



U.S. DEPARTMENT OF
ENERGY

Office of
Science

DOE/SC-ARM-16-028

Arctic Shield 2015 Field Campaign Report

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May 2016



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Arctic Shield 2015 Field Campaign Report

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May 2016

Work supported by the U.S. Department of Energy,
Office of Science, Office of Biological and Environmental Research

Executive Summary

During the week of July 13, 2015, the U.S. Coast Guard's (USCG) Research and Development Center partnered with Conoco Phillips through a Cooperative Research and Development Agreement to conduct a Search and Rescue (SAR) exercise off of Oliktok Point, Alaska. The Coast Guard was interested in exploring how unmanned aircraft systems (UAS) can be used to enhance capabilities for its SAR mission and gain a better understanding of how it could work jointly with private industry for response operations in remote regions.

Participants in the exercise included Coast Guard Pacific Area Command, Coast Guard Cutter *Healy*, Coast Guard District Seventeen, Coast Guard Air Station Kodiak, and Conoco Phillips.

Joining Conoco Phillips were their partners Insitu (a Boeing company), Era Helicopter, and Era Helicopter's partner Priority One. Other government agencies supporting the exercise were the U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility, the National Oceanic and Atmospheric Administration, the Federal Aviation Administration, and the North Slope Borough of the state of Alaska.

The exercise scenario involved a simulated small aircraft crash offshore where the survivors took refuge in a 6-man life raft. The aircraft's last known position and asset availability required the Coast Guard to coordinate the response with Conoco Phillips. This included the use of an Insitu-operated ScanEagle UAS, flown from DOE-ARM's Sandia National Laboratory-operated facility at Oliktok Point, and manned aircraft provided by both the Coast Guard's Forward Operating Location in Deadhorse and Era Helicopter.

Lessons learned from this exercise will help the Coast Guard understand how to best collaborate with private industry on the North Slope during response operations and develop requirements for UAS performing Coast Guard missions in the Arctic environment. For the ARM facility, the exercise demonstrated some of the opportunities and constraints of using UAS in the Arctic for research purposes.

Acronyms and Abbreviations

ARM	Atmospheric Radiation Measurement Climate Research Facility
DOE	U.S. Department of Energy
FAA	Federal Aviation Authority
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Aerospace Defense Command
NOTAMS	Notices to Airmen Service
SAR	search and rescue
UAS	unmanned aircraft system
USCG	U.S. Coast Guard

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1.0 Background

After gaining Federal Aviation Administration (FAA) approval, new special-use arctic airspace became available in 2015 as a tool to conduct climate and atmospheric research and address scientific questions by gathering additional data under conditions unique to the area. ARM staff at the NSA site applied repeatedly for the larger space, which extends over international waters and provides a significant safety margin for researchers by warning other pilots about scientific traffic the area. The ARM facility at Oliktok Point, and others who used the restricted airspace, are taking advantage of the FAA Notices to Airmen Service (NOTAMS) to alert aircraft in the area when flights for research and other authorized purposes are being conducted.

Called Warning Area W-220 by the FAA, the airspace is 40 miles wide. It starts just offshore of the U.S. Department of Energy (DOE) Atmospheric Radiation Measurement (ARM) Climate Research Facility's Oliktok Point, Alaska, site and stretches 700 miles north ending 400 miles short of the North Pole so as not to intrude into other nations' airspaces. The new area expands the ARM facility's research footprint in the Arctic and provides a safety margin for research operations focused on harsh Arctic atmospheric and climate conditions.

The U.S. Coast Guard Research and Development Center became the first government agency to lead a collaborative research effort using the new warning area in the summer of 2015 with a campaign focused on saving lives. The USCG is concerned about search and rescue in the Arctic; they have not had a year-round presence there to date, but they have become interested recently because of near-shore oil exploration and production activity, including helicopter operations. At the same time, the northward retreat of sea ice is opening Arctic seaways up to more ship traffic year round, creating the potential for expanding USCG commitment in this sparsely populated, sparsely serviced, and extreme environment.

The ARM facility benefited significantly from facilitating and observing the use of UAS in the search-and-rescue exercise. The joint civil and federal exercise involved deploying a six-man life raft and life-size heated dummy at sea to determine if UAS technology could be effective in locating survivors in the Arctic Ocean, helping manned ships and aircraft come to the rescue, and providing situational awareness of the recovery effort from overhead.

For DOE-ARM, the campaign was intended to demonstrate how small, low-cost, unmanned aerial systems can be used to study and measure clouds and aerosols in the cold and harsh Arctic atmosphere.

