-campaign check flight added another 3 hours. As in 2017, the ER-2 was based at Marine Corps Base Hawaii (MCBH) Kaneohe Bay on Oahu.

Science targets included Kilauea and Mauna Loa volcanoes and coral reefs throughout the island chain. Field teams were on the ground on the Big Island for volcano field measurements and in boats in the water over coral reefs. A few of the flights were scheduled to coincide with day or night overpasses by the ASTER and Landsat-8 satellite instruments over the volcano targets.

Contributed by Simon Hook

What's Inside...

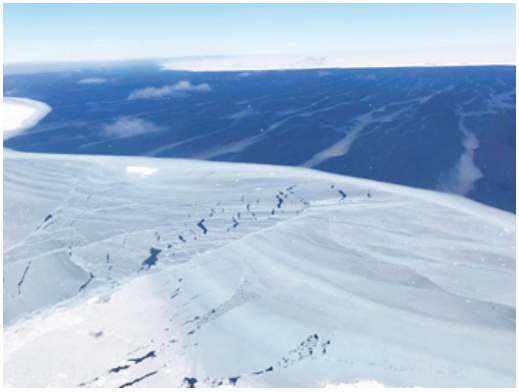


The HyTES image of the SO_2 plume from Pu'u 'O'o was acquired on January 18. The second image has been enhanced to highlight SO_2 in the plume.

OIB Busy in Antarctica

Operation IceBridge completed a dual-aircraft campaign over the Antarctic region in late 2017 with a mixture of new areas covered, as well as repeats of historic lines to assess changes in the polar ice cover. In the first campaign, the NASA P-3 aircraft, based out of Ushuaia, Argentina, was equipped with the traditional IceBridge instrument suite of laser altimeters, shallow and deep sounding radars, gravimeter, magnetometer, and thermal and visible imaging systems. In the second campaign, a Basler BT-67 aircraft, based primarily out of McMurdo Station, Antarctica, carried a laser altimeter and depth sounding radar.

The P-3 Antarctic campaign logged 11 research flights totaling 156 flight hours and traveled a distance of 85,106 km. The campaign achieved extensive coverage of sea ice in the Weddell Sea, including two underflights of the TanDEM-X spacecraft in coordination with the German Aerospace Center (DLR). New gravity surveys of the Larsen C and Venable Ice Shelves were also completed, including the first up-close look at the massive A68 iceberg that calved off the Larsen C glacier in July.



Sea ice in the Weddell Sea with iceberg A68 in the distance. Photo credit: Nathan Kurtz

In the midst of the campaign, the P-3 was also used to aid search and rescue operations for the missing ARA San Juan submarine, as part of a massive international cooperative effort. The P-3 was the first international aircraft made available for the search effort and carried the former captain of the San Juan on board to help. Though ultimately unsuccessful in locating the submarine, the effort and gesture of goodwill provided by NASA was widely recognized.

Extensive outreach and media coverage of the IceBridge P-3 campaign also came with news articles and radio interviews in media outlets such as Time, USA Today, NPR, Washington Post, Fortune, Gizmodo, NBC News, and many others. X-chat sessions with students and IceBridge researchers on the P-3 reached 252 students. A grand total of 8,479 students have been reached during IceBridge in classroom chats since 2012.

The Basler campaign, which flew right up until year's end, completed 16 flights totaling 108 flight hours and traveled a distance of 33,880 km. The science lines for the campaign were a mixture of new missions as well as lines flown previously in 2013 (with the P-3 based out of McMurdo) and also in 2016. The highest priority lines included surveys of the Trans-Antarctic Mountains, as well as the 88-degree "Pole Hole". The "Pole Hole" line is the planned area of many orbit crossings for the ICESat-2 satellite slated to launch this fall, and surveys of the area are necessary to establish a calibration target for the measurements. NASA GSFC staff also performed ground surveys of the line, as an independent way of verifying the data. These data will be essential for tying together the airborne record from IceBridge with the satellite records from ICESat and ICESat-2.

