Field season 2017

East GReenland Ice core Project (EGRIP) 2015-2020: First year of EGRIP deep drilling.

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



Picture 1: Picture of drill trench construction at EGRIP. Taken from drone on 22nd May 2016.

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DRAFT. Sections highlighted in yellow are not yet updated.

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EGRIP 2017 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 authors wish to express sincere gratitude to the U.S. National Science Foundation and their logistical agent CH2MHill Polar Services and to the New York Air National Guard (109th) for their assistance and their supportive actions in 2016 in anticipation of the upcoming EGRIP field campaign. Without this foresight, little of what is planned for the 2017 season could be realized.

Copenhagen, March 4th, 2017

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The East Greenland Ice drilling Project (EGRIP)

EGRIP 2015-2020: Season 2017

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 proposed drill site, EGRIP, is 2550 m and that climatic undisturbed layers are detected to 50.000 years before present. The surface velocity is 65 m/yr at the proposed 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 biggest 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. It is possible to find a site without crevasses, where the ice is flowing as an ice stream. Drilling an ice core through the 2550 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), submitted to the 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 a 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.

In 2012 detailed radio echo sounding and seismic work done by researchers from the Penn State University. The ice flows 65 m/yr horizontally to the north east 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), submitted to the Cryosphere)

The deep drilling project is planned for the years 2016 to 2020. The project is an international collaboration between several nations. At present, 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 and Italy announced participation and there may well be additional partners that would supplement the EGRIP research plan well.

The main part of the equipment needed to establish the EGRIP camp was at the NEEM site. At NEEM in 2015 heavy sleds with cargo were excavated, the two garages were taken down and stowed everything was hauled 460 km by traverse train in May 2015. The main building, the Dome, was put



on skis in 2011 to enable surface transport to the new site. 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 under carriage 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.

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 NEEM 270 individuals spent 12,500 man days in camp and we take pride in the man day distribution: 52 % young scientists, 26 % senior scientists and only 22 % logistics. The projects not only produced a deep ice core, but also provided 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 at the moment the research vessel Polarstern from AWI has a program planned in the ocean in front of the ice stream and in 2018 AWI also has an airborne radar campaign planned. Penn State University research group is planning seismic work on the whole NEGIS ice stream and especially the onset zone of the ice stream in the center of the Greenland ice sheet to understand why the ice stream is here. We will work towards bringing further projects to the NEGIS ice stream and the EGRIP ice camp with infrastructure and airfield for ski planes opens the gateway for additional projects.

Drilling at EGRIP 2017

Summary of the status after 2016 field season:

Much of the 2016 field season was used to transform the freshly blown balloon trench into a working drilling trench with the aim to start deep drilling in earnest in 2017. These activities included 1) surveying, leveling, and construction of the drill trench floor, 2) installing the tower and winch foundation beams, 3) excavating the 7-meter inclined trench, 4) installing the deep winch and motor, 5) installing the tilting tower, 6) building cabins for the workshop, core logging, and chips melting operations, and 7) making the intial installation of the mechanical workshop, core handling system, and drill fluid chips handling infrastructure.

Meanwhile, the main core pilot hole was drilled to 117.5 m with a borehole diameter of 129.6 mm, and the first three of the four required reaming steps were completed through the firn-ice transition in preparation for installing the firn casing.

On the surface, the EGRIP S1 core (4" diameter) was drilled and logged to 60.76 m. The shallow drill was also deployed to make an acces hole to the firn-ice transition in support of the RADIX fast access drill test (J. Schwander, Uni. Bern). Numerous surface shallow cores (ca. 10 m) were collected throughout the season with the hand auger by various teams.

Main core deep drilling 2017:

1) Finish the Trench construction

The start of the season will be dedicated to finishing the installation of all drill trench, fluid handling and core handling equipment. Early season priorities will be 1) to reinstall the power cables to the drill trench and solve the some general power issues experienced in 2016, 2) construct and furnish the driller operator cabin, 3) install the air ventilation systems, and 4) finish building the tables, floor and support structures around the various work stations, including fluid handling and core handling.The tower and winch placement will be adjusted in the first days at the start the season to account for firn compaction during the offseason, and additional hardware will installed to reinforce their connections to the foundation beams.



The view in the drill trench from the winch, along the drill tower, with the partially constructed opeators cabin seen on the right, followed by the chips melting cabin, and the mechanical workshop in the rear.



View from mechanical workshop of the 7-meter inclined trench and the installation of the unbalanced tower in its vertical position. Partially constructed operators cabin seen on the left.

2) Drill Fluid choice and fluid handling

We will use Estisol 240/Coasol as the EGRIP drilling fluid. With new pluming, pumping, and vacuum capabilities we strive to minimize contact between driller and driller fluid. For fluid recovery from the chips, we will use a vacuum enabled heated tank to melt and seperate water from the drill fluid.



Vacuum enabled melting tank ("Slamsuger") for drill fluid recovery mounted inside a Viessmann cabin.

4) Reaming and casing

Final reaming was postponed in 2016 when reamer #4 was stuck ca. 6 m below the inclined trench (14.6 m drillers depth) and eventually freed with heated glycol. In order to continue the reaming operation in 2017 we need to provide proper anti-torque by avoiding the glycol damaged borehole wall using extensions to move the anti-torque section relative to the motor section (and/or deploy

the large diameter anti-torque section). For the casing installation, we will continue reaming to the final target depth 56 m below the bottom of the inclined trench.

5) Install deep drill/establish drilling routine/deep drilling into brittle ice

After construction and set up phase, and once a steady routine for drilling is established, we will deploy two shifts spanning ca. 08:00 – 24:00, with 5 people total assigned to deep drilling during each flilght period. Teams will consist of 2 drillers per shift, with one drill lead/mechanic to support the entire program plus provide surface drilling support and training. Drilling will continue as deep as possible, taking necessary steps along the way to ensure the drilling and core handling processes yield the best possible core quality, especially in the brittle ice zone.

The EGRIP drill consists of two complete drill sondes, constructed for collecting 2 m cores. These shorter core lengths relative to the NEEM drill derive from the shorter tower used at EGRIP to compensate for the ceiling height in the new balloon trench set up. Shorter core barrel and core lengths, however, makes surface core handling somewhat easier, which should contribute to improved quality of brittle ice. The original HT drill (1.6 m cores) will also be available if needed. We aim to optimize surface times by exchanging hallow shafts and core barrels between runs. The full exchange of core barrell and hollow shaft also allows for more complete cleaning of each set, without slowing the overall process.

We aim to deploy new surface and borehole electronic sections, and an updated software control package. These will include enhanced motor control, improved interface with adjustable parameters to assist drill operators, upgraded navigation package for inclination, azimuth, and improved communications with faster speeds, more bandwidth, and improved error detection. The electronic and control systems used at NEEM will also be made ready and will serve as additional redundancy.

New cutters will be prepared for EGRIP 2017 for both deep and surface drillings. For deep drilling we will deploy step cutters under most circumstances. To make core extraction on the surface as gentle as possible for brittle ice, we will have the option to use step cutters that make nominal 97 mm cores, in addition to the standard 98 mm cores.



The lower part of the drill sonde, as deployed at RECAP (2015) with step cutters mouted on the drill head.

Surface Drilling 2017:



The Danish shallow drill, first deployed in 1976 (with Steffen Bo Hansen and Sigfus Johnsen), will enter its 41st year of service at EGRIP in 2017.

1) Firn air sampling program drill support

A firn air sampling program will be supported using the HT drill (1.6 m core barrel; 4" core; 129.6 mm borehole) during the period ca. June 9 - 27. This activity will be coupled to a manning plan intended to provide training/drill school for setting up and operating the shallow and intermediate winch with the HT drill.

2) Shallow drilling

We will support as much surface shallow drilling as is reasonable in the second half of the field season, using with the 3" shallow drill and shallow winch. We will provide some training for new

operators, and all surface drilling will be manned separately from the deep drilling operations. The drill leader on site will support both deep and surface drilling operations.



The HT drill mounted on the shallow winch and tower at EGRIP 2016.

Scientific plan for EGRIP 2017

For the processing line, the focus will be on the ice above the brittle zone. When the brittle zone in reached, processing will stop and the cores will be stored in the buffer until 2018. Manning of the science trench will be significantly reduced after June 22. Several shallow cores are planned, and it will be possible to process these in the science trench albeit with a reduced processing program.

The CFA team will work independently of the processing line. The goal of the CFA team is to measure 600 m in 2017, with priority on the ice above the brittle zone. This means, that the CFA team will return to EGRIP in 2018 for measurement of the brittle ice and deeper. The CFA analyses will be done on one side wedge of the CFA slab for isotopes while one wedge for tephra will be cut and melted for discrete continuous screening. This has called for a warm lab. which will be installed in the beginning of the season. The impurity and gas CFA will be done in Europe.

Details on science and processing plan.

The following studies and analyses are planned:

Logging and documentation, All freshly drilled ice cores will be fitted to previous runs and core quality and integrity documented. Core depth and bag numbers will be assigned. Logging and documentation will be done inside an active freezer unit installed in the logging tunnel.

Cutting scheme for EGRIP deep core. Core diameter: 98 mm. Weights of samples are per bag (55 cm length)



Di-electric properties measurements (DEP). This integrated AWI system records di-electric properties on the full and uncut core.

