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Arctic Infrastructure Research Group (AIRG) and Arctic Infrastructure Research Center (AIRC)

Problem Statement

The Arctic region is an area of strategic importance to the United States as the Department of Defense (DoD) confronts the challenges of an evolving geopolitical and changing physical environment. Vast, remote areas with extreme cold temperatures, high winds and snow complicating operations and support define the Arctic environment. The 2021 U.S. Army Arctic Strategy requires the Army to "provide equipment for Arctic-capable formations able to operate at extreme temperatures, down to -65° F for multiple days at a time. Significant gaps exist for developed and tested cold theatre infrastructure capable of meeting DoD requirements. The shortfall is most urgent for survivable expeditionary infrastructure to accommodate rapid force projection in any Arctic location, with ideal capability of evolution to semi-permanent encampments or permanent installations. Ground conditions are particularly challenging (Figure 1) where thawing permafrost and resultant settlement can detrimentally impact foundation stability. The ERDC Arctic Infrastructure Research Program facilitates development and evaluation of novel solutions addressing near-term and long-term technology gaps, providing efficient and long-lasting structures for all types of Arctic operations.

Figure 1. Arctic terrain, located at high latitudes, is vast and remote with high winds, snow, and extreme cold temperatures

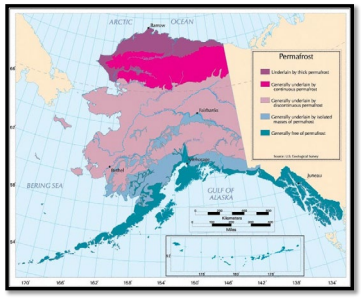

Figure 2. Features permafrost, or permanently frozen ground

Approach

ERDC established the ***Arctic Infrastructure Research Group (AIRG)*** in 2020 as a forum to classify Arctic infrastructure needs, identify gaps, and pursue solutions and technical advancement. AIRG membership includes all branches of DoD, who meet monthly to discuss all aspects of physical infrastructure utilized to facilitate Arctic military operations and support.

ERDC simultaneously established the ***Arctic Infrastructure Research Center (AIRC)*** in Fairbanks, Alaska to provide DoD with a critical full-scale and realistic Arctic testing and experimentation of infrastructure innovation. The AIRC is located on DoD land and comprises 134 acres with access roads, earthen pads, high power electricity, fiber-optic internet, roadway/runway test embankment, and sections for cold weather concrete testing. The AIRC facilitates new technologies, methods and research advances to increase Arctic warfighter safety/survivability and enable the Operating Force to meet new Army and DOD Arctic Strategies.

Objectives

The Arctic Infrastructure Research Program addresses the following objectives:

- Provide a DoD-wide platform to collaborate on infrastructure gaps and determine joint solutions.
- Advance solutions to important applied engineering infrastructure issues potentially hampering the Arctic DoD mission. Topics include:
    - cold resistant and robust structural and insulation materials
    - flexible foundation systems
    - efficient power generation/use/storage
    - innovations in water and wastewater supply/treatment/storage
    - robust pavements/embankments for airfields and roadways
    - sensors and monitoring methodologies.
- Conduct innovative research into new technologies and requirements for Arctic hardened infrastructure.
- Develop and evaluate new material and system technologies for both vertical and horizontal structures.
- Assist and provide alternatives for structures and basing planning.
- Publicize solutions and benefits from Arctic-centric infrastructure research to build awareness and address DoD's evolving infrastructure needs.
- Capitalize on the applied results to formulate hypotheses to investigate the larger impacts of the changing Arctic.

Benefits

The Arctic Infrastructure Research Program optimizes the sizeable DoD and Homeland Security investment in Arctic infrastructure to meet new mission requirements across the range of fixed, temporary, or expeditionary systems. Additional benefits include advancing new technologies, designs, and construction methods specifically tailored to unique Arctic conditions. The AIRC provides full-scale research and development capabilities for Arctic expeditionary/temporary structure systems and other ERDC research areas providing in-situ Cold Regions evaluations.

Points of Contact

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Learn More

ERDC Permafrost Tunnel Research Facility
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