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Earth Venture

Dryden aircraft chosen for new science missions

Hurricanes, air quality and Arctic ecosystems are among research areas to be investigated over the next five years with a series of new NASA airborne science missions.

Dryden will be directly involved in operation of at least three of the five competitively selected proposals, the first investigations in the new Venture-class series of low-to-moderate-cost projects established last year.

The National Research Council in 2007 recommended that NASA undertake such small, quick-turnaround, targeted science investigations, which complement the agency's larger research missions. All of this year's selections are airborne investigations. Future Venture proposals may include those with small, dedicated spacecraft and instruments flown aboard other spacecraft.

The missions will be funded during the next five years at a total cost of not more than $30 million each. Costs cover initial development and deployment through data analysis. Approximately $10 million was

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ED09 0326-24 **NASA Photo by Tony Landis**

ED07 0042-09 **NASA Photo by Lori Losey**

***Above**, two of NASA's Global Hawks in their blue-and-white paint scheme are parked side by side on the Dryden ramp. Bearing NASA tail numbers 871 and 872, the two autonomously operated unmanned aircraft will be used in upcoming science missions.*

***At left**, an unmanned air vehicle synthetic aperture radar, or UAVSAR, is contained in the underbelly pod beneath NASA's Gulfstream-III research aircraft as it banks over Edwards Air Force Base.*

Students serve on DC-8 mission

By Beth Hagenauer
Dryden Public Affairs

Three Massachusetts high school students began their summer with a journey halfway around the world to participate in NASA efforts to image a Japanese spacecraft's fiery return to Earth.

Brigitte Berman, James Breitmeyer and Yiannis Karavas were the youngest members of a science team using NASA's highly instrumented DC-8 airborne science laboratory to image the Japan Aerospace Exploration Agency Hayabusa spacecraft as it ended a seven-year journey made to capture a sample of the asteroid Itokawa and return it to Earth. The three students are studying space science at the Clay Center Observatory at the Dexter and Southfield Schools in Brookline, Mass.

The students and their instructor, Clay Center director Ronald Dantowitz, traveled to the Dryden Aircraft Operations Facility in Palmdale, Calif., where they went aboard the DC-8 to install 14 cameras on the converted jetliner. The cameras were designed to capture high-speed, high-resolution images of the spacecraft returning from its odyssey. The student team then traveled commercially to Australia to await the DC-8's arrival.

The experience came as something of a surprise to the students, who had been trained unknowingly for the mission by Dantowitz through an independent-study course. He had begun working with Berman more than 18 months previously and subsequently added the boys to the team, tasking them with planning a practice mission. After obtaining permission from the students' parents, Dantowitz then asked them to participate in the NASA mission.

Eleventh-grader Berman was thrilled with the opportunity. She has dreamed of wearing a blue NASA flight suit ever since seeing her third-grade teacher in one after completion of educator astronaut training. The 16-year-old exhibits a maturity that is reflected in her goal of studying astrophysics and finds the idea of traveling into outer space "fun."

Photo courtesy Ron Dantowitz

Brigitte Berman, a junior at Southfield School in Brookline, Mass., found being part of the science team on NASA's recent Hayabusa spacecraft re-entry imaging mission to be "really, really fun."

ED10 0145-12 NASA Photo by Tom Tschida

Yiannis Karavas, left, and James Breitmeyer, students at the Dexter School in Brookline, are guided by instructor and principal investigator Ron Dantowitz of the Dexter and Southfield schools' Clay Center Observatory in installing instruments aboard NASA's DC-8 flying laboratory. The team worked in preparation for the Hayabusa spacecraft re-entry imaging mission.

Breitmeyer said the students prepared for the mission by making and assembling paper mock-ups of the camera assembly. This led to installing the school's actual cameras behind optical windows on the DC-8. Specialized cameras occupied most of the aircraft's windows, and the remaining windows were covered so that no light escaped from the aircraft interior to distort images being taken. Several science team members viewed the spacecraft's re-entry with the naked eye, but most saw the one-minute event through cameras or monitors.

It was cold and dark on the plane, according to Breitmeyer, and several members of the science team expressed their unease with having only one opportunity to image the spacecraft. The re-entry, however, was brighter than expected, Berman added.

