Unmanned Aircraft Systems

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Providing Enhanced Capabilities to Address Key NOAA Mission Areas of Interest

The NOAA Unmanned Aircraft Systems (UAS) Program goal is to fully exploit UAS capabilities to meet NOAA's mission requirements of Science, Service, and Stewardship to understand and predict changes in climate, weather, oceans and coasts. The mission of the UAS Program is to facilitate UAS applications and utilization in NOAA and to accelerate the transition of UAS capabilities from research to operations by providing expertise and resources for UAS research and development (R&D) that are anticipated to yield societal and economic benefits.

Program Highlights

Disaster Response – Enabling More Efficient Capabilities to Improve Forecasts and Rapidly Provide Actionable Information

The NOAA UAS Program is investing in R&D activities intended to improve the resiliency of communities in the United States, before, during, and after disasters. With program support, NOAA's Northern Gulf Institute (NGI) recently deployed long-range UAS over a historic flood event in Mississippi, providing real-time imagery of flood inundation and water levels to the NWS Lower Mississippi River Forecast Center and FEMA. The data was used to update flood forecasts for the event and will also be used to calibrate models to produce more accurate forecasts for future events. The UAS Program is also supporting NOAA's Chemical Science Laboratory's "NightFOX" project, in which small UAS are being developed with specialized payloads to acquire observations over wildfires. In coordination with the Department of Interior, data will be used to improve fire weather modelling.

NOAA's NGI Cooperative Institute works with Mississippi State University to prepare for the deployment of the Outlaw G2E UAS over large swaths of flood-inundated locations in Mississippi with real-time data going to NWS. Source: Robert Moorhead, Director NGI

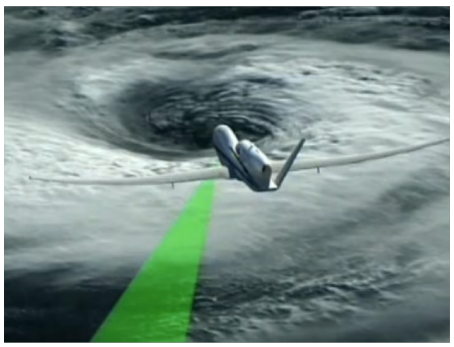
Wildlife and Habitat Monitoring – Observations of Marine Wildlife Populations and Assessment of Health and Ecosystems

The NOAA UAS Program, National Marine Fisheries Service's Office of Science and Technology and Marine Mammal Laboratory continue testing of UAS for detection of seals, polar bears, dolphins, porpoises, gray whales, right whales and orcas. These projects include the collection of imagery from both manned aircraft and UAS to evaluate the use of software to automatically detect marine mammals in aerial imagery and calculate the basic summary statistics needed for assessing density health. In addition, breath sampling from UAS provide enhanced health assessments. NOAA's Stewardship and collection results assist in ecosystems management and provide recommendations, when necessary, for developing sound management decisions under the Marine Mammal Protection Act and extinction risk assessments under the Endangered Species Act.

Blow sampling of large whales using APH-22 UAS without disturbance by close boat approach. Source: NOAA

Hurricane Forecasts – Improvements with Unique UAS Observations

The NOAA UAS Program is exploring the impact of meteorological data from UAS to improve hurricane track and intensity forecasts. Data collected from the high-altitude (65,000 ft), long-endurance (24+ hours) NASA Global Hawk continues to be evaluated from hundreds of hours of flight time, with early results indicating UAS collected data can improve hurricane forecasts. With AOML, the program is researching the utility of hurricane hunter aircraft launched UAS. Deployed directly into storms, these UAS can make low altitude meteorological measurements in the most hazardous hurricanes.



Graphic illustrating the high-altitude, long-endurance Global Hawk UAS platform operating above hurricanes to obtain measurements in and around storms to improve forecast capabilities. Source: NASA

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More Program Highlights

Atmospheric Observations – New Frontiers in the CONUS and the Arctic

With a strong emphasis on observational requirements and filling data gaps, the NOAA UAS Program is supporting initiatives to obtain crucial, yet under-sampled, meteorological observations in the lower atmosphere. In the arctic, new flux sensors have been integrated onto fixed wing UAS to obtain measurements over the ice and ocean to improve our understanding of the science and resulting forecast applications. Similarly, the program is exploring new capabilities that will allow small UAS to routinely sample the lowest 10,000 feet of the atmosphere by developing technology to safely operate beyond visual line of sight (BVLOS) range.

UAS Collaborates With Small Business Innovation Research Program

New activities funded through the Small Business Innovation Research (SBIR) program are helping NOAA explore unique UAS applications. This includes development of hybrid fixed wing, vertical multi-rotor UAS technology that can launch and recover scientific payloads from NOAA ships to measure aerosols and atmospheric fluxes. Projects include development of new methods to measure heat fluxes—the exchange of heat between the atmosphere and the underlying ice, ocean, and land surfaces—which is a key to understanding and predicting weather and climate. Other efforts involve support to obtain measurements in the atmospheric boundary layer and other NOAA mission areas of interest.

Small UAS, like the Meteomatics Meteodrone hexacopter, are being examined for their ability to obtain accurate, meteorological profiles of the lower atmosphere. Source: John Walker, Cherokee Nation Strategic Programs

The Latitude HQ-20 fixed wing hybrid quadrotor during launch and recovery exercises off NOAA Ship Oscar Elton Sette. Source: NOAA

What's Next for UAS?

NOAA's UAS program is working to advance the technological readiness of UAS in NOAA and build capability for their application across the agency. Research areas include, but are not limited to:

- Evaluate observing strategies and address critical data gaps
- Facilitate new UAS applications with NOAA
- Evaluate ship-launched UAS technology and infrastructure
- Enable BVLOS operations within NOAA
- Analyze the value of high-altitude observations
- Develop UAS CONOPS to for pinniped surveys in remote areas

Research Partnerships

The NOAA UAS program provides UAS research resources throughout NOAA and is working with partners to test, evaluate, and demonstrate the utility of UAS technology for the agency. Partners include NOAA Cooperative Institutes, Federal agencies (NASA, DOI, DOE, DOD, and FAA), academic institutions, and industry representatives. These partnerships have been instrumental in achieving the results to date and will remain critical moving into the future.

Did You Know?

- Small UAS can typically operate at distances up to 1 mile away with pilot "line of sight" operations. With BVLOS operations, the amount of area covered in a single operation could be 4 to 9 times larger with only a modest increase in ranges up to 2 to 3 miles, respectively.
- Over 2500 dropsondes, an expendable atmospheric profiling tool, were successfully deployed from the Global Hawk UAS during joint NOAA/NASA missions from 2011 - 2017.
- The NOAA UAS Program has a vibrant technology transfer strategy that includes SBIR and Cooperative Research and Development Agreements (CRADA).

For more information, contact: Captain Philip Hall, Director, NOAA UAS Program
National Oceanic and Atmospheric Administration (NOAA), Oceanic and Atmospheric Research (OAR)
Email: philip.g.hall@noaa.gov
Phone: (301) 734-1102

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