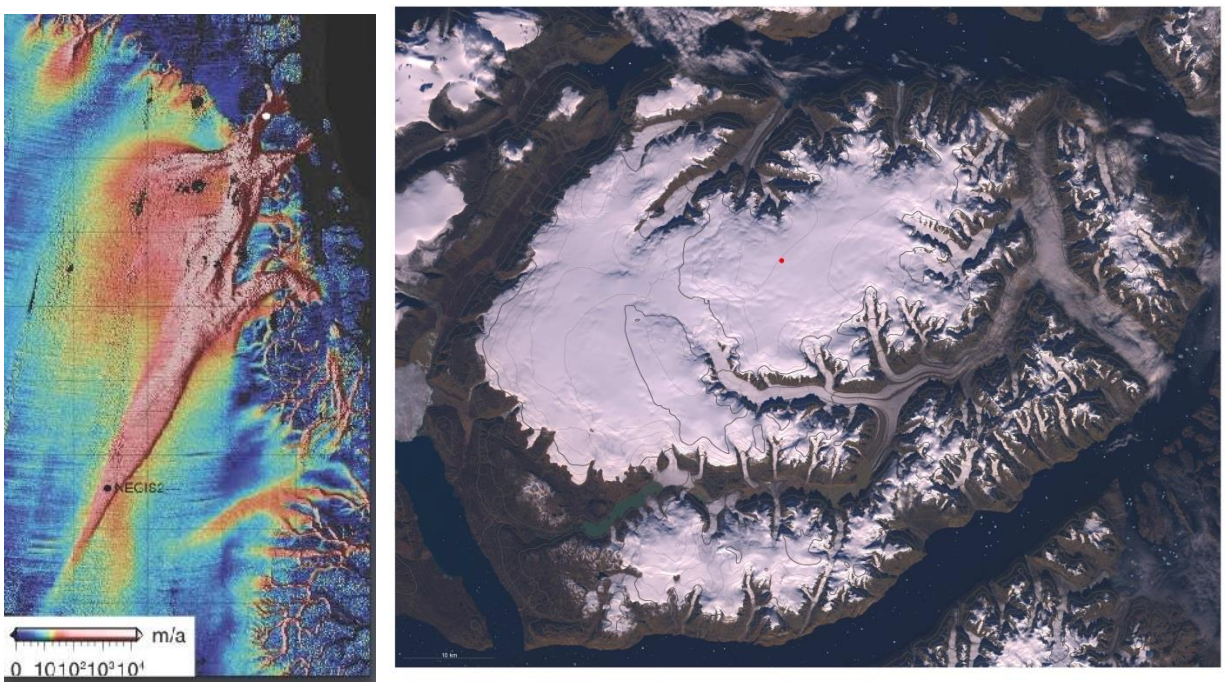
Field season 2015

East GReenland Ice core Project (EGRIP) 2015-2020: Moving NEEM camp to new EGRIP drilling site.

and

REnland ice CAp Project (RECAP) 2015.

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



Picture 1: Left: Velocity field of East Greenland ice stream with EGRIP (NEGIS 2) marked. Right: The Renland glacier with proposed RECAP drilling site.

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EGRIP and RECAP 2015 introduction

In 2015 there will be two field seasons – at EGRIP and RECAP - and we have decided to make a joint field plan because there is much logistic overlap between the two projects.

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 camps. 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 2014 in anticipation of the upcoming EGRIP and RECAP projects. Without this foresight, little of what is planned for the 2015 season could be realized.

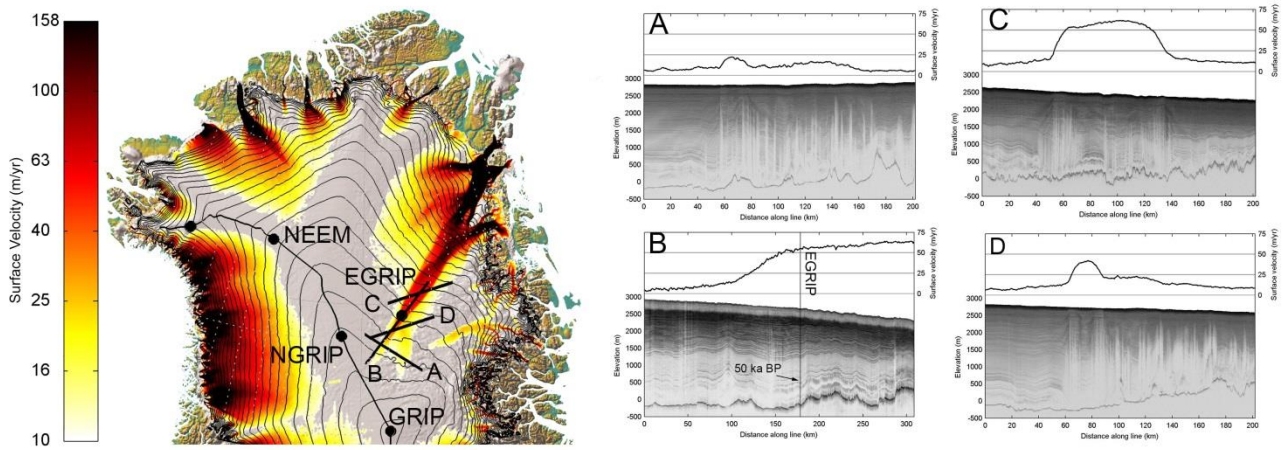
Copenhagen, March 23rd, 2015

Lars Berg Larsen, Simon Sheldon, Dorthe Dahl-Jensen, Bo M. Vinther and J.P.Steffensen

EGRIP 2015-2020: Season 2015

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.

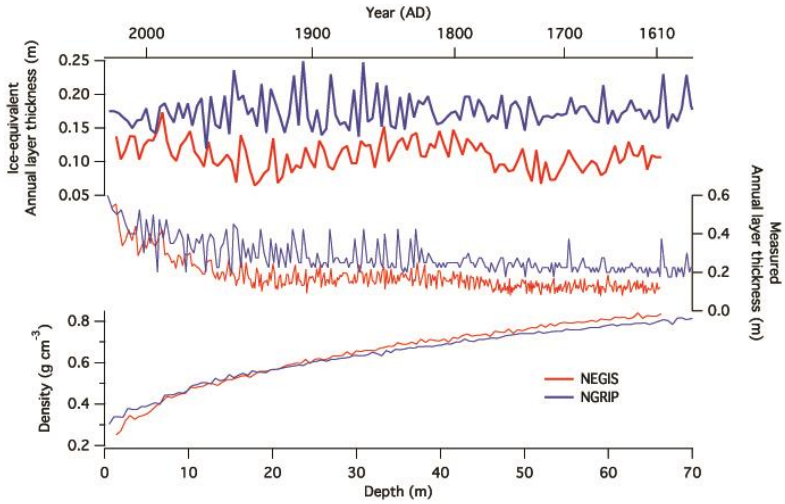
-study the dynamics of the ice flow by borehole observations of basal sliding, borehole deformation, and basal water processes.

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.

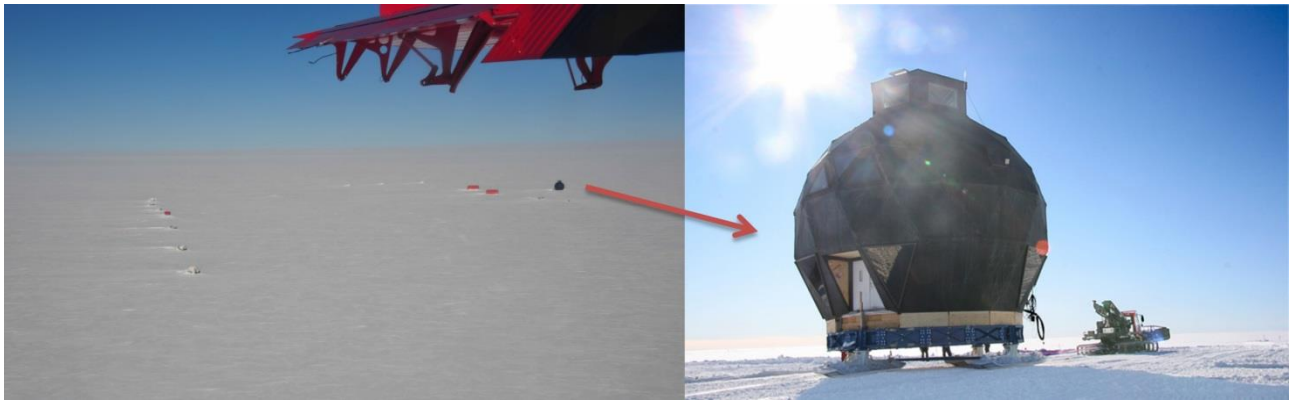


Reconstruction of the annual layer thickness from the 67 m shallow ice core from NEGIS. The accumulation rate is 0.11 m/yr and a significant increase of accumulation in the more recent warmer years is not observed. The results are compared with records from NGRIP. (P.Vallelonga et al, Preliminary glaciochemical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

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.

The deep drilling project is planned for the years 2015 to 2020. We imagine the project as an international collaboration between 4-6 nations. At present USA and Germany are involved and their national funding agencies have been positive and they can provide the needed air support (USA, ski equipped LC-130 and fuel; Germany, ski equipped Basler (DC3) and vehicles). Norway (Bjerknes

center in Bergen) has recently announced its participation, while Japan, Switzerland and France are the most likely additional partners that would supplement the research group well.
The main part of the equipment needed to establish the camp is at present stored at the previous deep drilling site NEEM, 380 km West-Northwest of EGRIP. The main building, the Dome was put on skis in 2011 to enable surface transport to the new site. All the remaining equipment is stored on sledges at NEEM. In 2016 the equipment must be pulled to EGRIP and trenches for drilling and science constructed so that deep drilling and science can commerce in 2017. Besides from drilling and analyzing the 2550 m deep ice core, a suite of borehole logging equipment, both existing and newly developed, will be used to monitor the ice deformation, ice sliding and basal water system in the borehole penetrating to the bedrock.



Left: Fly over photo of the stored NEEM camp May 2013. The line to the left is sledges with equipment stored and the black building to the right is the main dome on skis. In the two red tents the tracked vehicles are stored. Right: Photo from 2011 of the 4 storey, 45 ton main dome on skis being pulled by the NEEM Pistenbully.

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 analyses are performed at the field camp on the fresh ice core and 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 streams in 2015-2016 and the 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 an EGRIP ice camp with infrastructure and an airfield for ski planes opens the gateway for additional projects.

Scientific plan for EGRIP 2015

Deep borehole logging at NEEM (Dorthe Dahl-Jensen)

The 2550 m deep liquid-filled borehole at NEEM has been left undisturbed since 2012. The borehole will be logged with the Danish logger for temperature (precision 0.01 °C) as well as inclination, azimuth, borehole diameter and pressure. The drill trench was closed in 2012 and after extending the casing to the surface, the drilling was back-filled with snow. The logging will happen from the snow surface using the small logging winch. The temperature data will be used for reconstruction of past surface temperatures and a monitoring of the ice temperatures near the bed, where there is melt water. The diameters will be used to monitor the pressure balance of the liquid in the borehole and to observe if there are changes around the folded zones of the Eemian ice. The inclination and azimuth can be used to monitor the deformation of the borehole. As the surface velocity is or the order 5 m/yr monitoring of the shape of the borehole since 2010 should allow us enough accuracy. Since the last use of the logger, the surface software has been updated by Christian Panton.

Strain net and GPS (Christine Hvidberg, Lars Berg Larsen)

The 9 strain net stakes around NEEM will be remeasured. The most distant stake position, 50 km upstream from NEEM, will be measured during the traverse. The stakes left during the 2007 NGRIP-NEEM traverse will be remeasured if they can be found. Continuous GPS measurements will be performed along the traverse route and onward to Summit.

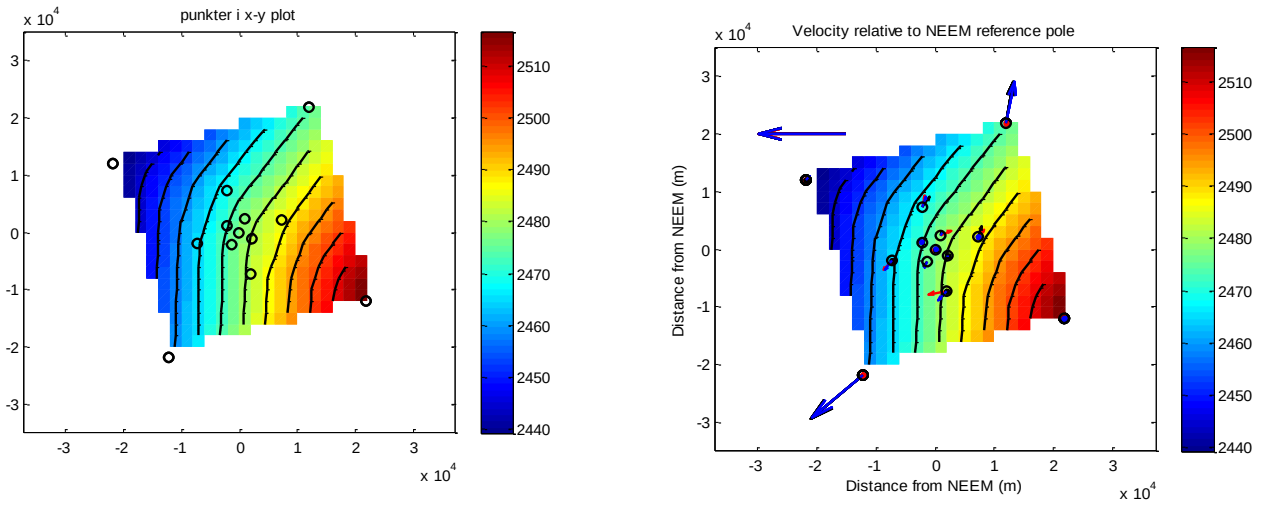


Fig. Left: Map of existing strain net at NEEM. The circles indicate poles. It is of high priority to re-measure the filled poles. The purple circle indicates the reference pole at NEEM. Right: Arrows indicate horizontal surface velocities relative to the NEEM reference pole over the period 2007-2008 (red), 2008-2009 (black), 2009-2010 (blue).

Radar measurements on the Neem to EGRIP traverse (Nanna B. Karlsson, Anna Winter)
During the traverse the team will perform surface-based, high resolution radar mapping along the ice divide and from the ice divide to the new drill site EGRIP. Radar mapping will be done using the AWI (Alfred Wegener Institute, D) radar "Maria", that operates at two frequencies: 250MHz and 500MHz. The dual frequency makes it possible to map in detail the shallow structures in the upper few hundred metres while at the same time penetrate deeper into the ice. This will provide important information on internal layer structure and aid towards reconstructing past accumulation rates.

Greenland snow core array (Paul Vallelonga, Helle Kjær)
The N2E traverse offers a rare opportunity to investigate gradients of impurity deposition across Northern Greenland and particularly from West to East across the ice divide. We will use a US IDDO hand auger to drill 5 snow/firn cores along the traverse from NEEM to EGRIP. 15 m cores at NEEM and EGRIP will be used to investigate recent decadal variability in stable water isotopes and chemical impurities. Additionally, we will drill three 10 m cores along the transect to investigate the depositional gradients of impurities between NEEM and EGRIP. Following each drilling, the temperature at the bottom of the borehole will be measured using a thermistor. Finally, we will collect a 50 mL surface sample every 5 km for measurement of typical parameters (stable water isotopes, Sodium, Ammonium, Calcium, insoluble dust particles). Surface samples will also be collected every 5 km from EGRIP onward to Summit. The snow/firn cores and surface samples will be analysed using the Copenhagen CFA system, with measurements of stable water isotopes, chemical impurities (H_2O_2, Na, NH_4, H^+, conductivity, dust) and sea ice proxies (Na, MSA, halogens). The transect will allow an investigation of relative sources and transport pathways for sea ice proxies across Northern Greenland.

Preliminary study of Bromine isotopes in Greenland snow (Paul Vallelonga)
It has been hypothesised that the autocatalytic photo-oxidation process known as "the bromine explosion" may induce isotopic fractionation of bromine above seasonal sea ice. Large volumes (5 to 10 L) of snow will be collected at NEEM and snow coring sites along the traverse to investigate seasonal variability in bromine isotopic compositions and to investigate potential links to bromine enrichment processes.

Investigating snow properties along the Greenland traverse and at drill sites (Anna Winter, Nanna Karlsson, Paul Vallelonga, Helle Kjær, Sepp Kipfstuhl, HC Steen-Larsen)
Snow density and water isotopes will be measured at 2cm resolution in an array of 5 snow pits, which will be sampled along the traverse. 3m snow pits will be sampled at NEEM and EGRIP and 2 m snow pits will be sampled at three points along the traverse. The density and water isotope samples of the top 2 m will among several studies be used to improve our understanding of the snow-air interaction and for benchmarking isotope-enabled GCMs.
Snow radar will be measured along the traverse and onward to Summit. An important goal is to have a continuous record of accumulation and density from the surface to the 2012 melt layer. Tubes will be collected every 10 or 20 km. Density and isotope measurements back at AWI for snow (top 2

metres)-atmosphere interaction studies and benchmarking of isotope-enabled GCMs. Specific surface area (SSA) of the surface snow will be determined once a day.

Variability of surface isotopic compositions at drilling sites (responsible: Vasileios Gkinis, Helle Kjær)

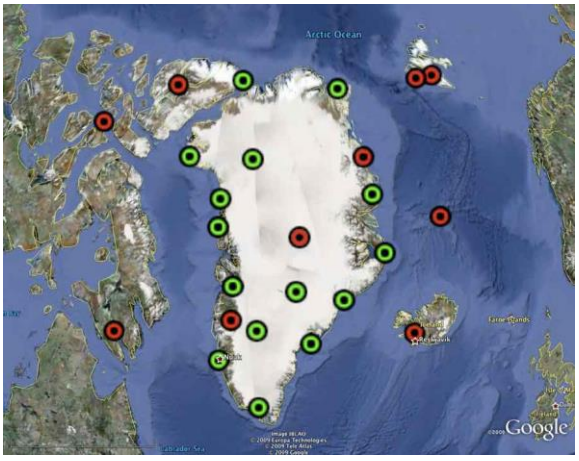
Approximately 50 samples collected from 5 locations during the traverse. The aim of the study is to look into the variability of the isotopic composition and produce a characterization of the noise of the isotopic signal (d17O, d18O, dD, Dxs, 17Oxs) at the surface. This work is relevant also for the diffusion studies carried out at CIC.

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 placed at EGRIP will fit into the network very well; we always seek to place more stations on the ice sheet.

Maintenance of the permanent seismic station at NEEM (GLISN project)



1 The map shows the **location of existing real-time broadband seismic stations (red) joining GLISN with open data sharing and sites (green) where equipment, telemetry, and infrastructure is being installed and upgraded in concert with GLISN partners.**

The IRIS Consortium has been awarded $1.9M in Major Research Instrumentation (MRI) funding from the US National Science Foundation for the 3-year development of a Greenland Ice Sheet Monitoring Network (GLISN) under the direction of Kent R. Anderson, and Robert Detrick. The development effort is a coordinated international collaboration of 10 nations - Denmark, Canada, Germany, Italy, Japan, Norway, Switzerland, France, Poland, and USA - for an enhanced broadband seismic capability for Greenland. The project has established a real-time sensor array of many stations to enhance and upgrade the performance of the existing Greenland seismic infrastructure for detecting, locating, and characterizing glacial earthquakes and other cryo-seismic phenomena, and contribute to our understanding of Ice Sheet dynamics. Complementing data from satellites, geodesy, and other sources and in concert with these technologies, GLISN will provide a powerful tool for detecting

change and will advance new frontiers of research in glacial systems; the underlying geological and geophysical processes affecting the Greenland Ice Sheet; interactions between oceans, climate, and the cryosphere; and other multidisciplinary areas of interest to geoscience and climate dynamics. The development of the telemetry infrastructure linking the sites together into a coherent framework creates the temporal resolving capability and potential for rapid scientific response. All data from GLISN will be freely and openly available to anyone in real-time, without restriction. The instrument development of GLISN is focused on 1) upgrading equipment and adding real-time telemetry to existing seismic infrastructure in Greenland; 2) installing new, telemetered, broadband seismic stations on Greenland's perimeter and ice sheet; 3) coalescing telemetry from existing real-time, high-quality, broadband stations in and around Greenland into the GLISN network; and 4) distributing the real-time data to users and international data centers. In collaboration with GLISN, the Global Centroid Moment Tensor Project at Lamont-Doherty Earth Observatory will provide a near-real-time catalog of glacial earthquakes. The development incorporates state-of-the-art broadband seismometers and data acquisition; Iridium and local Internet; power systems capable of autonomous operation throughout the polar year; and stable, well-coupled installations on bedrock and the Ice Sheet. GPS will also be installed at sites on the Ice Sheet. Work on the engineering and technical side of the IRIS project will be performed by the field engineering staff at the New Mexico Tech PASSCAL Instrument Center.

PARCA AWS station system maintenance (Koni Steffen, ETH Zürich, CIRES Colorado)
During the annual maintenance of the Automated Weather Stations in N-Greenland, the NEEM/EGRIP traverse will encounter a Twin Otter either enroute to EGRIP or just after arrival at EGRIP. The team will stop by for fuel and rest while maintaining the AWS at EGRIP.

Logistic plan for EGRIP 2015

The overall logistical goal is to move all remaining NEEM drilling camp equipment by overland traverse to the new EGRIP position. At EGRIP we plan to layout the future camp, place the main dome in position, construct garages and build a skiway. A request for area allotment has been sent to the Greenlandic Authorities. A set of environmental conditions has been issued to EGRIP. These are similar to the conditions imposed on NEEM, so we have no doubt that we can fulfill them. It is also a goal to support scientific activities at NEEM, en-route and at EGRIP. To accomplish the overall goal, the campaign can be broken down into the following steps:

1. Ensure we have enough tractor power and fuel to pull the est. 200 tons of cargo over the snow.
2. Re-activate NEEM camp and build a Ski Landing Area to receive 4 LC-130 flights (one flight is the initial put-in).

3. In two weeks, excavate the main dome and pull it to the surface, break down and stow garages and remaining equipment on sleds and taking down the ski Landing Area.
4. In approx. 10 days pull all equipment to EGRIP.
5. In two weeks, place the main dome in new position at EGRIP, mark out the new camp, construct two garages and build a new skiway.
6. Support the U.S. GrIT tractor on its onwards journey to Summit.
7. Close down the new EGRIP camp and leave camp.
8. Support of science during the campaign.

Ad.1: Already 1.5 years ago the U.S. NSF graciously agreed to our request to leave a CASE tractor from the GrIT traverse, sled and fuel in depot at NEEM in 2014. Our calculations indicated, that in order to have enough tractor power, we needed a new Pistenbully (PB 300). This has been purchased in Germany in February. Due to transport restraints, the only way to get this PB 300 to NEEM in time was to ship it through the U.S. for air lift to Kangerlussuaq. It will be air lifted to NEEM in sections and assembled on site. This is why we need four flights by LC-130 to NEEM.

Ad.2: The old NEEM skiway from 2012 has been lost, as most markers have disappeared. We will mark a new one on top of the old.

Ad.3: A substantial amount of snow has accumulated around the garages and main dome and this has to be removed before the buildings are taken down or moved.

Ad.4: At NEEM there are 7 heavy sleds and one U.S. GrIT carpet sled. We will transfer fuel from the NEEM steel tanks to U.S. fuel bladders for ease of transport. We will stow all equipment onto sleds for transport. Five tracked vehicles will pull the cargo: 2 x PB 300, 2 x Flexmobils and one CASE tractor. The CASE tractor will pull the 45 ton Main Dome. We plan to use the main dome as quarters and kitchen during the traverse.

Ad.5: After arrival at EGRIP, the main dome will be placed in position and the new camp marked out in accordance to the plans. Fuel will be transferred back to the steel tanks, and after two days the U.S. CASE tractor accompanied by a scientific snowmobile team will continue upstream towards Summit. Snow hills will be constructed and the two garages will be built. The garages will be stocked with equipment and the remaining equipment will be placed on heavy sleds in a cargo line. A new, fully marked skiway will be laid out and groomed in preparation of two LC-130 flights that will test the skiway and eventually perform the pull-out from EGRIP.

Ad.6: The U.S.GrIT has graciously agreed that the route of the CASE tractor onwards to Summit can be along the ice stream. It will be accompanied by a science team for upstream measurements. The science team and snowmobiles will be flown out of Summit.

