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PREFACE

This report has been published by the Polar Ice Coring Office (PICO) for the sponsors and participants of National Science Foundation-supported research in Greenland. The purpose of this report is to provide an overview of the 1994 Greenland field season and of PICO's activities during that season. The contents include a summary of events taken from the daily and weekly situation reports of the Greenland Field Center and PICO Operations at the Summit Camp.

MISSION STATEMENT

The Polar Ice Coring Office is a National Science Foundation contract with the University of Alaska Fairbanks for the collection of cores for scientific study. This tasking has expanded to encompass all aspects of drilling (ice, soil, rock), logistics, and research and development to meet the needs of the scientific community.

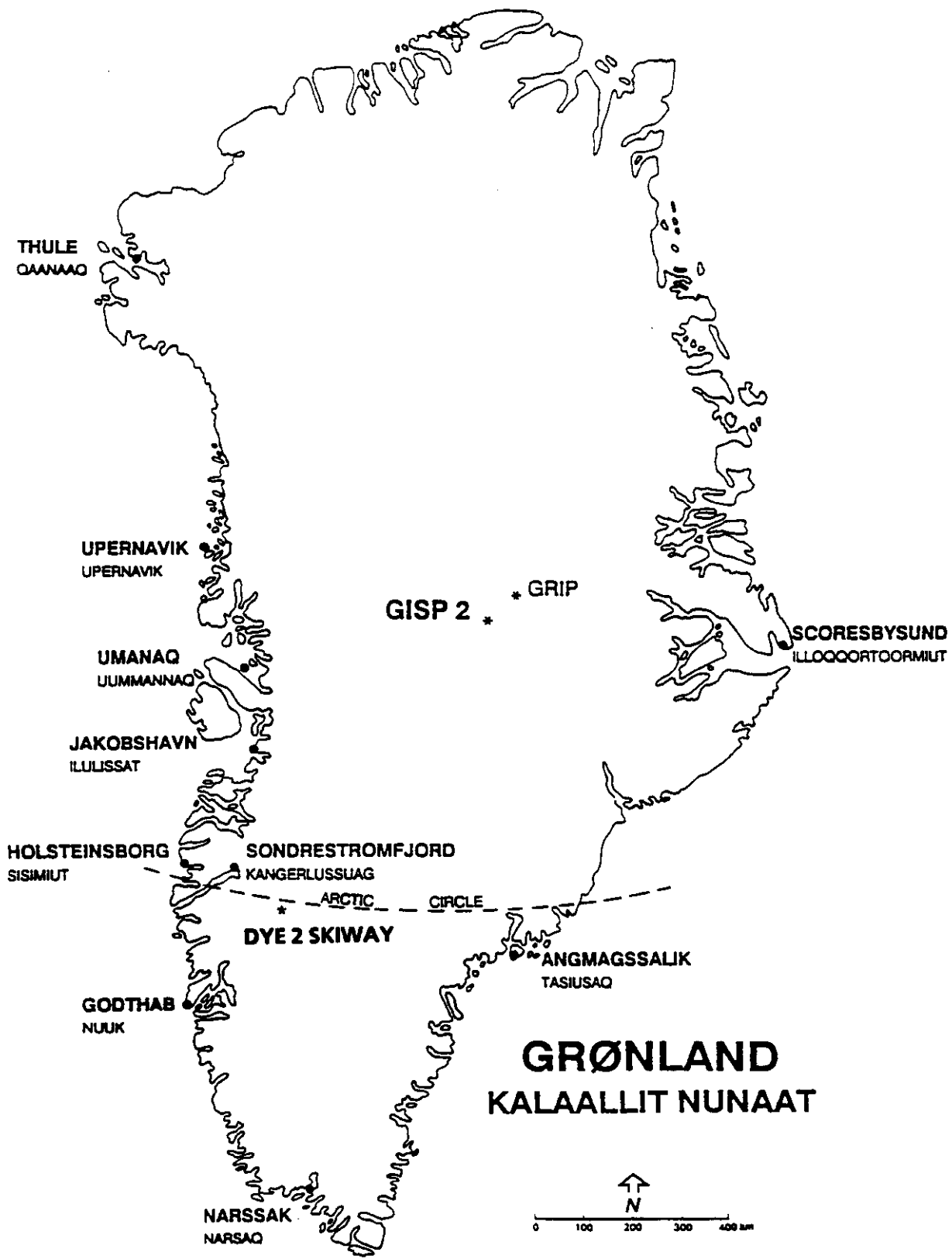
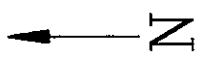
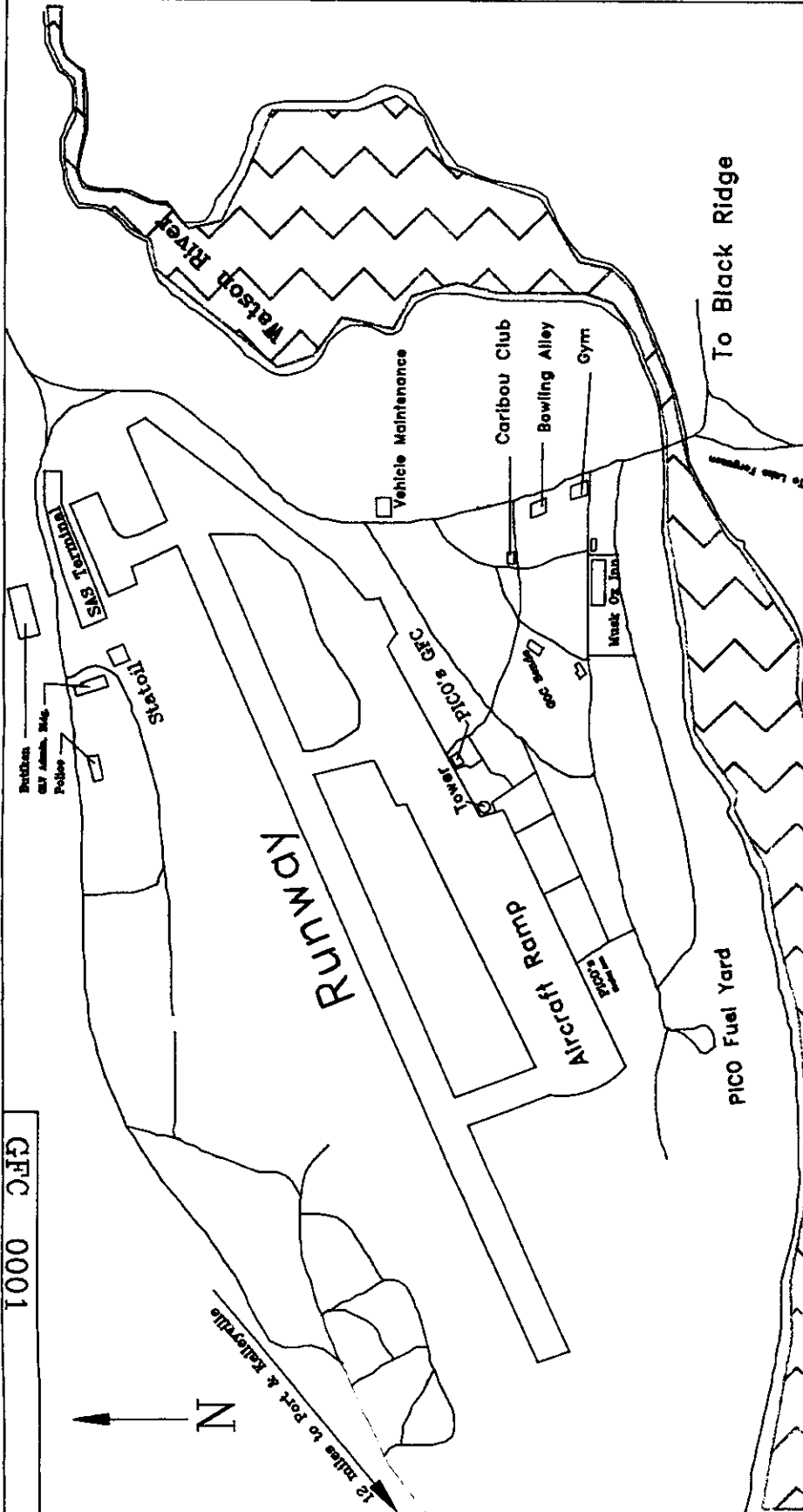


