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The Dryden X-PRESS

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Snow and ice science

By George Hale
Goddard Space Flight Center

Researchers with NASA's Operation IceBridge recently completed a five-week field campaign based out of Punta Arenas, Chile. From Oct. 12 to Nov. 8, IceBridge researchers gathered valuable information on land and sea ice during 16 science missions over Antarctica. During this year's Antarctic campaign – the fourth in the mission's history – IceBridge scientists added to existing sea ice elevation data, surveyed new areas of the Antarctic ice sheet and reached out to students, teachers and the public.

Missions were flown aboard NASA's DC-8 aircraft, which has its home base at the Dryden Aircraft Operations Facility in Palmdale. When the DC-8 returned to the DAOF, IceBridge instrument teams began downloading data gathered during the campaign. The next step is to process, analyze and prepare the information for the National Snow and Ice Data Center in Colorado.

A portion of the campaign's flights focused on areas of Antarctic sea ice that were previously surveyed by IceBridge and NASA and European Space Agency satellites. By taking repeated measurements of ice surface elevation, IceBridge is building a record of change in the Antarctic. In addition to ice surface elevation, IceBridge used its suite

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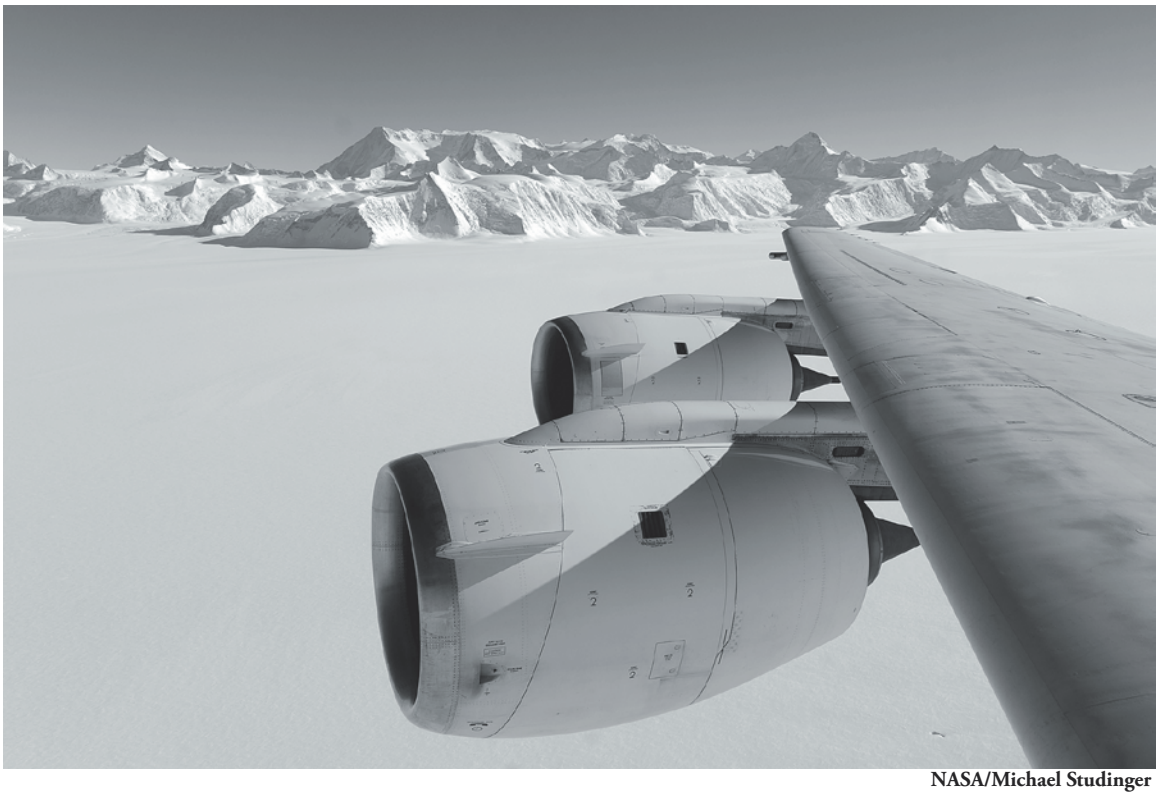


