

# SUMMIT STATION GUIDE 2024

**Battelle Arctic Research Operations**  
<https://battlearcticgateway.org/>

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## Summit Station Guide

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The pristine environment of the ice sheet surrounding Summit Station, and the historical context of the GISP2 paleoclimate record, has made Summit Station an ongoing research site for investigating high-latitude physical processes, atmospheric and snow science, ice core interpretation, and climate change. Astrophysical research projects are drawn to the site's high altitude, northern latitude, and isolation. As the only such year-round facility located on the Greenland ice sheet, Summit Station has an expanding role as an access point for international science activities in the region. The purpose of this document is to acquaint researchers with the research environment at Summit Station, and to identify responsibilities and processes for ensuring a successful cooperative endeavor. The station and its surroundings are carefully managed to minimize the impacts of activities on current or future science, and the participation of science groups is important to this process. Ongoing upgrades will continue to facilitate cutting-edge science at this unique observation site.

## COVID-19

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**Since March 2020, travel to Greenland for research and operations has been impacted by the COVID-19 pandemic. Current NSF protocols related to deployment are maintained [here](#).**

Researchers are responsible for abiding by all federal, regional, and local COVID-19 guidelines and requirements.

## Planning Process

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Those wishing to work at Summit Station must contact Battelle ARO Science Planning Administrator, Naomi Whitty ([arctic.planning@battelle.org](mailto:arctic.planning@battelle.org) +1.303.551.3505). Battelle ARO will distribute a *Requirements Questionnaire* to the researcher to determine the scope, impact, and feasibility of the project. B-ARO can also answer logistical questions and will provide a proposal estimate to specify project cost, which must be included with proposals to the NSF and other funding agencies. Learn more about available proposal assistance at <https://battlearcticgateway.org/researchers/> B-ARO will work closely with the research team to keep logistics and support within scope. Planning will be an ongoing process that will be finalized a few weeks before the project deploys for the field.

Science teams planning to work in Greenland must comply with all permitting requirements of the Government of Greenland. An overview can be found on the Ministry of Nature, Environment and Justice website: <https://exp.gl/About>

Additional permit information: <https://exp.gl/Legislation--Logistics>

Many projects working at Summit Station (or in Summit area allotment boundaries) are included in the Summit expedition permit acquired annually by Battelle ARO but must independently submit a sub-permit application to the Government of Greenland. Groups traveling on long day trips from the station may be required to apply for an Expedition Permit. More details may be [found here](#).

# Conducting Research: Roles and Responsibilities

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## Science Coordination Office (SCO)

The diverse and interconnected research conducted at Summit Station and the dry snow zone of the Greenland ice sheet is facilitated by the Science Coordination Office (SCO) <https://geo-summit.org/> The role of the SCO is to support decision-making processes concerning current and future Summit Station activities, and to protect the pristine character of the site as a long-term resource for science. The SCO is composed of researchers who have a comprehensive understanding of the operational requirements, science activities, and infrastructure at the station. Researchers considering fieldwork at Summit Station must contact the SCO at [sco@geo-summit.org](mailto:sco@geo-summit.org) during the proposal stage.

## Science Project Manager for Summit Station

The Battelle ARO science project manager (PM) coordinates logistical support for research projects at Summit Station. They work directly with researchers to develop season plans prior to deployment to Summit Station. These plans include details of facility access, technician assistance, equipment usage, lodging, transportation, cargo, field risk management, and other support provided by Battelle ARO. The PM coordinates with research teams and the SCO to efficiently use Summit resources and to avoid conflicts between science projects. The PM also supervises the year-round Summit Station science technicians and their support of ongoing research, and coordinates with the site supervisor and other staff to ensure that project needs are met while groups are in the field.

Contact the science project manager (a Battelle ARO PM is assigned to assist with proposal estimation and for management of support once the proposal is awarded) with questions regarding Summit Station, project support, and any changes to project plans.