Cutting of sample sections (Horizontal band saw, or Swiss saw). Two cuts along the core axis will split the core in three for later processing.

Electrical Conductivity Measurements (ECM). After the first cut in the horizontal saw, the core will be mounted in the Danish ECM setup for DC conductivity measurements. Afterwards, the core will be returned to the horizontal saw for cutting the central slab.

Line Scanning. The 36 mm thick central slab will be polished on both sides with a microtome knife and the scanned in the AWI line scanner.

Cutting of isotope and tephra samples. The wedges for stable isotopes and tephra will be cut at band saws and stored in a buffer before measurement in the field.

Measurements of physical properties. Samples for measurements of physical properties will be packed; but for those analyses that require fresh ice, systems will be set up in the science trench and in a designated warm lab. inside the science trench.

Continuous Flow Analysis (Gas and CFA). The Gas and CFA sections will not be split in the field. The section will be packed and sent to Europe.

Cutting of SC sections. The SC section will not be split from the main core piece in the field.

Ice core packing. All of core sections for Europe will be packed in crates and sent to Copenhagen.

The first few weeks will be spent finishing and adjusting the new core extraction system and the core logging facility. Some construction work on the core logging freezer is needed, such as mounting a new door and mounting of the active cooling system. In the science trench, benches for DEP, Swiss saw, ECM and line scanning as well as tables for cutting and packing samples will have to be built. Two warm labs. (Viessmann cabins) for physical properties and isotope CFA will be built and outfitted. The science team will work on establishing an ice core processing routine and work flow that minimizes the risk for errors and maximizes the processing rate.

Processors will follow a detailed ice core cutting, processing and sampling plan that has been made to comply with EGRIP Steering Committee decisions.



Surface movement by GPS (Christine Hvidberg, Lars B. Larsen, Aslak Grinsted).

Surface velocity and strain rates will be measured by GPS in 2017 at EGRIP. The purpose is to provide 6 year long records 2015-2020 of surface movement at EGRIP and along NEGIS to validate satellite observations and reveal spatial and temporal variations of flow speed and elevation.

In 2015, a strain net of 17 GPS poles were established at EGRIP and their 3D positions were measured (latitude, longitude, height). These poles will be re-measured in 2017. See figure. A permanent GPS pole was established in 2015 at EGRIP. The station is planned as part of a survey along the NEGIS ice

stream from the ice divide to the coast done in collaboration with DTU-Space, and the station will be monitored continuously. The station will be maintained and checked in 2017. More permanent poles were established in 2016, both upstream and downstream from EGRIP. Additional detailed surveys of surface movement are planned in 2017 in particular regions near EGRIP using a combination of surface GPS and drones.



Figure: Map of the strain net at EGRIP showing the 17 poles established in 2015 (red crosses) and the two permanent GPS stations (blue circles). Only the permanent station close to the EGRIP camp as established in 2015. The EGRIP camp is indicated by the black cross. The background shows surface velocity derived from an optical IV method (Imgraft/Grinsted).

Airborne radar measurements at EGRIP and in NE Greenland (Daniel Steinhage, AWI).

Due to certification issues, the planned radar campaign using EGRIP camp as base for operations for the AWI Basler (DC3) carrying German radar and survey equipment is postponed to 2018. In 2016, AWI placed a fuel depot at EGRIP of 28,800 liter for operations in 2018.

EGRIP surface processes program

Main responsible: Hans Christian Steen-Larsen (hanschr@gfy.ku.dk), Sepp Kipfstuhl (Sepp.Kipfstuhl@awi.de), and Thomas Blunier (blunier@nbi.ku.dk)

<u>Snow-air water vapor exchange</u> *Purpose:* To characterize and parameterize the water vapor isotopic exchange between the snow pack and the atmosphere in order to understand the post-depositional processes affecting the snowpack water isotopic composition

Measurements:

Continuous water vapor isotope measurements at multiple levels Eddy-covariance

PROMICE weather station including atmospheric temperature, wind, and humidity, snow surface temperature, snow pack temperature, snow height variations, incoming and outgoing radiation. See <u>http://www.geus.dk/DK/publications/geol-survey-dk-gl-</u>

bull/33/Documents/nr33 p69-72.pdf

Surface sampling along 1000 m transect multiple times daily, for isotopic analysis. The top 30 cm will be sampled in high resolution.

Snow surface and snow pack properties

Purpose:

To characterize and parameterize the post-depositional processes influencing the structure and spatial variability in the snow surface and snow pack properties

Measurements:

Specific Surface Area of top 2.5 cm along a 100-300 m transect daily.

A specific experiment with 'painted' water will be carried out in the top 2 meters of the snow pack to characterize the snow-pack isotope post-depositional processes.

Accumulation and precipitation isotope studies

Purpose:

To establish a dataset to be used for benchmarking of regional and general circulation model in the area around EGRIP

Measurements:

Bamboo stake 'forest' will be measured daily to constrain accumulation and sublimation rates. Snow height lasers will be installed scanning surface structures variability.

Low cost sonic snow height rangers will be validated against the bamboo stake 'forest' and left year round to measure accumulation rate.

Go-Pro cameras will take pictures of sky and snow surface structures. '

Precipitation samples will be collected on tables lifted above the snow surface on event and sub-event resolution for sub-sequent isotopic analysis.

Interstitial-atmosphere air exchange

Purpose:

To characterize and parameterize the synoptic caused wind pumping and its influence on the mixing of the interstitial air in the top meters of the snow pack

Measurements:

Continuous CH4 atmospheric measurements at several levels above the snow pack as well as in-situ interstitial air measurements at several depths in the snow pack.

Remote sensing satellite radiation validation and characterization

Purpose:

To characterize and validate the Sentinel-3 radiation observations of the snow near the EastGRIP camp. The characterization will also consist of sub-grid variability observations. *Measurements:*

Combined black carbon, SSA, radiation measurements, and snow structure (SSA and Density) measurements of the snow surface at multiple sites upwind and downwind of camp. Each site will consists of 20 cm profiles.

<u>Remote sensing of the atmospheric boundary layer structure</u> *Purpose:*

To quantify the structure of the atmospheric boundary layer above the EastGRIP region and to produce a dataset, which can be used to benchmark regional climate simulations. *Measurements:*

Vertical atmospheric temperature profiler, ceilometer, Parsivel2 drop size disdrometer (measuring precipitation type, phase, and spectra of fall velocity and size) and a Metek Micro Rain Radar (vertically pointing precipitation radar with up to 3000m range and 32 range bins).

Studies of recent precipitation by shallow cores in snow pits and aerosol sampling (Japanese and Danish scientists).

This study will be conducted throughout the field campaign at EGRIP.

Associated projects at EGRIP:

Earthquake station at EGRIP (Trine Dahl-Jensen and Tine B. Larsen, GEUS)

Starting in 2000, the seismological groups at KMS and GEUS – now all at GEUS – have placed earthquake seismic stations at over 20 sites in Greenland, both on the coast and on the ice sheet. We record globally occurring earthquakes, and use the data to investigate the local structure beneath and between the stations. A station was placed placed at EGRIP in a garage tent in 2015, and in 2016 the station was moved to the newly constructed core buffer trench. The station is solar/battery powered and collects data onto a memory chip. Once a year the memory chip is exchanged and the station is maintained.

Remote sensing reference station at EGRIP (Waleed Abdalati, CIRES Colorado).

This group visited EGRIP last year and maintained surface equipment 1 km SE of EGRIP. The equipment measures surface snow properties with the aim to obtain ground truth readings for satellite observations. This year they will visit EGRIP again, but only for a few hours.

GLISN seismic network. (The GLISN project)

The GLISN network operates several permanent seismic stations on the Greenland ice sheet, e.g. at Summit and at the NEEM site. During the annual maintenance of the sites, the team will use EGRIP as a re-fuelling stop in August.

Windsled team (Danish representative: Prof. Jason Box, GEUS)

A Spanish team using a wind sail driven research platform will reach EGRIP around June 18. EGRIP will provide space for people and cargo (on space available basis) for pull-out to Kangerlussuaq by LC-130

flights. The team will collect snow samples enroute, and will operate an accumulation radar on the flow line from Summit to EGRIP.

Logistic plan for EGRIP 2017

The logistic plan for 2017 is to finalize the infrastructure of the drill trench and science trench and to finish installation of an actively cooled core extraction facility to protect the ice cores from the brittle zone from temperature shock as they are retrieved. A scheduled overhaul of the diesel main generator is planned for early May. A new heavy cable will be laid out to the drill trench from the main generator. A ventilation system will be installed in the drill trench and core extraction area. The successfully tested satellite dish from 2016 will be upgraded and re-installed, allowing for high bandwidth satellite communication. Due to the polar bear incident in 2016, a movement radar will be tested. This radar should be capable to detect movement in a 5 km radius of camp. EGRIP has purchased a cloud base laser device to improve weather reporting and reduce the risk of aborted flights. Three balloon trench projects are planned: Building a balloon trench garage for heavy equipment, building a new cooks freezer and using balloons to construct underground cable conduits. At entrances and in tunnels, doors and curtains will be installed to maintain low temperatures in the trenches.