Figure 1. Location map of Greenland

GFC 0001



12 miles to Port & Kaktovik



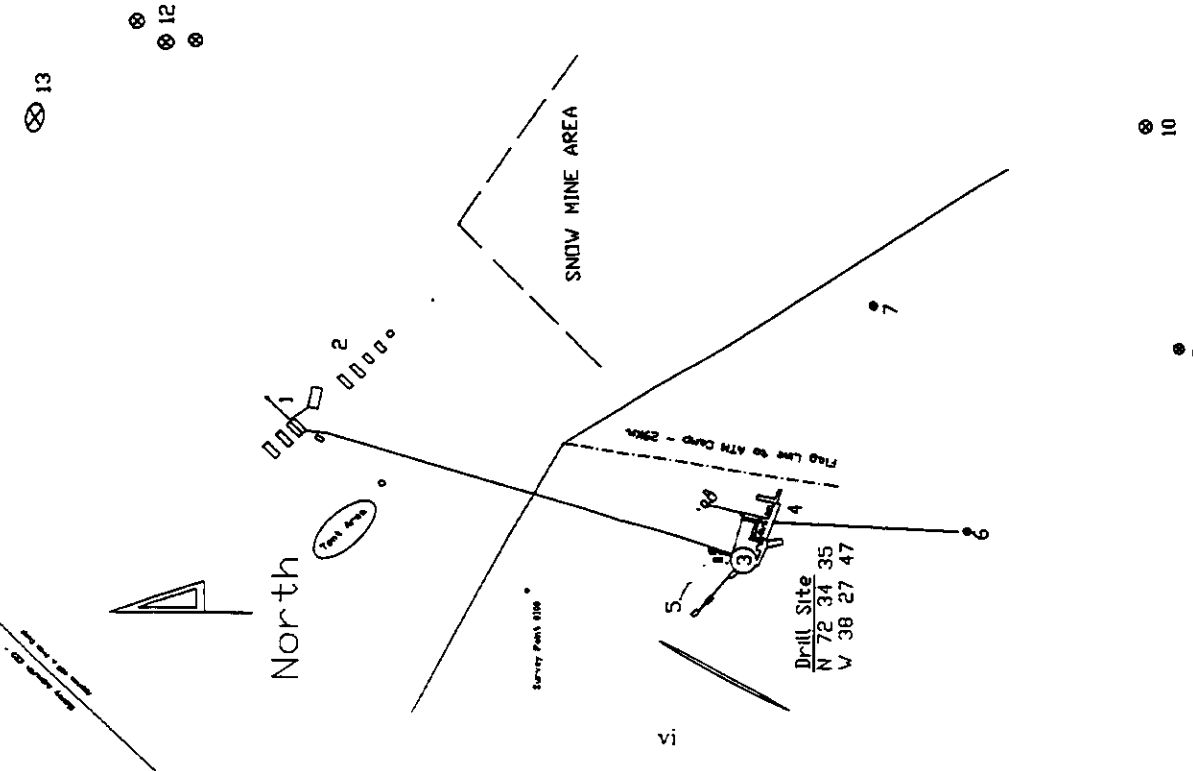
To Black Ridge

Polar Ice Coring Office
205 O'Hall Building, University of Alaska, Fairbanks, Alaska 99775-1710

Greenland Field Center Area Map

DATE	NOVEMBER 30, 1993	SCALE	NONE
DRAWN BY	TIG	CHECKED BY	
APPROVED BY			
PROJECT NO.	GFC 0001		

2000 GISP



- 1 Permanent GISP Buildings
- 2 Shipping Units
- 3 Drill Site
- 4 Science Facility
- 5 Alcohol Test
- 6 Univ. of Wash. Vapor Sampling
- 7 Univ. of Penn. Snow Pit 1
- 8 Univ. of Penn. Snow Pit 2
- 9 Univ. of Penn. Snow Pit 3
- 10 Univ. of Wash. AVS Site
- 11 Haz-Mat Site
- 12 Fuel Berms
- 13 Storage Barn

Scale in Meters

Polar Ice Coring Office
 205 O'Neill Building, University of Alaska, Fairbanks, Alaska 99775

GISP 2 Site Map

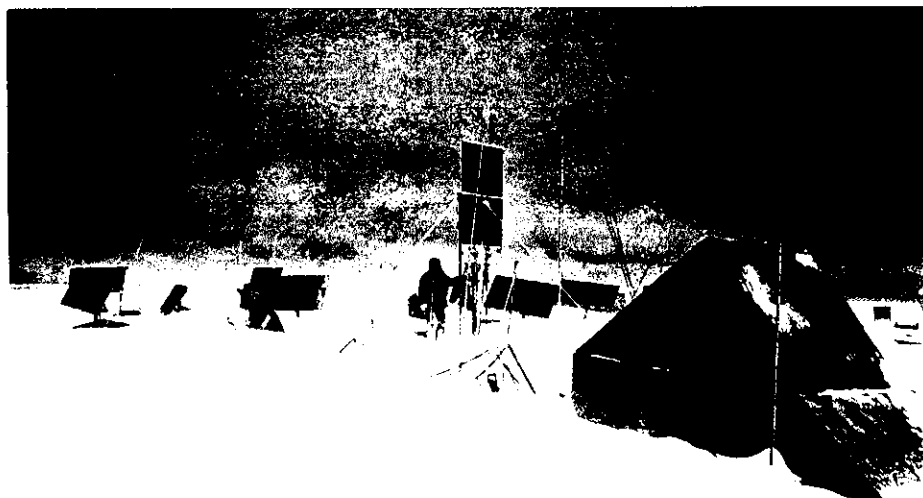
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INTRODUCTION

One of the primary objectives of Summit Camp this season was to begin phasing down camp operations from the old camp. In previous seasons the Summit Camp supported science and drilling activities for the GISP2 project in addition to several smaller science projects. This camp supported up to 60 people at a time. The primary scope of Summit Camp this season was to provide a clean air/atmospheric sampling and study facility with a camp population of up to 20 people.

In response to the new scope of science at Summit Camp, the old ATM site was relocated from roughly 30 kilometers away to a new location approximately 11 kilometers south of camp. Additionally, a new 70-foot atmospheric sampling tower and trench were constructed in camp to facilitate data/sampling acquisitions.

Another primary goal was to retrograde the garbage, obsolete and miscellaneous equipment, and 55-gallon drums which had accumulated during previous seasons. This objective was reached by transporting over 60 pallets (112 tons total) of retrograde cargo from the Summit Camp.



ATM clean air sampling trench and solar collectors. (Photo by Don Kahler)