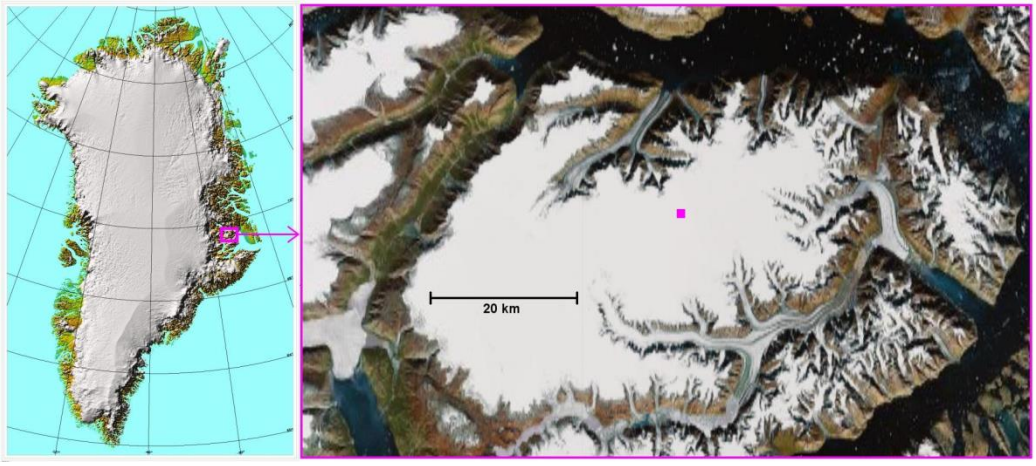
Ad.7: The goal of this point is to leave EGRIP stocked with fuel and in an overwintering state that allows us to open and re-activate the camp in 2016 within 36 hours.

Ad.8: At NEEM there will be support for the following activities: Borehole logging, re-measurements of strain-net and GLISN. En-route, two snowmobile teams will be active, a radar and GPS positioning team and a snow sampling and surface ice coring team. At NEEM we will support U.S. PARCA program and a NASA team and a GEUS seismic project. (For details, please see the science plan).

RECAP (The REnland ice CAP project) 2015:

Background:

The Renland ice cap is situated in Eastern Greenland on a high elevation plateau on the Renland peninsula in the Scoresbysund fjord (figure 1). Climatic conditions on the Renland ice cap are strongly influenced by the varying Arctic sea ice export along Greenland's east coast. An ice core from the Renland ice cap is thus perfectly suited for obtaining information on Eastern Greenland climatic conditions including the export of sea ice from the Arctic Ocean for the past 100,000 years. The RECAP ice core drilled to bedrock will be the backbone of a coordinated science program between Denmark, the U.S., Germany and Italy. The shallowness of the Renland ice cap furthermore assures that it does not have a brittle ice zone in the Holocene ice like the Greenland ice sheet. The RECAP ice core can therefore yield the first continuous Holocene profiles of gasses and chemical impurities extracted from Greenland.



Left, map of Greenland, showing the location of the Renland Ice Cap (Danish Cadastre). Right, satellite image of the Renland peninsula, which is almost entirely covered by the Renland ice cap. The dome on the eastern plateau of the Renland ice cap is marked with a purple square.

The Renland ice cap is constrained by the surrounding topography and its eastern plateau reaches an elevation of 2340m at its summit, where the thickness of the ice cap is almost 400m and the accumulation rate approximately 0.5m of ice equivalent precipitation per year. Brittle ice, that is very detrimental to ice core quality, forms at depths below 600m, hence in contrast to the main Greenland ice sheet, the Renland ice cap contains no brittle ice zone. An ice core from Renland will

therefore also yield the first continuous Holocene profiles of gasses and chemical impurities from Greenland.
Given the unique location and properties of the Renland ice cap, the RECAP core will provide data with direct bearing on the following high-priority science questions:

1) How did the East Greenland and thus Arctic sea-ice conditions evolve during the Holocene and the Glacial and how did conditions and variability compare to the present downturn in sea ice?
2) How did the atmospheric composition, including pole-to-pole gradients in trace gas contents, change during the entire Holocene?
3) What is the East Greenland signature of the abrupt climate shifts seen during the last Glacial?
4) Has the Renland ice cap always had the same shape and size, so the climate record from a Renland ice core can be assumed to stem from snow deposition on a site with unchanged elevation, yielding a Greenland climate record at fixed elevation?

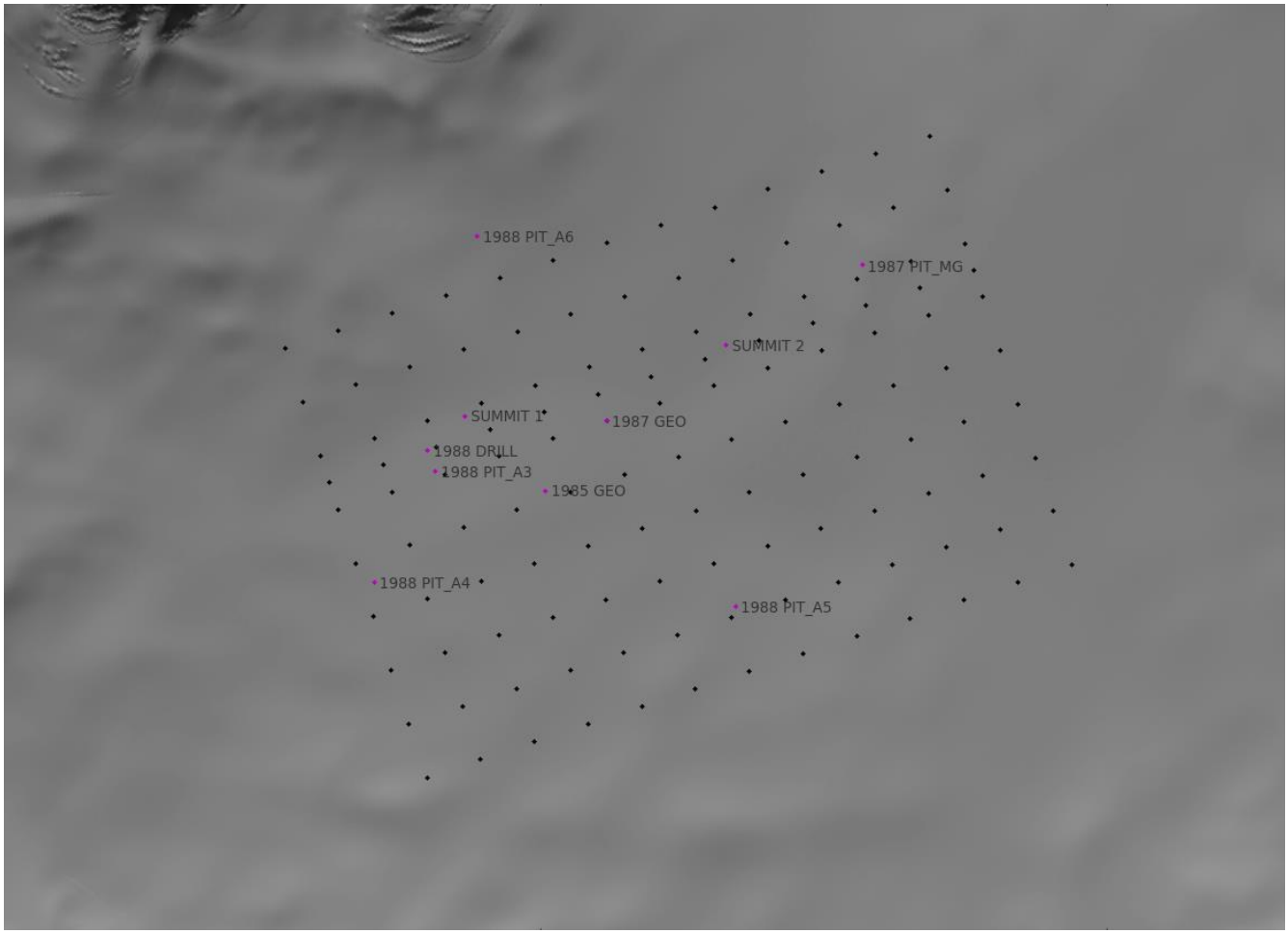
These science questions are directly influencing how the scientific community will interpret the present decline in Arctic sea-ice; our future understanding of the dynamics of the climate system; our interpretation of Human and natural influences on the Earths atmospheric composition; and our future interpretation of the ice cores from the main Greenland ice sheet. To address these, as well as numerous other science questions, we propose to drill the RECAP core through the Renland ice cap down to bedrock. Drill site location will be near the dome of the ice cap (exact coordinates to be determined using U.S. radar equipment). The core will be drilled with the modern well-proven Copenhagen intermediate drill system, capable of drilling high quality 4 inch diameter cores in liquid-filled boreholes. Furthemore a firn-gas project will be carried out using a U.S. firn gas sampling system and the Copenhagen shallow-drilling system (3 inch cores).

Scientific plan for RECAP 2015

Late April to early May: Radar measurements with CRESIS surface radar, establish skiway (4 crew).

Early May to end of May: Establish main camp, deep drilling, firn gas project (11 crew).

Beginning of June to late June: Deep drilling, rapid access test, take down camp (11 crew).



Planned radar grid, with location of relevant sites from 1980s campaign (by CP):

Logistic plan for RECAP 2015

The overall logistic purpose is to support a drilling to bedrock on Renland ice cap (to approx. 500 m depth), to support basic ice core processing on site, to support a firn air pumping and shallow ice coring operation, to support a pre-site radar survey and to support testing of new ice drilling technologies. These activities require a field camp with 11 persons over a period of 2 months.

Renland ice cap is not easily accessible. LC-130 cannot land on this small ice cap so the bulk of the air lift to the ice cap occurs through a collaboration with German Alfred Wegener Institute (AWI) who have put a Basler ski-equipped air craft to the disposition of RECAP in three periods (around put-in, around mid-season crew exchange and around the pull-out). The Basler will operate out of the civilian airport of Constable Pynt (Nerlerit Inaat or CNP), which is the airport of Scoresbysund (Itoqqortormiit) and Mestersvig (MST), which is an abandoned mining town, now operated by the Danish military in the NE-Greenland National Park.
Aircraft fuel is available in CNP as well as housing and infrastructure. But in October 2014 it became clear that C-130 operations in CNP were doubtful. We therefore planned to use MST for C-130

transports. At that time, however, cargo from Denmark (drilling fluid, generators and other heavy items) had already been shipped to CNP by ship in three 20' containers. Plans were changed, and airlift to Renland would now occur from both CNP and MST.

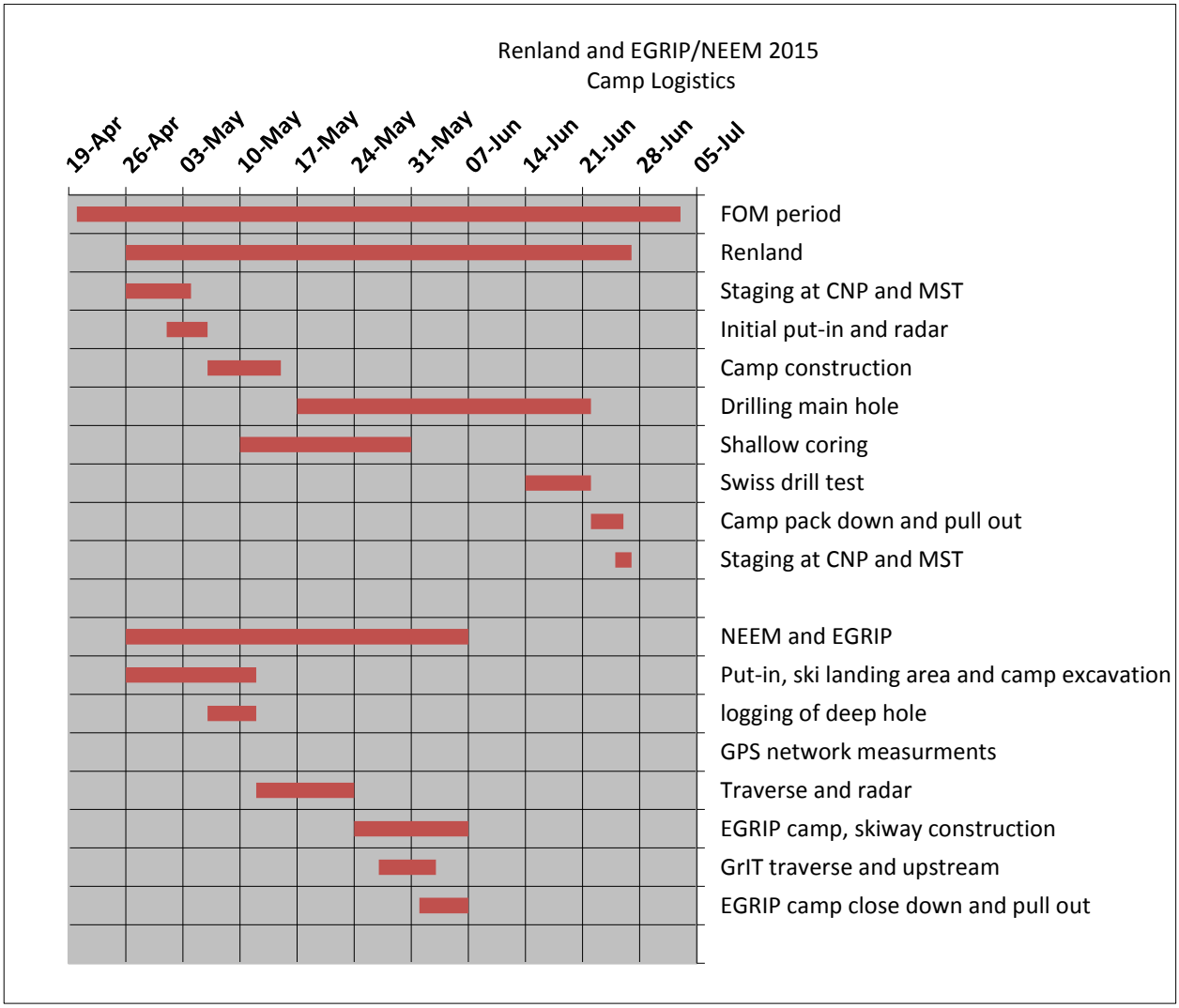
We have filed a request to use MST with the Danish military, and we have included MST in our request for expedition permit from the Greenland authorities. The present manning plan for RECAP has been based on the assumption that cargo and passengers from Kangerlussuaq can be flown to MST by U.S. C-130 for put-in, crew exchange and pull-out. In the beginning of March, we got notice from the Danish Military that MST cannot be used on May 31. Therefore, the planned C-130 crew-exchange flight was cancelled. **This means that the persons involved in RECAP crew exchange around May 31 have to be transported in and out of CNP by either commercial flights or by Basler to either destinations in Greenland or Iceland. These individuals should keep in contact with Lars Berg Larsen or Bo Vinther for travel updates.**

The logistic operations in RECAP will follow these steps:

1. Two persons deploy to CNP by commercial plane to unpack cargo there and make it ready for shipment.
2. The rest of the put-in crew and East coast FOM will fly to MST by 109th C-130 along with cargo (tents, weatherports, drills, food, etc.).
3. A group of four persons will fly to Renland Ice cap (either by helicopter or Twin Otter) for site survey using Kansas radar. In about three days the optimal drilling site should be identified and camp put-in can occur using the Basler from both CNP and MST. Two radar operators return to CNP. At MST a freezer will be built to keep ice cores from Renland cold.
4. RECAP camp construction will progress while the Basler finishes deployment of people and equipment.
5. Drilling processing and sampling and firn air program.
6. Mid-season crew exchange will occur by Basler to CNP. No significant cargo transport, except for ice core from Renland to MST.
7. Drilling processing and sampling and rapid access drill test.
8. During pull-out, the Basler will shuttle cargo to CNP for stowing into containers bound for Kangerlussuaq and passengers, ice cores and other equipment to MST.
9. Passengers, ice cores, and all equipment in MST is picked up by C-130 in two (possibly three) C-130 flights to Kangerlussuaq.

Timeline for EGRIP and RECAP projects.

The projects are planned to take place from 26th April to 27th June 2015. Thus we plan for 8 weeks of work on the ice.



Publications and out-reach.

To enhance public interest in our work, both EGRIP and RECAP plan to have a web diary where the public may follow the progress on a day-to-day basis.

Important: Sudden changes in manning plan due unforeseen issues.

Please keep in mind, that being on the manning plan for 2015 is not a guarantee that you will go to NEEM/EGRIP or Renland and stay there for the scheduled time. In this line of work, even small incidents may have large consequences. Even though we are scientists, we also share a treat with sea-men – we are superstitious. Therefore we hesitate to mention specific incidents as it could become self-fulfilling. So, at this time let us just say, that a broken vital part with a long delivery time may cause severe delays.

THEREFORE: PEOPLE WHO ARE SCHEDULED TO GO TO NEEM/EGRIP or RENLAND SHOULD PREPARE THEMSELVES OF THE POSSIBILITY OF HAVING TO LEAVE CAMP EARLIER THAN PLANNED, LATER THAN PLANNED OR TO HAVE THEIR STAY CANCELLED. PLEASE FOLLOW THE DEVELOPMENTS ON THE EGRIP/RENLAND HOME PAGE BEFORE YOU LEAVE FOR GREENLAND.

EGRIP/RENLAND 2015 schedule

		Camp activity headlines.
20/04/2015	Monday	FOM's arrive. Setup radio, comm. Register vehicles.
26/04/2015	Sunday	Mission 1. NEEM put-in. Camp opening.
		Mission 2. MST transfer no 1.
27/04/2015	Monday	Mission 3. MST transfer no 2. First possible Renland Radar deployment.
28/04/2015	Tuesday	Mission 3. MST transfer no 2. Placeholder. Two Renland crew to CNP for excavation of cargo. GrIT plane flies to Thule.
29/04/2015	Wednesday	Mission 4. NEEM transfer of GrIT PAX and spareparts from Thule.
		Mission 1a. PB first flight, 2 x GLISN PAX
30/04/2015	Thursday	Mission 1b. PB second flight. Basler arrives at CNP.
01/05/2015	Friday	Renland/MST/CNP Basler missions begin.
02/05/2015	Saturday	Mission 1 b Placeholder. First possible deployment of Renland Camp crew. First possible return of Renland Radar crew.
05/05/2015	Tuesday	Twin Otter pick up of GLISN and mechanic
06/05/2015	Wednesday	
10/05/2015	Sunday	Renland/MST/CNP Basler missions end.
12/05/2015	Tuesday	Traverse begins (25 liter/km). Total cargo 140 ton
24/05/2015	Sunday	traverse ends. Koni Steffen and crew with T.O.
25/05/2015	Monday	
26/05/2015	Tuesday	Koni Steffen out.
27/05/2015	Wednesday	GrIT Tractor leaves for Summit.Renland/MST/CNP Basler missions begin.
29/05/2015	Friday	Koni Steffen at EGRIP - again!
31/05/2015	Sunday	Mission 6. CANCELLED (Resupply and personnel exchange (Mesters Vig) has to be CNP) See mission 6 below.
01/06/2015	Monday	Mission 5a. 109th PLACEHOLDER! Optional EGRIP flight. Waleeds T.o. Renland/MST/CNP Basler missions end.
03/06/2015	Wednesday	GrIT Tractor arrives at Summit.
07/06/2015	Sunday	Mission 5. Planned EGRIP pull out.
24/06/2015	Wednesday	Renland/MST/CNP Basler missions begin.
26/06/2015	Friday	Mission 7 . 1 st retro Mestersvig
27/06/2015	Saturday	Mission 8. 2 nd and final retro Mestersvig.
28/06/2015	Sunday	optional MST pull-out PLACEHOLDER from May 31..
30/06/2015	Tuesday	optional EGRIP pull-out PLACEHOLDER. Renland/MST/CNP Basler missions end.
03/07/2015	Friday	FOMs leave Kangerlussuaq
04/07/2015	Saturday	
05/07/2015	Sunday	

EGRIP/RECAP Manning 2015

EGRIP

Sorted by arrival dates	Name	Country	To SFJ	To NEEM	From EGRIP	From SFJ
FOM	Larsen, Lars Berg	DK	20-Apr			26-Apr
FOM	Steffensen, Jørgen Peder	DK	20-Apr			26-Apr
FOM	Hansen, Steffen Bo	DK	28-May			31-May
FOM	Hvidberg, Christine	DK	28-May			09-Jun
FOM	Steffensen, Jørgen Peder	DK	07-Jun			12-Jun
FOM	Steffensen, Jørgen Peder	DK	23-Jun			03-Jul
FIELD LEADER	Steffensen, Jørgen Peder	DK		26-Apr	07-Jun	
MECHANIC	Hilmarsson, Sverrir Æ.	IS	20-Apr	26-Apr	07-Jun	09-Jun
MECHANIC	N.N. Pistenbully mechanic	D	28-Apr	30-Apr	05-May	09-May
COOK	Dahl-Jensen, Dorthe	DK	25-Apr	26-Apr	07-Jun	09-Jun
ASSISTANT/MEDIC	Brejnebøl, Matthias	DK	25-Apr	26-Apr	07-Jun	09-Jun
FIELD ASSISTANT	Kipfstuhl, Sepp	D	25-Apr	26-Apr	07-Jun	09-Jun
FIELD ASSISTANT	Pedro, Joel	DK/AUS	27-Apr	29-Apr	07-Jun	09-Jun
MECHANIC/DRIVER	Smith, Pat	US	24-Apr	29-Apr	27-May	10-Jun
SURFACE	Karlsson, Nanna	DK	27-Apr	29-Apr	07-Jun	09-Jun
SURFACE	Kjær, Helle Astrid	DK	25-Apr	29-Apr	27-May	09-Jun
SURFACE	Vallelonga, Paul	DK	25-Apr	29-Apr	27-May	09-Jun
SURFACE	Winter, Anna	D	27-Apr	29-Apr	27-May	09-Jun
GLISN	Childs, Dean	US	24-Apr	29-Apr	05-May	21-May
GLISN	Leone, Orlando	US	24-Apr	29-Apr	05-May	21-May
	EGRIP-Summit traverse arrives Summit 03-jun					

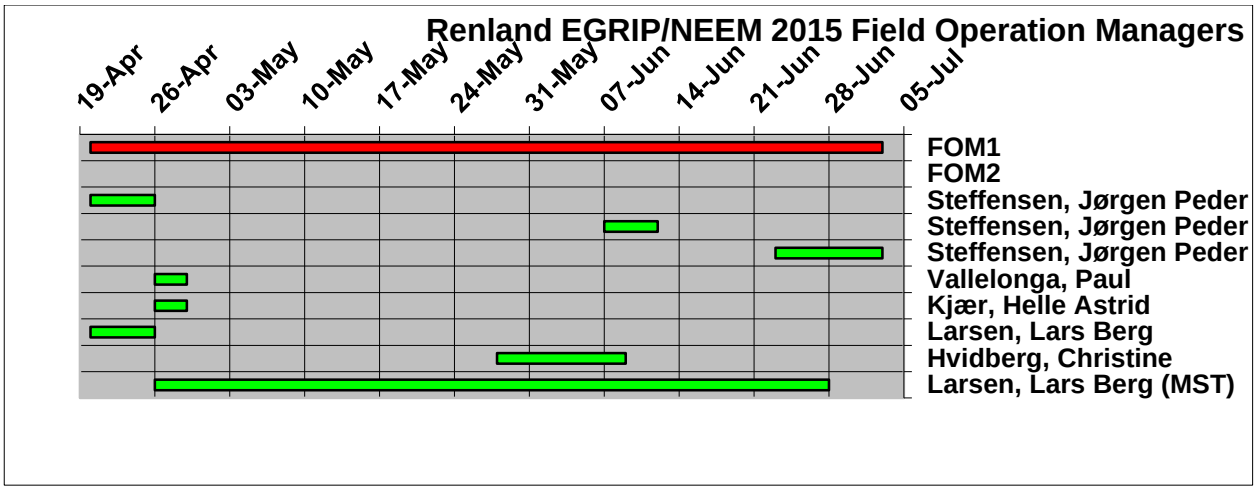
RECAP

	Name	Country	To SFJ	To Iceland	To CNP	To MST	To Renland	From Renland	From CNP	From MST	From Iceland	From SFJ
FOM MST and CNP	Larsen, Lars Berg	DK	20-Apr			26-Apr				28-Jun		01-Jul
FIELD LEADER	Rasmussen, Sune O.	DK	24-Apr			26-Apr	28-Apr	31-May	03-Jun		04-Jun	05-Jun
FIELD LEADER	Svensson, Anders M.	DK		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
DRILL MECH	Wistisen, Dennis Westphal	DK	24-Apr			26-Apr	04-May	31-May	03-Jun			04-Jun
DRILL MECH	Hansen, Steffen Bo	DK		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
COOK	Harvey, Sarah	US	24-Apr			26-Apr	04-May	24-Jun		26-Jun		01-Jul
DOCTOR	Elliot, Lizzie	AUS		28-Apr	29-Apr		04-May	24-Jun		26-Jun		27-Jun
ELECTRICIAN	Sheldon, Simon	DK		28-Apr	29-Apr		04-May	31-May	03-Jun		04-Jun	
ELECTRICIAN	Schwander, Jacob	CH		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
DRILLER	Vaughn, Bruce	US	24-Apr			26-Apr	04-May	31-May	03-Jun			04-Jun
DRILLER	Popp, Trevor	DK	20-Apr			26-Apr	28-Apr	24-Jun		28-Jun		01-Jul
DRILLER	Tell, Jan	D		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
PROCESSING	Freitag, Johannes	D		28-Apr	29-Apr		04-May	31-May	03-Jun		04-Jun	05-Jun
PROCESSING	Maffezzoli, Niccolo	DK		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
PROCESSING	Vinther, Bo M.	DK	24-Apr			26-Apr	07-May	24-Jun		28-Jun		01-Jul
Italian test	Spolaor, Andrea	I		26-May	27-May		31-May	24-Jun		26-Jun		27-Jun
PROCESSING	White, James	US		26-May	27-May		31-May	24-Jun		26-Jun		01-Jul
FIRN AIR	Doyle, Emily	US	24-Apr			26-Apr	04-May	31-May	03-Jun			06-Jun
FIRN AIR	Sowers, Todd	US	24-Apr			26-Apr	04-May	31-May	03-Jun		04-Jun	
RADAR	Koldtoft, Iben	DK	24-Apr			26-Apr	28-Apr	03-May	04-May		05-May	
RADAR	Panton, Christian	DK	24-Apr			26-Apr	28-Apr	03-May	04-May		05-May	
DK-media	Sorento, Keneth	DK		26-May	27-May		28-May	31-May	03-Jun		04-Jun	
BASLER CREW	Ken Borek pilot	CAN				01-May				10-May		
BASLER CREW	Ken Borek pilot	CAN				01-May				10-May		
BASLER CREW	Ken Borek mechanic	CAN				01-May				10-May		
BASLER CREW	Ken Borek pilot	CAN			27-May				01-Jun			
BASLER CREW	Ken Borek pilot	CAN			27-May				01-Jun			
BASLER CREW	Ken Borek mechanic	CAN			27-May				01-Jun			
BASLER CREW	Ken Borek pilot	CAN				24-Jun				01-Jul		
BASLER CREW	Ken Borek pilot	CAN				24-Jun				01-Jul		
BASLER CREW	Ken Borek mechanic	CAN				24-Jun				01-Jul		