The overall logistical goal is to complete construction of a fully operational deep drilling camp with ice core storage facilities, science trench, drill trench, workshops, warm laboratories and housing for 35 people. The drillers will complete installation of deep drilling equipment in the drill trench, line the top of bore hole with a casing and will proceed to drill past the first 100 m of the EGRIP deep core and hopefully reach a depth below the brittle zone. The science trench will be outfitted with tables and equipment, and an active cooling system in the ice core extraction area will be activated.

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

- 1. Open and re-activate EGRIP camp and skiway. Skiway markers will be set back in line and a test of using the Pistenbully snow blower to harden the skiway surface will be carried out.
- 2. Overhaul of main generator and finishing laying electrical cables, including a test of making cable conduits using balloon technique. Setting up new radar for testing, and installing ceilometer (cloud base measurement).
- 3. Reopening of all entrances to the trenches and making necessary adjustments.
- 4. Finshing infrastructure in drill trench, science trench and the core extraction freezer.
- 5. With full manning, drill and process and measure the top 600 m until brittle zone.
- 6. Support a firn air pumping campaign.
- 7. Building a new cooks freezer and a test overwintering garage with balloon technique.
- 8. Facilitate the return to Kangerlussuaq of the wind sled project.
- 9. Once the brittle zone is reached, processing of deep core will stop and all cores will be logged and stored in the buffer. The science crew will be reduced. Drilling will continue.

- 10. Support a shallow drilling campaign to retrieve 2-3 shallow cores (approx. 70 m deep)
- 11. Support several visits from Distinguished Visitors.
- 12. Support surface snow, water vapour and aerosol sampling throughout the season.
- 13. Support surface ice dynamics measurements, e.g GPS strain net.
- 14. Support the Abdalati project and GLISN seismic project.

Ad.7: Two new balloons have been purchased: A 5m diameter sphere to seal the entrance of the test garage and a 60 cm diameter x 70 m long cable conduit balloon.

2017 calendar overview.

		109th		
Date	Day	deployment	Camp activity headlines.	
18/04/2017	Tuesday		Period 1. FOM's arrive. Setup radio, comm. Register vehicles.	
26/04/2017	Wednesday		Mission 1. EGRIP put-in. Camp opening.	
30/04/2017	Sunday		Mission 2. 2nd put-in	
18/05/2017	Thursday		Mission 3.	
20/05/2017	Saturday		Mission 3 a. Placeholder	
22/05/2017	Monday		Mission 4. Drill fluid, equipment	
26/05/2017	Friday		Abdalathi group	
09/06/2017	Friday		Mission 5.	
19/06/2017	Monday		Windsled arrives	
20/06/2017	Tuesday		Windsled arrives	
21/06/2017	17 Wednesday Period 4. Windsled		Period 4. Windsled	
22/06/2017	Thursday		Mission 6. 1st possible DV visit	
25/06/2017	17 Sunday Mission 7.		Mission 7. 2nd possible DV visit	
27/06/2017	Tuesday		Mission 7a placeholder	
20/07/2017	Thursday		Mission 8. 3rd possible DV visit	
29/07/2017	Saturday		Mission 9. 4th possible DV visit	
11/08/2017	Friday		GLISN?	
17/08/2017	Thursday		Mission 10. First pull-out.	
20/08/2017	Sunday		Running of Musk Ox	
22/08/2017	Tuesday	Mission 11. Final pull-out		
23/08/2017 Wednesday Row club dinner			Row club dinner	
27/08/2017	Sunday		FOMs leave Kangerlussuaq	

EGRIP Manning 2017 (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.

Sorted by name	Name	Country	Latest arrival to SFJ	To EGRIP	From EGRIP	Earliest departu re from SFJ
Doctor	Bagge, Kristian	DK	19-Jul	20-Jul	22-Aug	24-Aug
egg	Bagshaw, Elizabeth	UK	17-May	18-May	22-May	24-May
egg	Bagshaw, Elizabeth	UK	19-Jul	20-Jul	29-Jul	31-Jul
processing	Barbante, Carlo (Swiss saw)	1	08-Jun	09-Jun	22-Jun	24-Jun
Tephra	Berben, Sarah	N	08-Jun	09-Jun	25-Jun	27-Jun
FOM	Blunier, Thomas	DK	20-May			09-Jun
Firn Air	Blunier, Thomas	DK/CH	09-Jun	09-Jun	22-Jun	24-Jun
Drill Mechanic	Bo Hansen, Steffen	DK	29-Apr	30-Apr	22-May	24-May
Drill Mechanic	Bo Hansen, Steffen	DK	24-Jun	25-Jun	20-Jul	22-Jul
Driller	Boeckmann, Grant (IDDO driller)	US	29-Apr	30-Apr	09-Jun	11-Jun
Carpenter	Bovet, Christian	DK	25-Apr	26-Apr	18-May	20-May
processing	Capron, Emilie (logging)	F	17-May	18-May	22-Jun	24-Jun
Driller	Chung, Ji-woong	KOR	19-Jul	20-Jul	17-Aug	19-Aug
Tephra	Cook, Eliza	DK/UK	21-May	22-May	09-Jun	09-Jun
FOM	Cook, Eliza	DK/UK	09-Jun			17-Jul
RADIX TEAM	Dahl-Jensen, Dorthe	DK	08-Jun	09-Jun	25-Jun	27-Jun
FIELD LEADER	Dahl-Jensen, Dorthe	DK	19-Jul	20-Jul	22-Aug	24-Aug
processing	de Fleurian, Basile (DEP and surface)	Ν	24-Jun	25-Jun	20-Jul	22-Jul
DV and Media	Domnick, Anna	D	21-Jun	22-Jun	25-Jun	27-Jun
Drill Mechanic	Duphil, Romain	F	19-Jul	20-Jul	17-Aug	19-Aug
Associated Programs	Edwards, Ross (windsled)	AUS	19-Jun	20-Jun	25-Jun	27-Jun
processing	Eichler, Jan (PP)	D	08-Jun	09-Jun	20-Jul	22-Jul
FIELD ASSISTANT	Ekaykin, Alexey	RUS	17-May	18-May	09-Jun	11-Jun
Surface Science	Faber, Anne Kathrine (Vapour+snow)	N/DK	17-May	18-May	22-Jun	24-Jun
Doctor	Florian, Hans Chr.	GRL	25-Apr	26-Apr	18-May	20-May
Surface Science	Freitag, Johannes (vapour+snow)	D	08-Jun	09-Jun	25-Jun	27-Jun
CFA	Gkinis, Vasileios	DK	08-Jun	09-Jun	20-Jul	22-Jul
processing	Goto-Azuma, Kumiko (logging)	J	19-Jul	20-Jul	17-Aug	19-Aug
Surface Science	Grindsted, Aslak (GPS strain)	DK	19-Jul	20-Jul	17-Aug	19-Aug
СООК	Guarda, Gonzalo	DK	21-Jun	22-Jun	22-Aug	24-Aug
СООК	Harvey, Sarah	US	25-Apr	26-Apr	25-Jun	27-Jun
processing	Hauge, Lisa Lolk (Scanning ECM)	DK	08-Jun	09-Jun	25-Jun	27-Jun
Doctor	Helms, Lydia V.	GRL	17-May	18-May	09-Jun	11-Jun
Doctor	Herbst, Mayu	DK	24-Jun	25-Jun	20-Jul	22-Jul

