



# Unmanned Aircraft Systems

[www.uas.noaa.gov](http://www.uas.noaa.gov)

Bridging Information Gaps in Hazardous, Remote, and Data Sparse Regions

## What Does the Unmanned Aircraft Systems Program Do for the Nation?

The Unmanned Aircraft Systems (UAS) program aims to make UAS observations an essential component of the NOAA observing system. UAS can advance NOAA's ability to monitor and understand the global environment by complementing observations from satellites, ships, aircraft, balloons, and surface-based sensors. Better data and observations improve understanding and forecasts, save lives, property, and resources, advancing NOAA's mission goals.

### Program Highlights:

#### High-Impact Weather Monitoring: Global Hawk lets forecasters and scientists see inside a storm.

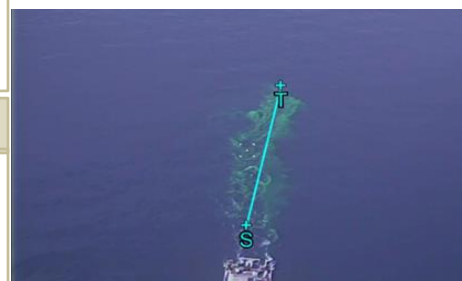
The NOAA UAS program launched the Sensing Hazards with Operational Unmanned Technology (SHOUT) project in 2014 with Disaster Relief Appropriations Act of 2013 funds to evaluate the use of NASA's UAS, Global Hawk, to observe high impact weather events like hurricanes. The Global Hawk can stay aloft for over 25 hours, flying at altitudes up to 65,000 feet, providing nearly continuous observations of hazardous storms. Through a partnership with NASA, the Global Hawk has been flown over 24 times during 12 named hurricanes and tropical storms collecting data that allow forecasters and scientists to see clearly inside a storm, capture changes in speed and intensity and fill in gaps in other available data. Analyses have demonstrated that the data can lead to significant improvements in forecasts of hurricane track and intensity.



NASA's Global Hawk landing at NASA's Wallops Flight Facility following a mission sampling hurricanes. Source: NOAA

#### Polar Monitoring: Using UAS to Monitor Potential Oil Spills in the Arctic

The NOAA UAS program collaborated with the US Coast Guard during the recent Arctic Shield 2013-15 missions to ensure the Arctic remains a safe, secure and environmentally protected resource to test the use of a 13-pound Puma UAS in responding to potential future oil spills in the Arctic. Pumas were hand launched from the US Coast Guard Cutter Healy north of Alaska and used to return imagery of simulated oil on the water. With increased oil exploration and drilling in the Arctic, rapid response to oil spill and SAR events will be critical. The Puma has the capability to immediately see the size and potential impact of an oil spill event. This mission complimented work monitoring simulated oil spills in other regions including the Channel Islands and more flights were executed in the Summer of 2015 in the Arctic.



Imagery from the Puma UAS showing fluorescein dye used to simulate a potential oil spill. Source: NOAA

#### Marine Monitoring: Scientists use Puma to monitor NOAA Marine Sanctuaries.

Scientists have been employing the hand launched Puma UAS in many of our National Marine Sanctuaries to test their usefulness in monitoring marine life, possible fishing violations, and conducting marine debris surveys. Missions have been performed in the Channel Islands, the Northwest Hawaiian Islands, off the Olympic Coast, and near the Florida Keys. The Puma is particularly valuable in monitoring dangerous or hard to reach areas and is so quiet that it doesn't disturb the wildlife it is observing.



Preparing to launch the Puma UAS off the Research Vessel Tatoosh near the Quillayute Needles Archipelago off the coast of La Push. Source: John Lok / The Seattle Times



## More Program Highlights

### UAS Observations Support Flood Forecasting

Small UAS are being flown over river basins to test their usefulness in providing forecasters critical information to improve flood warnings. The Puma and Altavian UAS were used in 2013 and 2014 to construct detailed maps of the Pearl River Basin in Mississippi highlighting where flooding could occur.



Map of the Pearl River Basin in Mississippi collected using the Altavian UAS on September 23, 2014. Credit: Robert Moorhead, Mississippi State University

### UAS Collaborates With Small Business Innovation Research Program

New activities funded through the Small Business Innovation Research (SBIR) program are helping NOAA explore future novel applications of UAS. Projects include development of new methods to measure the heat flux between the ocean and atmosphere with the development of a new, inexpensive air-launched UAS capable of collecting accurate moisture and temperature measurements. Another project is investigating more efficient ways of collecting highly precise gravity measurements through integration of new instrumentation on the Centaur Optionally Piloted Aircraft. Other platforms currently used within NOAA UAS demonstrations had their development partially supported through SBIR projects.



The Aurora Flight Sciences Centaur Optionally Piloted Aircraft will be tested for gravity sampling missions with SBIR funding. Credit: Aurora Flight Sciences

## What's Next for UAS?

NOAA's UAS program is working to advance the technological readiness of UAS systems and build capability for their application across the agency. Several new concepts have been proposed including:

- Collecting detailed observations low in the atmosphere in support of understanding and forecasting convective continental storms
- Evaluating methods to employ UAS in the rapid response to natural disasters
- Advancing the capability of vertical take off and landing UAS for wildlife monitoring and other applications
- Employing UAS to collect detailed measurements of air quality

## Research Partnerships

The NOAA UAS program is working with a large and diverse range of partners to demonstrate the utility of the technology for the agency. The partners are composed of all the line offices across NOAA, other Federal agencies from both the civilian community and Department of Defense, numerous academic institutions, and a large number of industry representatives. These partnerships have been instrumental in achieving the results to date and will remain critical moving into the future.

### Did You Know?

- NOAA has flown Puma UAS on 200 flights for science data collection over rivers, beaches, and oceans since 2013.
- Over 1600 dropsondes, an expendable atmospheric profiling tool, were successfully deployed from the Global Hawk UAS during joint NOAA/NASA science missions since 2011.
- NOAA regularly conducts inter-agency UAS operations with government, industry and academic partners.
- The NOAA UAS Program has a vibrant Technology Transfer strategy which include active SBIRs and several Cooperative Research and Development Agreements (CRADA).

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