OPERATIONAL CHANGES

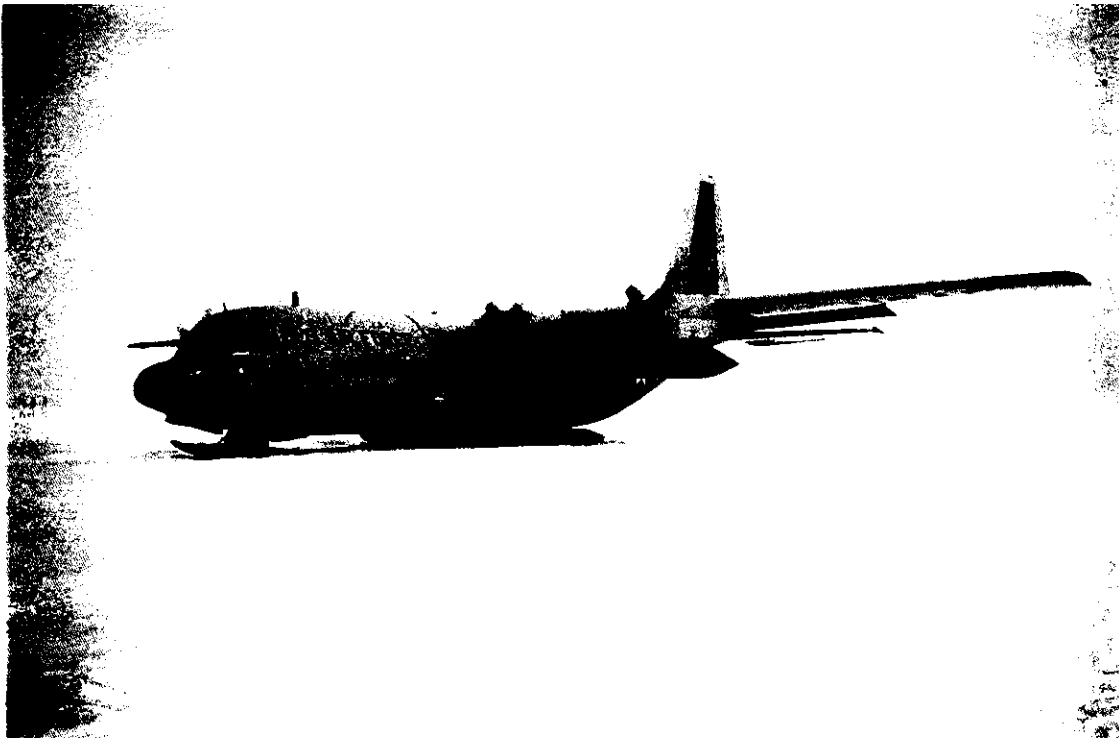
- This season, the Greenland Field Center (GFC) was staffed with two people, rather than three as in previous field seasons.
- PICO coordinated and paid for travel of all scientific personnel from their home institutions to Greenland and return.
- PICO coordinated and provided all meal services and berthing to scientific personnel, as well as PICO personnel, while staying at the GFC in Kangerlussuaq.
- Air Mobility Command support for passengers or cargo movements was not available by the Air Force; therefore all cargo was transported to and from Greenland via commercial freight-forwarding companies, SAAMs, or charters.
- Summit Camp was downsized to a 20-person atmospheric sampling camp, rather than a 40-person camp as in the previous field season. Due to this downsizing, the following changes were made:
 1. A new 50-kilowatt “mobile” generator was installed.
 2. Camp staff was reduced to five people rather than eleven, as in previous field seasons. Camp staff consisted of Cook, Mechanic, Medic, General Field Assistant, and Remote Camp Manager.
- A new ATM site was established, and an air-sampling tower was erected.
- Shop and food storage weatherports were excavated and reassembled on berms three feet above grade.
- The old bathhouse and generator module were sealed and abandoned.

FIELD SEASON SUMMARY

6-7 October	109th Arctic Planning Conference.
30 March	Advance team arrived at Kangerlussuaq, Greenland.
9 April	Chartered aircraft arrived.
10-16 April	Flight period 1: 1 flight.
12 April	Summit put-in flight.
21 April	ATM sampling tower raised.
24 April-7 May	Flight period 2: 2 flights.
24 April	Generator module delivered to Summit Camp.
4 May	New ATM site established 11 kilometers south of camp; new generator and snow melter on-line.
5 May	DYE2 put-in.
6 May	ATM sampling tower and trench completed.
9 May	Excavation of existing shop and food weatherport begun.
23-27 May	Flight period 3: 4 flights.
1 June	Completion of raising the old shop and moving into the new.
6-11 June	Flight period 4: 2 flights; traverses begun.
7 June	GRIP opened.
12-18 June	Flight period 5: 2 PICO and 2 GRIP/PICO flights.
22 June	GRIP closed.
1 July	Completion of raising the old food weatherport and moving into the new.
11-16 July	Flight period 6: 4 flights; traverses completed.
14 July	DYE2 closed.
15-20 August	Flight period 7: 2 flights; camp pull-out and closing.
20 August	Retrograde charter aircraft to CONUS.
30 August	GFC closed for season.



Heavy lifting, ski-equipped, summit-capable C-130 aircraft of the 109th Air National Guard continue to make high-latitude, high-altitude research projects feasible. The 109th's record for science support missions to the Summit of the Greenland Ice Cap remains at a remarkable 100% success rate.



FIELD SEASON OPERATIONS

GFC and Summit Camp Summary

In October 1993, representatives from PICO attended the Arctic Planning Conference held at the 109th New York Air National Guard (NYANG) in Scotia, New York. All flight requirements of the 109th NYANG and PICO's Greenland season were reviewed, and the flight periods were established for the 1994 field season.

Completed Support Information Packets (SIPs) for the 1994 season were received and reviewed to identify any ordering requirements for supplies and/or equipment. Additionally, the food order was revised to accommodate station loading at Summit Camp. From the SIPs, detailed field season plans were developed. These planning documents included timelines and work assignments for phase-up, camp operations, and detailed plans for resupply, communications, emergencies, and retrograde.

On March 30, 1994, four PICO employees arrived in Kangerlussuaq to open the GFC and start preparing for the field season. This team included two of the GFC staff and two Summit Camp members.

It was discovered upon arrival at GFC that the steam piping for heating had frozen and burst, causing considerable damage within the building. Most of the carpet was either wet or frozen, and the entire facility had a very bad odor. This required a complete cleaning of the entire building from floor to ceiling, which consumed the first three days of activities by the PICO staff. All linens, pillows, and sheets required laundering. The Greenland Airport Authority (GLV) shampooed all carpeting after the first flight period was completed.

The following day's efforts were spent checking gear for the initial Summit Camp put-in. This included checking all communications gear, reviewing all medical supplies, packaging food, and palletizing all supplies. Due to the unknown landing and snow conditions at the Summit Camp, the put-in flight was limited to 10,000 pounds.

The GFC staff assisted the Summit Camp staff when necessary in preparation for the put-in flight. Only two PICO staff members manned the GFC instead of three, as in previous seasons.

GRIP and PICO once again shared the forklift and flatbed truck throughout the field season.

All fresh-food items were supplied by the Butik, the local store. A fresh-food order was normally placed two weeks prior to the time a flight period began and was delivered on the next available flight to Summit Camp and DYE2. The bulk-food order, which was placed at the beginning of the season and consisted of frozen and dried products, was put out to bid and purchased in CONUS. The initial order, delivered on the charter flight,

was broken down and packaged by flight periods and then sent out to the respective camps throughout the field season.

With the exception of minimal supplies of synthetic oil, greases, and two-cycle oil, most fuel and oil products were supplied by Stat Oil and GLV, as was done during the previous season. JP4 was supplied to the 109th Air National Guard through GLV with a minimal per-gallon handling fee.

GLV provided extremely prompt and professional maintenance services, as they did last season. This included, but was not limited to, welding, vehicle and building maintenance, and numerous other services. Although these services were available last season, the level and quality of service this season was greatly improved. The attention PICO received, especially last-minute requests, was eager performance on a timely and professional basis. Turnaround projects, repairs, or requests that required completion prior to the ending of a four-day flight period were given extra attention.

A single Summit Camp put-in flight was scheduled on April 12. A team of eight, consisting of five PICO staff members and three ATM scientists, flew into Summit Camp on this put-in flight.



Upon arrival at Summit Camp, it was found that the food and science weatherports, along with the generator/bath module, were completely buried with only the stove pipes above grade.

(Photo by Don Kahler)

Upon arrival at the Summit Camp, it was discovered that winter-over drifting was extreme. The west end of the Big House was drifted in up to the roof, and the generator module door was about 12 to 14 feet deep into the snow.

Three employees spent the majority of the day digging out and attempting to start the CAT 931 on the vehicle berm. Two of the Skandic Skidoos were dug out and started.

Several attempts were made to establish radio contact with the put-in plane and GFC using the South-Comm 120 radios. These attempts were made at pre-scheduled times with no contact for the first one and a half days. The first radio contact with GFC was on the HF radio on the second day.

On the second day, the CAT 931 and Tucker were successfully started, and camp phase-up began. However, the CAT track sheared a pin, which took most of the third day to repair due to the various complications with the cold and buried equipment. The weather began deteriorating on the second day, and for about two weeks, there were high winds, sometimes up to more than forty knots and temperatures down to minus 40°F.