IT and comms	Hillerup, Jens Christian	DK	29-Apr	30-Apr	09-Jun	11-Jun
IT and comms	Hillerup, Jens Christian	DK	19-Jul	20-Jul	22-Aug	24-Aug
MECHANIC	Hilmarsson, Sverrir Æ.	IS	25-Apr	26-Apr	22-Jun	24-Jun
MECHANIC	Hilmarsson, Sverrir Æ.	IS	28-Jul	29-Jul	22-Aug	24-Aug
Surface Science	Hirabayashi, Motohiro (Japanese snow)	J	29-Apr	30-Apr	22-May	24-May
Surface Science	Hoffmann, Andrew (vapour+snow)	DK/US	24-Jun	25-Jun	20-Jul	22-Jul
MECHANIC	Holm, Jan Wachholz (SVEDAN)	DK	17-May	18-May	22-May	24-May
CFA	Holme, Christian	DK	21-May	22-May	22-Jun	24-Jun
processing	Homma, Tomoyuki (PP)	J	19-Jul	20-Jul	17-Aug	19-Aug
Surface Science	Hörhold, Maria (vapour+snow)	D	29-Apr	30-Apr	18-May	20-May
Driller	Hüther, Matthias	D	17-May	18-May	25-Jun	27-Jun
Surface Science	Hvidberg, Christine (GPS strain)	DK	19-Jul	20-Jul	17-Aug	19-Aug
MECHANIC	Jacobs, Chris	UK	08-Jun	09-Jun	22-Aug	24-Aug
electronics	Jensen, Bent Neumann	DK	24-Jun	25-Jun	20-Jul	22-Jul
processing	Jensen, Camilla Marie (Swiss saw)	CH/DK	29-Apr	30-Apr	22-May	24-May
processing	Jianzhong, Xu (logging)	CHN	21-May	22-May	09-Jun	11-Jun
Carpenter	Jørgensen, Nicolai	DK	29-Apr	30-Apr	22-Jun	24-Jun
Surface Science	Kahle, Emma (Spiked Water)	US	28-Jul	29-Jul	17-Aug	19-Aug
processing	Karlsson, Nanna (DEP)	D/DK	17-May	18-May	22-Jun	24-Jun
FIELD ASSISTANT	Kawamura, Kenji	1	25-Apr	26-Apr	18-May	20-May
processing	Keisling, Benjamin (Scanning ECM)	DK/US	21-May	22-May	09-Jun	11-Jun
processing	Kerch, Johanna (PP)	D	19-Jul	20-Jul	17-Aug	19-Aug
processing	Kipfstuhl, Sepp (PP)	D	25-Apr	26-Apr	09-Jun	11-Jun
FOM	Kirk, Marie	DK	18-Apr			18-May
FOM	Kirk, Marie	DK	07-Jun			26-Jun
FOM	Kirk, Marie	DK	16-Jul			27-Aug
processing	Kjær, Helle (logging)	DK	08-Jun	09-Jun	20-Jul	22-Jul
processing	Kleitz, Ina (PP)	D	21-Jun	22-Jun	29-Jul	31-Jul
processing	Koldtoft, Iben (Packing)	DK	29-Apr	30-Apr	09-Jun	11-Jun
Associated Programs	Larramendi, Ramon (windsled)	E	19-Jun	20-Jun	22-Jun	24-Jun
FOM	Larsen, Lars Berg	DK	18-Apr			10-May
FOM	Larsen, Lars Berg	DK	17-May			10-Jun
Surface Science	Larsen, Lars Berg (GPS strain)	DK	19-Jul	20-Jul	17-Aug	19-Aug
processing	Lee, Khanghyun (logging)	KOR	24-Jun	25-Jun	20-Jul	22-Jul
Driller	Liisberg, Jesper B.	DK	08-Jun	09-Jun	25-Jun	27-Jun
processing	Lohmann, Johannes (logging)	DK/D	28-Jul	29-Jul	17-Aug	19-Aug
FIELD ASSISTANT	Loose, Nora	N	24-Jun	25-Jun	20-Jul	22-Jul
Surface Science	Madsen, Martin Vindbæk (vapour+snow)	DK	19-Jul	20-Jul	17-Aug	19-Aug
Driller	Miyahara, Morihiro	J	19-Jul	20-Jul	17-Aug	19-Aug
processing	Mojtabavi, Hamid (DEP)	D	19-Jul	20-Jul	17-Aug	19-Aug
Associated Programs	Moreno, Hilo (windsled)	E	19-Jun	20-Jun	25-Jun	27-Jun
CFA	Morris, Valerie	US	17-Mav	18-Mav	22-Jun	24-Jun
Associated Programs	N.N. (windsled)	US	, 19-Jun	, 20-Jun	22-Jun	24-Jun
DV and Media	N.N.2	?	21-Jun	22-Jun	25-Jun	27-Jun
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Driller	Nakazawa, Fumio	J	17-May	18-May	09-Jun	11-Jun
Surface Science	Nakazawa, Fumio (Japanese snow)	J	08-Jun	09-Jun	25-Jun	27-Jun
Driller	Nielsen, Karl Emil	DK	24-Jun	25-Jun	20-Jul	20-Jul
Shallow driller	Nielsen, Karl Emil	DK	20-Jul	20-Jul	22-Aug	24-Aug
processing	Nielsen, Søren B. (logging)	DK	24-Jun	25-Jun	29-Jul	31-Jul
processing	Nisancioglu, Kerim (Packing)	Ν	08-Jun	09-Jun	25-Jun	27-Jun
boundary	Norwegian nn1. (Boundary layer)	Ν	17-May	18-May	22-May	24-May
boundary	Norwegian nn2. (Boundary layer)	Ν	17-May	18-May	22-May	24-May
FIELD ASSISTANT	Nyman, Karl	DK/S	19-Jul	20-Jul	17-Aug	19-Aug
Firn Air	Orsi, Anaïs	F	08-Jun	09-Jun	25-Jun	27-Jun
processing	Pedersen, Rasmus (Swiss saw)	DK	21-May	22-May	09-Jun	11-Jun
processing	Plach, Andreas (logging)	Ν	19-Jul	20-Jul	17-Aug	19-Aug
Driller	Popp, Trevor	DK/US	25-Apr	26-Apr	22-Jun	24-Jun
Driller	Popp, Trevor	DK/US	19-Jul	20-Jul	22-Aug	24-Aug
Doctor	Preisler, Henrik Park	DK	08-Jun	09-Jun	25-Jun	27-Jun
processing	Qi, Zhang (logging)	CHN	08-Jun	09-Jun	25-Jun	27-Jun
Driller	Rasmussen, Sune	DK	17-May	18-May	09-Jun	11-Jun
Driller	Rathmann, Nicolas	DK	08-Jun	09-Jun	25-Jun	27-Jun
Firn Air	Roberts, Jason (driller)	AUS	08-Jun	09-Jun	25-Jun	27-Jun
Driller	Schiwek, Swenja	D	19-Jul	20-Jul	22-Aug	24-Aug
RADIX TEAM	Schwander, Jakob	СН	08-Jun	09-Jun	25-Jun	27-Jun
Surface Science	Shigeyama, Wataru (Japanese snow)	J	20-Jul	20-Jul	22-Aug	24-Aug
processing	Shigeyama, Wataru (PP)	J	08-Jun	09-Jun	20-Jul	20-Jul
Associated Programs	Simonsen, Jens Jakob (windsled)	GRL	19-Jun	20-Jun	22-Jun	24-Jun
FOM	Simonsen, Marius	DK	16-Jun			25-Jun
Shallow driller	Simonsen, Marius	DK	25-Jun	25-Jun	20-Jul	22-Jul
Surface Science	Steen-Larsen, H.C. (vapour+snow)	DK	29-Apr	30-Apr	09-Jun	11-Jun
FIELD LEADER	Steffensen, Jørgen Peder	DK	25-Apr	26-Apr	09-Jun	11-Jun
FOM	Steffensen, Jørgen Peder	DK	16-Jul			27-Aug
Electric Engineer	Stocker, Bruno	СН	25-Apr	26-Apr	09-Jun	11-Jun
FIELD LEADER	Svensson, Anders	DK	08-Jun	09-Jun	25-Jun	27-Jun
Driller	Tell, Jan	D	08-Jun	09-Jun	20-Jul	22-Jul
CFA	Thayer, Abigail	US	21-Jun	22-Jun	20-Jul	22-Jul
Firn Air	Vallelonga, Paul (driller)	DK	08-Jun	09-Jun	25-Jun	27-Jun
CFA	Vaughn, Bruce	US	17-May	18-May	09-Jun	11-Jun
MECHANIC	Vestergård, Jesper (IVECO overhaul)	DK	25-Apr	26-Apr	30-Apr	02-May
FIELD LEADER	Vinther, Bo	DK	24-Jun	25-Jun	20-Jul	22-Jul
processing	Vinther, Bo. (logging)	DK	29-Apr	30-Apr	09-Jun	11-Jun
Surface Science	Vladimirova, Diana (vapour + snow)	DK/RUS	21-Jun	22-Jun	29-Jul	31-Jul
RADIX TEAM	Walther, Remo	СН	08-Jun	09-Jun	25-Jun	27-Jun
Driller	Wang, Shimeng	CHN	24-Jun	25-Jun	20-Jul	22-Jul
processing	Weikusat, Ilka (PP)	D	21-May	22-May	09-Jun	11-Jun
Drill Mechanic	Wistisen, Dennis	DK	25-Apr	26-Apr	09-Jun	11-Jun

EGRIP GANNT sheets.



FOM's:

EGRIP manning:





Camp population

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



Personnel Transport 2017

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. A windsled team will arrive to camp on the snow and will be flown out of EGRIP.

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 and Medical Evacuations (MEDEVAC) will be covered by 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. And remember to bring a PLB (Personal Locator Beacon), a SPOT 3 unit and Iridium phone or VHF radio. The Field Leader will hand out PLB, SPOT, phone and radio.
- The eating hours are (please be in time, to make is easy for the cook).
 - o Breakfast is individual (normally between 7:00 and 8:00),
 - Lunch is at noon (13:00 on Sundays),
 - 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
 - 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. Refill it with snow from the marked area when there is room in the pot to keep a steady water supply in the camp.
- 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 litre 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 comprises, 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.dk". 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.dk".

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 qualified medical staff in the camp at all times, and is prepared to arrange medical evacuation of field participants or visitors if deemed necessary by the medical staff and field leader. However, participation in the EastGRIP field work or visits to the EastGRIP camp are performed at your own risk, and each participant (or his/her institution) is responsible for obtaining medical clearance and insurance.

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.

Each participant will have to sign a declaration 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.

Evacuation from the camp to a medical facility will as a general rule be arranged by and covered by the project.

By signing the declaration, each participant also expresses understanding that it is the responsibility of himself/herself or his/her home institution to cover the costs of medical treatment and repatriation, and/or arrange appropriate insurance cover.

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 and will be kept in the field operations office in Kangerlussuaq.

