Field season 2024

East GReenland Ice core Project (EGRIP) 2015-2024: Seventh year of EGRIP deep drilling.

Prepared by Ice and Climate Group, NBI
for
The EGRIP project responsibles and participants and Danish and Greenlandic authorities.

EGRIP summer 2023.

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EGRIP 2024 introduction

This report provides international partners and Danish and Greenlandic authorities information on field activities in Greenland and it provides information to the participants on the conditions in Kangerlussuaq, and the field camp. It includes a summary of all individual travel dates and information on science programs. It also contains information and rules on environmental issues, work safety and disaster preparedness. All participants are assumed to be familiar with the content of this report.

In addition to general information, the report contains reference information of special interest for the Field Operation Managers and Field Leaders.

The SARS-Cov-2 pandemic has really upset all planning of completing the deep drilling and surface science work at EGRIP. The entire field seasons of 2020 an 2021 were cancelled; but in 2022 we were able to restore camp and in 2023 we were able to drill through the ice stream and into the basal material. This season, 2024, we will finish operations in the deep bore hole, do some replicate drilling tests, close the underground trenches and pack down camp for traverse to the old GRIP site in 2025.

The authors wish to express sincere gratitude to the U.S. National Science Foundation and their logistical agent Battelle ARO Polar Field Services (PFS) and to the New York Air National Guard (109th) for their assistance and their supportive actions in anticipation of the upcoming EGRIP field campaign. Without this assistance, little of what is planned for the 2024 season could be realized.

Copenhagen, February 22nd , 2024

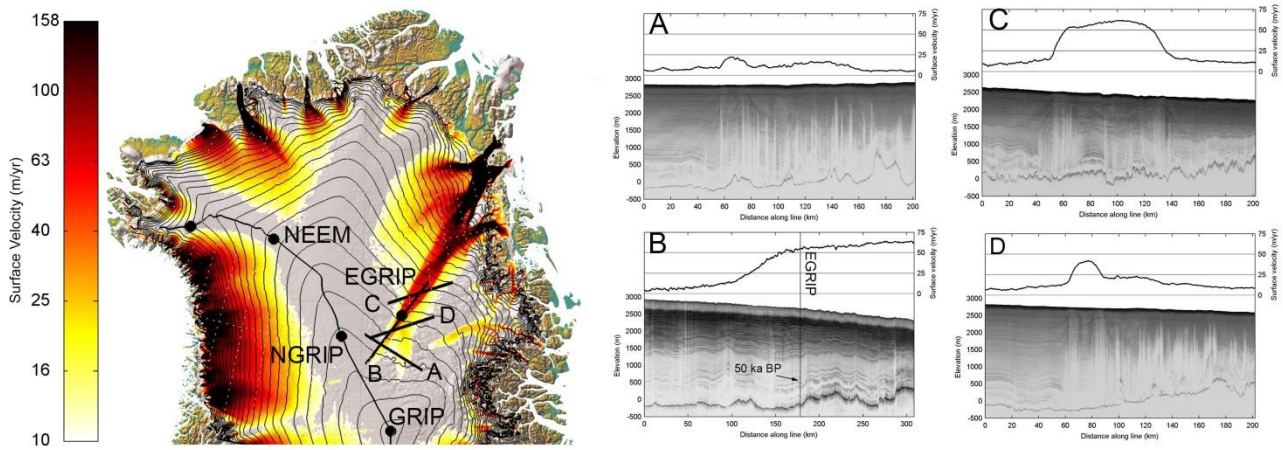
Iben Koldtoft, Grant Boeckmann, Dorthe Dahl-Jensen, Marie Kirk and J.P. Steffensen

The East Greenland Ice drilling Project (EGRIP)

EGRIP 2015-2024: Season 2024

Background:

The behavior of the fast flowing ice, ice streams through the Greenland ice sheet, is not well understood. The ice streams discharge ice into the ocean that accounts for half the loss of mass from the Greenland ice sheet and many ice streams have doubled their velocities during the last decade. There is a need to understand the processes of the ice streams before they properly can be included in ice sheet models which will enable predictions of future loss of mass from the ice streams and thus improve estimates of future sea level rise.



Map of Greenland and the North East Greenland Ice Stream (NEGIS). Velocities from RADARSAT synthetic aperture radar data are shown in color (Joughin, Journal of Glaciology, 2010) The deep drill sites and the main ice ridge are marked as well as the profiles (A-D) where radio echo sounding profiles have been recorded by aeroplane and surface velocities have been extracted from the map to the left. (B) Profile from University of Kansas 1999 (19990525_01_09, 19990525_01_10, 1990525_01_16) *showing that the ice thickness at the drill site, EGRIP, is 2550 m and that climatic undisturbed layers are detected to 50.000 years before present. The surface velocity is 51 m/yr at the drill site, EGRIP. (A,C,D) Profile from NASA Operation IceBridge 2013 using the University of Kansas depth penetrating radar across the ice stream clearly showing the margins disturbed by shear deformation (*profiles from 20120404_01_16 to 20120404_01_19 (A); *20130402_01_24 to 20130402_01_27 (C); 20130423_01_3 to 20130423_01_6 (D)) (figure produced by D.Dahl-Jensen)*

In North East Greenland, the largest ice stream in Greenland begins right at the central ice divide and cuts through the ice sheet in a wedge shape to feed into the ocean through three large ice streams (Nioghalvfjerds isstrømmen, Zachariae isbræ and Storstrømmen). The onset of the ice stream on the ice divide is believed to be caused by strong melting at the base and the ice reaches velocities over 100 m/yr 200 km from the ice divide, but still 500 km from the coast where the ice is heavily crevassed. EGRIP camp is a site without crevasses, where the ice is flowing as an ice stream. Drilling an ice core through the 2650 m of ice reaching to the bedrock would allow us to reach the following goals:

-study the dynamics of the ice flow in an ice stream by ice rheology and deformation studies of the ice core.

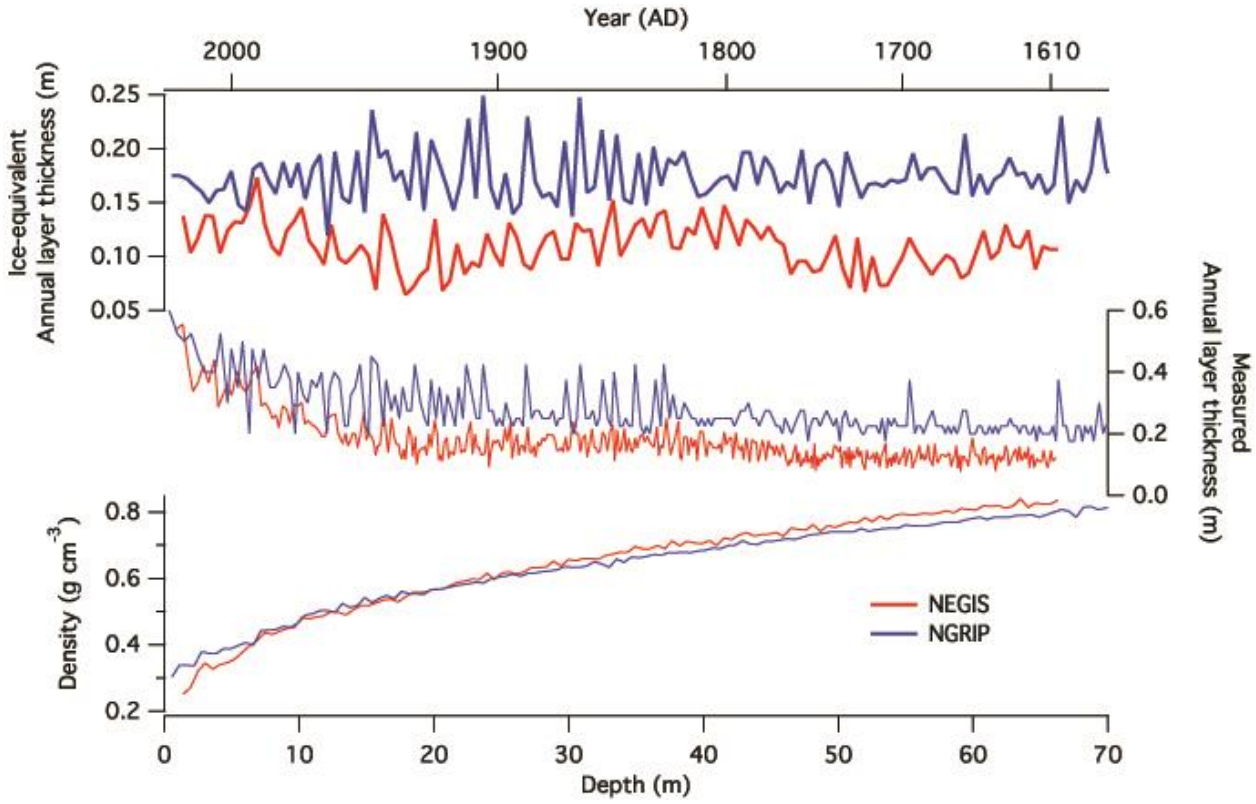
-study the dynamics of the ice flow by borehole observations of basal sliding, borehole deformation, and basal water processes.

Besides from the ice dynamic goals the internal radio echos sounding layers traces layers that are more than 50.000 years old. The layers have been traced back to other deep ice cores in Greenland (P.Vallelonga et al.: Preliminary glaciochemical and geophysical study of the Northeast Greenland Ice Stream (NEGIS), Cryosphere). Climatic studies of this period and especially the present interglacial (the last 11.000 years), a period where records of high resolution chemistry and greenhouse gasses are not available from other Greenland ice cores is an important goal for the project:

-high resolution climate records of greenhouse gasses, water isotopes and impurities through the last 25.000 years covering the onset of the present interglacial, the climatic optimum 8,000 years ago and the industrial period of the past two hundred years.

In 2012 a 67 m long pilot ice core was drilled in collaboration with researchers from the Alfred Wegener Institute (Germany) and the Penn State University (USA). The ice core properties are well preserved and the site is promising. The AWI ski equipped DC3 (Polar 6) supports the mission.

In 2012 a 67 m long pilot ice core was drilled from the proposed EGRIP drill site (75.6268N 35.9915W). The annual layer thickness is 11 cm and annual cycles are detected in water isotopes, dust and chemical impurities. Also, in 2012 detailed radio echo sounding and seismic work was done by researchers from the Penn. State University. The ice flows 50+ m/yr horizontally to the Northeast at the selected site. The shear margins of the ice stream are observable on the surface but the bedrock topography does not show a trough in which the ice stream flows. The radio echo sounding and seismic measurements show zones with basal water and also zones with less water. Studies of the flow pattern from the internal layers and from ice stream models could determine if the ice stream has been permanent or if it can switch on and off.



Reconstruction of the annual layer thickness from the 67 m shallow ice core from NEGIS. The accumulation rate is 0.11 m/yr and a significant increase of accumulation in the more recent warmer years is not observed. The results are compared with records from NGRIP. (P.Vallelonga et al, Preliminary glaciochemical and geophysical study of the Northeast Greenland Ice Stream (NEGIS), Cryosphere)

The deep drilling project was originally planned for the years 2016 to 2020 however, due to the global COVID pandemic field work in 2020 and 2021 was completely cancelled and the project was extended to 2024. The project is an international collaboration between several nations. National funding agencies in Denmark, Germany, Japan, Norway and the U.S. have committed themselves to support EGRIP, both financially and logistically. The in-kind support by U.S. NSF, by making ski equipped LC-130 available to the project and by sharing costs for flights and fuel and German in-kind support by ski equipped Basler (DC3) and vehicles is tremendously valuable to the project. At the EGRIP steering committee meeting in Copenhagen in the fall of 2016, Switzerland, France and China became contributing partners. In 2019 Canada became a partner. The U.K., Italy, Sweden, South Korea and Iceland are accociated partners that would supplement the EGRIP research plan well.
The main part of equipment and infrastructure needed to establish the EGRIP camp was at the NEEM site. In 2015 heavy sleds with cargo were excavated, the two garages were taken down and stowed and everything was hauled 460 km from NEEM to EGRIP by traverse train. The main building, the Dome, which was put on skis in 2011, was pulled to the EGRIP site with tractor support by the National Science Foundation. At EGRIP, the dome was parked on the ski, the two garages were built and outfitted, while the rest of the cargo was stored on sledges.


Left: The main dome at its parking position at EGRIP in June 2015.The undercarriage is covered by plywood before snow is packed around the base. Right: Photo from June 9 2015 just before the door is closed and crew leaves camp. Note the snow pack around the base.

In 2016, the EGRIP camp became almost fully equipped, and a trench system consisting of drill trench, science trench, ice core buffer, storage cave, tunnels, ramp and stairwells was constructed using the balloon technique. Drill trench and science trench were partially outfitted and the first 110 m of the deep ice core was drilled.

In 2017, the infrastructure of both science and drill trenches were completed. A freezer unit was installed inside the connecting tunnel between drill trench and core buffer. It was kept at -30 C and served as core logging area. At the end of 2017 season, the drillers reached a depth of 900 m. The top 300 m ice core was processed in the science trench, while the rest was stored in the buffer for de-stressing. Due to the core logging freezer, the crew managed to keep the cores from the brittle zone (550 m – 900 m) at very high quality. Besides drilling and processing, EGRIP camp also supported surface snow studies, studies of water vapour and aerosols, a firn air sampling program, the Swiss RADIX fast access drill test and some associated programs.

In 2018 the main drilling continued to a depth of 1750 m, past the brittle zone and well into ice from the last glacial period. In the processing line, staff managed the complicated task of logging fresh brittle ice and put it into storage, logging brittle ice from 2017 and processing it, and finally catching up with the drillers and ending processing at 1750m. The CFA isotope laboratory was unable to complete their measurements. As the brittle zone was passed, the freezer unit of the logging cabin was dismantled.

In 2019, the CFA isotope laboratory got a head start to catch up with the processing line. The EGRIP main drilling progressed slowly. The drillers had issues with high amounts of chips in the fluid, which required intensive filtering and progressively harder core breaks. At one time, the drill became disengaged from the cable, which required the manifacture of a special hook to collect the drill from the bottom of the hole. As the number of hard core breaks grew, the winch and the cable was damaged and the winch motor was not stong enough. Drilling was halted on July 9th at a depth of

2122m. This had implications on ice core processing, as most of the core was processed by mid-July. It was decided to cancel ice core processing for the remainder of the season, except for CFA isotopes and Physical Properties. Also, the EGRIP Executive Committee decided that all future EGRIP main core processing should take place in at cold room at AWI, Bremerhaven.

The field seasons of 2020 and 2021 were both cancelled due to the COVID pandemic.

In 2022, the first half of the season was spent digging out all buried structures and raising them to the surface. Also, camp personnel succesfully brought back all underground trenches by trimming the ceilings to restore proper working heights. Due to firn flow, the ceilings had come down by 1 meter from 2019 to 2022. Luckily, there was no severe structural damage to equipment in the caves. After restoration, deep drilling could continue, from 12 July to 6 August, reaching a final depth of 2418m.

In 2023, drilling could begin soon after arrival. At beginning of July, basal material was reached, and the last real ice core was at 2663.73 m. Several rock core drillings of basal material were made under red light illumination. All ice cores drilled were logged. DEP profiles were made and then the cores were packed and shipped for full processing at AWI in the autumn. A few samples for physical properties were collected. Many experiments were conducted on the deep borehole: Cryoegg, borehole logging, basal material pinger, new acoustic fluid level monitor. All equipment in the core buffer, science trench, logger trench, connecting tunnel, staircase and core storage is now packed. Only the drill trench remains setup for final deep bore hole experiments in 2024.

Many of the deep drillings in Greenland have been made as collaborations between Denmark, US and other nations. We have a proud record of very efficient and successful projects. Part of our tradition is to bring science and scientists to the field camp. Many measurements are performed on the fresh ice core in the field camp in a clean environment. At EGRIP we are able to continue staffing in a similar way as NEEM, where 270 individuals spent 12,500 man days in camp with a man day distribution of 52 % young scientists, 26 % senior scientists and only 22 % logistics. Thus the project not only produces a deep ice core, but also provides education for young researchers and enhanced international collaboration.

We believe that the EGRIP project will give unique knowledge of the flow of the very important and unknown ice streams which will lead to improved predictions of sea level rise. The deep ice core drilling should be followed by additional studies of the NEGIS ice stream, and AWI has carried out extensive aerial radar surveys in 2019 and 2022 up and down the ice stream with EGRIP camp as a base.

Drilling at EGRIP 2024

<u>Short summary of the situation for deep drilling in 2024:</u>

The bore hole will be logged and some experiments to retrieve more basal material will be done. Then the equipment in the drill trench will be dismantled and taken to the surface for shipment. We plan to make an intermediate drilling inside the white storage garage. Here, it will be tested if our new technique for replicate drilling works. The drilling equipment will then be packed. A part will go to the planned 2025 drilling in Canada on Müller Ice cap, a part will go to Kangerlussuaq and a part will be stowed for traverse to the old GRIP site in 2025.

Scientific plan for EGRIP 2024

The full EGRIP deep core was succesfully processed at AWI in the autumn of 2023. Some of the basal samples retrieved in red light have been studied in Copenhagen; but we hope to obtain some more basal material in 2024 before the drilling equipment is taken down.

Before EGRIP opens, a group of three people will go to the U.S. Summit station for nine days to drive over to the old GRIP site (27 km East of Summit) in order to locate the top of the casing on the GRIP borehole. It is expected that the top of the casing is approx. 2 m below surface. The group will bring a ground penetrating radar and map of the old GRIP site. Once the casing is located, the team will use a borehole camera to check if the casing is still intact. An intact casing is necessary for the ERC project Green2Ice to proceed to move EGRIP camp materiel to GRIP by traverse in 2025.

In case the GRIP borehole cannot be found or the casing at GRIP is too damaged for further drilling in the hole, then the ERC Green2Ice group will have to reconsider moving to GRIP or staying at EGRIP.

Associated projects at EGRIP:

CryoEgg (Elizabeth Bagshaw, University of Cardiff).

The Cryoegg Project will develop a wireless system which uses radio frequency to measure the properties of deep ice and subglacial meltwater and return data to the surface. We are creating a ‘Cryoegg’, a small, wireless sensor that can measure the temperature, pressure and chemistry of the meltwater underneath the ice. The project is funded by the UK Engineering and Physical Sciences Research Council, and harnesses communications engineering methods to design a bespoke subglacial sensor for fast flowing ice. The Cryoegg must be able to collect fundamental measurements of water beneath up to 2.5 km of ice, be free to move within meltwater present beneath the ice, and transmit data to the surface. The sensor suite must be able to operate in low temperature, high pressure conditions, with no external power supply for up to 12 months. The radio data transmission must be efficient, able to pass through mixed media (ice, sediment, water, cracks), and received and recorded at the surface by a low power, small footprint receiver which can operate for prolonged timescales. Our tests at EGRIP will ensure the sensor is capable of operating in its target environment, and eventually collect data from beneath the ice stream. The project will enable the investigation of one of the last frontiers on planet Earth: subglacial environments, the cold, dark, high pressure zones beneath kilometres of ice.
In 2024, the cryoegg team will perform tests before the drill trench closes in June.

Geophysical ice stream studies (Knut Christianson, Washinton State).

A group of three people will use EGRIP as base of operations for an NSF sponsored project on radar survey and mapping the Ice stream. They will operate out of EGRIP by snowmobiles.

AWS station system (Greenland Climate Network, former PARCA) maintenance (Nanna Karlsson, GEUS Copenhagen)

During the annual maintenance of the Automated Weather Stations in N-Greenland, the EGRIP camp will be re-fuelling station and base for the GC team for few days in May. GC team uses a Twin Otter air craft.

Logistic plan for EGRIP 2024

Former science trench and drill trench at EGRIP, August 2023.

The logistic plan for 2024 is focused on enabling the drillers to finish their work with the deep borehole and make drill tests on the surface. For communication, we will use Iridium Openport and continue testing Starlink. We plan to mount the polar bear Doppler radar again in 2024. The radar is capable of detecting movement in a 3 km radius of camp. EGRIP will continue using a ceilometer for reporting clouds to improve weather reporting and reduce the risk of aborted flights. We will ship out as much equipment as possible and will prepare camp for the 2025 traverse to GRIP. We plan to install solar panels on the main dome in the 2nd half of the field season. The solar panels are part of an infrastructure upgrade of the ice drilling camp.

The overall logistical goal is to keep running a fully operational camp with a drill trench, workshops and housing for up to 20 people.

To accomplish the overall goals, the campaign can be broken down into the following steps:

1. First ten days: Open and re-activate EGRIP camp by securing communications, power supply, water supply and quarters. The skiway will be activated and drill trench opened.
2. Logging of deep borehole and experiments for collecting more basal material.
3. Packing and returning equipment to Kangerlussuaq.
4. Preparing camp for the scheduled move from EGRIP to GRIP in 2025.
5. Support Greenland Climate Network program.
6. Support borehole measurement programs, e.g. Cryoegg .
7. Support the NSF Christiansson field work around EGRIP.
8. Support replicate coring tests in garage tent.
9. Support a group of people working on installing solar panels on the main dome.

2024 calendar overview.

18/04/2024	Thursday		Period 1
19/04/2024	Friday		
26/04/2024	Friday		FOMs arrive in Kanger A
01/05/2024	Wednesday		Summit/GRIP radar in
07/05/2024	Tuesday		Period 2
08/05/2024	Wednesday		
09/05/2024	Thursday		Summit/GRIP radar out
10/05/2024	Friday		Mission 2A put-in
19/05/2024	Sunday		Mission 2B
03/06/2024	Monday		Period 3
04/06/2024	Tuesday		
06/06/2024	Thursday		mission 3A
15/06/2024	Saturday		Mission 3B placeholder
17/06/2024	Monday		
09/07/2024	Tuesday		Period 4
10/07/2024	Wednesday		
11/07/2024	Thursday		Mission 4A -pull-out
17/07/2024	Wednesday		Mission 4B placeholder
23/07/2024	Tuesday		
24/07/2024	Wednesday		
26/07/2024	Friday		FOMs leave Kangerlussuaq
13/08/2024	Tuesday		Period 5
14/08/2024	Wednesday		
27/08/2024	Tuesday		
28/08/2024	Wednesday		
29/08/2024	Thursday		

EGRIP Manning 2024 (sorted by name)

Note: The dates of arrival and departure to and from Kangerlussuaq (SFJ) are dates of reference for booking tickets/flights to and from SFJ only. They are not fixed dates for the project. Dates in red are for calculation purposes only.