NASA/Michael Studinger

Courtesy of Stefan Elieff

***Above**, as the DC-8 Flying Laboratory passes over Ellsworth Range, Antarctica, Mount Vinson is seen in the center of the picture's background. The mountain rises to an altitude of more than 16,000 feet, making it the highest point on Antarctica.*

***At left**, the DC-8 is pictured on the ramp in Punta Arenas, Chile, during the IceBridge mission as a storm brews in the skies above.*

Fused Reality: Welcome to the latest in simulation

By Jay Levine
X-Press editor

Simulation is an excellent tool that allows pilots an opportunity to train in an unfamiliar aircraft or to gain experience and confidence for a new mission.

A disadvantage of simulation has been that the pilot does not have the sense of being in the cockpit and some of the cues, like motion, that come with that experience are often missing. Systems Technology Incorporated, or STI, of Hawthorne, Calif., developed a new simulation system as part of a Dryden Small Business Innovative Research agreement that can bridge that gap.

The new system is called Fused Reality and it allows a pilot to use a blend of actual flying and a flight environment assembled with live video and virtual reality to provide for the most realistic simulation experience currently available. Bruce Cogan, Dryden research engineer and Phase 2 contracting officer's technical representative, said the company's success would benefit Dryden and NASA.

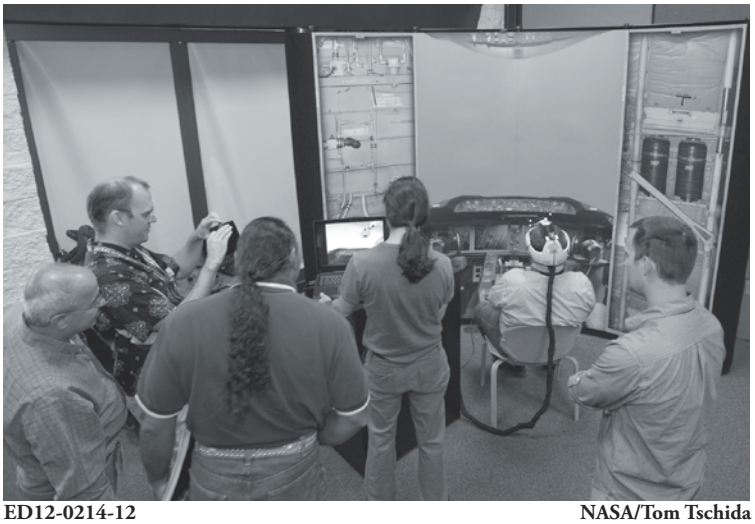
"They delivered beyond what was expected and they are providing us with a system that will allow us to take the next step, which is putting the system in a NASA DFRC aircraft to support flight research experiments. This will be possible by interfacing Fused Reality with a Piccolo autopilot (a commercially available flight management system) to provide aircraft position data. It (Fused Reality) is good technology that NASA can really use."

Aerial refueling training is one example of how this technology can be used. While an aircraft is in flight, the pilot uses a helmet that permits him or her to see the sky view coming in from a camera, while the out-the-window view of the "drogue" and "aircraft" he or she is to mate with for refueling are from a virtual reality element of the simulation.

ED12-0145-50 NASA/Tom Tschida

ED12-0214-12 NASA/Tom Tschida

***Above**, Dryden pilot Troy Asher, left, readies himself in the cockpit of a Learjet that once at altitude will use the new Fused Reality flight simulator for an aerial refueling drill. **At top right**, Asher is seen from another view with the Fused Reality helmet.*



ED12-0214-12 NASA/Tom Tschida

Dryden researchers had an opportunity to "fly" the Fused Reality system during a presentation at Dryden this summer.

The environment through the helmet is achieved through a video board and an image generator drawing from live video. Sunlight from the aircraft's windows provides the virtual frame for the virtual world, explained Edward Bachelder, STI technical director and inventor of Fused Reality.

"Sensors on the aircraft add to the flight simulator. It's the motion of the aircraft that drives the simulation," Bachelder said. "We could not have developed this without NASA. NASA provided the dollars and the inspiration."