A few days later, the Big House had running water, the telex and communications equipment was set up, and the 40-foot berthing and two science weatherports were fully erected. Snow was being dragged away from camp, and initial grooming of the sampling tower site was complete.

An ATM sampling tower and trench were constructed in the vicinity of the old GISP2 snow mine, about 0.25 kilometer southeast of the Big House. The trench is approximately 8 x 12 x 10 feet deep, and the 70-foot tower is founded at the bottom of the trench at one end, extending 60 feet above the existing surface. By the end of the second week, the trench had been excavated and roofed, and the tower was erect and temporarily guyed.

A new, smaller 50-kilowatt generator and snow melter module was delivered to Summit Camp during flight period 2. During the fourth week, the new generator was put on-line and efficiently powered camp with only minor problems for the duration of the season. Its average fuel consumption was about 285 gallons of DFA each week (or about 1.70 gallons/hour), ranging from 225 gallons up to a high of 360 gallons during peak camp loading. The generator requires about two quarts of oil each ten days of operation. The new generators were switched and serviced every ten days. During the eighth week of camp, the water pump housing cracked, and a pump was taken from the old bathhouse for a replacement. It currently requires a new water jet pump housing. During peak season the generator was frequently operating at or near maximum capacity. The generator load was closely monitored, especially during peak season, in order to prevent overheating or other problems due to overload.



Science and PICO personnel are shown here excavating and erecting the new 70-foot Eddy Flux tower and trench.

(Photo by Don Kahler)

During installation of the new generator and power lines, ATM staff set up the new remote ATM camp approximately 11 kilometers south of Summit Camp. This facility had been located 30 kilometers south of Summit Camp in previous seasons. Setup included excavation of a new battery trench very similar to the tower trench. Four kilowatts of solar panels were also erected at the new site.

Shortly after camp was operational, it was quite evident that maintaining safe access to the existing shop and food weatherports (which were completely buried) for the duration of the season would be virtually impossible. Excavation commenced in the fifth week. During the next eight weeks, as time permitted, both structures were rebuilt on raised three-foot foundation berms above the existing drift line.

A 40-foot weatherport (the old science weatherport) was set up. The wood-framed portion of the old shop was set up at one end of the new shop in a similar fashion as the old shop, for a total length of 48 feet of usable, heated space. The new shop is insulated in order to try to minimize the burning of heating fuel. The shop weatherport was located further north from the Big House in the opposite direction from the clean-air sampling tower in order to minimize local pollution at the tower and to discourage drifting/burial of the Big House.

Due to damage to the old food weatherport structural frame from extensive burial in previous years, one of the 30-foot weatherports (used for berthing in previous seasons) was set up for the new food weatherport.

The new weatherports are separated slightly more than previous years and are erected offset, but parallel, to the Big House and the prevailing easterly winter wind in an attempt to minimize winter-over drifting.

Another primary goal during the 1994 season was to supply Summit Camp with as much necessary fuel and cargo as possible to keep it operational with minimum resupply for the next two seasons. Following is the fuel movement summary:

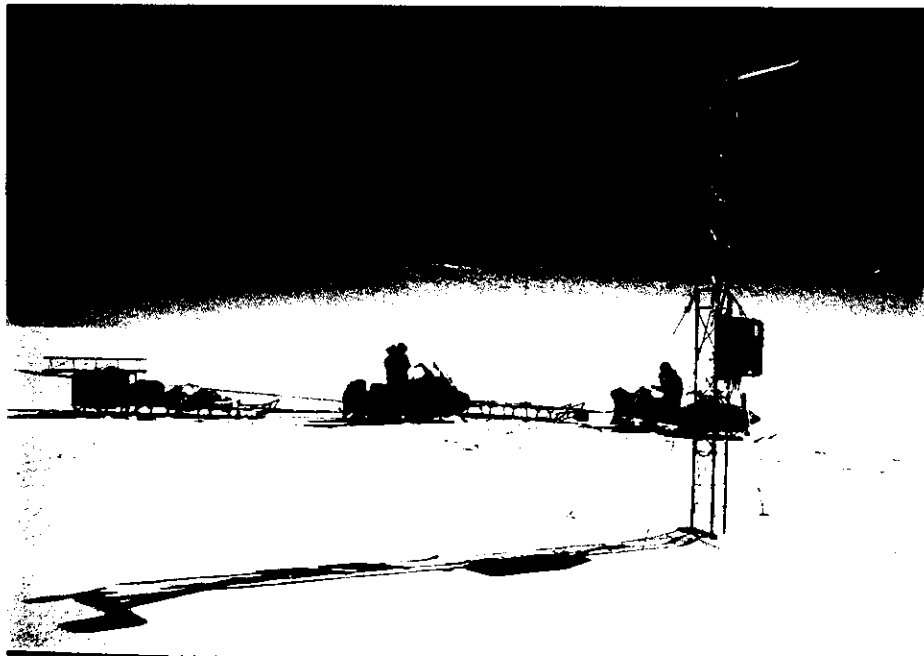
	<u>DFA (gal)</u>	<u>Mogas (gal)</u>
Pre-season inventory:	15,369.0	1,355.0
Total fuel delivered during season:	19,340.0	2,460.0
Total fuel consumed:	9,086.0	1,085.0
(19-week season)		
Average weekly consumption:	478.2	57.1
Closing inventory	25,623.0	2,730.0

Assuming the average fuel consumption this year (which should be slightly high due to the heavy fuel use during retrograde this season), there is approximately $25,623/478.2 \approx 53$ weeks worth of DFA supply, or $2,730/57.1 \approx 47$ weeks of Mogas. This should comfortably and conservatively accommodate the two following projected 19-week seasons or 38 weeks total. The highest weekly use was 600 gallons during the seventh week, and the lowest was 446 gallons during the eleventh week. The 1993 fuel berm was extended to accommodate three 2,000-gallon bladders for this storage. However, it was discovered that two of the bladders were damaged, so all fuel was left palletized (as delivered) on the fuel cargo line.

Summit Camp also worked closely with GRIP personnel in assisting them with put-in and pull-out of their very brief summer season. GRIP put-in was at the beginning of flight period 4; however, their anticipated season was cut short due to equipment failure of their primary project requiring them to close camp by the end of flight period 5. Summit Camp staff assisted in preparing and loading retrograde material going to

Kangerlussuaq, such as equipment and ice samples, as well as fuel and equipment to Station Nord.

Three MAGIC traverses and four University of Wisconsin AWS traverses were completed. Although the traverses were successfully completed, many equipment problems were experienced. Traverse parties repeatedly attempted to establish communications with Summit Camp using the old South Comm 120 radios. During the seven traverses, some lasting three to four days, two-way radio contact was never established in spite of both parties standing by at three separate, pre-scheduled times each day. In addition, twice a Skidoo had to be hauled over 50 kilometers on a sled by one of the other machines, the breakdown due primarily to a failing/fatigued suspension system.



One of several traverses to service the MAGIC and AWS remote sites. (Photo by Bill Barber)

A PICO staff member assisted the traverse scientists in wilderness navigation, Arctic survival, and work at the remote field sites. All navigation was successfully accomplished using hand-held, battery-operated Global Positioning System (GPS) units.

All routes, over 586 kilometers total, were reflagged with flags placed each half kilometer for a total of over 1,200 bamboo flags tied and placed. These flag lines should be usable for two to three years. Given the proven success of GPS navigation, the immense “real” cost associated with flagging (materials, transportation time, wear and tear on machinery), and the extremely low use of these routes, serious consideration should be given to using the well-known, worldwide accepted technology of GPS and abolishing future flagging, except for the heavily traveled trails close to camp.

After flight period 6, efforts shifted to winterizing Summit Camp and preparing for pull-out. The flight line flags were raised and replaced as necessary, and the flight line loading area was completely reflagged.

The freezer trench floor was lowered about 16 inches to compensate for loss of headroom due to the roof settling over the previous years. Doghouses were either installed or extended on the freezer trench, the ATM battery trench, and the old generator module. Panels were prefabricated to extend the tower trench doghouse in 1995. A new drill dome dormer, door, and bridge were constructed (at the level of the control room) for ease of access to the dome as the moat continues to drift in.

