Capabilities – Arctic Infrastructure Research Center (AIRC)

Expeditionary Infrastructure

Expeditionary infrastructure addresses most concerns for military exercises and Arctic and sub-Arctic field work, including instrumentation readiness, structural integrity, research processes, environmental impact, permafrost challenges, and Arctic hazards such as weather, wildlife, and natural events. This includes:

- Testing cold-weather capability of expeditionary shelters
    - Evaluating internal temperatures, heat footprint, insulation, and materials
    - Testing field readiness and requirements for the necessary time commitment for setup, gear, tools, and manpower
- Studying permafrost degradation under large- and small-scale infrastructure (roads, foundations, shelters, maintenance platforms, etc.) to be applied to field work and large-scale infrastructure installation

Power & Energy

Power and energy research addresses reliable and sustainable energy sources for field operations. It focuses on the generation, storage, and efficient use of energy in extreme cold. This includes:

- Testing sustainable and reliable power generation methods suitable for extreme cold, including portable generators, solar arrays, and hybrid systems
- Evaluating energy storage solutions, such as batteries and fuel cells, under low temperatures
- Optimizing energy consumption for shelters, communications, instrumentation, and field operations

Water & Wastewater

Water and wastewater research ensures safe water use and disposal in remote Arctic environments. It emphasizes hygiene, environmental protection, and field practicality. This includes:

- Assessing water collection, purification, and storage methods in frozen or remote environments
- Testing wastewater management systems that prevent environmental contamination and maintain hygiene in extreme cold

- Developing protocols for safe handling and disposal of graywater and blackwater in Arctic field conditions

Logistics Infrastructure

Logistics infrastructure focuses on moving personnel and equipment safely and efficiently in Arctic conditions. Research examines vehicle performance, terrain challenges, and operational planning. This includes:

- Testing the performance and durability of ground transport vehicles under extreme cold, snow, and ice conditions
- Evaluating mobility aids, such as tracked vehicles, snowmobiles, and all-terrain platforms, for personnel and equipment transport
- Assessing route planning, obstacle mitigation, and emergency response capabilities in Arctic and sub-Arctic terrain