Following a successful set of ground tests this summer, Dryden pilots Troy Asher and Jim Less flew the system from Mojave Airport with the Calspan Corporation's Learjet 25 variable stability in-flight simulator.

"It is a cross between a simulator and a video game," Asher said. "It's not like anything I've seen before. You get into the familiar environment of the airplane and the goggles display virtual objects (like a tanker out the window) on top of what's really there. It's like being in a very realistic cartoon where all the acceleration and tactile cues come from the airplane."

Less sees uses for Fused Reality.

"This system has great potential for training and flight test. In flight test, this system would allow us to evaluate experimental control laws against operationally representative tasks such as aerial refueling, formation flying, target tracking, or even landing. These tasks would be displayed virtually to the pilot and could be accomplished safely away from the ground and other aircraft. This would permit more realistic testing of new systems with greatly reduced risk," Less said.

Fused Reality could be used on a number of Dryden aircraft including the T-34, the TG-14 and the F/A-18 aircraft, Cogan explained. The system may also have a role in NASA's Aviation Safety program as part of flight research programs at Wichita State University, Wichita, Kan., and the University of Iowa in Iowa City, Iowa, Cogan said.

David R. Landon, STI CEO, said with the Fused Reality System, "the magic is in the math, not in the hardware." In other words, the system's complex algorithms, or mathematical equations, are what make it work. That's important, Landon said, because every few years

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Monitoring the fault

Dryden, JPL partner to keep tabs on movement

A sophisticated airborne synthetic aperture radar system developed by researchers at NASA's Jet Propulsion Laboratory was used in a series of earthquake imaging flights over central California during the week of Nov. 26.

A NASA C-20A, which is a modified Gulfstream III based at the Dryden Aircraft Operations Facility in Palmdale, carried the Uninhabited Aerial Vehicle Synthetic Aperture Radar, or UAVSAR, while flying a precision path over California's central San Andreas Fault. The UAVSAR imaged the fault line to document any subtle deformation in the Earth's surface. In concert with data from previous flights along the same route, the UAVSAR results can help researchers determine if there have been any changes in the activity of the San Andreas Fault in that area.

ED07-0027-39 **NASA/Tom Tschida**

The NASA C-20A is seen lifting off with the UAVSAR located in a pod underneath the aircraft.

Carried under the C-20A's belly, the UAVSAR is capable of spotting the smallest changes in the Earth's surface during precise passes over the same, targeted areas. An advanced research autopilot Dryden researchers developed enables the aircraft to fly similar passes within less than 10 meters deviation from a previous track, despite its flight altitude of 41,000 feet and regardless of weather conditions aloft.

ED12-0340-10 **NASA/Carla Thomas**

NASA 747 departs for Houston

NASA's modified Boeing 747 Space Shuttle Carrier Aircraft, or SCA, No. 905 retracts its landing gear as it climbs into the clear blue sky after its last liftoff from Edwards Air Force Base in November. The 42-year-old converted jumbo jetliner landed at Ellington Airport in Houston where it will remain while its future use or retirement is considered.

Anderson, former Dryden engineer, dies at 78

Herbert Anderson, who was a Dryden aerospace engineer, passed away Nov. 17 due to complications from a stroke. He was 78.

Anderson worked as an engineer at Dryden for 38 years prior to his retirement in 1998. Some of the flight-test projects in which he was involved included work as lead flight hardware operations engineer on the HL-10 and M2-F3 lifting body programs in the late 1960s and early 1970s, as the lead operations engineer on the KC-135 winglets research project and later as an operations engineer on the Convair CV-990 Landing Systems Research Aircraft into the 1990s.

News at NASA

Leadership changes at two centers

NASA Administrator Charles Bolden has announced leadership changes for the agency's Glenn Research Center in Cleveland and Johnson Space Center in Houston.

James Free will succeed Ramon (Ray) Lugo as Glenn's center director when Lugo retires in January. Free has served as Glenn's deputy director since January 2011.

Ellen Ochoa will succeed Michael Coats as Johnson's center director when Coats retires at the end of the year. Ochoa has served as Johnson's deputy director since September 2007.

