SAND2021-12777C

SANDIA IS COMMITTED TO HELPING IN THE ARCTIC

Our capabilities, born from our Laboratories' core mission, have positioned Sandia to successfully contribute solutions to challenges facing the Arctic

1 HISTORY

Over five decades ago, Sandia developed atmospheric monitoring capabilities in support of our nuclear deterrence mission. Today those capabilities have evolved to enable us to better understand the changes and impacts of climate change in the Arctic.

2 LOCATION

For the past 20 years Sandia has managed the US DOE's Atmospheric Radiation Measurement (ARM) site on the North Slope of Alaska near the Arctic Ocean. This location uniquely positions us in the "eye of the hurricane" in terms of observing changes taking place in the Arctic.

3 CAPABILITIES

As a result of strategic investment funding from Sandia leadership and DOE BER funding, we have developed critical capabilities that enable us to monitor and predict changes occurring in the Arctic.

4 PARTNERSHIPS

Strategic initiative funding has enabled us to develop key relationships with Arctic stakeholders including the University of Alaska (Fairbanks and Anchorage), the Wilson Center, US Department of Defense, US Department of Homeland Security, and others.

5 PEOPLE

Passionate staff and the support of management are our greatest asset and have fueled the Arctic initiative to get us to where we are today.

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SANDIA'S EXPERIENCE IN THE ARCTIC

ARCTIC SCIENCE & SECURITY

20 Years of climate measurement on Arctic Coast

Energy transitions for Alaska native villages

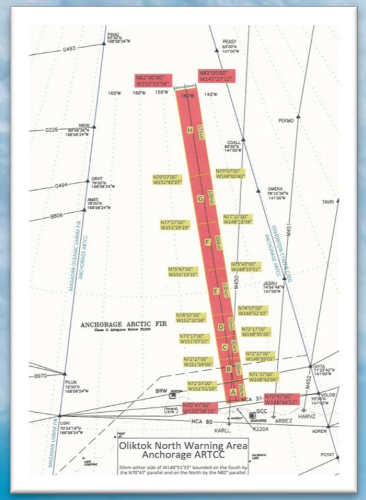
Search and rescue drills with the US Coast Guard

Greenhouse gas and thawing permafrost assessments

Computer modeling of ice sheets and coastal erosion

Distributed acoustic sensing in Arctic Ocean

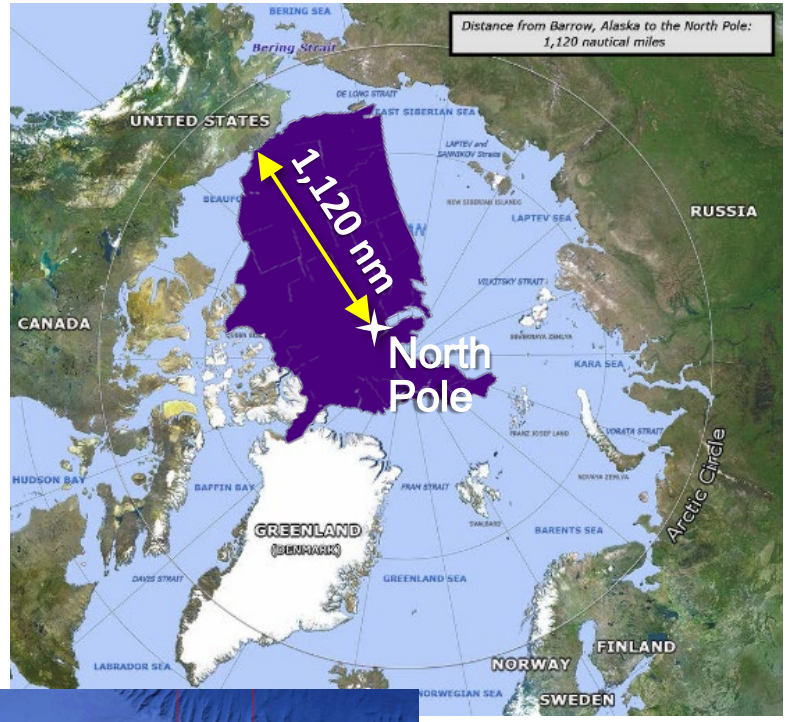
Down South — Airborne SAR to detect crevasses in landing area in Antarctica



SANDIA-MANAGED DOE/ARM NORTH SLOPE OF ALASKA (NSA) FACILITIES

ARM–NSA and Adjacent Arctic Ocean Research Facilities:

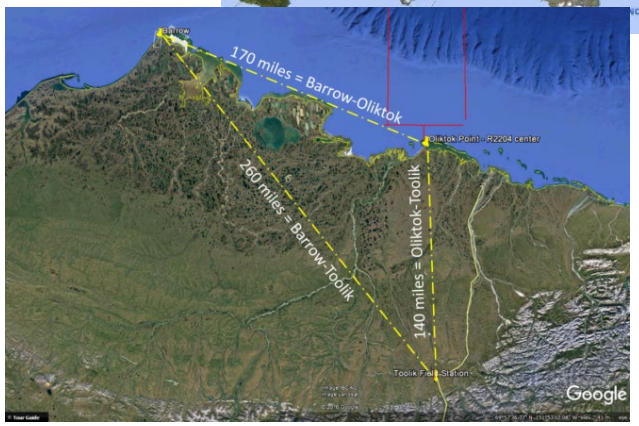
- **Utqiagvik/Barrow**: to measure ocean-land-atmosphere interface conditions
- **Atqasuk**: to measure land–atmosphere interface for comparison with Barrow measurements for differences between land and shore conditions (inland)
- **Oliktok and Third ARM Mobile Facility**: to measure ocean–land–atmosphere interface; use of controlled airspaces for aerial atmospheric measurements



Barrow
1997–Present

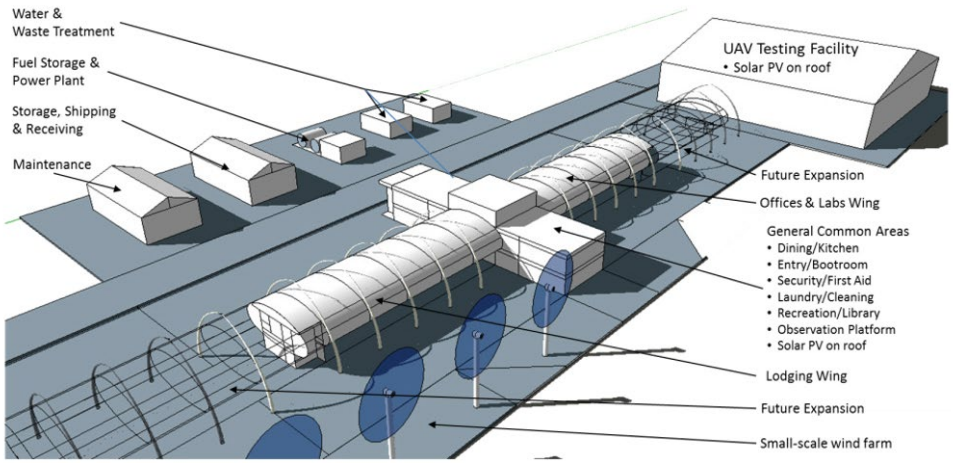
Atqasuk
1999–2010

Oliktok (AMF-3)
2013–2021

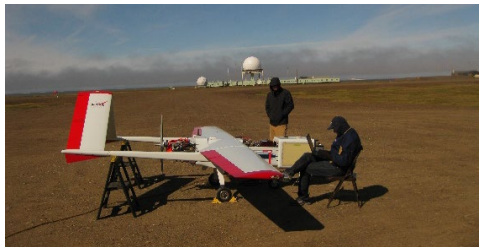


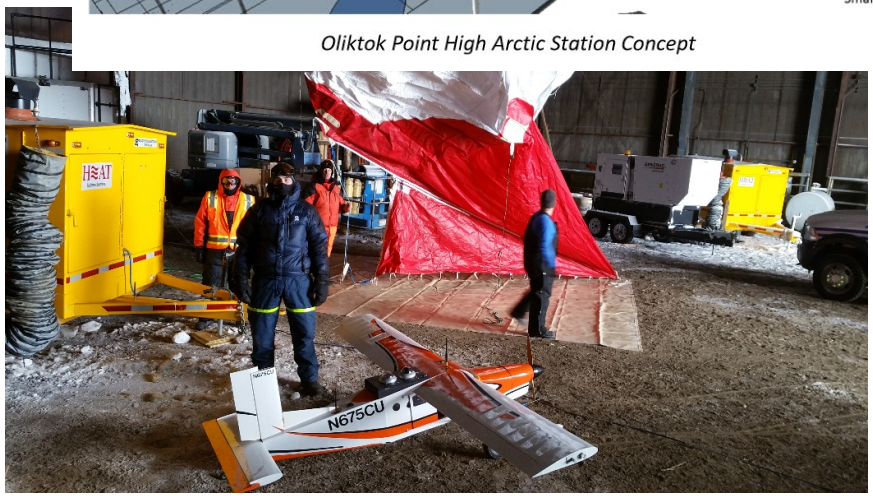
PROPOSED U.S. HIGH ARCTIC RESEARCH CENTER (USHARC)

USHARC will support cooperative research, identify appropriate Arctic technologies, and conduct field tests and exercises to enable advances in the development, resilience, preservation, and stewardship of Arctic resources, communities, and the environment.