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 snowmelter full. Use ONLY the assigned buckets and showels and take ONLY snow at the assigned spot. Hygiene is very important.

House mouse duty.

One person will be assigned to keep toilets and common areas in the main dome (EGRIP) or toilets and kitchen tent at Renland clean.

Terms of reference for the EGRIP 2017 Field Season (formal control and command)

During the field season J.P. Steffensen, Anders Svensson, Bo Vinther and Dorthe Dahl-Jensen 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, Lars Berg Larsen, Marie Kirk, Eliza Cook and J.P. Steffensen will be field Operations Managers (FOMs). 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 only formal liason between EGRIP and U.S. logistics (CPS), 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, Lars Berg Larsen and Marie Kirk have 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, MP3 players, 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 can have two spares in your carry on.

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 duffelbag).

For all scientists that ship lithium batteries by cargo, please note that Lithium batteries are now 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 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.

Personal Locator Beacon (PLB).

A personal locator beacon, PLB, will be issued to everyone who have 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.

EGRIP camp will have a number of SPOT 3 devices to give to people working away from camp. The SPOTS 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 SPOT 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 at EGRIP this field season. Also, the doctor will have a hot line to doctors in Denmark. In case of illness the camps 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 (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 Glasware 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 2017, 230 Volts, 50Hz will be the standard supply. The camp will be powered by diesel generators. For projects away from camp, such as firn air pumping and shallow coring, we will also use diesel generators where possible to limit the use of gasoline.

EGRIP:

Diesel	
--------	--

1 – Iveco	125KVA	3 x 230V (400V/50Hz)	Main generator.
1 – SDMO	40KVA	3 x 230V (400V/50Hz)	Backup generator
1 – Mase	16KVA	3 x 230V (400V/50Hz)	3rd backup
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	
1 – Robin	4KVA	1 x 230V / 50Hz	

Reserves in Kangerlussuaq:

Diesel		
3-SDMO	12KVA	1 x 230V/50Hz
MoGas		
1 – Honda	4KVA	1 x 230V / 50Hz

Please help to conserve fuel by conserving power.

EGRIP 2017 – Address and useful numbers

Official address: EGRIP 2017 Box 12 DK-3910 Kangerlussuaq Greenland Phone +299 84 11 51; FOM cell +299 52 41 25 FOM Iridium +8816 234 95044; Iridium data: +8816 929 48570 fax +299 84 12 27; 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 site can be made as described below:

Iridium OpenPort telephone to EGRIP Camp

<mark>+8816 234 92110</mark>

This number may change. 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.

Cost examples to or from OpenPort or Iridium handheld

Land line or Cell phone	\$1.20 per minute + line operator, up to \$10/minute
Iridium or Thuraya Voice	\$4.40 per minute
Global Star	\$6.26 per minute
Iridium to Iridium	\$0.60 per minute
Iridium to VSAT	\$12.00 per minute

Iridium Satellite handheld telephones			
Voice 💦 👘	Data	Telephone Name	Location
<mark>+ 8816 234 93272</mark>	+ 8816 929 49576	EGRIP 1 (FL)	EGRIP
+ 8816 234 95066	+ 8816 929 49618	EGRIP 2	EGRIP
+ 8816 234 94868	+ 8816 929 10405	EGRIP 3	EGRIP

Only some of these 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 dur	ring
Lunch	15:00 – 16:00 GMT
Evening dinner	21:00 – 22:00 GMT

The Iridium systems (OpenPort and hand-held) should be operational 24 hours.

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.

On the ice we use the Iridium OpenPort system to send & receive E-mails. We will have special computers set up for personal use for text messages. And we will be able to send & receive any E-mail via the address:

For Field leader at EGRIP : <u>fl@egrip.camp</u>

BUT at a high cost! PLEASE Remember to avoid surfing on the internet with a lot of banners and pictures, and avoid attaching image files. The field leader will send images for the NEEM diary on the NEEM home page every day on behalf of everybody.

Iridium OpenPort system

EGRIP camp will utilize the Iridium OpenPort system. This system consists of an array of antennae and receivers that multiplex to obtain two ingoing phone lines and internet connection. This system was very stable in previous years. At EGRIP there is a complete backup OpenPort system. While the Field Leader has unrestricted access to telephones and the internet, camp personnel are in general restricted from surfing on the internet.

Please Note

Using the internet over Iridium OpePort is paid for per MBit. 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

Internet Connection

At EGRIP in 2016, we successfully tested a satellite communication system, VSAT, which was connected to a geostationary satellite. The system worked well, at 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 2017, but since we are changing to another satellite provider we can give no guarantees as to the availability or speed of the internet connection.

Cell phones

For telephony in camp people can use their smartphones on the EGRIP wireless network to make calls between each other. The app to download is **Zoiper**. Links: <u>iPhone</u>, <u>Android</u>. Installation guides will be available in the dome.

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 VSAT system. If the VSAT connection is available, participants can also make international calls from their phones, and the outside world can call into camp. The number for the EGRIP exchange is +45 77 34 74 44. The caller will be asked to put in the local extension for the desired participant.

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

EGRIP official communications:

SITREP

The two Field Leaders 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 sent by e-mail on Monday the EGRIP project group and 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 programmes
- 6. Drill depth and time
- 7. Status for drilling
- 8. Other info
- 9. Signature of the Field Operations Manager

Daily report on the web (<u>www.eastgrip.org</u> or www.icecores.dk)

Daily a short "What we have done today" report and stories from the traverse & camps 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. The Field Operations Manager (fom@egrip.camp) will coordinate this activity.

Description of EGRIP camp

Quartering and buildings



EGRIP until May 18:	PAX normal	Max.PAX	
Kitchen/office	4	10	40' wooden dome
Big tomato	1	2	Fiberglass hut
Small tomato	1	1	Fiberglass hut
Flexmobil	0	1	Cabin
Flexmobil	0	1	Cabin
New Pistenbully	0	1	Cabin
Garage, mechanic			26' x 40' Weatherport
Garage, carpenter			26' x 40' Weatherport
Quarter (WP 1)	(2)	(4)	10' x 15' Weatherport
Quarter (WP 9)	(2)	(4)	10' x 15' Weatherport
Quarter (WP 8)	(3)	(6)	12' x 20' Weatherport
Quarter (WP 2)	(3)	(6)	12' x 20' Weatherport
Total	6 (16)	16(36)	
Numbers in parenthesis	valid after weather ports h	ave been con	structed.
EGRIP after May 18:			
Kitchen/office	4	10	40' wooden dome
Big tomato	1	2	Fiberglass hut
Small tomato	1	1	Fiberglass hut
Flexmobil	0	1	Cabin
Flexmobil	0	1	Cabin
New Pistenbully	0	1	Cabin
Garage, mechanic			26' x 40' Weatherport
Garage, carpenter			26' x 40' Weatherport
Garage, storage			24' x 28' Weatherport
Freshie shack (WP 9)			12' x 20' Weatherport
New quarter (WP 8)	3	6	12' x 20' Weatherport
New quarter (WP 4)	3	6	12' x 20' Weatherport
Quarter (WP 2)	3	6	12' x 20' Weatherport
Quarter (WP 3)	3	6	12' x 20' Weatherport
Quarter (WP 1)	2	4	10' x 15' Weatherport
Quarter (WP 5)	2	4	10' x 15' Weatherport
Quarter (WP 7)	1	2	10' x 10' Weatherport
New quarter (WP 6)	1	2	12' x 10' Weatherport
Total	24	52	

EGRIP camp June 2016.

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 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 650 including many kids. The terminal area is composed of several businesses: Met office, (Flight Information Center "FIC" has moved to Nuuk) Air Greenland, local supermarket "Pilersuisoq", some souvenir shops, a road side grill and Air Greenland. The terminal side includes private housing, a combination of Air Greenland terminal and Hotel Kangerlussuaq, which also houses the GLAIR 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 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.



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 is rare in these months, but given the right conditions, it can still be quite cool.

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.

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. The Roklub at Lake Ferguson is sometimes open in summertime and offers informal dinners at reasonable prices although the quality is varying. In the old dining hall, 100 m from KISS there is a small shop, a bar and fast food place. Dining is available at the terminal. There is a cafeteria where the price of a typical meal is DK Kr.90. 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.

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Kawamura, Kenji	J
Kerch, Johanna (PP)	D
Kieling, Benjamin (Scanning ECM)	US/Dł
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Kleitz, Ina (PP)	D
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Larramendi, Ramon (windsled)	Е
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Morris, Valerie	US
N.N. windsled5	Е
N.N.2 (DV and media)	?
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Nisancioglu, Kerim (Packing)	Ν
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EGRIP FOM (Field Operations Manager) telephone	+299 84 11 51
FOM mobile	+299 52 41 25
Fax	+299 84 12 27
FOM satellite phone	+8816 234 95044
e-mail	fom@egrip.camp

Iridium Satellite handheld telephones to EGRIP camp.