The winter-over vehicle berm and science cargo berm were constructed. Science gear and the science and berthing weatherports were placed on the science pallet line for overwintering. Camp equipment, including the generator module, Skidoos, Tucker, CAT 931, and YanMar snow blower, were winterized and placed on the vehicle berm.



At the end of the season, winter-over pallets are raised on berms and/or drums to minimize burial during winter-over.

During flight period 7, all buildings were winterized and sealed, and camp personnel were safely deployed to GFC. Upon personnel arriving at the GFC, all equipment received maintenance and was cleaned and stored for the winter. All CONUS-bound science cargo and logistics support supplies were prepared for retrograde on the 20 August chartered aircraft flight. Upon departure of the charter, all camp staff deployed to CONUS.

GFC staff moved all office supplies and storage to the new GFC office in the KISS 662 building, and GFC officially closed on 30 August 1994.

DYE2 Summary

The DYE2 skiway is a facility managed and 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 DYE2 facility (66°29'N; 46°17'W; 7,660-foot elevation) utilizing the preexisting skiway site. Major responsibilities are to provide current aviation weather and a prepared skiway for U.S. Air Force skiway proficiency training. The skiway itself is oriented 180°-360° magnetic and is 6,000 feet long by 200 feet wide. Grooming is accomplished with a LMC 1200 Spryte tracked vehicle pulling an eight-foot-wide hydraulically controlled planer/groomer. A 15- x 20-foot preway stove-heated weatherport tent is used as the main structure at the DYE2 camp. It includes a four-burner propane range as well as a solar-powered 100-watt SSB Icom M-700 radio. Camp staff consisted of two people.

On April 25, 1994, two DYE2 employees arrived in Kangerlussuaq and began field preparation to include checking equipment, resupply, food orders, and general preparation for deployment. The scheduled put-in was for the first week in May.

Camp gear and equipment had been staged in the GFC bay area on two pallets the previous season for ease of preparation. The LMC 1200 track vehicle, snow machines, and generator were checked for any problems and prepared for deployment. A Cheyenne 503R was transferred from Summit Camp to replace the ailing Skandic 377 snow machine. Also two 8-x-8-foot Arctic oven tents were obtained from the Summit Camp stock to provide functional and practical tents for put-in, pull-out and emergencies. A fresh-food order was submitted to GFC, and POL products were procured for the season. Dry-food products arrived via charter and were prepared for deployment.

The put-in flights were scheduled for Thursday, May 5, 1994. Flight day proved to have good weather, and put-in was uneventful. The skiway was in good condition, but there was considerable snow accumulation. Two 8-x-8-foot arctic oven tents were quickly erected, and the SC120 radio was set up for establishing radio contact with GFC. All skiway flags were up, though some were tattered due to winter storms. The two winter-over cargo pallets, which were placed on 3-foot-high snow berms and drums at the conclusion of the 1993 field season, were still exposed.

Construction of the weatherport was not started for several days due to high winds. The previous season, extra help was provided making camp setup more manageable in high-wind conditions. This season, due to a limited number of flights, it was not possible to deploy an extra person to the field to assist with put-in. Because of this, and due to the high winds, we were unable to erect the weatherport immediately.

For the remainder of the week, camp construction continued. This was a put-in flight only and no training was expected for two weeks. The weather was generally okay; but there was a steady 20-knot wind, and snow made some tasks slow. The temperatures were mild compared to the previous seasons; however, within one week the camp was fully constructed allowing for focus on the skiway.

There were five flight periods, including the put-in and pull-out, all lasting not more than one week in duration. Both skiway and ski landing areas were maintained for aircraft training. Unfortunately because of poor weather, aircraft mechanical problems, and other scheduling difficulties, there were fewer training missions at DYE2 than in previous seasons.



DYE2 pull-out crew prepares for camp closing.

Recommendations for 1995: Using MAPP gas for cooking is not acceptable. It does not burn clean, thereby leaving various airborne byproducts in the tent and chronically clogging the burner jets. Attempts were made to adjust the stove numerous ways, without success. Summit Camp, according to this year's Cook, shared this same problem, with there being occasions when the gas was so bad that they were required to exit the Big House. There are several physical irritations which include watery eyes,

headaches, feeling as though you have been "gassed," and nausea. It is highly recommended that the cooking gas be returned to propane.

The electrical problem with the Spryte's charging system was not solved by the end of the season. The alternator and voltage regulator were replaced, and the system checked. The new alternator works, but the battery is not receiving a charge. At this point, the consensus is that the problem is in the wiring harness. A wiring harness test was performed as described in the LMC manual in the Ford "Alternators and Charging Systems." In step one of the test, it was found that an "open in the F circuit" existed. It is suggested that the machine be taken in for repair at the beginning of the 1995 field season.

A total of 15 drums of Mogas, 2 drums of DFA, and just over 2 bottles of MAPP gas were used throughout the season. The weather was mild and the length of operation short, which contributed to the small amounts of fuel used. The Spryte uses an average of about four gallons per hour during operation. There is a total of 5 drums of Mogas at the DYE2 camp; however, it is recommended that a minimum of 12 drums be brought in during put-in of the 1995 field season to ensure an adequate fuel source. The Preway oil stove uses 1-2 gallons of DFA per day. There are four drums of DFA at the camp. This should be sufficient for next season; however, contaminants (water, etc.) continue to be a problem with this stock. Therefore, bringing two clean drums of DFA is recommended on put-in so that DFA can be pumped from the camp stock into a clean barrel while avoiding transfer of contaminants. The MAPP gas bottles presently at DYE2 should last another two seasons. Several gallons of white gas should be brought in on put-in. The listed name for this fuel is "Rense Benzene." There are two pallets of Mogas on snow berms east of camp that belong to the GRIP/NASA group.

Due to poor propagation, communication between DYE2 and GFC was inadequate. Therefore, it is recommended that an Inmarsat Standard C telex be purchased so that there is reliable communications. Additionally, this would provide the same access to cargo network so that resupply items may be procured and tracked on a timely basis.

COMMUNICATIONS

This field season saw another improvement in the communications between Alaska, GFC Kangerlussuaq, and Summit Camp. PICO implemented a method for transferring files electronically via the Inmarsat C from Kangerlussuaq and Summit. Files were sent electronically, in a compressed format, over the phone lines through multiple satellites between Fairbanks and GFC. This transfer of files enabled all PICO locations to have the most current information regarding cargo status, passenger movements, and purchasing information. Each PICO location was to update logistical information daily for its location and transfer the updated file to the main server, enabling all locations to receive the latest logistical information.

Due to poor propagation, communications between the field camps and GFC were not as good as in previous seasons. The telex was used between GFC and Summit Camp a great deal in lieu of the HF radio. However, the telex at Summit Camp started to fail towards the end of the field season, and finally crashed for the remainder of the final month of the season. The camp then relied on the HF radio for the daily communications with GFC for the remainder of the field season.

A new ICOM PS-80 ground-to-air radio and antenna was installed at the Summit Camp prior to the last flight of flight period 6. Although it has had very limited testing, it seemed to be a major improvement.



Tony Perry, Assistant Field Office Manager, works at the Greenland Field Center communications center. (Photo by Jay Klinck)

PASSENGER AND CARGO MOVEMENTS

Personnel

A total of 36 people moved to and from Summit Camp during the 1994 field season. The Air Mobility Command, used in previous years for transporting passengers and cargo to and from CONUS, was no longer available. Most personnel arrived in Kangerlussuaq via commercial SAS flights from Copenhagen, Denmark. Exceptions were those transported via the 109th Air National Guard under extenuating circumstances.

PICO established a purchase order with the Komfort Inn in Copenhagen, Denmark, for housing all transiting personnel. All billing was handled through PICO for housing expenses, eliminating the need for science and camp personnel to travel with large sums of money for taking care of their housing expenses. Additionally, PICO was able to negotiate a lower cost for housing of all transiting personnel.

