THE 1992 GREENLAND FIELD SEASON
AFTER OPERATIONS REPORT
FOR NSF-SPONSORED PROJECTS

for

Division of Polar Programs
National Science Foundation
Washington, D.C. 20550

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PICO is operated by UAF under contract to the National Science Foundation, Division of Polar Programs.

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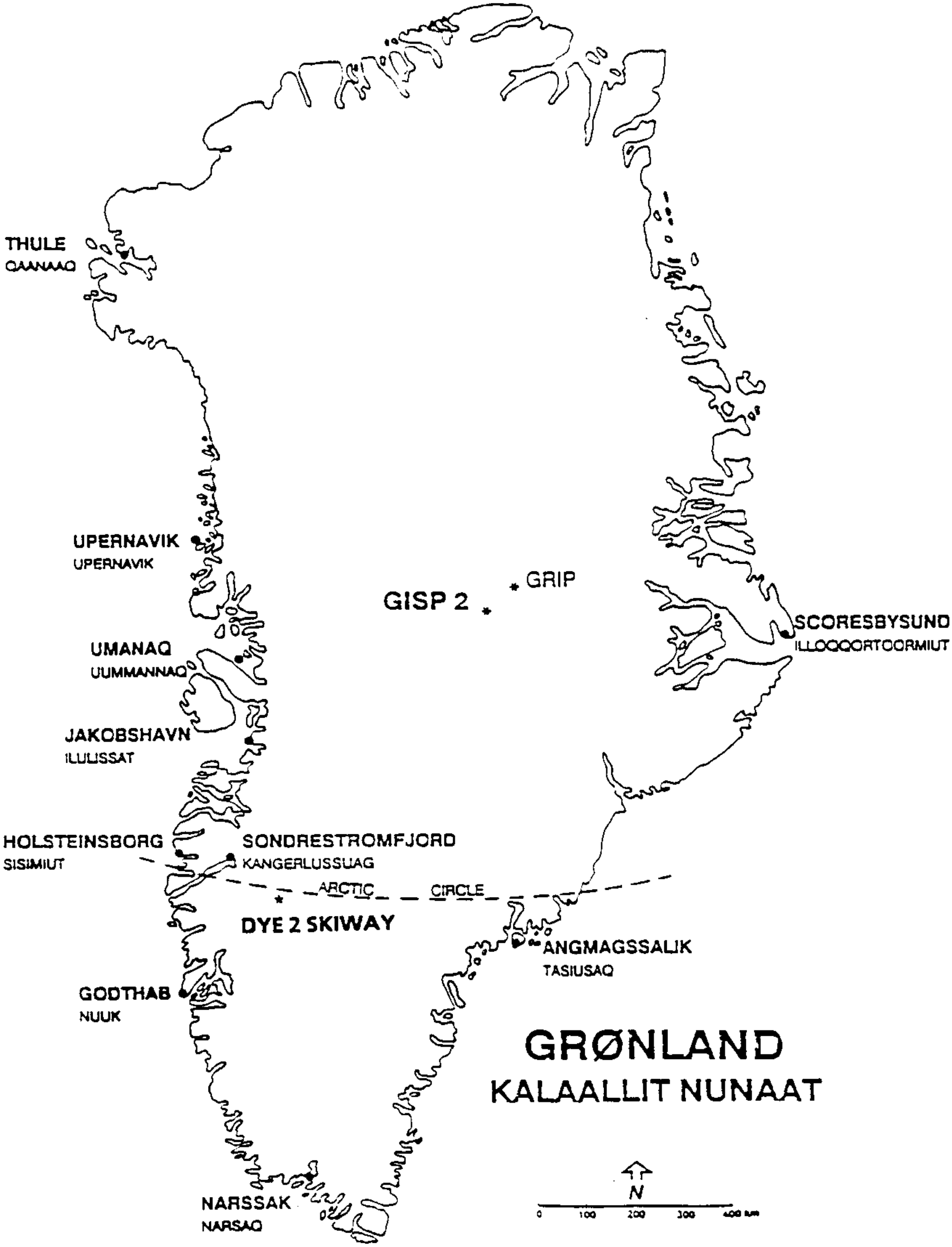


Figure 1. Location map of Greenland

1992 After Operations Report

Greenland Operations Center

INTRODUCTION

The "1992 Greenland Field Season After Operations Report for NSF- Sponsored Projects" has been prepared to summarize the field activities of, and logistical support for, the 1992 National Science Foundation-Division of Polar Programs (NSF-DPP) sponsored research projects in Greenland.

Søndrestrøm field office inventory ranges from reusable structures to communications gear. (Photo: Jay Klinck)

The Polar Ice Coring Office (PICO) at the University of Alaska Fairbanks (UAF) provides administrative support, field operations management, and coordination of logistical requirements for NSF-sponsored projects.

PICO operations support includes:

- arrangements for transportation of personnel and equipment between Greenland and the U.S.,
- distribution of supplies and equipment received from coordinators at UAF to the proper research locations,
- response to and support of the needs of the GISP2 Field Camp,
- on-site coordination of field activities originating at Søndrestrøm Air Base,
- control and maintenance of an inventory of field camp equipment that includes: oversnow vehicles, shelter/tents, kitchen supplies, radios, generators and fuels, and
- liaison between NSF, scientists, and support subcontractors, both military and civilian.

PICO also provides:

- ice core and hot water drilling services,
- the loan of non-technical drilling equipment, and
- borehole logging equipment and services to NSF-DPP glaciological and geophysical projects

A location map of Greenland is provided as Figure 1. Coastal sites of NSF-sponsored research include Søndrestrøm Air Base, Thule Air Base, Ilulissat (Jakobshavn), Nuuk (Godthaab), and Kangerlussuaq and Angmagssalik on the east coast. Sites on the ice sheet include GISP2 and DYE 2.

OPENING STATEMENT

Perhaps the most significant event of the season was the unexpected deterioration of the Kevlar drill cable and the consequent termination of the season. While this was a disappointment to everyone, significant progress was made in bore hole depth, bore hole logging, cores of opportunity, science and engineering data collection, and improvements in overall logistical support. Although all the desired goals were not achieved, many were, and enough progress and improvements were made to say that we had a worthwhile Greenland Field Season in 1992.

SPECIAL THANKS

There are numerous organizations and individuals responsible for a project of this scale, and any success achieved belongs to all of them. PICO is indebted to the entire support network and offer you our thanks.

We would especially like to thank the other field operatives with whom we share the field and without whom the daily business would be more difficult.

Greenland Operations Center (GOC) and the GRIP Camp

The continued cooperation between the operations centers and camps contributed to the efficient and successful operation of the '92 field season.

We would especially like to acknowledge the assistance provided with vehicle support in SFJ-Søndrestrøm, medical evacuation, Twin Otter support and cooperation with load sharing on summit flights.

109th New York Air National Guard Tactical Air Group (NYANG)

Thanks to the 109th Tactical Air Guard for their professional support and "can do" attitude under remote and challenging circumstances. The additional effort from airmen to mission commanders was exemplary. Their contribution to a successful season was very much appreciated by PICO and all Greenland Field Season participants.

PRESEASON PLANNING

End of Season Review - Miami, Florida, October of 1991

Although this was an after operations review, it set the stage for the upcoming season. The annual GISP2 post season review and debriefing was hosted by the University of Miami. The science community presented PICO with its appraisal of the season's logistics and drilling support. A discussion and analysis of the season's activities provided valuable input to all the participants and provided guidance for increasing the efficiency and effectiveness of PICO's support for the '92 field season.

Arctic Planning Conference - Scotia, New York, October 22-29, 1991

Representatives from PICO and the Science Management Office (SMO) participated in the Annual Arctic Planning Conference hosted by the 109th NYANG, in Scotia New York.

The '91 season's flight schedule and operations' procedures were reviewed. Following this review, the proposed schedule for the '92 field season was presented. The needs of the other user groups were also presented. From this data a preliminary flight schedule was negotiated for all groups requiring ski aircraft support in Greenland.

This scheduling provided a cornerstone that allowed us to move from a preliminary to an intermediate planning phase for the '92 season.

SMO Request for Support

With receipt of the preliminary request for material support in October, the logistics staff began matching assets with requirements and researching the cost and availability of the requested supplies and services.

SMO Final Request for Support

In December corrections, additions, and deletions to the support request were reviewed. Selections were finalized by consensus of the PICO logistics and drilling staff and the SMO. Procurement of specified supplies began.

University of Alaska Fairbanks (UAF)

Logistics and drilling support for the 1992 Greenland Season and specifically GISP2 was coordinated through the PICO UAF office.

In October planning began for known staffing, medical, material, drilling support, shipping, and travel needs.

In December, with the receipt of the finalized annual SMO Support Request for GISP2, planning efforts were refined and accelerated. Requests for support from other projects were prioritized and processed as they were received.

GREENLAND FIELD OPERATIONS CENTER

(PICO-SONDE)

Early Season Operations, 23 January - 15 March

The Field Operations Manager and two assistants arrived in Søndrestrøm and began opening the station on 23 January. Severely cold weather hampered all operations through January and February reaching a record cold day of -47°F and severe wind chill.

National Scientific Balloon Facility (NSBF)- Harvard Balloon Project:

PICO provided travel arrangements via MAC flights, liaison for local services, Arctic clothing, local travel, housing, ground facilities, vehicles, shop, office, and warehouse space at Søndrestrøm. Extensive coordination with military and Danish contractors was arranged to insure project success.

