

NASA's Unpiloted Global Hawk Completes First Science Flight

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The Global Hawk can fly autonomously to altitudes above 60,000 feet -- roughly twice as high as a commercial airliner -- and as far as 11,000 nautical miles. Operators pre-program a flight path, and then the plane flies itself for as long as 30 hours. Credit: NASA/Dryden/Carla Thomas

(PhysOrg.com) -- NASA has successfully completed the first science flight of the Global Hawk unpiloted aircraft system over the Pacific Ocean. The flight was the first of five scheduled for this month's Global Hawk Pacific, or GloPac, mission to study atmospheric science over the Pacific and Arctic oceans.

The Global Hawk is a robotic plane that can fly autonomously to altitudes above 60,000 feet -- roughly twice as high as a commercial airliner -- and as far as 11,000 nautical miles, which is half the

circumference of Earth. Operators pre-program a flight path, then the plane flies itself for as long as 30 hours, staying in contact through satellite and line-of-site communications links to a ground control station at NASA's Dryden Flight Research Center in California's Mojave Desert.

"The Global Hawk is a revolutionary aircraft for science because of its enormous range and endurance," said Paul Newman, co-mission scientist for GloPac and an atmospheric scientist from NASA's Goddard Space Flight Center in Greenbelt, Md. "No other science platform provides the range and time to sample rapidly evolving atmospheric phenomena. This mission is our first opportunity to demonstrate the unique capabilities of this plane, while gathering atmospheric data in a region that is poorly sampled."

GloPac researchers plan to directly measure and sample greenhouse gases, ozone-depleting substances, aerosols, and constituents of air quality in the upper troposphere and lower stratosphere. GloPac's measurements will cover longer time periods and greater geographic distances than any other science aircraft.

During Wednesday's flight, the plane flew approximately 4,500 nautical miles along a flight path that took it to 150.3 degrees West longitude, and 54.6 degrees North latitude, just south of Alaska's Kodiak Island. The flight lasted just over 14 hours and flew up to 60,900 feet. The mission is a joint project with the National Oceanic and Atmospheric Administration, or NOAA.

The plane carries 11 instruments to sample the chemical composition of the troposphere and stratosphere. The instruments profile the dynamics and meteorology of both layers and observe the distribution of clouds and aerosol particles. Project scientists expect to take observations from the equator north to the Arctic Circle and west of Hawaii.

Although the plane is designed to fly on its own, pilots can change its course or altitude based on interesting atmospheric phenomena ahead. Researchers have the ability via communications links to control their instruments from the ground.

"The Global Hawk is a fantastic platform because it gives us expanded access to the atmosphere beyond what we have with piloted aircraft," said David Fahey, co-mission scientist and a research physicist at NOAA's Earth System Research Laboratory in Boulder, Colo. "We can go to regions we couldn't reach or go to previously explored regions and study them for extended periods that are impossible with conventional planes."

The timing of GloPac flights should allow scientists to observe the breakup of the polar vortex. The vortex is a large-scale cyclone in the upper troposphere and lower stratosphere that dominates winter weather patterns around the Arctic and is particularly important for understanding ozone depletion in the Northern Hemisphere.

Scientists also expect to gather high-altitude data between 45,000 and 65,000 feet, where many [greenhouse gases](#) and ozone-depleting substances are destroyed. They will measure dust, smoke and pollution that cross the Pacific from Asia and Siberia and affect U.S. air quality.

The Global Hawk will make several flights directly under the path of NASA's Aura satellite and other "A-train" Earth-observing satellites, "allowing us to calibrate and confirm what we see from space," Newman added. GloPac is specifically being conducted in conjunction with NASA's Aura Validation Experiment.

The GloPac mission includes more than 130 researchers and technicians from NASA's Goddard Space Flight Center, Dryden [Flight](#) Research Center, Jet Propulsion Laboratory in Pasadena, Calif., and Ames

Research Center in Moffett Field, Calif. Also involved are NOAA's Earth System Research Laboratory; the University of California, Santa Cruz; Droplet Measurement Technologies of Boulder, Colo.; and the University of Denver.

NASA Dryden and the Northrop Grumman Corp. of Rancho Bernardo, Calif., signed a Space Act Agreement to re-fit and maintain three Global Hawks transferred from the U.S. Air Force for use in high-altitude, long-duration Earth science missions.

Provided by JPL/NASA

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