All National Science Foundation (NSF) participants arriving in Kangerlussuaq were issued photo identification cards. This identification card allowed use of the bus or taxi, access to the flight line, access to the Butik for purchasing items, and entrance into the Polar Bear Inn canteen for meals. All meals were paid through PICO, again eliminating the need for science and camp personnel to travel with large sums of money.

Following is a breakdown of the passenger movements to and from Greenland:

Flights	Passengers
CONUS to Greenland	51
GFC to Summit Camp	42
Summit Camp to GFC	41
Summit Camp to Thule	1
Greenland to CONUS	50

Cargo

Most supplies required over the 1994 field season in support of PICO operations in Kangerlussuaq, DYE2, and Summit Camp were locally supplied when available. Exceptions were special repair parts, specific scientific equipment, and other items not available in Greenland. These other supplies were purchased either in Denmark or CONUS.

Critical resupply items were shipped via a transport delivery service that had offices in CONUS and Denmark. GFC was able to receive critical items in less than three days for shipments from Fairbanks, Alaska.

There were three options for transporting cargo to Greenland: the initial charter flight, the 109th SAAM, and a freight-forwarding company. Both the charter and SAAM were cost shared with SRI Kellyville. The following is a breakdown of cargo movements from CONUS to Greenland via each method:

Flight	Weight (lb)
April Charter	
UAF Cargo	43,901
SRI Kellyville	3,370
April 109th SAAM	
UAF Cargo	15,670
SRI Kellyville	360
June 109th Flight	3,200
Freight Forwarder	<u>5,023</u>
Total to Greenland	71,524

Over 131 tons of fuel and cargo were deployed to the Summit Camp as follows:

Fuel/Cargo	Weight (lb)
DFA Pallets	157,087
(500-gal bladders, rollagons, 55-gal drums)	
Mogas Pallets	15,200
Science and Support Cargo	77,790
New Generator Module	<u>13,000</u>
Total GFC to Summit	263,077

One of the primary objectives this season was to retrograde the garbage, obsolete and miscellaneous equipment, and 55-gallon drums which had accumulated in previous seasons during drilling and other activities. The goal was to begin phasing down camp operations for the new primary scope of Summit Camp as a clean air/atmospheric sampling and study facility.

This season, over 60 pallets (112 tons total) were retrograded from Summit Camp. This was approximately 71 pallet positions due to the fact that many pallet numbers occupy more than one position (such as the Prime Mover, old Cat 931, or the driller's aluminum/ciba tubes). This freight was split up among 25 LC-130 flights which landed at Summit Camp this season. Most flights returned to Kangerlussuaq from Summit Camp; however, a few departed to Thule or Station Nord (GRIP flights). A list of contents along with the number of pallets and weights are shown below. Included in this summary are the GRIP retrograde activities that took place from the Summit Camp.

Contents	No. of Pallets	Weight (lb)
Drilling Cargo:	14	71,640
winch		
prime mover		
drill cable		
butyl acetate		
glycol		
hydraulic fluid		
miscellaneous equipment/cargo		
Garbage:	14	47,940
scrap wood		
unusable/worn out equipment		
waste oil		
GRIP Cargo:	8	39,440
ice		
crane Iller (tracked vehicle)		
trackmaster (tracked vehicle)		
weatherport		
Station Nord cargo		
miscellaneous cargo		
sleds/loose load		
Empty 55-gal Drums:	13	20,800
312 drums total		
Science and Other Cargo:	6	18,920
Old Cat 931:	3	13,300
Structures:	3	9,140
boonie barn		
old food weatherport		
old shop weatherport		
Jamesway		
Fueling Equipment:	3	5,340
Total Retro Cargo from Summit to GFC		226,520



A small sample of the initial put-in cargo for the 1994 field season.

(Photo by Sam Lamont)



Onloading 1994 end-of-season science and drilling retrograde cargo.

(Photo by Don Kahier)

At the end of the Greenland field season, there was one retrograde charter flight from Greenland to Ypsilanti, Michigan. A total of 59,814 pounds of cargo was transported to the CONUS via the charter and freight forwarder.

Because there was an empty flight going to Greenland on 20 August for the retrograde charter, prestage supplies for the 1995 field season were sent over on this flight. This charter was cost shared with SRI Kellyville. The following is a breakdown of the cargo transported to Greenland on this charter flight:

Cargo	Weight (lb)
UAF Prestage Cargo	7,599
SRI Kellyville	<u>9,733</u>
Total Prestage Charter Cargo	17,332



Tony Perry, Assistant Field Office Manager, and John Roberts, Transportation Specialist, assist with unloading of the final retrograde charter flight in front of the Greenland Field Center building.
(Photo by Don Kahler)

FACILITIES

It was discovered upon arrival at GFC that the steam piping for heating had frozen and burst, causing considerable damage within the building. Most of the carpet was either wet or frozen, and the entire facility had a very bad odor. This required a complete cleaning of the entire building from floor to ceiling. All linens, pillows, and sheets required laundering, and GLV shampooed all carpeting.

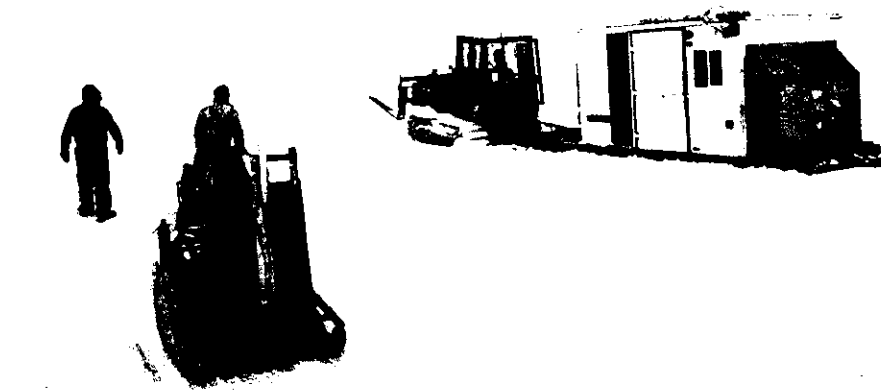
An agreement was reached with GLV and NSF concerning the berthing and office space at the KISS building for the 1995 field season. We are renting five rooms in the KISS building 662 for PICO office and storage space. One room, provided by PICO, will be used as an office by the 109th Air National Guard during flight periods. This arrangement will allow GLV to complete mechanical and electrical improvements over the next ten months.

An ATM sampling tower and trench were constructed in the vicinity of the old GISP2 snow mine, about 0.25 kilometers southeast of the Big House. The trench is about 8 x 12 x 10 feet deep, and the 70-foot tower is founded at the bottom of the trench at one end, extending 60 feet above the existing surface. By the end of the second week, the trench had been excavated and roofed, and the tower was erect and temporarily guyed.

A new, smaller 50-kilowatt generator and snow melter module was delivered to Summit Camp during flight period 2, the week of April 25. During the fourth week, the new generator was put on-line and efficiently powered camp with only minor problems for the duration of the season. Its average fuel consumption was about 285 gallons of DFA each week (or about 1.70 gal/hr), ranging from 225 gallons up to a high of 360 gallons during peak camp loading. The generator requires about two quarts of oil each ten days of operation. The new generators were switched and serviced every ten days. During the eighth week of camp, the water pump housing cracked, and a pump was taken from the old bathhouse for a replacement. It currently requires a new water jet pump housing.

During installation of the new generator and power lines, ATM staff set up the new remote ATM camp approximately 11 kilometers south of Summit Camp. This facility had been located 30 kilometers south of Summit Camp in previous seasons. Setup included excavation of a new battery trench very similar to the tower trench. Four kilowatts of solar panels were also erected at the new site.

A 40-foot weatherport (the old science weatherport) was set up. The wood-framed portion of the old shop was set up at one end of the new shop in a similar fashion as the old shop, for a total length of 48 feet of usable, heated space. The new shop is insulated in order to try to minimize the burning of heating fuel. The shop weatherport was located further north from the Big House in the opposite direction from the clean-air sampling tower in order to minimize local pollution at the tower and to discourage drifting/burial of the Big House.



