

National Oceanographic and Atmospheric Agency



By Robbie Hood and Rene Eppi

As one of the nation's leading environmental agencies, the National Oceanic and Atmospheric Administration (NOAA) relies heavily on a variety of Earth observing platforms to provide continuous, reliable and sustained streams of data. These data are used in numerous ways that drive decisions at all levels of government, and have a direct and measurable impact on economies and lives around the globe.

It is not enough to obtain the necessary environmental data from satellites and in situ platforms alone. Unmanned Aircraft Systems (UAS) can revolutionize NOAA's ability to monitor and understand the global environment. There is a key information gap today between instruments on Earth's surface and on satellites - UAS can bridge that gap. Operated by remote pilots and ranging in wingspan from less than six feet to more than 115 feet, UAS can also collect data from dangerous or remote areas, such as the poles, oceans, wildlands, volcanic islands, and wildfires. Better data and observations improve understanding and forecasts, save lives, property, and resources, advancing NOAA's mission goals.

UAS can help NOAA meet its mission goals with a more advanced fleet capable of collecting data from areas that are currently inaccessible (such as under clouds). Specifically, UAS may:

- Extend hurricane landfall lead times by observing storm environments.
- Improve the accuracy of storm forecasts, benefitting emergency managers and diverse private industries, from energy and tourism to airlines.
- Improve climate change understanding, to help mitigate and plan for it.
- Assess Arctic ice change and affects on ecosystems & coasts.
- Improve flood and drought forecasts, helping water managers.
- Increase safety and success in fighting wildfires that threaten people and property.
- Monitor coasts, oceans, environments important for fish, and marine sanctuaries.

The Arctic is emerging as one of the most important research areas because of its rapid rate of environmental change, and because of the impact that these changes will have on the rest of the Earth's systems. The Arctic drives weather patterns that affect people and ecosystems around the globe, and the region's climate is changing quickly. The ability of scientists to track and understand those changes is limited today:

- Satellite measurements over the poles are often ambiguous because clouds, snow, and sea ice may produce similar signals.
- Marine mammals such as ice seals range throughout the ice pack too far from shore to survey effectively using manned aircraft.
- Land surface measurements in the Arctic are sparse, as are ocean measurements, which are collected mainly from buoys that must be removed before wintertime sea ice forms.
- There are no systematic measurements of the upper air over the vast Arctic Ocean, compromising scientists' ability to understand air pollution in the region, and to forecast severe storms.

Campaigns using UAS can help clarify critical mechanisms for change in the Arctic, including change in sea ice, severe storms, marine mammal populations, deforestation, permafrost distributions, and glaciers. Routine UAS flights with direct vertical measurements at fixed locations around the Arctic can advance our understanding of weather, climate, the cryosphere and biosphere over the Arctic Ocean.

NOAA is working with partner agencies in other Arctic nations to expand the ranges of UAS flights so that scientists can begin to gather more comprehensive observations that will further our understanding of the region. Many scientific questions are currently not addressed in the Arctic because data collection with conventional tools is difficult, costly, or dangerous. Proposed Arctic measurements would require regular flights of 30 hours plus. UAS flights could support societal and scientific needs by:

- Enabling better short- and long-term predictions of sea ice, weather, and climate.
- Extending the range and capabilities of NOAA's research fleet by launching and retrieving UAS from vessels to study sea ice, marine mammals, ocean color and temperature, and other sea surface factors.
- Improving understanding of carbon sinks and support of carbon science missions in the Arctic.

Collaboration between all Arctic countries is required to support a comprehensive understanding of changes occurring in the Arctic environment. Bilateral meetings and discussions between the United States and other Arctic country representatives from Sweden, Norway, Russia, and Canada are underway to coordinate Arctic monitoring efforts, and regarding the potential use of UAS. However, circum-Arctic coordination will need to include communication across aviation authorities on issues of UAS in Arctic airspace. Circum-Arctic coordination is necessary to allow for an improved understanding of the current state of the Arctic. Environmental measurements from UAS should allow for advancements in scientific understanding that will assist in both short and long-term predictions for the Arctic. These improved predictions will be valuable for decisions regarding Arctic maritime transport for shipping, development, and ecosystem management.

Rene Eppi
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