The unseasonably cold weather made it a constant struggle to keep a fleet of nine vehicles and five snow machines running. Vehicles were borrowed from the USAF, Greenland Home Rule (GHR), and GOC/GRIP to meet the demands of the project.

Meetings with the base commander and the new GHR airport manager finalized coordination of the requested facilities for support of the NSBF/Harvard Balloon Project. Many facilities were being transferred to the GHR, and new agreements needed to be made with the old and new landlords.

A communications and a telemetry center were set up at the PICO office and on Black Ridge in order to communicate with the Twin Otter and high altitude balloons.

Project personnel and cargo began arriving on 1 February with a total of twenty-six participants on station by 10 February. By the end of the project, three instrument packages had been successfully launched and recovered.

By 13 March the majority of the scientists and technicians had departed for Continental United States (CONUS).

Main Season Operations, 16 March - 11 September

PICO continued its seasonal operations from the old fire station building, T-436 (a cold storage warehouse/garage) and Building 387 (an office/shop which is the main support facility).

Communications, cargo management, passenger movement, procurement of base supplies, and coordination of local flights were the primary tasks of the SFJ staff.

Vehicles:

Two of the three vehicles on station failed to pass the new Greenland motor vehicles inspection. The 1953 Dodge 4x4 and the 1976 Ford pick-up were retired indefinitely. The 1987 Ford 4x4 crew cab was able to pass the new test after some maintenance work. InAugust , a 1992 Ford one-ton flatbed arrived from CONUS to provide some relief for our vehicle shortage. The Falcon Project and GOC/Sonde assisted PICO in maintaining operational capability with the loan of two vehicles.

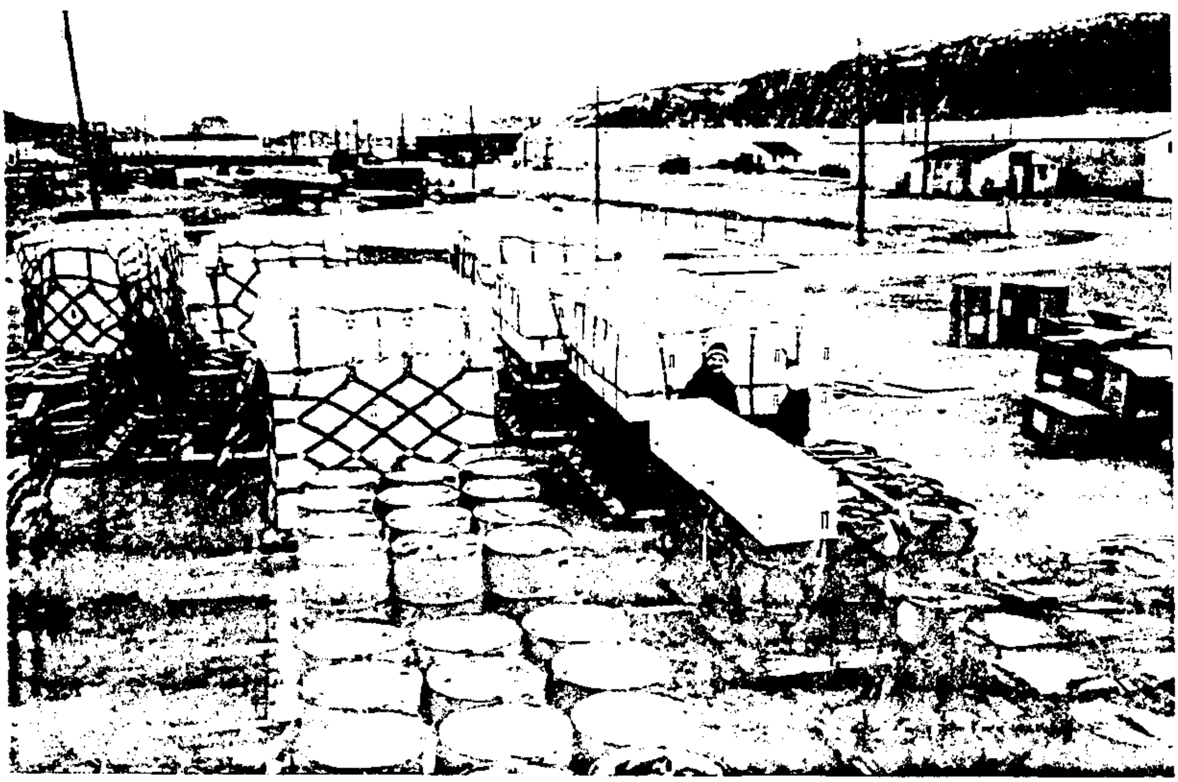
In addition the Taylor fork lift and 5-ton Dodge flatbed were again made available by GOC/Sonde. This provided flight-line cargo handling capability. Four bicycles and the limited local shuttle bus and taxi service rounded out our local transportation needs.

Communications:

Once again, communications proved to be the critical element for the success of the Sonde operations center. While GISP2 has two-way telex capability with CONUS it does not have voice or fax capability. Sonde operations provides the vital voice and fax, real time communications link between the remote camps and CONUS.

Communications with remote camps is by UHF radio, which is dependent on atmospheric conditions. Radio conditions were better than the past season with fewer blackout periods. Telex was used during radio blackouts but was inadequate for making real-time decisions because of the slow and indefinite message delivery. Overall, communications were good this season, and the loan of a portable earth station (from GOC/Sonde) for real-time telex was a tremendous help during busy flight periods.

In addition, communication and liaison activities with local officials and vendors were vital for the successful operation of the field camps. (For details of the different communications systems employed, refer to GISP2 communications.)



Over 81 pallets of cargo were shipped in 1993 to the GISP2 camp. (Photo: S. Lamont)

Cargo Movement:

Cargo was collected from four different carriers at seven different pick-up points, up to seven days per week at the height of the season. It was repacked, stored or palletized, and directed to its final destination.

A new tracking system was developed and employed that allowed for precise tracking of cargo on a per piece basis. This dramatically increased accountability in assuring timely procurement and delivery of resupply items.

In terms of volume to and from CONUS, SFJ received over 81,000 lbs and retrograded over 62,000 lbs of cargo. Cargo between SFJ and GISP2 was over 523,000 lbs deployed and 143,000 lbs retrograded.

As mentioned above, the weather was unseasonably cold in January and February and continued this trend with freezing temperatures and snows through late June. Unusually high precipitation brought us from winter cold to a problem with flooding. Our normal cargo staging areas quite literally became small lakes. Permission from the base commander to temporarily relocate provided temporary relief and extra work. We were not able to reclaim our staging area until late July.

Personnel Movement:

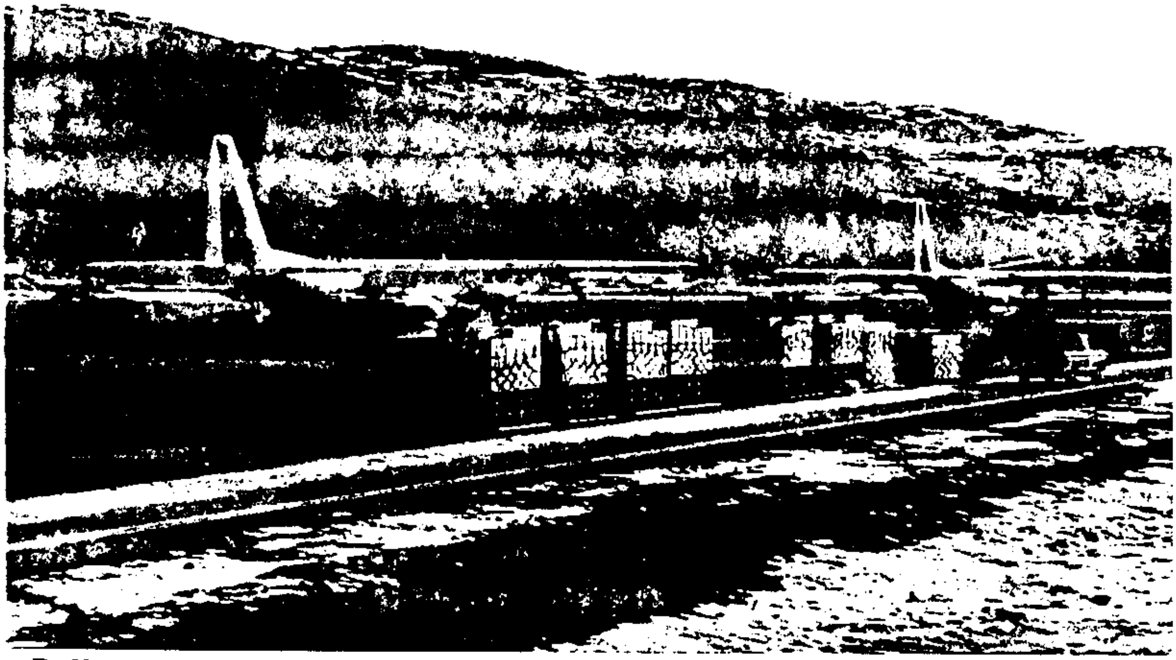
Of the total 176 pax moved to and from SFJ for all projects, 124 of those traveled to the GISP2 camp. Personnel arrived via MAC, 109th, and commercial carriers. Pick up and delivery of passengers to airplanes and providing local transportation for meetings and resupply errands were a normal part of the daily routine. Military and commercial travel bookings within Greenland and for return to CONUS were also coordinated through the SFJ office.

Procurement of On Base Supplies:

After request for resupplies were received from remote camps, items were identified for on base purchases. Items that could not be purchased on base were immediately requested through UAF Logistics.