## Summit Station Science Technicians

Science technicians are available year-round at Summit Station to provide hands-on project support. Science technician responsibilities include inspection of instrument components, frost removal, sample collection, routine service and calibration, reporting and documentation, as well as diagnostics and repairs in close coordination with researchers.

Researchers requiring science technician services must request this support at the project planning stage. The researcher then works with the PM to provide comprehensive science protocols. This information will be reviewed by Battelle ARO to ensure the protocol provides adequate guidance for the science technicians and is supportable within the staffing level planned for the season.

Experimental research sometimes requires extended troubleshooting. However, if the time committed to any given project routinely exceeds the anticipated level by 25% or more, it may adversely impact other projects. In such an event, the PM will assist with identifying solutions. All equipment, instrumentation, and science protocols must be fully operational before the science technicians can assume responsibility for an experiment.

Effective science technician support requires researcher engagement. Researchers must communicate with the science technicians to ensure that support requirements are met. When contacted by the science technicians regarding an experiment, it is the researchers' responsibility to respond promptly.

## Construction Support

All requests for construction support must be communicated to the PM during the proposal estimation process. This includes even seemingly small requests such as cutting of wall penetrations or minor carpenter assistance in mounting equipment. The Battelle ARO construction team works on a closely planned schedule, and unforeseen tasking can be very impactful or unsupportable.

Because of electrical and safety code requirements, special power demands must be coordinated in advance, so a licensed electrician can be assigned as needed. Project power requirements should be communicated during planning, as station power production and power loads are closely tracked. Power at Summit Station is typically provided as 110 VAC, 60 Hz, with US-style power outlets. Requirements outside these parameters must be discussed during the planning process. In no case will researchers be allowed to modify grid-tied electrical components themselves.

## Summit Station Site Supervisor

The Summit Station site supervisor has the final authority on safety and operational issues at Summit Station. They lead a daily morning briefing to discuss weather, planned work activities, flight operations, and any other station-wide concerns. Attendance is required for all station personnel, including researchers, unless coordinated in advance.

Based on weather conditions, the site supervisor may limit or prohibit travel or other activities.

Any concerns or requests concerning onsite operations should be promptly addressed to the site supervisor. The site supervisor will redirect researchers to their PM as appropriate.

## Polar Code of Conduct

NSF-supported Arctic research field sites, camps and stations are managed in accordance with NSF policy:

**NSF Polar Code of Conduct:** [https://www.nsf.gov/geo/opp/documents/policy/polar\\_coc.pdf](https://www.nsf.gov/geo/opp/documents/policy/polar_coc.pdf)

**NSF Harassment Notice:** <https://www.nsf.gov/pubs/issuances/in144.jsp?org=NSF>

The Battelle ARO site supervisor has the responsibility and authority to address issues and may remove any participant who is exhibiting unacceptable behavior from a field location.

## Cargo

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All cargo destined for Summit Station is routed to Kangerlussuaq prior to shipment to Summit Station via the 109th New York Air National Guard (ANG). Cargo can arrive in Kangerlussuaq via commercial air from Europe or via the ANG from Stratton Air Base in Scotia, NY. ANG flights are limited and researchers must conform to the flight schedule; all cargo requirements must be communicated as early as possible to the PM.

It is the researcher's responsibility to ensure all inbound and outbound shipments are accurately entered into the Cargo Tracking System.

[Cargo Tracking System \(CTS\)](#)

[Cargo Tracking System Instructions](#)

[ANG Customs and Cargo Instructions](#)

All hazardous cargo must be identified to the PM prior to shipment. Researchers are responsible for hazardous cargo arrangements and must provide SDS to the Summit Station site supervisor upon arrival.

Researchers are also responsible for return shipping and disposal of hazardous cargo. All hazardous cargo shipped out of the field requires certification: if the research team is not qualified to certify hazardous cargo, Battelle ARO field personnel must be notified upon arrival for arrangements.