The new portable generator module being towed to the winter-over berm.
(Photo by Don Kahler)

Due to damage to the old food weatherport structural frame from extensive burial in previous years, one of the 30-foot weatherports (used for berthing in previous seasons) was set up for the new food weatherport.

The new weatherports are separated slightly more than previous years and are erected offset, but parallel, to the Big House and the prevailing easterly winter wind in an attempt to minimize winter-over drifting.

The freezer trench floor was lowered about 16 inches to compensate for loss of headroom due to the roof settling over the previous years. Doghouses were either installed or extended on the freezer trench, the ATM battery trench, and the old generator module. Panels were prefabricated to extend the tower trench doghouse in 1995. A new drill dome dormer, door, and bridge were constructed (at the level of the control room) for ease of access to the dome as the moat continues to drift in.

Both the shop and food weatherports were raised approximately three feet above the existing surface onto compacted foundation berms. The doghouse on the freezer trench was also raised to compensate for burial from drifting snow. Shafts were built to access the old generator module and the old bathhouse.

EQUIPMENT AND VEHICLES

Scheduled for use during the 1995 field season, the Taylor forklift at GFC will require the main oil seals to be changed, as well as a few other minor repairs.

Two new 1994 Skandic II Skidoos were used at Summit Camp this season. These machines worked well for light loads and general transportation but had several problems, typically with the suspension system, when used for heavy pulling as required on traverses.



After five seasons of use, the Tucker Sno-Cat continues to be a workhorse at the Summit Camp. (Photo by Don Kahler)

MEDICAL SERVICES

The 1994 season was a quiet and fairly routine season medically, and there were no emergency or routine medevacs required. There were four accident-related injuries that were treated on site by the Medic, preventing the requirement for a medevac. In all cases, the patients were treated and returned to work within a short period. There were several routine patient encounters documented throughout the season, and numerous other very informal medical-related discussions with camp members that were not recorded.

The first Camp Medic was relieved from his duties and deployed from Summit Camp on April 26. A replacement Medic did not arrive at Summit Camp until June 15. Upon termination of the original Medic, a briefing was held with all camp members to discuss safety and the resources available amongst the camp members on site in case of an emergency. There were several camp members identified who were either Emergency Medical Technicians and/or first aid trained. Fortunately, everyone in camp enjoyed good health, and there were no medical emergencies during this interim period.

Due to the change of the contract, all prescription drugs and narcotics were returned to PICO's medical consultant. It is recommended that a careful review of the remaining inventory be done so that a medical supply list can be established in time for procurement for the 1995 field season. This medical supply inventory has been provided to the new contractor, University of Nebraska Lincoln.

It is recommended that the Medic and at least two other PICO personnel be trained in remote Arctic wilderness first aid/survival. One of the trained PICO personnel should be the employee who will be assisting on traverses.

1994 GREENLAND SCIENCE PROJECTS

<u>Principal Investigator</u>	<u>Institution</u>	<u>Project Name</u>
Roger C. Bales	University of Arizona	Snow-Atmosphere Transfer Function for Reversibly Deposited Chemical Species
Mary R. Albert	U.S. Army CRREL	Near-Surface Processes Affecting Gas Exchange at Summit, Greenland
Daniel J. Jacob, J. Munger, and Song-Mio Fan	Harvard University	Eddy Correlation Measurements of Snow-Atmosphere Exchange of NO _x and Water Vapor at Summit (Greenland)
Jack E. Dibb and Ernst Linder	Univ. of New Hampshire	Impact of Aging and Spatial Heterogeneity of Snow on the Preservation of Atmospheric Signals in the Snowpack at Summit, Greenland
Cliff Davidson	Carnegie Mellon University	Transport and Deposition of Chemical Species to Greenland Ice Sheet at Summit, Greenland
Edwin Waddington and Gary D. Clow	University of Washington	High Precision Temperature Log of GISP2 and GRIP Boreholes, Greenland, for Paleoclimate Reconstruction and Ice Dynamics Studies
Edwin Waddington	University of Washington	Ice Motion Survey for GISP2 Flow Modeling and Ice Core Interpretation
Jean Luc Jaffrezo	Laboratoire de Glaciologie, France	Air Snow Exchange Investigations

Charles R. Stearns	University of Wisconsin	Climate and Meteorology of the Greenland Crest
Robert Clauer	University of Michigan	Magnetometer Arrays on the Greenland Ice Cap (MAGIC)
Jerry A. Ferguson	Navel Command, Control & Ocean Surveillance Center, RDT&E Division	Atmospheric Noise Measurements
William G. Mattox	Worthington, Ohio	Greenland Peregrine Falcon Survey



One of the automatic weather stations set up by Dr. Chuck Stearnes of the University of Wisconsin.

WEEKLY SUMMIT SITUATION REPORTS SUMMARY

Week 1 - March 27 to April 2

- Four support staff arrived Kangerlussuaq March 28.
- Reestablished local accounts and contacts.
- Began to reactivate GFC; repaired water damage.
- Started up and registered all vehicles.
- Set up office and communications center, berthing.

Week 2 - April 3 to 9

- Summit Camp staff arrived.
- Began Summit Camp put-in preparation.
- Issued arctic clothing.
- Office, comm. center, berthing, warehouse, and shop ready for 1994 season.
- Freezers on-line.
- Pre-staged pallets and equipment for charter flight.
- Charter DC-8 arrived April 9 with 45,794 lb of cargo; departed April 9.

Week 3 - April 10 to 16

- Flight period 1: Skier 43 arrived, 1 flight.
- Built pallets for Summit Camp put-in.
- Summit Camp put-in April 12; 8 pax on station.
- Began receiving cargo at GFC.
- Accessed all existing structures; heat and running water in the Big House; erected 40-ft berthing weatherport; commenced construction of 16- and 20-ft weatherports.
- Began initial grooming, compaction of sampling tower site and new generator site.
- Continual, moderate ground blizzards.

Week 4 - April 17 to 23

- Began gateway data transfers.
- Built pallets at GFC for flight period 2.
- Completed construction of 16- and 20-ft science weatherports.
- Moved all camp personnel out of Big House into berthing weatherport or Arctic Oven tents.
- Prepared five pallets and groomed flight line for flight period 2 retrograde.
- Excavated tower trench and erected sampling tower.

Week 5 - April 24 to 30

- Flight period 2: Skier 42 arrived, 2 flights, 9 pax on station.
- GFC prepared Summit Camp resupply.
- DYE2 staff arrived.
- Built DYE2 pallets.
- Erected new UHF antennas.
- Began seasonal fuel uplift to Summit Camp.
- Received new generator on April 26 and installed at SW corner of Big House.
- Constructed new ATM battery trench.

Week 6 - May 1 to 7

- New GFC manager arrived.
- DYE2 put-in on May 5: 2 flights.
- Reviewed air and ground operations with FIC and 109th.
- Put new generator and snow melter on-line.
- Continued digging out camp.
- Completed final construction of sampling tower.
- Scientists began living and sampling at new 11 km ATM site.

Week 7 - May 8 to 14

- Began building pallets at GFC for flight period 3.
- DYE 2 reached operational status.
- Began initial preparation for flight period 3; excavated and palletized cargo at Summit Camp.
- Began preliminary excavation of existing shop and food weatherport for eventual raising of these structures.
- Erected balloon boonie barn; commenced weather balloon sampling.

Week 8 - May 15 to 21

- Filled and pre-staged all fuel bladders for flight period 3.
- Precut and palletized lumber for flight period 3.
- Established retrograde area at GFC.
- Excavated and palletized cargo; groomed flight line.
- Continued excavation of existing shop and food weatherport.
- Constructed foundation berm for new raised shop weatherport.
- Installed "bamboo forest" sampling grid at new ATM site.