Coordination of Aircraft:

There were nine flight periods during the season. Eight flight periods were in support of GISP2. The ninth was a training period for the 109th at the DYE 2 Skiway. Pre- and post- flight meetings were attended by GRIP, PICO, and 109th representatives. This proved effective as a forum for open and ongoing communication between all parties. Meetings were held to determine the exact scheduling for local flights and often changed daily due to weather. Establishing the number of flying hours needed and signing off on actual flight hours was the key function of these meetings.



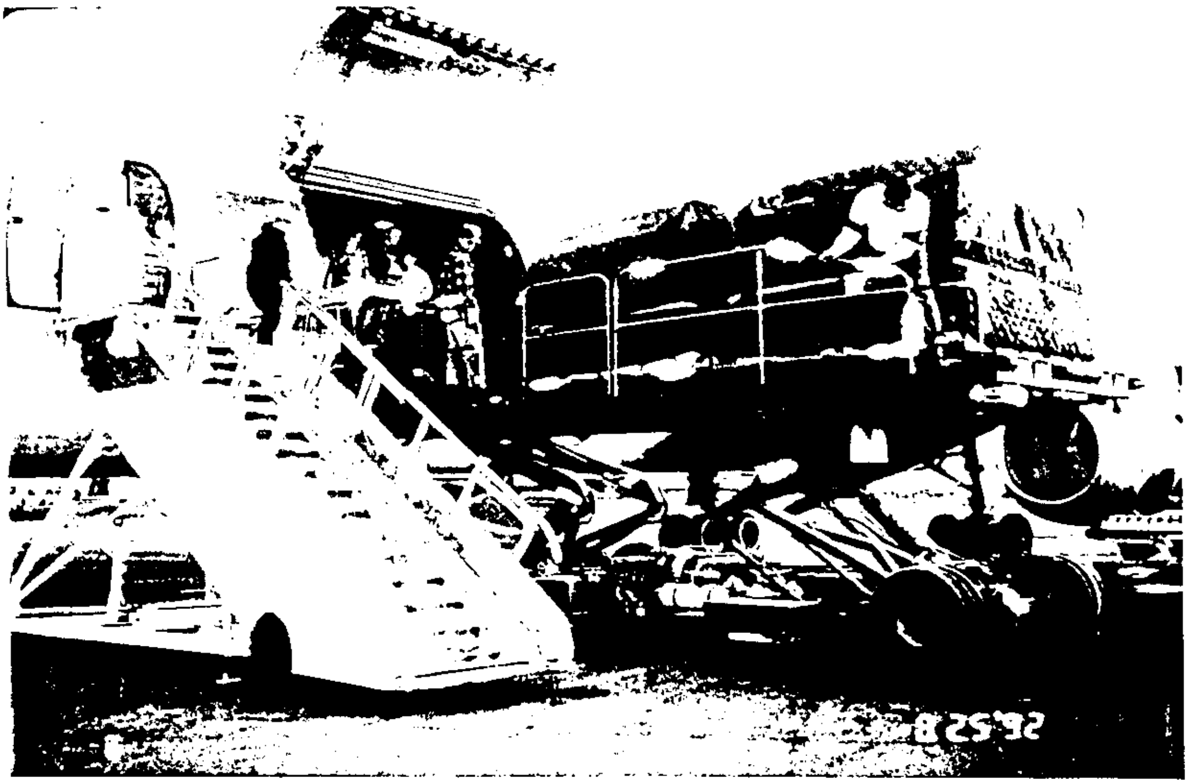
Palletized supplies and equipment staged for debarkation to the GISP2 camp. (Photo: S. Lamont)

Ice Retrograde

The plan for special handling procedures and precise coordination of aircraft developed by PICO Logistics was implemented in SFJ to safely receive, store and transport thirteen pallets of ice cores and other samples. PICO engineers working with data from the SMO and private vendors of cold storage containers provided continuous thermocouple temperatures monitoring to insure cargo safety. A vapor barrier and insulated blanket system was engineered and provided to increase the safety of the ice at ambient temperatures.

Due to a deteriorating world scene, the USAF SAAM scheduled for this task was canceled 24 hours before its scheduled arrival at SFJ. A delay would have been very costly in terms of rescheduling of manpower and equipment. Immediately implementing an established contingency plan, PICO provided alternative air transportation using a civilian charter. The ice was loaded and shipped on schedule.

A DC-8 was chartered for retrograding the ice and drilling gear to Denver, Colorado. The ice palletizing, transfer and loading took four hours. This operation went very smoothly as a result of thorough pre- planning and an on site rehearsal. This shipment totaled 45,000 lbs, and was a non-stop flight from Kangerlussuaq to Denver. The plane was then met by refrigerator vans to transport the core to the Denver Ice Repository. The drilling equipment was forwarded to PICO/UAF.



Two of the thirteen ice core pallets being loaded on a chartered DC-8. (Photo: S. Lamont)

GISP2 1992 SUMMARY

15 March through 30 March: Søndrestrøm staff cleaned up and made necessary repairs to the PICO facilities, and began preparing for the arrival of GISP2 and DYE 2 personnel and cargo. Warm storage equipment was retrieved from the central warehouse and the remaining elements of communications were set up. This included phone, fax, commercial and DSN phone lines, telex, and UHF and VHF radios.

Although resupply agreements and service agreements were reestablished, the ability to get needed supplies and services locally was greatly curtailed by the drawdown prior to the im2pending closing of the USAF base at Søndrestrøm.

30 March: The GISP camp manager and skiway operators arrived to assist Søndrestrøm staff with preparations for GISP2 and DYE 2 put-in on 13 April. Unpacking and inspection of the DYE 2 portable camp and of the GISP2 warm storage items began in preparation for the arrival of the main camp staff.

6 April: Sixteen camp support staff and drilling staff arrived in Søndrestrøm to begin staging cargo and supplies for 13 April put-in.

12 April: The DYE 2 put-in flights were successful, and radio communications with SFJ and temporary life support were established by five PICO staff. The two skiway operators remained to complete setting up the facility.

13 April: The GISP2 put-in was successful. Two C-130 flights, each limited to 10,000 lbs (due to the unprepared skiway) supported this opening. Seventeen camp members (including three ATM personnel) were involved in establishing the camp life support systems as well as radio communications with Søndrestrøm.

20 April: Three ATM staff traversed to ATM and began opening the site.

26 April: Following thirteen days of camp set-up, drilling preparation activities began. Logistics and drill crew activities included: repair track on 931 Cat; install front differential on Tucker Sno-Cat; dig out cargo line; repair an maintain Hermen Nelson heaters; repair and maintain snow machines; repair and maintain Yanmar snow blower; work on heat exchanger unit on water melting system; prepare surface and erect berthing tents; erect science weatherport.

4 May through 10 May: Science personnel began arriving in Søndrestrøm for deployment to GISP2. Science field facilities and core processing line set-up began. Eighteen personnel and over 73,000 lbs of cargo were deployed. Drilling preparation was begun. This included: assisting with flight period and pallet handling; modifying the 5.2 drill base to accommodate logging winch installation; installing a logging winch for USGS; measuring the butyl level in the borehole; installing the winch motor; shortening the prime mover hydraulic hoses; testing the fire prime mover and winch; welding the oil line for the camp generator #1; setting up for cable unspooling of main winch; unspooling winch cable; cutting off welded grooved drum on main winch.

11 May through 5 June: Twenty-one science personnel deployed and six redeployed to and from the summit. Science equipment and support supplies continued to be deployed to the summit.

Three flight periods with a total of five flights supported the camp during this period. Drilling preparation continued including: installing new bolt-on grooved drum on main winch; assisting with flight period cargo and pax; repairing winch hydraulic motor leak; spooling drill cable; digging out butyl sump at butyl farm; extending butyl farm power and sump enclosure; mounting winch in proper direction after spooling; setting up drill computer and butyl monitoring system; setting up butyl safety change room and unpack safety gear; issuing safety gear; assembling and testing various drill system components; fabricating and setting up core extraction tray; fabricating penetration drive; modifying and assembling drill string; testing drill communication; logging and reaming boreholes.

2 June: Deep-core drilling began.

3 June: Two pallets of ice cores from 1991 drilling were returned to SFJ for storage.

23 June through 25 June: Four pallets of ice cores and miscellaneous samples were returned from GISP2 to SFJ for storage. Science personnel change-out included twenty three people deploying to GISP and twenty redeploying.

9 July: Five-inch drilling operations were discontinued due to cable deterioration. Drilling for cores of opportunity and retrograde preparation continued. Preparations for early redeployment and camp closure began.

27 July through 31 July: Six pallets of ice cores were returned form GISP2 to SFJ for storage. With the cessation of drilling, science personnel continued closing up the core processing line and twenty-seven personnel were redeployed to SFJ bound for CONUS.

17 August: Two pallets of ice cores were returned from GISP2 to SFJ for storage. Final close-out of camp and over-wintering preparations were completed. The remaining camp personnel began to redeploy.

19 August: The final flight left the summit for the season. Between 17 and 19 August, thirty-two personnel were returned to SFJ.

22 August: Two pallets of science ice samples were returned from SFJ to Scotia, N.Y. for transport to their respective institution.

26 August: The 5.2-inch core stored in SFJ was loaded on a chartered civilian DC-8 for the National Ice Repository in Denver.

10 September: The DYE 2 skiway facility was closed, secured for the winter, and the two skiway operators returned with their equipment. This included the Thiokol Spryte which was returned to CONUS for a complete overhaul.