Contributed by Nathan Kurtz

View from P-3 flying low over Hektoria Glacier on the Antarctic Peninsula. Photo credit: Nathan Kurtz

Directors' Corner

Welcome to another ASP newsletter, Randy and I hope you enjoy reading about the program. We've been busy as usual with over 1,300 hours flown for earth science and with multiple aircraft in the air as I type. We have several campaigns set to deploy in days and others in the planning phase. We want to wish all the best of luck while on deployment and hope everyone accomplishes their missions safely. We know it's a lot of hard work and long hours so please ensure you stay safe and have fun. If you have any issues with the program or while on deployment, please utilize your chains of command but also remember Randy and I are also here for you so please do not hesitate to contact us. We are always just an email or telephone call away, no matter where you are in the world. We also hope that you get some good downtime and enjoy the spring and summer months with friends and family. Be safe and I'll end with my customary "As always, if you have any feedback about this newsletter or the Program – good or bad – please let Randy and me know."

Bruce Tagg and Randy Albertson
Airborne Science Program

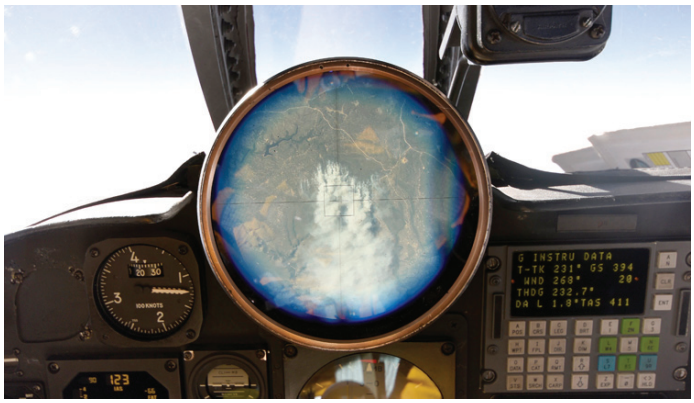
ACEPOL Mission Tests Polarimeter Prototypes on ER-2

An ER-2 flight campaign called Aerosol Characterization from Polarimeter and Lidar (ACEPOL) sought to test capabilities of several proposed instruments for the Aerosol-Cloud-Ecosystem (ACE) mission, currently in pre-formulation phase. The mission flew nine flights last November observing targets including California's Central Valley and the Pacific Ocean, and as far east as Arizona, where the team observed smoke from controlled forest fires near Flagstaff.

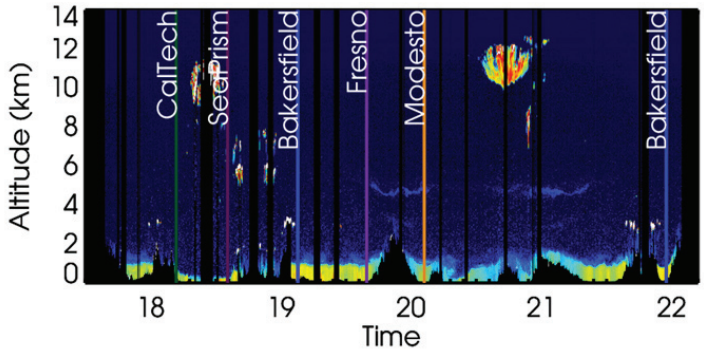
The ER-2's payload included four airborne polarimeters (AirHARP,AirMSPI, AirSPEX and RSP) and two lidar instruments (CPL and HSRL-2). Each of the polarimeters used different techniques and angles to measure and record data. The instruments also differed from one another in size and power. From an engineering perspective, the ultimate goal of the ACEPOL mission was to better understand how those overall differences translate into data collection.

The combination of the polarimeter and lidar instruments, along with ground based data from stationary air quality measurement stations provide scientists with a more complete picture of the three-dimensional distribution of aerosols in the Earth's atmosphere. Utilizing a variety of different approaches for collecting data also enables scientists to differentiate various types of aerosols (e.g., smoke, dust, pollution) and clouds (cirrus, stratus, etc.).

