S U M M I T

G U I D E

2 0 2 0

NSF ARSLS Logistics Contractor
http://cpspolar.com/

Prepared by NSF ARSLS Logistics Contractor
Updated January 2020

Contents

Summit Station Guide

Summit Station was established in 1989 as the Greenland Ice Sheet Project 2 (GISP2) drill site. Since then, it has developed to support a wide range of scientific research activities on a year-round basis. The fields of meteorology, glaciology, atmospheric chemistry, and astrophysics are represented, with other fields welcome. The station serves as a base for both campaign science and long-term environmental observations.

The purpose of this document is to acquaint researchers with systems for facilitating a quality research environment at Summit Station. This is achieved by identifying responsibilities and the processes through which we can ensure a cooperative and mutually rewarding endeavor. Short- and long-range plans are in effect to improve the station infrastructure, but the primary agent of change is you. The goal is to continue maintaining a world-class research facility and create an unparalleled example of environmental stewardship.

Planning Process

Those wishing to work at Summit Station must contact the Logistics Contractor's Greenland Science Planner, Jason Buenning (jason@polarfield.com; +1.303.984.1450 x207). The Logistics Contractor will distribute a *Requirements Questionnaire* to the researcher to determine the scope, impact, and feasibility of the project. The Logistics Contractor can also answer logistical questions and will provide a project cost estimate, which must be included with proposals to the NSF and other funding agencies. Learn more about available proposal assistance at http://cpspolar.com/for-researchers/proposal-assistance/. The Logistics Contractor will work closely with you to keep logistics and support within scope. Planning will be an ongoing process that will likely be finalized a few weeks before your project deploys for the field.

After your initial contact with the Logistics Contractor, the next step is to ensure your project meets the Government of Greenland permitting requirements. Visit www.nanoq.gl/expeditions to view requirements and download forms from the Ministry of Nature and Environment Section of Industry, Energy, and Research for conducting scientific research in Greenland. Almost all projects require government approval; you can find the guidelines and criteria on this webpage. Also, contact your Project Manager to determine if your project will fall under the existing permit that covers Summit Station.

Conducting Research: Roles and Responsibilities

Science Coordination Office (SCO)

The diverse and interconnected research conducted at Summit Station is facilitated by the Science Coordination Office (SCO). The role of the SCO is to support decision-making processes concerning current and future Summit 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 are required to contact the SCO at sco@summitcamp.org during the proposal stage.

Summit Station Science Project Manager

The Summit Station Science Project Manager coordinates the logistical support for research projects. The Project Manager works directly with researchers to develop season plans, including details of facility access, technician assistance, equipment usage, lodging, transportation, cargo and other support to be provided by the Logistics Contractor, prior to deployment to Summit. The Project Manager works with research teams and the SCO to efficiently use Summit resources and to avoid conflicts between science projects. The Project Manager also supervises the year-round Summit 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 Summit Station Science Project Manager (Sam Dorsi, sam@polarfield.com) with questions regarding Summit Station, support of your project, and any changes to project plans.

Summit Station Science Technicians

Summit Station Science Technicians are available year-round to provide hands-on project support. Science Technician responsibilities include inspection of instrument components, frost removal, manual gas or snow sample collection, routine service and calibrations, 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 Summit Science Project Manager to provide comprehensive science protocols. This information will be reviewed by the Logistics Contractor to ensure the protocol provides adequate guidance for the Science Technicians and is supportable within the staffing level planned for the season.

It is recognized that the nature of experimental research sometimes requires continued troubleshooting and development. 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 Project Manager 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.

The level of support the Science Technicians can provide is largely determined by the researchers who lead the project. Researchers must communicate with the Science Technicians to ensure that support requirements are being 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 identified in advance and discussed with your Project Manager. This includes even seemingly small requests such as cutting of wall penetrations or minor carpenter assistance in mounting equipment. The construction team works on a closely planned schedule, and unforeseen tasking can be very impactful.

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 is typically provided as 110 VAC, 60 Hz, with US-style power outlets. Requirements outside these parameters must be discussed with your Project Manager 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 all safety and operational issues at Summit. 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 Project Manager as appropriate.