EGRIP 2024 Manning plan, 5.Apr 2024						
Sorted by name	Name	Country	Latest arrival to SFJ	To EGRIP	From EGRIP	Earliest departure from SFJ
Drill test	Babb, David	CAN	17/May	19/May	06/Jun	08/Jun
FOM	Blunier, Thomas	DK	04/Jun			25/Jun
Drill Coordinator	Boeckmann, Grant	DK	17/May	19/May	11/Jul	13/Jul
Filed Assistant	Buchardt, Susanne Lilja	DK	17/May	19/May	06/Jun	08/Jun
GPS + Radar	Christiansson, Knut	US	04/Jun	06/Jun	11/Jul	13/Jul
Driller	Dahl-Jensen, Dorthe	DK	08/May	10/May	06/Jun	08/Jun
GRIP radar	Gerber, Tamara	DK	29/Apr	01/May	09/May	11/May
Field Assistant	Grinsted, Aslak	DK	08/May	10/May	19/May	21/May
Drill Coordinator	Hansen, Steffen Bo	DK/US	08/May	10/May	06/Jun	08/Jun
MECHANIC	Hilmarsson, Sverrir Æ.	IS	08/May	10/May	11/Jul	13/Jul
GPS + Radar	Hoffmann, Andrew	US	04/Jun	06/Jun	11/Jul	13/Jul
Field Assistant (DV)	Jensen, Claus Bang	DK	08/May	10/May	19/May	21/May
COOK/NURSE	Kalf-Hansen, Anders	DK	04/Jun	06/Jun	11/Jul	13/Jul
Associated (GEUS)	Karlsson, Nanna	DK	16/Jun	18/Jun	19/Jun	21/Jun
Field Assistant	Kipfstuhl, Sepp	D	08/May	10/May	11/Jul	13/Jul
FOM	Kirk, Marie	DK	26/Apr			10/May
FOM	Kirk, Marie	DK	24/Jun			18/Jul
GRIP radar	Koldtoft, Iben	DK	29/Apr	01/May	09/May	09/May
FOM	Koldtoft, Iben	DK	09/May			16/May
Field Assistant	Koldtoft, Iben	DK	04/Jun	06/Jun	11/Jul	13/Jul
Elec. Mech	Leonhart, Martin	D/DK	08/May	10/May	11/Jul	13/Jul
COOK/DOCTOR	Mikkelsen, Astrid Duus	DK	08/May	10/May	06/Jun	08/Jun
Drill test	Miyahara, Morihiro	JP	04/Jun	06/Jun	11/Jul	13/Jul
DV and Media	Mortensgaard, Lin (DIIS)	DK	04/Jun	06/Jun	07/Jun	09/Jun
Associated (GEUS)	nn	DK	16/Jun	18/Jun	19/Jun	21/Jun
Associated (GEUS)	nn	DK	16/Jun	18/Jun	19/Jun	21/Jun
Associated (GEUS)	nn (GEUS flt crew)	IS	16/Jun	18/Jun	19/Jun	21/Jun
Associated (GEUS)	nn (GEUS flt crew)	IS	16/Jun	18/Jun	19/Jun	21/Jun
GPS + Radar	Paden, john	US	04/Jun	06/Jun	11/Jul	13/Jul
Cryo Egg	Prior-Jones, Michael	UK	17/May	19/May	06/Jun	08/Jun
FOM	Rasmussen, Sune O.	DK	14/May			08/Jun
Drill test	Rathmann, Nicholas	DK	04/Jun	06/Jun	11/Jul	13/Jul
MECHANIC	Schmid, Alexander (PB)	D	08/May	10/May	19/May	21/May
Field Assistant (DV)	Schwennesen, Mads Kofoed	DK	08/May	10/May	19/May	21/May
Associated (GEUS)	Solgaard, Anne	DK	16/Jun	18/Jun	19/Jun	21/Jun

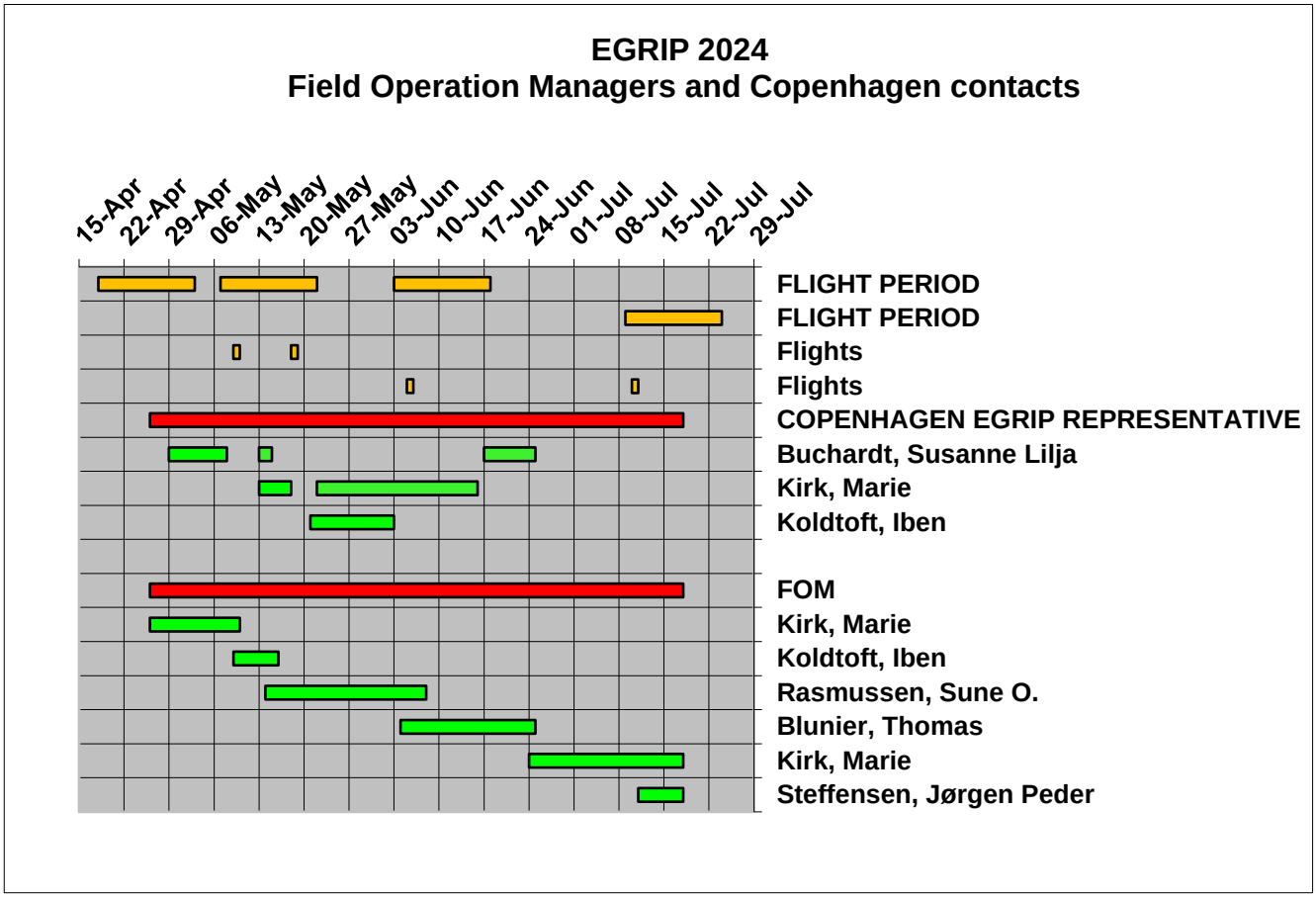
Field Assistant	Steffensen, Jørgen Peder	DK	08/May	10/May	19/May	21/May
Field Assistant	Steffensen, Jørgen Peder	DK	04/Jun	06/Jun	11/Jul	13/Jul
FOM	Steffensen, Jørgen Peder	DK	11/Jul			18/Jul
GRIP radar	Steinhage, Daniel	D	29/Apr	01/May	09/May	11/May
Field Assistant	Streng, Kyra	D	04/Jun	06/Jun	11/Jul	13/Jul
FIELD LEADER	Svensson, Anders M.	DK	04/Jun	06/Jun	11/Jul	13/Jul
FIELD LEADER	Vinther, Bo M.	DK	08/May	10/May	06/Jun	08/Jun
Driller	Westhoff, Julien	DK/D	08/May	10/May	06/Jun	08/Jun

Important: Sudden changes in manning plan due unforeseen issues.

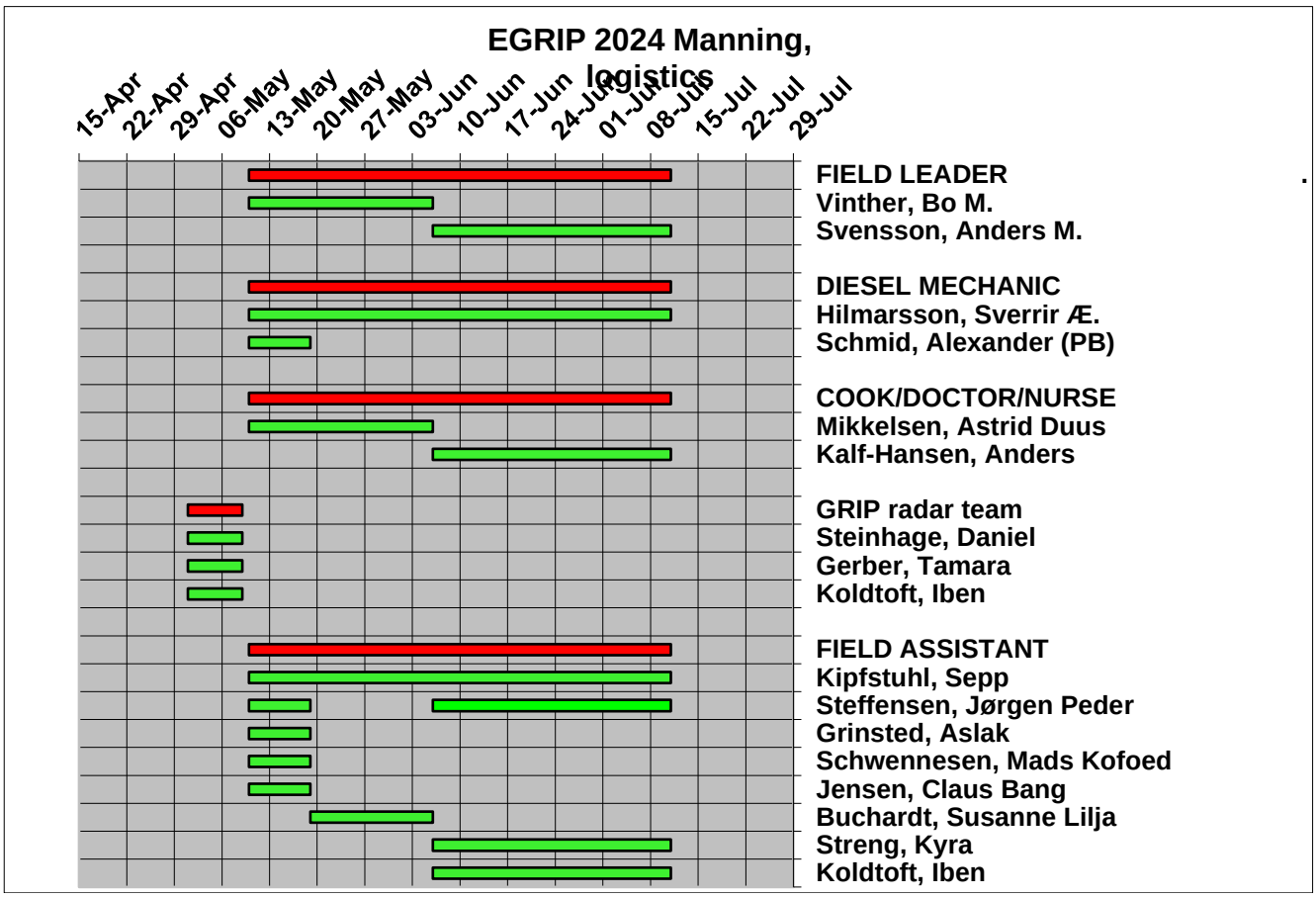
Please keep in mind, that being on the manning plan for 2024 is not a guarantee that you will go to EGRIP and stay there for the scheduled time. In this line of work, even small incidents may have large consequences. Even though we are scientists, we also share a treat with sea-men – we are superstitious. Therefore, we hesitate to mention specific incidents as it could become self-fulfilling. So, at this time let us just say, that a broken vital part with a long delivery time may cause severe delays.
THEREFORE: PEOPLE WHO ARE SCHEDULED FOR DEEP DRILLING OR ICE CORE PROCESSING IN JUNE, JULY AND AUGUST SHOULD PREPARE THEMSELVES OF THE POSSIBILITY OF EITHER HAVING TO LEAVE CAMP EARLIER THAN PLANNED OR TO HAVE THEIR STAY CANCELLED. PLEASE FOLLOW THE DEVELOPMENTS ON THE EGRIP HOME PAGE BEFORE YOU LEAVE FOR GREENLAND.
We are sorry for this inconvenience, but in our planning we have been forced to assume the most optimistic outcome of activity, i.e. the situation where the most people are needed in camp. If we had planned for less, a smaller number of people would have been planned for, and we could end up in a situation where activities had to be stopped due to lack of man-power.

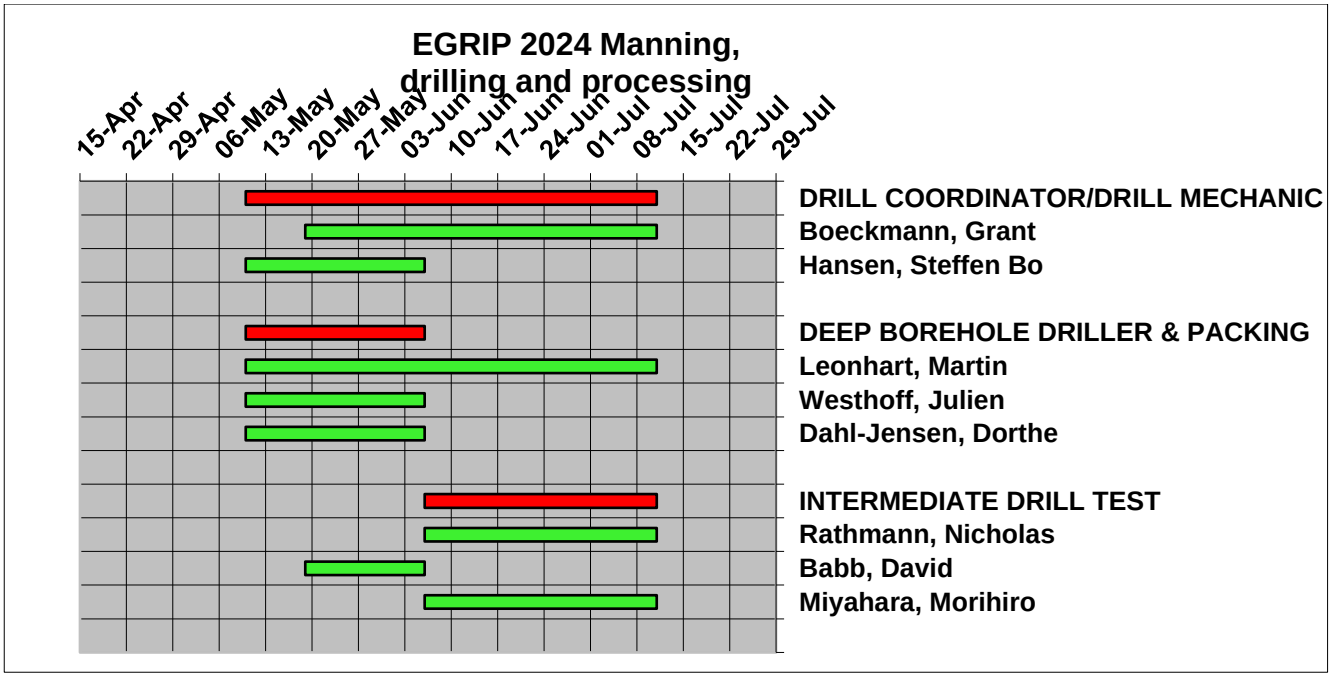
EGRIP GANTT sheets.

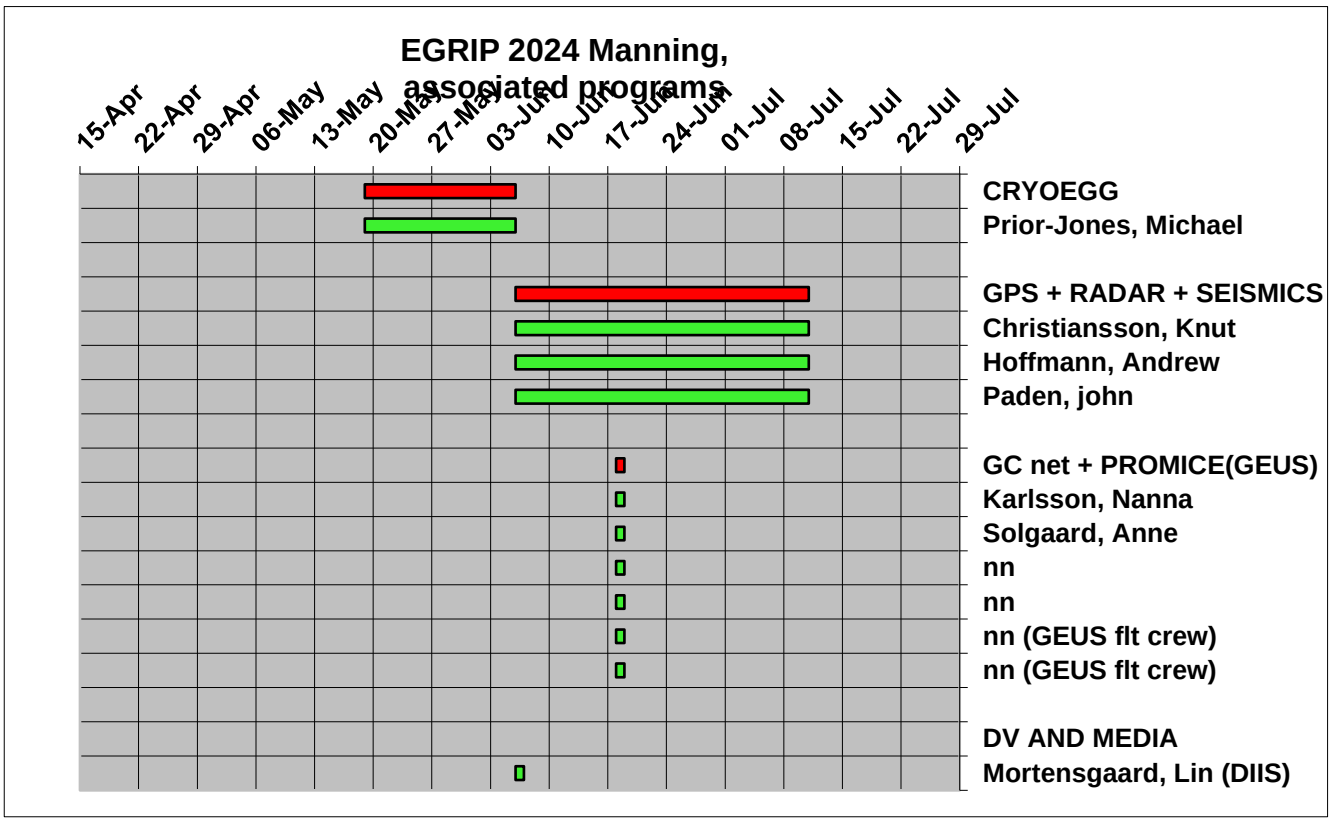
FOM's:



EGRIP manning:

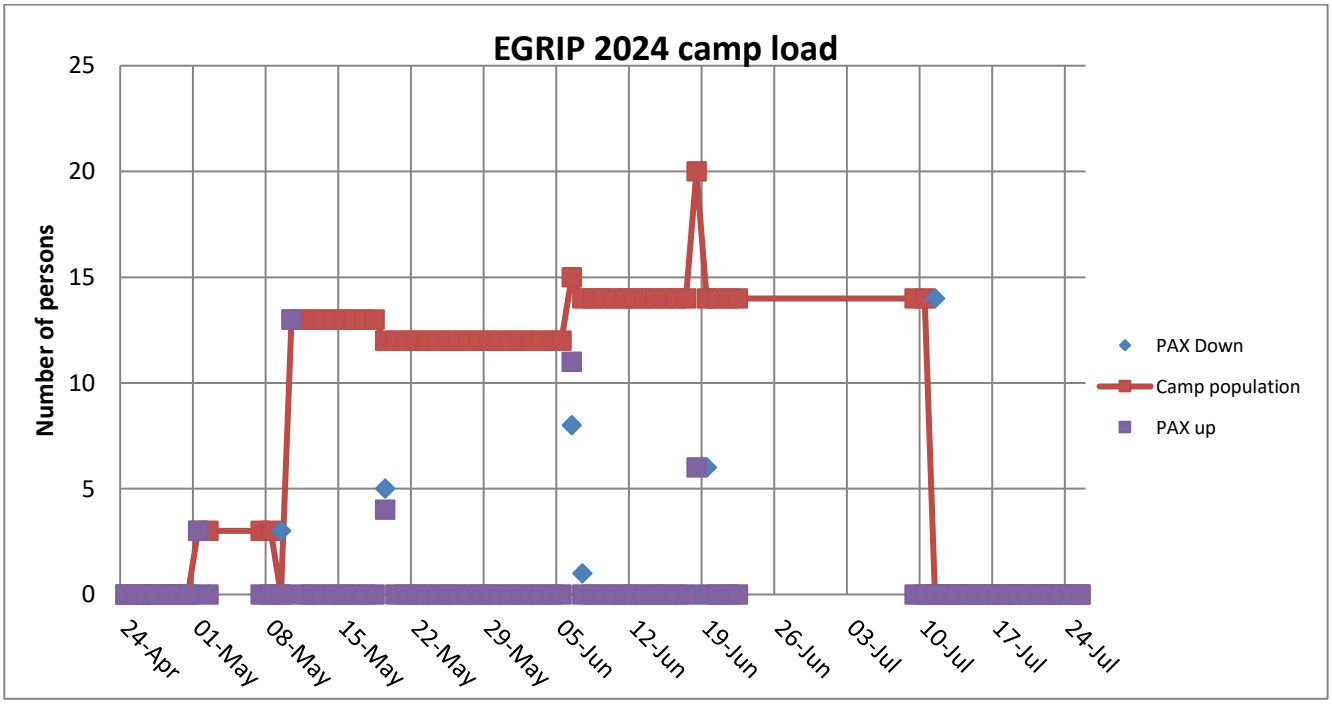






Camp population

The diagram below gives an overview on the population in camp.



Personnel Transport 2024 and COVID quarantine issues.

The field participants will deploy to Kangerlussuaq, Greenland mostly via Copenhagen and in a few cases from Stratton AB, Scotia, N.Y. The transport to and from EGRIP camp will be direct from/to Kangerlussuaq with a U.S. air force LC130.

During the stay in **Kangerlussuaq**, people will be billeted in Kangerlussuaq International Science Support (KISS). At KISS, all participants will be provided with bed linen but are responsible for cleaning their room.

Note, unless arranged otherwise, each nation must take care of tickets and insurances of their own participants. If trouble arises at making ticket reservations we should be notified. The increasing number of tourists travelling to Greenland results in a long waiting list, so please make the reservations as early as possible. EGRIP has a general financial guarantee for extraordinary Search and Rescue operations (SAR). Medical Evacuations (MEDEVAC) will be organized and covered up front by EGRIP.

COVID quarantine procedures of the National Science Foundation(NSF) are at time of writing under review. NSF wants to maintain a high level of COVID safety at Summit station and is reviewing the special quarantine program. However, EGRIP will to follow a less restrictive set of rules, which will be similar to those of the New York Air Guard. EGRIP personnel should respect the COVID "bubble" of Summit personnel.
EGRIP passengers will have to arrive in Kangerlussuaq 48 hour before departure.

The current setup requires:

1. All persons going to Greenland for EGRIP should maintain a degree of social distancing (avoiding concerts, large bar gatherings, large family affairs etc.) one week before travelling.
2. All persons going to EGRIP will have to be fully vaccinated, including a booster shot (This is a requirement to obtain medical clearance for work at EGRIP).
3. The FOMs in Kangerlussuaq have received training and are certified to perform antigen tests with test kits that have a 95% detection rate. EGRIP provides the test kits.
4. There will be antigen tests available at EGRIP station.
5. EGRIP will have either a physician (doctor) or a nurse at EGRIP the entire season.

The agreement with the NSF entails that all EGRIP participants arriving to Greenland from the U.S. by 109th will have to follow NSF/Batelle ARO guidelines regarding quarantine and testing in New York as these participants will mix with Summit personnel on the plane. On arrival in Kangerlussuaq, the U.S. EGRIP participants may exit quarantine and join the EGRIP crew. The EGRIP FOM will perform antigen tests 24 hours before and on the day of departure to EGRIP. A person with a positive test will have to go into quarantine and miss the flight to EGRIP.

Personal field equipment

All participants, except for those who have special arrangements with EGRIP operations, are expected to provide their own polar field equipment and personal clothing, including normal winter garments, towels, toiletries, soap, facecloth, etc. A typical polar field bag should contain:

Polar Survival Kit

2	Woolen underwear, terry cloth, trousers and jacket
1	Fleeced trousers and jacket
1	Overall trousers
1	Polar boots, including extra liners, preferably 2 pairs.
3	thick woolen polar socks
1	polar parka coat
1	Insulated work leather gloves
1	Thin inner gloves
1	Insulated leather gloves, or ski type gloves
1	*Mittens. Optional*
1	Dark sunglasses
1	Sleeping bag, -10 degC or lower
1	Fleece liner for sleeping bag
1	fleece or woolen cap or hat, preferably of the balaclava type
1	Ear gear, fleece or rubber.
1	Face mask, *optional, only for those involved in snowmobile traverses.*
1	Personal medicine (pls inform the doctor)

Please bring also

1	Neck Tie or Dress
1	Solid hiking boots
1	A sturdy cup for coffee or tea
1	Your favourite cooking book
1	Your favourite music on IPOD
1	Your favourite game
1	Your favorite instrument - if it allows for transportation
1	A good portion of good humor

The polar field bag must follow the individual on the flight from Kangerlussuaq to the camp. It is not permitted to board aircraft or engage in traverses without a suitable survival kit. Please expect your luggage to be stowed on a pallet for transportation to camp, and like on commercial air lines, only one small carry-on bag is normally allowed. In special cases, like put-in missions, you will be allowed also to keep ONE sea bag with survival equipment with you in the LC-130.