Karavas was aboard the flying laboratory for an instrument checkout flight prior to the mission. During the actual Hayabusa data-collection flight, Karavas gathered scientific information from the ground as the spacecraft descended over Southern Australia's Woomera Test Range.

Berman, Breitmeyer and Dantowitz joined a group of about 30 scientists who flew on the DC-8, enabling NASA to carry out the goal of obtaining data about the re-entry of the 40-pound sample return capsule. Scientists hope to find that the capsule carries samples collected from the asteroid Itokawa when the Hayabusa craft landed there in 2005.

NASA's interest was in the performance of the capsule's heat shield during re-entry speeds exceeding 27,000 mph. After the capsule separated, the carrier spacecraft broke apart and burned as it descended over the Australian test range.

Dantowitz said that he could not have completed the mission without the students.

"I have been on a number of missions," he reflected. "This is the most rewarding because of this, working with these students. We are training our replacements."

New phase of flight test undertaken with SOFIA

The second segment of flight tests is currently being flown with the Stratospheric Observatory for Infrared Astronomy 747SP aircraft to prepare the observatory for early-science missions. When completely operational, NASA's SOFIA program will provide a fully capable observatory cleared for telescope cavity, open-door science instrument flights at up to 45,000 feet.

The early-science component encompasses two milestone events, short-science and basic-science missions. Short-science requirements involve clearing the SOFIA system for telescope-assembly operations at or above 35,000 feet and with the telescope assembly and aperture operated at up to 40 degrees elevation. The second phase, basic science, requires the observatory to fly above 41,000 feet with the telescope assembly and aperture operating in the full range of 23 to 58 degrees elevation, the full range of vertical movement.

The nine flights, planned for June through August, will entail evaluation of the aircraft's performance, handling qualities and structural characteristics. Test data will be collected to quantify airframe and telescope-cavity acoustic and vibration characteristics. Testing during these and subsequent flights will result in airworthiness requirements being met for the 747 flying observatory and its 20-year operational lifetime.

ED10 0080-01 NASA Photo by Jim Ross

The SOFIA undergoes a test mission with the upper rigid door over the telescope cavity – one of three components comprising the door system – fully open.

Proper disposal is the law

Sorting waste and keeping hazardous items out of the trash can help protect the environment and avoid fines up to $25,000 that can be assessed daily for each improper disposal violation.

Nearly a ton of government-owned electronics, hazardous and universal waste recently was dumped in the large metal trash bins located near some base facilities, according to Edwards Air Force Base Sanitary Landfill workers. The landfill team removed these items from the trash and coordinated an effort to properly dispose of them. Although the discovered items do not appear to be from Dryden, it is a reminder for people to be careful about what is thrown in the trash.

The find included "e-waste," a newer category for electronic garbage. The California Environmental Protection Agency defines e-waste as a popular, informal name for electronic products nearing the end of their useful life. That includes items such as computers, televisions, videocassette recorders, stereos, copiers and fax machines. Although many of these products can be reused, refurbished or recycled, electronic discards are one of the fastest-growing segments of the nation's waste stream, according to the California EPA website.

"My guess is, the people doing this didn't know who to call to find out how to dispose of these items, and so they dumped them in the garbage," said Kathryn Curtis, hazardous materials/waste program manager in the Edwards Environmental Management office. "They might have been cleaning out a building, storage cabinet or something like that and thought, 'look at all of this junk' and didn't know what else to do with it."

To make sure that is not the case at Dryden, Steve Fedor, Dryden senior environmental services information specialist, highlighted what Dryden regularly disposes and how people on center can properly get rid of those unwanted items.

"The process is very simple. For e-waste that is owned by NASA Dryden and the Dryden Aircraft Operations Facility, it is collected for recycling at the warehouse located in Building 4876. The

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News at NASA

Got game?

NASA is giving gamers a taste of lunar adventure with release of Moonbase Alpha, a free online video game.

The game has single and multiplayer options that allow participants to step into the role of an exploration team member in a futuristic 3-D lunar settlement. Players must work to restore critical systems and oxygen flow after a meteor strike cripples a solar array and life support equipment. Available resources include an interactive command center, lunar rover, mobile robotic repair units and fully stocked equipment shed.