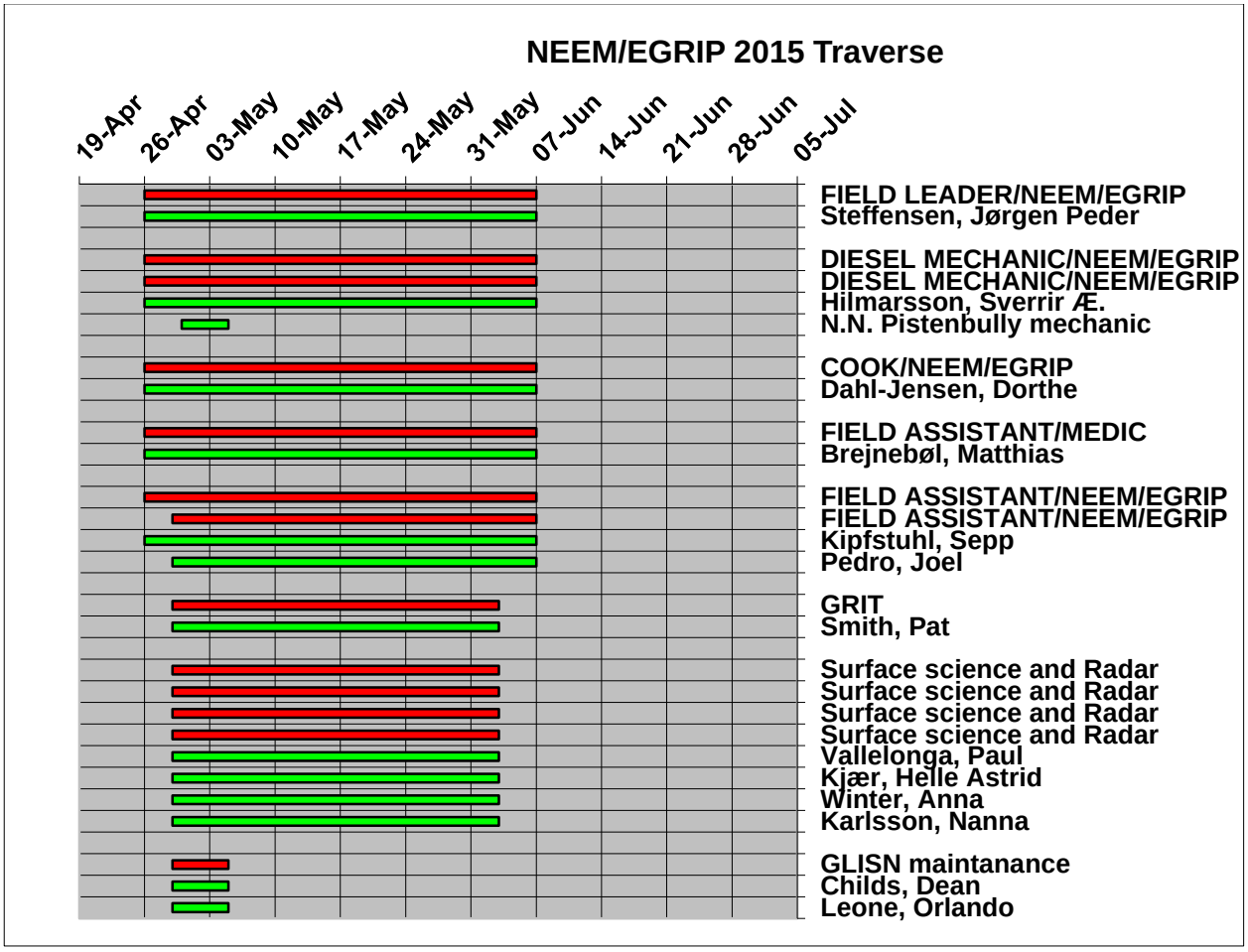
NOTE: Due to the cancellation of the mid-season C-130 on May 31. All personnel exchange in and out of CNP will be done by commercial flight or by the Basler via Iceland. All dates to and from Renland and CNP/MST are not fixed. The Basler flights to and from the ice cap are organized on a day to day basis.

EGRIP and RECAP GANNT sheets.

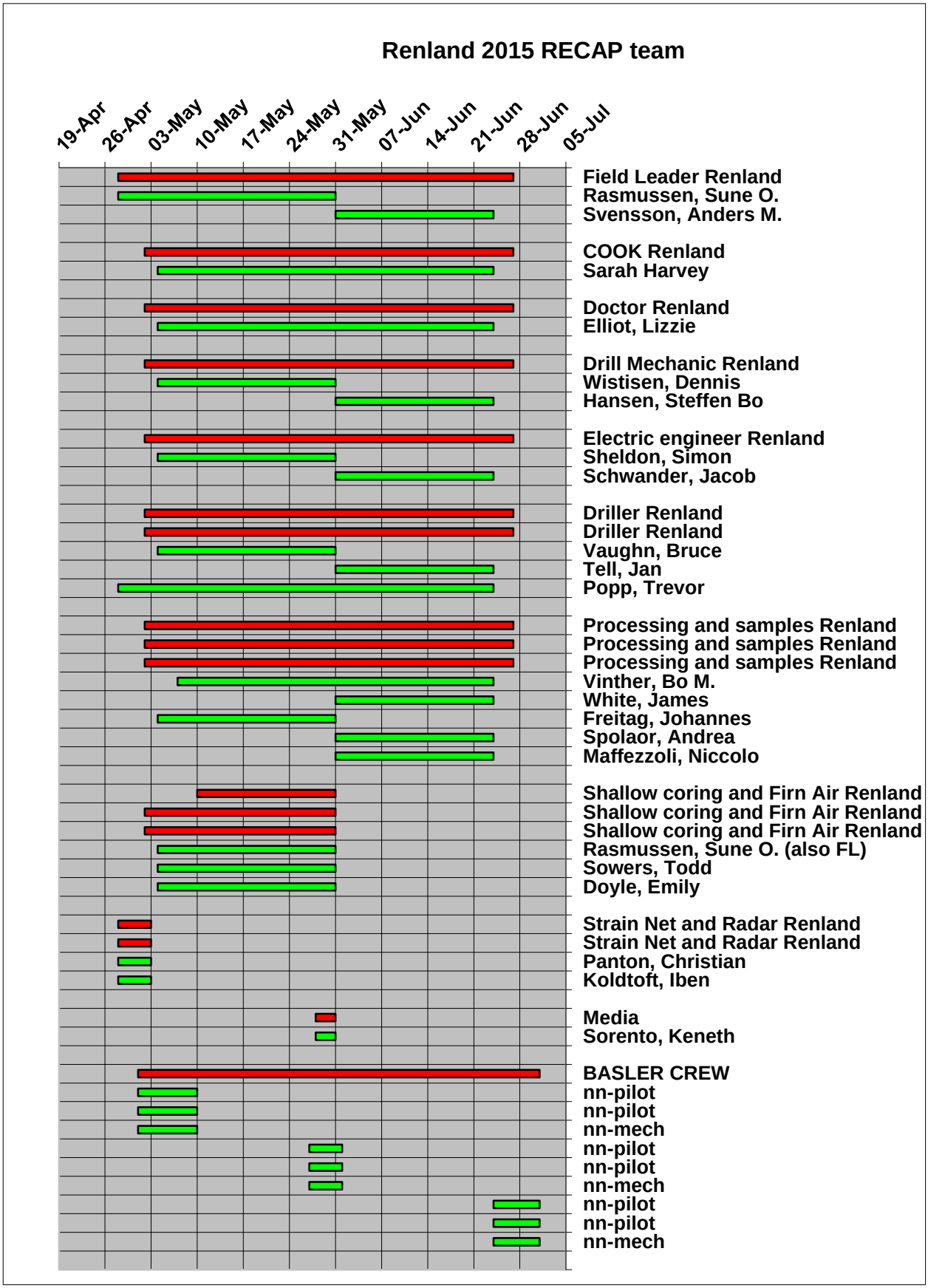
FOM's:



NEEM EGRIP traverse crew:

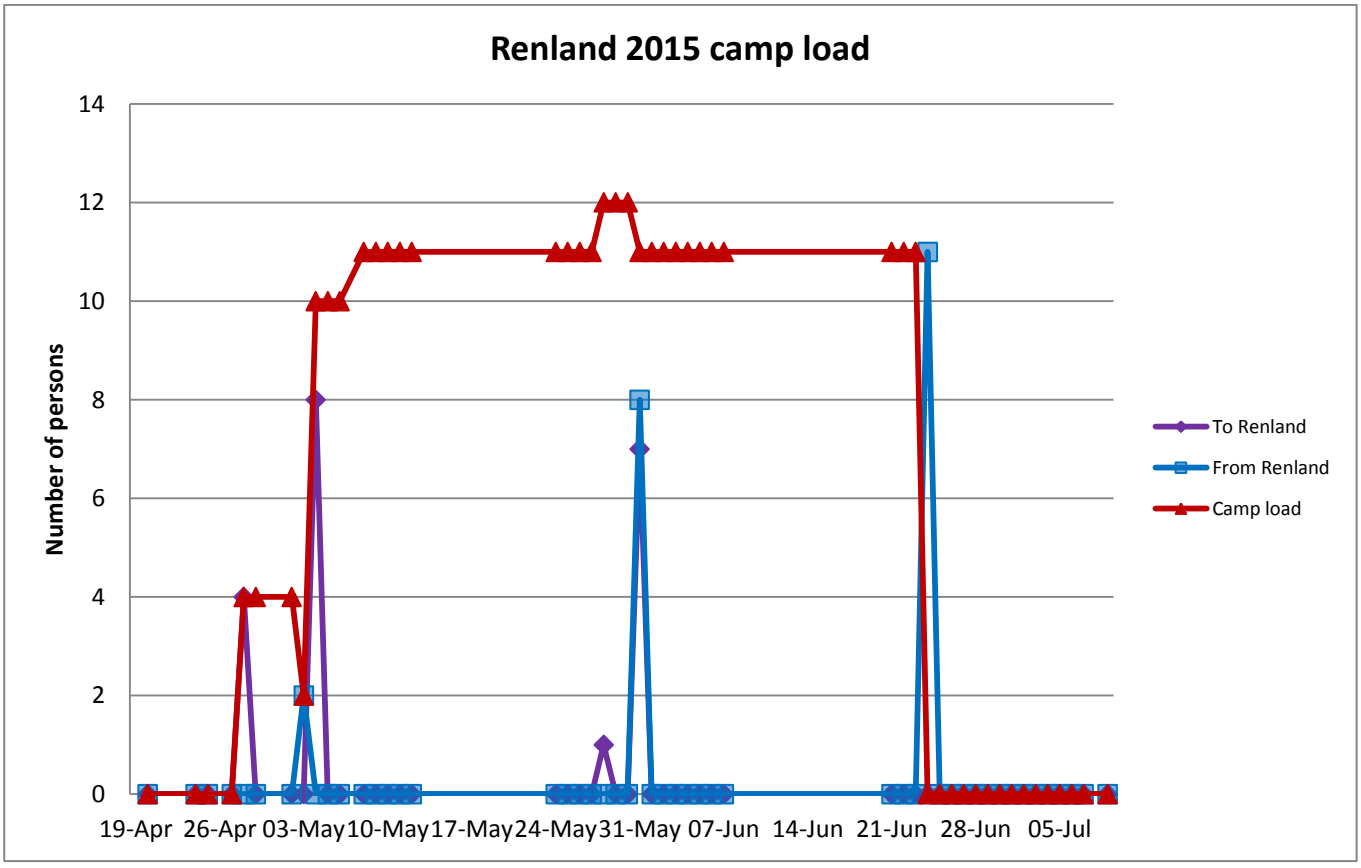


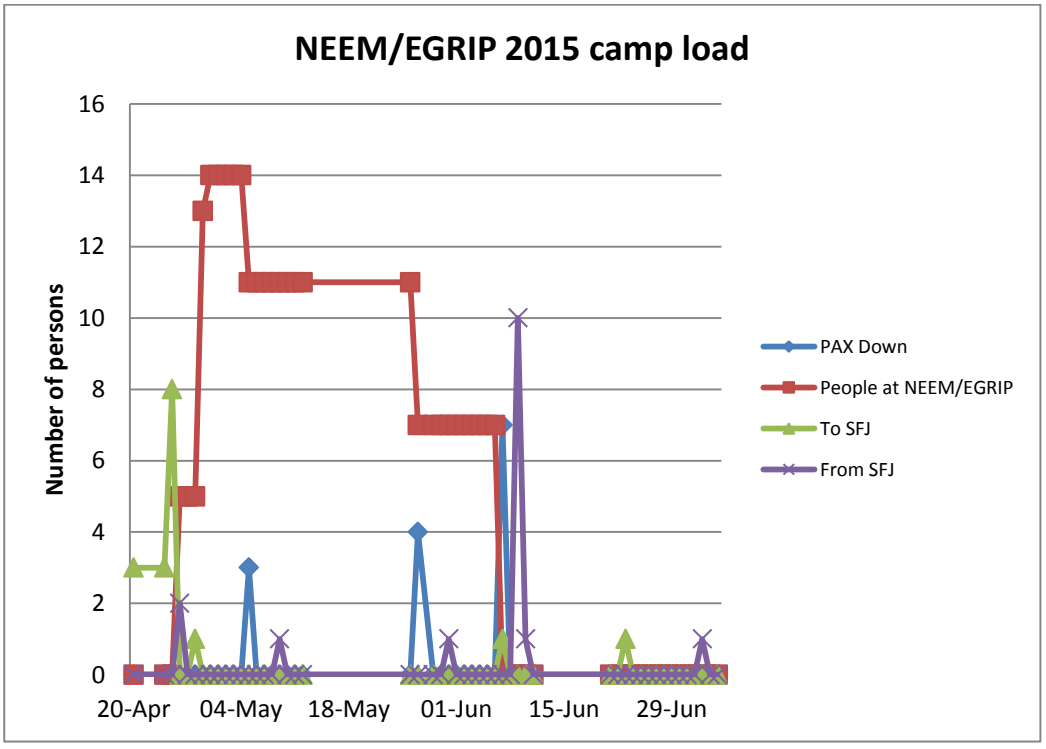
RECAP crew:


Renland 2015 RECAP team
19-Apr
26-Apr
03-May
10-May
17-May
24-May
31-May
07-Jun
14-Jun
21-Jun
28-Jun
05-Jul
Field Leader Renland
Rasmussen, Sune O.
Svensson, Anders M.
COOK Renland
Sarah Harvey
Doctor Renland
Elliot, Lizzie
Drill Mechanic Renland
Wistisen, Dennis
Hansen, Steffen Bo
Electric engineer Renland
Sheldon, Simon
Schwander, Jacob
Driller Renland
Driller Renland
Vaughn, Bruce
Tell, Jan
Popp, Trevor
Processing and samples Renland
Processing and samples Renland
Processing and samples Renland
Vinther, Bo M.
White, James
Freitag, Johannes
Spolaor, Andrea
Maffezzoli, Niccolo
Shallow coring and Firn Air Renland
Shallow coring and Firn Air Renland
Shallow coring and Firn Air Renland
Rasmussen, Sune O. (also FL)
Sowers, Todd
Doyle, Emily
Strain Net and Radar Renland
Strain Net and Radar Renland
Panton, Christian
Koldtoft, Iben
Media
Sorento, Keneth
BASLER CREW
nn-pilot
nn-pilot
nn-mech
nn-pilot
nn-pilot
nn-mech
nn-pilot
nn-pilot
nn-mech

Camp population

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





EGRIP/RECAP 2015 – Address and useful numbers

Official address: EGRIP 2015 or RECAP 2015 c/o EGRIP 2015
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

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

Iridium OpenPort telephones (NEEM/EGRIP)

+8816 777 15686 SIM card not activated yet

Only one of these numbers will be available at any given time. 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
+ 8816 234 93272	+ 8816 929 49576	NEEM-EGRIP 1 (FL)	Traverse
+ 8816 234 93253	+ 8816 929 48507	NEEM/EGRIP 2	Traverse
+ 8816 234 93166	+ 8816 929 11610	NEEM/EGRIP 3	Traverse
+ 8816 234 91171	+ 8816 929 48550	NEEM/EGRIP 4	Traverse
+ 8816 234 95066	+ 8816 929 49618	RECAP 1 (FL)	Renland Camp
+ 8816 234 94868	+ 8816 929 10405	RECAP 2	Renland Camp
+ 8816 234 91327	+ 8816 929 49331	RECAP 3	Renland Camp

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 during

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. By February 2009 the Inmarsat satellites have been relocated, the system is not so reliable, but we have a BGAN system in camp as back up.

VSAT system (Renland only):

Direct inward dialing (DID): US DID: +1 (929) 237-1743
DK DID: +45 3271 3214

Cost is the same as calling a Danish mobile (in Europe) or a U.S. mobile in North America.
Please observe: Calling to/from other systems, such as Iridium or other sat systems, is very costly: A VSAT call from Renland to Iridum handheld in Constable Pynt is easily 12 USD/min. A call from VSAT Renland to a Kangerlussuaq, Greenlandic cell, is typically 1USD/min.

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 : fl@egrip.camp
For Field leader at Renland: flr@egrip.camp

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 and RECAP 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/NEEM 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.

Internet Connection

At Renland, we have leased a satellite communication system, VSAT, which is connected to a TELSTAR satellite. This system will be tested at Renland, and if successful, it will be employed by EGRIP in the coming years.

Please Note

Using the internet is paid for per MBit. If unlimited, unnecessary uploads & downloads of software updates, large email attachments, images, movies, etc. by EGRIP/RECAP participants will very quickly cost the EGRIP/RECAP 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

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/RECAP 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 (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 and Renland camps to the Field Operations Manager office in Kangerlussuaq that will take care of the home page. The Field Operations Manager (fom@egrip.camp) will coordinate this activity.

Personnel Transport 2015

The field participants will deploy to Kangerlussuaq, Greenland via either Scotia AB (from the U.S.) or Copenhagen. The transport to and from NEEM/EGRIP camp will be direct from/to Kangerlussuaq with a U.S. air force LC130. RECAP participants will be transported to either Constable Pynt or Mestersvig by LC130 and then onto Renland ice cap by AWI Basler.

During the stay in **Kangerlussuaq**, people will be billeted in Kangerlussuaq International Science Support (KISS). At Constable Pynt people are billeted in the guest house at the airport, and at Mestersvig in a building with bunk beds. At KISS, all participants will be provided with bed linen but are responsible for cleaning their room.

Unless otherwise arranged, each nation takes care of tickets to/from Greenland for their participants. If troubles arise 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.

Note, unless arranged otherwise, each nation must take care of tickets and insurances of their own people. EGRIP and RECAP have a general financial guarantee for extraordinary Search and Rescue operations.

People directly employed by EGRIP or RECAP receive a per diem to cover the cost of living according to Danish rules. In SFJ, the per diem, which can be charged to the project, is approx.. 430 DK Kr per day. On the ice, the per diem is approx.. 150 DK Kr per day. The actual per diem paid to the participants should to follow the rules in each country, and the physical payment will be taken care of by each nation unless arranged otherwise.

Personal field equipment

All participants, except for those who have special arrangements with EGRIP/RECAP 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 LLB grey polar socks
1 LLB parka
1 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 Balaklava cap
1 Ear gear, fleece or rubber.
1 Face mask, *optional, only for those involved in snowmobile traverses.*
1 Personal medicin (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. 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.

NOTE: Please read carefully the next two sections

Booze and Drugs (rules updated Nov 2014)

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.

Dangerous goods (HAZMAT) Lithium batteries.

While certification of dangerous goods and the packing thereof rests with qualified personnel, Lars Berg Larsen and J.P.Steffensen 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 NEEM/EGRIP or Mestersvig/Constable Pynt, 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.

“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.

Welcome to the EGRIP/NEEM and Renland Camps

NEEM camp in July 2014 with GLISN station (top) (photo: GLISN team).

Flade Isblink camp, May 2006. RECAP will be of similar size.

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) and Iridium phone or VHF radio. The Field Leader will hand out PLB, phone and radio.

- The eating hours are (please be in time, to make is easy for the cook).
    - Breakfast is individual (normally between 7:00 and 8:00),
    - Lunch is at 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 make sure that:
        - 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 at 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.
- 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 (in case of EGRIP) or from the kitchen tent (in case of Renland).**

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.

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. (Optional for EGRIP: 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/NEEM and Renland 2015 Field Season

During the field season J.P. Steffensen will be Field Leader at EGRIP/NEEM and Sune O.Rasmussen and Anders Svensson will be field leaders at Renland, having formal command & responsibility of operations.

Accidents and Illness

There will be a doctor at Renland camp and a medic on EGRIP this field season. Also, the doctor/medic 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 either Kangerlussuaq, East

Greenland, Thule, Summit, Station Nord, etc. to transport the patient(s) to a suitable emergency site/hospital.

Good communication (Iridium handheld, Iridium OpenPort, BGAN, 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.

Power Supply

Within all operations during 2015, 230 Volts, 50Hz will be the standard supply. The camps 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.

Some U.S. teams will be using 115V, and at Renland we have arranged to borrow U.S. type generators for this equipment.

NEEM/EGRIP:

Diesel

1 – Iveco	125KVA	3 x 230V (400V/50Hz)	Main generator.
1 – Mase	16KVA	3 x 230V (400V/50Hz)	2nd backup
1 – SDMO	15KVA	3 x 230V (400V/50Hz)	1st 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	

Renland:

Diesel

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

MoGas

1 – Honda	4KVA	1 x 230V / 50Hz	
1 – Honda 1000	1KVA	1 x 110V / 60Hz	(on loan from CPS)

Please help to conserve fuel by conserving power.

Handling of Waste and environmentally hazardous chemicals

NEEM/EGRIP has been imposed with strict environmental conditions on NEEM/EGRIP camp operations by the Greenland government. As NEEM/EGRIP camp is located in a pristine area of the Greenland ice sheet, 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.

The environmental conditions are very similar to the general environmental conditions imposed on expeditions in the National Park and Open Territory.

In both NEEM/EGRIP and Renland camps 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 or Constable Pynt 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 NEEM/EGRIP in the kitchen and on the first floor of the main dome and on Renland in the kitchen tent.
Only one of the three main fuel tanks (or fuel drum) will be in camp at any time. The other two (or other drums) will be at the apron on in the cargo line.

An emergency response plan for spills and fire has been made for EGRIP/NEEM 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.

Quartering and buildings

NEEM camp June 2010.