Harassment

NSF-supported Arctic Research field sites, camps and stations are managed by the Logistics Contractor using the following guidelines**.** Professional conduct and acceptable behavior are mandatory for participants during work and non-work hours. Participants are expected and required to work cooperatively, to treat others with dignity and respect, to follow the site-specific policies and procedures, and to contribute to a safe work and living space at all times.

The Logistics Contractor site manager has the responsibility and authority to address behavior issues and may remove from a field location any participant exhibiting unacceptable behavior. This includes but is not limited to harassment, alcohol misuse, unsafe work behavior, and not following the site-specific policies and procedures. For more information on NSF's harassment policy visit: https://www.nsf.gov/pubs/issuances/in144.jsp?org=NSF

Cargo

All cargo destined for Summit Station is routed through Kangerlussuaq prior to shipment to Summit via the 109th New York Air National Guard (ANG). Cargo to Kangerlussuaq can arrive via commercial air from Europe or via the ANG from Scotia, NY. Researchers will be asked to conform to the ANG's schedule. Communicate all requirements as early as possible to your Project Manager, as space is often very limited.

Please refer to the Greenland Guide and/or Logistics Contractor website for details on how to prepare cargo for transport on the New York Air National Guard 109th flights.

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

All hazardous cargo must to be identified to your Project Manager prior to shipment. Researchers are responsible for hazardous cargo arrangements and must provide SDS to the Summit Station Site Supervisor upon arrival.

At Summit, an outdoor cargo line is provided for storing shipping containers, gas cylinders, and spare materials. Limited indoor heated can be provided for items that cannot be frozen. Work with your Project Manager to identify indoor storage needs prior to arrival at Summit.

Researchers are also responsible for return shipping of hazardous cargo. All hazardous cargo shipped out of the field requires certification: if you are not qualified to certify hazardous cargo, you must notify field personnel upon arrival for arrangements.

Researchers should plan to remove all supplies from Summit at the end of their deployment. Only priority items approved by the NSF via the Logistics Contractor Project Manager can remain over the winter season or beyond the end of the project life.

For efficiency in the field, we encourage you to plan outbound shipments prior to deployment.

Travel to Summit

Visit the Logistics Contractor website at www.polar.ch2m.com and review the *Greenland Guide* prior to your trip. It may also be useful for you to visit http://www.summitcamp.org and http://www.geosummit.org for information on current research projects, conditions, and services. If you are not a US citizen, consult the US Customs and Border Protection website at http://www.cbp.gov for information on visas.

Contact your Project Manager if you have questions prior to departure or enroute.

Travel to Kangerlussuaq

It is possible to travel to Kangerlussuaq commercially through Copenhagen or with the Air National Guard (ANG) from Scotia, NY. Please refer to the *Greenland Guide* for further details.

Travel from Kangerlussuaq to Summit

Upon arrival in Kangerlussuaq, Logistics Contractor staff will provide a briefing on current plans for the Kangerlussuaq to Summit flight. Schedules are highly dependent on weather and subject to change. It is advisable to regularly check the notice whiteboard located on the first floor of the Kangerlussuaq International Science Support (KISS) building.

Summer flights to Summit occur via ski-equipped LC-130. Flight duration is approximately two hours. It is important to dress appropriately, with cold-weather gear at hand, as disembarking passengers will experience outdoor Summit weather conditions upon arrival. After exiting the aircraft, passengers will be directed to walk about 200 meters to the Big House where the Station Site Supervisor and Station Medic will greet you and provide a briefing. With exception of your hand-carry items, which you should bring with you, all other baggage and cargo will be offloaded by the Summit staff and ANG crew.

