



Ikhana

Unmanned science and research aircraft system



NASA's Ikhana Predator B received an avionics upgrade, wingtip winglets and a new paint scheme in 2013. GA-ASI Photo

A General Atomics Aeronautical Systems MQ-9 Predator B unmanned aircraft system (UAS) was acquired by NASA in November 2006 to support Earth science missions and advanced aeronautical technology development. The aircraft, named Ikhana, also acts as a test bed to develop capabilities and technologies to improve the utility of unmanned aircraft systems.

Ikhana is a Native American Choctaw word meaning intelligent, conscious or aware. The name is descriptive of the research goals NASA has established for the aircraft and its related systems.

Representative Experiments and Projects

The MQ-9 aircraft, designed for long-endurance, high-altitude flight, has been modified and instrumented for use in multiple civil research roles.

A variety of Earth science in situ and remote sensing instruments can be installed to collect data during flights lasting more than 20 hours.

Data gathered by sensors on Ikhana within the Earth's atmosphere complement measurements of the same phenomena taken from space and those taken on the Earth's surface.

Ikhana participated in the Western States Fire Mission that from 2007 – 2009 demonstrated improved wildfire imaging and mapping capabilities of a sophisticated sensor and real-time data communications equipment developed at NASA's Ames Research Center at Moffett Field, Calif.

The aircraft carried the Autonomous Modular Sensor in a wing-mounted pod in support of the wildfire missions. The sensor is capable of peering through thick smoke and haze to record hot spots and the progression of wildfires over a lengthy period. The data gathered was overlaid on Google Earth maps and down-linked in near-real time to the Interagency Fire Center in Boise, Idaho, and made available to fire incident commanders to assist them in allocating fire-fighting resources.

NASA's Aeronautics Research Mission Di-

rectorate uses the aircraft for advanced aircraft systems research and technology development.

A NASA-patented fiber optic-based sensor technology moved from years of laboratory development and testing to large-scale, dynamic field testing in 2008 when it was flown on the remotely piloted Ikhana to measure change in the wing shape in flight in real time. The effort represented one of the first comprehensive flight validations of fiber optic sensor technology.

An Automatic Dependent Surveillance-Broadcast, or ADS-B, device was first tested on NASA's MQ-9 Ikhana unmanned aircraft on March 15, 2012. ADS-B is an aircraft tracking technology that all planes operating in U.S. airspace must adopt by January 2020 to comply with Federal Aviation Administration regulations.

NASA operates a ground control station and satellite communication system for transmitting flight commands to and downlinking aircraft and mission data from Ikhana. The ground control station is installed in a mobile trailer and, in addition to the pilot's instruments and controls, includes computer workstations for scientists and engineers. All the aircraft systems are mobile, making Ikhana ideal for missions conducted from remote sites around the globe.

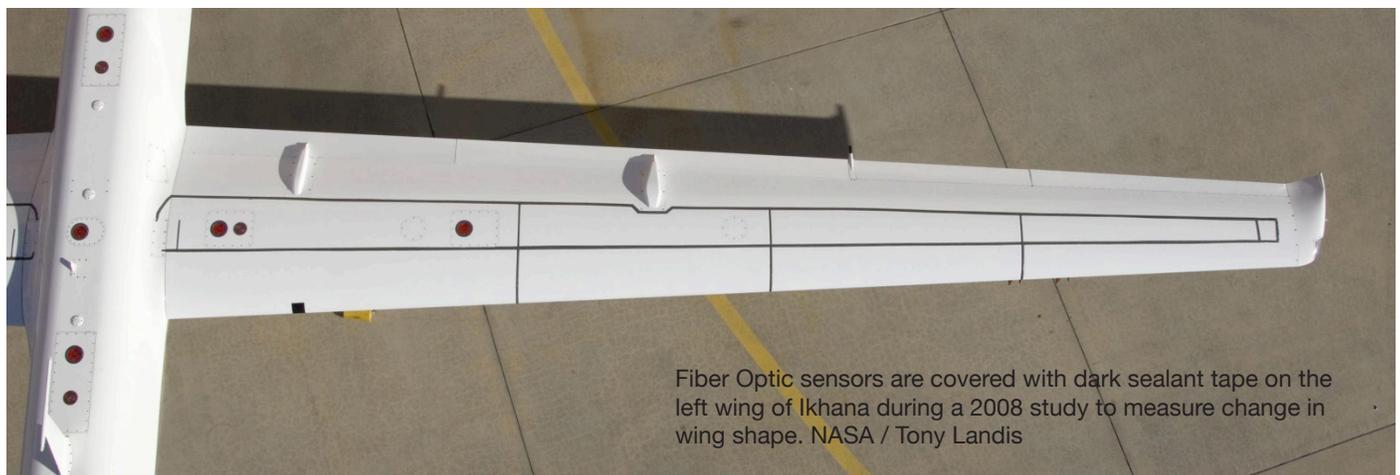
Aircraft Description

The aircraft is based at NASA's Dryden Flight Research Center located on Edwards Air Force Base, Calif.

General Atomics Aeronautical Systems Inc. (GA-ASI) of San Diego, Calif., developed the original Predator A medium-altitude, long-endurance UAS during the mid-1990s for the United States Air Force. Development of the larger, more powerful Predator B was initiated in 2000 by the firm with partial funding from NASA. The agency was interested in the Earth science capabilities of a civil version of the aircraft with a larger payload and high-altitude capability, along with long endurance.

NASA's MQ-9 Ikhana / Predator B has a wingspan of 66 feet and is 36 feet long. More than 400 pounds of sensors can be carried internally and over 2,000 pounds in external under-wing pods. Ikhana is powered by a Honeywell TPE 331-10T turbo-prop engine and is capable of reaching altitudes above 40,000 feet. Ikhana was the first production Predator B equipped with a digital electronic engine controller developed by Honeywell and GA-ASI that makes the aircraft five to 10 percent more fuel efficient than earlier versions.

In 2013, Ikhana received a major avionics upgrade, bringing the aircraft's systems to current standards and making the UAS maintainable and sustainable. The Ikhana project also acquired a new 140-by-30-inch generic science pod with a payload capacity of more than 500 pounds. The pod's internal arrangement is reconfigurable to accommodate a variety of science sensors and instruments.



Fiber Optic sensors are covered with dark sealant tape on the left wing of Ikhana during a 2008 study to measure change in wing shape. NASA / Tony Landis

National Aeronautics and Space Administration

Dryden Flight Research Center

P.O. Box 273

Edwards, California 93523

www.nasa.gov

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