READ CAREFULLY THIS SECTION: Welcome to the EGRIP Camp (Rules and information)

EGRIP camp at pull out August 2016 with Main dome and three garages and the cargo line. (photo: DDJ).

The living conditions on the ice cap are quite different from those back home, therefore we would like to tell you some simple rules to follow. Some of them are even new for old-timers.

- The ski-way area and apron are **off limits** unless approved by the Field Leader.
- When an aeroplane is expected, the Field Leader has assigned a person in charge of the apron activities. You are obliged to act as instructed by this person.
- Never leave the camp without informing somebody, the weather can change very quickly. If you go more than 2 km away from camp, the field leader should be informed. Remember to bring a PLB (Personal Locator Beacon), a Garmin In-Reach unit and Iridium phone or VHF radio. The Field Leader will hand out PLB, In-Reach, phone and radio.
- The eating hours are (please be in time, to make is easy for the cook).
    - Breakfast is individual (normally between 7:00 and 8:00),
    - Lunch is at 13:00 (On Sundays a special brunch is sometimes served),
    - Dinner is at 19:00. While eating outside of lunch and dinner hours, make sure that all plates, etc. are cleaned after use.
- Heavy vehicles and snow blowers are only operated by few people assigned by the Field Leader.
- Skidoos –
    - Everybody can use the skidoos when not in specific use, but please follow these rules:
        - Drive slowly in camp, and never use 2nd gear.
        - Park the scooters with the gear in non-engaged position and plugged to power.
        - Skidoos can only be removed from the camp area after an agreement with the Field Leader.
        - When attaching a sledge to a skidoo, always use the hook. Only connect the sledge with a rope if no other option exists, and keep the rope as short as possible.
        - Make sure the main drive belt is not frozen by shaking the skidoo from side to side before start.
        - Skidoos are not toys - only drive skidoos when necessary.

  - Do not drive in the clean zone, South and West of camp unless permitted by the Field Leader.

- NEVER operate vehicles and machinery under the influence of alcohol. Offenders will immediately be expelled from camp.

- Never leave any cargo or items on the surface without marking it with a bamboo pole, otherwise it may be lost due to snow drift overnight. Roll up cargo straps and put them in designated piles. Collect metal and nylon packing straps as these are dangerous for snowmobile traffic.
- If you remove marked items on the snow, then also remove the bamboo marker in order to avoid disorder and digging for nothing.
- Drinking water originates from a marked area. So never drive or walk through this area or contaminate it with any bodily fluid. Just keep out of the marked area.
- Drinking water will be produced in the cooks snow melter. To keep a steady water supply in the camp, refill it with snow from the marked area when there is room in the pot.
- In order to keep the camp clean there are only a few bamboo poles where you are allowed to take a leak. The poles are close to the outhouse tents.
- During blizzards visibility goes down. If visibility becomes so poor, that you cannot see adjacent tents or buildings from where you are, there is a serious risk of getting lost. **Stay inside where you are until you are picked up by a team member from the main dome.**

Booze and Drugs.

You can bring the following tax free to Greenland: 200 cigarettes or 100 cigarillos and 50 ml perfume or 250 ml Eau de toilette are allowed.

1 liter strong alcohol, 2 liter beer (typical six-pack) and 2.25 liter wine (typical 3 bottles) are allowed. If you are caught with excess tobacco, perfume or alcoholic beverages on arrival, it will be confiscated and you will be fined around 1,200 DKK.

You cannot import goods in excess of the allowance and declare it. You'll have to buy it in Kangerlussuaq.

In case you have not purchased the allowed duty free items in Copenhagen, you can do it in Kangerlussuaq on arrival, showing the boarding pass, and before you leave the secure area.

You can buy alcoholic beverages and tobacco in the local store in Kangerlussuaq. The price of one beer in Greenland is approximately 20 DKK, one liter hard liqueur costs approximately 500 DKK.

People can bring their own prescription medicine. If prescription medicine is needed, make sure camp physician is informed. In case of illness, necessary drugs will be supplied by the camp physician. Greenland law forbids any import and consumption of drugs, such as cannabis, morphine and designer drugs. Any person who attempts to bring in or use illegal drugs in Greenland will be expelled from camp immediately and FOMs and Field Leader will contact Greenland police.

Policy for use and handling of pictures/recordings

Prepared for the NEEM-SC meeting by Sune Olander Rasmussen, Copenhagen, olander@gfy.ku.dk. Final version adopted by the EGRIP-SC October, 2016.

All persons, including visitors, going to Greenland as part of the EGRIP field campaign implicitly give their consent to the following use of pictures/recordings by accepting to participate in the field campaign. Additional rules or limitations may be enforced by the field leader in special cases.

Participants appearing on pictures and in recordings:

The EGRIP field work participant approves use of digital and analogue pictures, filmed material, and sound recordings made during the EGRIP campaign (defined here as the period from arrival in Greenland until departure from Greenland) in which the participant appears.
The approved use comp rises, but is not limited to; use on the internet, in print, in television broadcasts, but only applies to material depicting field participants during work and daily life situations.

Any field member may withdraw this consent for any given photo or film sequence without further explanation.

Pictures/recordings depicting participants in situations not mentioned above should never be made public without explicit consent from all recognizable persons on the pictures/recordings. Field members taking pictures or making film and/or sound recordings must accept to delete pictures/recordings if requested to do so by a participant that appears in the material.

Rights of use

When material is shared with other field participants or uploaded to field computers, the photographer by doing so gives permission for the material to be used by the EGRIP project. Photographers wanting personal acknowledgment must make sure that their pictures are named with the photographer's name as the last part of the file name, e.g. " EGRIP-main-dome-4-July-2017-John-Doe.jpg".

Material produced as part of the field campaign or obtained from participants can be used by all EGRIP collaborators crediting the EGRIP project as a community: "Photo/Source: EGRIP ice core drilling project, www.eastgrip.org". For media files containing the name of the photographer, use the credit line with the name of the photographer included, e.g. "Photo/Source: John-Doe , EGRIP ice-core drilling project, www.eastgrip.org".

The original photographer retains the rights to any other use of the material, including any commercial use.

Declaration of liability release for EastGRIP field participants

The EastGRIP project aims to have a medical doctor/physician in camp at all times, and is prepared to arrange medical evacuation to a medical facility on the Greenlandic coast of a field participant or visitor if deemed necessary by the doctor and field leader. However, participation in the EastGRIP field work or visits to the EastGRIP camp is at the participant's (and/or their institution's) own risk, and each participant (or his/her institution) is responsible for medical and proper insurance cover.

Each institution should be prepared to contribute to costs related to evacuation of their participants from camp to a medical facility at the coast, and in particular, each participant (or their institution) is responsible for securing cover of costs of medical treatment and repatriation (and/or for taking out insurance against these costs).

In extreme cases, a Search and Rescue operation (SAR) may be necessary. Once initiated, a SAR is carried out by the Joint Rescue Coordination Centre (JRCC) Denmark, and is out of the hands of the EastGRIP project. The JRCC staff collects and distributes essential information concerning a distress situation, arranges the dispatch of rescue assets to aircraft or ships in distress and coordinates the efforts of all responding resources. Each nation is responsible for covering SAR costs for their participants (and/or for taking out insurance against this cost).

All field participants are required to sign a liability waiver accepting these terms before boarding a plane to EastGRIP.

By joining the Eastgrip fieldwork, each participant waive any rights to hold University of Copenhagen, the EastGRIP project, or any project staff members liable for any non-deliberate injury or damage caused e.g. by accidents, failure of equipment, or during medical treatment.

By signing the participant declare that he/she understands that is it the responsibility of himself/herself or his/her home institution to arrange appropriate insurance cover for personal injury or liability.

By signing the declaration, each participant also expresses understanding that it is the responsibility of himself/herself or his/her home institution to securing cover of costs of medical treatment and repatriation (and/or for taking out insurance against these costs).

By signature, each participant also confirms that he/she will follow the safety guidelines outlined in the field plan and follow instructions given by the field operations manager, the field leader, and flight crews.

The declaration is signed before deployment to EGRIP camp and uploaded in the medical system. The declaration will be kept in the field operations office in Kangerlussuaq.

Policy on handling cases of work place accidents, safety issues, mobbing, harassment and sexual harassment at EGRIP.

In accordance with the law on physical and psychical working environment at Danish/Greenlandic workplaces, and the Arctic safety manual for University of Copenhagen, the Field Leader at EGRIP is the project appointed safety officer. All work related incidents should be reported to the Field Leader.

In case of sensitive issues such as harassment or sexual harassment, incidents may be reported to one of two NAMED PERSONS (one male, one female) who will then inform the Field Leader about the issues in an anonymized version. The Field Leader or the camp physician may also be approached directly about such issues. The Field leader shall post the two NAMED PERSONS on a note on the board next to the bathroom entrance.

Assigned Duties

Everybody in camp will be assigned extra duties on a rotary basis. These duties include:

Cooking. Although there will be a cook, Saturday night dinners are prepared by the camp crew. Sunday morning breakfast is self-service. If you skip meals, please inform the cook(s) in advance.

The field Leader will make a roster with rotating duties on the following:

Dishwashing. We expect all to help keeping the dishwashing an easy duty.

Snow melter. Although one person is assigned, everybody has the duty to keep the snow melter full. Check the water level before and after you have taken a shower and after doing laundry.

Drinking water snow melter.
Each day one person is assigned to be responsible for keeping the drinking water snow melter full. Use ONLY the assigned buckets and shovels and take ONLY snow at the assigned spot. Hygiene is very important.

House mouse duty.
One or two persons will be assigned to keep toilets and common areas in the main dome clean.

Terms of reference for the EGRIP 2024 Field Season (formal control and command)

During the field season Bo Vinther and Anders Svensson will be Field Leaders at EGRIP having formal command & responsibility of operations in camp. All field participants must follow all instructions from the Field Leaders (The Field Leader role is similar to the role of a captain of a ship at sea).

In Kangerlussuaq, Marie Kirk, Susanne Buchardt, Sune Olander Rasmussen, Iben Koldtoft, J.P. Steffensen will be field Operations Managers (FOMs). There will be FOM assistants as well. The FOM is the official spokesperson for EGRIP and the FOM has control of all EGRIP assets in Kangerlussuaq, such as the office, cars, bicycles etc. The FOM is the formal liaison between EGRIP and U.S. logistics (Battelle ARO), New York Air National Guard and Greenland authorities. The FOM has final say on composition of cargo and on passenger lists for all flights to and from EGRIP.

Dangerous goods (HAZMAT) Lithium batteries.

While certification of dangerous goods and the packing thereof rests with qualified personnel, Marie Kirk has IATA, DOT (49 CFR) and U.S.Air Force certification (AFMAN 24-204), we want to point out some new important regulations,

Under normal circumstances people travelling do not carry HAZMAT in amounts that require certification and declaration. As there have been a series of incidents involving fires on aircraft from shorted lithium batteries, you must take special care.

All modern electronics: Cell phones, GPS, laptops, cameras etc. contain lithium batteries. Most of these batteries are considered “small” in the new regulations, except for laptop batteries with extended life time. They are considered “medium”. And for “medium” batteries the following apply:

Quote from IATA regulations 2.3.3.2 Lithium Ion Batteries:
“Lithium ion batteries exceeding a watt-hour rating of 100 Wh but not exceeding 160 Wh may be carried as spare batteries in carry on baggage, or in equipment in either checked or carry on baggage. No more than two individually protected spare batteries per person may be carried.”

As long as the batteries are installed in the appropriate equipment, they are not considered HAZMAT, but loose spare batteries have to be packed in such a manner that shortening is impossible by e.g. covering the poles with tape. The quoted IATA regulation says, that you may not put medium sized spare batteries into your checked baggage. You may be allowed to have two spares in your carry on – HOWEVER, THIS DEPENDS ON THE AIRLINE. CHECK RULES FOR LITHIUM BATTERIES WITH THE AIRLINES YOU ARE USING.

When travelling with the 109th to and from EGRIP keep all your batteries in your carry on. Do not put spare batteries in your luggage (suitcase or duffel bag).

For all scientists that ship lithium batteries by cargo, please note that Lithium batteries are Dangerous Goods and have to be packed and certified by authorized companies. It is still possible to pack a

laptop in a zarges box, but be careful with spare batteries. If in doubt, consult us or your local HAZMAT company.

Note: There is a huge distinction between “lithium batteries” and “lithium ion batteries”.

“lithium batteries” are non-rechargeable high-power cells that work very well in the cold. They are always HAZMAT. In size they vary from button cells in remote controls to car battery size. Automatic defilibrators (AEDs) contain Lithium batteries.

“lithium ion batteries” are rechargeable batteries that are in almost any computer, cell phone or GPS. They are only HAZMAT under the regulations mentioned above.

For more information on HAZMAT and Lithium, please see section on HAZMAT.

Personal Locator Beacon (PLB) and Garmin In-Reach.

A personal locator beacon, PLB, will be issued to everyone who has to leave camp. It is a unit with the size of a hand held radio. The unit is registered at the radio authority of Greenland. When activated, the unit contacts a satellite with a distress signal. The unit transmits its identity code and GPS position (it has a built in GPS). The radio authority will contact the FOM in Kangerlussuaq with specifics of identity and position. The PLB is a last resort emergency device.

EGRIP camp will have a number of Garmin In-Reach devices to give to people working away from camp. The In-Reach will be set up so that the Field leader receives position updates on remote field teams. If you’re interested, it is possible to buy these devices on the web. The device can be set to transmit your position at a fixed time each day by e-mail to your family and friends.

Accidents and Illness

There will be a doctor/nurse at EGRIP this field season. Also, the doctor/nurse will have a hot line to doctors in Denmark. In case of illness, the camp will be able to treat a patient with a wide selection of drugs. In case of accidents, the patients will first be given First Aid and if evacuation is needed an aeroplane will be called in from Kangerlussuaq, East Greenland, Thule, Summit, Station Nord, etc. to transport the patient(s) to a suitable emergency site/hospital.

Good communication (Satellite broad band, Iridium handheld, Iridium OpenPort, Radio, personal locator beacons) and navigation equipment (GPS) should ensure fast evacuation if needed. Under most circumstances, we can move a patient to a hospital within 24 hours.

Handling of Waste and environmentally hazardous chemicals

EGRIP has been imposed with strict environmental conditions on EGRIP camp operations by the Greenland government. As EGRIP camp is located in a pristine area of the Greenland ice sheet and is inside the NE-Greenland National Park, the camp is constructed to reduce the environmental impact as much as possible, e.g. by using wood and snow as primary construction materials and by using temporary tent structures to maximum extent.

In EGRIP camp strict guidelines of waste management will be enforced.

LITTERING IS NOT ALLOWED. It is the duty of everybody to pick up any litter encountered.
Any traffic outside the general camp area has to be sanctioned by the Field Leader.
All waste will have to be sorted into the following categories:

- Natural combustible (e.g. wood, card board).
- Kitchen Waste.
- Glassware.
- Metal (e.g. cans, nails and screws).
- Hazardous solids (e.g. batteries, PVC).
- Hazardous fluids (e.g. fuel, hydraulic fluid, drill fluid).

All glassware, metal and hazardous material and kitchen waste will be retrograded to Kangerlussuaq for further processing.
To limit possible spills of fuel, only authorized personnel is allowed to operate pumps for fuel transfer.
All spills of hazardous fluids to the snow have to be excavated and the polluted snow has to be deposited in a salvage drum.
Use only designated toilets. Urination is only allowed at designated spots (pee-poles).

Special rules apply for fuel handlers, heavy vehicle operators and mechanics: A daily check on fuel tanks, pump system, hydraulics and hazardous chemical storage is necessary to insure no leakage to the environment.

Fire hazards

Camp structures are spaced so that an accidental fire will not spread to other structures. Carbon dioxide extinguishers and fire blankets will be placed at all locations where fuel is handled, at EGRIP in the kitchen and on the first floor of the main dome.
Only one of the three main fuel tanks will be in camp at any time. The other two tanks will be at the apron on in the cargo line.

An emergency response plan for spills and fire has been made for EGRIP camp. This plan is available in the main dome kitchen (Evacuation Zone A) and the Field leader office and in the carpenters garage (Evacuation Zone B). Camp personnel should know the contents of this plan.

Power Supply

Within all operations during 2024, 230 Volts, 50Hz will be the standard supply. The camp will be powered by diesel generators. For projects away from camp, such as shallow coring and radar surveys, we have both gasoline diesel generators available.

EGRIP:

Diesel

1 – Iveco	125KVA	3 x 230V (400V/50Hz)	Main generator.
1 – SDMO	40KVA	3 x 230V (400V/50Hz)	Backup generator
1 – SDMO	15KVA	3 x 230V (400V/50Hz)	2nd backup
1 – Hatz	5 KVA	1 x 230V / 50Hz	available

MoGas

1 – Honda	4.5KVA	1 x 230V / 50Hz	available
1 – Robin	4KVA	1 x 230V / 50Hz	

Reserves in Kangerlussuaq:

Diesel

3 - SDMO	12KVA	1 x 230V/50Hz

MoGas (i.e. petrol/benzin)

1 – Honda	4KVA	1 x 230V / 50Hz

Please help to conserve fuel by conserving power.

EGRIP 2024 – Address and useful numbers

Official address:

EGRIP 2024
Box 12
DK-3910 Kangerlussuaq
Greenland
Phone +299 52 41 25
e-mail: fom@egrip.camp

This is the address of the Field Operations Manager (FOM) office in Kangerlussuaq which is located in the KISS building room 208

During the field season contact to the participants at the EGRIP camp can be made as described below:

Camp Internet Connection – Starlink test

At EGRIP in 2024, we continue using the satellite communication Starlink which is connected to a global satellite grid. In 2023, the system worked well, and while it was operational, all communications and data traffic was handled through a flat rate package with unlimited data and communications. This system will be set up again at EGRIP 2024 during the first week.

Camp Cell phones – Satellite network.

For telephony in camp, people can use their smartphones on the EGRIP wireless network to make calls between each other. There will be an app to download. Installation guides will be available in the dome. The system will not be operational the first week.

We plan to install a computer that will act as a hub for WIFI connection of all cell phones in camp. It is the intention to link this computer to the internet via the STARLINK system. If the STARLINK connection is available, participants can also make international calls from their phones, and the outside world can call into camp. The system will not be operational the first week.

The number for the EGRIP exchange will be published in daily reports and SITREPs when active.

The caller will be asked to put in the local extension for the desired participant.

EGRIP field Leader will have ext. 401, EGRIP FOM will have ext. 301, public phone in EGRIP Dome will be ext. 402.

Details on how to connect and when the system is on-line will be posted on the EGRIP webpage.

Camp Iridium OpenPort system

EGRIP camp will utilize the Iridium OpenPort system in the first week, and then the system will act as backup in case the other satellite system goes off-line. This system consists of an array of antennae and receivers that multiplex to obtain two in-going phone lines and internet connection. This system has been reliable in previous years. At EGRIP there are two complete OpenPort systems (One emergency back-up). While the Field Leader has unrestricted access to telephones and the internet via OpenPort, camp personnel are in general restricted from access to the internet.

When camp is communicating via OpenPort, Please Note:
Using the internet over Iridium OpenPort is paid for per Mbyte (price is about 10 USD per Mb). If unlimited, unnecessary uploads & downloads of software updates, large email attachments, images, movies, etc. by EGRIP participants will very quickly cost the EGRIP budget a fortune! Please, turn off all automatic downloads and all banners and pictures on your browser before connecting.
Communication costs for NEEM 2010: 360,000 DKK

Iridium OpenPort telephone to EGRIP Camp

This number is not yet fixed. Please be aware that calling camp on Iridium can be as expensive as 6 USD per minute. Please ask the Field Operations Manager which number is current.

Only some of the Iridium numbers will be available at any given time. Please ask the Field Operations Manager (FOM) which number is current.

Initially **NO** external bell will be connected to the phones so arriving calls are not always heard.

Good times to call are during

Lunch	15:00 – 16:00 GMT
Evening dinner	21:00 – 22:00 GMT

The Iridium system OpenPort will be operational 24 hours if VSAT connection is not active.

EMAIL:

The Field Operations Manager will check arriving E-mail at least once a day on the following email: fom@egrip.camp (Don't forward large attached files).

For Field leader at EGRIP: fl@egrip.camp

On the ice, when we use the Iridium OpenPort system to send & receive E-mails, we will still be able to send & receive any E-mail via the above address; BUT at a high cost! PLEASE Remember to avoid attaching image files with your e-mails. The field leader will send images for the EGRIP diary on the EGRIP home page every day on behalf of everybody.

Please look up on the EGRIP web-page to check if EGRIP camp is communicating by VSAT or OpenPort.

EGRIP official communications:

SITREP

Field Leader and FOM will Sunday night prepare a **SIT**uation **REP**ort "SITREP", i.e. a report on the preceding week's field activity. This report will be transmitted by E-mail to the Copenhagen office. From here, it will be retyped and put on the EGRIP home page for download and for the relevant Greenlandic and Danish authorities.

The Sitrep follows the following format:

1. Number, date and time
2. Passenger movements
3. Cargo movements
4. Camp activities
5. Sub programs
6. Drill depth and time

7. Status for drilling
8. Other info
9. Signature of the Field Operations Manager

Daily reports on the web (www.eastgrip.org) and SITREPs on www.eastgrip.nbi.ku.dk

Daily, a short “What we have done today” report and stories from camp will be placed on the web. Information will be sent from the EGRIP camp to the Field Operations Manager office in Kangerlussuaq who, in turn, will take care of the home page together with the logistical team in Copenhagen (logistics@egrip.camp). The Field Operations Manager (fom@egrip.camp) will coordinate this activity.

Description of EGRIP camp

Quartering and buildings

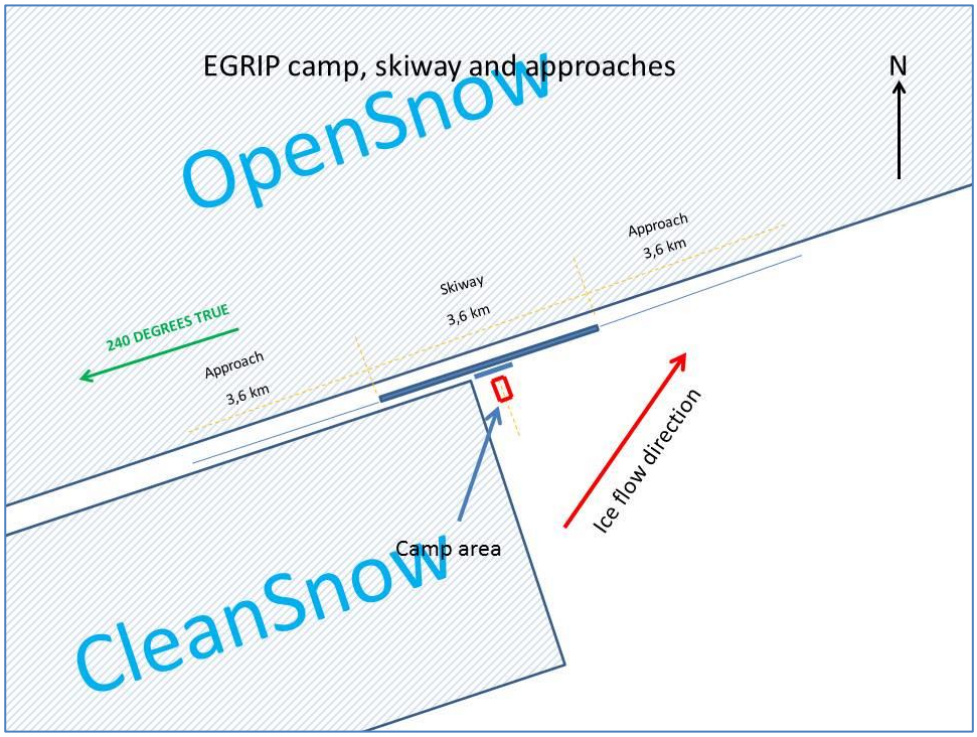
EGRIP camp July 2016.