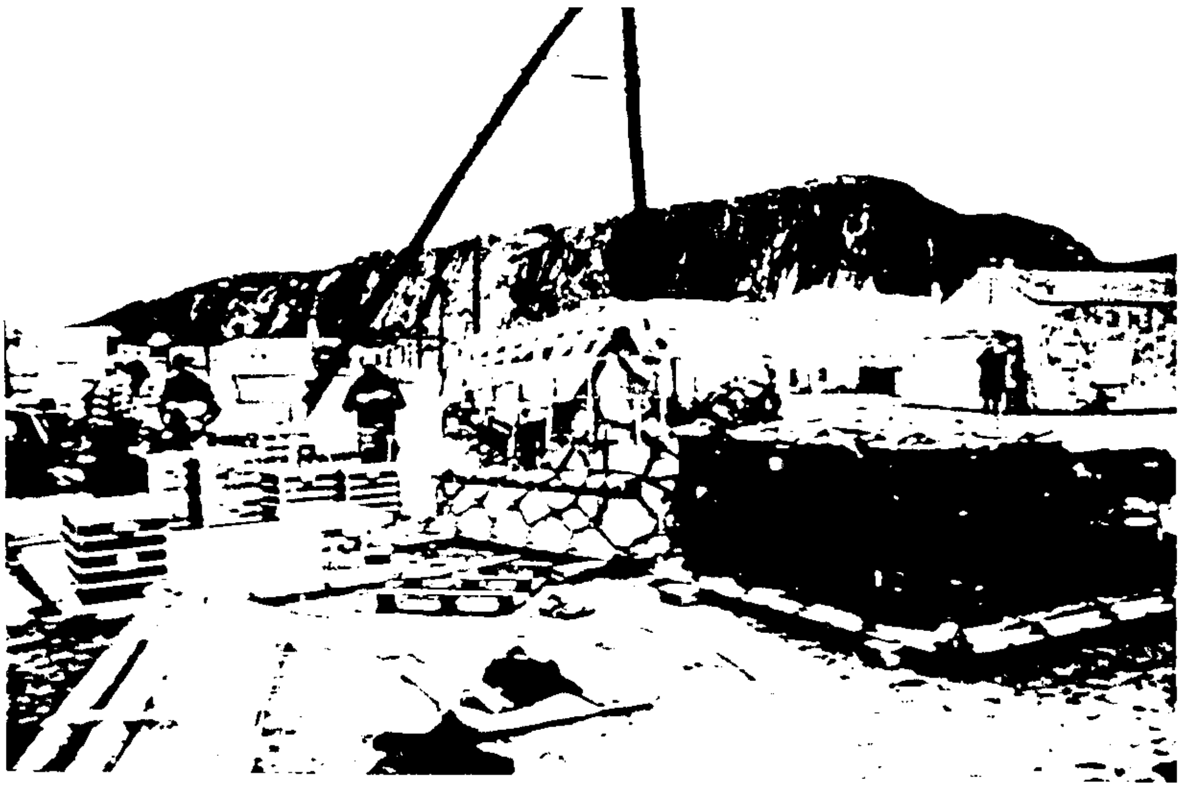
11 September: SFJ staff closed the office and departed for CONUS.

GISP2 CAMP OPERATIONS

Overview

Logistics proceeded as planned for the fourth GISP2 season. The camp was activated and operational with most structure shells erected by the second week. Drifting encountered from the winter was similar to previous seasons, however, during the season,weather was severe and the storms were relentless with constant winds and drifting snow. This pattern varied throughout the season and did not follow the experience of previous seasons. The blowing snow rarely allowed the surface to harden as it had in the past. Due to the drifting snow, many man hours were allocated to keeping pallet lines accessible and structures dug out. No major problems were encountered with the camp itself.

Staging for Put-In



Essential gear being staged for initial put-in flights. (Photo: B. Koce)

One week prior to put-in sixteen camp members arrived in Søndrestrøm. This advance group assisted with the staging for the first flights into camp. All Nansen sleds that had been returned to Søndrestrøm for maintenance were repaired which included: replacing broken slats and ties and applying three coats of linseed oil. The communications equipment was inspected and batteries charged with individual radios tested. Food was purchased and packed for the initial deployment to camp. All survival gear was inspected, survival stoves repaired and tested, and survival bags packed. The camp doctor inventoried and packed camp medical supplies and conducted medical briefings. These briefings included: altitude sickness, diet, cold injuries, and UV protection. General camp supplies were broken down from pallets arriving via MAC. Supplies were reconfigured for the put-in pallets to come within the 10,000 lb ACL allocated for each of the two initial flights. Work teams were established, and tasks were reviewed and assigned for the camp put-in.

Put-In and Phase-Up

Weather during the put-in flight was exemplary at the summit with temperatures at -25°C, no wind, and the sun shining. After landing at GISP2 camp, and prior to the C-130 taking off, communications were established with both the aircraft and PICO Søndrestrøm using a portable South Comm-120. Once the initial assessment of the camp was completed, work teams began working in their assigned areas. Digging out and activating the generators went smoothly although the drifting was to the top of the roof. The Big House was opened and heated by late afternoon of the first day. Some of the equipment took more time than anticipated to get operational. The Tucker Sno-Cat was not running until the following day, but could not be utilized at the onset of the season until the front axle was replaced. Three of the Skidoos started without complications after recovering them from the storage berm; however, the remaining Skidoos stored in the drill dome required heating and/or needed the batteries boosted. The new Caterpillar 931 needed to have one of the track pins replaced that broke during the last day of pull out in 1991, which was completed by the end of the first week.

Week One Activities, 13-20 May, 1992

HF radio, telex, and weather instruments were operational and main generators activated. The Big House, shop, storage WeatherPort, drill dome, bath house and generator modules were opened. The 1991 Caterpillar 931, eight Skidoos, and the Tucker Sno-Cat were all operational. Four WeatherPort structures used for berthing were erected.

Completion of Put-In, 3 June 1992

Within the first three weeks of phase-up, all heated WeatherPorts were erected, and all structures activated, power was available to all required locations, and the camp was functioning as designed. The drill winch and prime mover were in place and operational.

Equipment Repairs

The heat exchanger for the snow melter loop was removed, serviced, and reinstalled. New bleeder valves were installed at the high point of the melter loop allowing complete circulation through the melter. The exhaust stacks on the generator were raised and air intakes modified. The new track link for the new 1991 Caterpillar 931 was installed, and the Tucker Sno-Cat differential, and batteries were replaced. The compressor for the freezer required recharging and operated without failure throughout the season. The snowmobiles required normal maintenance with exception of the older 1984 models. The older Skidoos, heavily used throughout the season, required continual maintenance and repairs.

Generator Module Repairs

During June, generator fuel consumption increased by 15%. The exhaust stacks began to spew threatening black smoke. Inspection of the 3116 Caterpillar generators showed that the injectors were carboned up, and it was determined that restricted air flow was causing an improper fuel mixture. The exhaust stack and air intake shaft were both modified to improve air flow. The engine air intake filter was replaced, and the filter on the intake shaft eliminated. The number one engine had the injectors replaced due to excessive carbon build up caused by the incorrect air/fuel ratios. These modifications allowed an ample supply of air into the generator room, and fuel consumption returned to normal. The air intake/exhaust system had worked satisfactorily in past seasons. It is speculated that snow build up and drifting patterns precipitated this problem with the air flow. We had no further problems with the generators during the field season.

Camp Infrastructure

Generator Module:

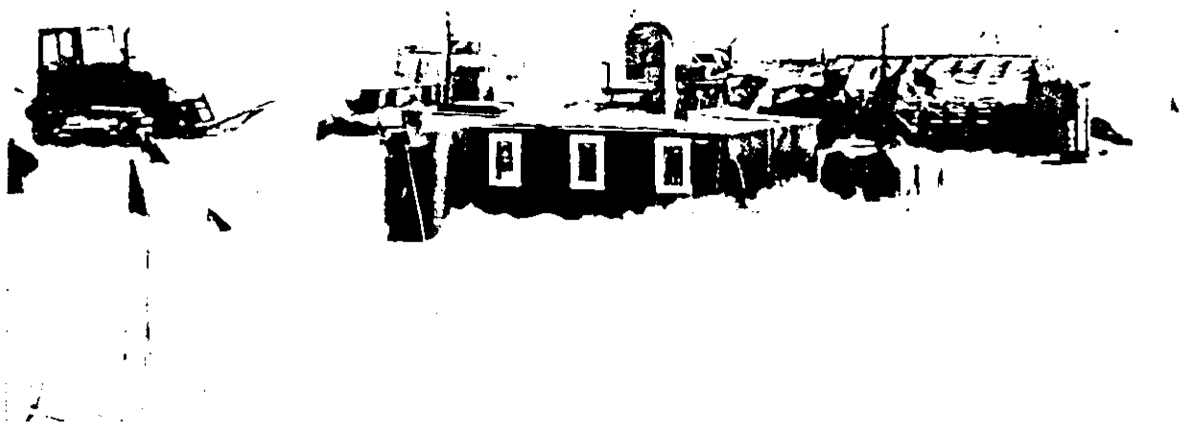
The 125 kW Cat diesel generators maintained an average output of 45 kW to 50 kW with a surge of 65 kW when the compressor for the freezer was in operation. The weather stripping on the door was replaced to prevent snow filtering in. The mufflers were removed, cleaned, serviced and exhaust pipes lengthened.

Power Distribution:

The above-ground power lines leading to the Drill Dome from the end of the CPL entrance were stressed by the weight of the accumulated snow. The power cables feeding the Drill Dome came in contact with and bent the refrigeration piping. The main high voltage feed lines from the generator module to the transformer room were in good shape. Other than a few minor leaks in the roof of the transformer room, and the cables becoming a little tighter at the disconnect boxes, all were still in good condition. The cables in the trench were more stressed than last season but functioned as in the past with no problems. This cable stretching bears close monitoring and may cause some cables to become disconnected if settling increases much more.