Retrograde cargo is generally requested to be submitted to the Battelle ARO cargo coordinator 1.5 days before the outbound flight. This allows for the cargo to be palletized, weighed, and reported on flight manifests.

Researchers must remove all supplies from Summit Station at the end of their deployment.

For efficiency in the field, plan returning science cargo shipments prior to deployment.

At Summit Station, an outdoor cargo line is provided for storing shipping containers, gas cylinders, and spare materials. Indoor heated storage is available for sensitive items that cannot freeze; however, such space is very limited and closely managed. Researchers must work with the PM to identify indoor storage needs during the proposal estimation process.

## Travel to Summit

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Please review the [Greenland Guide](#) for Greenland deployment travel requirements. It may also be useful for researchers to visit <https://geo-summit.org/> for information on current research projects, conditions, and services.

Contact the PM if there are questions prior to departure or during travel.

## Travel to Kangerlussuaq

Researchers can travel to Kangerlussuaq on commercial carriers from Copenhagen, Denmark or on the Air National Guard (ANG) from Stratton Air Base in Scotia, New York, USA. Refer to the [Greenland Guide](#) for further details.

## Travel from Kangerlussuaq to Summit

Upon arrival in Kangerlussuaq, Battelle ARO staff will provide a briefing on the Kangerlussuaq to Summit Station flight. Schedules are highly dependent on weather and subject to change.

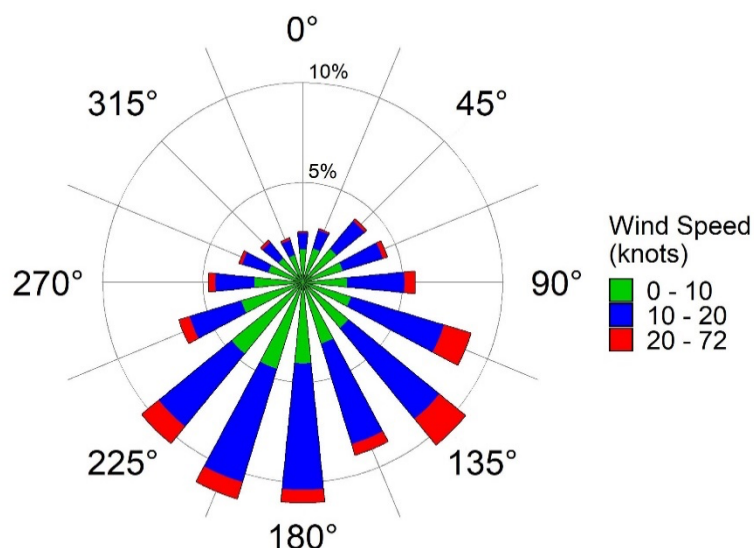
Summer flights to Summit Station are on ski-equipped LC-130 operated by the ANG. Flight duration is approximately two hours. Appropriate dress is required, with cold-weather gear at hand, as disembarking passengers will experience outdoor Summit Station weather conditions upon arrival. After exiting the aircraft, passengers will be directed to walk about 200 meters to the central Big House structure where the Battelle ARO site supervisor and station medic will greet arrivals and provide a briefing. Except for hand-carry items, all baggage and cargo will be offloaded by the Summit Station staff and ANG crew.

## Site Context and Climatology

Summit Station is named for its proximity to the apex of the Greenland ice sheet. Located in the dry snow region, approximately 400 km from the east and west coastlines, Summit Station experiences ~0.7 m snow accumulation per year. As Summit Station is co-located with the GISP2 borehole, it both benefits from and enhances the interpretation of a ~110,000-year reconstructed climate record. Due to its high latitude and high altitude, Summit Station offers access to free tropospheric air. Summit Station is within the Northeast Greenland National Park at N 72.6° W 38.5° and 3,250 m (10,530 ft) AMSL.