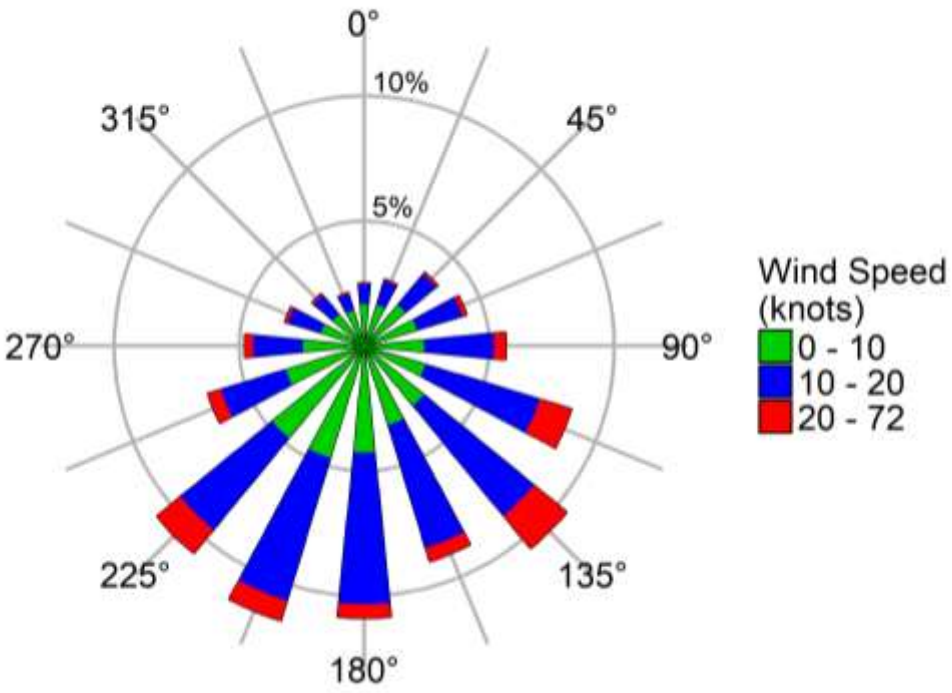
Site Context and Climatology

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 is co-located with the GISP II 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 offers access to free tropospheric air. Summit is within the North-East Greenland National Park at N 72.6° W 38.5° and 3,250 m (10,530 ft) AMSL.

The pressure altitude at Summit ranges from about10,000 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 71 knots were recorded in February 2018.