It is the first game in NASA's Learning Technologies project. The project supports delivery of NASA content through interactive technologies to enhance science, technology, engineering and mathematics, or STEM, education.

Moonbase Alpha, rated "E" for "Everyone," is a precursor to a planned NASA-based multiplayer online game project. NASA released the game on Valve's Steam network. The agency will use the Steamworks suite of services for server browsing, leaderboards, statistics and more.

The U.S. Army Game Studio developed the game with support from Virtual Heroes, a division of Applied Research Associates in Research Triangle Park, N.C. This collaboration between NASA and the Army's Aviation Missile Research Development and Engineering Center is an example of government agencies working together to advance education in the STEM fields.

For more information about Moonbase Alpha, visit http://www.nasa.gov/moonbasealpha.

X-Press July 16, 2010

Dryden's Orion team welcomed home

By Jay Levine
X-Press Editor

For the past four years Dryden's Orion crew module abort flight test team has worked for a successful research flight that went flawlessly May 6.

The team reflected on the journey during a June 24 ceremony at Dryden in which they talked about dedication and sacrifice. The team faced challenges daily as members spent weeks and months away from their families during the 10 months leading up to the launch.

Dryden Exploration Mission Director Brent Cobleigh explained that a basic passenger car could go from zero to 60 miles per hour in 6.1 seconds and from zero to 100 mph in about 8.6 seconds. For a high-performance sports car, those numbers are from zero to 60 in 3.8 seconds and from zero to 100 mph in 4.2 seconds. That example was offered to illustrate a comparison with the Orion launch abort system and crew module, which went from zero to 60 mph in .28 seconds and from zero to 100 mph in .42 seconds with 500,000 pounds of thrust.

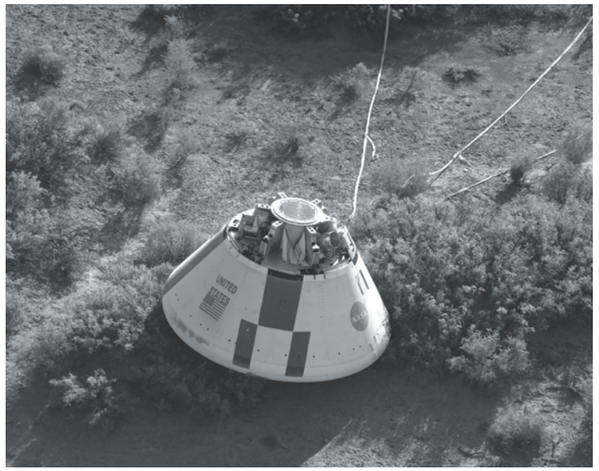
However, the true value of the test flight lies not in its speed, but in its reliability, he said.

"You will never take all of the risk out of spaceflight, but teams like ours try to greatly reduce it," Cobleigh said.

The use of a system like the one demonstrated at White Sands Missile Range in New Mexico, where the test took place, can decrease the possibility of losing a crew in the Orion spacecraft from 1 in 559 to one in 1,877 during the launch phase of the mission, he said.

Dryden Center Director David McBride thanked the team at the ceremony.

"Welcome home. You made us proud with a flight that went flawlessly. That is due to the dedication of the team," he said.



NASA Photo courtesy Johnson Space Center

The Orion test module comes to a rest following the May 6 flight at White Sands Missile Range, N.M.

Dryden is not unfamiliar with the rocket business. The Orion launch abort system test marked the 663rd rocket-powered flight Dryden has been involved with, McBride said. The complicated integration project also is part of what the center does best, he added.

Regardless of the direction of the agency's space program, McBride told the team that its work on the launch abort system is "the shape of things to come" and will have a valued role in the safety of future space travelers.

Johnson Space Center, Houston, was a key partner in the multi-center effort that also included Kennedy Space Center, Fla., Langley Research Center, Hampton, Va., Marshall Space Flight Center, Huntsville, Ala., Glenn Research Center, Ohio, and industry partner Lockheed Martin.

Orion flight test manager Don Reed talked briefly about the crew module's trip, made at an altitude of one mile and at speeds exceeding 500 mph.

"Are you ready to fly again?" Reed asked.

The May 6 flight was so good that the crew module came through essentially unscathed. It was returned to Dryden in June for preparations for another potential launch at White Sands, in 2012, to test the vehicle from a higher altitude.