	Voice	Data	Telephone Name	Location
--	-------	------	----------------	----------

+ 8816 234 93272	+ 8816 929 49576	EGRIP 1 (FL)	EGRIP
+ 8816 234 95066	+ 8816 929 49618	EGRIP 2	EGRIP
+ 8816 234 94868	+ 8816 929 10405	EGRIP 3	EGRIP

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

Iridium OpenPort system (EGRIP only)

+8816 234 92110

Kangerlussuaq

e-mail:

KISS:

While participants are in Kangerlussuaq they can be	reached by:
Fixed line:	+299 84 11 51
EGRIP FOM Cell :	+299 52 41 25

CPS POLAR FIELD SERVICES, Kangerluss	<u>uaq</u>
Office:	+299 84 15 98
Fax	+299 84 15 99
Mobile:	+299 52 42 18 (primary)
	299 52 42 81 (secondary)
E-mail:	cpskangerops@polarfield.com (Jessy Jenkins)
	kyli@polarfield.com (Kyli Cosper)
	<pre>robin@polarfield.com (Robin Abbott)</pre>
Air Greenland Cargo	+299 84 12 87
Tickets	+299 84 13 63
NYANG	+299 84 13 89
Met Office tel.:	+299 84 10 22
e-mail:	<u>139ravenops@gmail.com</u>
New numbers after move to Nuuk from	
FIC: telephone:	+299 36 33 53 (sector north)
FIC e-mail	
Notam & com centre	+299 30 33 04
Rescue and Coordination Centre (RCC)	+299 36 33 18

rcc@naviair.dk

+299 84 13 00 +299 84 14 87 +299 84 11 07

fax:		+299 84 14 72
email		<u>sciencesupport@mit.gl</u>
<mark>Summit camp</mark>		
Iridium sat. Tel.:		+8816 314 59738
HF radio on	8093 MHz	(Summit Camp, daily at 08:45)

MEDICAL ADVISORY GRO	<mark>UP</mark>	
Rigshospitalet	(Phone +45 3545 3545)	
Mette Siemsen	Phone +45 3545 8018	mette.siemsen@rh.regior
	Cell +45 6128 1107	
	Private +45 3940 3107	
Mette Brimnes Damholt	Phone +45 3545 0589	damholt@dadInet.dk
	Cell +45 2465 5006	

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 2017 Box 12 DK-3910 Kangerlussuaq Phone +299 84 11 51. Mobile +299 52 41 25 Fax +299 84 12 27 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

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:

Shipping by air to EGRIP from/via Europe:

Cargo for EGRIP April 26, **Must arrive** Kangerlussuaq (SFJ) latest **APRIL 20** Cargo for EGRIP June 9, **Must arrive** Kangerlussuaq (SFJ) latest **JUNE 2.**

By Boat:

Delivery deadline for the ship in Aalborg is May 26 (normal cargo) to May 31 (full 20' containers) for arrival SFJ 11. June 2016. The cargo will most likely be available June 20.

Shipping to EGRIP from the United States

CPS 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 NOTE: Be sure to mark your cargo with "EGRIP 2017" to avoid your cargo ending up at Summit!

CPS POLAR FIELD SERVICES contacts: Jessy Jenkins (jessy@polarfield.com) and Earl Vaughn (Earl.Vaughn@gmail.com)

It is necessary for you to enter your shipment into the CPS cargo tracking system (CTS). Robin Abbott or Jessy Jenkins (robin or jessy@polarfield.com will provide you with a password and login. You will receive an email from us when we have received your cargo in good order in Kangerlussuaq.

Below are the instructions provided to us by CPS Polar Field Services (http://www.polar.ch2m.com).

U.S. Shipping and CUSTOMS INFORMATION – 2016



2016 Greenland ANG Shipping Requirements

Due to heightened security and military shipping requirements at both Stratton ANGB NYANG 109th AW LC-130 and Stewart ANGB NYANG 105th AW C-17, it is imperative that all cargo transiting to Greenland by this method meet the required delivery timelines outlined below.

All cargo must be received at Stratton/Stewart Air Bases no later than <u>10 days</u> prior to the planned flight date. *Cargo will <u>NOT</u> be accepted on the day of an ANG flight*

Please ensure your cargo arrives in NY in time to process and ship to Greenland when it is needed. Cargo delivered the day of an ANG flight will be delayed due to customs and military processing requirements.

CUSTOMS

All cargo shipped to Stratton & Stewart Air Bases for delivery to Greenland must be **registered** (examined and certified) with U.S. Customs & Border Patrol (CBP) before it can leave the country. Registration options are:

1) Self-registration (Required for Newburgh shipments)

Completed by the researcher or a representative at home institution prior to shipping to CPS. If self-registering, ship cargo so that it arrives at Stratton/Stewart at least **<u>10 days</u>** prior to the scheduled ANG departure flight.

2) CPS registration (Available only for Stratton shipments)

CPS arranges CBP to register the shipment once cargo on-site at Stratton. Shipper must provide 3 copies of CBP-4455 to CPS NY Office. Cargo must be received <u>**3 weeks**</u> prior to the scheduled ANG departure flight.

See "2016 ANG Shipping, Customs Instructions" for more detailed information.

HAZARDOUS CARGO

All hazardous Cargo shipped via the NYANG to Greenland <u>MUST</u> be registered by CPS. CPS cargo representatives must be provided with advance notice, and cargo must arrive at least <u>3 weeks</u> prior to ANG flight date.

For more information on customs and hazardous cargo registration, see the Greenland Guide.

SHIPPING ADDRESSES

C-17, Newburgh NY	<u>C-130, Scotia NY</u>
Arrive no later than 10 days prior to ANG flight.	Arrive no later than 10 days prior to ANG
	flight.
Dino Guthrie, CPS	
C/O OWEN WHITE, NYANG	
105th Air Terminal	109th Small Air Terminal, Bldg. 20
Stewart ANGB	1 Air National Guard Rd.
One Maguire Way	Scotia, NY 12302-9752
Newburgh NY 12550-5075	Attn: Dino Guthrie
Phone: 845-563-1318	Phone: 518.364.6975
Fax 845-563-1321	

CONTACTS

Daniel "Dino" Guthrie, Phone 518.364.6975, <u>dino@polarfield.com</u> Earl Vaughn, Phone 518.605.0979, <u>earl.vaughn@gmail.com</u>

The CPS Greenland Team looks forward to working with you this season. Please do not hesitate to contact us with any questions regarding cargo, hazardous materials shipping, or customs documentation.



Sending Cargo to Greenland via ANG

STEP 1: COMPLETE CUSTOMS FORMS

A Certificate of Registration (form CBP-4455) is <u>required</u> when shipping your cargo to Greenland via the 109th Air National Guard.

US Customs & Border Protection website: http://www.cbp.gov/xp/cgov/toolbox/forms/

- From the "FORMS" page, select "CBP form 4455."
- Complete CBP-4455. Include the following information:
 - Carrier: 109th Air National Guard (C130) or 105th Air National Guard (C17)
 - Date: [Insert Current Date]
 - o Name, address and zip code: You, the shipper
 - o Articles exported for: "Other science use in Greenland"
 - Number packages: [Include total number of items] Item number must be identifiable on each package.
 - o Kind of packages: Examples: Hardiggs, steel boxes, aluminum poles, wooden crate
 - **Description:** Type "See following (#) pages."
 - Attach a packing list to each CBP-4455 Form.
 - The numbered of items should match the information presented on the packing list information.
 - You do <u>NOT</u> need a separate Certificate for each item; one CBP-4455 Certificate will cover all items listed in the shipment.
 - You do not need to certify personal clothing or food.
 - Sign and date.

Complete CBP-4457 for shipment of personal gear. This form eliminates any questions or problems with personal equipment such as computers, electronic gadgets, etc.

STEP 2: CARGO INSPECTED BY CUSTOMS

The CBP-4455 Certificate MUST be signed by a customs agent to be valid.

A customs agent will inspect the contents of a shipment and check the corresponding packing list for accuracy. Cargo traveling to Greenland via the Air National Guard can be inspected in 1 of 2 ways:

- OPTION 1– Self-registration (Required for Newburgh shipments)
 - Cargo is inspected at local Customs and Border Patrol Office <u>BEFORE</u> shipment to NY
 Schedule an appointment with your local Customs and Border Protection Office (airports,
 - harbors) to have them inspect and certify cargo for shipment to Greenland.
 - o Prepare CBP-4455 and packing list as noted in Step 1.
 - Following the inspection, the CBP officer will sign the CBP-4455 form and stamp <u>ALL</u> copies of registration and packing lists.
 - o CBP will retain a copy for their records.
 - Include one copy of signed/stamped CBP-4455 and packing list with your cargo shipment to NY.
 - Send 2 copies to CPS NY Office



2016 ANG Shipping, Customs Instructions

 $\circ~$ Retain a copy for your records. Approved CBP-4455 forms will be needed when cargo is returned to the U.S.

**** A signed/stamped Certificate of Registration, CBP-4455 is valid for one year ****

- OPTION 2 CPS Registration (Available only for cargo sent to 109th ANG Base Scotia NY)
 - Cargo MUST arrive at least two weeks prior to your scheduled ANG flight.
 - Send 3 copies of completed and signed Certificates of Registration and corresponding packing lists to:
 - Dino Guthrie/ CH2M HILL Polar Services
 - Stratton Air Base
 - 1 Air National Guard Rd., Bldg 20 Scotia, NY 12302

cell: 518-364-6975 or office: 518-344-2635 dino@polarfield.com

- Pick up your approved CBP-4455 from CPS NY Office when transiting through NY.
- If not flying with the ANG, make arrangements for CPS NY Office to send a copy of the approved forms. Approved CBP-4455 forms will be needed when cargo is returned to the U.S.