NEEM/EGRIP:

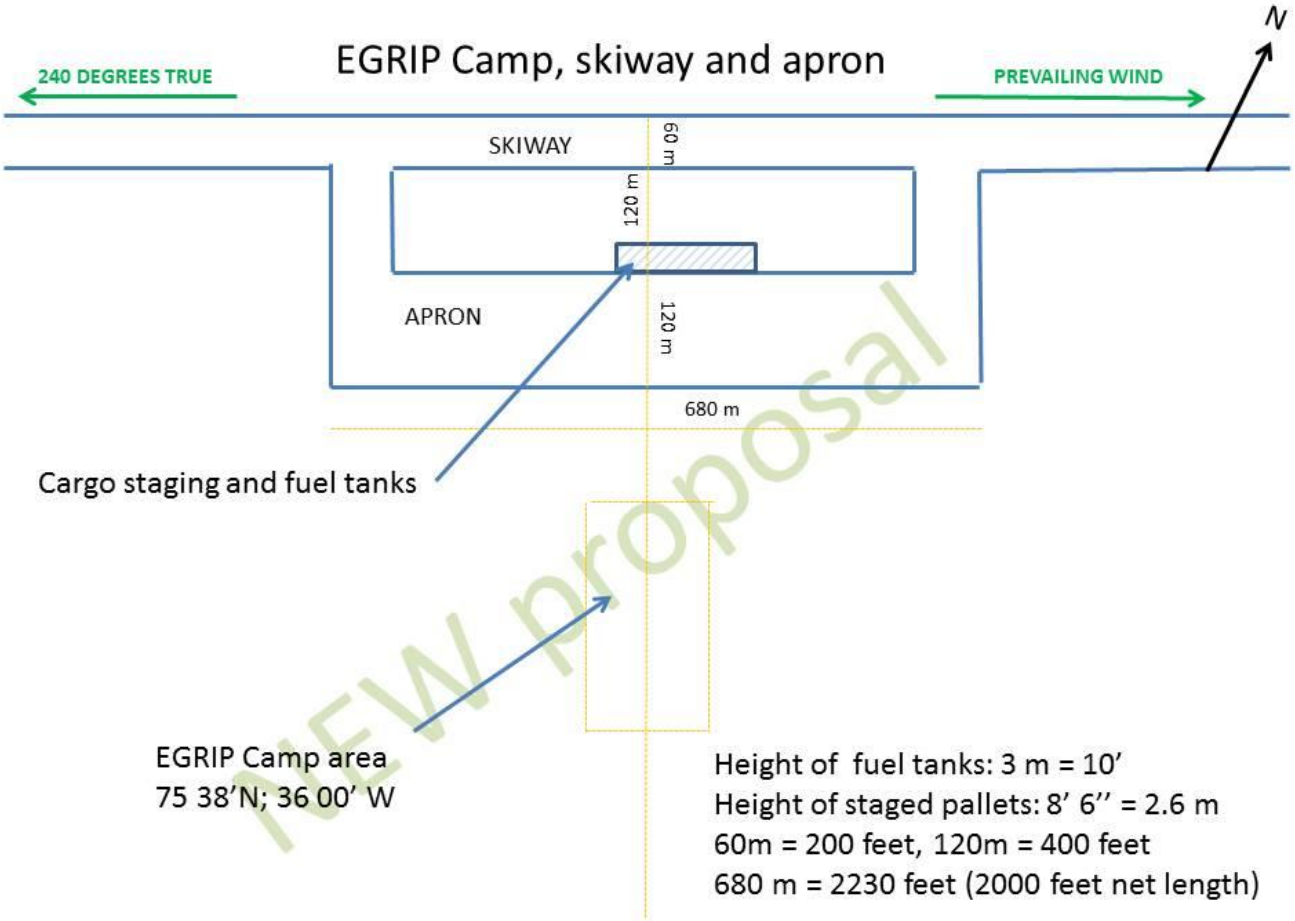
	PAX normal	Max.PAX	
Kitchen/office	9	12	40’ wooden dome
Big tomato	1	2	Fiberglass hut
Small tomato	1	1	Fiberglass hut
Flexmobil	0	1	Cabin
Flexmobil	0	1	Cabin
New Pistenbully	0	1	Cabin
Garage			26’ x 40’ Weatherport
Workshop			26’ x 40’ Weatherport
Quarter(Stowed)	(2)	(4)	10’ x 15’ Weatherport
Quarter(Stowed)	(2)	(4)	10’ x 15’ Weatherport
Total	11(15)	18(26)	

RENLAND:

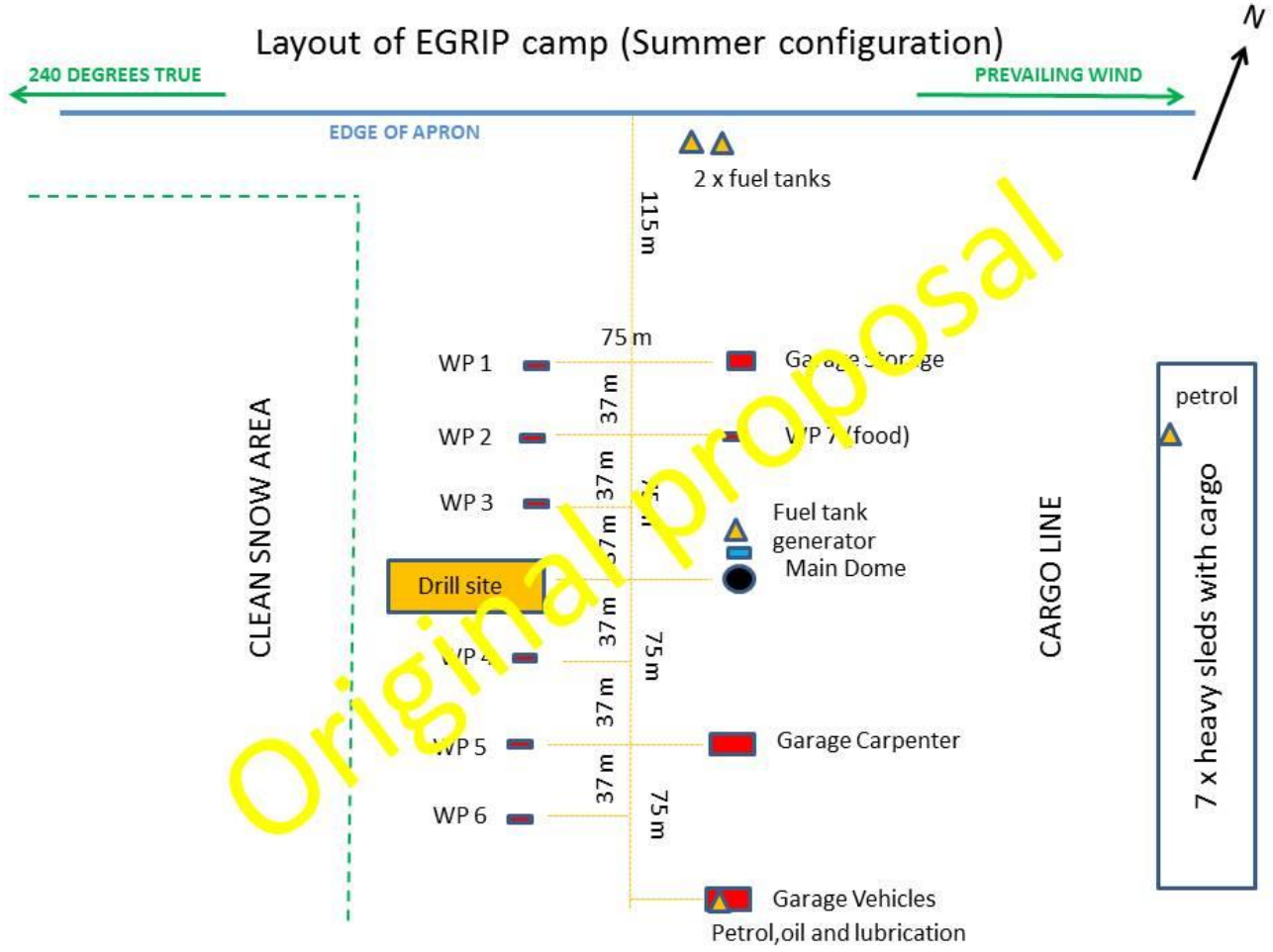
Kitchen/office	0	2	12’ x 30’ Weatherport
Quarter	12	24	12 North Face tents
Drill tent			24’ x 28’ Weatherport
Total	12	26	

Maps of the EGRIP camp area and RECAP camp layout

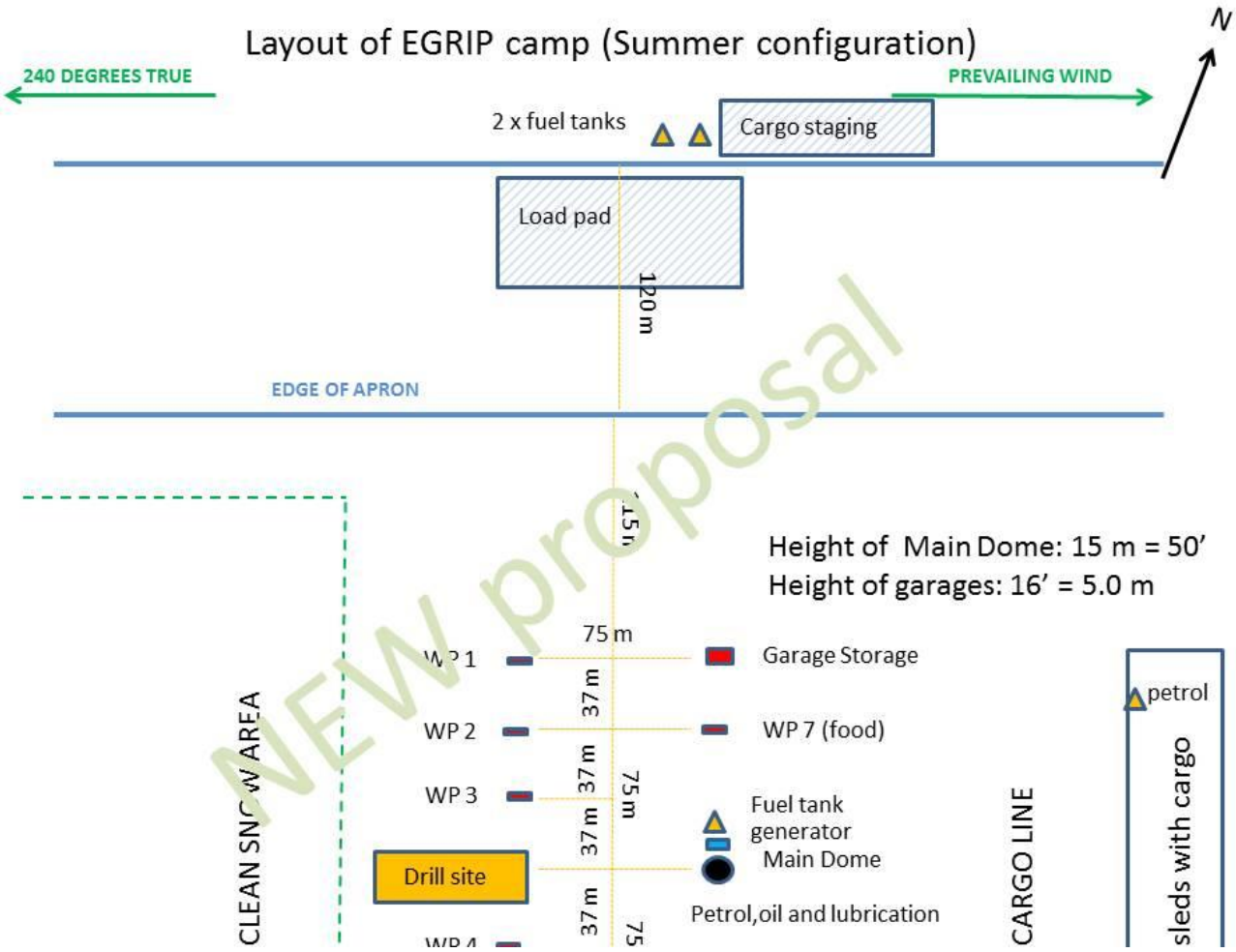
On the following three pages are maps of the EGRIP camp and Science areas in different scales.



Camp, skiway and apron layout.

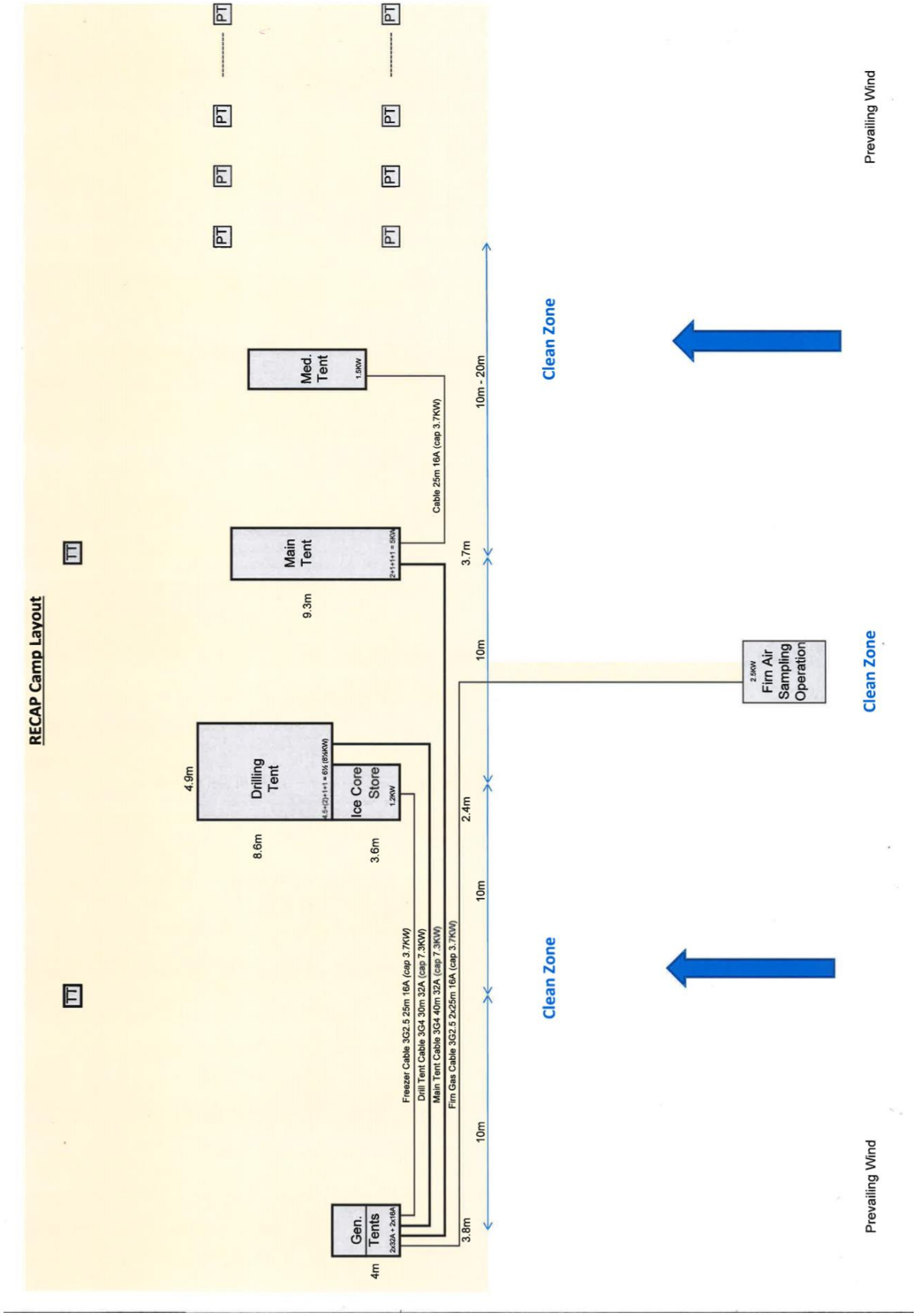


Map of future camp: Garage Carpenter and Garage Vehicles will be built in 2015. The Weatherports (WPs), drill site and Storage garage will be added in 2016. Due to a wish from the 109th to always park into the wind, we had to move the fuel at the apron and the cargo staging to the opposite side of the apron. The change can be seen on the next page.



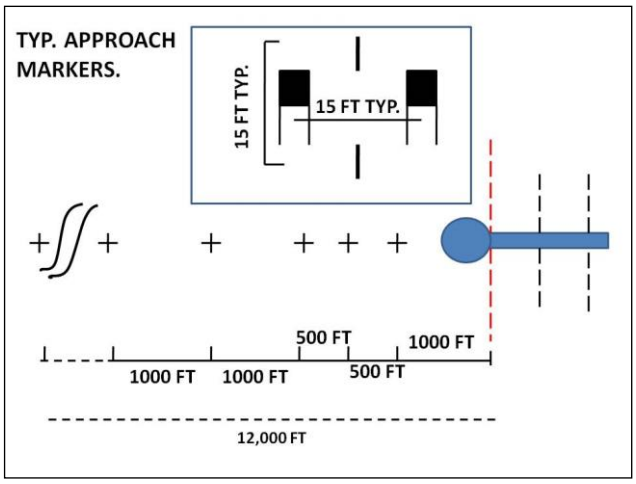
This new proposal was negotiated with the109th to meet with their desire to park the air craft into the wind. Bcause of the location of the fuel point on the starboard side of the plane, the fuel tanks have to be on the skiway side of the apron. The advanteage is that passengers leaving and entering the plane can walk straight to/from camp.

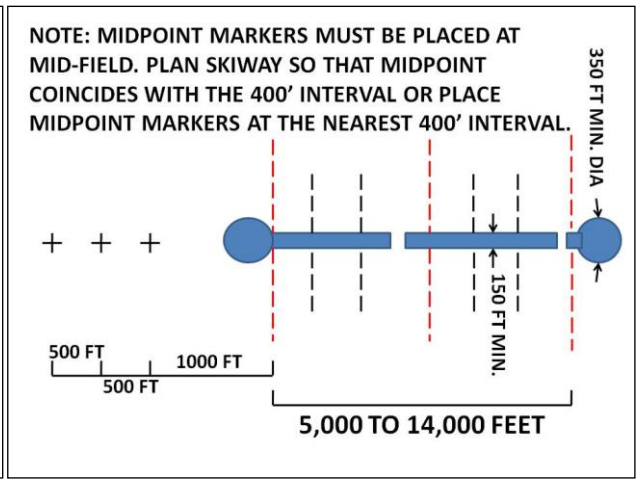
RECAP camp planned layout (by SGS):

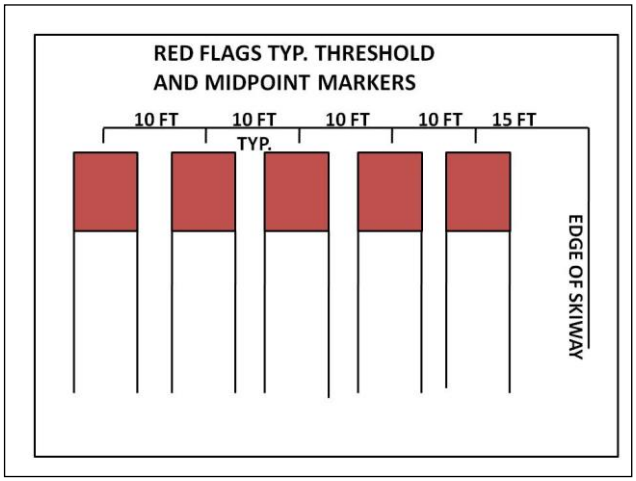


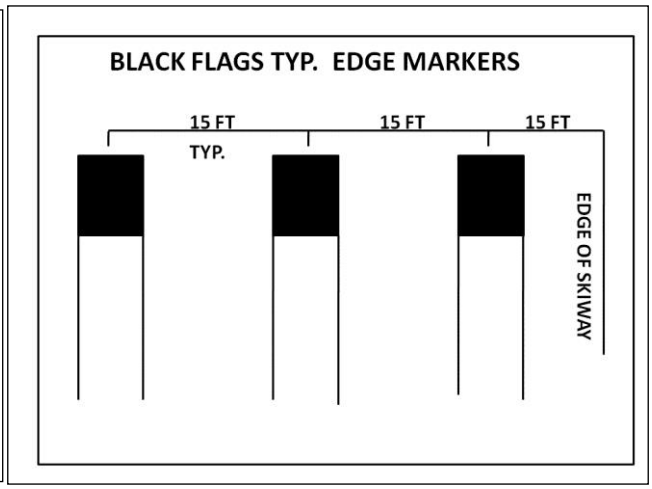
Skiway Marking:

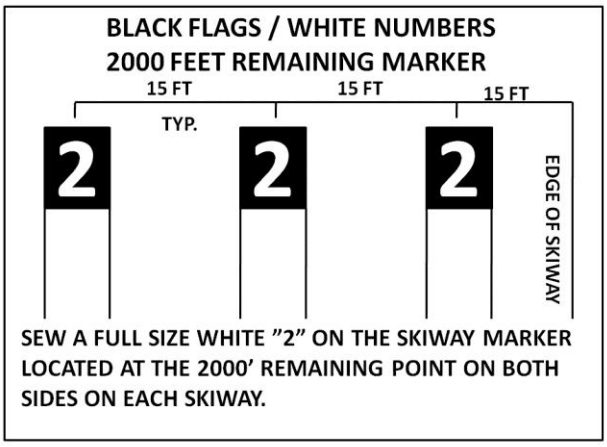
NEEM ski way will be 200’ x 12.000’ (Feet) – (choice of length 5,000’ – 16,000’, width 150’ – 400’)
Skiway design from AFI 13 – 217, 10.MAY 2007







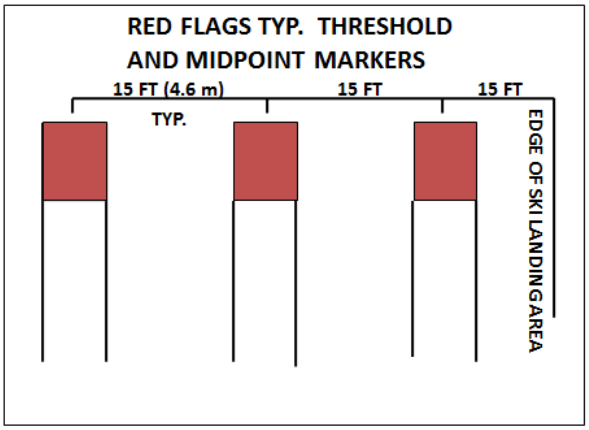


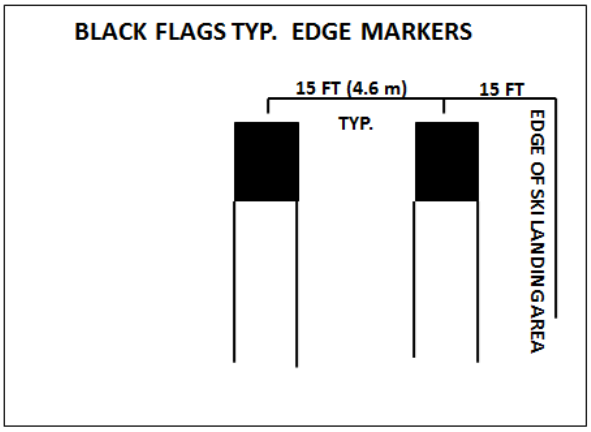


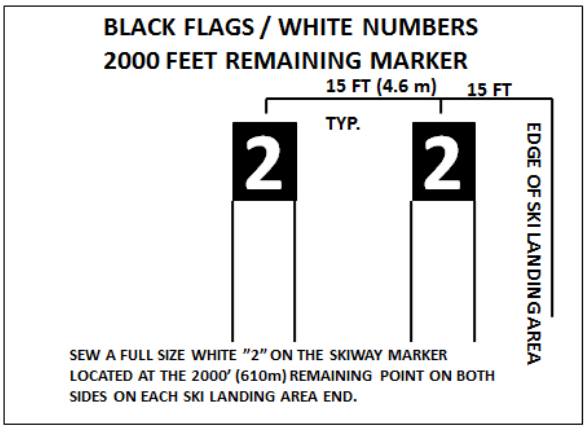
Ski Landing Area Marking:

NEEM ski landing area will be 200' x 12.000' (Feet) – (choice of length 5,000' – 16,000', width 150' – 400').

