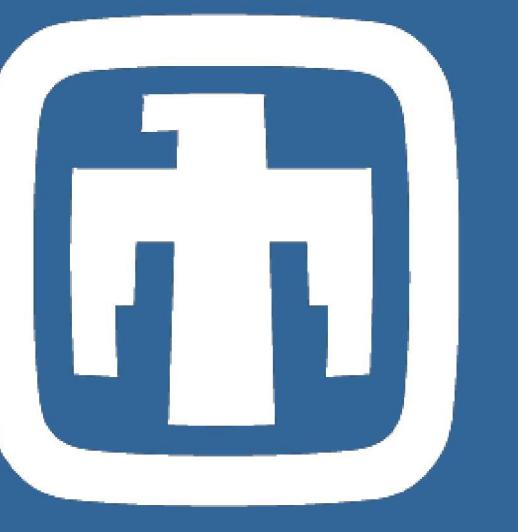


Strategies to Develop a Year-round Comprehensive US High Arctic Research Center in Alaska to Serve Broad National Interests



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Arctic Gaps of National Concern: Recent Reports

Energy, infrastructure, and transportation systems are at risk (Arctic Council 2009).

Opening Arctic is attracting significant international interest and activities focusing on natural resources (Nat Petrol Council 2015; Rosen and Thuringer 2017; Brigham 2014).

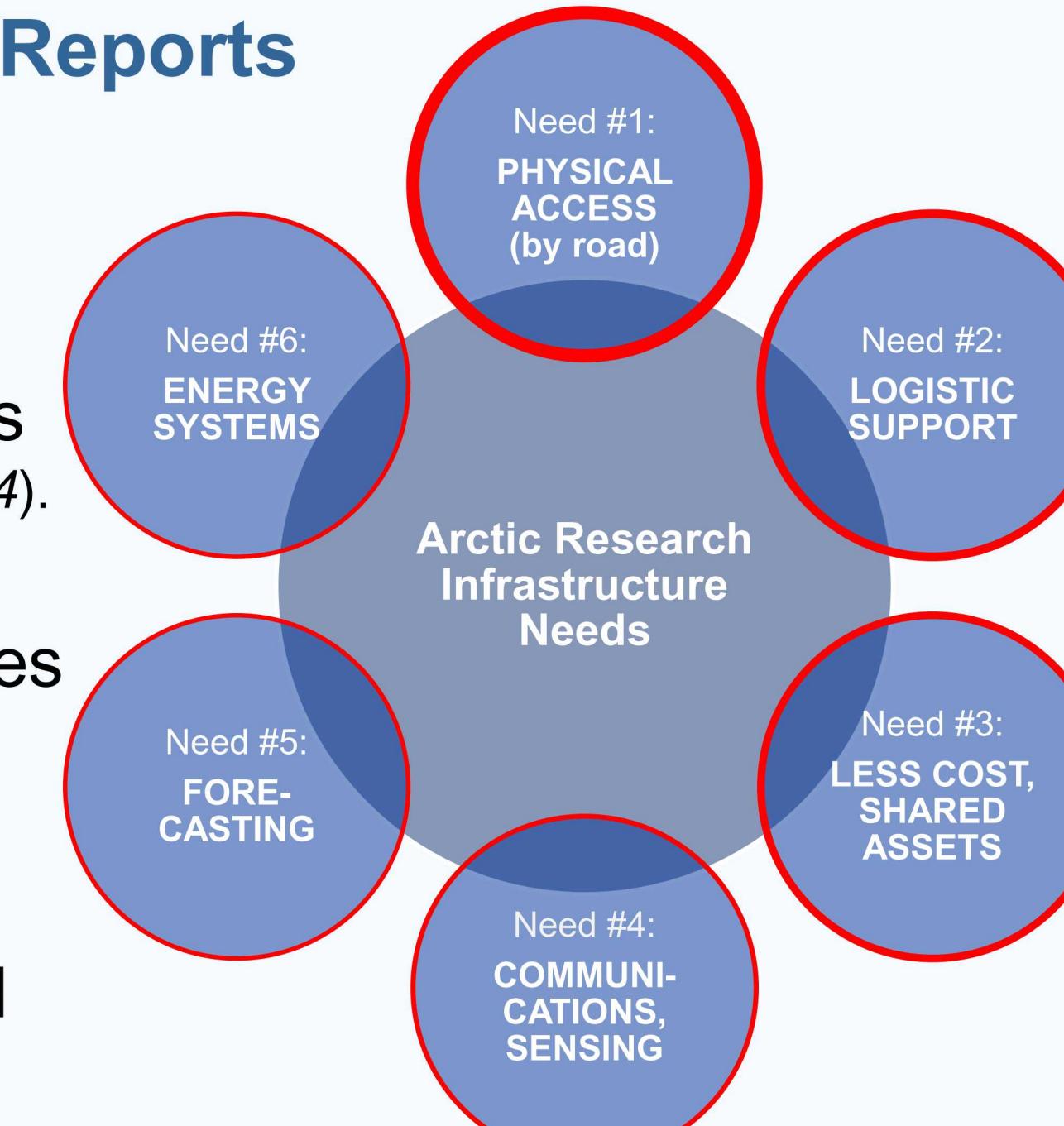
Opening Arctic brings new and complex national security, safety and emergency response challenges (DoD Arctic Strategy 2019; US Navy 2019; USCG 2019).