The ER-2, based at NASA's Armstrong Flight Research Center in Palmdale, Calif., was chosen because its high altitude flight regime provides a vantage point and conditions similar to space. By flying these instruments on an aircraft before the expense of launching them into space, scientists and engineers can make adjustments to the hardware and data retrieval algorithms. The aircraft test phase in sensor development is helpful for ensuring instruments are collecting both accurate and useful data prior to the time the final version of the sensors makes its trip into space.



The cock-pit view finder in the ER-2 shows a controlled fire burning near Flagstaff, Arizona on Nov. 7, 2017. This small fire event offered the ACEPOL science team a different test environment to observe with the polarimeter and lidar instruments onboard the aircraft. Credit: NASA/Stu Broce



HSRL-2 preliminary data from the ER2 ACEPOL flight on Nov. 7 showing the structure of aerosol and clouds in the atmosphere along the flight track. The ground is black, dark blue indicates clear air, white indicates water clouds. Transparent cirrus clouds high in the atmosphere show up in yellow and orange colors. Yellow, green and blue colors at lower altitudes indicate aerosol. Credits: NASA / Sharon Burton

In addition to testing capabilities of new sensors, ACEPOL flights also provided calibration and evaluation data for NASA's CALIPSO satellite lidar by staging satellite underpasses as part of their flight plans. In addition to comparisons with CALIPSO, ACEPOL also contributes to the development of future satellite missions including the European Space Agency's EarthCare, the European Organization for the Exploitation of Meteorological Satellites METOP-SG , and NASA's MAIA and PACE programs.

The ACEPOL mission involved partnership between multiple NASA centers, including Langley Research Center, Goddard Space Flight Center, the Goddard Institute for Space Studies, and the Jet Propulsion Laboratory. The mission also included international partnership with the Netherlands Institute for Space Research, which flew the AirSPEX instrument on board the ER-2 for the second time.

Contributed by Felix Seidel

Earth Venture Suborbital 2 Spring Schedule

There's a lot happening this spring with Earth Venture Suborbital – 2 Missions. See table below.

Mission	Aircraft	Recent Activity/Status
ATom	DC-8	ATom-4, the final campaign, just getting underway.
NAAMES	C-130	NAAMES will complete with a March 2018 campaign.
ACT-America	C-130, B-200,	ACT-America getting ready to fly again in Spring 2018 and complete in 2019.
ORACLES	P-3	ORACLES will complete in 2018 with a campaign returning to São Tomé
OMG	G-III, C-130	OMG will fly GLISTIN again in 2018 and 2019, and complete with sonde drops in 2018, 2019 and 2020.
CORAL	G-IV	CORAL completed in 2017 with final flights in Florida

University of Colorado, Boulder HR-AMS instrument being loaded into DC-8 for ATom-4. (L-R) Pedro Campuzano Jost, Ben Nault and Lynn Lohberger.

Eric Stith, NSRC, performing IT work during ATom-4 integration.

University of Vienna CAPS instrument on DC-8 wingtip being checked out by (L-R) Max Dollner and Nickolaus Foelker during ATom-4 integration.

SIERRA-B Conducts First Flight at Crow's Landing

SIERRA-B at Crow's Landing

NASA Ames Research Center has successfully returned the SIERRA UAV to flight. Two of the aircraft were originally acquired from the Naval Research Laboratory in 2006 and went on to fly more than 10 different science payloads including active, passive, and in situ instruments over its short operations career from 2009-2013. The SIERRA-B was modified to have a longer fuselage to carry more payload as well as a increasing the wind dihedral for improved flight stability and control. On March 23rd, SIERRA-B had its first flight at Crow's Landing under radio control. The flight was a success and the team will now move to envelope expansion. A number of projects are already funded and lined up to use SIERRA including the NASA ARMD UAS in the NAS project, as well as an SMD Earth Science Synthetic Aperture Radar payload.