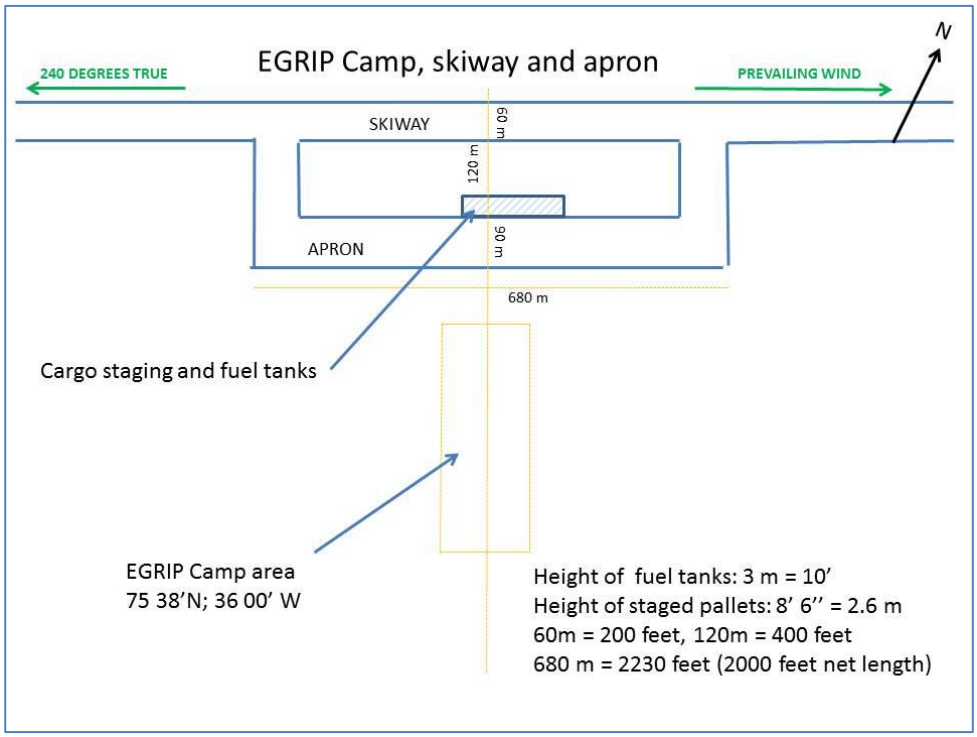
EGRIP	until May 19: PAX Normal(max)	after May 19: Pax Normal(max)	
Kitchen/office	8(10)	3(10)	40’ wooden dome
Big tomato	1(2)	1(2)	Fiberglass hut
Small tomato	1(1)	1(1)	Fiberglass hut
Pistenbully no2	0(1)	0(1)	Cabin
Pistenbully no3	0(1)	0(1)	Cabin
Garage, mechanic			26’ x 40’ Weatherport
Garage, carpenter			26’ x 40’ Weatherport
Garage, storage			24’ x 28’ Weatherport
Quarter (WP 6)		2(4)	10’ x 15’ Weatherport
Quarter (WP 8) + food		2(4)	12’ x 20’ Weatherport
Freshie shack (WP 9) Not planned.		0(0)	12’ x 20’ Weatherport
New quarter (WP 7) Not planned.		0(0)	12’ x 20’ Weatherport
Quarter (WP 5)		2(4)	10’ x 15’ Weatherport
Quarter (WP 3)		1(2)	10’ x 10’ Weatherport
New quarter (WP 4-clinic) Not planned.		0(0)	12’ x 10’ Weatherport
Total	10(17)	12(29)	

WPs 1 and 2 are returned to Kangerlussuaq. More WPs will be returned in 2024. For those individuals who prefer to sleep in small tents, EGRIP has a few tents to lend out.

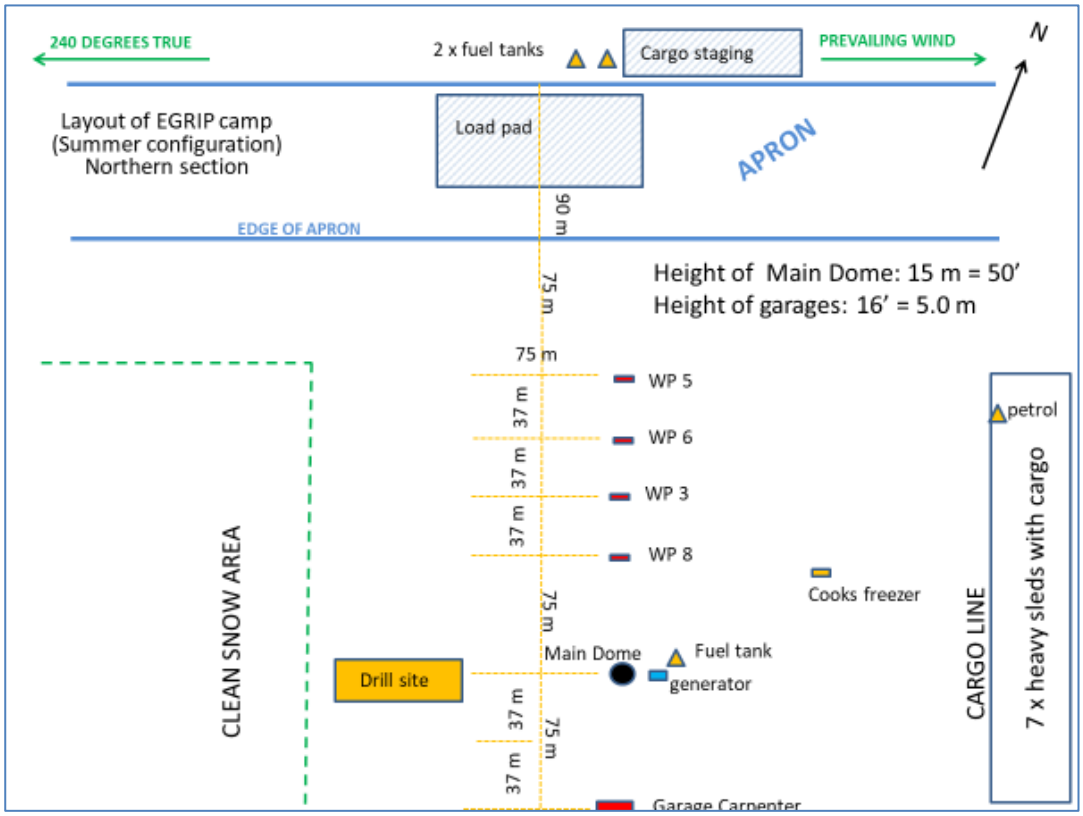
Maps of the EGRIP camp area.

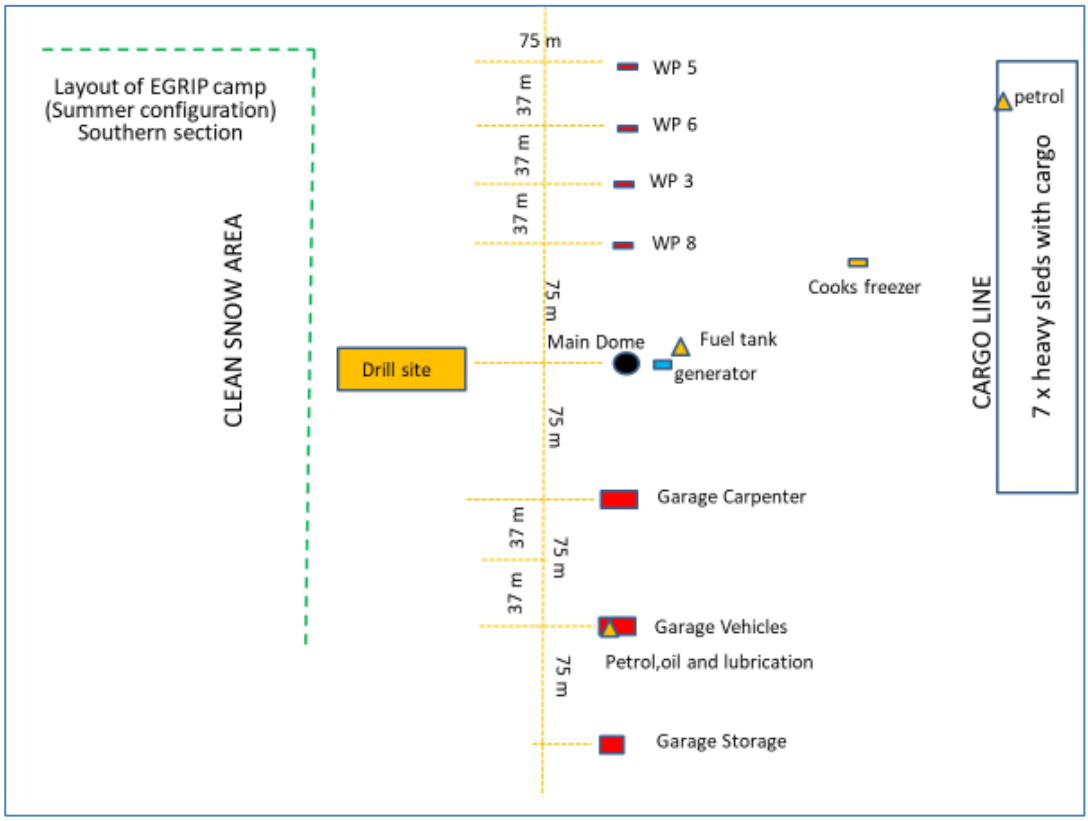
On the following three pages are maps of the EGRIP camp and Science areas in different scales.



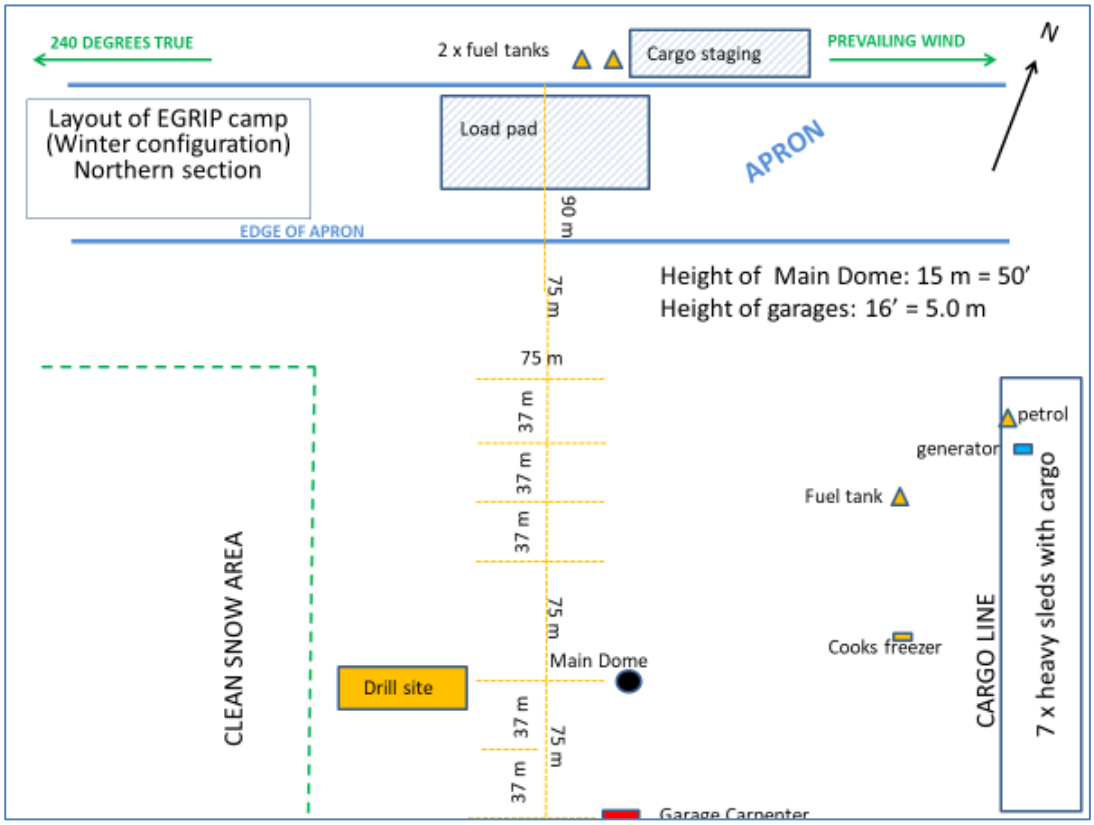


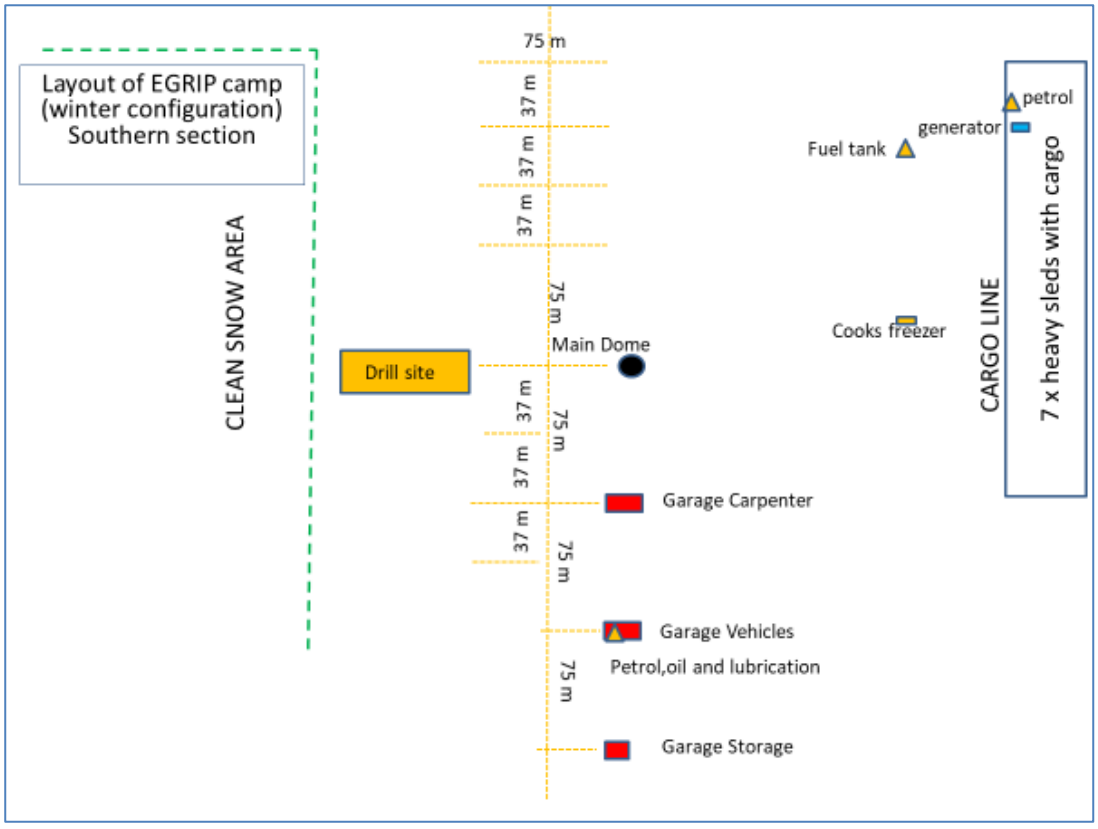
Camp, skiway and apron layout.





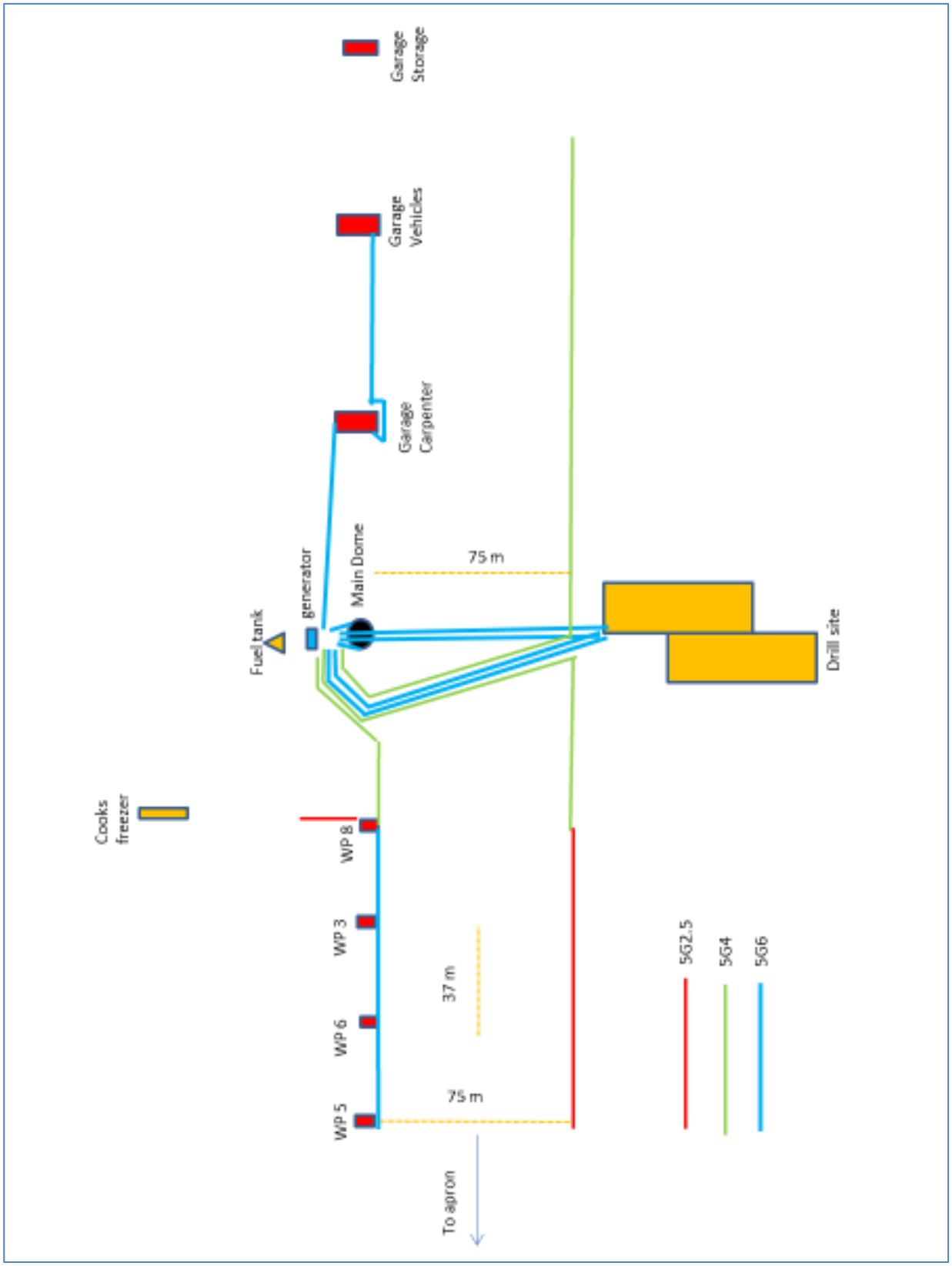
Map of EGRIP camp summer situation with all planned weatherports built.



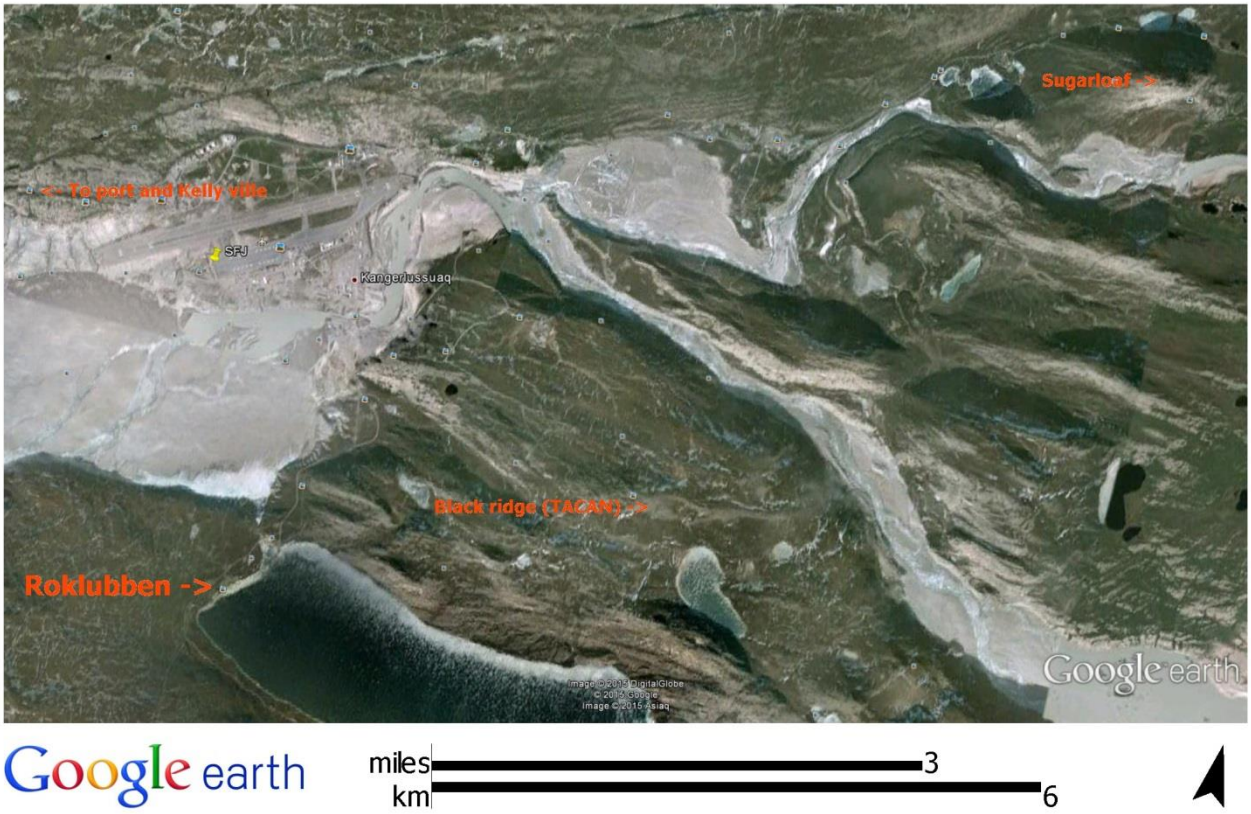


Map of EGRIP camp in winter situation. All weatherports are stowed on cargo line.

Electrical cabelling of EGRIP camp.



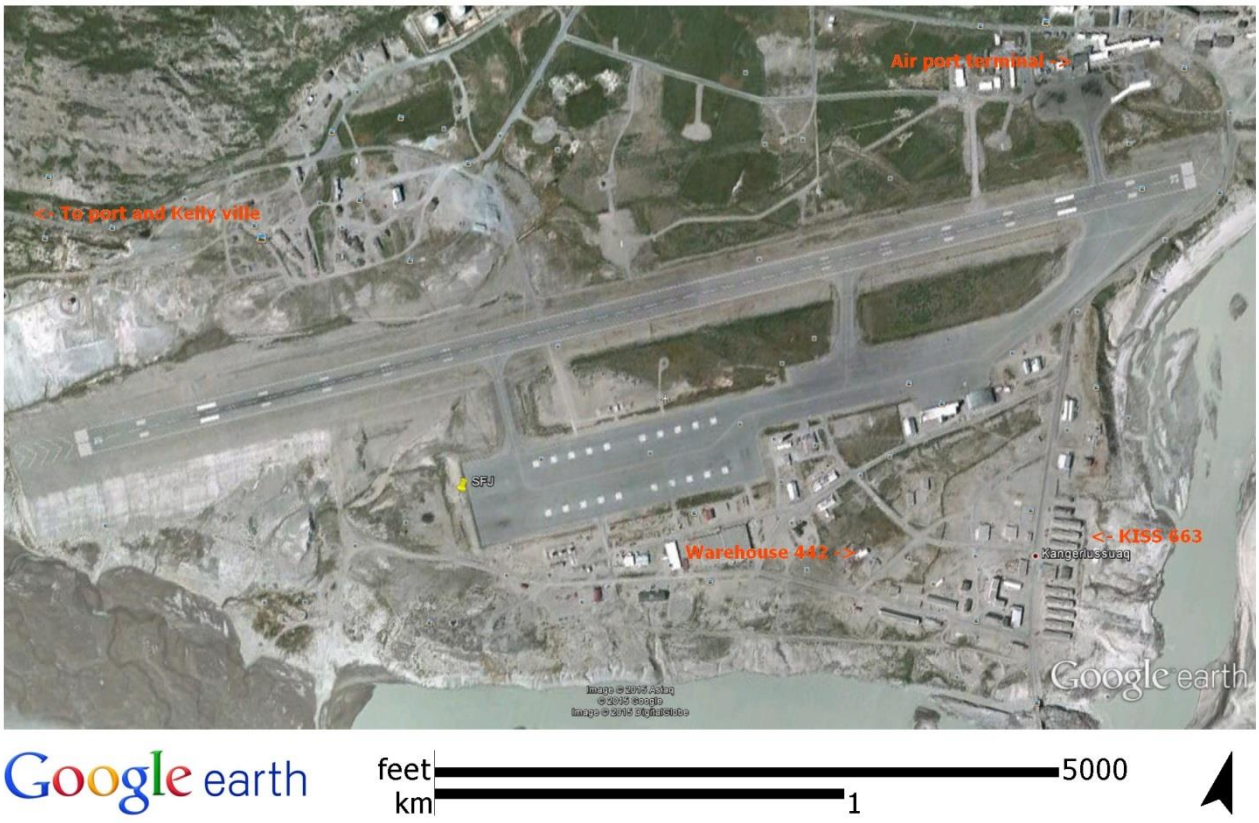
Description of Kangerlussuaq and Surrounding Area



In terms of complexity, Kangerlussuaq (Søndre Strømfjord or SFJ) is unique. Originally there was no native village. The first settlement was the US base Blue West Eight during World War II. The base was closed October 1, 1992, and all facilities handed over to the Greenland Airport Administration. Due to its US origin, the main electrical supply in Kangerlussuaq is 60 Hz, and you may encounter both 115V and 208V US type sockets, as well as 230V Danish sockets.