Oliktok Point High Arctic Station Concept





Sandia National Laboratories | ARCTIC RESEARCH | UAF University of Alaska Fairbanks

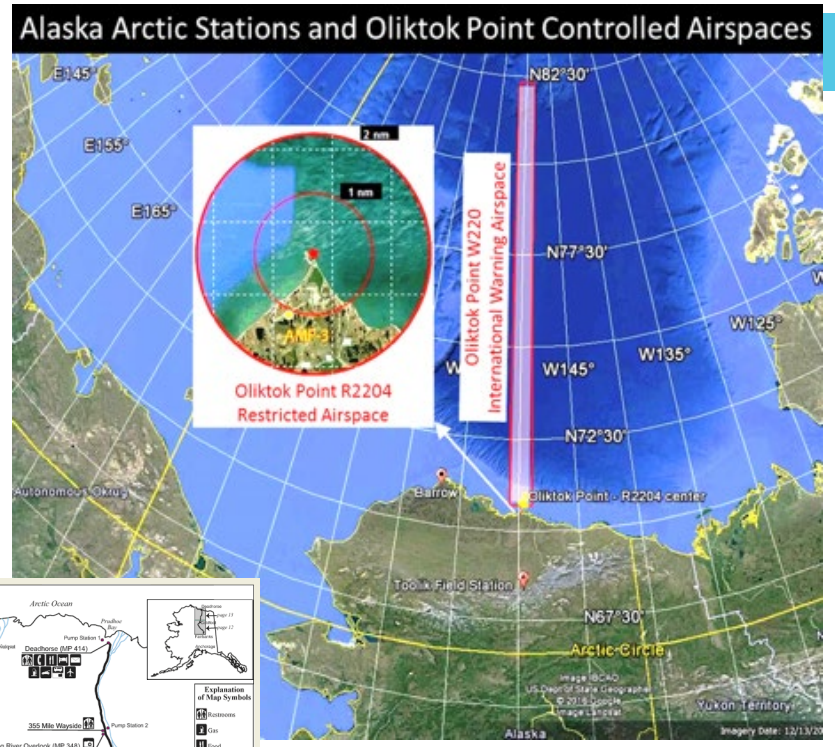
USHARC will include:

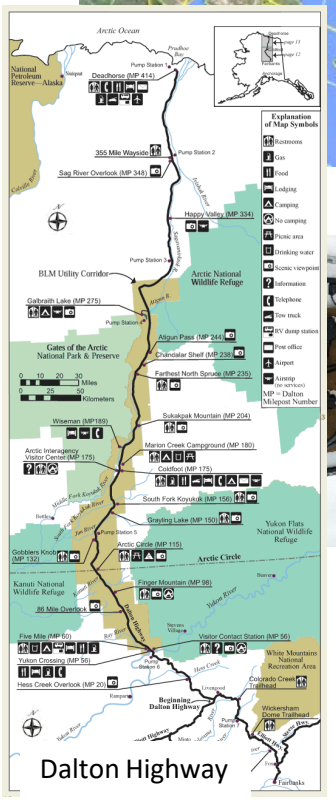
- Labs for research, testing, and technology development
- A facility for unmanned aircraft systems (UAS) and autonomous platform operations
- Staff and research lodging
- Operational support
- Spaces for teaching and training
- Access to the Arctic Ocean
- Access to the FAA-approved warning zone to conduct TBS and UAS operations