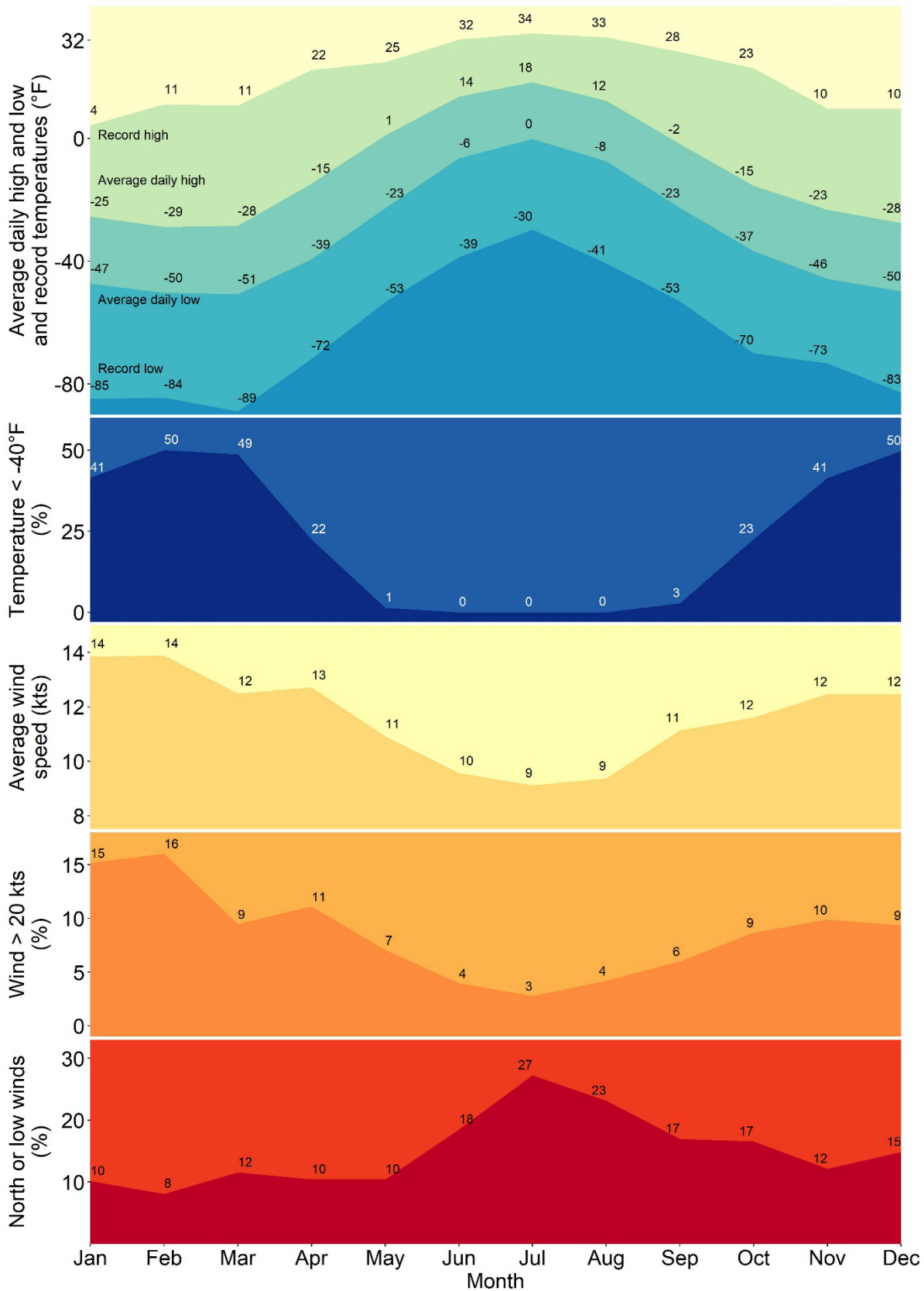
The pressure altitude at Summit Station ranges from about 10,000 to 12,500 ft. Recorded temperature extremes since 2009 range from -89°F in the winter to 34°F in the summer. Summertime winds average 10.2 knots but can exceed 40 knots during storm events. Wintertime winds are often stronger; sustained speeds of over 70 knots have been recorded.