Contributed by Matt Fladeland

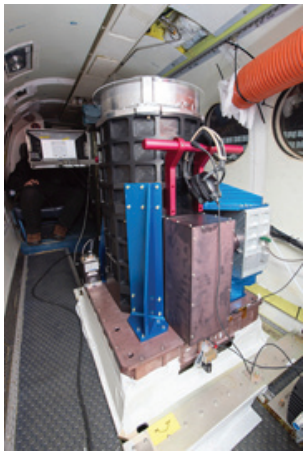
SIERRA-B team at NASA Ames Research Center

Recent Instrument Tests

At LaRC

Langley's Research Services Directorate recently completed test flights of two new instruments, a Triple Pulsed Lidar funded through the Earth Science Technology Office (ESTO) Instrument Incubator Program, and a passive remote sensing package developed by the Environmental Protection Agency (EPA).

Triple Pulsed Integrated Path Differential Absorption (IPDA) Two-Micron LIDAR, designed for the measurement of greenhouse gases, flew on the NASA LaRC B200 aircraft. The instrument takes accurate acnd simultaneous measurements of both carbon dioxide and water vapor down to the individual molecule. A total of four sorties were flown over land and water using 15.4 flight hours. The Principal Investigator is Upendra N. Singh of LaRC.



Triple Pulsed Integrated Path Differential Absorption (IPDA) Two-Micron LIDAR

The second instrument, called Transportable Environmental Resource Observation Suite (TEROS), completed instrument check flight on the LaRC Cessna 206H. Using two

TEROS

hyperspectral imagers, a thermal camera and a mapping camera, the instrument supports landscape analysis such as urban infrastructure mapping, land cover change, wetland and coastal zone change detection, and water quality research on algal blooms and mine drainage sediments.

TEROS was installed in the RSD-designed wing-strut pod installed under the right wing of the Center's Cessna 206H aircraft (NASA 507). The pilot flew multiple passes in grid pattern flight lines overhead NASA LaRC, where two ground targets had been placed for validation, for a total flight duration of 1.4 hours. The next flights of EPA-TEROS will be on the NASA Armstrong B200 aircraft (NASA 801) in April 2018 in California for the EPA Mother Lode Regional Applied Research Effort. EPA, in association with the state of California, is focusing on mine waste near residential areas, impacting Tribal lands, and/or wildlife areas. The Principal Investigator is David J. Williams, National Environmental Research Laboratory, EPA.

Contributed by Bruce Fisher

Upcoming Events

* UTM Workshop
  April 10-12, 2018; NASA Ames
  https://aviationsystemsdivision.arc.nasa.gov/aosp-partnership-workshop/

* TFRSAC Spring meeting
  May 9-10, 2018; NASA Ames
  Contact Hinkley, Everett A -FS [ehinkley@fs.fed.us]

* NASA ESTO Annual Forum: ESTF2018
  June 12-14, 2018; Silver Spring, MD
  https://esto.nasa.gov/forum/ESTF2018/index.html

* AIAA Aviation
  June 25-29, 2018; Atlanta, GA
  Aviation.aiaa.org

* SWOT Science Team Meeting
  June 26-29, 2018; Montreal, Canada
  https://swot.jpl.nasa.gov/meetings.htm?id=21

* International Society for Atmospheric Research using Remotely Piloted Aircraft (ISARRA)
  July 9-12, 2018; University of Colorado Boulder
  Isarra.colorado.edu

* Flight Week: "Lower Atmospheric Process Studies at Elevation – A Remotely Piloted Aircraft Team Experiment"
  July 14-21, 2018; San Luis Valley, Colorado
  Isarra.colorado.edu

* IGARSS 2018
  July 23-27, 2018; Valencia, Spain
  https://www.igarss2018.org/

* ForestSAT 2018
  October 2-5, 2018; College Park, MD
  http://forestsat2018.forestsat.com/forestsat-2018

* ATom Science Team Meeting
  November 13-15, 2018; NCAR
  Boulder, Colorado

What's Ahead at ESPO

ATom 4: NASA DC-8

Integration, March 12-April 23, 2018
Deployment, April 24-May 21, 2018
(Anchorage, Kona, Fiji, Christchurch, Punta Arenas, Recife (Brazil), Azores, Thule, Anchorage, Palmdale)

EXPORTS: 2 UNOLS/NSF ships

August 1 - September 15, 2018
(Seattle)