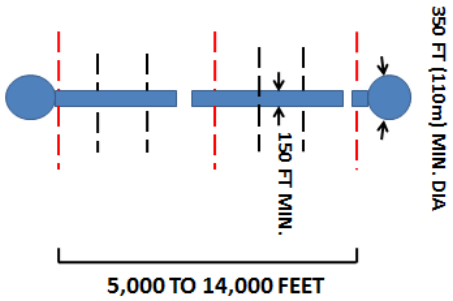
Landing Area design from AFI 13 – 217, 10.MAY 2007







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

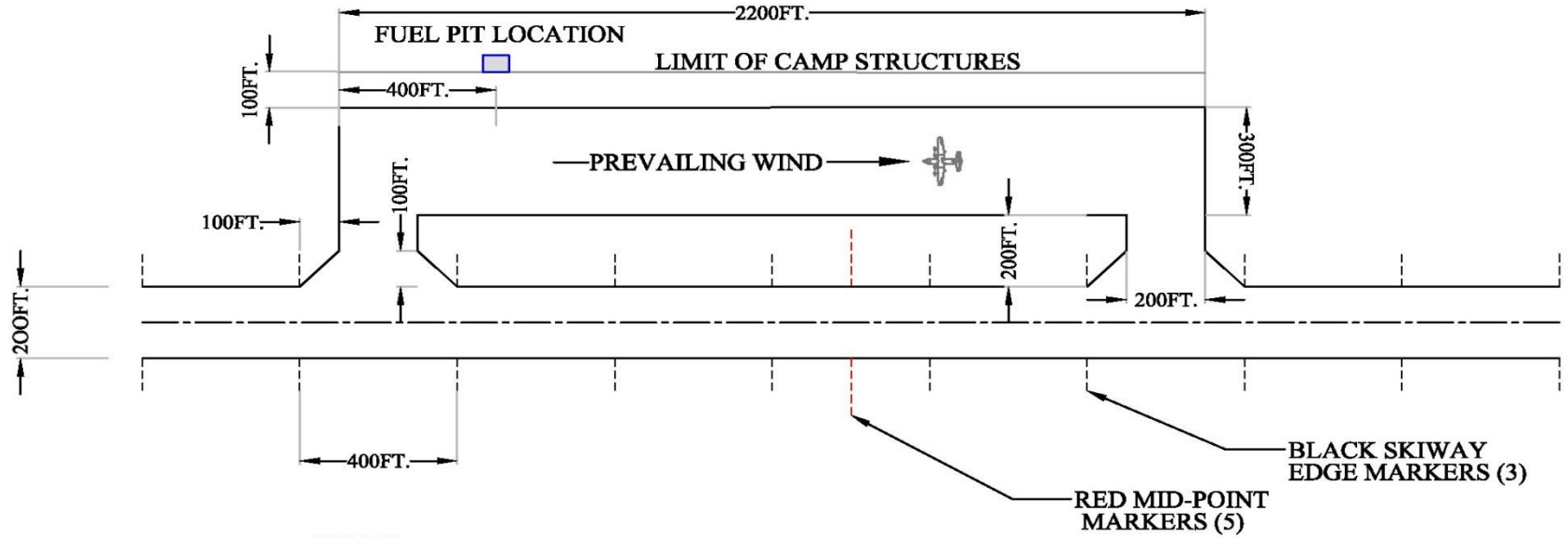


TYPICAL DIMENSIONS FOR MARKER BAMBOO:
2.4 m (94") x 2.5 cm (1 ")DIAMETER

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

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

SKIWAY APRON LAYOUT
(CARGO OFFLOAD / ONLOAD AREA)



NOTES:
1. DIMENSIONS AS NOTED.
2. ACTUAL LOCATION OF SKIWAY APRON IN RELATIONSHIP TO SKIWAY MAY CHANGE DEPENDING ON CAMP LOCATION.
3. MARK APRON CORNERS WITH DOUBLE GREEN FLAGS, APRON LIMITS WITH SINGLE GREEN FLAGS.
4. MARKERS ENLARGED FOR CLARITY.

LC-130 AIRPLANE DESCRIPTION
WINGSPAN...132' 7"
LENGTH...97' 9"
HEIGHT...38' 6"

JCS 2011

Positions of NEEM and EGRIP camps and 2015 traverse route.

NEEM position: 77.45N, 51.06W (decimal degrees), 2484 m a.s.l. (8140 feet)

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

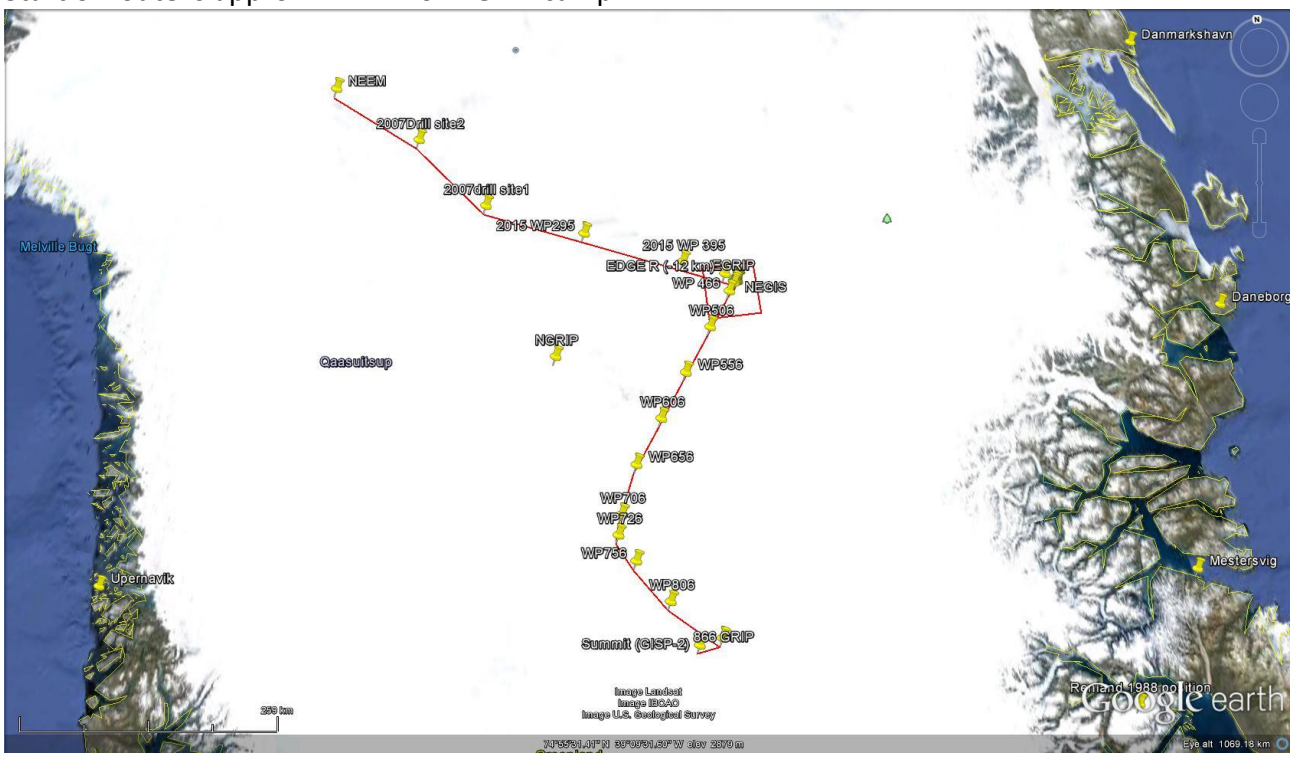


Fig. 5 1 The red line shows the 2015 route from NEEM to EGRIP and on to Summit.

Positions of NEEM skiway (official):

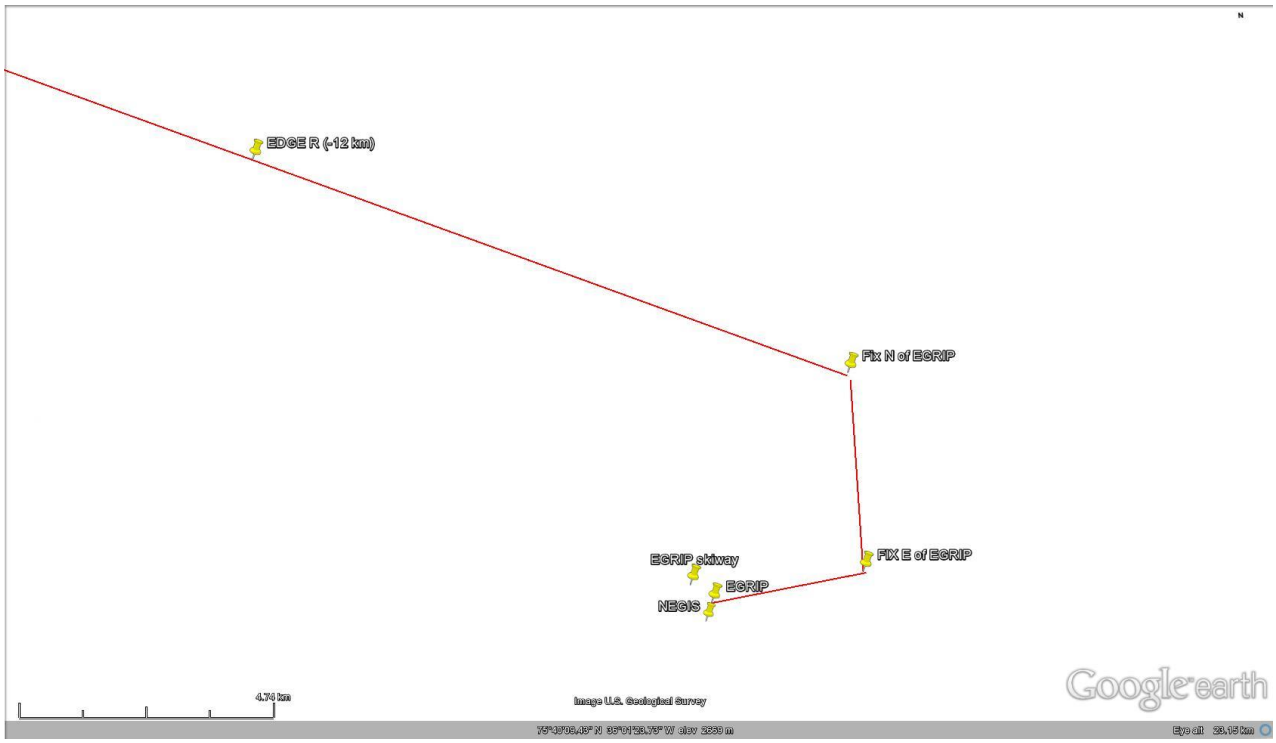
North end: N 77 degrees 27.969 min, W 51 degrees 2.793 min, alt. 2484 m

South end: N 77 degrees 25.941 min, W 51 degrees 2.471 min, alt. 2484 m

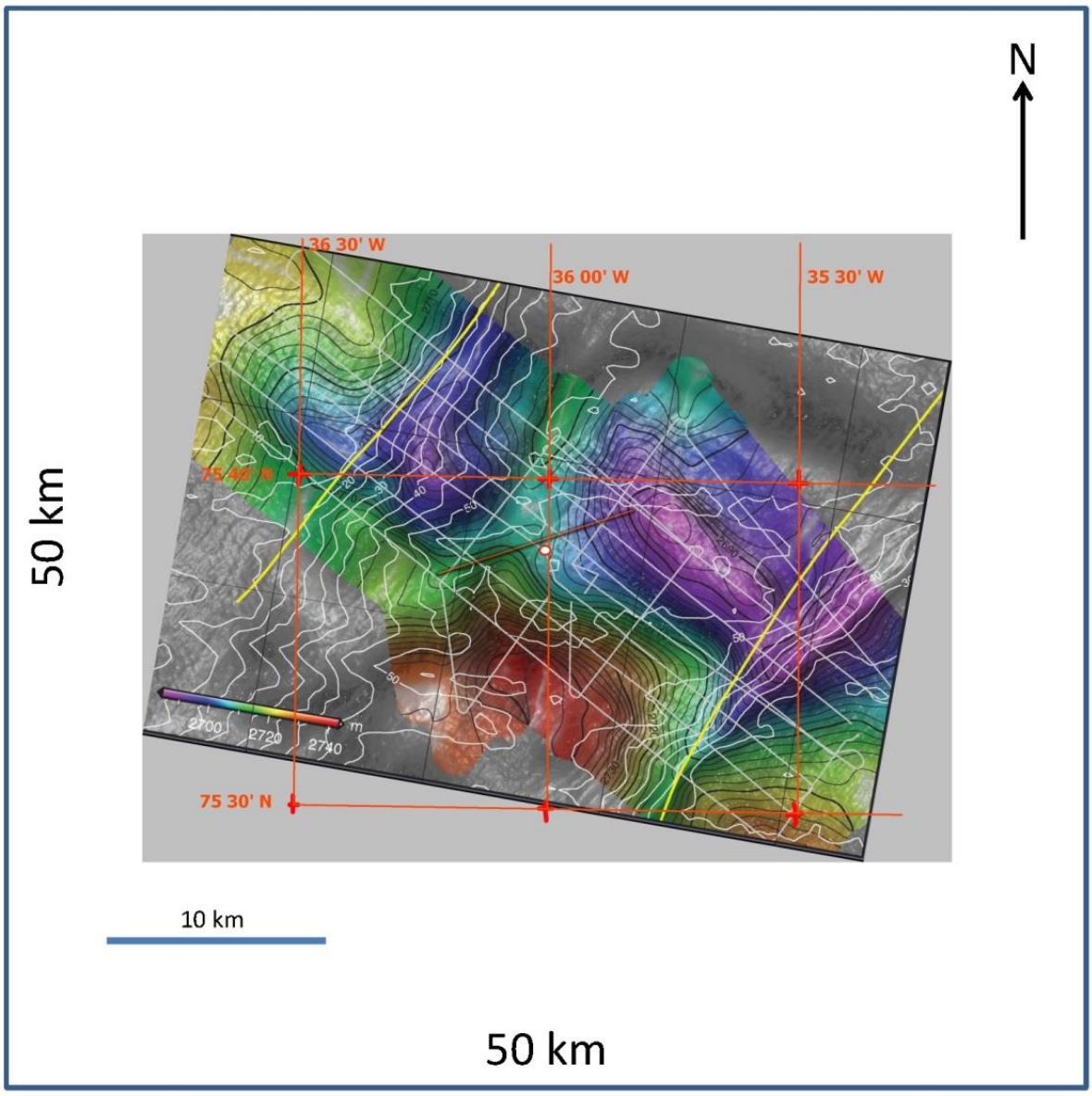
Skiways runs 358 and 178 degrees true.

Official (109th) altitude: 8,158 ft

Close up of traverse route at EGRIP.



A close up on the approach route to EGRIP. EGRIP camp is approx. 800 m NNW of NEGIS 2012 camp.



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.

List of waypoints 2015 traverse

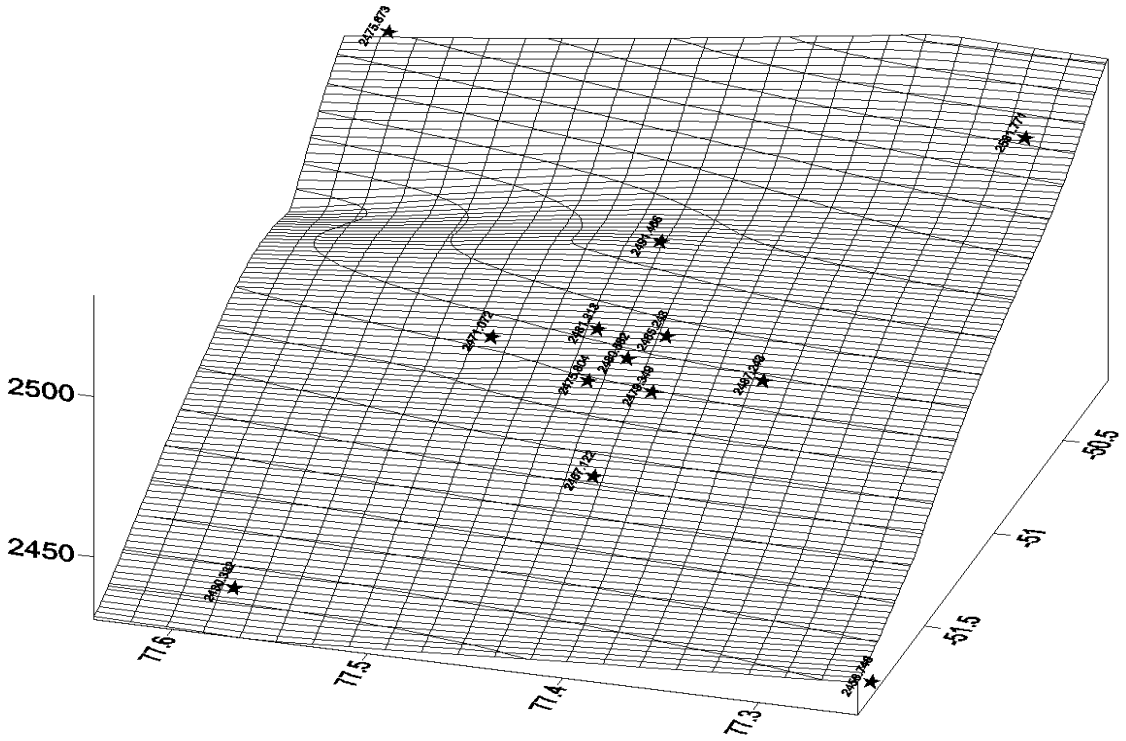
Waypoint	route distance km	lat. dec. Deg	long. dec.deg	altitude m	deg	min	sec	deg	min	sec
1	**NEEM**	**77.45**	**-51.06**	**2484**	**77**	**27**	**0**	**51**	**3**	**36**
2	0 (6.6 km from NEEM)	77.461	-50.817	2453.9	77	27	40	50	49	1
3	10	77.413	-50.468	2472.1	77	24	47	50	28	5
4	20	77.367	-50.114	2490.1	77	22	1	50	6	50
5	30	77.321	-49.759	2508.1	77	19	16	49	45	32
6	40	77.277	-49.405	2525.5	77	16	37	49	24	18
7	50	77.232	-49.051	2542.9	77	13	55	49	3	4
8	60	77.187	-48.699	2560.1	77	11	13	48	41	56
9	70	77.142	-48.349	2577.1	77	8	31	48	20	56
10	80	77.097	-47.999	2594.1	77	5	49	47	59	56
11	90	77.052	-47.651	2611.1	77	3	7	47	39	4
12	**95 (Drilling 2 (265))**	**77.029**	**-47.479**	**2619.5**	**77**	**1**	**44**	**47**	**28**	**44**
13	100	77.006	-47.308	2627.8	77	0	22	47	18	29
14	110	76.96	-46.965	2644.5	76	57	36	46	57	54
15	120	76.913	-46.624	2661.1	76	54	47	46	37	26
16	130	76.867	-46.284	2677.2	76	52	1	46	17	2
17	140	76.821	-45.944	2693.4	76	49	16	45	56	38
18	150	76.772	-45.616	2709	76	46	19	45	36	58
19	160	76.721	-45.291	2724.7	76	43	16	45	17	28
20	170	76.66	-45.004	2740.3	76	39	36	45	0	14
21	180	76.581	-44.834	2754.2	76	34	52	44	50	2
22	190	76.493	-44.765	2766.1	76	29	35	44	45	54
23	**195 (Drilling 1 (165))**	**76.448**	**-44.771**	**2771**	**76**	**26**	**53**	**44**	**46**	**16**
24	295 (100 km)	76.1783	-41.1561	2760 est	76	10	42	41	9	22
25	395 (200 km)	75.8594	-37.6958	2730 est	75	51	34	37	41	45
26	437.5 (Edge)	75.7094	-36.2742	2701	75	42	34	36	16	27
27	449.1 (Fix N)	75.6667	-35.8833	2698	75	40	0	35	53	0
28	452.8 (Fix E)	75.6333	-35.8833	2694	75	38	0	35	53	0
29	**456 (EGRIP)**	**75.629900**	**-35.986700**		**75**	**37**	**48**	**35**	**59**	**12**
30	466	75.554848	-36.206372		75	33	17	36	12	23
31	476	75.479595	-36.423818		75	28	47	36	25	26
32	486	75.404144	-36.639067		75	24	15	36	38	21
33	496	75.341118	-36.816783		75	20	28	36	49	0
34	506	75.265311	-37.028077		75	15	55	37	1	41
35	516	75.189314	-37.237253		75	11	22	37	14	14
36	526	75.113131	-37.444339		75	6	47	37	26	40
37	536	75.036763	-37.649360		75	2	12	37	38	58
38	546	74.972985	-37.818654		74	58	23	37	49	7
39	556	74.896287	-38.019961		74	53	47	38	1	12
40	566	74.819413	-38.219279		74	49	10	38	13	9
41	576	74.742366	-38.416632		74	44	33	38	25	0
42	586	74.678029	-38.579612		74	40	41	38	34	47
43	596	74.600670	-38.773431		74	36	2	38	46	24
44	606	74.523145	-38.965357		74	31	23	38	57	55
45	616	74.445457	-39.155415		74	26	44	39	9	19
46	626	74.367607	-39.343628		74	22	3	39	20	37
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**

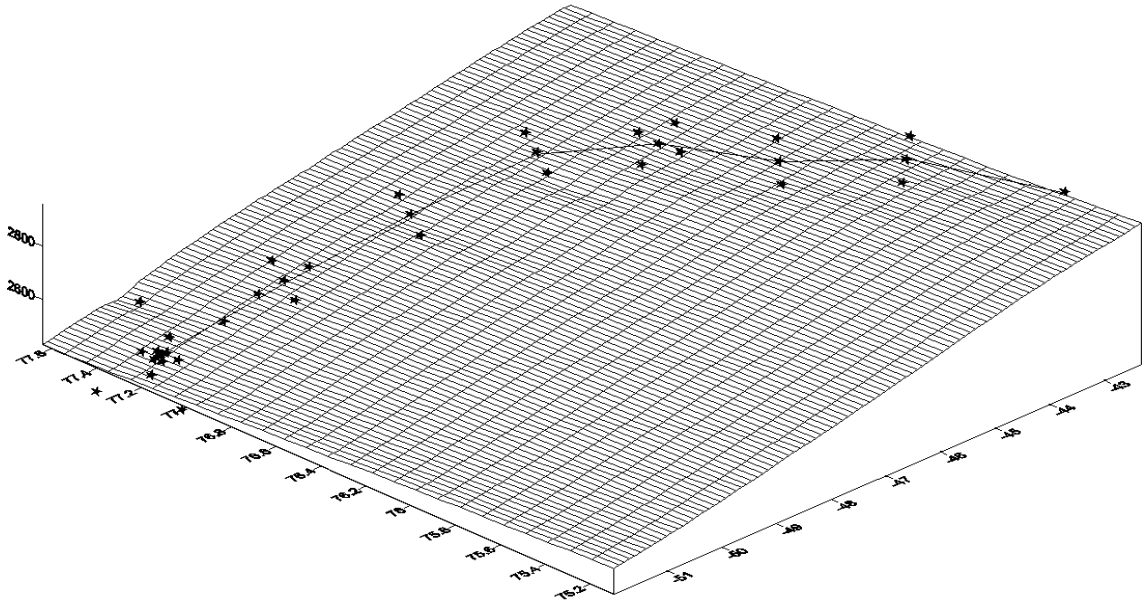
Traverse route NEEM -> NGRIP until “drilling 1” and then on to EGRIP. From EGRIP up along the flow line of NEGIS to main NS ice ridge and then S to GRIP/Summit.

Strain net around NEEM site.