Summit Wind Speed and Direction

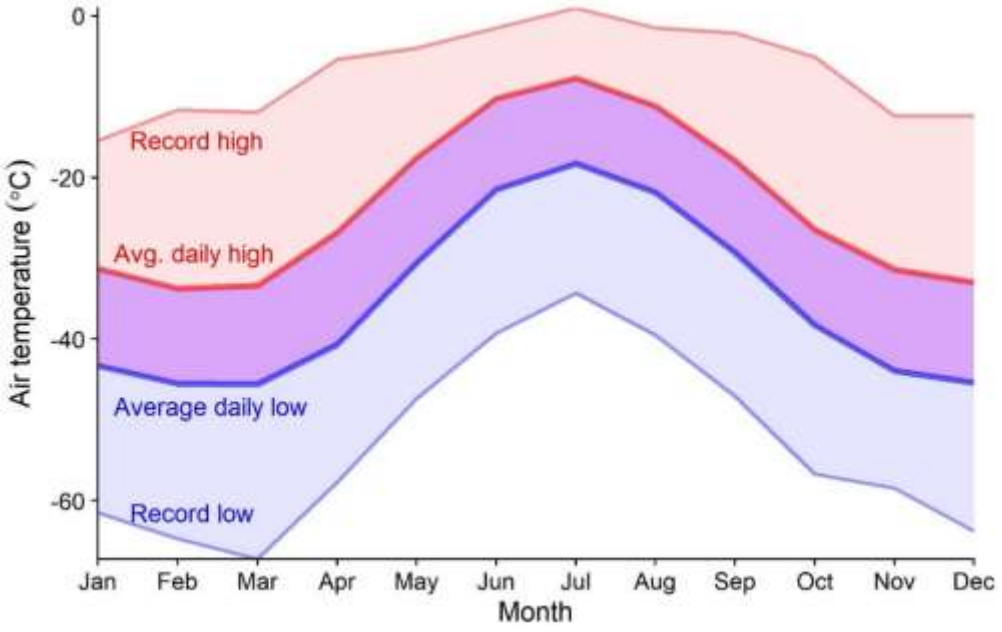
NOAA 10 m anemometer, 2009 - 2018

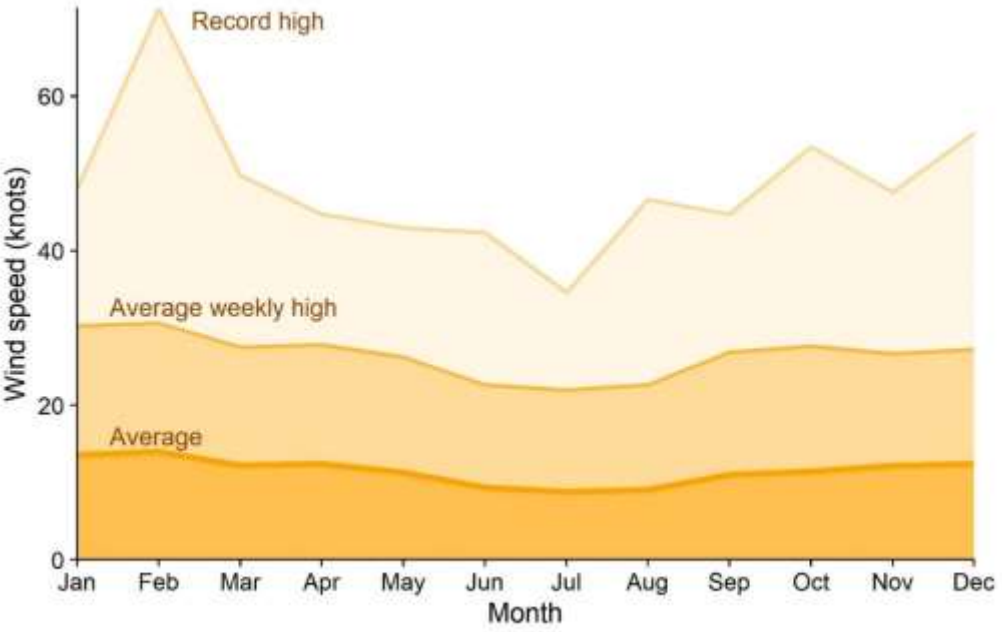


Summit Weather Summary Plots

(NOAA 1-minute data; 2008-07-01 to 2018-09-30)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Avg. Daily Low Temperature (°C)	-43.3	-45.5	-45.6	-40.7	-30.6	-21.5	-18.3	-21.8	-29.3	-38.3	-44.0	-45.4
Avg. Daily High Temperature (°C)	-31.3	-33.7	-33.4	-26.8	-17.6	-10.2	-7.7	-11.2	-17.9	-26.4	-31.4	-33.0
Avg. Wind Speed (knots)	13.5	14.0	12.2	12.4	11.3	9.3	8.8	9.0	11.0	11.4	12.1	12.4





Data NOAA 2008-07 to 2018-09

Station Layout

Summit is a remote research station that exists solely to support science. The station houses a variety of structures designed to support a highly variable population that ranges from a skeleton crew of four or five during the winter to a peak summer population of over 50.

The Big House is an elevated building that serves as the center of station activity. It contains the kitchen, dining area, Site Supervisor office, communications equipment, one bathroom, laundry, and a lounge.

The Berthing Module and Clinic structure is made from connected modules. It 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 a large mechanic workspace, a backup snow-melter for water production, and scientific balloon launching equipment. A standalone snow-melter structure provides the primary station water supply.

The two main science structures at Summit are the Temporary Atmospheric Watch Observatory (TAWO) and the Mobile Science Facility (MSF). The TAWO is located within the Clean Air Sector 700 meters south of Summit Station. The MSF is located 200 meters east of the Big House.

Services, People and Living

Accommodations

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

Food

Summit Station is staffed with a cook, who prepares lunch and dinner meals six days a week. Breakfast is self-serve, from a range of food items available at any hour. On Sunday, staff and researchers are asked to prepare their own meals or to serve themselves from leftovers. The 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 to offsite locations are enabled via VoIP, VSAT, and Iridium technologies. For non-emergency use, the Logistics Contractor requests that researchers only use the VoIP phones, as these are the most economical. Phones are available at several locations around Summit Station. Both researchers and staff are asked to limit personal phone usage, as the phones are primarily intended for priority science and business needs.