The population is approximately 450 including many kids. The terminal area is composed of several businesses: Air Greenland, local supermarket “Pilersuisoq”, some souvenir shops and Air Greenland cargo. The terminal side includes private housing, a combination of Air Greenland terminal and Hotel Kangerlussuaq, which also houses the Air Greenland offices and an ATM in DK Kroner. There are also buildings to the west of the terminal which house the Airport Administration and Air Cargo terminal (where outgoing and incoming cargo between Denmark and points in Greenland can be sent and received). The Greenlandic Post Office “Tusass” is located next to the local supermarket.

On the South side of the runway is the old U.S. Base. Here EGRIP office and quarters will be in KISS (Building 662). The project warehouse is building 442 which in 2022 was purchased from Greenland Airports by University of Copenhagen.



Weather: The climate is continental and dry with an annual precipitation averaging 120mm; winter temperatures reach down to -50°C and the summer temperature increases to above +20°C. In project planning for fieldwork in or around Kangerlussuaq, it is always best to prepare for the worst. The weather in Kangerlussuaq can be cold in May, and snow is always a possibility. June, July and August are normally fairly temperate with temperatures ranging from 5-21°C. Rain used to be rare in these months, but in July 2023, it was raining most of the time and the soil around Kangerlussuaq became really boggy.

Field clothing should include windbreaker, rain wear, work boots, warm hats and gloves, woollen shirts, sweaters and trousers. Given the wide range of temperatures during summer months, the use of layered clothing offers the greatest flexibility.

Be aware that cell phones cease to work 5 km from Kangerlussuaq. If you go on a walk, please tell the FOM where you are going and when you expect to be home. The FOM can lend you a satellite phone for emergencies.

Another important consideration is the insect season, normally from first week of June to late July. During this period, large, voracious Arctic mosquitoes are abundant.

In the past 5 years there have been 4 polar bear sightings in the Kangerlussuaq area.

Kangerlussuaq is the main hub for air traffic to and within Greenland with regular direct international connections to and from Copenhagen (Denmark) and occasionally Keflavik (Iceland).

In Kangerlussuaq you can buy regular, canned or freeze-dried foods, fuels (jet fuel/kerosene, gasoline, and field stove alcohol). There is also a post office, an airport hotel with cafeteria, a gym centre with swimming pool, a tennis-, badminton-, racket ball- and soft ball court, a golf course - and also a small museum with exhibitions about the history of Kangerlussuaq. Check **www.greenland-guide.gl** for information.

There are a few alternative dining and drinking establishments in Kangerlussuaq. In the old base laundry, 100 m from KISS there is a small shop and fast food place. The is a bar at "Nordlyset", some 150m from KISS towards the river at the rear of the building. Dining is available at the terminal. There is a cafeteria where the price of a typical meal is DK Kr.100, and a restaurant. In summertime restaurant "Roklubben" is mostly open for the public. This lakeside restaurant, some 5 km from Kangerlussuaq, offers a splendid view while dining on Greenland specialities.

BASE FOR SCIENCE

Kangerlussuaq has a long tradition as an important base for field geophysical and glaciological research projects, but so far the region has had only limited activities within the disciplines of life science. The area lies at the edge of the Polar Cap Zone and the Aurora Zone. It is therefore of particular interest to science studies related to the ionosphere and the magnetosphere as well as to the lower and upper atmosphere.

The Kangerlussuaq region is within the low Arctic eco zone with diverse habitats like salt lakes, dune systems, mountain tundra and steppes with caribou and musk ox populations etc. Reindeer are indigenous but muskoxen were introduced from Northeast Greenland forty years ago. Muskox and reindeer are hunted and in season meat can be purchased at authorized butchers.

The plant growing season is long, featuring 150 days without snow cover, 80 continuously frost-free days, and 150 consecutive days with maximum air temperature continuously above freezing; (the numbers given are average values). The climate is very stable and with low rate of rainy days. The monthly mean is 241 sun hours in May through August.

The Kangerlussuaq region is a well exposed high grade basement terrain forming the southern border zone of the Nagssugtoqidian orogen. The region has a glacial landscape dating back 8,000 years. The town is sitting on uplifted fjord sediments that popped up due to isostatic rebound after the last glacial. You may find proto-fossilized fish in the sediments west of town. Please note: It has become illegal to take large amount of fossils and rocks out of Greenland. As a rule of thumb, you are allowed to take out what you can have in a closed fist.

The proximity of the Inland Ice has a significant effect on the climatic regime for the living resources and further it presents unique logistic opportunities for studies on the Ice Sheet proper, the edge zone, and periglacial geomorphology.

The KISS (Kangerlussuaq International Science Support) facility

Scientists and students who plan to work in Greenland have facilities available in Kangerlussuaq. KISS offers an array of modern facilities and possibilities to rent equipment and goods for use in the field or at the labs of the KISS building.

KISS (bldg. 662 in the map) is owned by the Home Rule Government and operated by the Kangerlussuaq Airport Management. The use of KISS is reserved exclusively for researchers and research projects registered by the Greenland Authorities after submission of project plans.

It is important to realise that KISS is a year-round facility and that the Kangerlussuaq region offers obvious research opportunities and potentials during the 8 winter months. This applies both to projects in biology and geophysics and the presence of KISS now greatly improves the logistics for performing field operations during winter time

The KISS facility, and the other facilities in Kangerlussuaq offer unique possibilities for performing science based at Kangerlussuaq. Please contact the NEEM FOM office for more information.

EGRIP 2024 Responsibles

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Jørgen Peder Steffensen	Denmark	jps@nbi.ku.dk
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	Germany	
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Kerim Hestnes Nisancioglu	Geophysical Institute, Allégaten 70	kerim@uib.no
	NO-5007 Bergen, Norway	
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nn (GEUS flt crew)	CAN	x
nn (GEUS flt crew)	CAN	x
nn (GEUS team)	DK	x
nn (GEUS team)	DK	x
Paden, john	US	paden@ku.edu
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Rathmann, Nicholas	DK	nicholas.rathmann@nbi.ku.dk
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Streng, Kyra	D/NL	k.streng@uu.nl
Svensson, Anders M.	DK	as@nbi.ku.dk
Vinther, Bo M.	DK	bvinther@nbi.ku.dk
Westhoff, Julien	DK/D	julien.westhoff@nbi.ku.dk

Address of the 109th:

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Stratton Air National Guard Base,
1 Air National Guard Rd.
Scotia, New York 12302-9752

Phone numbers

Contacts to Ice and Climate group, NBI

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Marie Kirk	+45 35 33 13 20
e-mail:	m.kirk@nbi.ku.dk
EGRIP FOM (Field Operations Manager) telephone	+299 52 41 25
FOM satellite phone	(will appear on EGRIP home page)
e-mail	fom@egrip.camp

Iridium Satellite handheld telephones to EGRIP camp.

Only some of the telephones will be available at any given time. Please ask the Field Operations Manager (FOM) which numbers are current.

Iridium OpenPort system (EGRIP only)

Please ask the Field Operations Manager (FOM) which number is current. Numbers will be published in the Situation report (SITREP) on the EGRIP web page.

Kangerlussuaq

While participants are in Kangerlussuaq, they can be reached through the internet, as EGRIP offers WIFI services in KISS also by their own cell phones.

EGRIP FOM Cell :	+299 52 41 25

Battelle ARO POLAR FIELD SERVICES, Kangerlussuaq

Office:	+299 84 15 98
Fax	+299 84 15 99
Mobile:	+299 52 42 18 (primary)
	299 52 42 81 (secondary)
E-mail:	ARO-KangerOps@polarfield.com

Air Greenland Cargo	+299 52 43 98
Tickets	+299 70 12 12

NYANG (109th)	+299 84 13 89
e-mail:	139ravenops@gmail.com
FIC: telephone:	+299 36 33 53 (sector north)
FIC e-mail	fic@naviair.dk
Notam & com centre	+299 36 33 04
Rescue and Coordination Centre (RCC)	+299 36 33 18
e-mail:	rcc@naviair.dk
KISS manager	+299 52 45 33
email	sciencesupport@mit.gl

MEDICAL ADVISORY GROUP

EGRIP medical team in Denmark	medicals@egrip.camp

Cargo shipments to Greenland

EGRIP will have a Field Operations Manager in Kangerlussuaq all the time this season. It is essential that all shipments are labelled correctly, and that EGRIP is informed about every shipment. In addition, we can expect delays in the Air Greenland transport from Copenhagen to Kangerlussuaq although Air Greenland has increased the number of flights in summer.

Cargo to Kangerlussuaq should be labelled:

EGRIP Operations 2024
Box 12
DK-3910 Kangerlussuaq
Phone +299 52 41 25
Greenland

The international designation of Kangerlussuaq is **SFJ** (Søndre Strømfjord)

We would like following information about each collo:
Weight
Dimensions
Volume

Additional information and labeling
Non Freeze
Hold in Kangerlussuaq
Hazardous Material, including UN number and Proper shipping name.

Information on shipments and **Air Way Bill # (AWB)** should be emailed to:
fom@egrip.camp and **logistics@egrip.camp**

We urge people to ship cargo as early as possible. Based on our experience and this year available air cargo space to Greenland we as a minimum recommend following:

SHIPPING DEADLINES:

Cargo deadlines 2024

AIR Cargo

If you cannot have your cargo ready by these dates, please talk to Marie/Iben. **It is more expensive to hand-carry boxes, and we may find a faster shipping method.** **Please note that items longer than 318cm are subject to extra charge.**			
AIR Greenland			
Flight Period:	**ETA cargo EastGRIP:**	**ETA cargo SFJ:**	**ETD Cargo from UCPH/BWS to SFJ:**
GRIP mission	01 May 2024	26 April 2024	15 April 2024
1 EGRIP Put-in	10 May 2024	03 May 2024	22 April 2024
2 EGRIP-flight	19 May 2024	13 May 2024	06 May 2024
3 EGRIP-flight	06 June 2024	31 May 2024	24 May 2024
4 EGRIP Pull-out	11 July 2024	05 July 2024	28 June 2024

SHIP Cargo

Boat (RAL)	**ETA cargo EastGRIP:**	**ETA cargo SFJ:**	**ETD Cargo UCPH:**	**ETD cargo Aarhus:**
1	15 June 2024 (placeholder)	12 June 2024 (Great risk of delay)	17 May 2024	30 May 2024
2	11 July 2024 (Pull-out)	28 June 2024	03 June 2024	13 June 2024
3	Spring 2025	Various options	Ask UCPH logistics	Ask UCPH logistics

Shipping to EGRIP from the United States

Battelle ARO POLAR FIELD SERVICES and the EGRIP FOM must be notified of all cargo shipments, including commercial air in order to arrange for the receipt and transportation of cargo to the appropriate location in Greenland.

Please send the following info:

Weight
Dimensions
Volume

Date of arrival in NewYork

To EGRIP FOM's: fom@egrip.camp, logistics@egrip.camp,
Battelle ARO: Tracy Sheeley (sheeley@polarfield.com) and Kyli Cosper (kyli@polarfield.com)

PLEASE NOTE: Be sure to mark your cargo with "EGRIP 2024" to avoid your cargo ending up at Summit!

Useful tables
for planners, field leaders, Field Operation Managers, drillers and other interested parties.

Positions of NEEM and EGRIP camps and 2015 traverse route.

EGRIP position: 75.63N, 36.00W (decimal degrees), 2708 m a.s.l. (8885 feet)

Start of route is approx. 2 km N of NGRIP camp.

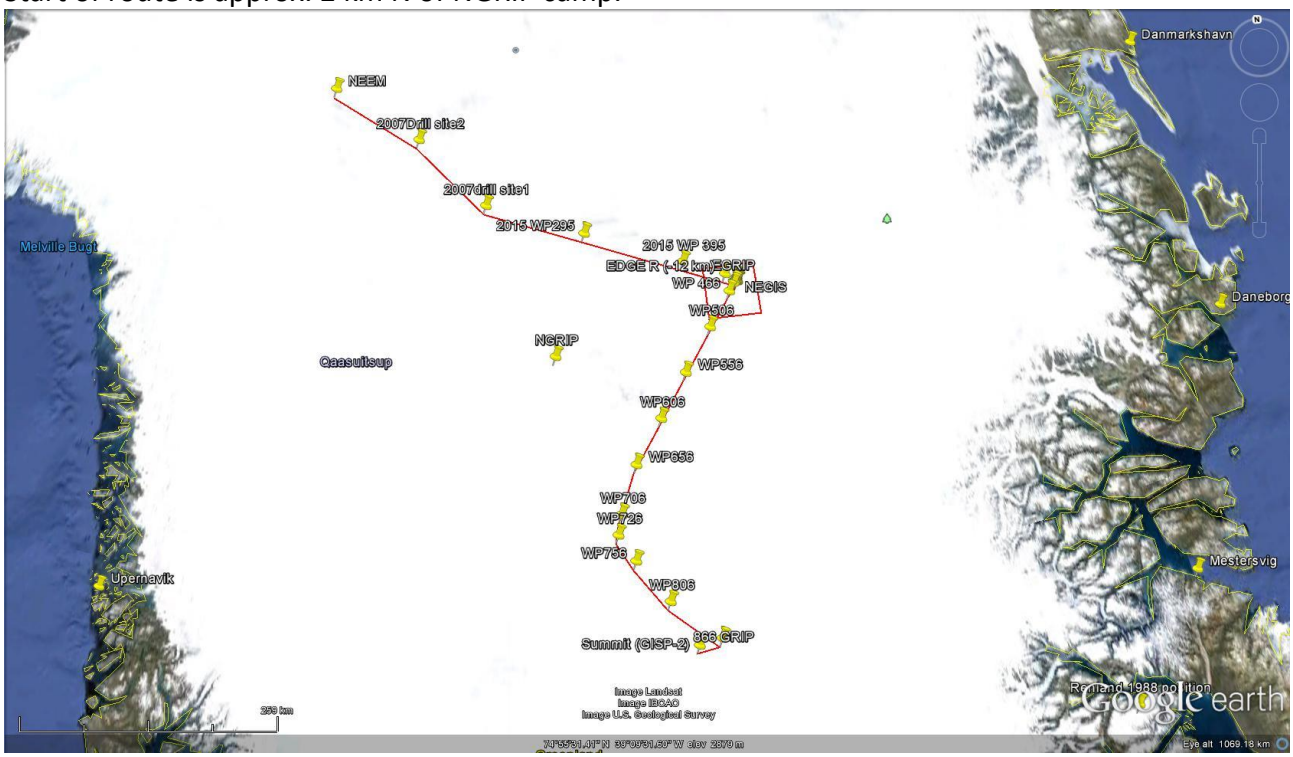


Fig. 5 1 The red line shows the 2015 route from NEEM to EGRIP and on to Summit.

Positions of EGRIP skiway (official-April 2023):

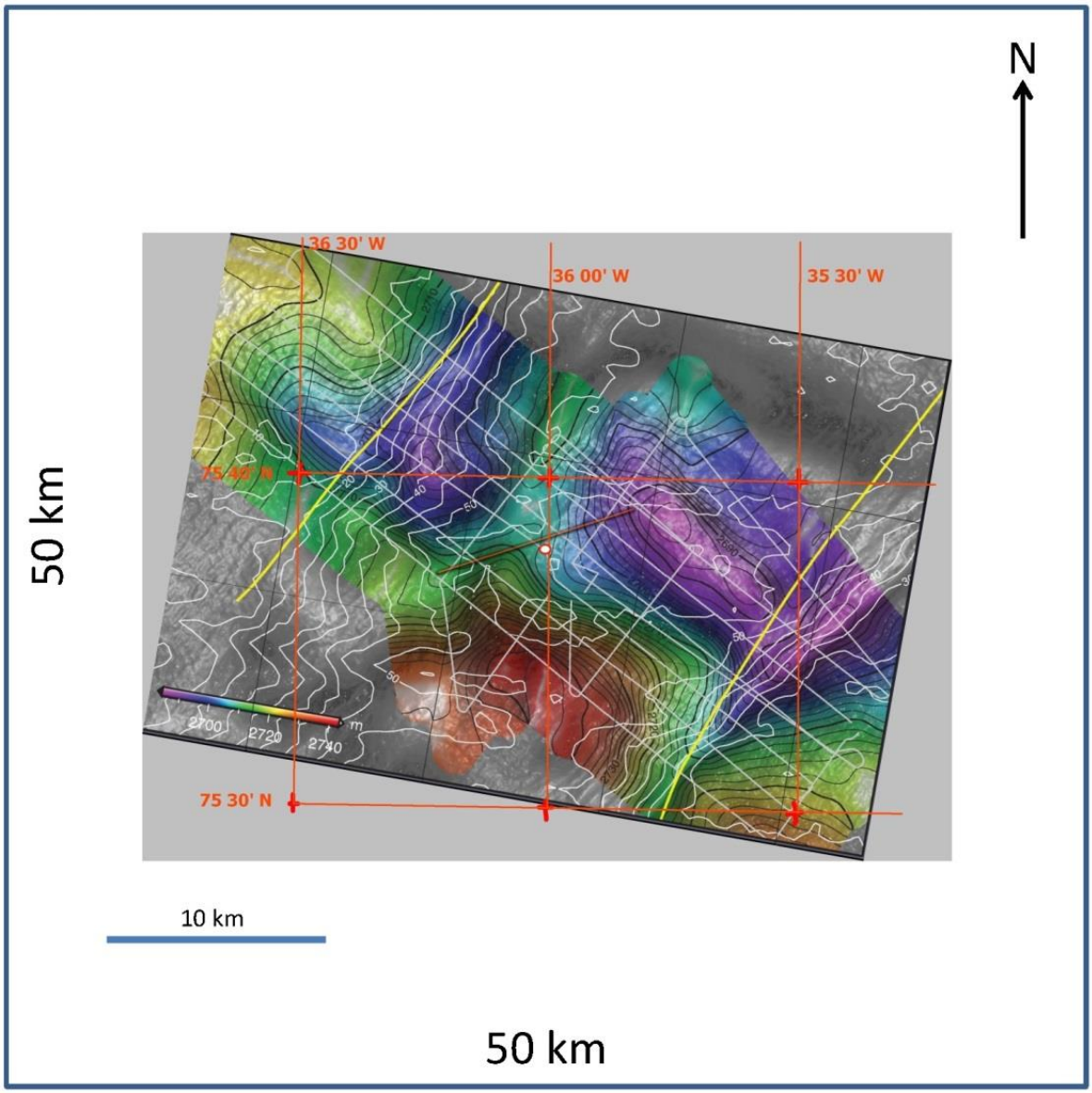
NorthEast end: 75 38’ 44.52’’N; 35 56’ 13.06’’W ELEVATION: 8871 feet (2704 m)

SouthWest end: 75 37’ 45.66’’N; 36 03’ 07.27’’W ELEVATION: 8898 feet (2712m)

Skiways runs 240 30’ and 060 30’ degrees true.

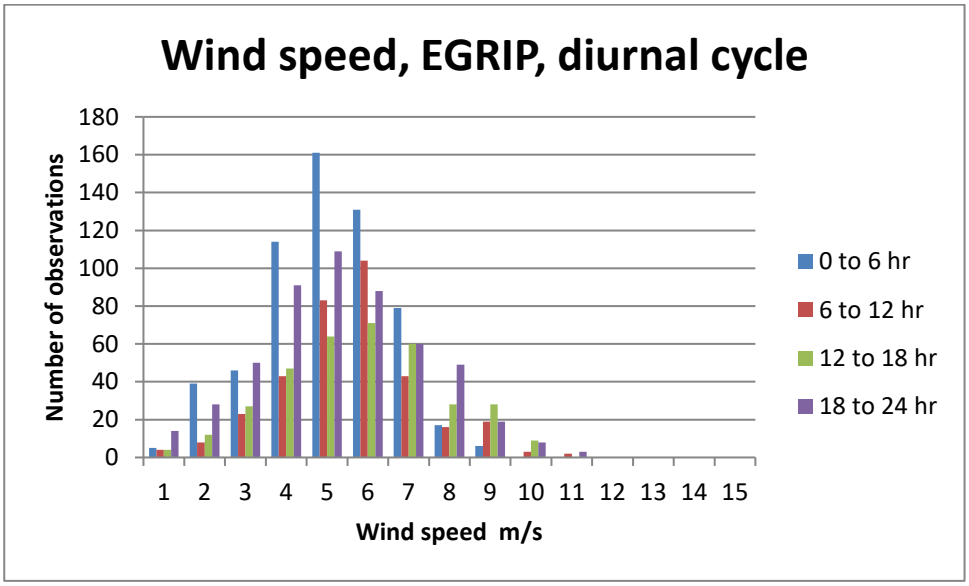
Official (109th) altitude: 8,885 ft, Slope 0.22 degrees, down vs 060.

Note: The entire camp moves 51m towards NNE each year.

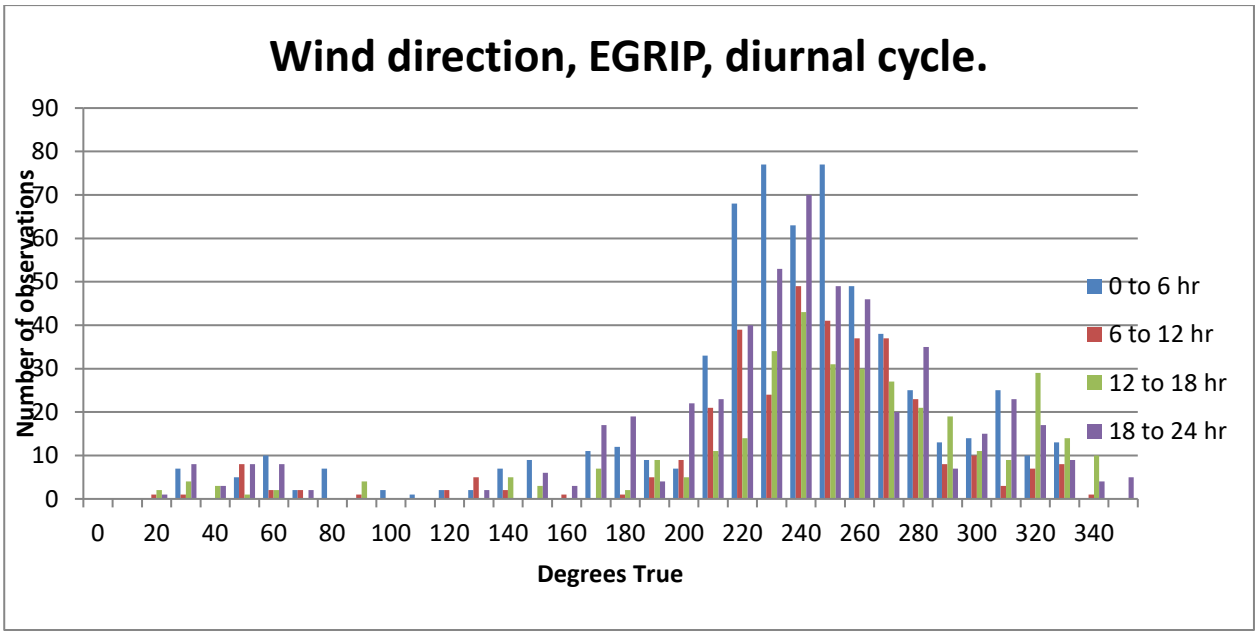


Map on the vicinity of EGRIP camp with camp and skiway (240 degrees true). Data has been compiled by Knut Christiansson, Penn. State. The entire frame is 50 km by 50 km and represents the area allotment requested for EGRIP at Greenland authorities.

