National Aeronautics and Space Administration

The Dryden X-PRESS

Volume 54 Number 21 January 6, 2012

What a year

Dryden employees contributed to key missions in 2011

Dryden continued its support of NASA's missions during 2011, helping to advance the agency's overall mission of Earth and space science and aerospace technology research.

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.

ED11-0144-06 NASA Photo by Carla Thomas

The Stratospheric Observatory for Infrared Astronomy climbs after takeoff from Air Force Plant 42 in Palmdale, Calif.

NASA Photo

NASA's DC-8 flying laboratory completed the third year of Operation IceBridge in October and November over Antarctica.

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

See 2011, page 4

NASA STARS

Student program builds skills, career enthusiasm

By Jay Levine
X-Press Editor

A select group of middle school students are seeing STARS.

Or more precisely, Cole Middle School students in Lancaster are participating in the Student Training and Advocacy for Professional and STEM Careers, or STARS. The program is aimed at providing opportunities and creating excitement for students in careers involving science, technology, engineering and mathematics, or STEM, and professional careers.

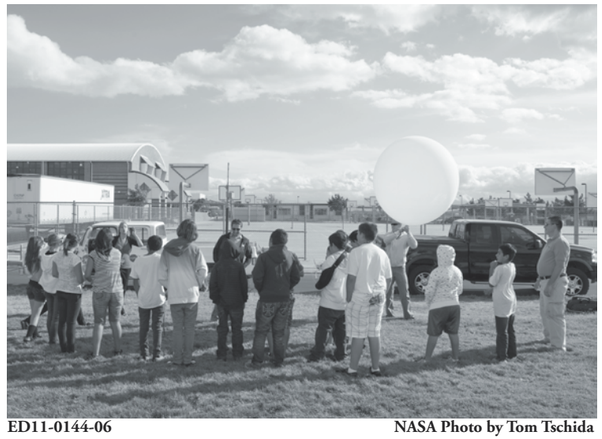
Dryden engineers Brian Taylor and Brian Griffin designed STARS as part of a leadership and management program they were enrolled in called Foundations of Influence, Relationships, Success and Teamwork, or NASA FIRST. Taylor and Griffin learned about leadership and program management and then used what they learned to begin the NASA STARS program.

Taylor and Griffin worked with the Dryden Office of Education and tapped funds from the Summer of Innovation program for paying two teachers to conduct the program. Next, the men approached the Dryden Executive Leadership Team to ask for help with the costs for materials.

Taylor is familiar with working with young people. He helped re-vamp and energize Dryden's Interdisciplinary National Science Project Incorporating Research and Education Experience, or INSPIRE, program in 2009 and 2010. His goal was to run the program like a project, in which he continued in a smaller role in 2011, where students would be responsible for roles on a flight project carried out on a remotely piloted aircraft. INSPIRE is a multi-tiered year-round program designed for high school students who are interested in science, technology, engineering, and mathematics education and careers.

A key difference between this program and other student programs is the five-month duration.

"I think it is important to work with students over time. Providing this program can give these kids a life experience more than equal to the cost (of setting it up). I think there is more potential to have an impact on them and their future (in a program like this)," Taylor said.



ED11-0144-06 NASA Photo by Tom Tschida

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.

ED11-0144-06 NASA Photo by Tom Tschida

Brian Griffin works with Mackenzie Denzin on a hands-on project.

Cole Middle School has been a Dryden partner in the past and is considered a school that has disadvantaged students who can benefit from a boost in math and science education, Taylor said. That's why he and Griffin, along with Russ Billings of the Dryden Office of Education, approached the school to gauge interest in their idea. Teachers Mary Kruppe and Dorothy Smith stepped up to the challenge of screening student applications and selecting the 18 students who are included in the program.

Students attend two-hour sessions on Tuesdays, after school, for five months. That amounts to about 40 hours of interaction with each student, Taylor said.

The program emphasizes hands-on activities and the lives, motivations and careers of guest speakers. For example, they had Fran Houtas talk to them about her career as a meteorologist and they were able to launch a weather balloon, build weather instruments and conduct experiments with her.

Also, during the second module on GPS, Michelle Berger talked to students about what influenced her to pursue a STEM career. The students used math they were learning in school, along with handheld GPS receivers, to measure the athletic field.

Taylor and Griffin are currently packaging the program for expansion to the Antelope Valley and beyond. Depending on the program's success, the Los Angeles Unified School District has expressed interest, Taylor added. A key feature of the program is relating what students are learning in class to how those skills are used in careers.

Students completed a weather module in October and GPS course in November. The next module is set to start Feb. 7. The focus on the next three modules will include renewable energy, aeronautics and astronomy.