Free began his career in 1990 at NASA's Goddard Space Flight Center in Greenbelt, Md., as a propulsion engineer and later as a systems engineer on NASA's Tracking and Data Relay Satellites. He joined Glenn in 1999 as the International Space Station liaison for the Fluids and Combustion Facility. His other NASA assignments have included director of Space Flight Systems at Glenn, Orion Service Module manager at Glenn and chief of the center's Orion Project Office. He also worked at Johnson as the Orion Test and Verification manager.

Ochoa is a four-time space shuttle astronaut who previously served as director and deputy director of flight crew operations at Johnson. She managed the Intelligent Systems Technology Branch at NASA's Ames Research Center in Moffett Field, Calif., before being selected as an astronaut candidate in 1990.

IceBridge... from page 1

of instruments ranging from ice-penetrating radar to a gravimeter to measure ice thickness, measure the depth and shape of water beneath ice shelves and map sub-glacial bedrock.

Including this year's IceBridge campaign, researchers have surveyed about 5,000 miles of Antarctic ice sheet grounding line during the past four years. That covers most of West Antarctica and some of East Antarctica. An ice sheet's grounding line is the point where ice transitions from being supported by land to floating on water. "Surveying such a large fraction of the grounding line of the Antarctic continent should greatly facilitate scientific understanding of Antarctic ice mass balance," said Airborne Topographic Mapper scientist John Sonntag.

IceBridge also achieved goals in the realms of educational outreach and science diplomacy by providing a research opportunity for two Chilean teachers, personnel from the U.S. Embassy in Santiago, including U.S. Ambassador to Chile Alejandro Wolff, and researchers from the Chilean Antarctic Institute. On the Nov. 1 flight over the Ronne Ice Shelf Chilean newspaper reporter Paula Lopez and science teachers Mario Esquivel and Carmen Gallardo joined IceBridge. During the mission, the teachers were able to get a birds-eye view of Antarctica and talk to IceBridge researchers. This flight experience gives the teachers new material to inspire and educate their students.

The 2012 Antarctic campaign also saw the use of a new online portal that allowed IceBridge researchers and students in nine U.S. states and three cities in Chile to chat in real time via the DC-8's satellite communication system. The text-based online chats let students ask questions about IceBridge, Antarctica and polar science, which personnel on the DC-8 were able to answer during the flight. Thanks to this tool, IceBridge was able to communicate with 49 classrooms and reach 728 students.

This year's Antarctic campaign owes its success to the hard work of the science instrument operators, people who maintain and fly the DC-8, and ground support and weather office personnel at the Punta Arenas airport. "I personally see wonderful people that work for IceBridge as the main reason why IceBridge is so successful," said IceBridge project scientist Michael Studinger.

Simulation

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a customer could invest in the most modern computer, helmet mounted display and the latest version of the Fused Reality software and turn any cockpit in about 30 minutes into a simulator at a fraction of the cost of building a new simulator or upgrading a current simulator.

Key partners also include the Calspan Corporation and the United States Test Pilot School at Edwards Air Force Base.

Whatever the future is for this new technology, NASA provided the support for industry to develop and commercialize it. It's part of NASA's mission to commercialize technology and the Fused Reality system is a government and industry success story.

Making progress

ED12-0162-142 **NASA/Tom Tschida**

Construction of Dryden's $11.2 million Facilities Support Center is going well. Underground infrastructure and masonry work is complete and structural steelwork is 90 percent done. Work has also begun on installation of interior walls and mechanical ducting on the 38,000-square-foot structure that is about half done. The FSC is expected to be complete in summer 2013.

Safety Day is now March 13

A Dryden Safety Day originally set for Jan. 9, 2013, has been changed to March 13.

In addition to the new date, the event also will coincide with the Employee Appreciation Lunch.

The theme for the Dryden Safety Day is, "I never thought it would happen to me!"

The mandatory day of activities for all Dryden employees in Hangar 4802 starts at 8 a.m. and concludes at 3:30 p.m.

The day will consist of speakers, training, interactive displays and booths. Watch for more information in the X-Press and on the Xnet.

For employees with additional questions, contact Denise Cope at ext. 2837.

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