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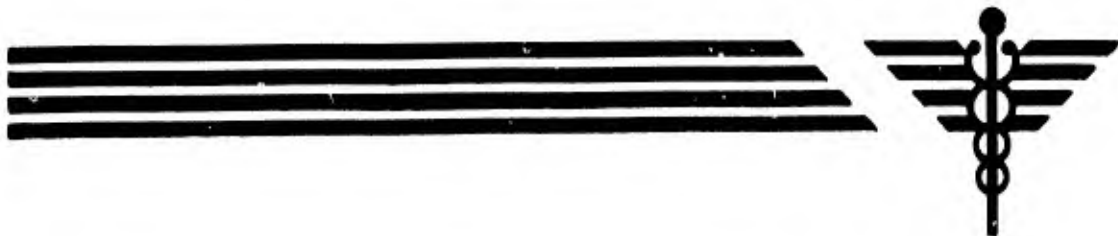
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US ARMY MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

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REPORT, MEDICAL SECTION, OF A GREENLAND OPERATION,
SUMMER 1957



UNITED STATES ARMY
MEDICAL RESEARCH AND DEVELOPMENT COMMAND

REPORT, MEDICAL SECTION, OF A GREENLAND OPERATION,

SUMMER 1957

by

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ABSTRACT

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OBJECT

To define qualitatively certain medical problems related to a Greenland military operation.

RESULTS

Considerable planning has to be made prior to the onset of the medical operation and this planning should be made in conjunction with personnel familiar to the locale as well as to the needs of the personnel. Sanitation and waste disposal present a problem in a temporary operation such as this. Perma-frost is constantly present and many accepted methods of disposal are impractical in this situation. In general, health matters seem not be appreciably altered from other locales. Respiratory infections, minor trauma, and dental complaints comprised the majority of patients seen.

Weather conditions make air evacuation undependable and overground or oversnow vehicles the most reliable.

CONCLUSIONS

Medical problems that arise appear essentially unchanged from medical problems arising elsewhere. More personal concern of health from unit leaders and individuals is mandatory for future good health of the unit. Minor alterations in equipment and packaging of supplies is needed for an operation of this type.

RECOMMENDATIONS

Considerable prior planning and cooperation from unit leaders is essential for an efficiently operated medical activity. Medical personnel should be thoroughly familiar with the needs and problems expected to arise before undertaking such a task.

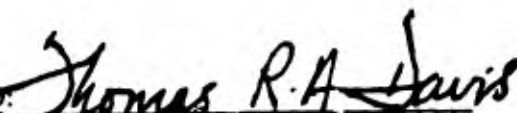
Several problems concerning health and sanitation are in need of investigation.

Submitted 6 August 1958 by:

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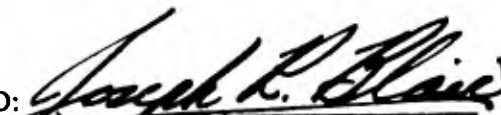
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REPORT, MEDICAL SECTION, OF A GREENLAND OPERATION,

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I. INTRODUCTION

A. Mission

The US Army Engineer Arctic Task Force, since renamed the US Army Polar Research and Development Center, has conducted research and development activities in northern Greenland for several years. The greatest portion of this research has been done by the Corps of Engineers and its various research agencies. In 1955 a civilian physician accompanied a portion of the unit on an Ice Cap journey.¹ In 1957 the medical section included medical officers for the first time. This report, a record of the field medical service of the Task Force during the 1957 summer season, is published with the hope that the information may be of value in the planning of medical service for similar operations in the future. The mission of the medical section of the US Army Engineer Arctic Task Force in 1957 was to provide medical support to the Task Force and its attached civilians; to develop ideas regarding medical research and development needed and feasible in support of military operations in Greenland; to conduct such research as was possible; to act as liaison for medical research team coming from US Army Medical Research Laboratory to conduct Ice Cap studies.