Week 9 - May 22 to 28

- Flight period 3: Skier 42 and 43 arrived, 5 flights, 13 pax on site.
- Sent 11 pallets of science cargo to Summit Camp.
- Resupplied Summit Camp.
- Summit Camp retrograde began with 16k winch and weatherports.
- Began seasonal fuel uplift to Summit Camp.
- Erected new raised 40-ft weatherport for new shop; raised old wood-framed carpenter shop at new location for a total of 48 ft of heated working and storage.
- Made preliminary move of inventory from the old to the new shop; began initial dismantling of the old shop.
- Established new CRREL site over 4 km NE of camp, across flight line from camp.
- Weather balloon line broke; balloon permanently lost on May 29.

Week 10 - May 29 to June 4

- Sorted retrograde cargo at GFC for forwarding, storage, or disposal.
- Cleaned and refilled fuel bladders and drums.
- Flight period 4 preparation; excavated and palletized cargo, groomed flight line.
- Began work to extend the existing fuel berm to hold three more 2,000-gal bladders.
- Began initial excavation of Big House moat in attempt to encourage natural scouring.
- Continued work, as time permitted, to excavate the old food weatherport.

Week 11 - June 5 to 11

- Flight period 4: Skier 41 and 43 arrived, 4 flights, 23 pax on station.
- GRIP camp put-in on June 7; camp population temporarily raised to 39 people with the overlap of Summit Camp pax and additional GRIP pax. Provided assistance to GRIP staff as requested.
- Sent borehole logging winch to Summit Camp.
- Continued fuel uplift.
- Continued retrograde.
- Flight period 5 preparation; continued excavation and palletizing cargo; groomed flight line.
- Extended existing fuel berm to hold three more 2,000-gal fuel bladders.
- Wayne Tobiason and CRREL personnel surveyed Big House drifting on June 9.

Week 12 - June 12 to 18

- Flight period 5: Skier 41 and 43 arrived, 4 flights, 21 pax on station.
- GRIP flights to Thule and Nord.
- Resupplied Summit Camp.
- Continued fuel uplift.
- Continued retrograde.
- Downloaded 16k winch by crane and prepared for CONUS retrograde.
- Skier 493 and personnel forced to spend the night June 16.
- Discovered leaks in two new 2,000-gal fuel bladders. Curtailed downloading of fuel and prepared damaged bladders for retrograde and repair. Began fuel barrel, rollagon, and 500-gal-bladder pallet line.
- GRIP experienced equipment failure of its main project and was forced to close camp early; all but two GRIP staff members flew out. Summit Camp personnel assisted as much as possible with GRIP pull-out.
- Continued food weatherport excavation and pallet line raising as time permitted.
- Began initial preparation for traverses, flag-tying, etc.

Week 13 - June 19 to 25

- Sorted retrograde cargo at GFC for forwarding, storage, or disposal.
- Cleaned and refilled fuel bladders and drums.
- Built CONUS retrograde pallets.
- GRIP camp closed on June 22; Summit Camp continued assistance.
- Completed raising last season's pallet line.
- Continued old food weatherport excavation; began construction of new raised foundation berm.
- Successfully completed two MAGIC and AWS traverses.

Week 14 - June 26 to July 2

- Cleaned out cargo staging yard at GFC.
- Cleaned and reorganized barrel yard at GFC.
- Continued preparing CONUS retrograde.
- Erected 30-ft food weatherport; moved all inventory into new structure. Completed most of dismantling of old weatherport (except thawing, freeing, and disassembling floor panels).
- Completed all but one traverse.
- USGS winch broke down while logging the main borehole at a depth of 2,000 m; repaired equipment and resumed logging.

Week 15, July 3 to 9

- Flight period 6 preparation.
- Continued CONUS retrograde packing.
- Excavated and palletized cargo; groomed flight line.
- Made initial brief pallet line inventory.
- Completed final MAGIC/AWS traverse.

Week 16 - July 10 to 16

- Flight period 6: Skier 41 and 43 arrived, 6 flights, 11 pax on station.
- DYE2 closed; pull-out on July 14.
- Sent DYE2 personnel to Summit Camp.
- Repaired and replaced DYE2 equipment.
- Resupplied Summit Camp.
- Began final fuel uplift.
- Continued Summit Camp retrograde.
- Excavated the food freezer trench floor lower.
- Installed new ground-to-air radio and antenna at Summit Camp.

Week 17 - July 17 to 23

- Identified and disposed of haz-mat from barrel yard at GFC.
- Inspected alternate facilities for GFC.
- Completed disposal of damaged retrograde items.
- Extended food freezer and ATM battery trench doghouses above existing snow drift line.
- Excavated Big House moat to encourage natural scouring and minimize winter-over drifting.
- Started preliminary work to prepare winter-over vehicle storage berm.
- Received new weather balloon during flight period 6; began flights this week.

Week 18, July 24 to 30

- Began clothing room inventory; disposed of damaged and worn clothing.
- Completed eight pallets for CONUS retrograde charter.
- Camp telex failed permanently for the season.
- Removed Big House fuel tank and all storage from beneath the structure.
- Began work to build the science cargo line storage berm.
- Began camp inventory.
- Constructed access to old generator shack and bathhouse.

Week 19 - July 31 to August 6

- Completed clothing room inventory.
- Completed clean up of barrel yard and storage berms.
- Constructed new drill dome dormer, door, and bridge (at the level of control room) for ease of access to dome as moat continues to drift in.
- Repaired flight line flags and replaced as necessary.
- Completed winter-over vehicle berm, fuel pallet line, and science line berm.
- Stored cargo on science and camp pallet lines.

Week 20, August 7 to 13

- Began preparation for flight period 7.
- Began end-of-season inventory.
- Reviewed end-of-season disposal needs with GLV.
- Began final camp closing preparation, palletizing cargo, flight line grooming.
- Winterized and stored equipment.
- Staged fuel for put-in 1995.
- Dismantled, palletized, and stored berthing and science weatherports and balloon boonie barn.
- Completed camp inventory.
- Closed ATM site for season.

Week 21, August 14 to 20

- Flight period 7: Skier 40 arrived, 3 flights.
- Winterized Big House.
- Shut down, winterized, and dragged generator module/snow melter to vehicle berm.
- Completed final winterizing, sorting, and staging of equipment, fuel, etc., for put-in 1995.
- Closed camp on August 17.
- Rehearsed charter load plan with PICO/SRI/GLV/GLAIR crews.
- Charter DC-8 arrived August 20 with 17,000 lb of cargo.
- Charter DC-8 departed August 20 with 44,000 lb of cargo.
- Prepared to close GFC office and warehouse, building 506.

Week 22 - August 21 to 27

- Relocated GFC office, comm. center, and issue room to KISS building 662.
- Completed end-of-season maintenance for all vehicles.
- Repacked DYE2 equipment for 1995 field season.

Week 23 - August 28 to September 3

- Closed GFC for the season; staff departed for CONUS August 30.

Appendix A: GPS Readings

The GPS readings that follow should not be considered "surveyed" information; they are approximate locations. All bearings and distances are given from each site to the "center" of the Big House. Coordinates of each site are also given.

Current reading for the Big House coordinates:

72°34.735' N

38°27.566' W

New CRREL Site (Mary Albert/Ted Arons) "Forbidden" Zone:

Bearing: 238° - Distance: 4.34 km

72°36.935' N

38°24.821' W

New Science Tower/Trench:

Bearing: 011° - Distance: 0.23 km

72°34.612' N

38°27.298' W

Skiway - Northeast End Turnaround:

Bearing: 256° - Distance: 4.00 km

72°36.435' N

38°23.125' W

Skiway - Central Turnaround:

Bearing: 247° - Distance: 1.70 km

72°35.534' N

38°26.046' W

Skiway - Southwest End Turnaround:

Bearing: 107° - Distance: 0.98 km

72°34.530' N

38°29.257' W

Dome:

Bearing: 067° - Distance: 0.31 km

72°34.570' N

38°27.815' W

Trailhead - West Traverse (AWS and Magic Sites):

Bearing: 162° - Distance: 0.61 km

72°34.945' N

38°28.478' W

Trailhead - North Traverse (AWS and Magic Sites):

Bearing: 236° - Distance: 1.50 km

72°35.482' N

38°26.695' W

The current Snow Mine (beyond Tent City):

Bearing: 107° - Distance: 0.30 km

72°34.695' N

38°27.998' W