Dryden employees contributed to key missions in 2011

Science

The SOFIA Observatory

The Stratospheric Observatory for Infrared Astronomy (SOFIA), an international collaboration between NASA and the German Aerospace Center, had a busy year, starting with the flight of the GREAT Spectrometer in April. GREAT, for German Receiver for Astronomy at Terahertz frequencies, is a high-resolution far-infrared spectrometer that finely divides and sorts light into component colors for detailed analysis.

On June 23, the SOFIA observed the dwarf planet Pluto as it passed in front of a distant star. This event, known as an occultation, allowed scientific analysis of Pluto and its atmosphere by flying SOFIA to an exact location where Pluto’s shadow fell on Earth at the right moment. This was the first demonstration in practice of one of SOFIA’s major design capabilities.

NASA selected the first six teachers to work with scientists aboard SOFIA during research flights in May and June as part of the SOFIA’s Airborne Astronomy Ambassadors program.

Operation IceBridge

NASA’s DC-8 flying laboratory and a team of scientists completed their third year of Operation IceBridge flights in October and November, surveying and mapping glaciers and the thickness of sea ice and ice sheets on Antarctica. The aircraft flew more than 307 flight hours on 31 data collection and transit flights from a staging base at Punta Arenas, Chile, during the six-week IceBridge campaign, most of more than 11 hours duration.

WISPAR science campaign

A NASA Global Hawk aircraft was the centerpiece of the Winter Storms and Pacific Atmospheric Rivers, or WISPAR, field campaign last winter. Three long-duration flights over the Pacific Ocean explored atmospheric rivers, arctic weather, and collected targeted observations designed to improve operational weather forecasts. The NOAA-led WISPAR airborne campaign focused on improving scientists’ understanding of how atmospheric rivers form and behave.

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Students involved with the NASA STARS program work on projects, like launching a weather experiment, to use the skills they are developing in class and learn about professional careers where those skills are used.

NASA fuel, safety and security personnel recently simulated a response to a significant fuel leak if it were to happen at the Dryden Aircraft Operations Facility. The drill involved a broken fuel valve on a delivery truck. The drill also allowed Los Angeles County Fire Department personnel to become familiar with NASA fueling capacities and location. Los Angeles World Airports personnel, who also participated, practiced procedures to allow emergency personnel access to the ramp. Kay and Associates employees, who are responsible for aircraft fuel, scripted the scenario as part of the aircraft fuel transfer process. While the incident is unlikely to occur, exercise officials said preparations for a number of scenarios sharpen responders for when emergency situations unfold.

A new image from NASA's Stratospheric Observatory for Infrared Astronomy, or the SOFIA, shows a complex distribution of interstellar dust and stars in the Orion nebula. Interstellar dust, composed mostly of silicon, carbon and other heavy elements that astronomers refer to generically as "metals," plus some ice and organic molecules, is part of the raw material from which new stars and planets are forming.
2011: What a year it was at Dryden

and evaluating the operational use of unmanned, high-altitude aircraft for investigating these phenomena, which could aid NASA in future weather predictions.

In early November, one of NASA Dryden's Global Hawk airborne science aircraft flew the 50th flight of a NASA Global Hawk, a 16-hour mission in preparation for the Airborne Tropical Tropopause Experiment, or ATTREX, campaign slated for 2013-2014.

ER-2Midwestern Wind, Rainfall Study

One of Dryden's high-altitude ER-2 aircraft deployed to Offutt Air Force Base, Neb., last spring for a six-week study in support of the future Global Precipitation Measurement, or GPM, satellite mission planned for 2013. Acting as a satellite simulator, the ER-2 carried instruments that sampled the entire column of atmosphere below the aircraft to verify that the data collected produced a consistent summary of precipitation physics and improved the accuracy of future satellite instruments.

G-III Hawaii/Alaska Volcanic Imaging Missions

Dryden's Gulfstream-III science aircraft conducted two volcano imaging missions during the year, one to Hawaii in the spring and a second to Alaska in early August. Using the Uninhabited Aerial Vehicle Synthetic Aperture Radar, or UAVSAR, developed by NASA's Jet Propulsion Laboratory, the first mission imaged volcanoes on Hawaii's Big Island and mapped surface deformations on the islands of Oahu, Molokai and Maui during seven flights.

On the G-III's second volcano mission, the UAVSAR imaged volcanoes in the Aleutian island chain to detect and measure small changes in the Earth's surface geophysical interest. It also imaged volcanoes in the Cascade Range during six flights at speeds of up to Mach 1.74 were flown with two interchangeable center bodies installed in an air inlet tube to measure airflow around them. Both structures are designed to direct and compress airflow internally through the engine and sent data from the standard smooth center body will be used to benchmark performance data for the channeled center body.