Reed has worked with Dryden before, with the X-38 crew return vehicle that was air launched from the NASA B-52B during the late 1990s.

"I was comfortable that Dryden could do it, and Dryden had the toughest job with the most sacrifice of anyone," he said. "The people who put their hands on it at the very end make a difference."

Griff Corpening, now based at Johnson Space Center, worked at Dryden during the first two X-43A launches. He is systems engineering and integration lead for the launch abort system test project.

"We did not fully appreciate what we were getting into," he said. "We were confident that this would be fairly easy compared to the X-43. It was pointy, like X-43, but was ground launched. In the end, we could not imagine how challenging it would be in every aspect. For example, we built up the launch facilities from bare ground at the White Sands Missile Range along with all the operations and procedures."

ED10 0170-52

NASA Photo by Tom Tschida

Brent Cobleigh, Dryden Exploration Mission Director

"You will never take all of the risk out of spaceflight, but teams like ours try to greatly reduce it."

Laurie Grindle deputy project manager

"It's been a long road and an uphill battle, but the team perservered and accomplished a lot."

Cathy Bahm, Dryden abort flight test deputy project manager

"We have an agile team ready for any challenge. It's one heck of a team."

David McAllister, abort flight test operations lead

"The team's versatility was a key reason that the launch was a success despite whatever adversity greeted team members at the beginning of each day."

He congratulated the team.

"It was a tremendous accomplishment. Thanks for your sacrifices and thanks to your families. I know there were a lot of missed birthdays and recitals and ball games. We accomplished something that will be talked about for years to come," he said.

The post-flight celebration had some unique aspects, such as a historical perspective by Chuck Rogers, Dryden's abort flight test project manager, of previous launch abort systems, including those from the Apollo program and with the Russian Soyuz. Another unique feature of the celebration was a detailed report from team leads about the kind of work, challenges and efforts that went into the Dryden effort.

Cathy Bahm, Dryden abort flight test deputy project manager, started off that portion of the program and was followed by representatives from safety, engineering, operations, range and project support.

Bahm explained aspects of the testing, from test and validation efforts to integration work, including Lockheed Martin avionics. She also detailed elements of the development of the Mobile Operations Center from an empty trailer to a command center used at the White Sands launch.

"We have an agile team ready for any challenge," she said. "It's one heck of a team."

Matt Redifer, Dryden crew module integrated product team lead, discussed some of his experiences.

Redifer discussed a huge number of challenges, including fixing a growing list of broken equipment items, the changing structural loads on the vehicle due to improved understanding of the flight environment, working around cultural differences among project partners and project flight reviews and processes.

Also included in the long list of tasks was the design and installation of 683 sensors, which were divided into 403 sensors for the launch abort system and 280 for the crew module.

David McAllister, abort flight test operations lead, said the team's versatility was a key reason that the launch was a success despite whatever adversity greeted team members at the beginning of each day.

ED10 0170-42

NASA Photo by Tom Tschida

***Above and at center**, just before a June 24 ceremony held at the center to welcome Orion team members home from New Mexico, Matthew Berry of Dryden's Operations Engineering branch explained intricacies of the Pad Abort-1 flight test module to visitors during Bring Your Children to Work Day.*

What all of the speakers made clear was that a dynamic and skilled team excelled individually and collectively. They made great sacrifices and made history with the flawless flight.

In 2012, the team believes that the effort begun when the crew module was returned to Dryden in June will lead to another great day for NASA and the nation in the effort to protect the people that are sent to space.

Earthquake studies

G-III and its instruments reveal quake impact

By Alan Buis
Jet Propulsion Laboratory

NASA has released the first-ever airborne radar images of a deformation in Earth's surface caused by a major earthquake – the magnitude-7.2 temblor that rocked Mexico's state of Baja California and parts of the American Southwest on April 4.

The data reveal that in the area studied, the quake moved the Calexico, Calif., region in a downward and southerly direction up to 31 inches. The maps can be seen at http://www.nasa.gov/topics/earth/features/UAVSARimage20100623.html.