II. THE SITUATION OF TASK FORCE OPERATIONS

A. Dates of Operation

The operation support began in early March 1957. Medical officers were present from 9 April 1957 to 16 September 1957. At this latter date the bulk of personnel had returned to the home base of the unit at Fort Belvoir, Virginia.

B. Locale

The US Army Engineer Arctic Task Force operates annually during the summer months from Thule Air Force Base, Greenland, to conduct Corps of Engineer research and development activities on the

¹Christie, Robert W. Medical Notes on a Greenland Ice Cap Expedition. JAMA 164:1314-7, 20 July 1957.

Greenland Ice Cap and adjacent land areas. During the winter months the unit is based at Fort Belvoir, Virginia. The major sites occupied in Greenland in 1957 were Camp Tuto, 14 miles inland from Thule AFB (at the edge of the Ice Cap), and Camp Fistclench, 200 miles inland on the Ice Cap. Smaller camps were located between Camp Tuto and mile 30 on the Ice Cap trail, and at Camp Redrock in the Nuna ramp area, about 30 miles north of Camp Tuto. A small party also operated from BW-1, an Air Force Base at Narsarssuak in southern Greenland.

C. Evacuation Routes and Facilities

A modern, well-equipped station hospital is located at Thule AFB. This was the route of medical evacuation and source of medical resupply for the Task Force. Thule AFB Hospital in turn evacuated patients to Pepperill AFB, St. Johns, Newfoundland. Travel between Thule AFB and Camp Tuto is normally by wheeled vehicle over a gravel road which is of high gear quality most of the summer season. Between Camp Tuto and Camp Fistclench surface travel is by tractor train, or by tracked oversnow vehicles (Weasel - M29C, Otter - M76, Tucker Sno-Cat, etc). Air transportation was available in 1957 by Transportation Corps H-19 helicopters between Thule AFB and Camp Tuto and nearby Ice Cap camps. Ski equipped TC L-20 aircraft and Air Force C-47 aircraft operated between Thule AFB and Camp Fistclench. H-19 helicopters were also capable of operating to Camp Fistclench, but this represented the extreme limit of safe operating range and was done infrequently. Aircraft from Thule Air-Sea Rescue unit were also available for emergencies, and were capable of parachuting medical corpsmen and of making belly landings on unprepared snow surface. The rescue planes could not take off with certainty after a belly landing. JATO was required for take off of ski equipped C-47 aircraft at Camp Fistclench (altitude 7,300 feet).

During planning it was understood that air flights between Thule AFB and Camp Fistclench would be as frequent as once or twice weekly, allowing for easy evacuation and medical resupply. Due to reduction of Air Force activities at Camp Fistclench, flights did not occur this often, especially after 1 July 1957 at which time the Air Force AC&W station adjacent to Camp Fistclench ceased operation. At times evacuation of non-emergency cases from Camp Fistclench was by tractor sled train. Although various project parties worked along the trail from Weasels, oversnow vehicles other than sled trains made only one round trip to Camp Fistclench during the season. There were frequent trips to the camps nearer to Camp Tuto. Travel time one way for Otter to Camp Fistclench was 24 hours; for tractor train three to five days (weather

being favorable and mechanical troubles infrequent. Neither condition prevailed on some trips - one tractor swing was stopped for six days by a storm.) The one-way flight time for a TC L-20 was two hours; for a C-47, one- and one-half hours; for an H-19 three hours.