Channeled Center-body Inlet Experiment

A primary research objective of this experiment was to define the airflow through an experimental jet engine inlet, then compare it to the airflow through a standard inlet. Six flights at speeds of up to Mach 1.74 were flown with two interchangeable center bodies installed in an air inlet tube to measure airflow around them. Both structures are designed to direct and compress airflow internally through the engine and sent data from the standard smooth center body will be used to benchmark performance data for the channeled center body.

DROID

A large hobby-type radio-controlled model aircraft was transformed into a high-tech flight research aircraft and is being used to develop a ground collision avoidance application for smart phones that can be used by general aviation aircraft. The DROID Remotely Operated Integrated Drone, or DROID, is the newest and smallest – member of Dryden's flight research aircraft stable. The Automatic Collision Avoidance Technology Ground Collision Avoidance System software is being adapted to demonstrate that even the simplest flight systems may benefit from Auto-GCAS technology.

Biofuel Fuel Emissions Test

Renewable biofuel made from chicken and beef tallow was tested in one of the four engines of NASA's DC-8 flying laboratory during ground tests last spring. The Alternative Aviation Fuels Experiment, or AAFEX, enabled aeronomics researchers to measure the fuel's performance in the engine and examined the engine exhaust for chemicals and contamination that could contribute to air pollution.

It was the first time that biofuel emissions had been measured for nitrogen oxides, commonly known as NOx, and tiny particles of soot or unburned hydrocarbons - both of which can degrade air quality.

Spaceflight

Space Shuttle Support

Dryden celebrated almost 40 years of support of NASA's space shuttle development and operations when shuttle flights concluded in July. The office provided management and coordination of facilities, systems, and ground servicing equipment in support of space shuttle launch, on-orbit, landing, recovery, and turnaround operations. During the more than 30-year program, 54 shuttle landings occurred at Edwards, beginning with STS-1 on April 14, 1981, and ending with STS-128 on Sep. 11, 2009. Dryden's Shuttle and Flight Operations Support Office began shut down activities in 2011 following the last shuttle mission, and is now engaged in disposition of specialized shuttle support equipment, a process expected to take at least two years.

Flight Opportunities Program

NASA's Flight Opportunities program, managed by Dryden, selected seven companies in August to integrate and fly a variety of technology payloads on commercial suborbital reusable vehicles near the boundary of space to help meet the agency's research and technology needs. These two-year contracts, worth a combined total of $10 million, will allow NASA to draw from a pool of commercial space companies to deliver payload integration and flight services.

Mars Rover Landing Radar Tests

Dryden and the Jet Propulsion Laboratory flight-tested the Mars Science Laboratory's landing radar, using an F-18 aircraft. The aircraft carried a Quick Test Experimental Pod underneath its left wing that housed the MSL test radar.

The F-18 made a series of subsonic, stair-step dives over Rogers Dry Lake at angles of 40 to 90 degrees in order to simulate what the MSL's radar will see during entry into the Martian atmosphere. Data collected by these flights were used to fine-tune the MSL's landing radar software to help ensure that it was calibrated as accurately as possible.

In other highlights of the year:

• Retired NASA astronaut Fred Haise returned to Dryden Aug. 11 to share recollections of his time as a research pilot at the center in the 1960s and to participate in ceremonies honoring him at the Lancaster JetHawks baseball team's annual Aerospace Appreciation Night in nearby Lancaster, Calif., Aug. 13.

• Members of the National Research Council's Aeronautics and Space Engineering Board, including the first man to walk on the moon, Neil Armstrong, toured Dryden on April 20. The study team reviewed a number of aeronautics research projects, specialized aircraft and research facilities at Dryden as part of their three-day visit.

• In November, Dryden awarded a $11.2 million contract to Comfort See Review, page 6
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& Hays Electric, Inc. of Long Beach, Calif., for construction of a $80,000-square-foot Facilities Support Center at its main Edwards campus. The single-story building will provide offices and technical spaces for Dryden’s Facilities Engineering and the Asset Management department, as well as the Safety, Health and Environmental Office, combining engineering and technical spaces for Dryden and technical spaces for Dryden’s F-15B research test bed aircraft. The experimental inlet was checked out on Dryden’s F-15B aeronautics research test bed aircraft, which continues to be an innovative and cost-effective tool for flight test of advanced propulsion concepts.

The CCIE project's primary research objective was to define the airflow through the experimental jet engine inlet, then compare it to the airflow through a standard inlet. Inside, airflow around two interchangeable center bodies installed in an air inlet tube was measured. The structures are designed to direct and compress airflow internally through the engine.