Bath Module:

No major repairs were required in this area. The bath module was completely drained at the close of the 1991 season preventing any winter-over damage. The bath module seems to have settled evenly maintaining the correct pitch for the sewer outfall line. The bath and generator modules have settled about 1° to the west. This is not yet a concern.



Generator, bath, and shop facilities at GISP2. (Photo: J. Klinck)

Snow Melter:

Attached to the generator and bath modules, the melter functioned considerably better after the heat exchanger was serviced. The daily water consumption for GISP2 has averaged between eleven to thirteen gallons per day, per person, for the past three years. This figure included showers, toilets, dishwashing, and laundry. GISP2's water usage is substantially less than any camp of this size which translates into significant fuel and labor savings.

CPL Trench Freezer:

A minor freon leak required the compressor to be recharged at the onset of the season with an additional boost mid-season. As designed, the freezer maintained a temperature of -20°C for the entire season. Anticipated repair parts are either in place or ordered.

Trenches:

The main access stairs to the CPL and other trenches were relocated at the end of the '92 season. The stairs and landing were removed, the snow dug out, and the stairs moved back three feet to compensate for the roof settling. This should afford ample head room during the 1993 season.

During the 1991 season, two additional core storage areas were cut into the side of the relaxation trench. New racks were fabricated to accommodate the additional core storage. In '91 it was anticipated that there would be one to two feet of roof settlement in the storage area. Settling occurred but the roof never came in contact with any of the core racks during the winter months. The entrance from the main trench was lowered by eighteen inches to provide eight feet of head room.

Where the side trenches were cut in, there was major roof settling. The lowest portion was close to eight feet from the initial fourteen foot height. Some of the side labs had additional floor area removed to provide adequate headroom. As the CPL roof assembly continues to settle along with the main duct work, we may need to consider removing unused portions of this duct. This would be one option for adding head room during the final season.

Outside the trench, the intake and exhaust blower motors were removed from their stands to alleviate excessive drifting. These units were stored on the winter/over berm.

The access to the food storage trench was reconfigured and raised. This included a new dog house, a door, and additional stairs.

Drill Dome:

The height of the drifted snow around the dome averaged about fifteen feet. The dome had scoured 360 degrees making it possible for someone to drive a Skidoo around the entire circumference. There was minor spin drifting inside the dome, and the carousel had settled slightly. Neither took much effort to correct. Drift control at the dome was ongoing throughout the season.

Big House:

This is a kitchen, dinning, bath, and office facility. Upon arrival to GISP2, we found the Big House encrusted with eight inches of rime ice. Drifting extending from the west end of the structure was above the roof of the bath and generator modules. Drifted snow around the perimeter of the Big House was five feet the underside of the structure (originally twelve feet above the surface). The snow directly below the underside of the structure was about the same level as last season. There was no observable settling of the Big House, and all the doors and windows were operable. This structure is used for the initial berthing for both put-in, pull-out and required emergencies and has a seating capacity for dining of up to forty- five.

Berthing:

Five heated WeatherPorts are erected each season for berthing. These WeatherPorts provide open berthing with the exception of a small area for the medical/first aid room at the end of WeatherPort #1. Berthing space is quite cramped with less than sixty square feet per person and no privacy. The maximum berthing capacity in the heated units is forty; however,up to one-third of the camp members, at times, chose to sleep in unheated tents.

Water and Sewer Lines:

The main water supply lines were reconnected to the Big House and were fully operational all season. The sewer out-fall line also functioned well, only freezing up once during the early part of the season.

Skiway:

The prepared length of the skiway was increased by 5,000 feet for a new total length of 15,000 feet. This was done in hopes of increasing the ACL from the summit. The width was maintained at 200 feet. Per Air Force regulations, the approach flagging was also moved out to maintain the required two-mile approach at both ends of the skiway. In addition, two sets of six radar reflectors were placed in line with the approach flagging.

Pallet Line:

The winter over pallet line was 80% buried when we arrived; therefore, the entire pallet line was dug out, relocated and reconfigured on a new prepared surface. An alternative grouping was tried in hopes of mitigating drifting. Pallets were placed in two parallel lines with approximately 100 feet between the lines and each pod on the line. A pod consisted of four pallets, each sitting on two of four 55 gallon drums.

Vehicles

The 1991 Caterpillar 931C LGP Series II is a traxcavator with bucket and/or forks, which is used for loading and off loading aircraft, snow removal, and water production. This vehicle was brought in during the 1991 field season. Condition: excellent.

The 1982 Caterpillar 931 LGP traxcavator with bucket and/or forks was used for moving snow and cargo, loading/unloading aircraft, and water production. This aged vehicle has major mechanical problems and is generally used as a back-up. Condition: fair.

The 1987 Tucker Sno-Cat has a crew cab and small bed and is used for moving snow and grooming the skiway with a twelve-foot-wide groomer. This vehicle has also been used for pulling the ten-ton sled and as the main traverse vehicle. Two of the track assemblies will be replaced and the other two rebuilt. Condition: good.

Skidoo snowmobiles are used for local transportation and most traverses.

Alpine II	2 each	1989	Condition: fair
Scandik	3 each	1984	Condition: poor
Cheyenne	4 each	1991	Condition: good

The Cheyenne models all showed metal fatigue of the slide assemblies will need to be replaced for the '93 season. These spare parts have been ordered. The Scandiks are showing their age as they near eight years old; however, they are still easy to start and have given us very good service.

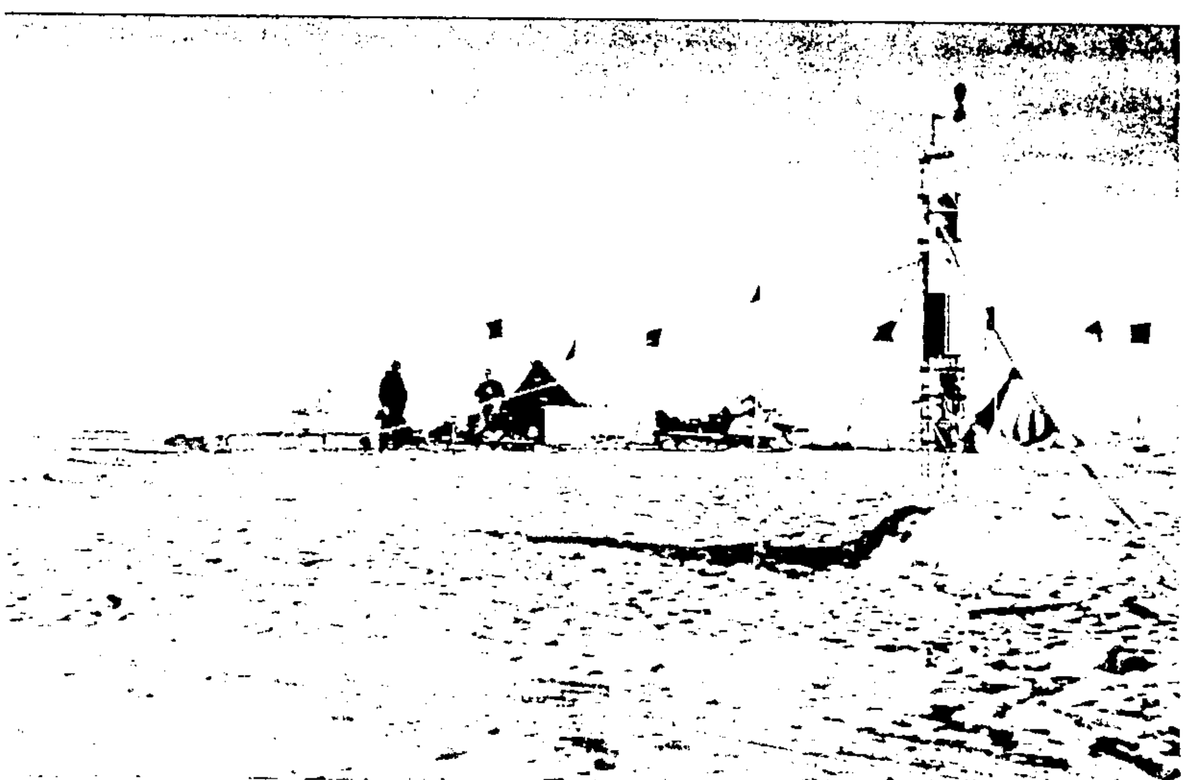
The Yanmar snow blower is a 3-cylinder, 23 hp tracked blower. Many of the rubber products on this machine have deteriorated due to the extreme cold conditions at GISP2 and will soon need new tracks. This piece of equipment continues to be invaluable to our yearly operations.

Fuel Consumption

	Diesel Gallons	MOGAS Gallons
Fuel on site 13 May 92	8,000	675
Average weekly use	1,169	121
Total used	19,876	2,055
Remaining on site 19 August 92	7,250	1,050

Traverses

Five Automatic Weather Station (AWS) sites from 100 to 175 km from the GISP2 camp were serviced. The trips normally took two to three days to complete, and in some cases, the traverses were combined with magnetometer installation or a data retrieval traverse. The AWS sites were visited to remove weather booms, raise the towers by two sections, re-reinstall the booms, test, and confirm the AWS operation. Normally, we used two Skidoos with sleds, which were packed with science equipment and life support supplies for one week of travel. Two to four people went on each traverse. Traverses are generally successful and uneventful; however, this season, one traverse member suffered a broken leg.