CAMP2Ex: NASA P-3B & SPEC Learjet 35

Integration, March 30 - July 3, 2018
Deployment, July 18 - September 5
(Subic Bay, Philippines)

ORACLES 3: NASA P-3

October 7 - November 1, 2018
(São Tomé)

New JSC G-V Aircraft Preparing for Science

NASA 95

The last several months have been exciting times for the Gulfstream V aircraft – NASA 95. The aircraft was sent off to Aerosmith Aviation in January where it received a fresh coat of paint. The old paint scheme was original to the airplane, so this effort was sorely needed to provide a measure of corrosion protection for aircraft structure. The JSC team also made significant strides over the last two months to finish the required modifications to make the aircraft a complete asset for the Airborne Science program. First, the JSC team finished the final design and aircraft modification efforts to prepare for the nadir window installation. This included the relocation of multiple antennas where the nadir windows will be positioned, the modification of the cabin floor structure to allow sensors an unobstructed field of view to the nadir windows, and the installation of seat track for rack and equipment mounting throughout the entire cabin length. Second, JSC awarded a contract to Avenger Aerospace and the Phoenix Air Group to design and install the two large nadir ports in the G-V. With the nadir window installation, the G-V will be ready to support the Airborne Science program. All modifications are scheduled for completion by January 2019. A full list of the features can be found at https://jsc-aircraft-ops.jsc.nasa.gov/gulfstream-gv.html#aircraftspecifications. JSC has dedicated engineering staff to work with scientists to develop cabin layouts and instrumentation integration plans for G-V payloads. If you are interested in flying payloads on the G-V, contact Derek Rutovic to start the conversation (mihailo.rutovic-1@nasa.gov, 832-205-3854).

Contributed by Derek Rutovic

From USAF to NASA LaRC Airborne Science

NASA 502

NASA Langley Research Center has recently acquired a former Air Force C-20B aircraft that is similar to a Gulfstream III aircraft and is being prepared to support the NASA SMD Airborne Science Program. This aircraft will be used to eventually replace the HU-25 Guardian airplane flown recently in support of Operation IceBridge. The aircraft is not a SMD core asset; therefore, design and outfitting choices are being made based on available resources and expected requirements. To date, NASA Langley has fully funded the design for two closely-spaced nadir portals for the aircraft, and also has secured engine hush kits and partial funding for one of the portals. The research system components of the aircraft (power, data, antennas, etc.) have completed preliminary design review based on derived requirements from several years of B-200 and HU-25 research platforms. The hush kit will enable the aircraft to be Stage III noise compliant, allowing the aircraft to deploy nationwide and worldwide without requiring engine noise waivers. The nadir portals (each with internal dimensions of 18.16 x 18.16 in.) will allow the aircraft to install Earth Science sensors, as is currently possible with the LaRC's two King Air aircraft and the HU-25A aircraft. Provisions for pressure domes for each portal are included in the design. The aircraft has an advertised range of 3750 n.mi. The expected duration will increase be about 7.5 hr, and the realistic mission altitude will be 45,000 ft. The goal is to have the new aircraft ready for research at NASA Langley in February 2019. The FAA N-number selected for this aircraft is N520NA and the call sign is NASA 520. The Point of Contact is Bruce D. Fisher, Chief Engineer, Research Services Directorate, NASA Langley, bruce.d.fisher@nasa.gov, (757) 864-3862.

