

Research Focus Areas

The UAS Program aims to identify, test, evaluate and demonstrate UAS technology as an environmental science observing capability that can be transitioned effectively into NOAA's operational observing system portfolio. UAS observations are intended to be cost-effective and to address critical observing gaps or provide significant improvements to current NOAA observing strategies. The UAS program has focused on research, development and transition to operations for UAS in three key science themes: high impact weather, marine, and polar observations. These science themes directly link to the NOAA Office of Oceanic and Atmospheric Research science portfolios of Weather, Ocean, and Climate, which in turn address the NOAA long term goals of:

- *Climate Adaptation and Mitigation* - An informed society anticipating and responding to climate and its impacts
- *Weather-Ready Nation* - Society is prepared for and responds to weather-related events
- *Healthy Oceans* - Marine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems
- *Resilient Coastal Communities and Economies* - Coastal and Great Lakes communities are environmentally and economically sustainable.



Research Area 1: High Impact Weather

The UAS Program has evaluated a broad range of UAS platforms and sensors for meeting NOAA's research and forecasting needs for high impact weather events. The goal is to utilize UAS as a complement to current observing assets, especially where the UAS can provide cost-effective and otherwise hard-to-obtain data in support of the National Weather Service. This includes the use of high altitude UAS, such as the Global Hawk, for sampling large areas over oceanic storms including tropical cyclones with remote sensors and in situ observations, as well as the use of lower altitude UAS for improved marine boundary layer and hurricane inner eye sampling. Localized UAS observations of flood conditions and terrains supporting the National Weather Service River Forecast Centers have also been researched and evaluated. Newer UAS projects started in 2016 are examining small UAS for lower atmospheric observations for the study and prediction of severe storms and air quality as well as imagery and mapping for post-storm damage assessment.



Research Area 2: Marine Monitoring

The UAS Program has been involved in researching and demonstrating various UAS systems for marine science and monitoring applications across NOAA, for both coastal and oceanic observations. This activity involves primarily medium altitude UAS along with small, low altitude rotary and fixed wing UAS. This work has evaluated the use of UAS for the operational needs of NOS's Office of National Marine Sanctuaries, National Geodetic Survey, Office for Coastal Management and the National Marine Fisheries Service Office of Science and Technology and Science Centers. The focus has included protected resource monitoring and research, marine mammal, turtle and bird counts, oil and chemical spill response, marine debris detection, and data collection of photogrammetric imagery for habitat characterization, wildfire damage assessments, and digital elevation mapping. Other project areas include precise gravity observations for land surface elevation and flood plain mapping.



Research Area 3: Polar Monitoring

The Arctic and Antarctic environments are a priority area for collecting hard-to-obtain environmental observations, and pose additional challenges for UAS systems to operate in these extreme environmental conditions. The UAS program has supported technology demonstrations of small UAS, jointly with partners in the US Coast Guard and private industry to evaluate performance, communication and ability to use small UAS for wildlife, sea ice mapping, rapid

response and maritime domain awareness in Polar environments during ship-based operations. Other focal areas include Greenland/Norway mapping and monitoring of sea ice loss, and atmospheric distribution of black carbon for climate-cryospheric interactions. Newly-developing partnerships have an emphasis on the use high altitude UAS for atmospheric observations and mapping of sea ice, glaciers, snow, and icebergs.