**** A signed/stamped Certificate of Registration, CBP-4455 is valid for one year ****

Returning Cargo to the U.S. from Greenland via ANG

Contact your local CPS support office in Kangerlussuaq or at Thule AB with questions regarding customs forms for retro cargo. If not traveling with your cargo, you will need to complete additional customs forms to be compliant.

The export signed/stamped Certificate of Registration, CBP-4455, and packing list provides proof that the cargo originated in the U.S. A copy of your outbound approved CBP-4455 will be required to bring cargo back into the U.S. via the ANG.

Prohibited and Restricted Items

Some items, including samples, may be prohibited or require a special permit to import into the U.S.

Review CBP's website for a list of Prohibited/Restricted items: http://www.cbp.gov/xp/cgov/travel/vacation/kbyg/prohibited_restricted.xml

Sending Cargo to/from Greenland via Carrier OTHER than ANG

Check with your local Customs and Border Patrol office if cargo will originate or return via a Port of Entry other than NY ANG. There my be additional requirements to process your cargo, and your local customs office is the best resource for all non-ANG shipments.

For additional Customs information, refer to the U.S. CBP service online brochure "Know Before You Go." available on the official CBP site, <u>http://www.cbp.gov/travel/us-citizens/know-before-you-go</u>

Contact CBP directly at http://www.cbp.gov/ or via telephone at (518) 431-0200.

Site Cargo Offices New York Office: Dino Guthrie at <u>dino@polarfield.com</u> Kangerlussuaq Office: Geoff Miller at <u>miller@polarfield.com</u> 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, 35.99W (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-2016):

NorthEast end: N 75 degrees 38.542 min, W 35 degrees 56.780 min, alt. 2705 m

SouthWest end: N 75 degrees 37.556 min, W 36 degrees 3.647 min, alt. 2712 m

Skiways runs 240 and 060 degrees true.

Official (109th) altitude: 8,885 ft

Note: The entire camp moves 50m 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.

Waypoint route distance lat. long. altitude km dec. Deg dec.deg m deg min sec deg min sec NEEM 77.45 -51.06 0 (6.6 km from NEEM) 77.461 -50.817 2453.9 77.413 -50.468 2472.1 2490.1 77.367 -50.114 77.321 -49.759 2508.1 77.277 -49.405 2525.5 77.232 -49.051 2542.9 77.187 -48.699 2560.1 2577.1 77.142 -48.349 77.097 -47.999 2594.1 77.052 -47.651 2611.1 95 (Drilling 2 (265)) 2619.5 77.029 -47.479 77.006 -47.308 2627.8 76.96 -46.965 2644.5 76.913 -46.624 2661.1 76.867 -46.284 2677.2 76.821 -45.944 2693.4 76.772 -45.616 76.721 -45.291 2724.7 76.66 -45.004 2740.3 76.581 -44.834 2754.2 76.493 -44.765 2766.1 195 (Drilling 1 (165)) 76.448 -44.771 295 (100 km) -41.1561 2760 est 76.1783 395 (200 km) 75.8594 -37.6958 2730 est 437.5 (Edge) 75.7094 -36.2742 449.1 (Fix N) 75.6667 -35.8833 452.8 (Fix E) 75.6333 -35.8833 456 (EGRIP) 75.629900 -35.986700 75.554848 -36.206372 75.479595 -36.423818 75.404144 -36.639067 75.341118 -36.816783 75.265311 -37.028077 75.189314 -37.237253 75.113131 -37.444339 75.036763 -37.649360 74.972985 -37.818654 74.896287 -38.019961 74.819413 -38.219279 74.742366 -38.416632 74.678029 -38.579612 74.600670 -38.773431 74.523145 -38.965357 74.445457 -39.155415 74.367607 -39.343628

List of waypoints of 2015 traverse

47		636	74.302610	-39.499080		74	18	9	39	29	57
48		646	74.224471	-39.683972		74	13	28	39	41	2
49		656	74.146177	-39.867087		74	8	46	39	52	2
50		666	74.067731	-40.048445		74	4	4	40	2	54
51		676	73.993497	-40.205827		73	59	37	40	12	21
52		686	73.906012	-40.281126		73	54	22	40	16	52
53		696	73.818500	-40.355632		73	49	7	40	21	20
54		706	73.730963	-40.429358		73	43	51	40	25	46
55		716	73.643401	-40.502316		73	38	36	40	30	8
56		726	73.560108	-40.563919		73	33	36	40	33	50
57		736	73.472239	-40.430987		73	28	20	40	25	52
58		746	73.401909	-40.257650		73	24	7	40	15	28
59		756	73.331506	-40.085393		73	19	53	40	5	7
60		766	73.252076	-39.893592		73	15	7	39	53	37
61		776	73.181208	-39.725133		73	10	52	39	43	30
62		786	73.110509	-39.557000		73	6	38	39	33	25
63		796	73.030682	-39.369698		73	1	50	39	22	11
64		806	72.968086	-39.169340		72	58	5	39	10	10
65		816	72.912809	-38.945014		72	54	46	38	56	42
66		826	72.850315	-38.694376		72	51	1	38	41	40
67		836	72.794496	-38.473498		72	47	40	38	28	25
68		846	72.738430	-38.253637		72	44	18	38	15	13
69		856	72.674986	-38.008189		72	40	30	38	0	29
70	866 (GRIP)		72.618183	-37.792072	3232	72	37	5	37	47	31
71	896 (Summit Camp)	72.5797	-38.4556	3220	72	34	47	38	27	20

Traverse route NEEM -> NGRIP until "drilling 1" and then on to EGRIP. From EGRIP up along the flow line of NEGIS to main NS ice ridge and then S to GRIP/Summit.

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 nr	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/m³, 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 interbox locking mechanism. The boxes should be equipped with handles.

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

Useful container data

Standard containers

The following table shows the weights and dimensions of the three most common types of containers worldwide. The weights and dimensions quoted below are averages, different manufacture series of the same type of container may vary slightly in actual size and weight.

		20' container		40' con	tainer	45' high-cube container		
		imperial	metric	imperial	metric	imperial	metric	
	length	19' 10½"	6.058 m	40' 0"	12.192 m	45′ 0″	13.716 m	
external	width	8' 0"	2.438 m	8' 0"	2.438 m	8′ 0″	2.438 m	
umensions	height	8' 6"	2.591 m	8' 6"	2.591 m	9' 6"	2.896 m	
	length	18′ 10 ⁵ / ₁₆ ″	5.758 m	39′ 5 ⁴⁵ ⁄ ₆₄ ″	12.032 m	44' 4"	13.556 m	
interior dimensions	width	7′ 8 ¹⁹ / ₃₂ ″	2.352 m	7′ 8 ¹⁹ / ₃₂ ″	2.352 m	7′ 8 ¹⁹ / ₃₂ ″	2.352 m	
	height	7′ 9 ⁵⁷ / ₆₄ ″	2.385 m	7′ 9 ⁵⁷ / ₆₄ ″	2.385 m	8′ 9 ¹⁵ / ₁₆ ″	2.698 m	
	width	7′ 8 ⅓″	2.343 m	7′ 8 ½″	2.343 m	7′ 8 ⅓″	2.343 m	
door aperture	height	7′5¾″	2.280 m	7′ 5 ¾″	2.280 m	8′ 5 ⁴⁹ / ₆₄ ″	2.585 m	
volume		1,169 ft³	33.1 m³	2,385 ft³	67.5 m³	3,040 ft ³	86.1 m³	
maximur gross ma	n ss	52,910 lb 2	24,000 kg	67,200 lb	30,480 kg	67,200 lb	30,480 kg	
empty wei	ght	4,850 lb	2,200 kg	8,380 lb	3,800 kg	10,580 lb	4,800 kg	
net load	l	48,060 lb 2	21,600 kg	58,820 lb	26,500 kg	56,620 lb	25,680 kg	

20-ft, "heavy tested" containers are available for heavy goods (e.g. heavy machinery). These containers allow a maximum weight of 67,200 lb (30,480 kg), an empty weight of 5,290 lb (2,400 kg), and a net load of 61,910 lb (28,080 kg).

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



SEW A FULL SIZE WHITE "2" ON THE SKIWAY MARKER LOCATED AT THE 2000' REMAINING POINT ON BOTH SIDES ON EACH SKIWAY.

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

NEEM 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



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.