Contributed by Bruce Fisher

Airborne Science People Appreciation

Mike Brown

Mike Brown serves as the crew chief for NASA JSC's Gulfstream-III (G-III) and Gulfstream V (GV) aircraft. Mr. Brown has expertly led the team of mechanics that maintain, modify, and upgrade both Gulfstream aircraft to meet NASA's airborne mission needs; the only maintenance that JSC does not complete in house are engine overhauls. Over the last six years, JSC has modified the G-III to install the UAVASR pod and system equipment, modified the G-III with a sonobuoy launch system, completed the major 72-month flight control maintenance, completed multiple engine changes, upgraded avionics, performed basic maintenance, and supported Earth Venture and other science flight objectives averaging 450 flight hours per year on the aircraft. In 2016 JSC purchased the GV as a partnership within NASA to support the International Space Station and Airborne Science Programs, and despite maintaining a full flight schedule on the G-III, Mr. Brown has successfully lead the maintenance team to modify the GV to support both programs and begin international mission support with the aircraft. Mr. Brown is always the go-to guy to solve the toughest maintenance problems for NASA. He is always on call answering questions when problems arise with deployed aircraft. When the G-III was struck by lightning and damaged in Alaska during an ABoVE deployment in 2017, the decision was made during the work day to send additional maintenance personnel to repair the airplane in the field; Mr. Brown was on a commercial flight that night to repair the aircraft. Seven days later the aircraft was returned to service after replacing the left elevator and all science objectives were completed. Mr. Brown's support the of JSC Gulfstream program is invaluable and has made a tremendous impact for the airborne science community.

Contributed by Derek Rutovik

Tom Parent

Tom "Duster" Parent has provided outstanding support to the Airborne Science Program serving both as the WB-57F project pilot and as a Gulfstream-III (G-III) aircraft commander at the Johnson Space Center. Mr. Parent has been integral to the success of the WB-57 in performing NASA Airborne Science Missions. He establishes a positive working relationship with the science team to understand their mission objectives and provide as much flexibility in mission operations for them to acquire the best science data opportunities. In addition, Mr. Parent has demonstrated that same lean forward attitude leading important science campaigns aboard the G-III. For the 2018 Oceans Melting Greenland GLISTIN-A deployment, he served as an aircraft commander coordinating with all team members to complete the entire mission ahead of schedule. To accomplish this he demonstrated a can-do attitude coordinating with JPL to efficiently execute the mission, aggressively planning ahead to update travel plans, communicating with engineers in Houston to address payload issues remotely, successfully integrating media teams on board during the mission, and personally hand carrying gear and aircraft parts to Iceland necessary to complete the mission. Mr. Parent has provided astute leadership coordinating operations on the ground and safely managing missions in the air and is a tremendous asset for the Airborne Science Program.

Contributed by Derek Rutovik

Adam Webster and Dave van Gilst

The following note was sent from Bruce Anderson (LaRC) to Melissa Yang (NSRC).

"I would like to recognize the tremendous contributions that your team made to the recent ND-MAX flight project. Their timely delivery of engineering services, data visualization software and analysis products were critical for meeting tight mission schedules and

Continued on page 9

Airborne Science People Appreciation

(continued from page 8)

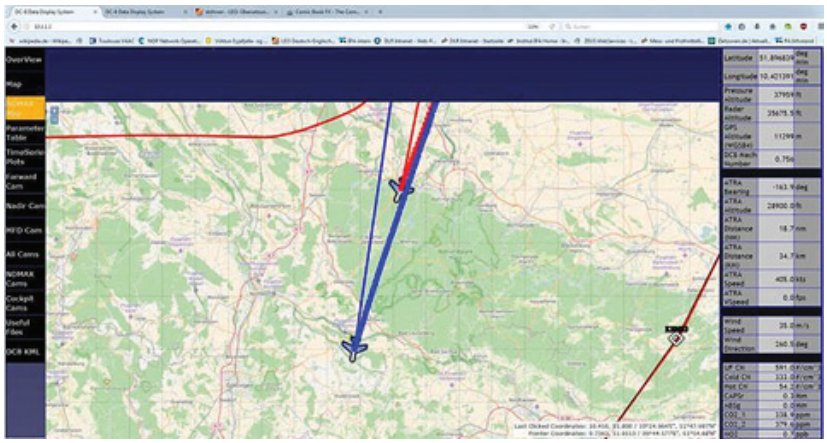
Adam Webster

challenging science objectives. I'd particularly like to call out the work of Adam Webster and David Van Gilst.