Automatic Weather Station Site. (Photo: J. Klinck)

Communications

GISP2 maintained communications with, but was not limited to, the following locations:

SITE	TELEX	FREQUENCIES
GISP	INMARSAT C. 0581 493134010	
Kangerlussuaq	INMARSAT C. 0237408661	
PICO/UAF	INMARSAT C. 0237408661	
DYE 2		4753 KHz primary 8093 KHz secondary
ATM		8093 KHz primary 4753 KHz secondary
Traverses		4753 KHz primary
Local, GISP2		152.0125 MHz primary 148.0125 MHz secondary

The primary high frequency (HF) communication equipment are ICOM M-700 and Southcom-120.

Difficulty was experienced in the Big House with VHF reception from GRIP and ATM. These transmissions could be heard on most of the other VHF radios in camp but not on the unit in the Big House. We believe we have traced the problem to the antenna: therefore, a new type of antenna will be installed and tested during the 1993 field season. Propagation continues to improve for high frequency (HF) communications as solar flare activity decreases. All hand-held and base VHF radios were modified to include the GRIP VHF frequency.

During times of poor propagation the telex was the only means of communicating with PICO Sonde. The telex was especially effective when PICO borrowed the mobile unit from GRIP giving us real time telex capability with the PICO Sonde office. It is strongly recommended that an additional two Inmarsat C terminals be purchased in order to provide real-time telex during times of emergencies and flight periods.

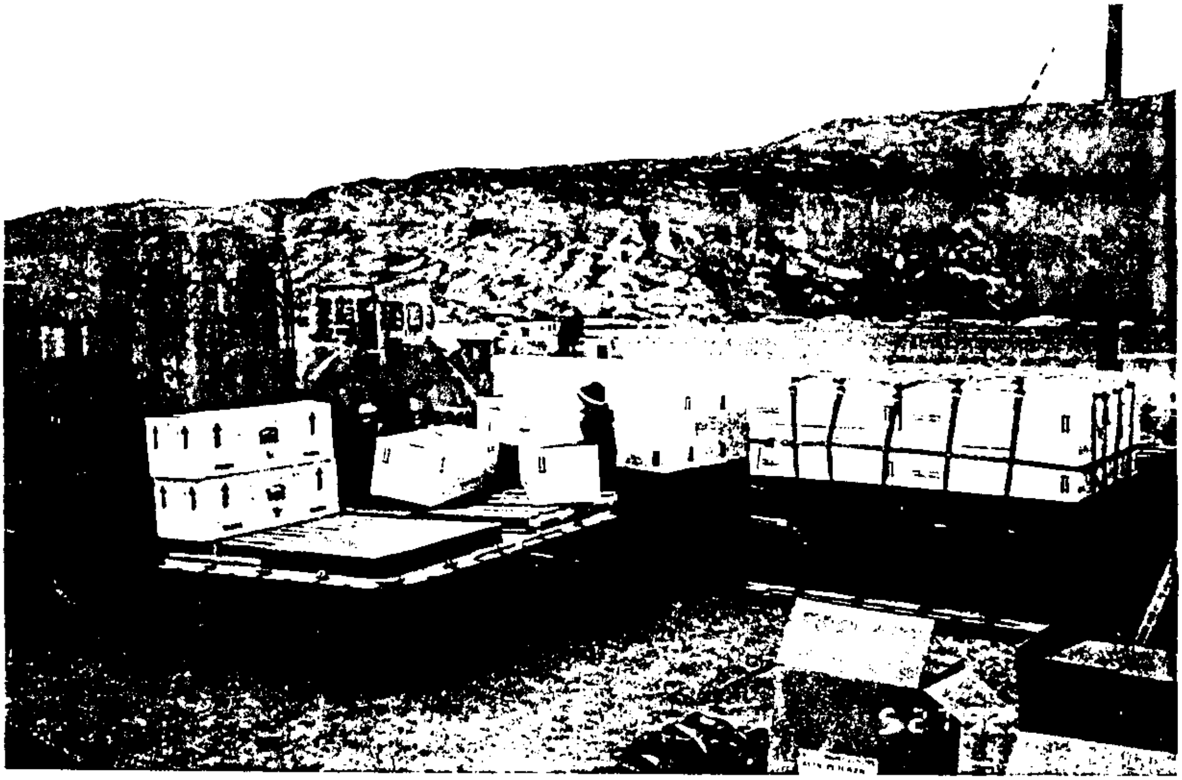
The GISP2 camp is one of the few U.S. stations in the world that does not have voice communications back to a commercial phone network. This is quite difficult for many of the camp members not being able to directly speak with associates or loved ones for a period of up to five months. Over the past field seasons, it was necessary to fly out several camp members to Søndrestrøm in order to deal directly with family or personal issues.

Flight Operations

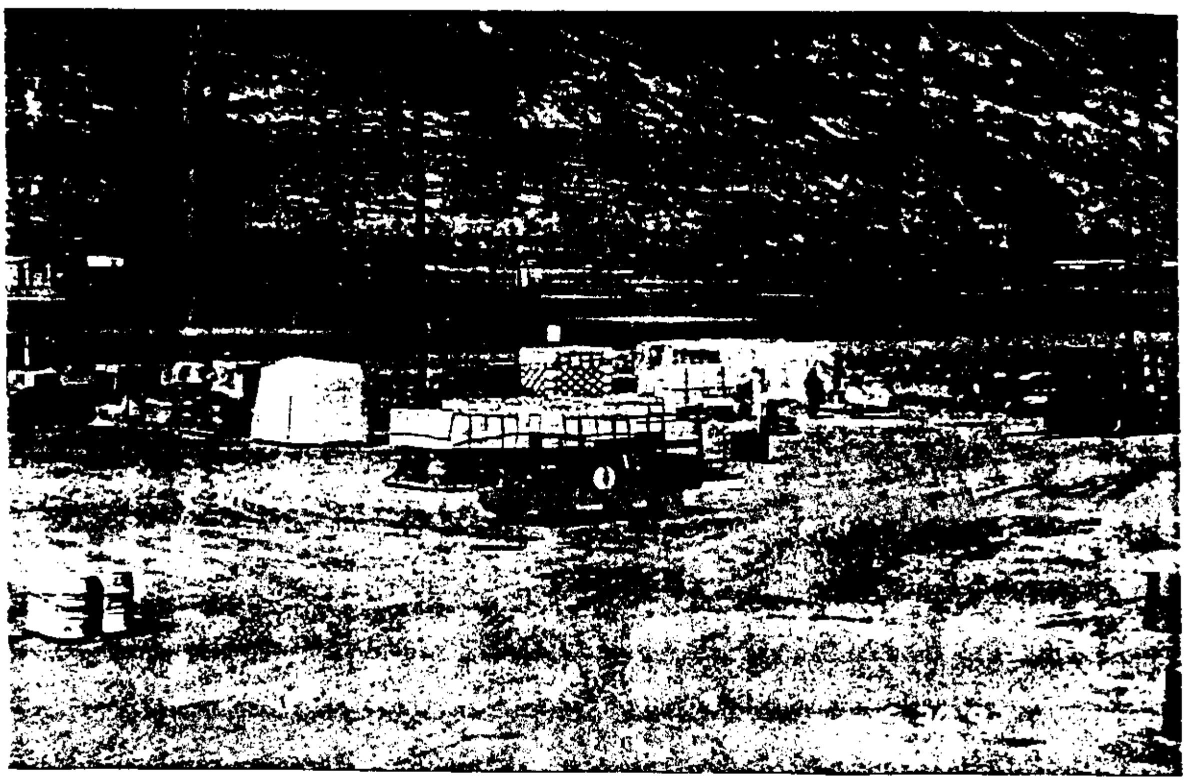
Flight operations this season were successful and no flights were turned around due to poor weather conditions. Continuing snow storms and unseasonably cold temperatures prevented the skiway surface from reaching the standards realized in previous seasons. At times, this reduced the retrograde ACLs allowed by the 109th to 5,000 lbs. The retrograde ACL always varies depending on pressure, temperature, winds, and skiway surface conditions.

109th Air National Guard C-130 at GISP2 offload ramp. (Photo: W. Tobiasson)

Flight Periods	PAX/Cargo In	PAX/Cargo Out
#1 = 2 flights	17 PAX 20,000 lbs camp gear, food & SMO gear	1 PAX
#2 = 3 flights	18 PAX 73,202 lbs 19 k DFA, 20 k SMO gear and general supplies	4 PAX 16,530 lbs empty drums and garbage
#2a = 2 flights	8 PAX 25,500 lbs drill string, core tubes and boxes	2 PAX 2,542 lbs 1,000 meter winch and cut drum
#3 = 2 flights	12 PAX 27,330 lbs DFA, MOGAS, oil and core boxes	2 PAX 7,200 lbs empty drums
#4 = 1 flight	4 PAX 25,000 lbs DFA	9 PAX 14,100 lbs ice core and 10,000 empty drums and garbage
#5 = 3 flights	43 PAX 71,620 lbs nBA, DFA, core boxesand general supplies	24 PAX 22,400 lbs Ice core, baggage and empty drums
#6 = 3 flights	20 PAX 73,445 lbs DFA, Food and science gear	24 PAX 40,000 lbs ice core and baggage
#7 = 3 flights	4 PAX 50,125 lbs DFA, MAPP gas,MOGAS, core boxes & propane	35 PAX 36,569 lbs ice core, samples, science gear and baggage



Due to heavy workloads, scientists often volunteer assistance. Dr. Gisela Dreschhoff and Dr. Ed Zeller. Photo: S. Lamont



PICO staff assembling pallets at the Sondrestrom staging area for shipment to GISP2. Photo: S. Lamont

Medical Services

There was a single medevac as a result of a skidoo accident on a return traverse trip which occurred 42 kilometers north of GISP2. The individual was returned to the GISP2 camp and the following day was flown via the British Antarctic Survey Twin Otter to Søndrestrom AB with a broken leg. There were an additional 5 routine medevacs on scheduled aircraft for xrays. The Gamow bag proved to be a valuable device and was only used on occasion. An oxygen saturation meter was used to monitor each camp member's blood oxygen level for the first two weeks in camp. This device proved to be the most important diagnostic tool our medics had in preventing and managing potential life threatening altitude related illnesses.