EGRIP weather 2014 from PARCA AWS



Wind speeds are in m/s. The ordinate is number of observations



When compared, it becomes clear that the wind is much more localized at EGRIP than at NEEM. Therefore a EGRIP skiway of 240 degrees true is within 20 degrees of the wind more than 60 % of the time. EGRIP is slightly colder than NEEM, but there are fewer cases with high winds. Finally, the annual accumulation of 11 cm ice eq. (30 cm snow) is less than half of NEEM.

Shipping boxes

The type of shipping box is very critical for both the protection of the cargo, and for efficient air transport. In Kangerlussuaq, the boxes will be stored on the cargo line which is exposed to snow, rain, sand and wind. On the ice, drifting snow will creep through any openings. The off loading from the aircraft at Summit is in the form of drifting cargo: The pallets are slid down the rear ramp of the aircraft while the aircraft is taxiing. In order to obtain the full payload and prevent the aircraft from cubing out before reaching maximum weight, the boxes should be stackable on an Air Force pallet. Also, wooden boxes with nails sticking out are dangerous to handle. By experience, we have found the following series of boxes to satisfy all the requirements:

Zarges aluminium box, type K-470. The following sizes are preferred:

order no	Internal dimens (L*W*H)	Outside dimens	Weight
40678	550*350*310	600*400*340	5,0
40564	550*350*380	600*400*410	5,3
40565	750*550*380	800*600*410	10,0
40566	750*550*580	800*600*610	12,0
40580	1150*750*480	1200*800*510	20,0

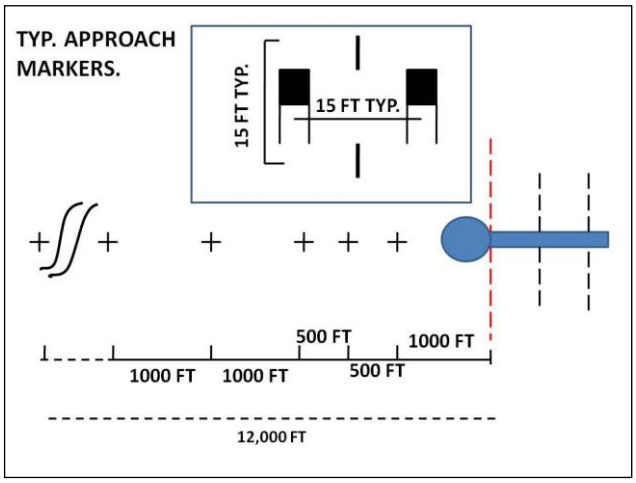
The boxes should be lined with a shock absorbing layer. We have found a 27mm layer of Dow Chemical EDPM foam, 35kg/m^3, to provide the needed protection for even fragile material. Finally, in order to seal the box, all seams (bottom inside and outside, two vertical seams) should be sealed with Loctite 290 penetrating sealing compound.

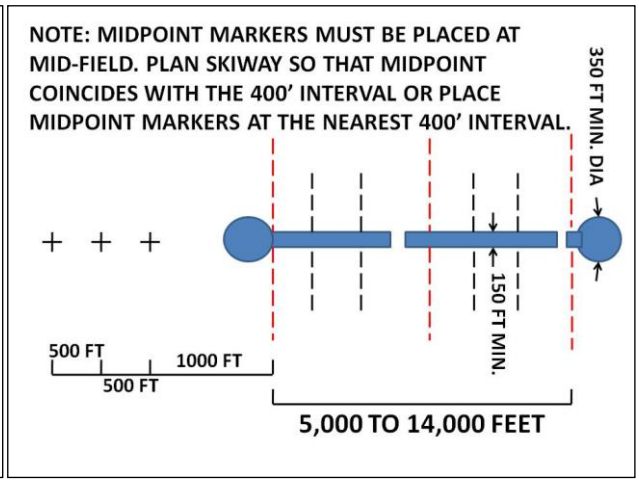
We propose that, whenever possible, all participants use these or compatible boxes for their cargo. In order to be compatible, a box should have the same outside dimensions, and the same type of inter-box locking mechanism. The boxes should be equipped with handles.

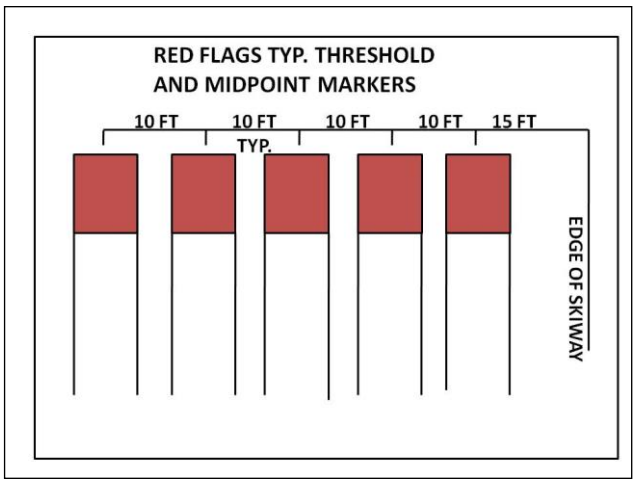
The costs of transporting boxes are considered to be part of the field expenses.

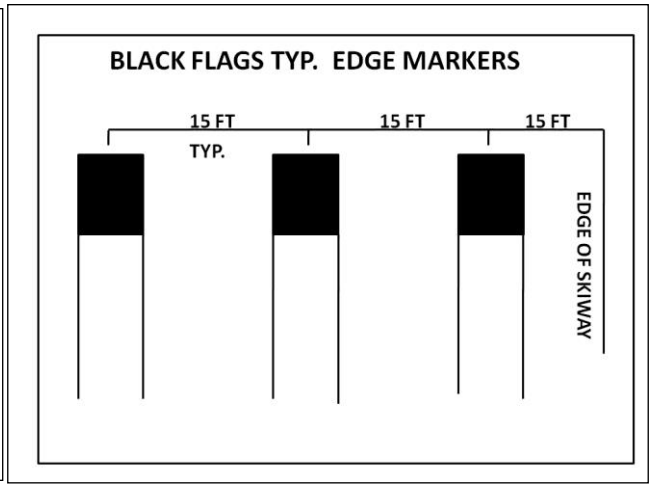
Skiway Marking:

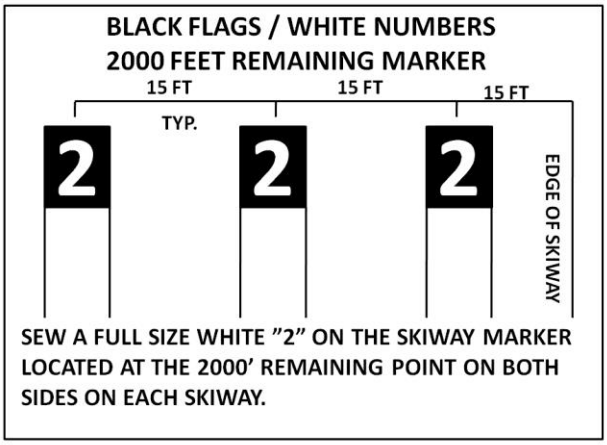
EGRIP ski way is 200’ x 12.000’ (Feet) – (choice of length 5,000’ – 16,000’, width 150’ – 400’)
Skiway design from AFI 13 – 217, 10.MAY 2007





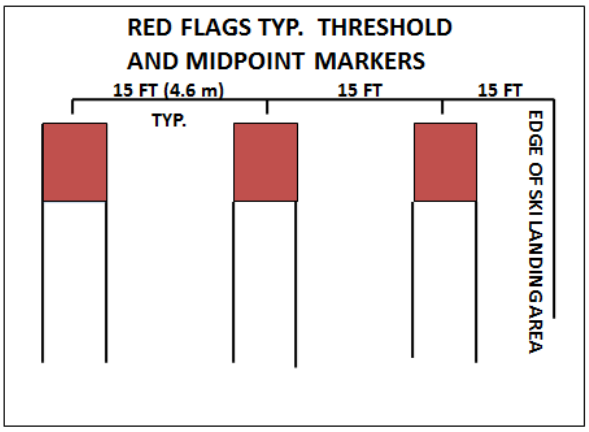


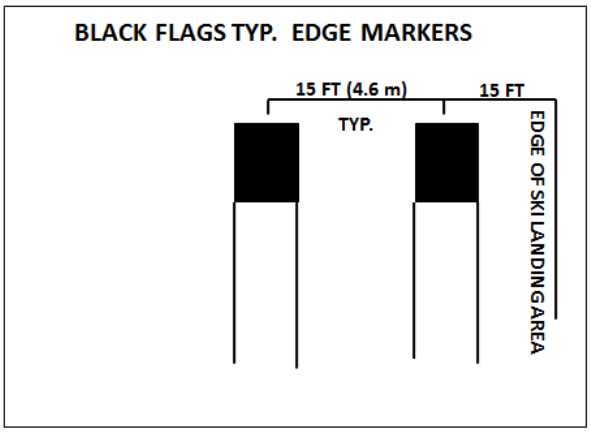


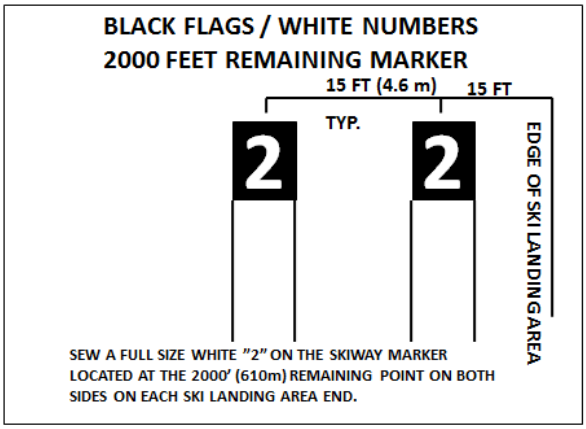


Ski Landing Area Marking (temporary skiway, last used at NEEM*):*

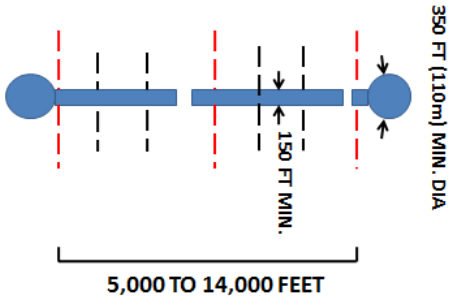
EGRIP ski landing area will be 200’ x 12.000’ (Feet) – (choice of length 5,000’ – 16,000’, width 150’ – 400’). Landing Area design from AFI 13 – 217, 10.MAY 2007







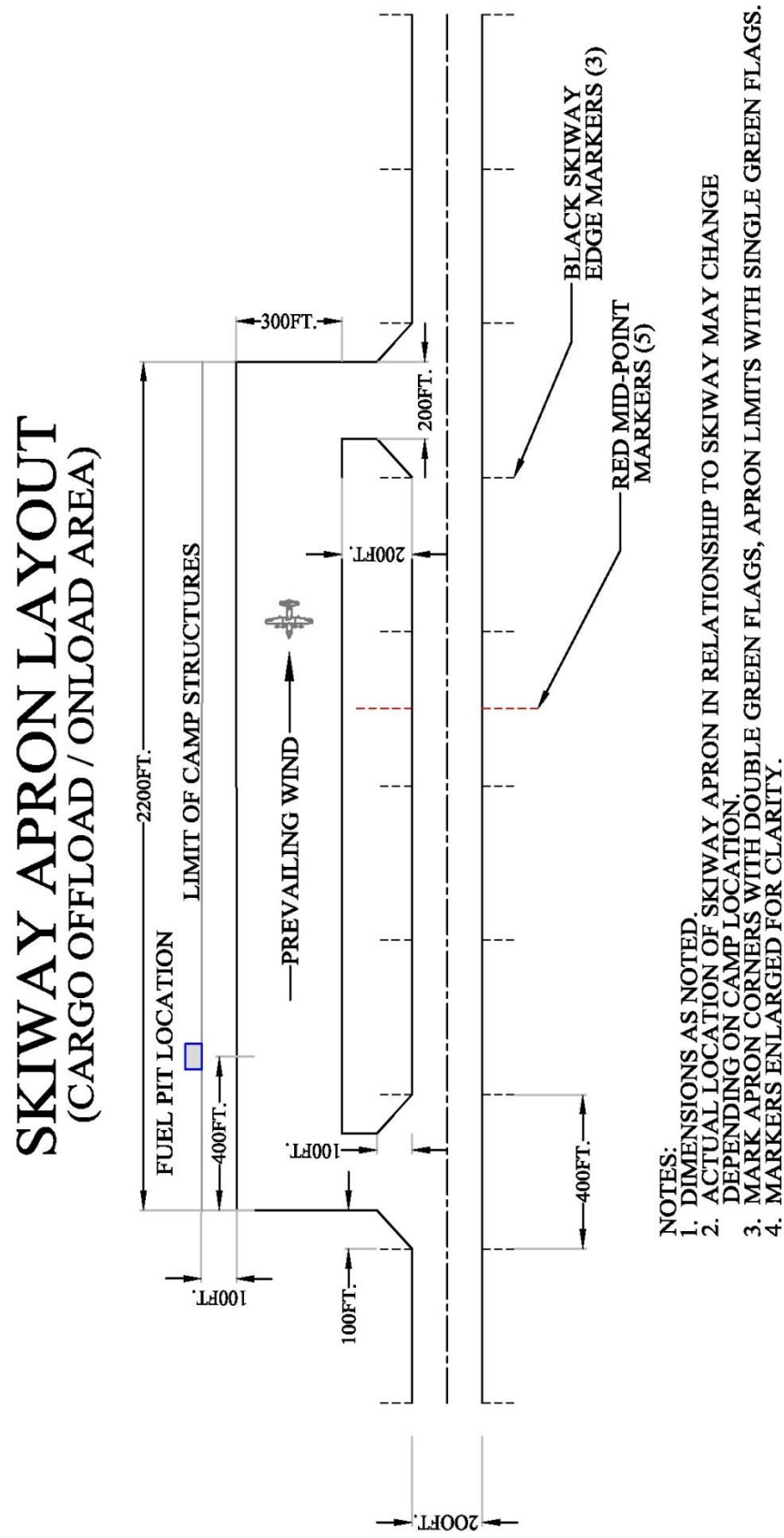
NOTE: MIDPOINT MARKERS MUST BE PLACED AT MID-FIELD. PLAN SKI LANDING AREA SO THAT MIDPOINT COINCIDES WITH THE 500’ (152.4m) INTERVAL OR PLACE MIDPOINT MARKERS AT THE NEAREST 500’ INTERVAL. NO APPROACH MARKERS NEEDED



TYPICAL DIMENSIONS FOR MARKER BAMBOO:
2.4 m (94”) x 2.5 cm (1 ”)DIAMETER

SKIWAY:
NO OF MARKERS NEEDED (12,000 FEET X 200 FEET) (3660 m X 61 m):
30 RED AND 12 BLACK WITH ”2” AND 268 BLACK (INCLUDING APPROACHES).
APRON AND TAXIWAYS: 30 GREEN.

SKI LANDING AREA :
NO OF MARKERS NEEDED (12,000 FEET X 200 FEET):
18 RED AND 8 BLACK WITH ”2” AND 80 BLACK
APRON AND TAXIWAYS: 30 GREEN.


SKIWAY APRON LAYOUT
(CARGO OFFLOAD / ONLOAD AREA)
2200FT.
FUEL PIT LOCATION
LIMIT OF CAMP STRUCTURES
400FT.
100FT.
100FT.
300FT.
200FT.
200FT.
100FT.
PREVAILING WIND
BLACK SKIWAY EDGE MARKERS (3)
RED MID-POINT MARKERS (5)
400FT.
200FT.
NOTES:
1. DIMENSIONS AS NOTED.
2. ACTUAL LOCATION OF SKIWAY APRON IN RELATIONSHIP TO SKIWAY MAY CHANGE DEPENDING ON CAMP LOCATION.
3. MARK APRON CORNERS WITH DOUBLE GREEN FLAGS, APRON LIMITS WITH SINGLE GREEN FLAGS.
4. MARKERS ENLARGED FOR CLARITY.
LC-130 AIRPLANE DESCRIPTION
WINGSPAN...132' 7"
LENGTH...97' 9"
HEIGHT...38' 6"
JCS 2011

Skiway official survey document:

May 29, 2015 survey in black
May 1 2018 re-survey in brown. April 30 2023 survey in blue.

SURVEYOR: Jorgen Peder Steffensen (Document updated April 2023).

NOTE:
1. ALL ELEVATIONS REFERENCE MEAN SEA LEVEL IN FEET (METRIC)
2. LATITUDES/LONGITUDES AND AZIMUTHS EXPRESSED IN DEGRESS-MINUTES-SECONDS FORMAT
3. ALL DISTANCES IN FEET (METRIC)
4. DUE TO ICE FLOW, EGRIP SKIWAY IS MOVING 150 FEET PER YEAR, BEARING 030

EGRIP CAMP (BGEG)

AIRFIELD REFERENCE POINT (ARP): CENTERLINE STATION 1640 (500 meter)
LATITUDE: 75-38-02.82 N LONGITUDE: 36-00-12.96 W
LATITUDE: **75-38-07.48N** LONGITUDE: **36-00-00.90 W**
LATITUDE: **75-38-15.18N** LONGITUDE: **35-59-39.98 W**

ELEVATION: 8885 (2708 meter)
DISTANCE SKIWAY CENTERLINE POINT TO THRESHOLD:
APPROACH: 6000
DEPARTURE: 6000

MAIN SKIWAY (200 ft. x 12000 ft.)
APPROACH (24) **Magnetic 2022: Skiway 28**
LATITUDE: 75-38-32.52 N LONGITUDE: 35-56-46.80 W
LATITUDE: **75-38-37.07 N** LONGITUDE: **35-56-34.12 W**
LATITUDE: **75-38-44.52 N** LONGITUDE: **35-56-13.06 W**
ELEVATION: 8871 (2704 meter)

DEPARTURE (06) **Magnetic 2022: Skiway 10**
LATITUDE: 75-37-33.36 N LONGITUDE: 36-03-38.82 W
LATITUDE: **75-37-37.85 N** LONGITUDE: **36-03-27.54 W**
LATITUDE: **75-37-45.66 N** LONGITUDE: **36-03-07.27 W**
ELEVATION: 8898 (2712 meter)

MAIN SKIWAY GRADIENT: 0.22%

SKIWAY AZIMUTHS from Approach True 24
True: 240 30’ (2022). The 2015 azimuth theodolite determination of 237 24’ was 240 25’ by GPS
Grid: unknown (mag. Declination Jan 2019: 27 00’)

MAIN DOME (HIGHEST STRUCTURE)
LATITUDE: 75-38-00.38 N LONGITUDE: 35-58-59.63 W (April 2023)
ELEVATION: 8925 (top of structure) (2720 meter)
AGL:
DISTANCE TO SKIWAY CENTERLINE: 1640 (500 m)
DISTANCE SKIWAY CENTERLINE POINT TO THRESHOLD:
APPROACH 24 : 6000 (1829 meter)
DEPARTURE 06 : 6000 (1829 meter)

Typical specifications for Twin Otter and Basler:

Actual specs depend on the aircraft used, its equipment, fuel type etc.

	De Havilland DHC-6, Twin Otter:	**Basler (modern DC-3), Polar 6:**
Weight empty [kg]	3456	8900
Max take off weight [kg]	5682	13068
Weight of ski	250	544
Empty weight with ski	3706	9444
Max load [kg]	1976	4008
Fuel consumption [kg/hr]	270(330l/hr)	470 (570l/hour)
Speed without ski [km/hr]	250(135 kn)	380 (205 kn)
Speed with ski) [km/hr]	230 (125 kn)	300 (160kn)
Max range [km]	556	3225
Max altitude [ft]	30,000	25,000
With pax	10,000	25,000
Fuel load [kg]	1100	4008
Loading data:		
Cargo hatch [m*m]	2.0*1.9	2.15 *(1.9 front – 1.6 rear)
Cargo compartment		
Length, incl rear cabin etc [m]	8.1	12.85
Width 1,1m, max	1.2	2.34
Height 1,3m, max	1.4	2.0
Pay load		
Normal with full fuel load [kg]	990	2500 (with fuel for 3 hours)
Maximum	1260	1500 (with fuel for 5 hours)

Twin Otter:
In order for the cargo to fit through the cargo door, if the cargo is:

5.5m long, it must not be more than 0.2m thick
4.0m long, it must not be more than 0.35m thick
2.5m long, it must not be more than 0.65m thick
1.3m long, it must not be more than 1.2m thick

Basler:
In order for the cargo to fit through the cargo door, if the cargo is:

6.0m long, it must not be more than 0.6 m thick

Typical LC-130 specifications:

(all specs for info only, depends on aircraft etc)

An empty LC-130 is [lbs]	91000
Tank capacity [lbs]	61000
Max touch down weight open snow [lbs]	125000
Max take off weight [lbs]	155000
Max landing weight [lbs]	155000
Max landing weight on prepared skiway [lbs]	135000
Fuel capacity [lbs]	62000
Fuel consumption [lbs/hr]	5000
Nominal speed [kn]	290
Flight time SFJ-NGRIP-SFJ (1020 nm)	4.4 hours
Flight time SFJ-NEEM-SFJ (1260 nm)	5.4 hours
Range with max payload [miles]	2364
Max air hours [h]	10
Cargo room max 41*10.3*9’ [m]	12.50*3.14*2.74
Physical door width 116" [m]	2.94
Cargo deck to ceiling 9' 1" [m]	2.76
Max weight for one pallet, pos 1-4 [lbs]	10000
Max weight of one pallet, pos 5 [lbs]	8500
Max weight of ramp pallet [lbs]	4664
Nominal empty weight of pallet and nets [lbs]	355
Max weight multplie pallet for combat offload [lbs]	12000
Pallet outside dimensions 88"*108" [m]	2.23*2.75
Pallet inside dimensions 84"*104"*2.25" [m]	2.13*2.64
Max height normal pallet, 96" [m]	2.44
Normal height of pallet, snow and combat [m]	2.28
Max height ramp pallet for combat offload [m]	1.75
Max height dual or tripple pallet [m]	1.75
Max vol per pallet [m^3]	13.7
Max vol ramp pallet [m^3]	8.75
Width wheel well area 123" [m]	3.12
Width ramp without rails 114" [m]	2.89
Width outboard rails 105 5/8" [m]	2.68
Ramp height 44" to 49" [m]	1.12 to 1.25
Ramp length 10' [m]	3.05
No of pax without using pallet space	4
1 pallet equals [pax]	8
2 pallet equals [pax]	14

Note: Pallet heights are measured from top of pallet.
Max weight for pallet on 931B forks is 2200 lbs

Small table of values and conversions:

1 foot =	0.3048 m
1 lbs =	0.4536 kg
1 US gallon =	3.7854 l
1 knot =	0.514 m/s

Max dimension of cabin luggage:	55*40*23 cm, 8 kg
Density of Jet A1	805 kg/m^3
Density of mogas	720 kg/m^3
200 l drum of JET A1 or D60	178 kg
Empty standard drum	15 kg
Jet A-1 weight vs. volume	0.52 liter per lbs.
Firn density for stop of water flow:	720 kg/m^3

CINA equation for the relation between pressure and altitude:

$$p[hPa] = p_0 \left(\frac{288 - 6.5 \cdot 10^{-3} \cdot h\,[m]}{288} \right)^{5.256}$$

where p_o=1013.25 hPa, 288K standard air temperature at sea level (15 °C) and 6.5*10^{-3} the standard lapse rate in the troposphere [°C/m]. Use this equation to obtain the sea level pressure when the altitude is known, i.e. for aviation weather reports.

Chill temperature:
This is the formula used for calculating wind-chill-temperatures (t temperature in C, v windspeed in m/s):

$$\mathrm{t_{Chill}}[\,^{\circ}\mathrm{C}] = \left(\frac{10.45 + 10\sqrt{\mathrm{v}} - \mathrm{v}}{22.034} \right) \cdot (\mathrm{t} - 33) + 33\ [\,^{\circ}\mathrm{C; m/s}]$$

Current capability of electrical cables:

Area [mm^2]	Resistance [Ohm,/100m]	Nom load [A]	Max load [A]
0,7	2.3	6	10
1,5	1.16	15	25
2,5	0.69	20	35
4,0	0.43	25	45
6,0	0.29	40	60
10	0.175	60	80
16	0.11	80	110
25	0.07	100	135

Connections to 5-conductor cable:

Old system		**New system**
Yellow/green:	Protective ground	yellow/green
Blue	Neutral (0)	blue
Black	L1	brown
Brown	L2	black
Black	L3	grey

Coordination of LC-130 in Kangerlussuaq

Note regarding the coordination of Polarfield/EGRIP
and 109'th TAG activities in Kangerlussuaq.