A science team at the Jet Propulsion Laboratory, Pasadena, Calif., used the JPL-developed Uninhabited Aerial Vehicle Synthetic Aperture Radar, or UAVSAR, to measure surface deformation from the quake. The radar is flown at an altitude of 41,000 feet aboard a Gulfstream-III aircraft based at Dryden.

The team used a technique that detects minute changes in the distance between the aircraft and the ground over repeated, GPS-guided flights. The team combined data from flights on Oct. 21, 2009, and April 13, 2010. The resulting maps are called interferograms.

The April 4 El Mayor-Cucapah quake was centered 32 miles south-southeast of Calexico, Calif., in northern Baja California. It occurred along a geologically complex segment of the boundary between the North American and Pacific tectonic plates.

The quake, the region's largest in nearly 120 years, was also felt in Southern California and parts of Nevada and Arizona. It killed two, injured hundreds and caused substantial damage. There have been thousands of aftershocks, extending from near the northern tip of the Gulf of California to a few miles northwest of the U.S. border. The area northwest of the main rupture, along the trend of California's Elsinore fault, has been especially active, and was the site of a large, magnitude-5.7 aftershock on June 14.

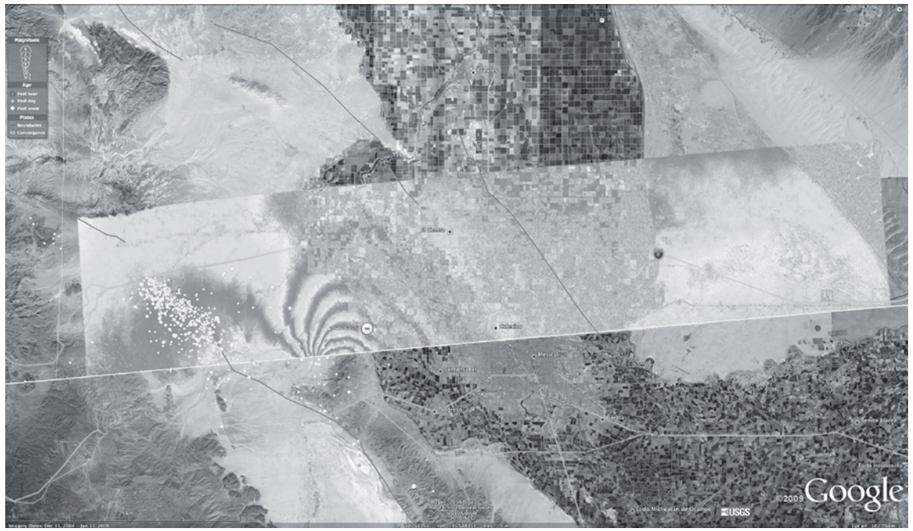


Figure 1 courtesy Jet Propulsion Laboratory/U.S. Geological Survey and Google

ED07 0042-05 **NASA Photo by Lori Losey**

NASA's Gulfstream III makes a low-level flyover at Dryden. The aircraft has logged many miles recently on missions such as the recent earthquake study made with the UAVSAR.

The UAVSAR has mapped California's San Andreas and other faults along the plate boundary from north of San Francisco to the Mexican border every six months since spring 2009, looking for ground motion and increased strain along faults.

"The goal of the ongoing study is to understand the relative hazard of the San Andreas and faults to its west like the Elsinore and San Jacinto faults, and capture ground displacements from larger quakes," said JPL geophysicist Andrea Donnellan, principal investigator on the UAVSAR project, which is being conducted to map and assess seismic hazard in Southern California.

Each UAVSAR flight serves as a baseline for subsequent quake activity. The team estimates displacement for each region, with the goal of determining how strain is partitioned between faults.

When quakes do occur during the project, the team will observe the associated ground motions and assess how the quakes may redistribute strain to other nearby faults, potentially priming them to break. Data from the Baja quake are being integrated into JPL's QuakeSim advanced computer models to improve understanding of the fault systems that ruptured and potential impacts to nearby faults such as the San Andreas, Elsinore and San Jacinto.

Figure 1 shows a UAVSAR interferogram swath measuring

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69 by 12.5 miles overlaid atop a Google Earth image. Each contour, or fringe, of the interferogram represents 4.7 inches of surface displacement.