Need domain awareness, robust communications, multi-domain sensors, in-situ observations, and environmental modeling. Year-round presence and predicting the environment are critical to meet mission demands (DoD Arctic Strategy 2019; USCG 2019).

Arctic missions may include search & rescue; pollution detection & response; illegal fishing; illegal entry to the US; foreign surveillance or intrusion; missile defense; and attacks on the US. This will involve security, intelligence and science resources.



Given the scale, complexity and multi-dimension impacts of Arctic change, cost-effective, year-round access to multiple Arctic domains for R&D, technology testing and domain awareness is needed (Wilson Center Polar Institute 2019).



US High Arctic Research Center (HARC)

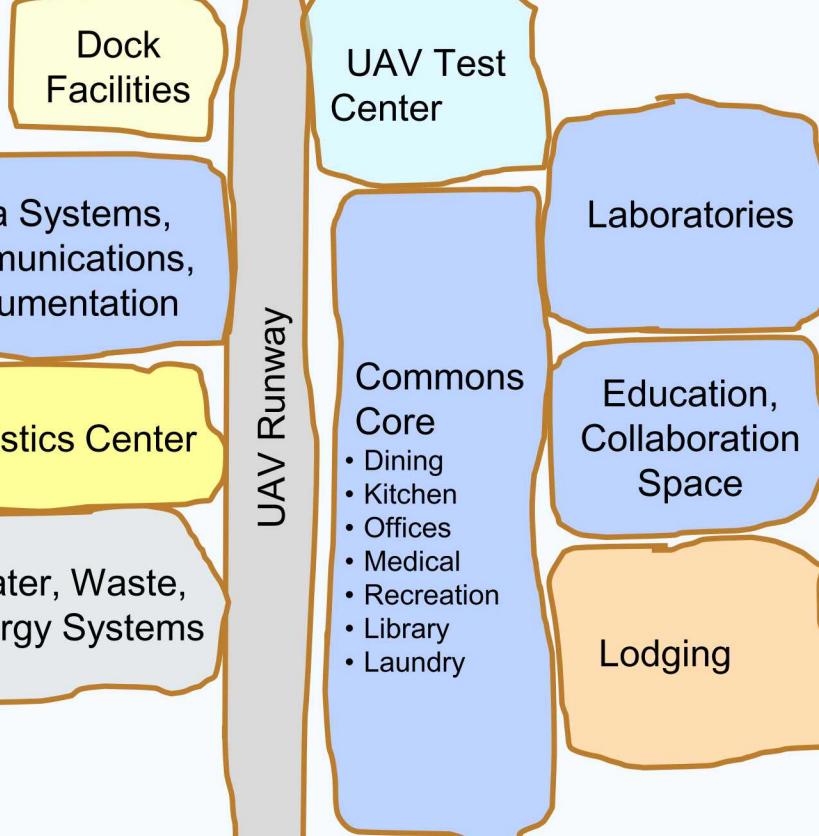
Concept: To develop a comprehensive multi-agency US High Arctic Research Center (HARC) as a national asset.



Vision: HARC shall be a national asset to support an Arctic science and security network to address the needs of many stakeholders. A proper network will enable research of Arctic environmental change, infrastructure resilience, emergency response, search and rescue, domain awareness, and technologies that support these – leading to economic development, environmental protection, and national security enhancements.