This note is written to make the field coordination between Polarfield/Batelle ARO, EGRIP and 109'th TAG as smooth and easy as possible by ensuring efficient ways of exchanging firsthand information between the responsible Field Operations Managers (FOM's) for CPS and EGRIP and 109'th TAG personnel during periods with flights for the GISP and EGRIP programs.

The outline of this paper should be presented to each Deployment Commander(DC) in a briefing and each mission crew should be briefed on the contents before scheduling a flight to/from EGRIP. This will ensure that the FOM's and the 109'th personnel will operate along the same outlines throughout each period of deployment.

In the following it is assumed that prior to the field activities of Polarfield and EGRIP in Greenland, plans and agreements have already been made between Polarfield/EGRIP and 109'th TAG regarding times of deployment in Kangerlussuaq, expected number of missions throughout the season, total cargo estimates, estimates on cargo straps, nets and pallets needed, ski-way marking, ski-way preparation, off load areas, radio frequencies etc.

Flight period:

After arrival of 109'th to Kangerlussuaq a meeting should be held between 109'th DC, 109'th cargo responsibles (Load masters and Aerial port) and the FOM's of Polarfield and EGRIP. Both FOM's need to be there since U.S. NSF activities and EGRIP project are independent and each FOM carries the financial responsibility regarding 109'th operations. At this meeting the FOM's will provide information on:

- Planned flights,
- Amount of cargo,
- Hazardous cargo,
- Number of PAX to be transported,
- Ski-way conditions in camp.
- Ski-way, taxiway and off-load area outlines relative to the camps,
- Updates on radio frequencies,
- Current weather and
- Communication radio frequencies & phone numbers.

The DC will provide information on the exact duration of the deployment, ground crew availability, aircraft availability and options in case of bad weather. The meeting will result in an operation schedule for the flight period in question. Both FOM's and the DC should consult each other in case of changes in this schedule.

Day to day operations:

The FOM's will normally organize that all cargo is palletized, strapped down and weighed. In cases of doubt the FOM's will consult the Aerial Port regarding palletizing. The FOM's will always consult the Aerial Port when married pallets are being built and when load vehicle (k-loader) is needed. The FOM's will list the weight and height of the pallets. The FOM's will indicate to Aerial Port which pallets are going on each flight and will indicate the position of any hazardous cargo on the pallets. Normally, transportation of pallets from the staging area to the planes and vice versa will be handled by Aerial Port using the Articulated front loaders(ATs) or other load vehicles. However, the FOM's will assist in the on- and off-loading of aircraft whenever needed using the EGRIP forklifts and trucks.

Cargo manifests, passenger manifests and shippers declarations of hazardous material will be prepared by each FOM office and delivered to Skier operations on the day before departure. In case of last minute changes (e.g. changes in passengers) the changes to the manifests will be passed on to Skier operations no later than two hours before departure. The FOM's will get aviation weather observations from the field camps on a one hour basis, starting at least 3 hours prior to scheduled departure. The FOM will ensure that the Field Leader also sends three consecutive Aviation weather reports to the DMI office, so DMI may work out an aviation weather report for the 109th pilots.

Since each FOM is economical responsible to his/her program, the FOM and DC either in person or by telephone will agree on whether a flight will depart or not. The FOM should be present at the AC at departure to provide last minute briefing with the departing crew.

During missions Telephone, Iridium phones, OpenPort phones and e-mail will be monitored for updates on weather and mission progress from plane crews and field camps. NOTE: Both EGRIP camp and FOM office will have phone lines open 24 hours a day. The FOM office will relay information on mission progress to Skier OPS. The FOM keeps a record of departure times and reported arrival times.

End of flight period:

At the end of deployment, before departure of the 109'th to the U.S. or, when there is a change of DC, a meeting should be held between the 109'th and the CPS and EGRIP FOM's in order for the FOMs and DC to sign the mission sheet, which includes the number of flight hours assigned to the different programs.

Updated, February 25, 2022 by J.P.Steffensen

AVIATION WEATHER REPORTS

The aviation weather reports should report the following in the sequence shown:

1. Time [local, here SFJ hours], use 24 hour format.
2. Ceiling Height to cloud base[100 feet, estimated or observed]. Type [SKC, FEW, SCT, BRK, OVC]
3. Visibility [nautical miles or fractions there off]
4. Temperature (Celsius). State centigrade.
5. Wind, Direction[10 deg resolution], State “true” or “magnetic” . And speed in knots
6. Pressure [hPa], reduced to zero elevation using 10700' for GRIP, 10600' for GISP, 9700' for NGRIP, 8140’ for NEEM and 8924’ for EGRIP. This is called the **QNH** value.
7. Horizontal definition [good, fair, poor, nil]
8. Surface definition [good, fair, poor, nil]
9. Comments.

Example: 0630 local, Scattered, 2500 feet estimated, vis. 2 miles, temp: -15 degC, Wind 290 mag at 12 knots, QNH 1013 hPa, horizon: good, surface: fair, “skiway clear, fogbank SE of ski-way.”.

Visibility: Nautical miles or fractions of miles. Any visibility problems less than 6 miles state obscuring phenomenon. Choices: Haze, snow, ice fog, ground fog, blowing snow, white out. Max visibility stated “unrestricted”.

Pressure: Local pressure converted to sea level according to international aviation CINA standard atmosphere. State hPa. Note, that the elevation used is the agreed upon, canonized elevation in feet, not the actual elevation. hPa (or millibar; 1 hPa = 1 mb)

Ceiling type: **SKY CLEAR** (SKC, no cloud al all), **FEW** (a small cloud here and there <25 %), **SCATTERED** (SCT. Even coverage of clearly separated small clouds. 25% -60%), **BROKEN** (BRK, Even coverage of clear blue patches of sky between clouds. 60 % – 85 %). **OVERCAST** (OVC, even cloud cover, 100%). With OVC always state cloud base height.

Horizon definition: **Good:** Sharp horizon **Fair:** Identifiable
Poor: Barely discernable **Nil:** No horizon

Surface definition

GOOD: Snow surface features are easily identified by shadow. (Sun in obscured)
FAIR: Snow surface can be identified by contrast. No definite shadow exist. (Sun obscured).
POOR: Snow surface cannot be identified except close up. (Sun totally obscured).
NIL: Snow surface features cannot be identified. No shadow or contrast. Dark coloured objects seem to "float" in the air. Glare is equally bright from all directions.

Whiteout NIL surface, NIL horizon

Comments: Plain language comments, trends, changes : «Fog bank north”, “Visibility decreasing.” “Winds variable”. “Barometer rising”.

Conversion:

1mB	= 1 hPa =	0.0295300 in.Hg.
1 foot	= 0.3048 meter,	
1 nau.miles	= 1853 meter.	
1 m/s	= 1.943 knots	

Communication plan

Typical radio communication plan.

The major part of the communication is performed using a satellite link, Iridium OpenPort and Iridium satellite communication. However, flight related communication close to camp is performed on VHF radio.

Call signs (Site Names): Polarfield Sonde, Summit Radio, East GRIP , GOC Sonde.

VHF radio.
Camp communication with air craft is performed on Air band **122.8MHz** FM, In camp radios will operate on Maritime Channel 8 (156.400 MHz). Maritime VHF is also used to support SAR operations.

If aircrafts are expected, weather reporting from camp starts 3 hours prior to estimated take off time on a one hour basis unless otherwise arranged. Reporting primarily on e-mail with telephone and radio as backup unless agreed otherwise. Weather observations should be reported to the FOM office, weather office in Kangerlussuaq (DMI) and the 109th. DMI needs at least three observations from camp to issue a local area forecast to the flight crews.

Summary of frequencies used in Greenland

VHF radio air band.	118.1	CNP AFIS
	118.3	SFJ Approach
	121.3	NUUK FIC
	121.5	**Call, Emergency**
	122.8	Air to ground, EGRIP or Summit
	126.2	SFJ Tower
	123.45	Open Mic. Flight chat line
VHF marine band:	Ch 8	EGRIP talk channel
	Ch 12	EGRIP talk channel
	Ch 16	International call and distress channel (156.8 mHz)

Phonetic alphabet

A special way of saying letters and numbers that makes them less likely to be misunderstood when they are transmitted over radios.

A	Alpha	N	November	1	Wun
B	Bravo	O	Oscar	2	Too
C	Charley	P	Papa	3	Tree
D	Delta	Q	Quebec	4	Fower
E	Echo	R	Romeo	5	Fiwer
F	Foxtrot	S	Sierra	6	Six
G	Golf	T	Tango	7	Seven
H	Hotel	U	Uniform	8	Aight
I	India	V	Victor	9	Niner
J	Juliet	W	Whiskey	0	Zeeroh
K	Kilo	X	Xray		
L	Lima	Y	Yankee		
M	Mike	Z	Zulu		

In addition, numbers are usually spoken as individual digits. For example, 123 would be read as “wun too tree”.

Useful abbreviations for de-cyphering pilot talk on flight plans.

AC: Air craft.

ACL: Air Craft Load	= Total weight of aircraft (in kg or pounds)
GC: Centre of gravity	For balancing the Air Craft
FL: Flight Level	level of flight in nearest 100 feet
POB: Persons on board	= total number of souls (PAX and crew)
Endurance or FOB	= Total time of flight with current fuel load.
1000z	= 10.00 GMT (0800 AM West Greenland summer time)

Flightplan:

IDENT: C-GHGF TYPE: DC3T VFR M SHG/S
DEPART BGNM@1200 FL125 N0205
ROUTE: BGSF
EET 0330 FOB 0600 POB 5
For PIC E BENGTSSON
J.P.Steffensen, FL EGRIP Camp
+8816 777 15686

Identity: Charlie-Golf Hotel Golf Foxtrot. Type: Turbo DC3 (Basler), Flying Visual Flight Rules. Safety equipment “M SHG/S” Departs EGRIP at 1200z , flying at flight level 12500 feet, , route to Sondrestrom, Estimated flight time 03.30 hours, Fuel on board 06.00 hours. 5 Souls on board. Pilot in Charge: E Bengtsson.

METAR and TAF:

METAR	bgsf 111320z auto 08007kt 9999ndv ncd m30/m34 q0995=

METAR	METAR
Bgsf	Valid for Kangerlussuaq/Sdr Strømfjord
111320z	Issued the 11th day of the month at kl. 13:20UTC
auto	
08007kt	Wind from 80° at 7 knots
9999ndv	Visibility > 10 km
ncd	
m30/m34	Temperature -30 degrees C, dewpoint temperature -34 degrees C
q0995	Pressure 995 hektopascal (hPa)

TAF-FT	bgsf 111058z 1112/1123 06006kt 9999 bkn150 tempo 1113/1123 4500 -shsn bkn024=

TAF-FT	Long TAF
Bgsf	Valid for Kangerlussuaq/Sdr Strømfjord
111058z	Issued the 11th day of month at 10:58 UTC
1112/1123	Valid from 09:00 and the next 11 hours
06006kt	Wind from 60° at 6 knob
9999	Visibility > 10 km
Bkn150	Broken at 15000 feet
Tempo	Periods with change
1113/1123	Between kl 13:00z and 23:00z
4500	Visibility 4500 meter (4,5 km)
-shsn	Light snowshowers
bkn024	Broken at 2400 feet

Positions in Greenland

Positions in Greenland				
Site	N, deg	W, deg	N, deg, min	W, deg,min
Aasiaat, BGAA	68,7219	52,7847	68 43 19	52 47 05
Akureyri, AEY	65,65	18		
AWI 1995 depot	76,63	46,37	76 38	46 22
Camp Century, tower	77,1797	61,10975	77 10 46	61 06 35
Camp Century,upstream	77,22122	60,80012	77 13 16	60 48 00
Constable Point, BGCO	70,7417	22,6583	70 44 30	22 39 30
Danmarkshavn, DMH	76,79	18,65		
Dye-2	66,485	46,298	66 29 06	46 17 54
Dye-3	65,15139	43,81722	65 09.05	43 49.02
EGRIP	75,63541	36,00025	75 38 07	36 00 01
GISP 2 (Summit)	72,58833	38,4575	72 34.78	38 27.27
GRIP	72,58722	37,64222	72 34.74	37 37.92
Hans Tausen, 95 Drill site	82,50556	37,47222	82 29.8	37 28.2
Jakobshavn, BGJN	69,2444	51,0622	69 14 40	51 03 44
Kangerlussuaq, BGSF	67,0111	50,725	67 00 40	50 43 30
Kulusuk, BGKK	65,5736	37,1236	65 34 25	37 07 25
Longyearbyen	78,25	15,5		
Narsarsuaq,BGBW	61,1611	45,42780	61 09 40	45 25 40
NEEM	77.4486	51.0556	77 26 54.93	51 03 19.89
NGRIP	75,1	42,30000	75 06	42 20
NGT23, B20	78,83333	36,50000	78 50 00.0	36 30 00.0
NGT27, B21	79,99925	41,13744	79 59 57.3	41 08 14.8
NGT30, B22	79,34142	45,91156	79 20 29.1	45 54 41.6
NGT33, B23	78,00000	44,00000	78 00 00.0	44 00 00.0
NGT37	77,25000	49,21667	77 15	49 13
NGT39	76,65000	46,48333	76 39	46 29
NGT42	76,00000	43,50000	76 00	43 30
NGT45	75,00000	42,00000	75 00	42 00
Nuuk, BGGH	64,1944	51,6806	64 11 40	51 40 50
Saddle North	66,43333	43,33333	66 26	43 20
Station Nord (STANOR)	81,6	16,650	81 36	16 39
Storstroemmen			77	22
T53. JJ			71 21.24	33 27.34
T61	72,2	32,3	72 12	32 18
Thule AB	76,53	68,7	76 32 00	68 42 00
Uummannaq, BGUQ	70,7342	52,6961	70 44 03	52 41 46

Relevant distances

From	To	km
AEY	NOR	1780
AEY	CNP	600
CNP	THU	1532
CNP	DMH	686
CNP	RENLAND	161
DMH	NGT33	627
DMH	NOR	539
EGRIP	DMH	480
EGRIP	CNP	695
EGRIP	SUMMIT	350
EGRIP	NEEM	440
EGRIP	NGRIP	190
MST	CNP	170
MST	RENLAND	141
NEEM	SFJ	1180
NEEM	THU	480
NEEM	UPERNAVIK	600
NEEM	NGRIP	365
NGRIP	CNP	799
NGRIP	GRIP	315
NOR	Longyearb	717
NOR	HT	335
SFJ	THU	1224
SFJ	JAV	245
SFJ	EGRIP	1088
SFJ	GRIP	796
THU	CC	205
THU	HT	887
THU	NGT33	625
THU	GRIP	1005
THU	NOR	1182

EGRIP Drilling Liquid Properties

A drilling liquid was developed for NEEM and used at EGRIP based on ESTISOL 240 (coconut oil extract) mixed with COASOL. This liquid is non-polar, non-hazardous, no explosive risk, 'healthy', has a low environmental impact, and is available. BUT is twice the price of D-40/HCFC-141b and has 5 times the viscosity at -30'C. We have also included a new cold temperature version ESTISOL 140, which was tested and found suitable for Antarctic operations at Aurora basin in 2014, also as a one components fluid (see densities below). It has higher vapour pressure so it can be smelled and it dries out from clothing much faster.

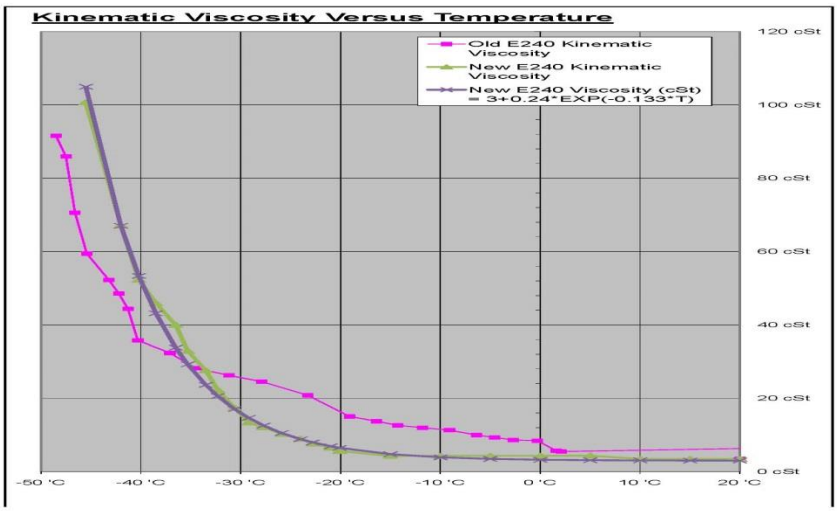
EGRIP is using COASOL/ESTOSOL 240 in combination with ESTISOL 140 in the coming years.

TABLE .	**COASOL**	**ESTISOL 240**	**ESTISOL 140**
Manufacturer	DOW	DOW	DOW
Melting point	< - 60 °C	< -50 °C	<-89 °C
Boiling point	274 - 289 °C	255 - 290 °C	199 °C
Flash point	131 °C	136 °C	75 °C
Explosive limit	0.6 – 4.7 % (vol)	None	None
Vapour pressure (20°C)	0.004 kPa		0.03 kPa
Density (20°C)	960 kg/m^3	863 kg/m^3	865 kg/m3
Density (-30°C)	995 kg/m^3	898 kg/m^3	915 kg/m3
Viscosity (20°C)	5.3 cSt	3 cSt	1.0 cSt
Viscosity (-30°C)	25 cSt	13 cSt	2.2 cSt
Auto ignition temperature	400 °C	None	270 °C
Bio-degradable	Yes	Yes	Yes
Fire fighting equipment	Water spray, foam, CO_2	Water spray, CO_2 foam, dry chemical	Water spray, CO_2, foam, dry chemical
Special protection	No	No	No
Hazardous material	No	No	No
Explosive risk	None	None	None
Max. Workplace air levels	None	None	None
Price US$ equiv. in Kg	5.50 $/Kg	4.60 $/Kg	4.5 $/kg
Data on ESTISOL 240, 256, EGDA, & COASOL are from safety tests according to EU Safety 91/155/EU, article 204020, 203989, 205698 & 204872 respectively			

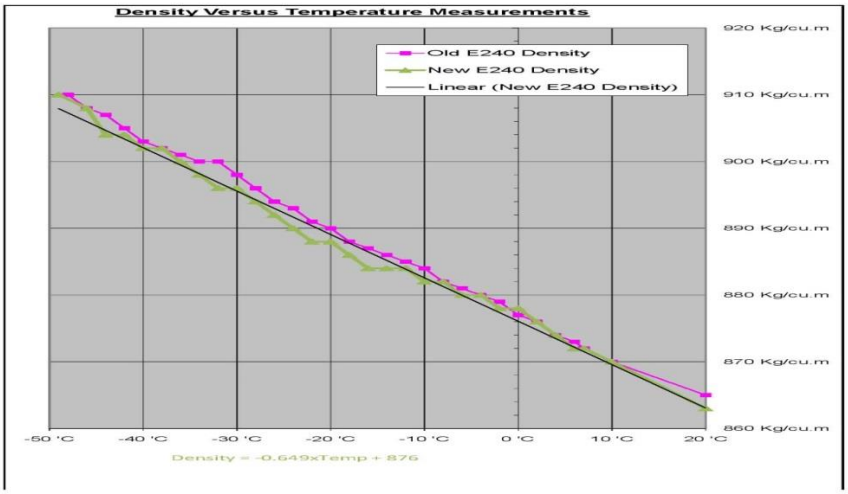
ESTISOL 240 was field tested as a drilling liquid at Flade Isblink, Greenland 2006 with a 4" diameter ice core drilled using the Hans Tausen electro-mechanical drill to a depth of 423.30m (260m of this core using the new liquid). The ice core quality was 'good', no problems encountered cleaning and processing the ice core, the mixture has a slippery feel with no discernable odour, and the liquid is very slippery when spilt on the smooth wooden flooring. The Hans Tausen drill descents at speeds of 0.95m/s at drill liquid temperatures of -16 deg. C.

By increasing the borehole diameter by 4mm (to 134mm) a 36% descent speed increase was achieved (1.28m/s). Further improvements can be achieved by adding a dead weight, reducing the pressure chamber diameter, or reducing the pressure chamber length.

The mix proportions for EGRIP fluid , 2-3 litre ESTISOL 1 litre COASOL

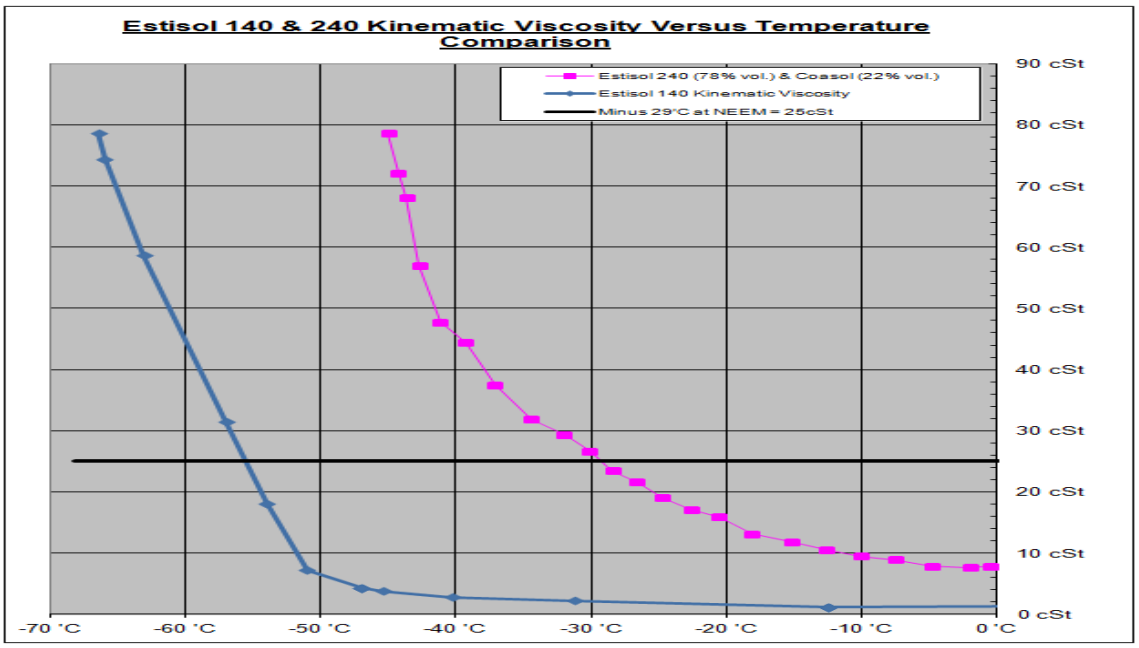


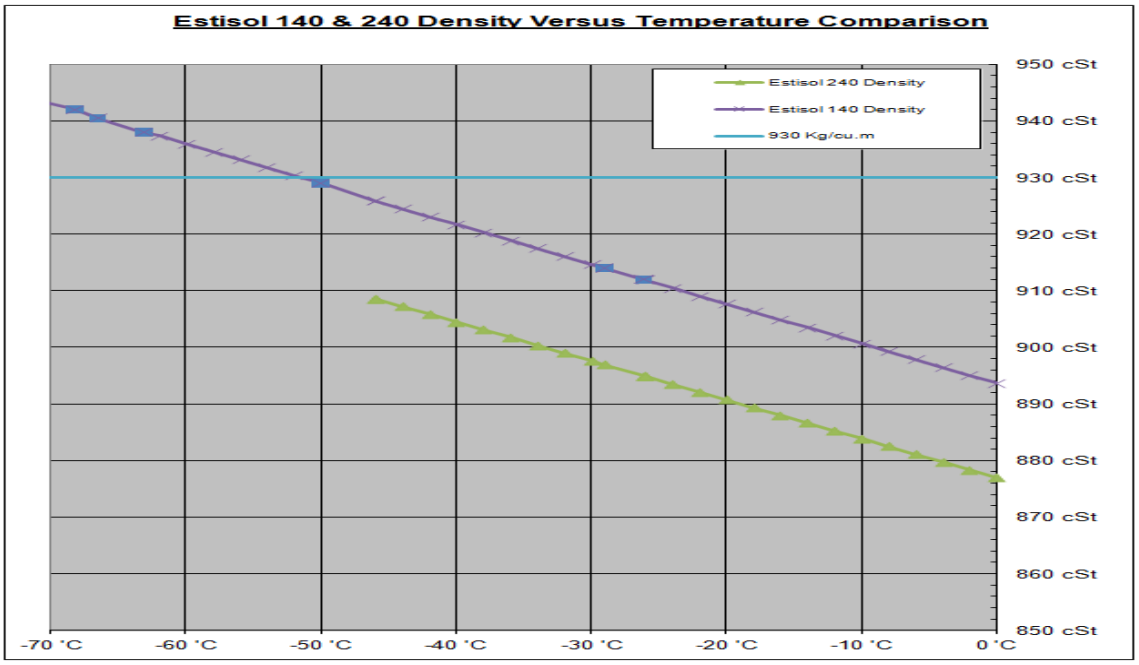
In February 2008, the supplier of Estisol 240 announced a change in specifications of the fluid due to a change in raw materials for the production (coconut oil has become too expensive) We therefore conducted a new set of measurements. As seen above, by cheer luck, this change has improved the fluid for our use. Purple: old Estisol 240; Green: New Estosol 240. Blue: simple model of kinematic viscosity vs. temperature.