The quake's maximum ground displacements of up to 10 feet actually occurred well south of where the UAVSAR measurements stop at the Mexican border. However, these displacements were measured by JPL geophysicist Eric Fielding using synthetic aperture radar interferometry from European and Japanese satellites and other satellite imagery, and by mapping teams on the ground.

Scientists are still working to determine the exact northwest extent of the main fault rupture, but it is clear that it came within 6 miles of the UAVSAR swath, close to the point where the interferogram fringes converge. Donnellan said continued measurements of the region should determine whether the main fault rupture has moved north.

An enlargement of the interferogram is shown in **Figure 2**, focusing on the area where the largest deformation was measured. The enlargement, which covers an area measuring about 12.5 by 12.5 miles, reveals many small "cuts," or discontinuities, in the fringes. These are caused by ground motions ranging from one to several inches on small faults.

"Geologists are finding the exquisite details of the many small fault ruptures extremely interesting and valuable for understanding the faults that ruptured in the April 4th quake," said Fielding. **Figure 3** shows a close-up of the region where the magnitude-5.7 aftershock struck.

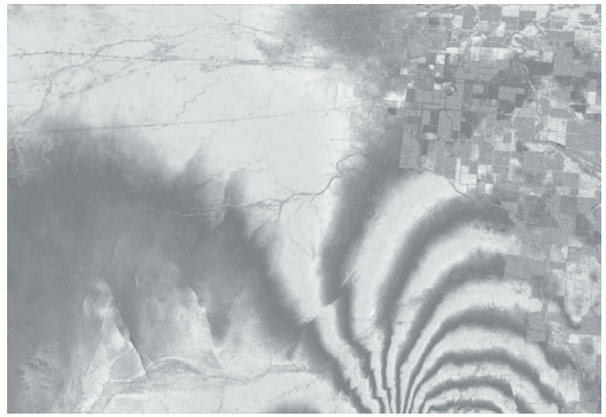

Figure 2 courtesy JPL

Figure 3 courtesy JPL/USGS/California Geological Survey and Google

"UAVSAR's unprecedented resolution is allowing scientists to see fine details of the Baja earthquake's fault system activated by the main quake and its aftershocks," said UAVSAR principal investigator Scott Hensley of JPL. "Such details aren't visible with other sensors."

The UAVSAR is part of NASA's ongoing effort to apply space-based technologies, ground-based techniques and complex computer models to advance understanding of quakes and quake processes. The radar was flown over Hispaniola earlier this year to study geologic processes following January's devastating Haiti earthquake. The data are giving scientists a baseline set of imagery for use in the event of future quakes. These images can then be combined with post-quake imagery to measure ground deformation, determine how slip on faults is distributed, and learn more about fault zone properties.

The UAVSAR also serves as an airborne test bed for evaluating the tools and technologies for future space-based radars, such as those planned for a NASA mission currently in formulation called the Deformation, Ecosystem Structure and Dynamics of Ice, or DESDynI. That mission will study hazards such as earthquakes, volcanoes and landslides, as well as global environmental change.

JPL is managed for NASA by the California Institute of Technology in Pasadena.

For more information on the UAVSAR, visit: http://uavsar.jpl.nasa.gov/.

Waste ... from page 3

contact is Renato Pastor and he is at ext. 3874. He will accept all types of e-waste such as old monitors, copiers, fax machines, circuit boards, and battery uninterruptible power supply systems," Fedor said.

He added that if any e-waste has batteries installed, they must be removed prior to relinquishing the item. The batteries can be turned in to the hazardous material personnel by calling ext. 7403 or ext. 3630.

Batteries are not included in e-waste. Batteries are considered "universal waste" and are managed under state and federal law and shipped following Department of Transportation regulations. Batteries that are to be turned in for disposal are required to be taped at both ends to prevent the batteries from shorting out and possibly causing a fire.

Battery collection buckets are placed throughout the center and more will be added as needed. Batteries can be collected for up to nine months. If the bucket should get filled prior to that, the customer should call ext. 7403 or ext. 3630 to have it picked up, emptied and returned. The phone number is marked on the top of the collection buckets. For larger batteries, customers should call for instructions. No taping is required for larger batteries. If the e-waste is ODIN equipment, Lockheed Martin/ODIN will handle the recycling process. For additional questions, call Fedor at ext. 7403.