Taylor and Griffin provide the curriculum, but flexibility is built in for teachers to interpret the plans. The two Dryden employees attend the sessions to provide a helping hand during the activities.

Students are excited about the program.

"I learned all the different types of thermometers that are used in

See STARS, page 7

ED11 0364-078 NASA photo by Tom Tschida

Los Angeles County Fire Department firefighters respond to a simulated fuel leak at the Dryden Aircraft Operations Facility.

Practice makes perfect

NASA fuel, security and safety personnel recently simulated 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.

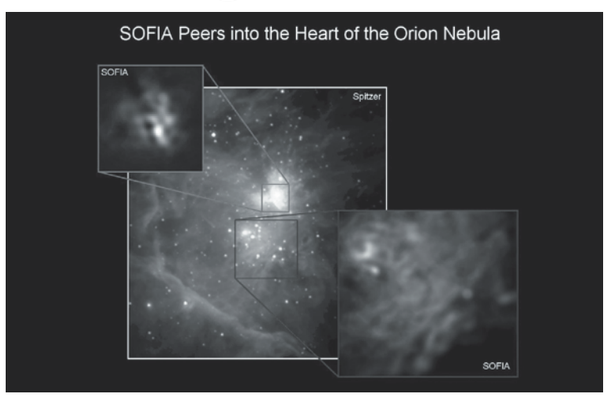
The drill also allowed Los Angeles County Fire Department personnel to become familiar with NASA fueling capacities and location. Los Angeles World Airports personnel, who also participated, practiced procedures to allow emergency personnel access to the ramp.

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.

New Orion image released

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.

See Nebula, page 8



News at NASA

DROID at AMA event

Dryden representatives joined more than 100 exhibitors from the model aviation industry at the Academy of Model Aeronautics 14th annual exposition Jan. 6–8 at the Ontario, Calif., Convention Center. Dryden representatives showcased a Dryden Remotely Operated Integrated Drone – or DROID – model aircraft that was modified to conduct flight research experiments.

Pilot training for unmanned aircraft systems and NASA education programs are other uses of the radio-controlled DROID.

The DROID was a testbed for adapting Automatic Collision Avoidance Technology, or ACAT, Ground Collision Avoidance System software to simple flight systems such as those used in model aircraft. The demonstration showed model aircraft may benefit from ACAT Auto-GCAS technology.

Dryden model shop technician and DROID remote pilot Lesli Monforton outlined how the center uses the DROIDs.

Also representing Dryden was Mark Skoog, who is Dryden's expert on collision avoidance. He is currently leading the Collision Avoidance Technical Stewardship Group for the Office of the Secretary of Defense and the Integrated Test Team for the ACAT projects.

He has been the NASA project manager for the Altair, Predator B, X-40 and X-37 UAVs.

The DROID flies out of AMA-chartered Muroc Model Masters club's model aircraft flight operations area on Rosamond Dry Lake at Edwards Air Force Base.

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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 NOAA 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-2 Midwestern 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.

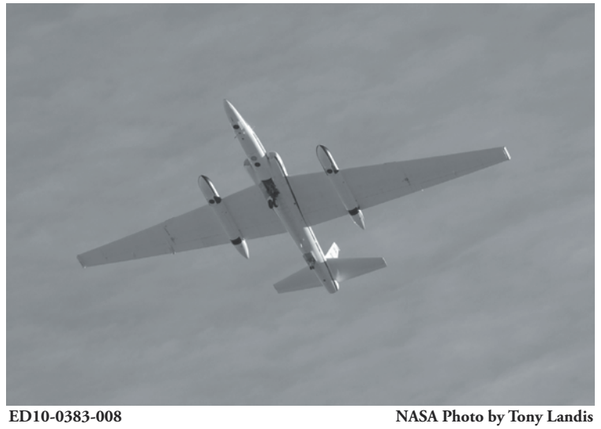
G-III Hawaii/Alaska Volcanic Imaging Missions

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 of geophysical interest. It also imaged volcanoes in the Cascade Range over Washington, Oregon and California while en route to its home base in Palmdale, Calif.

ED10-0233-22 NASA Photo by Tony Landis

NASA's Global Hawk soars aloft from Edwards Air Force Base, Calif., on a functional check flight of the aircraft payload system and science instruments. The grey fairing on the bottom of the aircraft houses the High Altitude Imaging, Wind and Rain Profiler, or HIWRAP, radar instrument that details wind characteristics within hurricanes.



ED10-0383-008 NASA Photo by Tony Landis

NASA environmental science ER-2 aircraft No. 806 takes off from Air Force Plant 42 in Palmdale, Calif., for a mission in the skies above California's Mojave Desert.