Of the available means of surface travel, none are suitable for movement of wounded patients because of the uneven snow surface and resultant severe jolting at any speed. The Otter jolts in a fore and aft pitching movement, the Sno-Cat rolls from side to side. The Weasel pitches, and as supplied to the Task Force has insufficient cabin space for transportation of wounded, although it is possible to modify the vehicle body. A modified Weasel, in that it had a closed, longer body for inside stretcher support, appeared to be the most dependable vehicle for wounded personnel transportation. Figures 1 and 2 show the dates when evacuation routes were closed by bad weather. Figure 1(a) reveals that surface travel between Thule AFB and Camp Tuto was open approximately 95% of the operational year; Figure 1(b) reveals that surface travel from Camp Tuto to Camp Fistclench was open approximately 82% of the operational year; and Figure 2 reveals that air travel from Thule AFB to Camp Fistclench was open only approximately 63% of the operational year. Ground to ground rescue should always be anticipated in the event air rescue isn't possible. Travel by air to Camp Fistclench from Thule AFB was prevented by bad weather at either airfield or en route as small aircraft navigated by visually following the trail marking flags. Larger aircraft could navigate without ground visibility en route but required nearly perfect visibility for a landing at Camp Fistclench because there were no navigational aides to assist landing. In preparing the figure for surface movement travel during a storm using trail wire equipment or radar to keep direction has not been considered. This equipment was not in working order during the 1957 season. If a safe trail is previously marked it should be possible to move during very severe storms with such directional equipment.

D. Communication

There was reliable telephone communication between Thule AFB and Camp Tuto, with radio as standby in case of a break in phone lines. There was somewhat less reliable radio communication from Camp Tuto to Camp Fistclench, to smaller camps, and to vehicles on the road between Camp Tuto and Thule AFB or operating on the Ice Cap. All radio communications were subject to capricious failure from magnetic storms or other atmospheric disturbance. At one time such conditions prevented radio contact between Camp Tuto and Camp Fistclench for a two-week

period. Radio signals were good enough for CW contact about 90% of the time and for voice contact about 50% of the time.

E. Weather

Extreme cold was not a significant feature of the 1957 summer operation. There were a few days of sub-zero temperatures early in the season. Much of the time temperatures at Camp Tuto were above freezing. At Camp Fistclench there were many days with above freezing temperatures, and thawing occurred during the warm portions of the day wherever the reflecting surface of the snow was broken by any dark object which could absorb the sun's heat. Camp Tuto was subject to violent winds occurring in "storms" which lasted from one to several days. Wind speeds up to 50 knots were not uncommon, and a peak of 100 knots occurred during a severe blow. Early and late in the season these winds were accompanied by blowing and drifting snow off the Ice Cap. In mid-summer moraine dust substituted for the snow. At Camp Fistclench winds above 20 knots were accompanied by drifting snow. Sun radiation and reflection was very strong at Camp Fistclench, where there was little landscape relief and few dark objects.

F. Personnel Strength

Approximately 350 military and 150 civilian scientists and technicians were present for the most active period from 15 June to 15 August with lesser numbers before and after. A maximum of 120 were present at Camp Fistclench. The balance were at Camp Tuto or at nearby camps.

G. Nature of Work

Much of the work of the Task Force was concerned with construction or construction research, with a large amount of heavy equipment, providing ample opportunity for traumatic injuries. Explosives were used extensively, and mining and drilling machinery, road building equipment, welding, and high voltage all contributed potential hazards of accidental injury. Many of the operations were conducted on the Ice Cap itself, with its inherent dangers of crevasse, hidden melt streams, and blinding storms.

III. PERSONNEL

The medical section consisted of two medical officers and five enlisted corpsmen. Many of the corpsmen were not well qualified to

meet the needs of the Task Force. The essential quality required of enlisted medical technicians for the Task Force is sufficient training, experience, and self-confidence to enable independent management of casualties while awaiting evacuation, and to perform simple treatment of minor illnesses and injuries during times when a medical officer cannot be reached because of distance or weather. It could easily happen that an aid man would be required to tend a seriously injured man for several days during a storm, with no professional assistance other than such advice and instruction as could be given by radio. Most of the men assigned to the Task Force as aid men in 1957 did not have these qualifications. Training was conducted to review fundamentals of care of wounds, suturing, intravenous infusion technique, and bandaging and splinting.

The problem of obtaining highly competent aid men is complicated by the fact that it is necessary for an aid man assigned with a small party to help with the project work, as there is not enough medical work to keep him occupied. Thus, in a sense, highly trained medical personnel might be considered partially "wasted." Against this disadvantage must be balanced the morale value of knowing that competent medical help is at hand despite the isolation of distance and weather.