Name	Latitude	Longitude		Antenna height
WPN-299	77,5509236	-51,9796059	2430,33	2.45
WPN-209	77,2490623	-51,5625473	2456,75	2.54
WPN-001	77,4266756	-51,3699399	2467,12	2.61
WPN-002	77,5097138	-51,1545152	2471,07	2.60
SUS	77,4558763	-51,1584124	2475,80	2.55
WPN-029	77,63987	-50,5627345	2475,87	2.51
PET	77,4250947	-51,120102	2479,35	2.45
NEEM Reference	77,4449867	-51,0690702	2480,58	2.00
CLA	77,4661369	-51,0314214	2481,31	
MAR	77,4343236	-50,9797357	2485,24	2.08
WPN-021	77,3801657	-50,9850457	2487,24	2.56
WPN-022	77,4634856	-50,7702814	2491,47	2.51
WPN-119	77,3350287	-50,1733762	2531,77	2.40

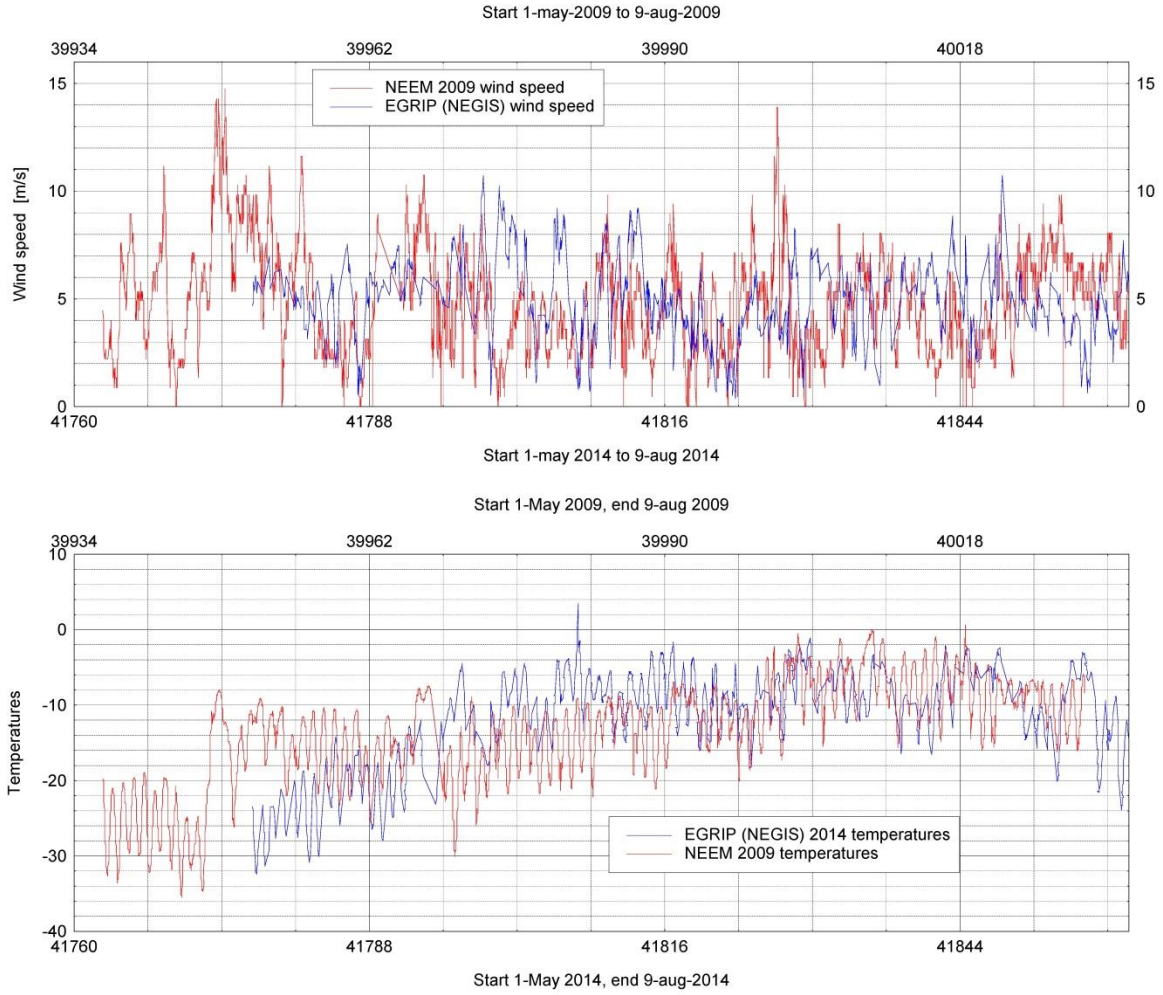


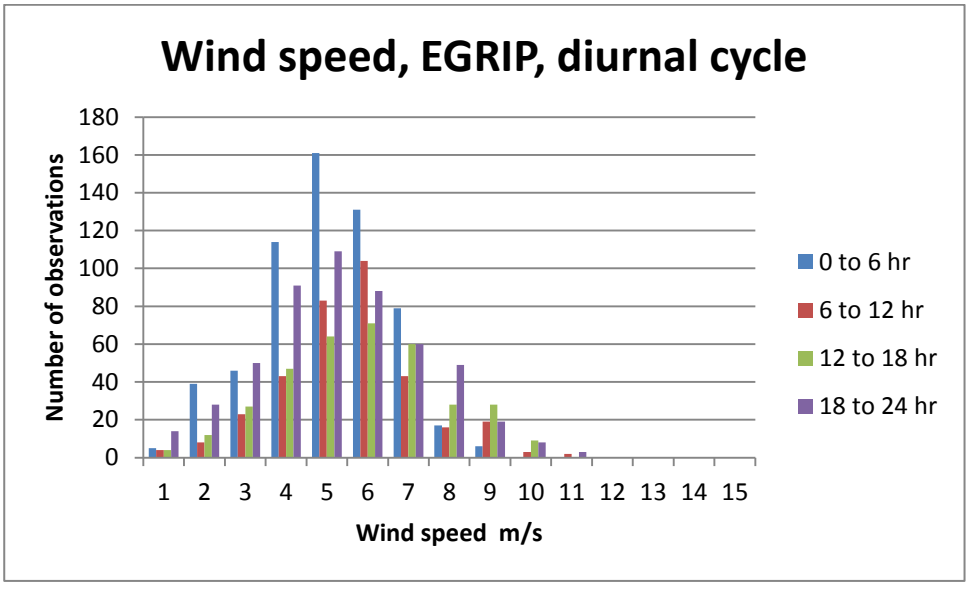
Old Traverse route NEEM > NGRIP with GPS strain net stages



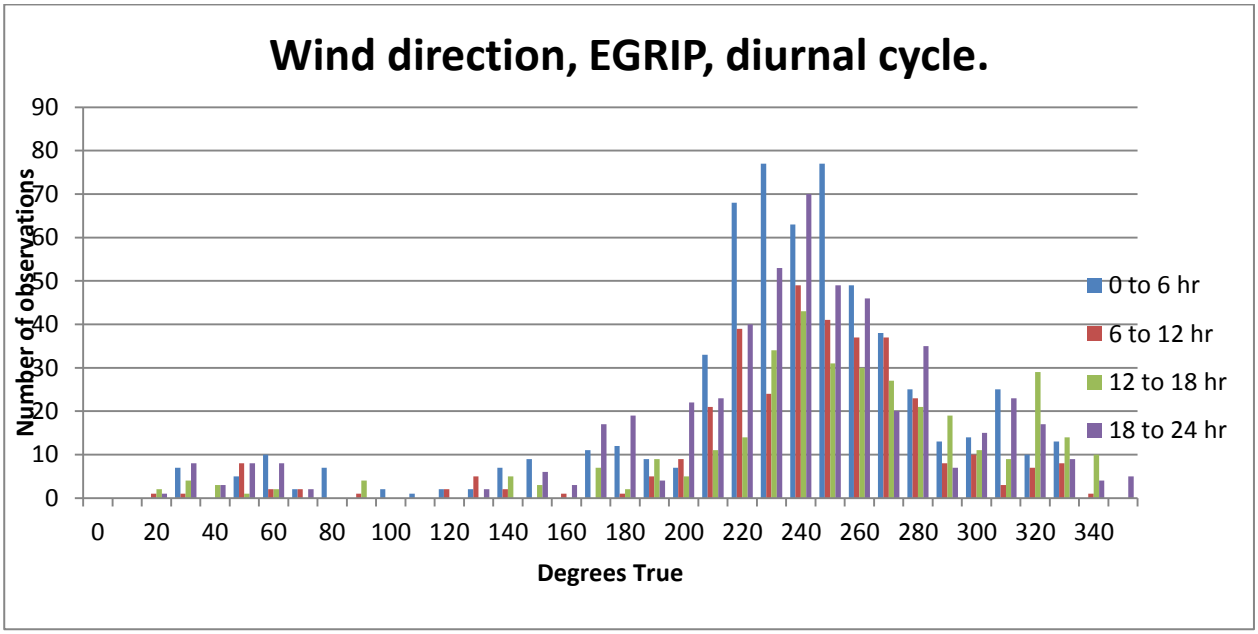
Name	Latitude	Longitude	Latitude	Longitude		Elev. Height	Lat-dms	Long-dms
CLA ITRF	77 27 58.0930	-51 01 53.1172	77,4661	-51,0314214	2481,31300000	2.481.313,0000		
MAR ITRF	77 26 03.5648	-50 58 47.0485	77,4343	-50,9797357	2485,24300000	2.485.243,0000	0.054	0.095
NEEM Reference ITRF	77 26 41.9520	-51 04 08.6526	77,445	-51,0690702	2480,58200000	2.480.582,0000	0.002	0.003
NGRIP Reference	75 05 47.3954	-42 19 42.4079	75,0965	-42,3284466	2957,10600000	2.957.106,0000	0.005	0.006
NGRIP Reference WCS84 (SOPAC)	75,09649867	317,6715543900			2955,49500000	2.955.495,0000	0.0161	0.0212
PET ITRF	77 25 30.3409	-51 07 12.3672	77,4251	-51,120102	2479,34900000	2.479.349,0000	0.012	0.032
SUS ITRF	77 27 21.1545	-51 09 30.2845	77,4559	-51,1584124	2475,80400000	2.475.804,0000	0.047	0.046
WP-13 ITRF	75 39 25.2634	-43 06 54.1247	75,657	-43,1150346	2906,46800000	2.906.468,0000	0.023	0.049
WP-13-A ITRF	75 36 41.3337	-43 25 33.2703	75,6115	-43,4259084	2905,27300000	2.905.273,0000	0.038	0.046
WP-13-A NAD-83	75 36 41.2850	-43 25 33.3007	75,6115	-43,4259169	2905,26000000	2.905.260,0000	0.038	0.046
WP-13-B ITRF-83	75 42 06.4916	-42 47 58.1033	75,7018	-42,7994731	2903,03200000	2.903.032,0000	0.042	0.066
WP-13-B NAD-83	75 42 06.4429	-42 47 58.1359	75,7018	-42,7994822	2903,01400000	2.903.014,0000	0.042	0.066
WP-23 ITRF	76 02 16.9748	-44 05 05.7534	76,038	-44,0849315	2858,09000000	2.858.090,0000	0.024	0.041
WP-23-A ITRF	75 58 26.1533	-44 20 44.7912	75,9739	-44,3457753	2855,56000000	2.855.560,0000	0.026	0.033
WP-23-B ITRF	76 06 05.3187	-43 49 11.7223	76,1015	-43,8199229	2853,85900000	2.853.859,0000	0.049	0.043
WP-31 ITRF	76 21 32.3098	-44 42 21.7799	76,359	-44,70605	2815,13300000	2.815.133,0000	0.031	0.062
WP-33 ITRF	76 26 52.7992	-44 46 16.6464	76,448	-44,7712907	2807,25700000	2.807.257,0000	0.005	0.007
WP-33-A ITRF	76 26 50.5697	-45 09 09.1353	76,4474	-45,1525376	2798,98600000	2.798.986,0000	0.018	0.043
WP-33-B ITRF	76 26 48.7695	-44 23 14.6405	76,4469	-44,3874001	2812,00700000	2.812.007,0000	0.042	0.039
WP-35 ITRF	76 32 13.3585	-44 46 54.9945	76,537	-44,7819429	2798,20800000	2.798.208,0000	0.018	0.020
WP-43 ITRF	76 47 49.6543	-45 46 46.4402	76,7971	-45,7795667	2740,03700000	2.740.037,0000	0.053	0.102
WP-43-A ITRF	76 43 00.7018	-45 57 22.1422	76,7169	-45,9561506	2747,90800000	2.747.908,0000	0.048	0.041
WP-43-B ITRF	76 52 47.5722	-45 37 28.5509	76,8799	-45,6245975	2735,16200000	2.735.162,0000	0.020	0.033
WP-53 ITRF	77 01 44.3634	-47 28 45.8452	77,029	-47,4794014	2661,04900000	2.661.049,0000	0.014	0.030
WP-53-A ITRF	76 56 56.1690	-47 39 38.9273	76,9489	-47,6608131	2664,44800000	2.664.448,0000	0.041	0.057
WP-53-B ITRF	77 06 43.3435	-47 19 27.8550	77,112	-47,3244042	2658,21700000	2.658.217,0000	0.011	0.018
WP-61 ITRF	77 12 36.3099	-48 52 27.0389	77,2101	-48,8741775	2596,13900000	2.596.139,0000	0.040	0.033
WP-63 ITRF	77 15 14.0872	-49 13 40.9971	77,2539	-49,2280548	2580,74800000	2.580.748,0000	0.030	0.032
WP-63-A ITRF	77 10 12.8721	-49 22 52.2526	77,1702	-49,3811813	2577,50800000	2.577.508,0000	0.034	0.042
WP-63-B	77 20 14.8850	-49 04 34.1969	77,3375	-49,0761658	2581,93700000	2.581.937,0000	0.102	0.068
WP-65 ITRF	77 17 56.5816	-49 34 55.8100	77,2991	-49,5821694	2559,41000000	2.559.410,0000	0.049	0.093
WPN-001 ITRF	77 25 36.0321	-51 22 11.7835	77,4267	-51,3699399	2467,12200000	2.467.122,0000	0.078	0.060
WPN-002 ITRF	77 30 34.9697	-51 09 16.2549	77,5097	-51,1545152	2471,07200000	2.471.072,0000	0.041	0.043

NEEM weather 2009 compared to EGRIP 2014





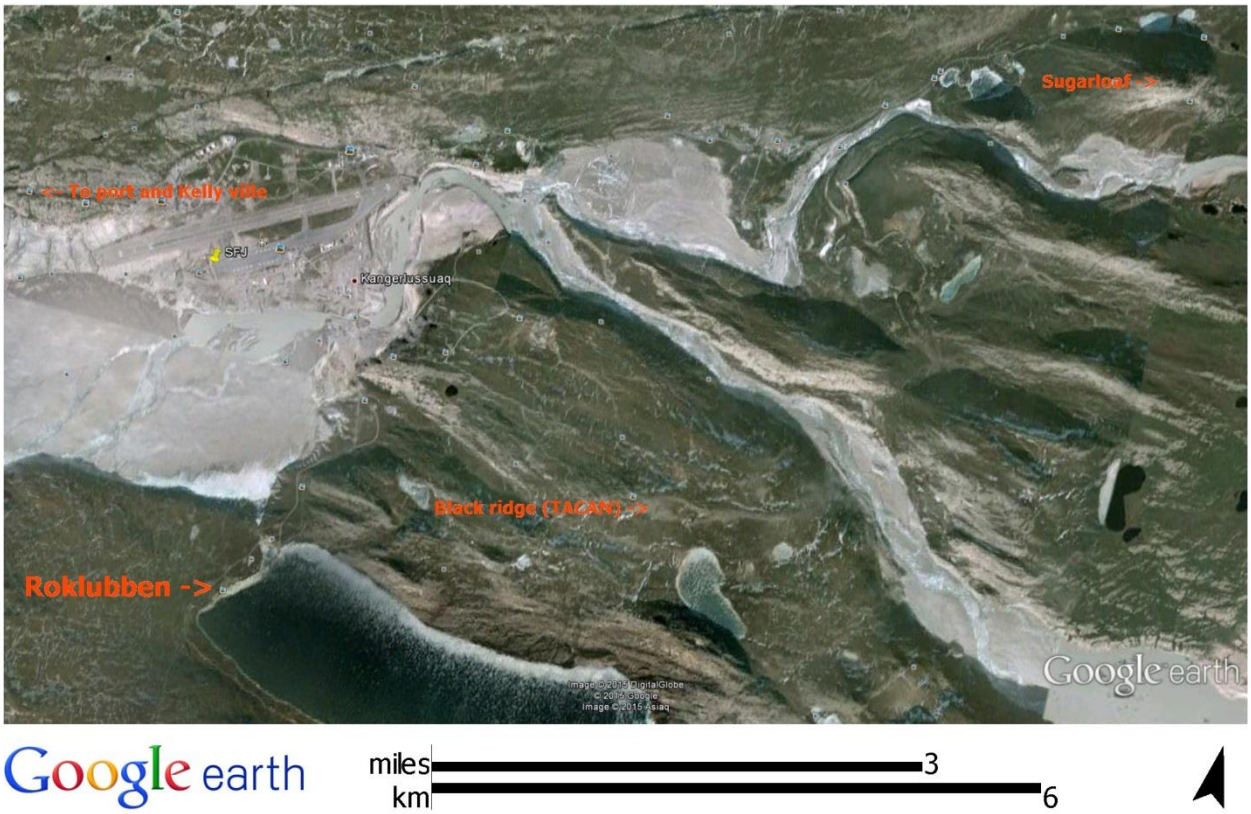
Wind speeds are in m/s. The ordinate is number of observations



Wind direction at EGRIP.

When we compare NEEM with EGRIP, 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 is less than half of NEEM.

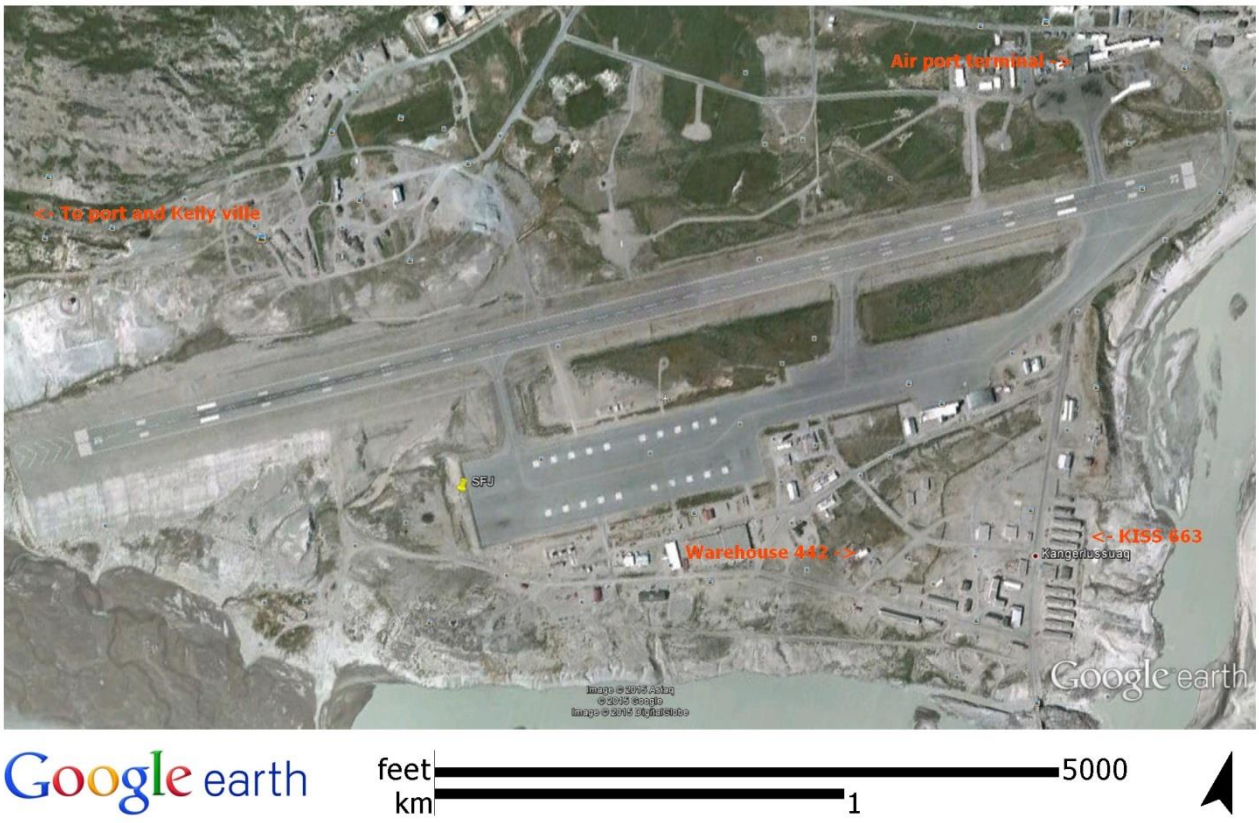
Kangerlussuaq and Surrounding Area



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, Air Greenland and Statoil. 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 and Renland office and quarters will be in KISS (Building 662). The project warehouse is building 442.



Weather: The climate is continental and quite xeric 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.

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.75. 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.

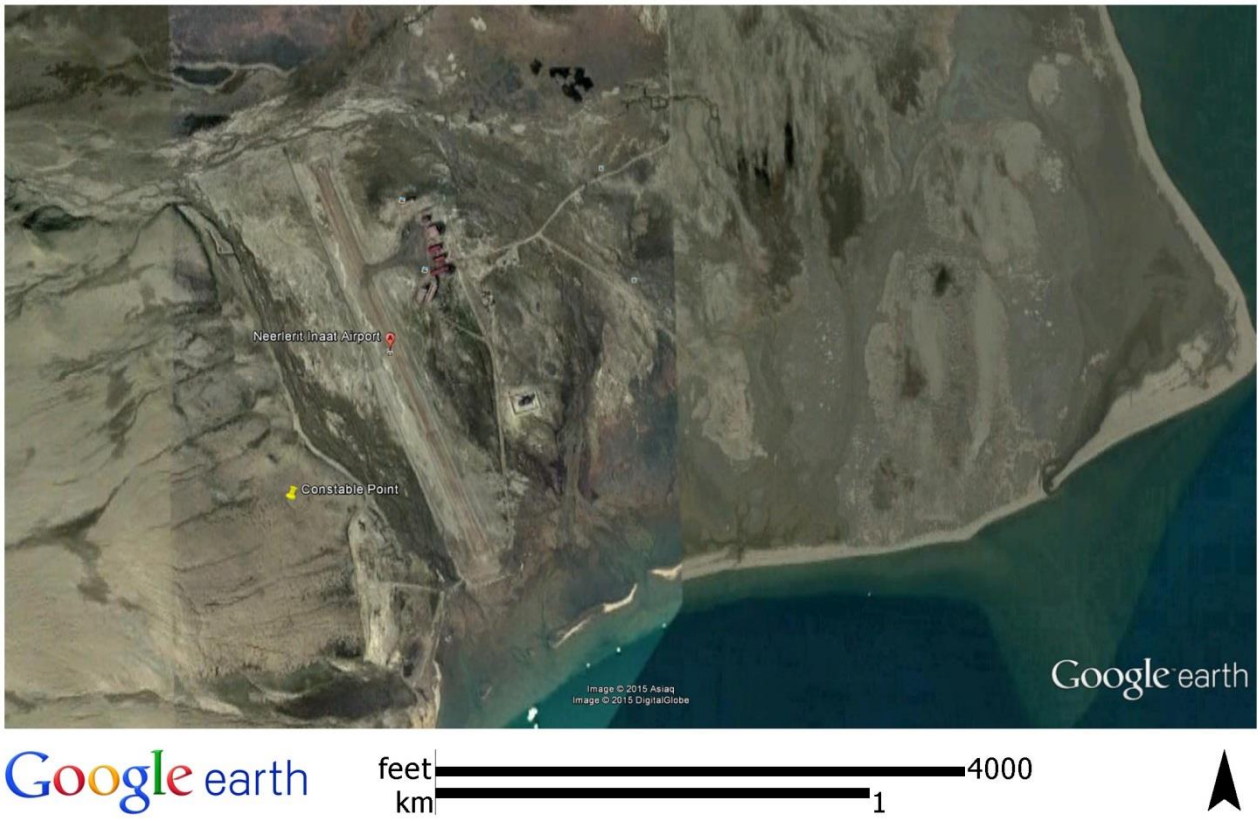
KISS (bldg. 662 in the map) is owned by the Home Rule Government and operated by the Kangerlussuaq Airport Management. The use of KISS is reserved exclusively for researchers and research projects registered by the Greenland Authorities after submission of project plans.

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.