Computers and Internet

Summit 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:

- Bandwidth is very limited. Science and work activities take priority over personal use.
- Limit your time on the network so others can share the resource.
- Certain bandwidth-intensive activities are not permitted, including video conferencing (e.g., Skype), and downloading or streaming video content (e.g., YouTube).
- Discuss any data transfers (> 25 MB/day) in advance with the Science Project Manager.
- 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, the Logistics Contractor will institute strict policies to regulate usage.

Money

The Danish Kroner currency is used throughout Greenland. However, no currency of any type is required at Summit, 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, via a subcontractor. 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, several staff members on station have a Wilderness First Responder certification.

Upon arrival in Kangerlussuaq, anyone experiencing symptoms of illness should be evaluated prior to departure for Summit. Please alert the Kangerlussuaq Logistics Contractor staff of any developing medical condition that could compromise travel to Summit. Even a moderate cold can greatly diminish tolerance to altitude.

Upon arrival at Summit, 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.

Altitude Sickness

The pressure altitude at Summit typically ranges from 10,000 to 12,500 ft. Altitude sickness is a serious medical concern and can result in evacuation. For that reason, the Logistics Contractor recommends that all participants consult with their physician regarding prescription medications for preventing altitude sickness. As past experiences at altitude are not always predictive, even repeat Summit visitors are encouraged to take precautions against altitude illness.
You will not have a chance to acclimatize before arriving at Summit. Follow these suggestions to minimize the risk of altitude sickness:

- Avoid alcohol for several days before and after arrival at Summit
- 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 at Summit

Conservation

Supplying resources at Summit is both labor-intensive and costly. Accordingly, participants are asked to be thoughtful in their usage of resources. Power and water are available in limited supply and are expensive to produce. Power generation is primarily produced via diesel generators that burn fuel flown in by aircraft. Efforts to make electronics as efficient as possible will reduce local combustion emissions and resulting science impacts, as well as long-term operating expenses. Water is produced with a great deal of effort and energy by melting snow. Please plan on washing no more than one load of laundry per week: bring clothing adequate to last for eight days. Limit showers to a maximum of once every four days. Hand soap and laundry detergent are supplied.

Recreation

Basic recreational facilities and materials are available at Summit, including exercise equipment, a video library, and books. Skiing, walking or snow biking on the skiway or on approved flagged routes are also popular activities. A check-out policy for recreational travel is in effect; consult the Site Supervisor for information.

Drugs and Alcohol

The Logistics Contractor does not tolerate alcohol or drug abuse. Staff or researchers over the age of 21 may consume alcohol and are expected to drink responsibly. Anyone using illegal drugs or abusing alcohol will be sent from Summit Station on the next available flight.

All staff and researchers are required to abide by the Government of Greenland policy for importation of alcohol into Greenland. The policy is subject to change, and in past years importation of alcohol has been restricted or illegal. If you are interested in bringing alcohol with

you, please review Government of Greenland customs guidance for further information. Illegal import of alcohol is not tolerated.

Vehicle Use and Travel

For safety reasons, locations in the Summit vicinity have been classified as either “in-station” or “out-of-station.” Different travel requirements apply to these locations. The details of the travel requirements are contained within the *Summit Station Travel Policy*, which the Site Supervisor will review upon your arrival. Contact your Project Manager to help understand how your project will be supported 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 clear-air science to minimize emissions whenever possible. Small sleds are available to assist in transporting loads by foot.

The Logistics Contractor 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 Project Manager to ensure that an appropriate machine is available and permissible in their project site. All staff and researchers must receive snowmobile training, and occupants 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 Project Manager and the SCO. Details and guidelines for access to the clean air sector are outlined in the *Clean Air Management Plan*, available from your Project Manager.

About this Guide

This guide is intended to offer an overview of what to expect at Summit and how to start your planning. It is not exhaustive and cannot provide all the information necessary for a safe and productive season at Summit. It does not substitute for a Logistics Contractor-developed Season Plan.

This guide is updated annually, and suggestions or comments are welcome.

Please contact Summit Station Science Project Manager Sam Dorsi at sam@polarfield.com with any questions.