Next Steps

- Broaden outreach to Stakeholders beyond science research
 - Native & local communities
 - Industry partners
 - Security agencies
 - International collaborators
- Build partnerships
 - Government (Federal, State, Tribal)
 - Local communities
 - Industry
- Generate a proposal
 - Work with all stakeholders
 - Facility planning and site selection
- Obtain funding to construct facility
- Work with stakeholders to coordinate program development



HARC: Increase U.S. Presence in the High Arctic

To increase U.S. Arctic presence, support Arctic research, and expand operational capabilities. HARC can provide:

- A Permanent, year-round facility in the US High Arctic
- Facilities for Arctic research, technology testing, training
- Shore location: campaigns across land, sea, air, and ice
- Domain awareness support (deployment, sensor testing, data systems, unmanned/autonomous platform facilities)
- Expanded comms (and research for same)
- Support field campaigns and exercises
- Forecasts and real-time conditions
- Forward deploy equipment for response aid

"We need a U.S. Arctic location for exercises to employ networked multiple autonomous systems"

-Dr. Philip McGillary; US Coast Guard Pacific Area & Icebreaker Science Liaison; Arctic Observing Summit (Fairbanks, AK; March 2016)

Prudhoe Bay: Unique Infrastructure and Assets

Addressing operational gaps for Arctic Science and Security

Gap #1: ACCESS - Gap #2: SUPPORT - Gap #3: COST, RESOURCES, EXPERTISE

Location: HARC site has access to coastal, marine and terrestrial environments. Connections via road and air transport can serve to connect a network of Arctic facilities.

Road Access: Very rare in U.S. Arctic! Dalton Highway connects to sub-Arctic Alaska and the contiguous U.S.

Controlled Airspaces: At Oliktok and across the ocean toward the North Pole; enables coordinated terrestrial + marine + aerial research and operations.

Transport Infrastructure: Includes Roads (land access); airports (flight access); and docks (marine access)

Utility Systems: For Electrical power; Communications; high-speed fiber-optic Data; Water and waste treatment; Gravel pits (State of AK); Fuel.

Services: For Medical, Fire, and Emergency services; Warehousing and storage, technical maintenance, housing, food service, shipping and supplies, etc.

Opportunity: "Jump start" HARC from agreements to use existing vacant or underutilized facilities?



Opportunities to serve Arctic stakeholders

A logistics hub and complement to existing Arctic research facilities

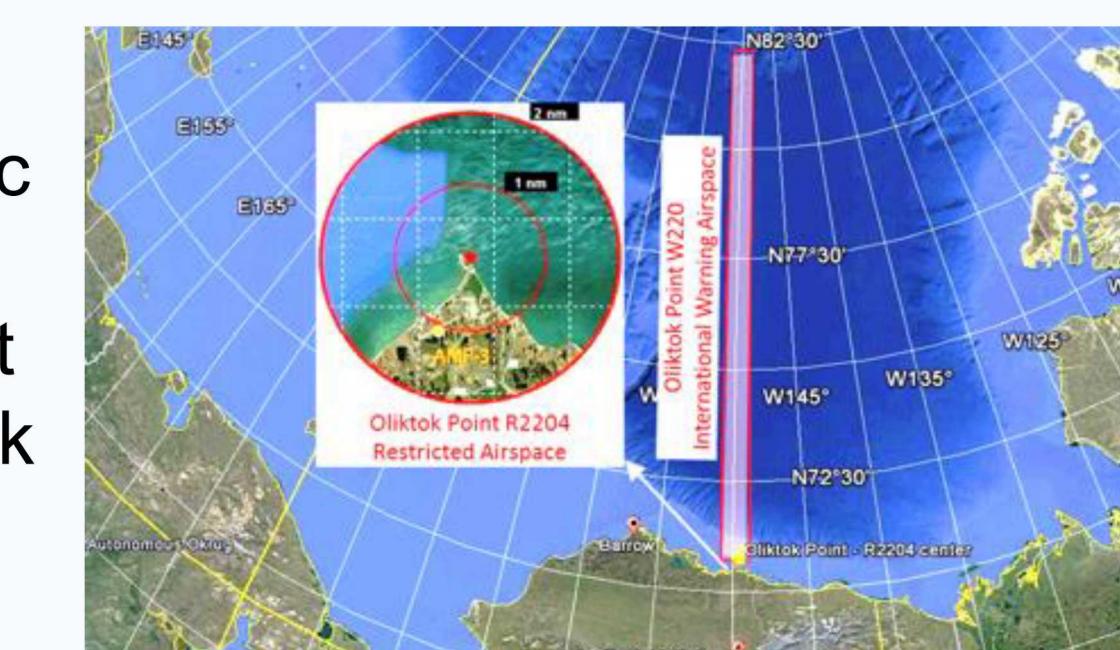
- All programs benefit from a robust networked Arctic research infrastructure



- Coordinate with Barrow Arctic Research Center, Barrow Environmental Observatory, Toolik Lake Field Station, NOAA Observatory, DOE-ARM, NGEE-Arctic (Nome and Utqiagvik), Teshekpuk Lake Observatory, AOOS, and others.