Patient secured for transport from accident site back to GISP2 camp. (Photo: J. Klinck)

Emergency Medivacs	1
Routine Medivacs	5
Routine patient encounters	106
Gamow bag uses	11

GISP2 did not experience overloading as in past seasons. The total population this season did not surpass 63 people during the changeover periods. The 5 heated berthing areas consisted of 1,950 square feet giving an approximate 48 square foot space per person, during peak loading periods. The total bed nights at GISP2 were 4,233.

Flight Period 1	13
Flight Period 2	25
Flight Period 2a	27
Flight Period 3	41
Flight Period 4	48
Flight Period 5	53
Flight Period 6	31
Flight Period 7	0

Food Services

There were approximately 13,000 meals served at GISP2 this season, and a night shift meal was served for the shift workers. At the onset of the season, the camp had a permanent "house mouse" to take care of the kitchen and dining areas and washing dishes for the camp. This position was cut after the first month due to budget considerations. These duties were then divided among the camp members for the remainder of the season. The Big House has a seating capacity for dining up to forty-five: however, during peak periods, it has the ability to feed up to seventy people. This is accomplished by running meals on a shift basis for short periods of time.

PICO cooks prepare one of 13,000 meals. (Photo: J. Klinck)

1992 GISP2 Principal Investigators

Principal Investigator	Institution
Ken Taylor	Desert Research Institute
Martin Wahlen	Scripps Institution of Oceanography
James White	University of Colorado
Alex Wilson	University of Arizona
Gregory Zielinski	University of New Hampshire
Kunihiko Nishiizumi	University of California San Diego
Michael Ram	University of New York at Buffalo
Eric Saltzman	University of Miami
Charles Stearns	University of Wisconsin
Cliff Davidson	Carnegie Mellon University
Jack Dibb	University of New Hampshire
Anthony Gow	Cold Regions Research Exper. Lab
Pieter Grootes	University of Washington
Paul Mayewski	University of New Hampshire
Byard Mosher	University of New Hampshire
Richard Alley	Pennsylvania State University
Rodger Bales	University of Arizona
Michael Bender	University of Rhode Island
Randolph Borys	Desert Research Institute
Edward Boyle	Massachusetts Inst. of Technology
Robert Clauer	University of Michigan
Gisela Dreschhoff	University of Kansas

Phase Down

Eleven pallets of ice cores were retrograded this season to Søndrestrøm, destined for the Ice Repository in Denver, Colorado. Other ice and snow samples were also retrograded for return on a cold deck flight with the Air National Guard to Scotia, New York.

A dog house and additional stairs were installed for the frozen food storage area. Heavy equipment batteries were removed and stored on the floor of the generator room. They were then attached to an array of solar panels affixed to the roof of the generator module and should be fully charged and ready to use at put-in 1993. The drill winch and enclosure were left in place this season, in order for drilling operations to begin sooner. The frame of the winch enclosure was reinforced to withstand added snow loading.

Closing and Pull-Out

All tasks were completed prior to the last flight on 19 August. The snow melter plumbing was inspected, cleaned, and winterized. All vehicles were serviced and stored on the winter-over berms. Berthing, science, and drilling structures were dismantled and stored. The Big House plumbing was winterized and secured with windows and doors covered with plywood. All supplies were stored on the winter over-berms or in the red storage WeatherPort. Currently, there are twelve pallets of garbage plus 135 empty 55-gallon drums ready for retrograde or disposal instructions.

GISP2 DRILLING AND ENGINEERING

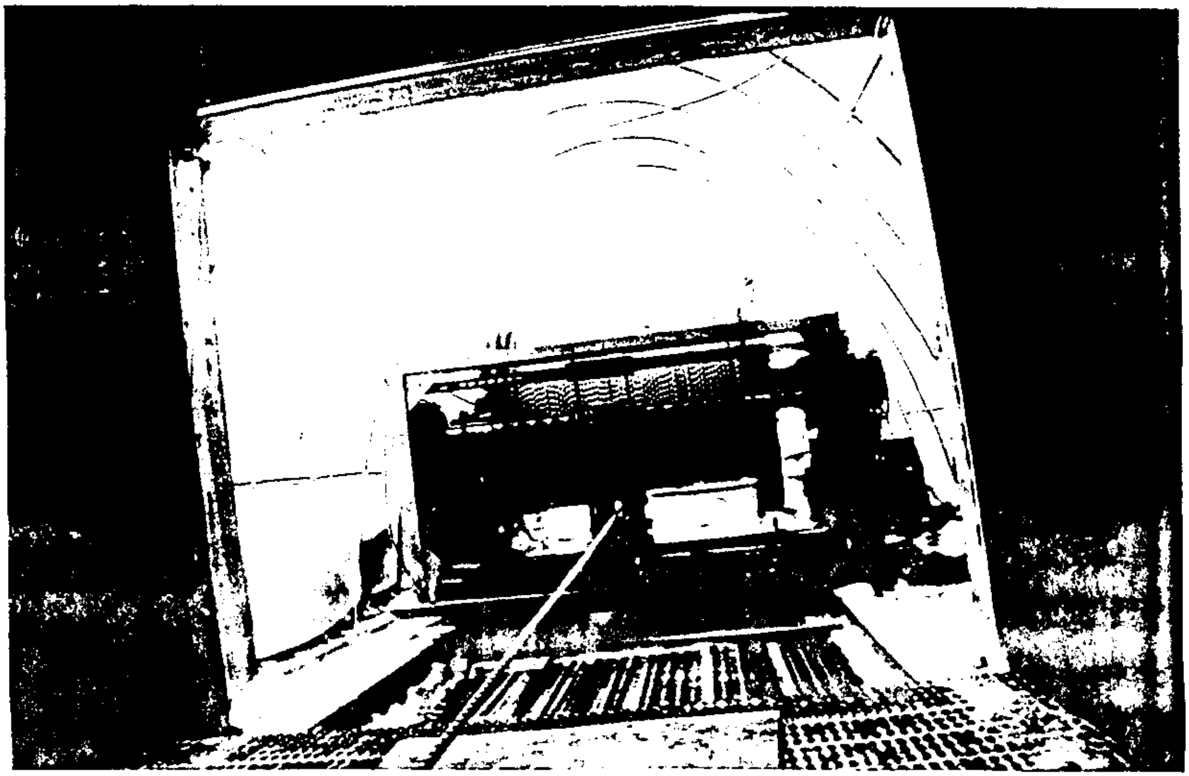
OPERATIONS SUMMARY

Field activities began 13 April with four drill personnel accompanying the camp opening staff to the GISP2 drill site. The first 13 days were spent assisting with camp open-up activities. Drill preparation activities commenced 26 April and continued until 2 June when drilling operations began. Core production continued until 9 July when cable deterioration dictated conclusion of the drilling activities. A depth of 2253.1 m was reached, and 742.5 m of 13.2 cm (5.2 inch) ice core were produced.

Preparations for the commencement of the GISP2 1992 drilling operations began May 27. Winch modifications occupied a great deal of this time period. Drilling personnel were also active participants in camp open up and maintenance. These activities continued throughout the entire GISP2 field season.

After establishment of basic camp requirements, the drill dome was dug out to allow access. Drifts 3-4 meters deep had to be excavated to allow access to the dome so construction and drill preparations could proceed.

The hydraulic winch used for the deep drill experienced several design flaws that affected both core quality and bore hole geometry. Much effort by PICO field drill staff was required to re-design and construct effective solutions to these difficulties.



4,000 meter hydraulic winch. (Photo: J. Klinck)

The winch motor experienced serious hydraulic leakage during the 1991 season and was brought back at the end of the 1991 season and repaired. The winch motor was installed after it was dug out from the winter over berm. This involved the construction of a lifting arm to install the 1000 pound motor. The installation was completed and the winch body moved into position for testing and cable un-spooling.

The level wind assembly that spools the cable onto the winch drum was improperly designed and needed to be replaced before proper cable spooling could occur. The old level wind assembly was removed and the new redesigned assembly installed.