Constable Pynt (Neerleriit inaat)



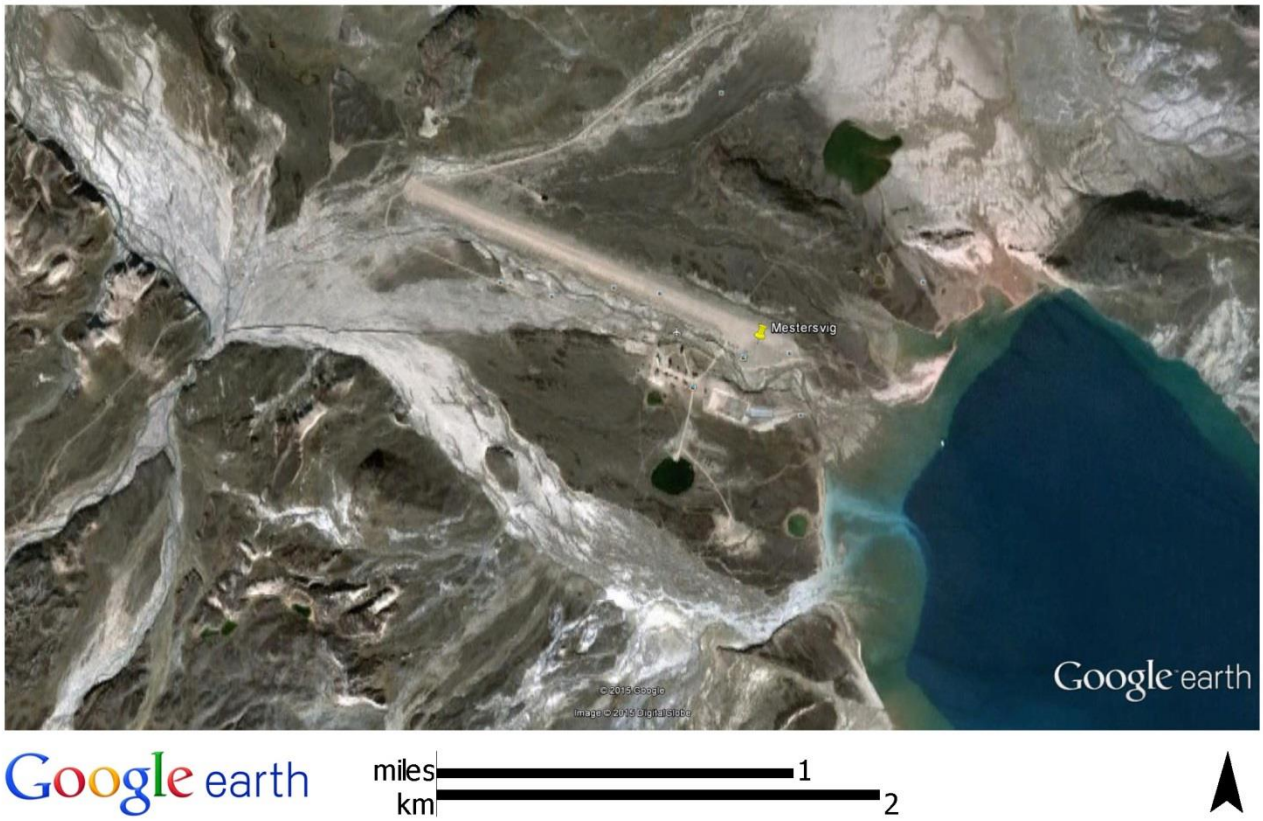
Neerleriit Inaat is the civilian airport for Scoresbysund (Ittoqqortormiit) the northernmost village on the east coast. It is manned all year around, and in winter time it has approx. one flight per week. The airport has a habour and RECAP had three containers with cargo delivered there last year.

There is an airport office, an airport quartering for passengers staying overnight, a canteen, a fire station, fuel station, a hangar and always electrical power. We expect that RECAP members be quartered in a guesthouse adjacent to the airport. The economy is regular and money based (Danish currency).

Please be aware that most of the open space at Constable Pynt is airport. Do not stray into airport areas without permission.

WARNING: Constable Pynt is polar bear country. Do not venture away from any buildings without permission, company, radio and protection. In case a polar bear is sighted, seek shelter inside a building and radio or telephone for help.

Mestersvig.



Mestersvig is an abandoned mining town North of Constable Pynt. It is manned all year by two people from the Sirius Patrol and is under the Danish Military. It is the Southernmost outpost in the NE Greenland National Park. The Sirius patrol people have full authority at Mestersvig. They carry Danish Police authority as well. Please follow all instructions given to you by staff.

There is quite a lot of infrastructure, such as garages, hangars, barracks and guesthouses. There is no canteen. RECAP personnel will most likely be quartered in a guest house, which is operated by self service only. We are planning for cooking our own meals.

In the vicinity there are several roads. A long one leading SW to the old mine and one leading NE towards an ocean harbour. These roads are several kilometres long. It would be tempting to take a walk in the area; but:

WARNING: Mestersvig is polar bear country. Do not venture away from any buildings without permission, company, radio and protection. In case a polar bear is sighted, seek shelter inside a building and radio or telephone for help.

Cargo shipments to Greenland

EGRIP/RECAP will have a Field Operations Manager in Kangerlussuaq most of the time, and a Field operations manager in Constable Pynt at all times this season. It is essential that all shipments are labelled correctly, and that EGRIP/RECAP 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 2015
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

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 NEEM from/via Europe:
Cargo for EGRIP/RECAP April 26, **Must arrive** Kangerlussuaq (SFJ) latest **APRIL 20**
Cargo for RECAP May 31, **Must arrive** Kangerlussuaq (SFJ) latest **MAY 25.**
Cargo for EGRIP June 1 – June 7, **Must arrive** Kangerlussuaq (SFJ) latest **MAY 28.**

By Boat:
Delivery deadline for the ship in Aalborg is May 15 to May 26 for arrival SFJ 7/6-2015.
The cargo will most likely be available June 20.

Shipping to NEEM from the United States/Canada

CPS POLAR FIELD SERVICES and the EGRIP/RECAP 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.
See:
http://www.polar.ch2m.com/SingleHTMLTextArea.aspx?P=1567e3227f9b417d886d94f311cf1a85

PLEASE NOTE: Be sure to mark your cargo with "EGRIP or RECAP 2015" to avoid your cargo ending up at Summit!
CPS POLAR FIELD SERVICES contacts: Stan Wisneski (stan@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 Stan Wisneski (robin or stan@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. CUSTOMS INFORMATION – 2012

A Certificate of Registration (form CBP-4455) is required when shipping your cargo to Greenland via the 109th Air Guard. You can access these forms on-line so please follow the directions below.

STEP 1:

Go to US Customs & Border Protection website: http://cbp.gov/. Click on "FORMS" up at the top of the page. Scroll down to "CBP form 4455" and open it up.

You can then fill out the form on line and print. You will need 4 copies.

Information to include in the following blocks**:**

Carrier: 109 Air National Guard
Date: current date
Name, address and zip code: 'you' the shipper
Articles exported for: science use in Greenland
Number packages: whatever the number (must be identifiable on each item)
You do not need to certify personal clothing or food.
Kind of packages: hardigs, steel boxes, aluminum poles, wooden crate, whatever?
Description: type in: "see following (#) pages" and attach your packing list to each 4455 Form. The numbered boxes should correspond to the shipping information. The customs agent will inspect the contents of all or some of your boxes and check your corresponding packing list for accuracy.
Sign and date:

STEP 2 :

Call your local Customs and Border Protection Office (airports, harbors) and ask them to inspect and certify your cargo for shipment to Greenland. They will then schedule a time to look at your freight. After they do so, they will sign the Certificate of Registration form that you filled out and

stamp all the copies of your registration and packing list. They will then keep a copy, and you should then include one copy along with your cargo, send one copy to Earl Vaughn, and keep one for yourself. Your cargo is then ready to ship to Scotia. **If you cannot get the cargo inspected and Registration signed at your location, then send the four completed and signed documents to the address below and the inspection will then take place in Scotia. Your cargo MUST arrive 2-3 week prior to your scheduled flight.**

The Certificate of Registration and packing lists will be all you will need to bring the cargo back into the country through any airport or terminal.

You also might consider filling out the CBP 4457 for your personal gear. It will also need to be inspected and paperwork stamped. It will eliminate any questions or problems with your gear or expensive equipment such as computers, electronic gadgets, etc. These two forms act like a visa for your equipment. It also eliminates the need for filing electronic Shipper's Declaration for equipment. If you have any questions please call or write Earl Vaughn (info below).

Earl Vaughn
CPS Scotia Bldg. 20
1 Air National Guard Rd.
Scotia New York 12302
518-344-2310
518-331-3103
earl.vaughn at gmail.com

Address of the 109th:

109th Airlift Group
New York Air National Guard
Stratton Air National Guard Base,
1 Air National Guard Rd.
Scotia, New York 12302-9752

RECAP/ 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.

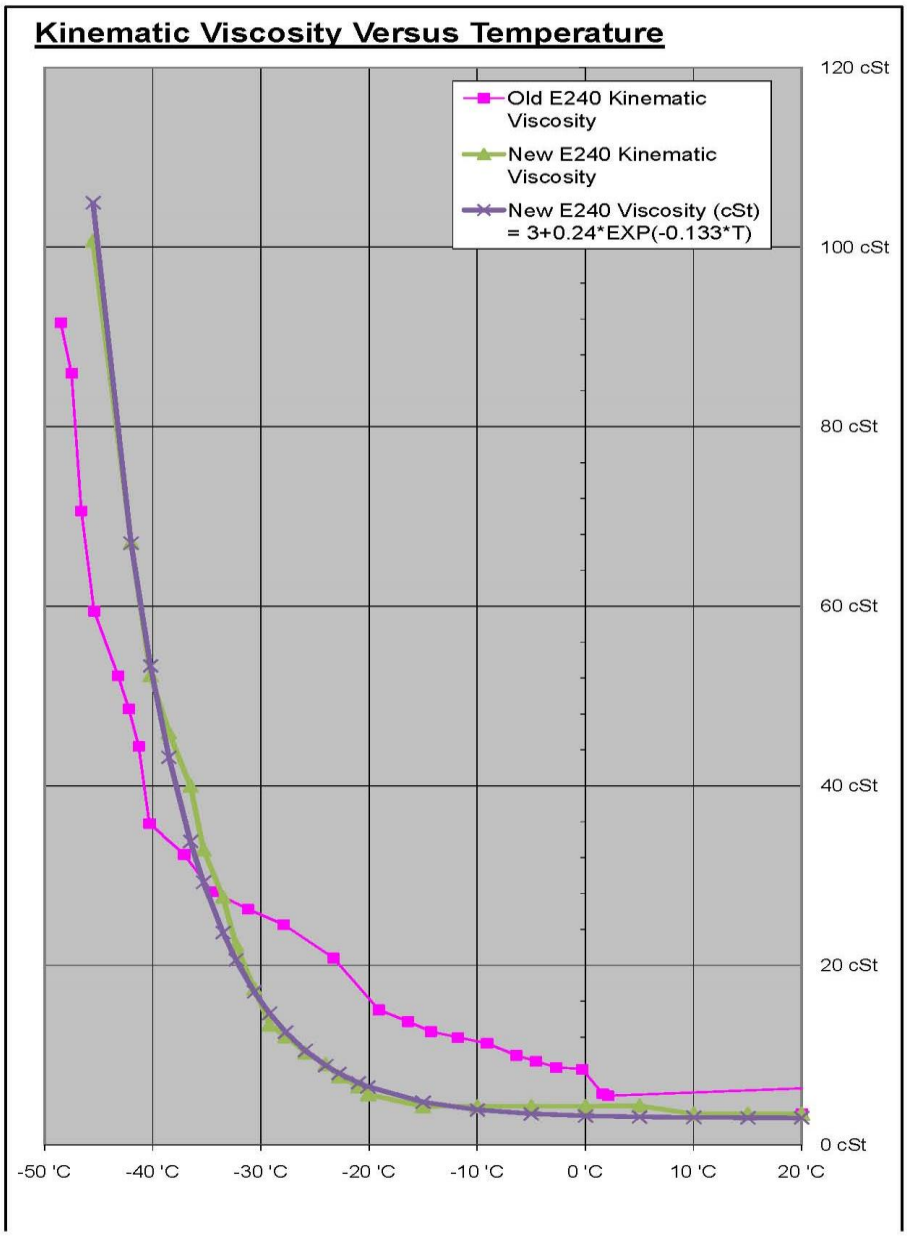
RECAP will utilize ESTISOL 140 in 2015 and EGRIP plans to use COASOL/ESTOSOL 240 in combination with ESTISOL 140 in the coming years.

TABLE .	**COASOL**	**ESTISOL 240**	**ESTISOL 140**
Manufacturer	DOW	DOW	DOW
Melting point	< - 60 ^{o}C	< -50 ^{o}C	<-89 ^{o}C
Boiling point	274 - 289 ^{o}C	255 - 290 ^{o}C	199 ^{o}C
Flash point	131 ^{o}C	136 ^{o}C	75 ^{o}C
Explosive limit	0.6 – 4.7 % (vol)	None	None
Vapour pressure (20^{o}C)	0.004 kPa		0.03 kPa
Density (20^{o}C)	960 kg/m^{3}	863 kg/m^{3}	865 kg/m3
Density (-30^{o}C)	995 kg/m^{3}	898 kg/m^{3}	915 kg/m3
Viscosity (20^{o}C)	5.3 cSt	3 cSt	1.0 cSt
Viscosity (-30^{o}C)	25 cSt	13 cSt	2.2 cSt
Auto ignition temperature	400 ^{o}C	None	270 ^{o}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			

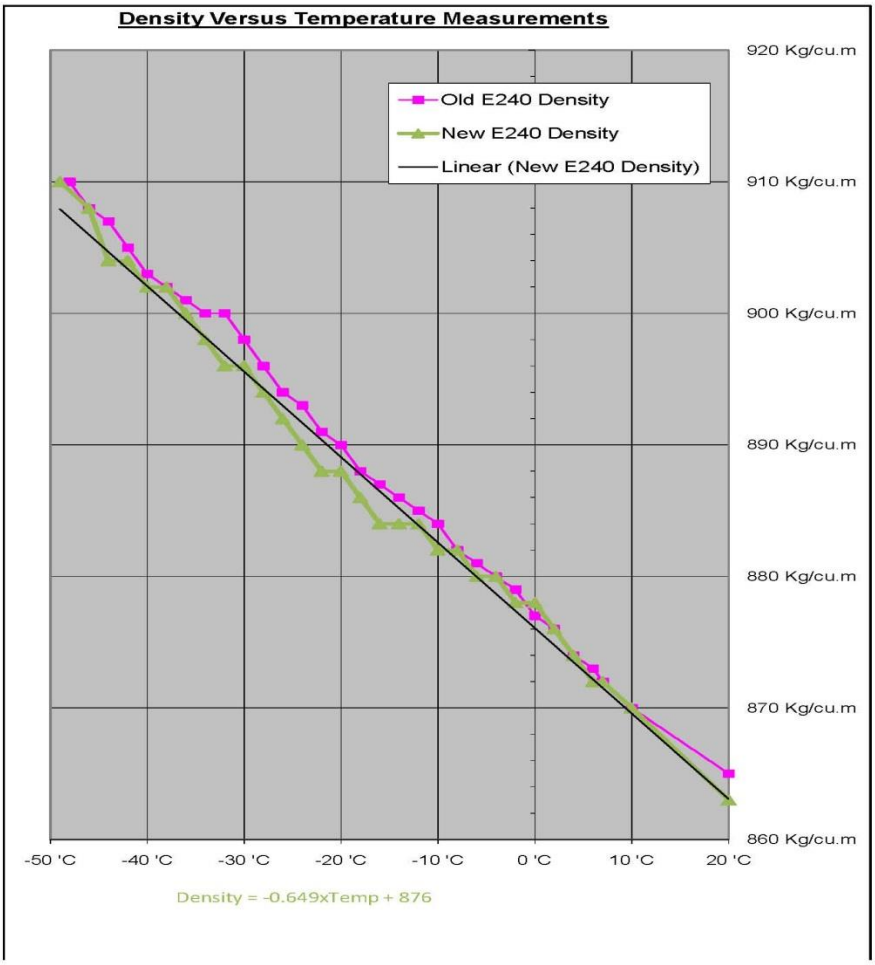
ESTISOL 240 was field tested as a drilling liquid at Flade Isblink, Greenland 2006 with a 4" diameter ice core drilled using the Hans Tausen electro-mechanical drill to a depth of 423.30m (260m of this core using the new liquid). The ice core quality was 'good', no problems encountered cleaning and processing 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

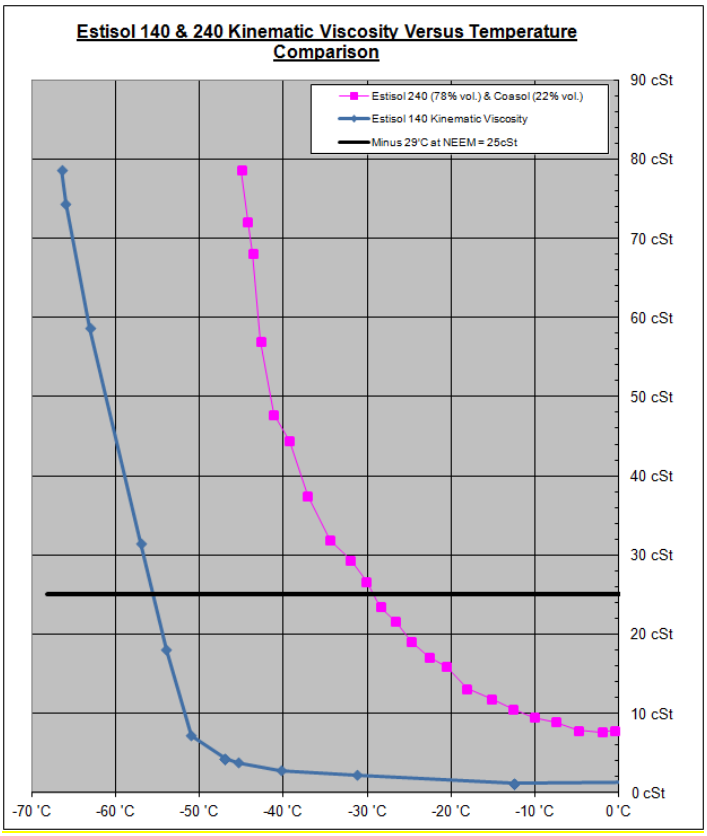


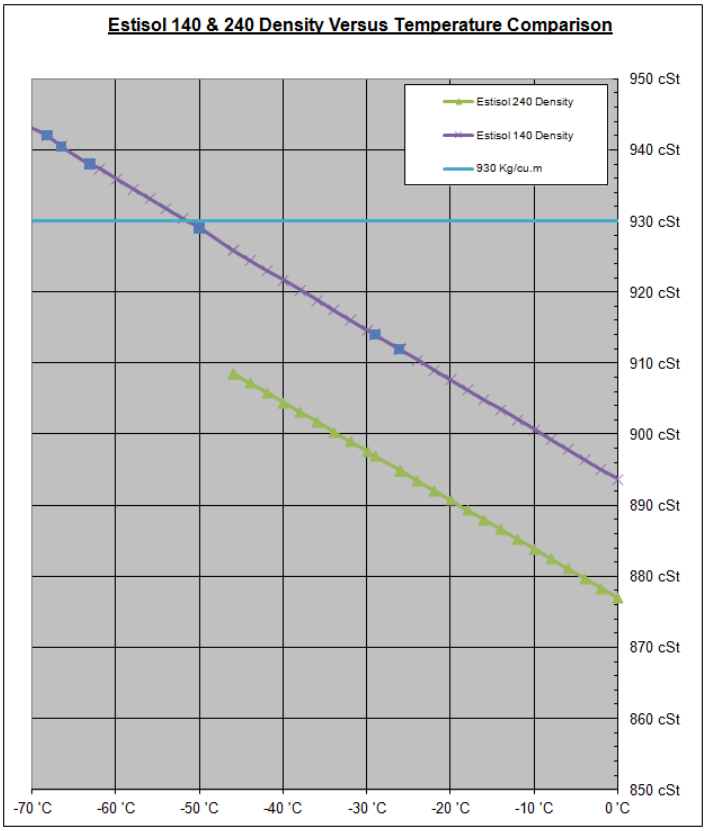
In February 2008, the supplier of Estisol 240 announced a change in specifications of the fluid due to a change in raw materials for the production (coconut oil has become too expensive) We therefore conducted a new set of measurements. As seen above, by cheer luck, this change has improved the fluid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

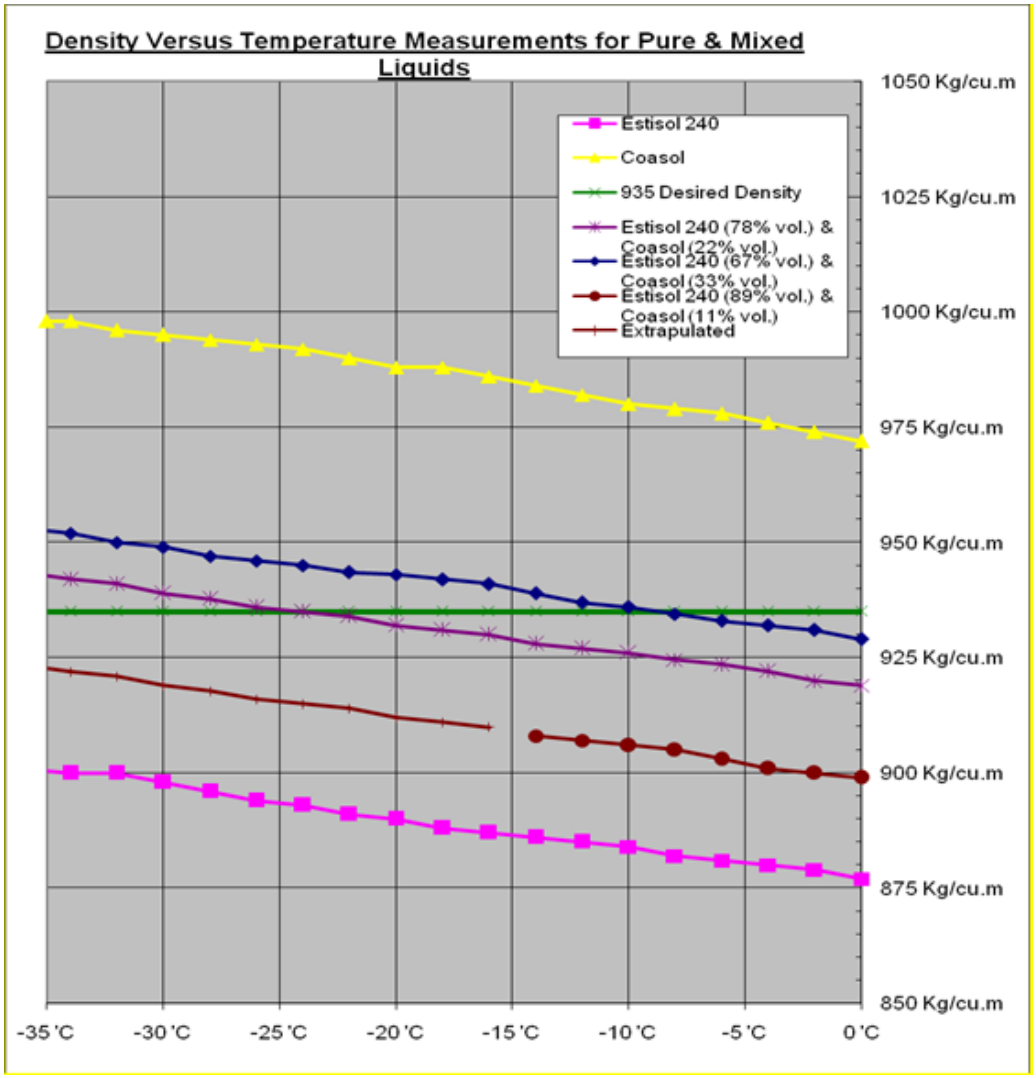


As seen above, the densities of new and old Estisol 240 are comparable.

Properties of ESTISOL 140.