Aeronautics

Sonic Boom Research

Dryden used supersonic aircraft to produce super-loud sonic booms over a remote part of the Mojave Desert in an effort to understand how to minimize their startling impact. The project, called SCAMP for Superboom Caustic Analysis and Measurement Program, collected data to validate computer prediction tools that can be used in the design of future quieter supersonic aircraft.

The Waveforms and Sonic boom Perception and Response, or WSPR, project gathered data from a select group of volunteer Edwards Air Force Base residents on their individual perceptions of sonic booms produced by aircraft in supersonic flight over Edwards. WSPR's primary purpose was to develop data collection methods and test protocols for future public perception studies in communities that do not usually experience sonic booms. Their reactions to low-noise booms will be a valuable guide for future work in sonic boom perception and response.

In January, Dryden and Seismic Warning Systems, Inc., began evaluating the company's QuakeGuard™ earthquake warning system to determine if sonic booms caused the devices to register false alarms. Under a NASA Space Act agreement, the company installed two of their QuakeGuard™ warning seismometers at Dryden, and the center tested the system during three flights with F/A-18 aircraft diving to place sonic boom shockwaves directly on the building.

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. Flight 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 Dryden 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.

ED11 0256-40 NASA Photo by Tom Tschida

Dryden's remotely operated "DROID-1" small UAV, one of three such model aircraft flown for aeronautical experiments, pilot proficiency and educational purposes at Dryden, takes to the air during a pilot-proficiency flight.

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 aeronautics 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.

ED09-0253-109 NASA Photo by Tony Landis

One of Dryden's contributions to the shuttle program was safely transporting the orbiters back to Kennedy Space Center, Fla. NASA's modified 747 Shuttle Carrier Aircraft with Discovery securely mounted on top soars into the morning sky.

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/A-18 aircraft. The aircraft carried a Quick Test Experimental Pod underneath its left wing that housed the MSL test radar.

The F/A-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 finesse 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

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 Channeled Center-body Inlet Experiment, or CCIE.

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 channeled; the other has a conventional, smooth shape. The slots cut along the length of the channeled 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 channeled center body. Data points that 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 also 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 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.

ED11 0258-29 NASA Photo by Jim Ross

Dryden's F-15B research testbed aircraft flew an experimental jet engine inlet to speeds up to Mach 1.74, or about 1.7 times the speed of sound.

ED11 0258-53 NASA Photo by Tony Landis

NASA research pilot Jim Less checks out the Channeled Center-body Inlet Experiment, or CCIE, jet engine inlet mounted underneath NASA's F-15B prior to a test flight.

Review... from page 5

& Hays Electric, Inc. of Long Beach, Calif., for construction of a 38,000-square-foot Facilities Support Center at its main Edwards campus. The single-story building will provide office and technical spaces for Dryden's Facilities Engineering and the Asset Management department as well as the Safety, Health and Environmental Office, combining in one structure functions that are currently performed in several obsolete and inefficient facilities on the Dryden campus.

• The U.S. Air Force Research Laboratory's Automatic Collision Avoidance Technology Fighter Risk Reduction Program team, which includes NASA Dryden, won an Aviation Week & Space Technology Laureate Award for its successful development and flight test of an Automatic Ground Collision Avoidance System. Dryden led the project's integrated test team that was responsible for the technical content of the project's test and evaluation, maintenance of the Air Force's F-16D test aircraft, project management and engineering services, and provision of the project's chief pilot.

• Boeing's Phantom Ray, a fighter-size Unmanned Aircraft System, made a successful first flight on April 27 at Edwards Air Force Base. Dryden hosted Phantom Ray flight test operations, providing hangar facilities, engineering and ground test support, as well as flight test range support for the project under a Boeing-funded commercial Space Act agreement with NASA.

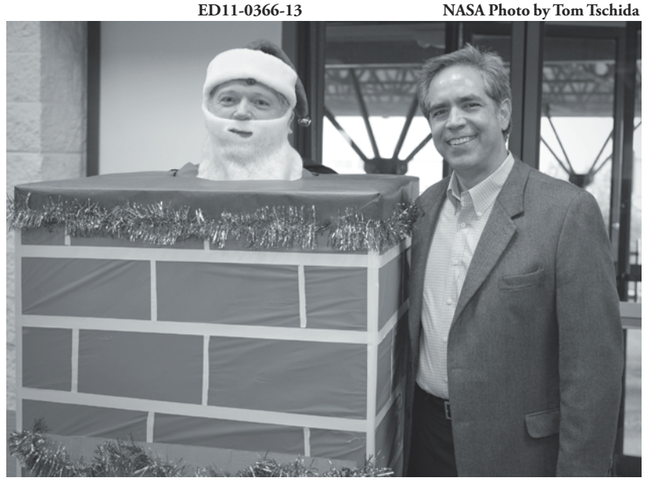
•Boeing's Phantom Eye, a hydrogen-powered, high-altitude, long-endurance demonstrator aircraft, arrived at Dryden in March. The unmanned aircraft underwent assembly and continues preparations for flight tests, expected to begin in 2012. As with the Phantom Ray, Dryden is hosting the Boeing flight test operation, providing hangar facilities, engineering, ground test and test range support for the project.