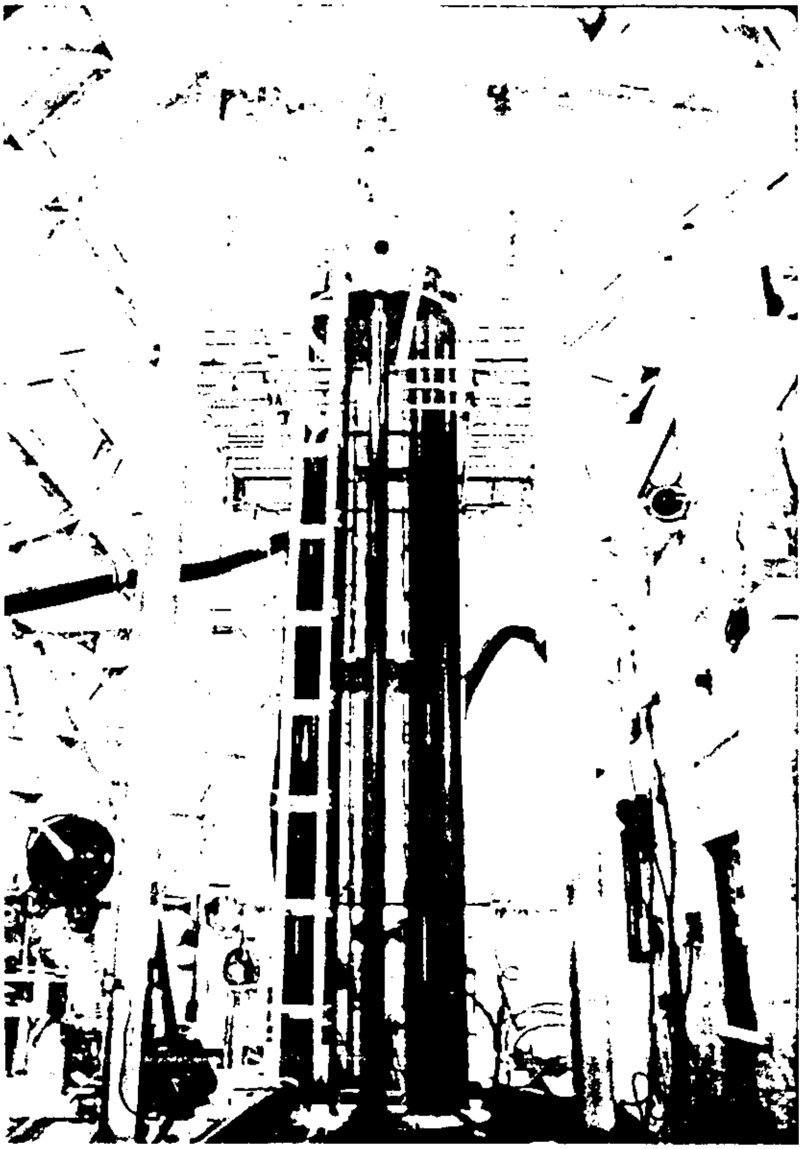
The prime mover for the winch was dug out from the winter over berm and brought to the drill dome where it was thawed out and serviced in preparation for initial testing. The power pig tail was installed to provide power to the prime mover to operate the starting aids. All filters and service elements were changed and checked. The prime mover was test fired and all systems checked. Hydraulic components were serviced and tested prior to un-spooling the 4000 meter long drill cable. After testing, an enclosure was erected around the prime mover to allow proper operation during periods of severe weather.

Due to improper spooling geometry it was necessary to replace the grooved drum on the main winch. This required unspooling the entire cable and cutting off the welded grooved drum in preparation for installing the new bolt-on grooved drum. The drum was installed and the drill cable respooled. The winch was then turned around into drilling position and the winch enclosure erected. A drill penetration drive was constructed and installed to allow an accurate control and repeatability of drill string feed rates. This allowed an accurate control over weight on bit which was the cause of excessive bore hole inclination problems encountered in 1991.

The butyl acetate recovery system was removed from storage and the site needed for it's installation was excavated from beneath 12 feet of drift snow. The auger system was cleaned and tested. Transfer pumps, centrifuge and butyl handling equipment were installed and tested. This allows the recovery of the drilling fluid contained in the chips. This recovery system recovered over 50 drums of butyl acetate during the 1992 field season.

Dome modifications to enhance safe handling of the core were made as well as changes to the core extraction tray that enabled the 6 meter long cores to be handled in a safe and efficient manner. Butyl acetate safety gear was issued and a butyl changing room erected for drillers and core handlers. A butyl acetate monitoring system was installed and tested. Safety meetings were held which covered safety requirements in the dome and camp.

The drill string was assembled and tested. It displayed communication errors that required that the instrument package data delivery rate be changed slightly. These changes were made and the drill string tested for proper operation. The bore hole logging winch installation and deployment was completed and the bore hole accurately logged for temperature and depth by the USGS. The drill string was then used for several additional logging runs to serve as a final test and drilling operation begun on June 2. The bore hole was reamed to ensure that no bore hole closure had occurred. Core production began June 6.



Drill carousel inside 52′ diameter geodesic dome. (Photo: J. Klinck)

The main problem during the 1992 season was the excessive wear of the Kevlar drill cable. A wax lubricant is applied to the Kevlar fibers to lubricate the fibers as they rub against each other. Butyl acetate, the drill fluid used to prevent hole closure, caused this lubricant to be washed off and the fibers began to wear rapidly until on 9 July several failures in the strength member were identified and drilling operations were stopped. Sections of the cable were removed to perform tensile tests to determine the extent of the damage. These tests revealed a reduction in strength of 60%. With this information, NSF decided to conclude the 1992 field season.

Despite the cable problems, the 1992 field season proved the effectiveness of the design modifications implemented in the drill. A new sealed motor canister improved motor life by allowing the motor to run in air instead of immersed in butyl acetate.

The cost for running the drill motors in 1991 was approximately $100 per hour. With the 1992 modifications, this was reduced to approximately $1 per hour.

There were no lost time accidents with the drilling operations in 1992. Safety protocol developed over the past field seasons has proven effective and manageable.

Closing of the drilling operations were approached with the thought of preparing for the 1993 field season as much as possible. The winch was left in place and winterized to allow for a quicker start up in 1993. A complete inventory and retro plan was developed in the course of closing up the drill dome.

OTHER PICO SUPPORTED ACTIVITIES

Atmospheric and Snow Sampling Site (ATM): Trench entrance structures were fabricated at GISP2, transported, and installed on both ATM trenches. Additional materials were supplied to support the trench roofs. All batteries were found to have discharged over the winter months and were returned to GISP2 for testing and recharging. Most of the batteries were usable after slow recharging which was completed over a three week period. Three new solar panel stands were constructed and twenty-five new posts were built. All tents, beds, sleeping mats, cooking facilities, and structures were supplied by PICO, which included pre-prepared frozen meals. ATM had two dedicated Skidoos for the entire season with fuel and maintenance supplied from GISP2.

Gisela Dreschhoff: Logistical support included transportation and accommodations for two personnel. All 4" ice cores recovered were retrograded to Denver, Colorado.

Bob Clauer Magnetometer Sites: Four magnetometer sites were visited and a new site was installed 175 km to the west. The site 130 km East of GISP was visited once. Two trips to the site 150 km north of GISP were made; the second to install additional batteries.

DYE 2 SKIWAY OPERATIONS

The DYE 2 Skiway is a facility operated by PICO to provide a training skiway for the 109th New York Air National Guard during the boreal summer. It is located at the abandoned DYE 2 facility east of Søndrestrøm at an elevation of 7,660'. Major responsibilities are to provide a continuously prepared skiway for training and emergency diversions, current aviation weather, and training support. Although self supporting, DYE 2 staff are available and often utilized between flight periods for needed support.

Aerial view of DYE 2 skiway. (Photo: J. Klinck)

Communications:

Providing communications for aircraft is one function of the DYE 2 camp. The camp operates on 4753 MHz, 8093 MHz and 122.8 KHz frequencies. DYE 2 camp also provides a valuable radio relay when direct contact is not possible between SFJ and CISP2. During radio blackouts, there are no communications to this camp. However, there are emergency transponder locators (ETL) on site in the case of an emergency.

Cargo Movement:

Initial seasonal set-up and take-down of the camp includes transportation of the skiway groomer (an LMC Spryte), routine life support supplies, and the skiway operators. No major cargo movement is required at DYE 2.

Personnel Movement:

Each season up to thirty-five people arrive at the camp for an Air Force Arctic Survival School called "Cool School."

Skiway Operations:

Preparing and maintaining the skiway throughout the season is the single most important task for the skiway operators. The operators were able to maintain the skiway at acceptable levels. This was accomplished only by hundreds of man-hours being expended to repair and maintain the aging Spryte. All other equipment performed satisfactorily.

Providing weather and ground communications for training flights was an integral part of the Skiway operation. Search and rescue communications were provided by the operators when a civilian plane ran out of fuel near the DYE 2 site.

OTHER PROJECTS SUPPORTED BY PICO IN GREENLAND

1992	Robert Clauer	3 pax	2,107 lbs cargo
	Gisela Dreschhoff	2 pax	1,035 lbs cargo
	GRIP	3 pax	0 cargo
	NSBF	30 pax	29,419 lbs cargo
	Bartol Research	2 pax	0 cargo
	Tad Pfeffer - UCB	3 pax	1,183 lbs cargo
	Graphic Institute	2 pax	0 cargo
	Falcons	4 pax	0 cargo
	Barry Weaver (Ascension)	4 pax	0 cargo
	NSF DV Visit	1 pax	0 cargo

CLOSING STATEMENT

The 1992 season ended only days before the closing of the USAF base at Søndrestrøm. The subsidized support enjoyed by U.S. projects in Greenland will be drastically curtailed and an increase in costs is guaranteed. PICO requested that projects operating out of Søndrestrøm continue to receive tax exempt status. We have received notification that this exemption will be granted, which will help to keep costs manageable.

The Greenland Home Rule government assumed full jurisdiction over the Søndrestrøm area on October 1, 1992. The new authorities intend to demolish the current PICO operations center. PICO has been involved in negotiations for alternate facilities and services with local GHR managers for the 1993 season.

The preferred designation for Søndrestrøm Fjord will now have the Greenlandic name Kangerlussuaq.