2.0 Notable Events

At the end of the exercise, the USCG had accomplished its objectives. They anticipated that the exercise would not go perfectly, but they felt they had learned a lot about the successes and shortcomings of using UAS for search-and-rescue operations. For the Coast Guard, the exercise was also about civil/federal collaboration. In the event of a major incident, they want to understand how to work with all entities on the North Slope. Assets and resources are scarce in the area and oil companies are required to maintain search-and-rescue and oil-spill response capabilities. The USCG learned to leverage those capabilities as well as those provided to the North Slope Borough, the local government entity.



Figure 1. A helicopter crew lowers a rescue swimmer into the Arctic Ocean in DOE airspace near Oliktok Point, Alaska during the Arctic Shield exercise in July, 2015. (Image courtesy of Coast Guard Petty Officer 2nd Class Grant Devuyst.)

Collaboration and safety, as well as research applications, were also priorities for ARM researchers during the exercise. In 2004, ARM was granted a four-mile-diameter restricted area around Oliktok Point, its base of operations for Arctic atmospheric measurements. Restricted areas are for U.S. airspace and warning areas apply to international airspace. The restricted areas was renewed in 2010, but the ARM facility saw the potential for more extensive, ongoing experiments, which created renewed interest in operating offshore. It was clear that balloons with sensors tethered in low clouds could pose dangers to aircraft, especially the small private planes that operated throughout Alaska.



Figure 2. A USCG aviation survival technician approaching the simulated person used in the Arctic Shield exercise in July, 2015. (Image courtesy of Coast Guard Petty Officer 2nd Class Grant Devuyst.)

3.0 Lessons Learned

This arctic exercise taught ARM researchers as well as other participants several important lessons regarding communication and inter-agency cooperation. First, ARM staff worked through the first activation of the warning area with two FAA representatives on site, which proved a very successful collaboration. Staff from both agencies used collaborative web technology to communicate information quickly and effectively. One member of the ARM team was also stationed at a North American Aerospace Defense Command (NORAD) radar scope in Anchorage, Alaska, clearing the area prior to the UAS launch. That was critical to the UAS exercise. These experiences will be important in establishing safe operational procedures for future ARM scientific campaigns using the warning area.



Figure 3. A UAS operator guides a Puma All-Environment UAS into a catch net on the Coast Guard Cutter *Healy* during the Arctic Shield exercise in July, 2015. (Image courtesy of Coast Guard Petty Officer 1st Class Shawn Eggert.)

4.0 Results

The campaign proved that UAS technology is viable for Arctic research. To locate the target life raft and dummy (Thermal Oscar, a USCG-developed floating dummy outfitted with a heat source that makes it visible to infrared sensors) on the first day of the trials, a UAS was launched from Oliktok Point and flew to the special-use airspace via an altitude reservation established by the FAA. The Coast Guard Cutter *Healy* then successfully took control of the UAS and directed it in a search pattern designed to locate the targets. Finding the target proved to be a challenge in the ice-covered waters and the *Healy* was obliged to guide the UAS to the right spot where it stayed and observed the manned aircraft recovery efforts. The next day, the team flew a second UAS, owned by the National Oceanic and Atmospheric Administration (NOAA), and encountered similar issues. This time, the team was able to remain at the targets and pass updated position information to manned aircraft on shore and guide the rescuers to the targets before they left land at Deadhorse, Alaska.

Both tests demonstrated that UAS technology can be a resource in future operations by supplementing manned rescue efforts and providing situational awareness. Real-time video imagery transmitted from both units illustrated how UAS technology can provide climate researchers with useful information for answering questions about atmospheric conditions. UAS were successfully launched from land and retrieved both at sea and ashore, demonstrating the robust functionality and flexibility of this relatively new data-gathering medium in one of the world's harshest atmospheric environments.

For the ARM facility, the exercise opens up the potential to use UAS in the W220 Warning Area to gather data on clouds and atmospheric constituents and track the northward movement of retreating sea ice. The technologies and practices implemented during Arctic Shield provide useful information for future ARM facility UAS research activities—including conducting such operations as safely as possible.



Figure 4. A helicopter prepares to land on the *Healy* after a rescue trial. (Image courtesy of Coast Guard Petty Officer 2nd Class Grant Devuyst.)

The link below provides a short video by Brian O’Kronley of the ScanEagle UAS in use at Oliktok Point, including both launch and retrieval.

<https://youtu.be/rNTSZRjr9J8>

5.0 Public Outreach

The USCG prepared a news release about the exercise:

<http://www.uscg.mil/acquisition/newsroom/updates/uas071315.asp>

More information was published in the online blog of the USCG 17th Coast Guard District:

<http://alaska.coastguard.dodlive.mil/2015/10/its-a-wrap-arctic-shield-2015/>



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