In addition to performing his usual engineering duties, Adam did a fabulous job in designing, fabricating and certifying three new inlets and two new cloud-probe pylons for NDMAX. This work was made doubly difficult when AFRC stopped work on the project between Oct 1 and Oct 13, 2017. To his credit, Adam (pictured below with one of the several dozen parts he designed and had fabricated for ND-MAX) continued to design and analyze the proposed installations during the work stoppage, then he cut short his fall and Christmas vacations to complete drawings, load calculations and assembly work. He delivered the new equipment to the DC-8 crew in early January and it was successfully installed and flight tested on Jan 9, 2018. Our ability to deploy on schedule with the desired payload firmly rested on Adam's shoulders and without his determination, dedication to his tasks and willingness to sacrifice for the benefit of the team, ND-MAX would have failed miserably.

Fresh off reviving the operating system of a dead, mission-critical instrument for us during NAAMES, Dave was again a mission hero for developing and implementing data acquisition and visualization software for determining aircraft separation and wake/plume location, which greatly improved our efficiency in sampling exhaust emissions and sub-visible contrails. This work involved developing a low-cost ADSB receiver for the DC-8; engineering software to read in ADSB aircraft separation distance, speed, altitude, bearing, etc.; and developing an innovative display for visualizing the location of the target aircraft's advected exhaust plume relative to the DC-8. With cross-track wind speeds approaching 100 knts on some flight legs, we would never have found the source-aircraft plume at the required 5 to 15 nm separation distances without Dave's "Bread Crumb" display. An example is shown above. I sat in the cockpit jump-seat with an exploded view of the plot on my laptop and coached the pilots to "lean left", "lean 1-deg right", etc., to intercept the plume—it worked great! Our collaborators from the German Aerospace Agency were particularly impressed and have requested Dave's source code for implementation in their future aircraft-chase flight experiments.

Moreover, we really appreciate Adam and Dave's efforts and believe they are highly deserving of special recognition and financial compensation for their extraordinary contributions to NDMAX success."