JCS 2011

Skiway official survey document:

DATE: May 29, 2015 May 1, 2016 re-survey in red. May 2017 prognosis in blue. SURVEYOR: Jorgen Peder Steffensen 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 040

EGRIP CAMP

AIRFIELD REFERENCE POINT (ARP): CENTERLINE STATION 1640 (500 meter) LATITUDE: 75-38-02.82 N LONGITUDE: 36-00-12.96 W LATITUDE: 75-38-04.26 N LONGITUDE: 36-00-08.94 W POINT HAS MOVED 54 M, BEARING 35 DEGREES TRUE IN 11 MONTHS LATITUDE: 75-38-05.70N LONGITUDE: 36-00-04.92 W ELEVATION: 8885 (2708 meter) DISTANCE SKIWAY CENTERLINE POINT TO THRESHOLD: APPROACH: 6000 DEPARTURE: 6000

MAIN SKIWAY (200 ft. x 12000 ft.) **APPROACH (24)** LATITUDE: 75-38-32.52 N LONGITUDE: 35-56-46.80 W LONGITUDE: 35-56-43.08 W LATITUDE: 75-38-33.90 N POINT HAS MOVED 51 M, BEARING 34 DEGREES TRUE IN 11 MONTHS LATITUDE: 75-38-35.28N LONGITUDE: 35-56-39.36 W ELEVATION: 8871 (2704 meter) **DEPARTURE (06)** LATITUDE: 75-37-33.36 N LONGITUDE: 36-03-38.82 W LATITUDE: 75-37-34.80 N LONGITUDE: 36-03-35.28 W POINT HAS MOVED 52 M, BEARING 32 DEGREES TRUE IN 11 MONTHS LATITUDE: **75-37-36.24N** LONGITUDE: 36-03-31.74 W ELEVATION: 8898 (2712 meter) MAIN SKIWAY GRADIENT: 0.22%

SKIWAY AZIMUTHS from Approach True 24 True: 237 24' Grid: unknown (mag. Declination Jan 2016: 28 42')

MAIN DOME (HIGHEST STRUCTURE) LATITUDE: 75-37-47.52 N LONGITUDE: 35-59-37.44 W 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		
	2450	0000		
	3450	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 [m³]	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: Density of Jet A1 Density of mogas		55*40*23 cm, 8 kg 805 kg/m ³ 720 kg/m ³ 178 kg
2001 drum of JET AT or D60		178 Kg
Empty standard drum		15 kg
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 $p_0=1013.25$ 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:

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

Current capability of electrical cables:

Area [mm²]	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:

Yellow/green:	Protective ground
Black	L1
Blue	Ν
Brown	L2
Black	L3

Attenuation of coaxial cables:

RG58/U attenuation per 30m:

B at SWR 1.0. +	-0.5 dB at SWR = 3
B at SWR 1.0. +	-1.2 dB at SWR = 3
3 at SWR 1.0 +	-1.2 dB at SWR = 3
	B at SWR 1.0. + B at SWR 1.0. + B at SWR 1.0 +

RG213/U attenuation per 30m:

10 MHz	0.7 dB at SWR 1.0	+0.4 dB at SWR = 3
200 Mhz	3.5 dB at SWR 1.0	+1.0 dB at SWR = 3
1500MHz	12 dB at SWR 1.0	+1.2 dB at SWR = 3

HF Radio Yagi-Uda Antenna:



From left to right, the elements mounted on the boom are called,

Reflector element, Driver element, Director element

The reflector is 5% longer than the driver element, and the director 5% shorter.

Typical dimensions for 3 element wide spaced 8093 kHz Yagi-Uda antenna:

Reflector length:	0.5*l	18.53m
Dipole length	0.475*l	17.60m
Director length	0.45*l	16.68m
Distance Reflector-Dipole	0.23*l	8.53m
Distance Dipole-Director	0.25*1	9.27m

With this length of the antenna the gain is expected to 7 dB, SWR<2

Coordination of LC-130 in Kangerlussuaq

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

This note is written to make the field coordination between CPS/CH2MHill, 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 NEEM programmes.

Copies of this paper should be given to each Deployment Commander(DC) and the mission crew should be briefed on the contents before departure to Greenland. This will ensure that the FOM's and the 109'th personnel will operate along the same outlines throughout the field season.

In the following it is assumed that prior to the field activities of CPS and EGRIP in Greenland, plans and agreements have already been made between CPS/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 CPS and EGRIP. Both FOM's need to be there since U.S. NSF activities and EGRIP project are independent and each FOM carry 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 and strapped down. 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

determine 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.

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 departure to provide last minute briefing with the departing crew.

During missions 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 Raven 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, incl. the number of flight hours assigned to the different programs.

Updated, March 11, 2017 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 8925' 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 fractio phenomenon. Choices: visibility stated "unrestr	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 converte atmosphere. State hPa. elevation in feet, not the	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 clou (SCT. Even coverage of c coverage of clear blue p cloud cover, 100%). Wit	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 definiti	on: Good: Sharp h	orizon	Fair: Identifiable	
	Poor: Barely d	iscernable	Nil: No horizon	
Surface definition	<u>on</u>			
GOOD:	Snow surface features a	re 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 c seem to "float" in the ai	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	NIL surface, NIL horizon		
Comments:	Plain language commen "Winds variable". "Baro	ts, trends, changes : «I meter rising".	Fog bank north", "Visibility decreasing."	
Conversion:	1mB 1 feet 1 nau.miles 1 m/s	= 1 hPa =0.029 = 0.3048 meter, = 1853 meter. = 1.943 knots	5300 in.Hg.	

Communication plan

Typical radio communication plan.

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

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

Short wave (or HF) Frequencies:

Primary Secondary	8093 kHz 4753 kHz	Ice freq. For camp to FOM communication Ice freq, Best for distances up to 400 km.
	3815 kHz	Optional frequency for local traverse, 3350 may also be used depending on distance and antenna
	4050 khz 7995 khz	Main east Greenland party line frequency. Ice freq, digital comms.

All frequencies use SSB, USB

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

HF Maritime:	2182	Emergency Call
HF Aircraft:	2950	NUUK FIC
	4724	Thule Airways
	5526	NUUK FIC
	6739	Main Aircraft frequency
	8945	NUUK FIC
	8968	Thule Airways
	10042	NUUK FIC
VHF radio.	118.1	CNP AFIS
	118.3	SFJ Approach
	121.3	NUUK FIC
	121.5	Call, Emergency
	122.8	Air to ground, EGRIP or RECAP, Summit
	126.2	SFJ Tower

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	Ν	November	1	Wun
В	Bravo	0	Oscar	2	Тоо
С	Charley	Р	Рара	3	Tree
D	Delta	Q	Quebec	4	Fower
E	Echo	R	Romeo	5	Fiwer
F	Foxtrot	S	Sierra	6	Six
G	Golf	т	Tango	7	Seven
Н	Hotel	U	Uniform	8	Aight
I	India	V	Victor	9	Niner
J	Juliet	W	Whiskey	0	Zeeroh
К	Kilo	Х	Xray		
L	Lima	Y	Yankee		
Μ	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 NEEM Camp +8816 777 15686 Identity: Charlie-Golf Hotel Golf Foxtrot. Type: Turbo DC3 (Basler), Flying Visual Flight Rules. Safety equipment "M SHG/S" Departs NEEM 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	Gældende for Kangerlussuaq/Sdr Strømfjord
111320z	Udstedt d. 11 i måneden kl. 10:20
auto	
08007kt	Vind fra 80°, 7 knob
9999ndv	Sigtbarhed > 10 km
ncd	
m30/m34	Temperatur -30 grader, dugpunktstemperatur -34 grader
q0995	Lufttryk 995 hektopascal

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

TAF-FT	Lang TAF
Bgsf	Gældende for Kangerlussuaq/Sdr Strømfjord
111058z	Udstedt d. 11 i måneden kl. 07:58
1112/1123	Gældende fra kl. 09:00 og de næste 24 timer
06006kt	Vind fra 60°, 6 knob
9999	Sigtbarhed > 10 km
Bkn150	Skyet i 15000 fod
Tempo	Perioder med ændring
1113/1123	Mellem kl 10:00 og 20:00
4500	Sigtbarhed 4500 meter (4,5 km)
-shsn	Lette snebyger
bkn024	Skyet i 2400 fod



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
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
CNP, BGCO	70,7417	22,6583	70 44 30	22 39 30
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
GISP (Summit)	72,58833	38,4575	72 34.78	38 27.27
GRIP	72,58722	37,64222	72 34.74	37 37.92
HT, 95 Drill site	82,50556	37,47222	82 29.8	37 28.2
JAV, 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
STANOR	81,6	16,650	81 36	16 39
Storstr mmen			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	То	km
AEY	NOR	1780
AEY	CNP	600
CNP	ТНИ	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	ТНՍ	480
NEEM	UPERNAVIK	600
NEEM	NGRIP	365
NGRIP	CNP	799
NGRIP	GRIP	315
NOR	Longyearb	717
NOR	НТ	335
SFJ	ТНՍ	1224
SFJ	JAV	245
SFJ	EGRIP	1088
SFJ	GRIP	796
ТНО	сс	205
THU	НТ	887
THU	NGT33	625
THU	GRIP	1005
ТНИ	NOR	1182

EGRIP Drilling Liquid Properties

A drilling liquid has been developed for NEEM 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.

RECAP will utilize ESTISOL 140 in 2015 and EGRIP plans to use COASOL/ESTOSOL 240 in combination with ESTISOL 140 in the coming years.

TABLE .	<u>COASOL</u>	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 NEEM 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:

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			Insid pressuri:	le Gamow bag v zed to 2 psi (103	when 3 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

- 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

SBT<90 mmHg and DBT<60 mmHG H

Hypotension

Optimal

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.

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

Result of blood glucose monitoring

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.