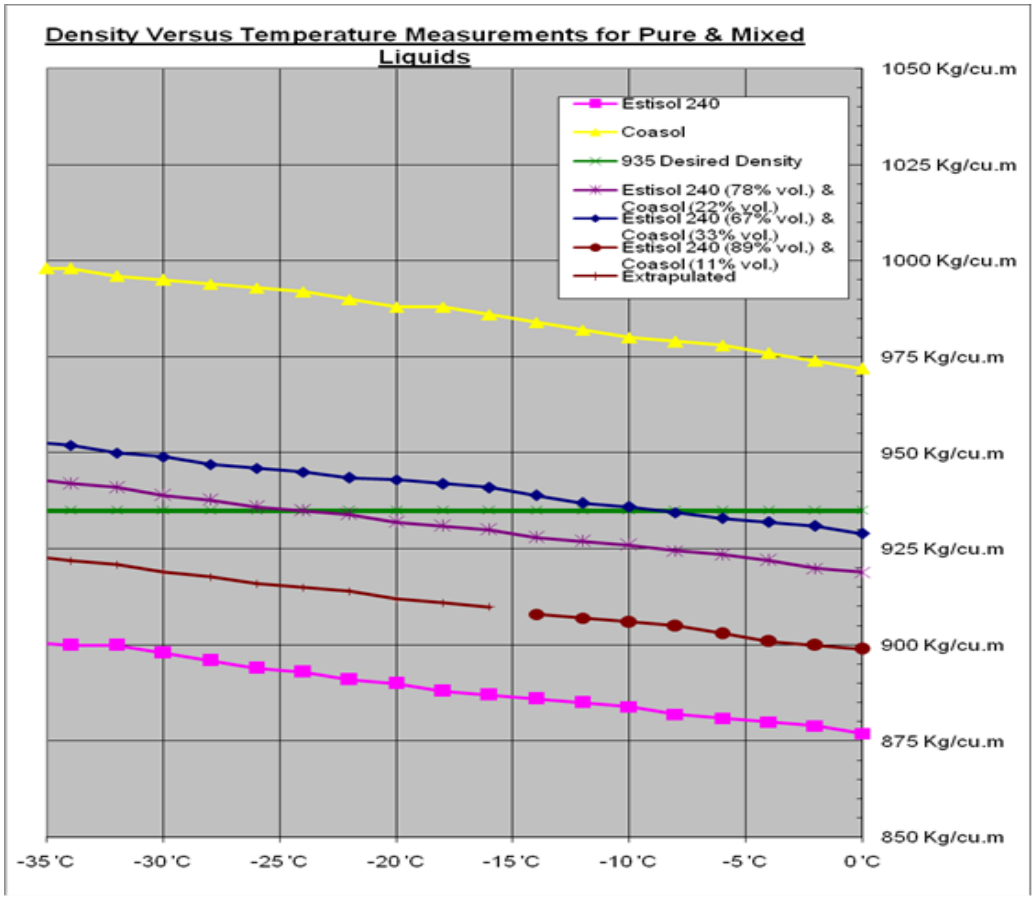


As seen above, the densities of new and old Estisol 240 are comparable.

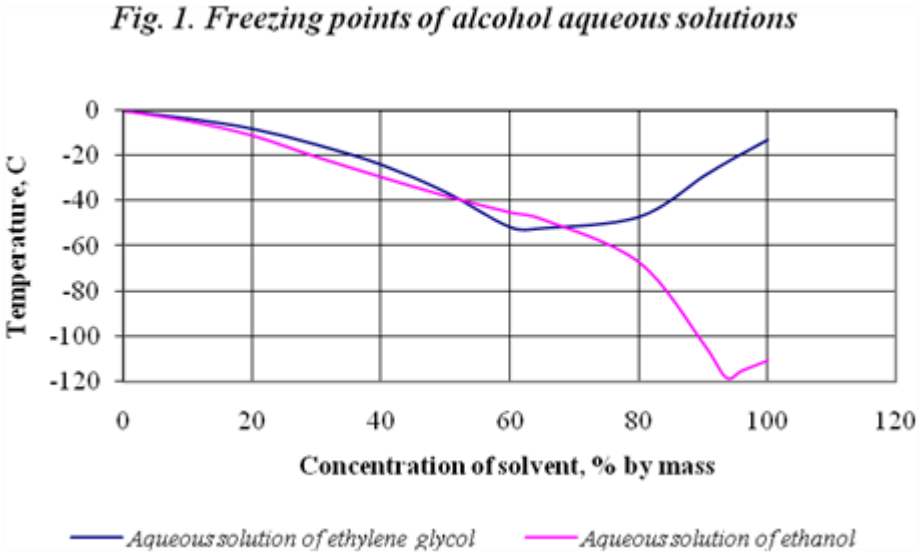
Properties of ESTISOL 140.



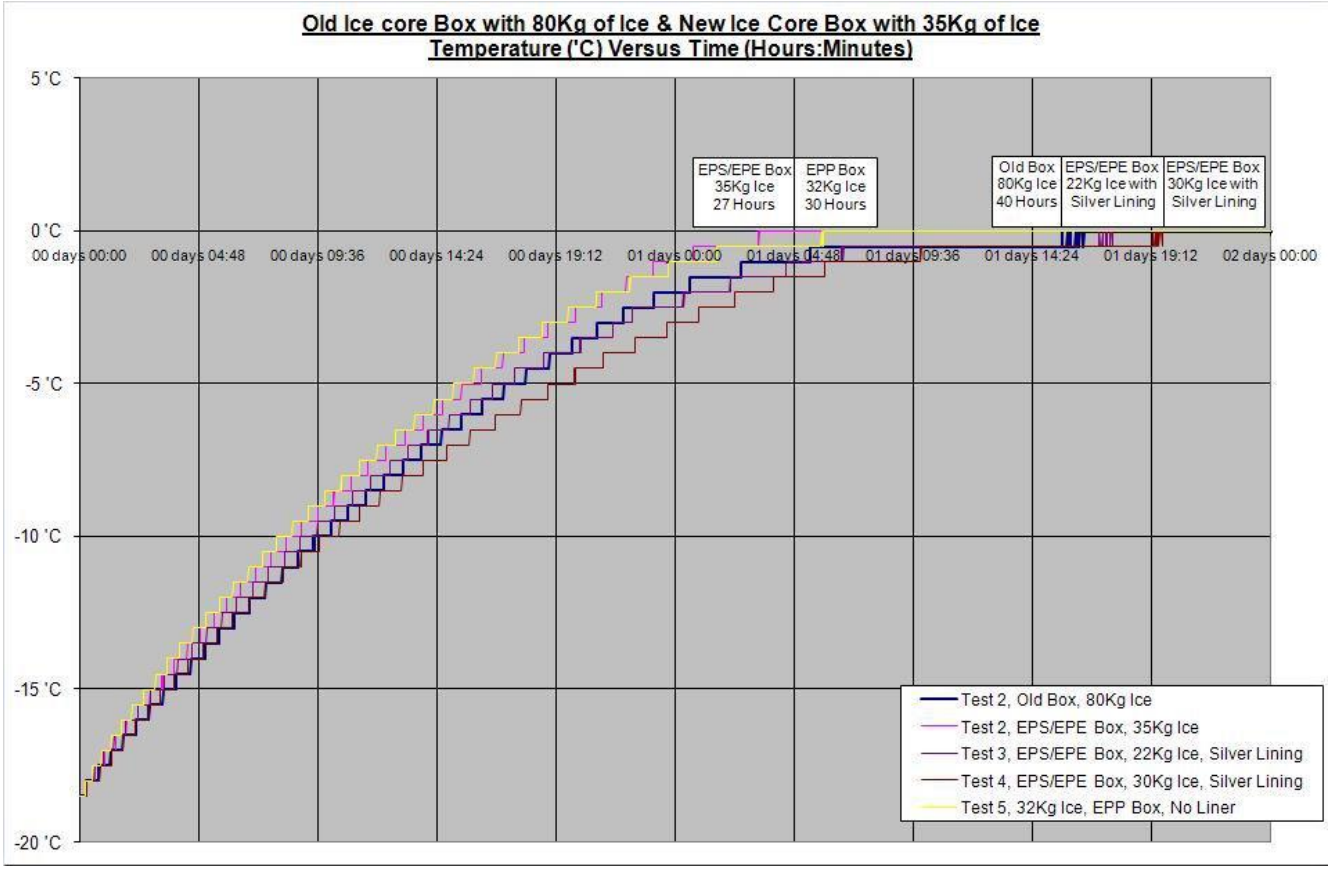




Above - density versus temperature of the drilling liquids in pure & in different mixes.



Ice core boxes, temperature measurements:



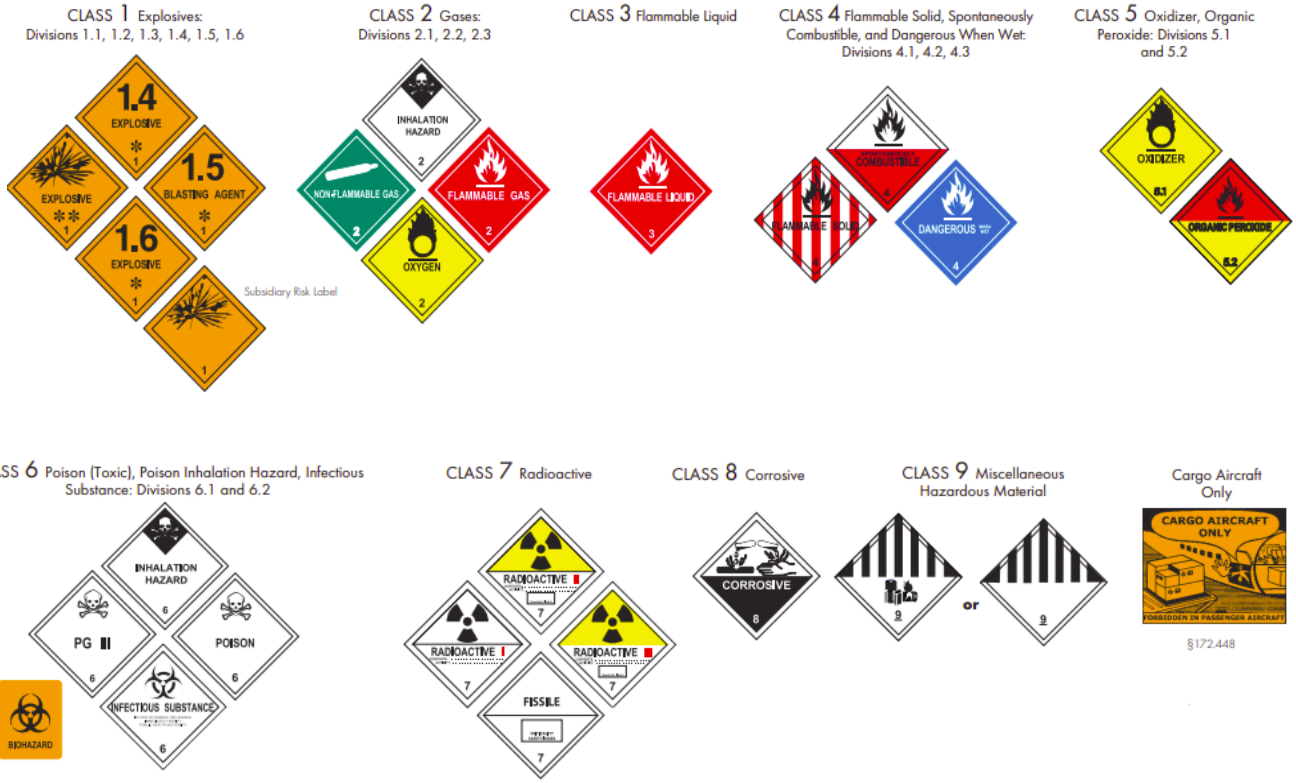
HAZMAT / DGR Information

What to be aware of when shipping Dangerous Goods DGR (EU) / HAZMAT (US)

Dangerous goods include explosives, gases, flammable liquids, toxic substances, infectious substances, radioactive substances, corrosive substances, lithium batteries and more, which can be a hazard to people, animals or the environment if not properly handled in use or in transport.

There are heavy regulations regarding shipping anything listed as DGR/HAZMAT and if not following these regulations, we can get in real trouble and heavily fined. Therefore, when you plan to ship cargo by Road, Rail, Ship or Air, it is important that you check your cargo for any of the left or similar danger symbols.

Another thing you should look out for are the below shipping labels (divided by the UN Model Regulations classification of danger).



If your goods or cargo is marked with any of these or any other hazardous labels, then you need to handle and ship them as DGR/HAZMAT. Which means that the packaging, labelling and paperwork, must be, handled by certified personnel e.g. the shipping agency that you plan to use, the logistical department at your institution, or the EastGRIP logistical group.

Important info: If you have found an old box with any of the shipping labels above, and you want to re-use it for shipping something else not hazardous, then you MUST remove the old labels, as the box will otherwise be considered as containing hazardous materials. Which can end up giving you a penalty.

It is very good to know that it is allowed to re-use undamaged shipping boxes. DGR/HAZMAT boxes are expensive.

Lithium Batteries

Lithium batteries have become very restricted to ship by AIR due to, a series of incidents involving fires on aircraft from shorted lithium batteries. All modern electronics, such as cell phones, laptops, cameras etc. contain lithium batteries.

IATA distinguishes between "lithium ion batteries" and "lithium metal batteries"

"lithium ion batteries" are a type of secondary (rechargeable) battery commonly used in consumer electronics. Also included within the category of lithium-ion batteries are lithium polymer batteries. **Generally found in mobile telephones, laptop computers, etc.**

"lithium metal batteries" are generally primary (non-rechargeable) batteries that have lithium metal or lithium compounds as an anode. **Generally used to power devices such as watches, calculators, cameras, temperature data loggers.**

Lithium batteries are classified in Class 9 – Miscellaneous dangerous goods as:

Loose batteries: UN 3090, Lithium metal batteries, or UN 3480, Lithium ion batteries **(forbidden for transport as cargo on passenger aircraft IATA)**.

Or, if inside a piece of equipment or packed separately with a piece of equipment to power that equipment as: UN 3091, Lithium metal batteries contained in equipment, UN 3091, Lithium metal batteries packed with equipment, UN 3481, Lithium ion batteries contained in equipment, or UN 3481, Lithium ion batteries packed with equipment (**less restricted IATA**).

Example of lithium batteries packed with equipment, in the original packaging.

So what does that mean for us?

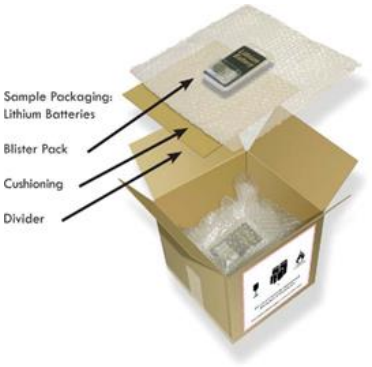
1). Find the MSDS (Manufacturers Safety Data Sheet) or SDS (not old version) and see under **Section 14: Transport information,** if/how your lithium batteries can be, shipped.

2). As UN 3090, Lithium metal batteries and UN 3480, Lithium ion batteries are, forbidden for transport as cargo on passenger aircraft. Always consider to ship as packed in /or with equipment. However even this has become complicated.

3). Consider to send by Ship (IMDG less restricted), or carry as hand luggage (see next page).

Packaging of the lithium batteries

It is important to remember, that one of the major risks associated with the transport of lithium batteries and battery-powered equipment is short-circuit of the battery as, a result of the battery terminals coming into contact, with other batteries, metal objects, or conductive surfaces.



- Packaged batteries or cells must, be separated in a way to prevent short circuits and damage to terminals.
- Cover the poles with tape.
- Must be packed in a strong outer packaging (preferable the original packaging) or contained in equipment (in preferable the original packaging).

To carry lithium batteries in your carry on hand luggage

https://www.easa.europa.eu/en/domain

To carry lithium batteries as carry on hand luggage is often easier than to ship them as cargo. However, here is also a few things to be aware off. One thing is that the different Airlines, have different regulations, so check their homepage before you travel with the lithium batteries.

A thing they all agree about; "it is safer to have lithium batteries in your carry on hand luggage, than in your checked in luggage."

Therefore, you will also find that you can actually carry quite a lot of lithium batteries with you on the plane.

IATA distinguishes between small (up to 100 Wh), medium (up to 160 Wh) and large lithium batteries (more than 160 Wh):

Wh rating or lithium metal content	Configuration	Carry-on baggage	Checked baggage	Operator approval
≤ 100 Wh / 2g	In equipment (PED or PMED)	Yes (max 15 PED/PMED[1])	Yes	No[1]
	Spare battery(ies)	Yes (max 20 spare batteries[2])	No	No[2]
>100 to ≤160Wh	In equipment (PED or PMED)	Yes	Yes	Yes
	Spare battery(ies)	Yes (max 2 spare batteries)	No	Yes
>160Wh	Must be prepared and carried as cargo in accordance with the IATA Dangerous Goods Regulations			
> 2g ≤ 8g	In equipment (PMED only)	Yes	Yes	Yes
	Spare batteries for PMED	Yes (max 2 spare batteries)	No	Yes

1. Each person is limited to a maximum of 15 PED. The operator may approve the carriage of more than 15 PED.
2. Each person is limited to a maximum of 20 spare batteries of any type. The operator may approve the carriage of more than 20 batteries.

Watt-hour rating, expressed in Watt-hours (Wh), the Watt-hour rating of a lithium cell or battery is calculated by multiplying the rated capacity in ampere-hours by the nominal voltage.

www.iata.org/contentassets/6fea26dd84d24b26a7a1fd5788561d6e/passenger-lithium-battery.pdf

Help: Marie Kirk has IATA, IMDG, DOT (49 CFR) and U.S. Air Force certification (AFMAN 24-604), and can help you with any questions that you might have. However, it is important to stress that Marie cannot certify cargo from your country of origin to Denmark/Greenland, as she needs to be able to physically inspect the cargo.

Sun glasses

It is recommended to use sunglasses with UV-protection (Polaroid) to protect eyes from excessive ultraviolet radiation, primarily to avoid snow-blindness, but also to reduce long-term ocular damage such as cataracts. Be careful to wear glasses that also block the sunrays around the edges of the lenses.

Standards for sunglasses – see labelling on inside of the frame

Europe CE (EN 1836:2005)

0	insufficient UV protection
1	sufficient UV protection
2	good UV protection
3	full UV protection

US (ANSI Z80.3-1972)
A compliable lens should have a UVB (280 to 315nm) transmittance of no more than one per cent and a UVA (315 to 380nm) transmittance of no more than 0.5 times of the visual light transmittance.

Australia (AS 1067)

0	some UV protection
1	.
2	.
3	.
4	high level of UV protection

Acute mountain sickness - AMS

Symptoms/signs of acute mountain sickness:

- Headache
- Fatigue/nausea
- Difficulty in breathing
- Sleep disturbances (insomnia)

Symptoms of AMS usually start 6 to 8 hours after a rapid ascent and reach their greatest severity within 24 hours, subsiding over 72 hours. Rapid ascent, exercise, and continuing to ascent to higher altitudes greatly increases the chances of suffering from AMS and its symptoms.

Best way to reduce risk of AMS is to **avoid excessive alcohol consumption the night before flying into camp** and to keep well hydrated on water.

AMS is rarely serious and is usually self-limiting, but may lead to more serious high altitude cerebral edema or high altitude pulmonary edema.

How to operate the Gamow bag

The purpose of the Gamow bag is to provide temporary first aid treatment to victims suffering from varying degrees of acute mountain sickness (AMS) on location and on an emergency basis.

1. Place victim inside bag.
2. Pull the zipper close.
3. Pump the foot operated air pump to begin inflation.
4. Check to make sure that the nylon web retaining straps are not twisted and that they are in their proper locations
5. Inflate the Gamow bag to the desired pressure – see below.
6. A pump per minute rate of 10 to 20 must be maintained at all times to ensure adequate victim protection from excessive carbon dioxide concentrations. An electric oil free air-compressor with an output of at least 1 cubic foot per minute (cfm) may be used to presurize the Gamow bag (use chrome inlet).
7. Do not connect the bag to oxygen.

Ambient conditions			**Inside Gamow bag when pressurized to 2 psi (103 mmHg)**		
Meters	Feet	mmHg	Meters	Feet	mmHg
2400	7874	562	1054	3458	665
2700	8859	541	1310	4298	645
3000	9843	522	1555	5102	626
3300	10827	503	1805	5922	607
3600	11812	484	2053	6736	588

The Gamow bag should only be used on a temporary or emergency basis. The bag is not intended as a cure for AMS.

Treatment with oxygen greatly outweights the use of the Gamow bag, but must be maintained at a flow of 6-8 liters per minutes.

How to monitor blood pressure using the Omron electronic monitor

1. The subject sits down and rests their arm on a table so the brachial artery is level with the heart. Alternatively lie on your back and rest the arm across your stomac. This is important when monitoring blood pressure, as pressure is proportional to height. For example, if one

measures the blood pressure at head height, the systolic/diastolic pressure readings will be approximately 35mmHg less compared to readings taken at heart level, whereas at ground height the pressure readings will be 100mmHg greater.

2. Wrap the sphygmomanometer cuff around the upper arm, just above the elbow. Place the tubings on the hollow of your elbow.
3. Press the **ON** button.
4. Press **START**.
5. The blood pressure monitor will automatically measure the blood pressure.
6. **NOTE:** Do not move the arm during monitoring.
7. Monitor displays the systolic blood pressure (the high value) and diastolic blood pressure (the low value) and heart rate.

Blood pressure	**Interpretation**	**Action**
SBT>180 mmHg or DBT>110 mmHG	Severe hypertension	Repeat the test; Contact physician
SBT>160 mmHg or DBT>100 mmHG	Moderate hypertension	Repeat the test; Contact physician
SBT>140 mmHg or DBT>90 mmHG	Mild/borderline	
SBT≈120 mmHg and DBT≈80 mmHG	Optimal	
SBT<90 mmHg and DBT<60 mmHG	Hypotension	

SBP= Systolic blood pressure

DBP= Diastolic blood pressure

How to monitor blood glucose

1. Wash your hands.
2. Prepare your lancing device.
3. Remove the test strip from its foil packet.
4. Insert the three black lines at the end of the test strip into the strip port.
5. Push the test strip in until it stops. The monitor turns on automatically.
6. Wait until the monitor displays the "Apply Blood message", which tells you that the monitor is ready for you to apply blood to the blood glucose test strip.
7. Use your lancing device to obtain a blood drop either from a finger or an ear lobe.
8. Before you obtain a blood sample from the fingertip or ear lobe, make sure the sample site is clean, dry, and warm. Avoid squeezing the puncture site.
9. Apply the blood sample to the test strip immediately.
10. Touch the blood drop to the white area at the end of the test strip. The blood is drawn into the test strip.
11. If the monitor shuts off before you apply blood to the test strip, remove the test strip from the monitor and try again.

12. Continue to touch the blood drop to the end of the test strip until the monitor begins the test. The monitor begins the test when you hear the beeper and/or the display window shows the status bar.
13. Then the display window shows the countdown. **Note: Do not** remove the test strip from the monitor or disturb the test strip during the countdown.

Result of blood glucose monitoring

Blood glucose	**Interpretation**	**Action**
LO = low (<1.1 mmol/L or 20 mg/dL)	Extremely low	Repeat the test; Contact physician
<2.8 mmol/L (50 mg/dL)	Moderately low	Repeat the test; Contact physician
4.1-5.9 mmol/L (74-106 mg/dL)	Normal	
>11 mmol/L (200 mg/dL)	Moderately high	Repeat the test; Contact physician
HI = High (>27.8 mmol/L or 500 mf/dL)	Extremely high	Repeat the test; Contact physician

Error messages:
Error no 105 or 705: take out batteries, wait five seconds, insert batteries, and try again.

Calibration of new test strip lot:
Insert calibration strip into strip port. Wait until the monitor displays the lot number. Check number against packet.