Outreach support

- Communities (e.g. Kaktovik Summer Oceanography Program, Collaborative Alaskan Arctic Studies Program (CAASP; marine mammal health assessment, ringed seal tagging, surface current mapping), NSB programs for STEM and technical education to support local technical/science skills
- Government (e.g. Nearshore Fish Surveys, USCG Arctic Shield (search and rescue), NSF Beaufort Lagoons LTER/Arctic LTER)



International collaborative Arctic programs and partners

- Examples: Arctic Coast Guard Forum (ACGF), INTERACT, Forum of Arctic Research Operators (FARO), Canadian High Arctic Research Station (CHARS), Oceans Network Canada, ArcticNet, Intern'l Coop. Engagement Program for Polar Research (ICE-PPR), IASOA, Global Terrestrial Network for Permafrost (GTN-P), Arctic Circumpolar Coastal Observatory Network (ACCONET), Arctic Observing Network (AON), University of the Arctic

Programs and Projects integration

- DHS Arctic Domain Awareness Center/ADAC,
- NASA Arctic COLORS (e.g. Colville River research)
- NSF: LTERs (e.g. Arctic Lagoons); NNA (e.g. multi-domain, multi-disciplinary research support); Sikuliaq (shore prep, storage, and dock support); coordination with BARC, Toolik Lake, other programs.
- Navy: Ice Exercise (ICEX); SODA (e.g. concurrent ACUASI UAV campaign)
- Support indigenous knowledge integration with BOEM, UIC, ARCUS, etc.



Credit: Sebastian Saarlos, April 2016; https://www.army.mil/article/166773/soldiers_sled_to_transport_equipment_tested_in_alaskan_cold

Summary Findings from recent HARC Engagements

Ice-Diminished Arctic Symposium (July 2019, Wash DC)

- HARC could be a national asset that acts as a long term presence. High value for research as we improve unmanned systems, communications, sensing, etc.
- Navy:** Comm's issues every time we are in the Arctic. Accurate and timely weather predictions need to support operations. Power systems are critical.
- USCG:** Comms #1. Definite value of a research station. Interest in 'warning area' for operations, and facility to test equipment. Facility also for general help, e.g. USS Healy efforts and exercises to improve response capabilities. Year-round facility would extend research as USS Healy is out only in summer. Research focus 2019 was comms; 2020 focus is AUVs. Plan to study hazardous spills.
- USAF:** Ability to operate could expand with HARC, e.g. to train in Arctic. Research of weather and impact on aircraft is critical (ex: ice fog, wind, snow, icing).

"It's all about sharing... and having the ability to maneuver. It's expensive to work in the Arctic and sharing resources makes sense."

[Mike Kristjansen; Logistics Manager, Canada Polar Continental Shelf Program (site shared with Armed Forces Canada Arctic Training Center)]

Arctic Shield 2015: Oliktok Point site and airspaces were used to deploy a UAV for the public-private search and rescue exercise.

Credit: USCG Petty Officer 2nd Class Grant DeVay

- NSF HARC Workshop for science need (Nov. 2019, Fairbanks, AK)
 - Key science drivers and unique opportunities at Prudhoe Bay were identified:
 - Beaufort Sea has significant gaps** in observations and monitoring
 - Impacts of (and on) **human activities** are poorly understood
 - Inter-agency/public-private collaborative opportunities
 - Need high resolution measurements across all domains to **support high resolution modeling and coupling for process-level dynamics**
 - Opportunity to **test new technologies** (e.g. unmanned systems and sensors)
 - Year-round facility for seasonal transitions** that are scientifically interesting
 - Identified specific **science gaps, operational needs, and technology uses** in four key science areas.
- ASM2019 North American Arctic coordination (Dec. 2019, Halifax)
 - North America assets collaboration can enable effective research to fill gaps.
 - Coordination can save costs, better support domain awareness and response.
 - Indigenous Network: knowledge supports planning, monitoring, response, and program decisions.