### Summit Station Wind Speed and Direction



# Summit Station, Greenland

## Annual climatology



Source data NOAA ESRL 1-minute averages, July 2008 to Sept 2021



## Station Layout

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Summit Station is a remote research station that exists solely to support science. The station houses a variety of structures designed to support a population that ranges from a minimum of five staff members during the winter to a maximum of approximately 41 staff and researchers during the summer.

The Big House is an elevated building that serves as the coordinating hub and center of station activity. It contains the kitchen and dining area, site supervisor and science technician offices, communications equipment, a bathroom, laundry, and lounge.

The Berthing Module contains a medical clinic, emergency food supply, communications equipment, five bedrooms, and one bathroom.

Diesel generators in the Summit Mobile Garage (SMG) power the station. The SMG also houses mechanic workspace and scientific balloon preparation equipment.

The two year-round science structures at Summit Station are the Atmospheric Watch Observatory (AWO) and the Mobile Science Facility (MSF). The AWO is located within the Clean Air Sector, a limited-access science zone 700 meters south of the main station structures. The MSF is located 200 meters east of the Big House.

## Services, People and Living

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### Accommodations

All researcher berthing is within communal, hard-sided structures. Participants should expect to have a roommate. Participants are provided with bedding but are responsible for providing their own sleeping bags and emergency sleeping pads. As most researcher berthing is passively heated, Arctic-grade winter sleeping bags are required. Both passively heated outhouses and indoor bathrooms with sinks are available.

The sleeping bag and emergency pad are also a requirement to support participant safety in the event of an aircraft forced landing away from human infrastructure.

### Food

Summit Station kitchen is staffed to accommodate non-vegetarian, vegetarian or gluten-free "friendly" meals (providing lunch and dinner 6 days per week). Any travelers with specific dietary concerns please plan to bring supplemental supplies. Breakfast and snacks are self-serve, with a range of food items available at any hour. On Sunday, staff and researchers are asked to serve themselves from leftovers or to prepare their own meals. The Battelle ARO site supervisor will assign 'house mouse' duty on a rotating schedule to both staff and researchers. Those assigned as 'house mouse' are expected to dedicate a significant portion of the day to chores, cleaning, and kitchen assistance.

## Phone

Phone connections from Summit Station to offsite locations are enabled via VoIP, VSAT, and Iridium technologies. For non-emergency use, Battelle ARO requests that researchers only use the VoIP phones, as these are the most economical. Phones are available at several locations and Wi-Fi calling is available.

## Computers and Internet

Summit Station is equipped with a satellite network connection, and wireless access points are available in many buildings. This connection is available for researcher use. However, the system capacity is intended to accommodate limited offsite communications and cannot support intensive demands. The following guidelines are in place for network usage at Summit Station:

- Bandwidth is very limited. Science and work activities take priority over personal use.
- Discuss any data transfers (> 250 MB/day) in advance with the PM and Battelle ARO ITC.
- Disable auto-update features, cloud services, data synchronizing applications, podcast subscriptions, and other passive bandwidth uses on all computers and devices.
- Place devices on 'airplane mode' when not in use to reduce background usage.
- If possible, schedule network activities during periods of low usage.
- If overtaxed, the system becomes unusable for all parties, and critical science functions are impacted. If this occurs, Battelle ARO can institute strict policies to regulate usage.

## Money

No currency of any type is required at Summit Station, as no goods are available for sale. See the [Greenland Guide](#) for further information regarding currency use in Greenland.

## Medical

During the summer months, Summit Station is staffed with a full-time, on-site medic. Emergency and non-emergency telephone-medicine consultation is also available. The station clinic is stocked with a full field medical kit. In addition to these services, typically several staff members at the station have a Wilderness First Responder certification.