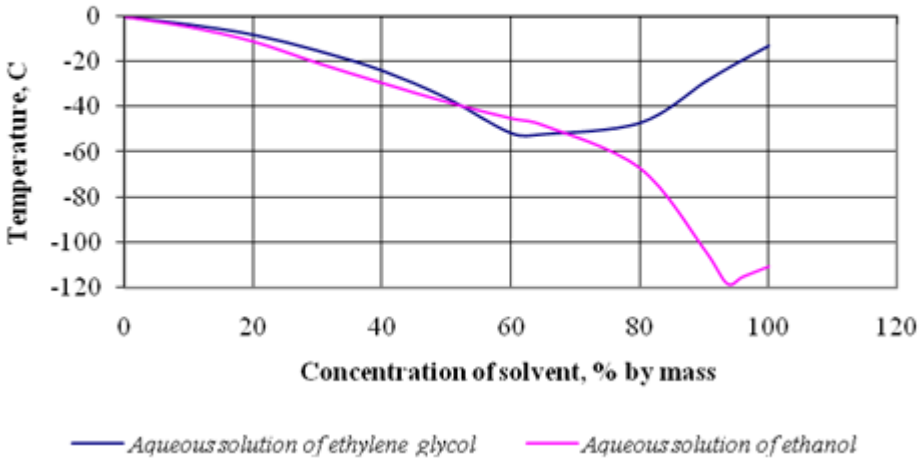




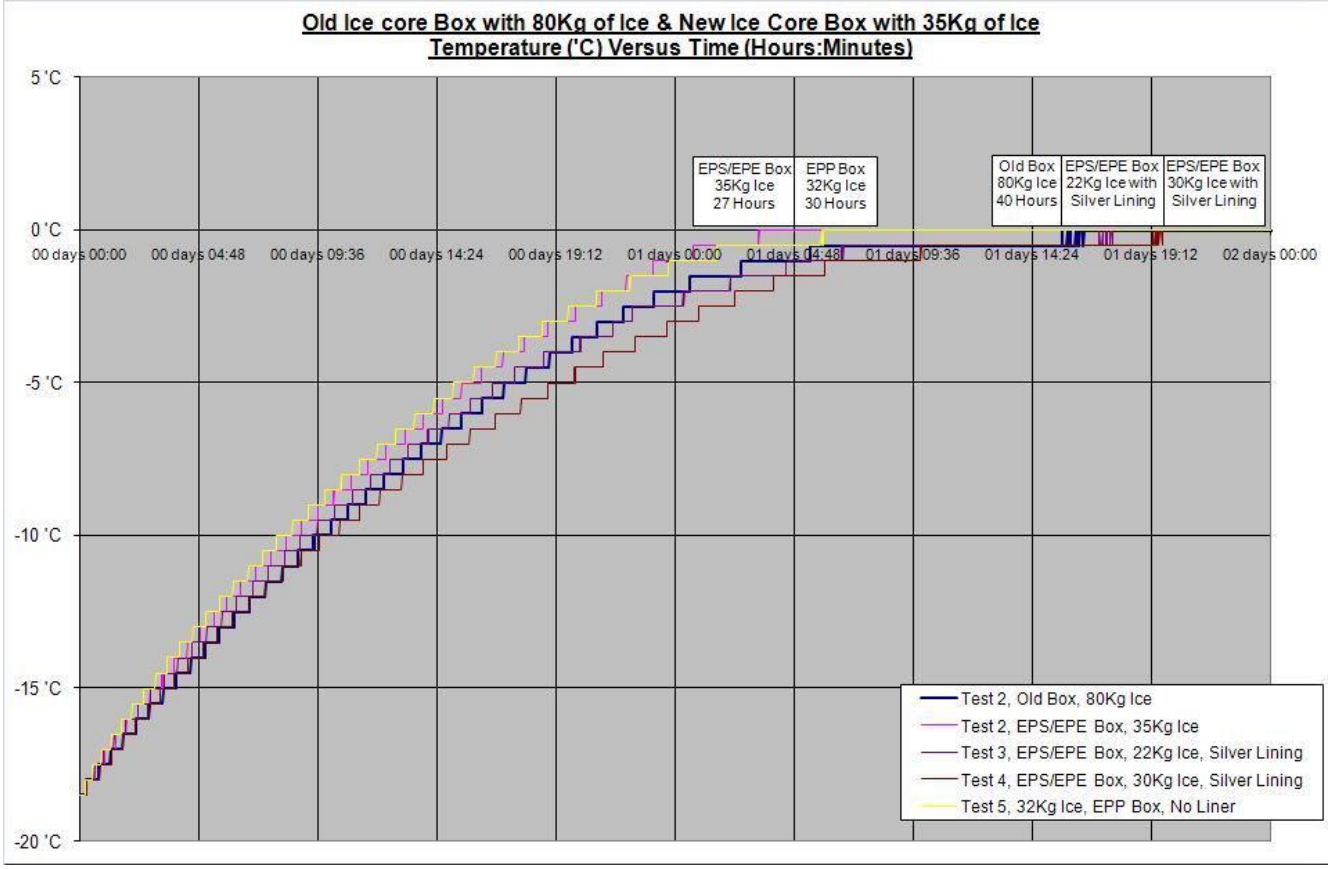


Above - density versus temperature of the drilling liquids in pure & in different mixes.

Fig. 1. Freezing points of alcohol aqueous solutions



Ice core boxes, temperature measurements:



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/m^3, to provide the needed protection for even fragile material. Finally, in

order to seal the box, all seams (bottom inside and outside, two vertical seams) should be sealed with Loctite 290 penetrating sealing compound.

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

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

Flight and cargo considerations 2015.

We have planned for 11 LC-130 missions (4 NEEM, 2 EGRIP and 5 to Mestersvig (Constable Pynt) this year. In our cargo schedule we have planned for an average load per flight of 12,000 – 15,000 lbs. It is our hope that with a good skiway and good refuelling possibilities we may negotiate a slightly higher payload with the pilots. However, as the schedule now looks, we have to ask all participants to be aware of the importance of keeping weights low.

Typical specifications for Twin Otter and Basler:

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

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

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

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

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

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

Typical LC-130 specifications:

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

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

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

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′ container		45′ high-cube container	
		imperial	metric	imperial	metric	imperial	metric
external dimensions	length	19′ 10½″	6.058 m	40′ 0″	12.192 m	45′ 0″	13.716 m
	width	8′ 0″	2.438 m	8′ 0″	2.438 m	8′ 0″	2.438 m
	height	8′ 6″	2.591 m	8′ 6″	2.591 m	9′ 6″	2.896 m
interior dimensions	length	18′ 10 5⁄16″	5.758 m	39′ 5 45⁄64″	12.032 m	44′ 4″	13.556 m
	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
door aperture	width	7′ 8 ⅛″	2.343 m	7′ 8 ⅛″	2.343 m	7′ 8 ⅛″	2.343 m
	height	7′ 5 ¾″	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 ft³	86.1 m³
maximum gross mass		52,910 lb	24,000 kg	67,200 lb	30,480 kg	67,200 lb	30,480 kg
empty weight		4,850 lb	2,200 kg	8,380 lb	3,800 kg	10,580 lb	4,800 kg
net load		48,060 lb	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).

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

Max dimension of cabin luggage: 55*40*23 cm, 8 kg
Density of Jet A1 805 kg/m^3
Density of mogas 720 kg/m^3
200 l drum of JET A1 or D60 178 kg

Empty standard drum 15 kg

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 ^{o}C) and 6.5*10^{-3} the standard lapse rate in the troposphere [^{o}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:

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

Current capability of electrical cables:

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

Connections to 5-conductor cable:

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

Attenuation of coaxial cables:

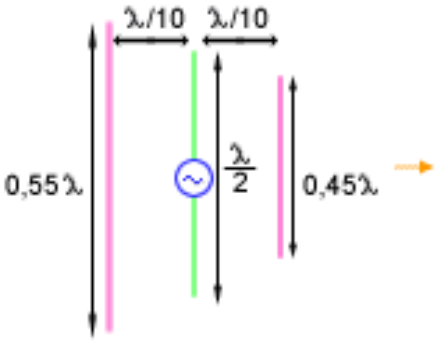
RG58/U attenuation per 30m:

10 MHz	1.5 dB at SWR 1.0.	+0.5 dB at SWR = 3
200 MHz	8.0 dB at SWR 1.0.	+1.2 dB at SWR = 3
1500 MHz	30 dB at SWR 1.0	+1.2 dB at SWR = 3

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*l	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 first hand information between the responsible Field Operations Managers (FOM's) for CPS and NEEM 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/NEEM 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 NEEM 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 flight crew will request a clearance to go from the FOM just before brake release prior to take-off. In case the FOM has not been present at plane departure, the flight crew will call the appropriate FOM office (either CPS SONDE or GOC SONDE) by radio HF 8.093 MHz of VHF 122.8 MHz to obtain clearance to go.

During missions 8.093 MHz, Iridium phone and OpenPort phones will be monitored for updates on weather and mission progress from plane crews and field camps. NOTE: Both camps and FOM offices will have phone lines open 24 hours a day. The FOM offices will relay information on mission progress to Skier OPS. The Fom keeps a record of departure times and reported arrival times.

End of flight period:

At the end of deployment, before departure of the 109'th to the U.S. or, when there is a change of DC, a meeting should be held between the 109'th and the CPS and NEEM 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, 2015 by J.P.Steffensen

AVIATION WEATHER REPORTS

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

1. Time [local, here Sonde 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. This is called the **QNH** value.
7. Horizontal definition [good, fair, poor, nil]
8. Surface definition [good, fair, poor, nil]
9. Comments.

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

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

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

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

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

Surface definition

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

Whiteout NIL surface, NIL horizon

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

Conversion:

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

Communication plan

Typical radio communication plan.

The major part of the communication is performed using Iridium OpenPort and Iridium satellite communication. However, most flight related communication is performed on the radio.

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

Short wave (or HF) Frequencies:

Primary	**8093 kHz**	Ice freq. For camp to FOM communication
Secondary	**4753 kHz**	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	Main east Greenland party line frequency.
	7995 khz	Ice freq, digital comms.

All frequencies use SSB, USB

VHF radio.

Camp communication with air craft is performed on Air band **122.8MHz** FM, Camp has also capability to transmit and receive on Maritime Channel 8 (156.400 MHz) to support SAR operations.

Schedule:
GOC Sonde will monitor 8093 on a routine basis. Main Sonde-Camp contact time is at 18:45 SFJ hours, but depends on CPS Polarfield Services use of the frequency and the camp activities.

If aircrafts are expected, weather reporting starts 3 hours prior to estimated take off time on a 30 min basis unless otherwise arranged. Reporting primarily on OpenPort e-mail with telephone and radio as backup unless agreed otherwise.

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

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

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

AC: Air craft.

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

Flightplan:

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

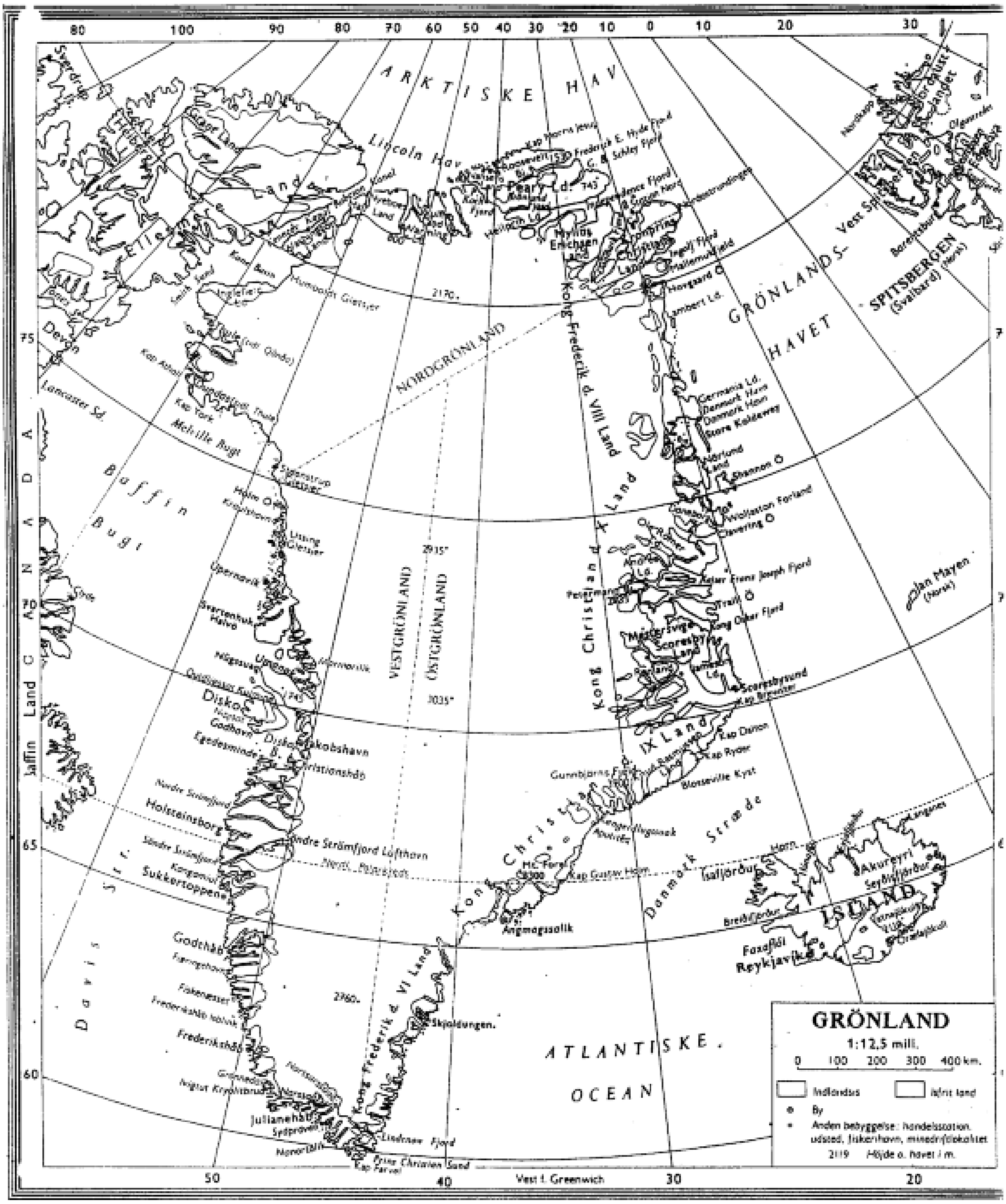
Sondrestrom, Estimated flight time 03.30 hours, Fuel on board 06.00 hours. 5 Souls on board. Pilot in Charge: E Bengtsson.

METAR	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


GRÖNLAND
1:12,5 mill.
ARKTISKE HAV
ATLANTISKE OCEAN
GRÖNLANDS-HAVET
Baffin Bugt
Davis Str.
Danmark Stræde
SPITSBERGEN (Svalbard) (Norsk)
ISLAND
Jan Mayen (Norsk)
Reykjavik
Akureyri
NORDGRÖNLAND
VESTGRÖNLAND
ÖSTGRÖNLAND
Peary Ld.
Kong Frederik d. VIII Land
Kong Christian X Land
Kong Christian d. IX Land
Kong Frederik d. VI Land
Scoresbysund
Angmagssalik
Skjoldungen
Godthåb
Sukkertoppen
Holsteinsborg
Julianehåb
Frederikshåb
Upernavik
Thule
Disko
Jakobshavn
Lincoln Hav
Ellesmere Land
Melville Bugt
Lancaster Sd.
Vest f. Greenwich
Indlandsis
Isfrit land
By
Hōjde o. havet i m.

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

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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

Voice	Data	Telephone Name	Location
+ 8816 234 93272	+ 8816 929 49576	NEEM-EGRIP 1 (FL)	Traverse
+ 8816 234 93253	+ 8816 929 48507	NEEM/EGRIP 2	Traverse
+ 8816 234 93166	+ 8816 929 11610	NEEM/EGRIP 3	Traverse
+ 8816 234 91171	+ 8816 929 48550	NEEM/EGRIP 4	Traverse
+ 8816 234 95066	+ 8816 929 49618	RECAP 1 (FL)	Renland Camp
+ 8816 234 94868	+ 8816 929 10405	RECAP 2	Renland Camp
+ 8816 234 91327	+ 8816 929 49331	RECAP 3	Renland Camp

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 (NEEM/EGRIP only)

+8816 777 15686
+8816 777 15687 SIM card activates 1 st May.
+8816 777 15688

VSAT system (Renland only):

Direct inward dialing (DID): US DID: +1 (929) 237-1743
DK DID: +45 3271 3214

Cost is the same as calling a Danish mobile (in Europe) or a U.S. mobile in North America.
Please observe: Calling to/from other systems, such as Iridium or other sat systems, is very costly: A VSAT call from Renland to Iridum handheld in Constable Pynt is easily 12 USD/min. A call from VSAT Renland to a Kangerlussuaq, Greenlandic cell, is typically 1USD/min.

Kangerlussuaq

While participants are in Kangerlussuaq they can be reached by:

Fixed line:	+299 84 11 51
NEEM/RECAP FOM Cell :	+299 52 41 25

CPS POLAR FIELD SERVICES, Kangerlussuaq

Office:	+299 84 15 98
Fax	+299 84 15 99
Mobile:	+299 52 42 18 (primary)
	299 52 42 81 (secondary)
E-mail:	stan@polarfield.com (Stan Wisneski)
	bear@polarfield.com (Eric Coplin)
	cpskangerops@polarfield.com (Audrey Mills)

Air Greenland Cargo	+299 84 12 87
Tickets	+299 84 13 63
Statoil	+299 52 42 22

NYANG	+299 84 13 89
Met Office tel.:	+299 84 10 22
e-mail:	139ravenops@gmail.com

New numbers after move to Nuuk from SFJ.

FIC: telephone:	+299 36 33 53 (sector north)
FIC e-mail	fic@naviair.dk
Notam & com centre	+299 36 33 04

Rescue and Coordination Centre (RCC)	+299 36 33 18
e-mail:	rcc@naviair.dk

KISS:	+299 84 13 00
	+299 84 14 87
	+299 84 11 07
fax:	+299 84 14 72
email	sciencesupport@mit.gl

Summit camp

Iridium sat. Tel.:		+8816 314 59738
HF radio on	8093 MHz	(Summit Camp, daily at 08:45)

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	Cell	+45 2465 5006	

Sun glasses

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

Standards for sunglasses – see labelling on inside of the frame

Europe CE (EN 1836:2005)

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

US (ANSI Z80.3-1972)

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

Australia (AS 1067)

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

Acute mountain sickness - AMS

Symptoms/signs of acute mountain sickness:

- Headache
- Fatigue/nausea

- Difficulty in breathing
- Sleep disturbances (insomnia)

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

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

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

How to operate the Gamow bag

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

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

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

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

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

How to monitor blood pressure using the Omron electronic monitor

1. The subject sits down and rests their arm on a table so the brachial artery is level with the heart. Alternatively lie on your back and rest the arm across your stomac. This is important when monitoring blood pressure, as pressure is proportional to height. For example, if one measures the blood pressure at head height, the systolic/diastolic pressure readings will be approximately 35mmHg less compared to readings taken at heart level, whereas at ground height the pressure readings will be 100mmHg greater.
2. Wrap the sphygmomanometer cuff around the upper arm, just above the elbow. Place the tubings on the hollow of your elbow.
3. Press the **ON** button.
4. Press **START**.
5. The blood pressure monitor will automatically measure the blood pressure.
6. **NOTE:** Do not move the arm during monitoring.
7. Monitor displays the systolic blood pressure (the high value) and diastolic blood pressure (the low value) and heart rate.

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

SBP= Systolic blood pressure

DBP= Diastolic blood pressure

How to monitor blood glucose

1. Wash your hands.
2. Prepare your lancing device.
3. Remove the test strip from its foil packet.
4. Insert the three black lines at the end of the test strip into the strip port.
5. Push the test strip in until it stops. The monitor turns on automatically.
6. Wait until the monitor displays the "Apply Blood message", which tells you that the monitor is ready for you to apply blood to the blood glucose test strip.

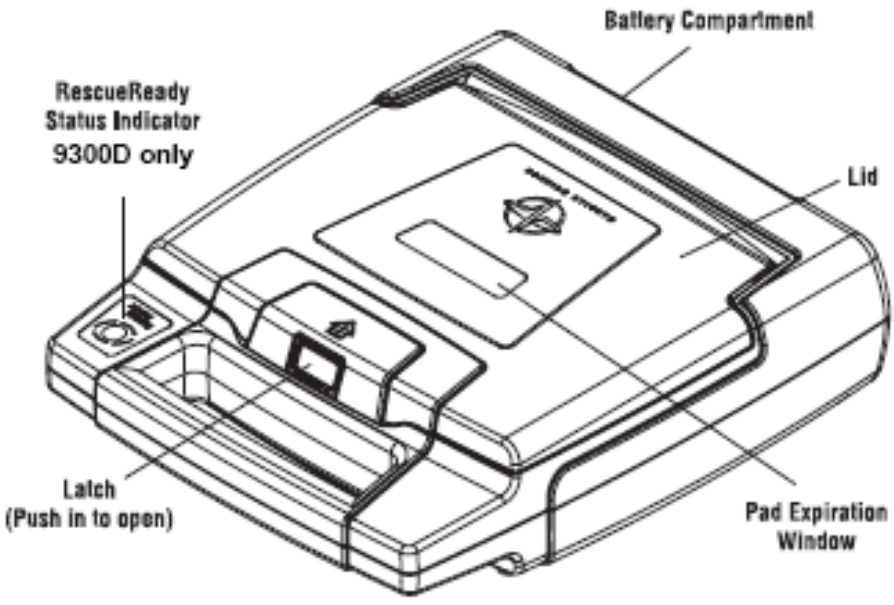
7. Use your lancing device to obtain a blood drop either from a finger or an ear lobe.
8. Before you obtain a blood sample from the fingertip or ear lobe, make sure the sample site is clean, dry, and warm. Avoid squeezing the puncture site.
9. Apply the blood sample to the test strip immediately.
10. Touch the blood drop to the white area at the end of the test strip. The blood is drawn into the test strip.
11. If the monitor shuts off before you apply blood to the test strip, remove the test strip from the monitor and try again.
12. Continue to touch the blood drop to the end of the test strip until the monitor begins the test. The monitor begins the test when you hear the beeper and/or the display window shows the status bar.
13. Then the display window shows the countdown. **Note: Do not** remove the test strip from the monitor or disturb the test strip during the countdown.

Result of blood glucose monitoring

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

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

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



Automated External Defibrillator (AED)

CARDIAC SCIENCE AEDs
G3 third generation

STEP 1: ASSESSMENT AND PAD PLACEMENT

PREPARATION

Determine that the patient is over 8 years of age or weighs more than 55 pounds (25 kg) and exhibits the following:

The patient is unresponsive, and
the patient is not breathing.

Remove clothing from the patient's chest. Ensure the skin site is clean and dry. Dry the patient's chest and shave excessive hair if necessary.

Open the AED lid and wait until the LEDs are lit.

Note: When the patient is a child under 8 years of age or weighs less than 55 lbs (25kg), the AED should be used with the Model 9730 Pediatric Attenuated Defibrillation Pads. Therapy should not be delayed to determine the patient's exact age or weight. See the directions for use accompanying pediatric pads for procedure on changing adult pads to pediatric.

PLACE PADS

The AED will issue the prompt *"Tear Open Package and Remove Pads"* Keep the pads connected to the AED, tear the pad package along the dotted line and remove the pads from the package. Leave the package attached to the pad wires.

After the prompt *"Peel One Pad From Plastic Liner,"* with a firm, steady pull, carefully peel one pad away from the plastic liner.

Then, after the prompt *"Place One Pad on Bare Upper Chest,"* place the pad with the sticky side of on the patient's skin on the upper right chest, placing the top of the pad on the collarbone. Avoid placing the pad directly over the sternum.

Finally, after the prompt *"Peel Second Pad and Place on Bare Lower Chest As Shown,"* pull the second pad from the plastic liner and place it on the lower left chest, below and left of the breast.

Note: Cardiac Science's standard defibrillation pads are non-polarized and can be placed in either position as shown on the pad package.

When the pads are placed, the voice prompt will say *"Do not touch patient. Analyzing Rhythm."* If the pads are not properly placed or become disconnected at any time during the rescue, the voice prompt *"Check Pads"* will be heard. When this occurs, ensure that:

Pads are firmly placed on clean, dry skin
Pad cable is securely plugged into the AED

STEP 2: ECG ANALYSIS

As soon as the AED detects proper pad placement, the voice prompt *"Do Not Touch Patient. Analyzing Rhythm"* will be heard. The AED will begin to analyze the cardiac rhythm of the patient.

If a shock is advised, the voice prompt will say, *"Shock Advised. Charging."*

When the AED is charged, it continues to analyze the patient's heart rhythm. If the rhythm changes and a shock is no longer needed, the AED will issue the prompt *"Rhythm Changed. Shock Cancelled,"* disarm and initiate CPR.

If no shock is advised, the AED will prompt to start CPR.

If noise is detected during analysis, the AED will warn you with the prompt *"Analysis Interrupted. Stop Patient Motion"* and restart the analysis. This usually occurs if the patient is excessively jostled or there is a strong electromagnetic emitting electronic device nearby (within 5 meters). Remove the electronic device or stop the excessive motion when you hear this prompt.

STEP 3: SHOCK DELIVERY AND CPR MODE

When the AED is ready to deliver a defibrillation shock, the **SHOCK** button will flash and the prompt *"Stand Clear. Push Flashing Button to Deliver Shock"* will be heard.

Make sure no one is touching the patient and push the **SHOCK** button to deliver a defibrillation shock. (If you do not push the **SHOCK** button within 30 seconds of hearing the prompt, the AED will advise, *"It is now safe to touch the patient. Start CPR."*

After the AED delivers the defibrillation shock, the voice prompt will say, "*Shock Delivered."* The AED will then prompt you to start CPR.

Note: During a rescue, the text screen displays voice prompts, elapsed time of rescue and number of shocks delivered, (for 9300D only).

CPR MODE

After shock delivery or detection of a non-shockable rhythm, the AED automatically enters CPR mode. The voice prompt *"Start CPR"* will be heard.

During the CPR time-out, the AED will not interrupt the CPR mode if the patient's condition changes and the AED detects a shockable rhythm. After the CPR time-out period has expired, the voice prompt *"Do Not Touch Patient. Analyzing Rhythm."* will be heard.

Note: During CPR mode, the text screen displays a countdown timer, (for 9300D only).

If the patient is conscious and breathing normally, leave the pads on the patient's chest connected to the AED. Make the patient as comfortable as possible and wait for Advanced Life Support [ALS] personnel to arrive. Continue to follow the voice prompts until the ALS personnel arrive, or proceed as recommended by the Medical Director.

STEP 4: POST RESCUE

After transferring the patient to ALS personnel, prepare the AED for the next rescue:

1. Retrieve the rescue data stored in the internal memory of the AED by using RescueLink software installed on a PC (see detailed procedure in the Data Management section).
2. Connect a new pair of pads to the AED.
3 Close the lid.
4. Verify that the **STATUS INDICATOR** on the handle is **GREEN**. (For 9300D only)