Scientists say hazardous, universal and electronic waste products leak toxic substances – mostly metals – into a typical landfill, Curtis said, adding that state law and a federal executive order require recycling of electronic waste.

The Air Force Flight Test Center Environmental Management Office contributed to this article.

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provided through the American Recovery and Reinvestment Act toward the maximum $150 million funding ceiling for all five missions.

Dryden is among six NASA centers, 22 educational institutions, nine U.S. or international government agencies and three industrial partners involved in the missions. The five missions were selected from among 35 proposals.

Three Dryden aircraft modified for environmental science missions will be involved in a like number of projects. They include a Gulfstream III carrying a synthetic aperture radar capable of penetrating vegetation and soil to depths of several feet, and both of NASA's Global Hawk remotely operated unmanned aircraft, which have been adapted to carry atmospheric sampling instruments.

The G-III carrying the UAVSAR instrument, which was developed by NASA's Jet Propulsion Laboratory, will be the platform for the Airborne Microwave Observatory of Subcanopy and Subsurface investigation. This mission will focus on North American ecosystems, critical components of the global exchange of greenhouse gas carbon dioxide and other gases within the atmosphere.

To improve understanding of the size of this exchange on a continental scale, this investigation addresses uncertainties in existing estimates by measuring soil moisture in the root zone of representative regions of major North American ecosystems.

The Airborne Tropical Tropopause Experiment will study chemical and physical processes in the atmosphere at different times of year to improve understanding of the processes controlling the flow of atmospheric gases into tropical regions. Water vapor in the stratosphere significantly affects Earth's climate, the ozone layer and the amount of solar energy the Earth retains. Investigators will conduct four airborne campaigns with NASA's Global Hawk aircraft from bases in California, Guam, Hawaii and Australia.

The Hurricane and Severe Storm Sentinel mission will involve both of NASA's Global Hawk aircraft, flown high above major storms in the Atlantic Ocean basin on flights lasting up to 30 hours. Predicting the intensity of hurricanes is less reliable than predicting the location of hurricane landfall, in large part because the processes involved in intensity change are poorly understood. The Global Hawks will deploy from NASA's Wallops Flight Facility in Virginia during the 2012-14 Atlantic hurricane seasons.

The two unmanned aircraft are currently based at Dryden's main facility, while the G-III is based at the Dryden Aircraft Operations Facility in Palmdale, Calif.

The remaining two experiments will involve science aircraft based at Glenn Research Center, Cleveland, Ohio, Langley Research Center, Hampton, Va., and the Wallops Flight Facility.

In the Carbon in Arctic Reservoirs Vulnerability Experiment, an integrated data set will be collected that will provide unprecedented experimental insights into Arctic carbon cycling, particularly into the release of important greenhouse gases such as carbon dioxide and methane. A lack of detailed measurements has prevented thorough understanding of the release and absorption of carbon from Arctic ecosystems and the carbon's response to climate change.

Instruments aboard a Twin Otter aircraft from Glenn Research Center will collect the first simultaneous measurements of surface characteristics controlling carbon emissions and key atmospheric gases.

Although satellites can measure air quality factors like aerosols and ozone-producing gases in an entire column of atmosphere below them, distinguishing the concentrations at the level where humans live is a challenge.

The Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality experiment will provide integrated data of airborne, surface and satellite observations taken simultaneously to study air quality as it evolves throughout the day. NASA's B-200 and P-3B research aircraft, based at the Langley Research Center and Wallops Flight Facility, respectively, will be flown in concert to obtain samples of a column of the atmosphere over instrumented ground stations.

The Earth System Pathfinder program is managed at Langley Research Center for the agency's Science Mission Directorate.

The missions in the program provide an innovative approach to addressing Earth science research, and offer periodic windows of opportunity in which new scientific priorities may be accommodated.

July 21, 1955 – X-2 (46-674) and EB-50D (46-096) returned to Edwards Air Force Base following rocket engine installation in the X-2.

July 30, 1963 – Joe Walker gave up leave time to test fly first F-104N (011) at Palmdale.

July 28, 1977 – Runway suitability tests for the Space Shuttle Approach and Landings Test program were conducted with landings on Runway 17 using NKC-135A (55-3128), piloted by Phil Bruce and Paul Schaul.

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