Dave van Gilst's "Bread Crumb" display

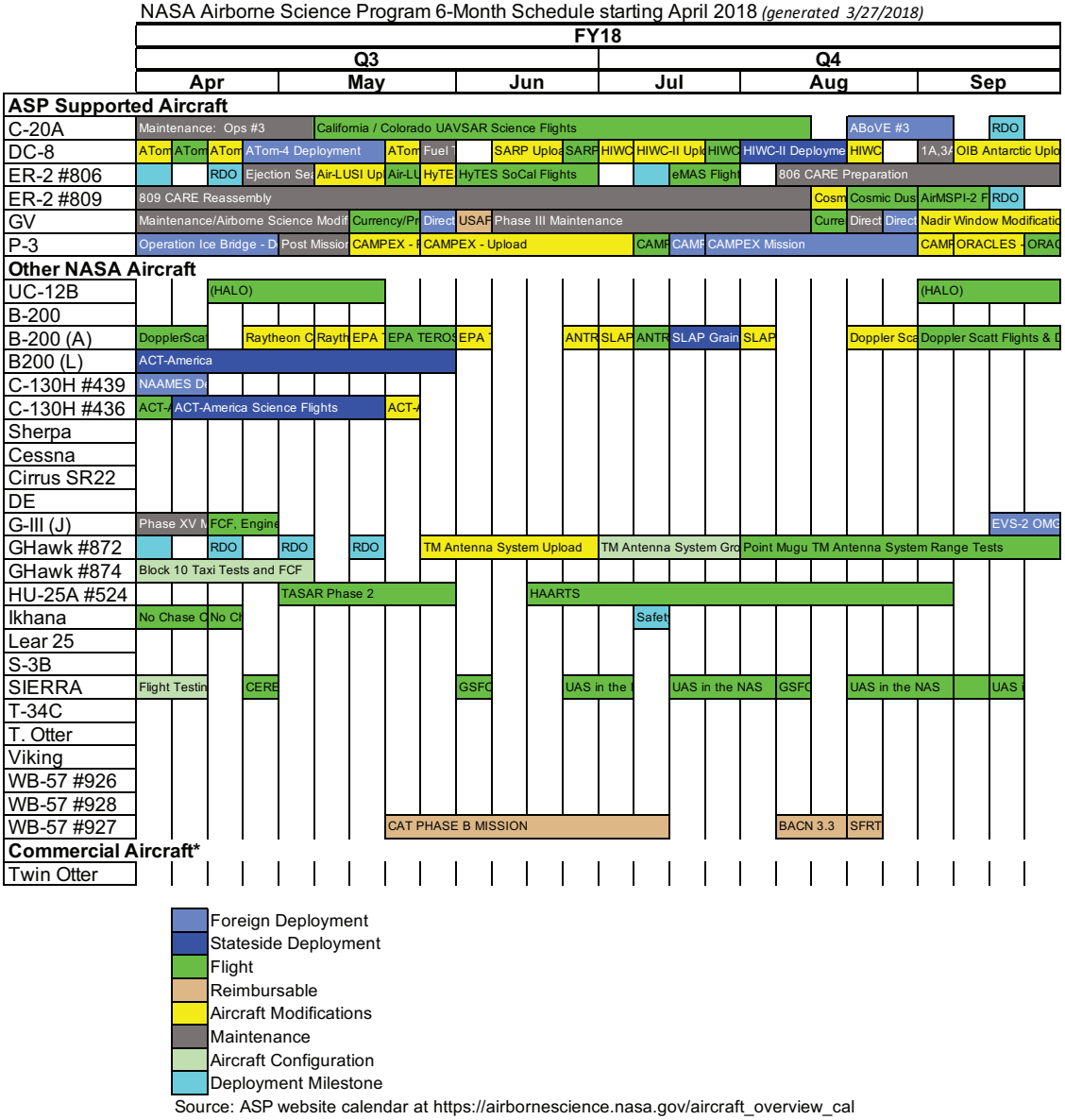
Call for Content

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).

NASA SMD ESD Airborne Science Program 6-Month Schedule

NASA Airborne Science Program 6-Month Schedule starting April 2018 *(generated 3/27/2018)*



Foreign Deployment
Stateside Deployment
Flight
Reimbursable
Aircraft Modifications
Maintenance
Aircraft Configuration
Deployment Milestone

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	2,900	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_-_Armstrong
	Gulfstream V (G-V)	NASA-JSC	10	8,000	91,000	51,000	500	>5,000nm	https://airbornescience.nasa.gov/aircraft/Gulfstream_V
	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	6.2	4,100	13,500	31,000	260	1,250	http://airbornescience.nasa.gov/aircraft/B-200_UC-12B_-_LARC
	B-200	NASA-AFRC	6	1,850	12,500	30,000	272	1,490	http://airbornescience.nasa.gov/aircraft/B-200_-_AFRC
	B-200	NASA-LARC	6.2	4,100	13,500	35,000	260	1,250	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	B-200 King Air	NASA-WFF	6.0	1,800	12,500	32,000	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	5.7	1,175	3,600	15,700	150	700	http://airbornescience.nasa.gov/aircraft/Cessna_206H
	Cirrus SR22	NASA-LARC	6.1	932	3,400	10,000	150	700	http://airbornescience.nasa.gov/aircraft/Cirrus_Design_SR22
	Dragon Eye	NASA-ARC	1	1	6	500+	34	3	http://airbornescience.nasa.gov/aircraft/B-200_-_LARC
	Global Hawk	NASA-AFRC	30	1900	25,600	65,000	345	11,000	http://airbornescience.nasa.gov/aircraft/Global_Hawk
	Gulfstream III (G-III)	NASA-JSC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_-_JSC
	Gulfstream III (G-III)	NASA-LaRC	7	2,610	69,700	45,000	460	3,400	http://airbornescience.nasa.gov/aircraft/G-III_-_LARC
	HU-25A Falcon	NASA-LARC	5	3,000	32,000	42,000	430	1,900	http://airbornescience.nasa.gov/aircraft/HU-25A_Falcon
	Ikhana	NASA-AFRC	24	2,000	10,000	40,000	171	3,500	http://airbornescience.nasa.gov/aircraft/Ikhana
	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
	Twin Otter	NASA-GRC	3	3,600	11,000	25,000	140	450	http://airbornescience.nasa.gov/aircraft/Twin_Otter_-_GRC
	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