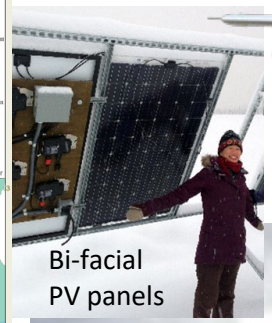
OPPORTUNITIES TO COMPLEMENT AND EXTEND ARCTIC RESEARCH

Location, Assets, and Experience at Oliktok

- **Location**: Near Prudhoe Bay, the USHARC site has access to coastal, marine and terrestrial environments. Connections via road and air transport to Barrow/Utqiagvik and Toolik Lake can serve to connect a network of Arctic facilities.
- **Road Access**: Dalton Highway connects Deadhorse to sub-Arctic Alaska, Toolik Lake Field Station, and the contiguous U.S. The site has access to local services, as well as seaports and airports for deliveries and global services.
- **Controlled Airspace**: At Oliktok and across the ocean toward the North Pole. This enables coordinated terrestrial + marine + aerial research and operations.
- **Unmanned Aircraft Systems (UAS)**: UAS facility at the station operated by UAF, with an airstrip and hangar; to serve research, testing, and development.
- **Communications and Data**: Broadband fiber-optic cable recently installed at Oliktok Point is fully operational. Secure communications at the USAF Long Range Radar Station is present.
- **Infrastructure and Services**: UAF and Sandia relationships with North Slope Alaska partners (e.g. oil companies, native corporations) offer equipment, skills and services; including medical facilities and emergency response teams.
- **Collaboration**: Spaces and systems for Arctic stakeholders at USHARC will connect to a network of Arctic stations for coordinated projects.
- **Research Support**: Both UAF and Sandia have experience with logistics and research in the Alaskan High Arctic. Station will be developed with lab spaces, logistic and operational support, prep areas, UAS facilities, utility systems, and lodging.

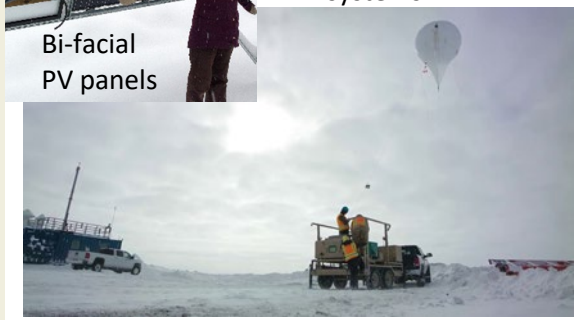






miniSAR radar system

Unmanned and tethered balloon systems



OLIKTOK USHARC SITE: UNIQUE ASSETS AND INFRASTRUCTURE

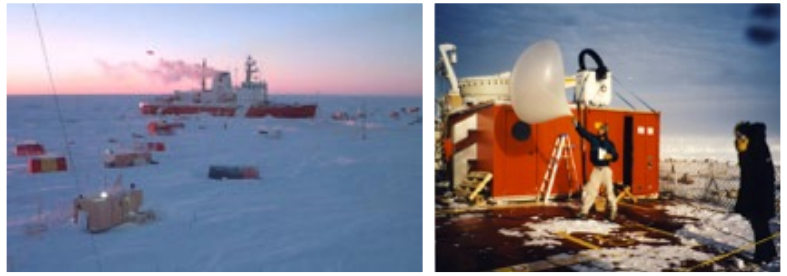
NETWORK PARTNERS FOR SCIENCE AND TECHNOLOGY DEVELOPMENT

Integrate and augment research via a facilities network

Integrate programs, capabilities, resources, and observation systems across stakeholder groups, the U.S. Arctic, and the pan-Arctic.

Example partners:

Toolik Lake Field Station (NSF, UAF, CH2MHill Polar)
NSF Arctic: LTERs (*Beaufort Sea Lagoons, Arctic LTER (Toolik/NSA Foothills), Bonanza Creek*); Navigating the New Arctic (*NSF Big Idea*)
Barrow Environmental Observatory (BEO)
NOAA Barrow Observatory
Barrow Arctic Research Center (BARC)
DOE High Latitudes Scientific Grand Challenge
NASA (ABoVE, Arctic COLORS)
NOAA Arctic Program, USAON
USGS (*Changing Arctic Ecosystems Initiative, Arctic Science Program*)
U.S. Army Corps of Engineers Cold Regions Research & Engineering Lab/CRREL
Office of Naval Research/ONR (SODA)
IARPC (*5-year Arctic Research Plans, Collaboration Teams*)
SEARCH
Canadian High Arctic Research Station/CHARS and PKC
International efforts (*e.g., SHEBA, MOSAIC*)
Wilson Center
Arctic NGOs



SHEBA Ice Camp and Sonde launch (1997)

BACKUPS

ARM CATEGORIES OF INSTRUMENTATION

- Surface Meteorological Sensors
- Wind, Temperature, and Humidity Profilers
- Cloud Observation Instrumentation
- Downwelling Radiation Sensors
- Upwelling Radiation Sensors
- Aerosol Instrumentation
- Gas Instrumentation
- Scanning Radars
- Scanning Lidars
- Field Campaigns