Happy Holidays

ED11-0366-13 NASA Photo by Tom Tschida

Dryden employees and their families celebrated the holidays in a number of ways. For example, a number of Dryden employees and their families took advantage of the Children's Christmas Party at Mulligan's Family Fun Center in Palmdale, above.

Dryden Center Director David McBride must have been really good in 2011, as he had a visit from Santa at the Center Director's Open House. The Dryden Hallway Holiday Choir performed at the open house events at Dryden and at the Dryden Aircraft Operations Center in Palmdale.



ED11-0381-23 NASA Photo by Tom Tschida

ED11-0367-61 NASA Photo by Tom Tschida

A number of Dryden employees and their spouses, or significant others, celebrated the holiday season together at the Cascades Restaurant in Palmdale. Dancing, as at left, followed the dinner.

STARS... from page 2

one machine that are attached to a weather balloon and that there are different kinds of air currents. I also was 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, a 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."

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 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.

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.

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.

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 study 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 34 universities or research institutions in 16 states.

Nebula... from page 3

The two insets display mid-infrared images showing portions of the Orion nebula star-forming region, also known as Messier 42 (M42). The SOFIA images were produced by SOFIA staff scientist James De Buizer and his collaborators from data obtained in May - June 2011 during the SOFIA's Basic Science program. The observations were made using the Faint Object Infrared Camera for the SOFIA Telescope (FORCAST) instrument, led by principal investigator Terry Herter of Cornell University. Those observations are subjects of scientific papers to be submitted to The Astrophysical Journal.

The SOFIA's large telescope is able to resolve many individual protostars and young stars as well as knots of dust and gas that could be starting the process of gravitational contraction to become stars. The massive protostar known famously as the BN (Becklin-Neugebauer) Object stands out in the inset box at the top left of the photo. The BN/KL region of Orion gets its name from the initials of pioneering infrared astronomers Eric Becklin, Gerry Neugebauer, Doug Kleinmann and Frank Low who mapped it in the late 1960s and early 1970s, using some of the first astronomical infrared detectors. In this image, infrared light with wavelengths of 20, 31, and 37 microns, is seen coming from relatively cool interstellar dust with temperatures of approximately 100 - 200 kelvins.

The SOFIA image in the inset box at the bottom left of the image shows the Ney-Allen Nebula, a region of intense infrared emission that was discovered surrounding the luminous Trapezium stars by astronomers Ed Ney and David Allen. Some of the compact features shown here are disks of dust and gas around young solar-mass stars that could be planetary systems in the process of formation. Infrared light with wavelengths of 8, 20, and 37 microns are seen coming from material as warm as 500 kelvins (450 F) in this image.

The large background image is a composite of data from the Spitzer Space Telescope in which light with wavelengths of 7.9, 4.5, and 3.6 microns is emitted from hot dust and gas heated by embedded stars, and from the stars themselves. The BN/KL region is so bright as to be over-exposed in the Spitzer image.

The two SOFIA images were made at combinations of wavelengths and angular resolutions unavailable to any other observatory on the ground or in space. The SOFIA and Spitzer images of Orion together provide a comprehensive view of stages of star formation from cold interstellar clouds to fully-fledged stars.

The SOFIA airborne observatory incorporates a 17-metric ton reflecting telescope with an effective diameter of 2.5 meters (100 inches) mounted inside an extensively modified Boeing 747SP. The SOFIA aircraft flies at altitudes as high as 45,000 feet (14 km), above more than 99 percent of the water vapor in Earth's atmosphere that blocks most infrared radiation from celestial sources.

The SOFIA is a joint program of NASA and the German Aerospace Center (DLR), and is based and managed at NASA's Dryden Aircraft Operations Facility in Palmdale, Calif. NASA's Ames Research Center in Moffett Field, Calif., manages the SOFIA science and mission operations in cooperation with the Universities Space Research Association (USRA), headquartered in Columbia, Md., and the German SOFIA Institute (DSI) at the University of Stuttgart.

The X-Press is published the first Friday of each month for civil servants, contractors and retirees of the Dryden Flight Research Center.

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