Upon arrival at Summit Station, the station medic will provide a medical information questionnaire. Be sure to bring a sufficient supply of prescribed medications, with the awareness that departure flights are often delayed, and that limited medications are available at Summit Station.

## Altitude Sickness

The pressure altitude at Summit Station typically ranges from 10,000 to 12,500 ft. Altitude sickness is a serious medical concern and can result in evacuation. Battelle ARO recommends that all participants consult with their physician regarding prescription medications for preventing altitude sickness. As past experiences at altitude are not predictive, repeat Summit Station visitors are encouraged to take precautions against altitude

illness.

There is no opportunity to acclimatize before arriving at Summit Station. Participants travelling through Kangerlussuaq will ascend from sea level. Follow these suggestions to minimize the risk of altitude sickness:

- Avoid alcohol for several days before and after arrival.
- Avoid fatty or greasy foods.
- Eat large quantities of carbohydrates for a few days before arrival.
- Drink plentiful hydrating liquid for a few days before arrival.
- Get adequate rest prior to and during travel.
- Plan for minimal physical labor during initial days of acclimatization after arrival.

## Conservation

Resources at Summit are precious. Participants are expected to be mindful and conserve when possible, both in their experimental design and in their onsite usage during the field season. Electrical power is produced by diesel generators using fuel supplied via aircraft. Electrically efficient instrument designs will reduce local combustion emissions and resulting science impacts, as well as reduce project support costs. Water is produced from snowmelt through a power and labor-intensive process. Limit laundry to no more than one load per week: bring clothing adequate to last for eight days. Limit showers to a maximum of once every four days barring extenuating medical circumstances. Hand soap and laundry detergent are supplied.

## Recreation

Basic recreational facilities and materials are available at Summit Station, including exercise equipment, board games, and books. Skiing, walking, or snow biking on the skiway or on approved flagged routes are also popular activities. A check-out policy applies to recreational travel; consult the Battelle ARO site supervisor for information.

## Drugs and Alcohol

Battelle ARO does not tolerate drug or alcohol abuse. Staff or researchers over the age of 21 who consume alcohol must do so responsibly. Anyone using illegal drugs or abusing alcohol will be sent from Summit Station on the next available flight.

Review rules regarding importation of alcohol prior to travel. Rules are subject to change. Customs and Greenland FAQs: <https://visitgreenland.com/plan-your-trip/#practical-info>.

## Vehicle Use and Travel

For safety reasons, locations in the Summit Station vicinity have been classified as either “in-station” or “out-of-station.” Different travel requirements apply to these locations. Travel requirements details are explained in the *Summit Station Travel Policy*, which the site supervisor will review with participants upon arrival. Contact the PM for information regarding project support in accordance with the policy.

At Summit Station a “pedestrian culture” is encouraged. Most areas can be reached by foot, and it is critical for the ongoing success of clean-air science to minimize emissions whenever

possible. Small sleds are available to facilitate transporting loads by foot.

Battelle ARO maintains a small pool of snowmobiles for use by staff and researchers. Snowmobile use must be approved by the site supervisor. Projects requiring snowmobiles must coordinate in advance with their PM to ensure that an appropriate machine is available and permissible at their project site. All snowmobile operators must receive training annually, and operators and passengers must wear helmets. Unauthorized or recreational use of snowmobiles is forbidden.

Operation of equipment in the clean air and other science sectors is strictly controlled, and requests must be approved by the PM and the SCO. Details and guidelines for access to the clean air sector are outlined in the *Clean Air Management Plan*, available from the PM.

## About this Guide

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This guide is intended to offer an overview of what to expect at Summit Station and the steps needed to initiate the planning process. It is not exhaustive and cannot provide all the information necessary for a safe and productive season at Summit Station. It does not substitute for a Battelle ARO-developed season plan.

This guide is updated annually.