One center body is channelled, the other has a conventional, smooth shape. The slots cut along the length of the channelled center body simulate a simple device that in an actual inlet would allow optimization of the amount of air flowing into the engine, resulting in improved airflow efficiency at a wide variety of speeds. This would improve fuel efficiency as well.

Six flights were flown, three with each center body installed. Flight tests were made incrementally at speeds up to Mach 1.74, or about 1.7 times the speed of sound. Flight data from the smooth center body were used to benchmark performance data for the channelled center body. Data points from NASA Dryden engineers collected during the experiment included inlet mass airflow information, internal surface pressure distribution numbers, and airflow distortion, or turbulence, data at the exit end of the device.

Dryden propulsion engineers are now performing post-flight data analysis on the two inlet configurations and will report on the results. The resulting data will be compared with computational fluid dynamics, or CFD, predictions. Potential future applications for the simplified inlet design include its use on a new generation of supersonic cruise aircraft, reducing the complexity and weight of this important component of supersonic propulsion systems.

The CCIE inlet was developed by Techland and Research, Inc., of North Olmsted, Ohio, through a NASA Small Business Innovation Research contract. The CCIE project is funded by NASA’s Aeronautics Research Mission Directorate and managed by the Supersonics Project in the directorate’s Fundamental Aeronautics Program.

**X-Press**

January 6, 2012

**Unique jet inlet tests complete**

By Gray Creech

Dryden Public Affairs

Aeronautics researchers at Dryden recently completed flight tests of a unique experimental jet engine inlet design in the Channelled Center-body Inlet Experiment, or CCIE.

The experimental inlet was designed to direct and compress airflow internally through the engine. One center body is channelled, the other has a conventional, smooth shape. The slots cut along the length of the channelled center body simulate a simple device that in an actual inlet would allow optimization of the amount of air flowing into the engine, resulting in improved airflow efficiency at a wide variety of speeds. This would improve fuel efficiency as well.

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**STARS ... from page 2**

one machine that are attached to a weather balloon and that there are different kinds of air currents. I was also able to see different types of tools like infrared thermometers. In the GPS unit, I learned that GPS stands for global positioning system and that there are different types of satellites. The GPS (works) by getting the signal from the satellites, wrote Irvin Merine, student.

For Taylor, it comes down to this: “We want them to learn about STEM and professional careers. We want to inspire them and show them that there are opportunities out there.”

**X-Press has a new schedule**

Due to staff reductions, the X-Press, which was published on the first and third Fridays of the month, will now be published once a month, on the first Friday. The X-Press will continue to be delivered to Dryden employees and retirees and its content will remain available on Dryden internal and external websites.

**Barlow, key range figure, dies at 57**

Thomas L. Barlow, a member of the WATR communications group, a contract technical monitor and WATR facility manager, passed away in December at the age of 57. He will be remembered for his outstanding contributions and service by all in the Test Systems Directorate.

**Griffith, a former NACA pilot, dies at 90**

National Advisory Committee for Aeronautics test pilot John Griffith died Oct. 21. He was 90.

Griffith was a research pilot at the NACA’s Muroc, now Edwards Air Force Base, Flight Test Unit in August of 1949, just before the NACA unit became the High-Speed Flight Research Station, now Dryden. He flew early experimental aircraft, including the X-1, X-4, D-558-1, and the D-558-2. He flew the X-1 more than nine times, the X-4 seven times, the D-558-1 fifteen times, and the D-558-2 nine times.

His top speed in the X-1 was Mach 1.20. He also was the first NACA pilot to fly the X-4. He left the NACA in 1950 to fly for Chance Vought.
NSSC helps to accelerate agreements

On November 29, 2011, NASA selected 300 small business proposals for possible contract awards through the Agency’s Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs. The SBIR and STTR programs address specific technology gaps in NASA missions, while striving to complement other Agency research investments.

The SBIR program selected 260 proposals, with a combined value of approximately $33 million, for negotiation of Phase I feasibility contracts. The STTR program selected 40 proposals, with a combined value of approximately $5 million, for negotiation of Phase I contracts. The NSSC processed these selections during December and anticipates having all awards made before the end of January.

These programs are based on a three-phase award system. Phase I is a feasibility study to evaluate scientific and technical merit. Awards are for six months for the SBIR contracts and 12 months for the STTR contracts, in amounts up to $125,000. Firms successful in Phase I are eligible to submit Phase II proposals, expanding on Phase I results. Phase III includes commercialization of the results of Phase II, and requires the use of private sector or non-SBIR Federal funding as innovations move from the laboratory to the marketplace.

Selected SBIR proposals were submitted by 196 small, high-technology firms in 37 states. Selected STTR proposals were submitted by 36 small, high-technology firms in 13 states. As part of the STTR program, the firms proposed to partner with 54 universities or research institutions in 16 states.