Early in the planning of future operations sufficient aid men should be requisitioned to cover all proposed separate parties. These men should report for duty with the Task Force as early as possible, but at least eight weeks before departure for Greenland. They should have a careful review of their competency by a medical officer. The aid men who have had their medical experience as truck drivers or cooks in medical units should be assigned to other work. Those with adequate experience and capacity for learning should be given as much additional training as possible during the preparatory weeks.

If a medical officer were permanently assigned to the Task Force he could conduct such training, and would make a valuable contribution to the function of the medical section in Greenland. If a medical officer cannot be assigned permanently in the future then every effort should be made to obtain an experienced senior rank non-commissioned officer who would be capable of conducting training and providing continuity of medical section activities through the winter months. Such a non-com should have extensive Dispensary and/or Clinical experience.

Enlisted aid men assigned to the Task Force should receive a thorough grounding in the techniques of mountain and glacier rescue and evacuation, and should be assigned members of rescue teams.

IV. FACILITIES

A. Camp Tuto

The medical facilities at Camp Tuto were housed in one 32 foot Jamesway building divided into two equal sections by a cross partition. The front half was used as dispensary. It was furnished with desk, filing cabinet, medication table, instrument table, examining table, and chairs. With the exception of the desk, chairs, and filing cabinet the furniture was made on the spot by Task Force personnel. The rear half of the building was used as living quarters for the medical officer(s) and also provided space for storage, packing, cleaning, wrapping, and sterilizing of supplies. Excellent electrical lighting was available. An M-1941 tent stove burning diesel fuel provided heat for each half of the building.

Although this building served satisfactorily in 1957 it would be improved by the addition of a waiting room section. As it is now arranged the medical officer is forced to examine and treat patients in view of other waiting patients. With a large sick call there was some tendency for noise and confusion. Privacy is occasionally essential. Without using more space it would be possible to divide off a front waiting room section of eight feet, an examining and treatment section of 12 feet, and a living section of 12 feet, adequate for one officer. Surplus Jamesway end sections for partitions are readily available.

For 1958 some patient bed space is considered desirable such as could be provided in a 12 or 16 foot Jamesway building. This would give room for four beds and a stove where patients could be observed and partially isolated. It would be convenient to have the dispensary located near to the new mess hall if bed space is to be provided. There should be a source of auxiliary electrical power for the medical facility to be used when main generators are shut down for maintenance or repair.

In planning medical facilities in a Jamesway hut it is important to recall that the addition of a vestibule of present standard design makes it impossible to bring a litter patient through the door. A vestibule was not used on the front section at Camp Tuto this year, although it has advantages as a heat trap in severe weather. Present vestibule design could be modified so that the door was to the front rather than to the side, thus eliminating the ninety degree turn within the vestibule.

As is true of all arctic shelters the vestibule doors should open inward. This redesign is considered essential, so that a drift against

the door will not block egress in an emergency, such as fire. If a drift does build in front of a door, one can still climb in and out if the door opens inward. If the door opens outward, the entire drift must be cleared away before the door can be opened. Dividing the door horizontally in "Dutch door" style would be a further advantage in locations where drifts build against any surface during a storm. The upper half could be opened for access, without spilling the drift into the room at each passage. With the upper half closed, persons could pass through the lower half with minimal escape of heated air.

B. Camp Fistclench

The dispensary at Camp Fistclench was set up in a 12 by 16 foot steel expanding van mounted on sled runners. This van was equipped with excellent fluorescent lighting, windows, blackout-covers, and somewhat noisy and unreliable gasoline heaters. Because of the blower noise the gasoline heaters were not used but instead an M-1941 tent stove using diesel fuel was installed. The interior furnishings were essentially similar to the Camp Tuto dispensary.

This building served well, although it had the same disadvantage of no separate waiting area. The steps leading to the floor level were steep and difficult for an injured person to negotiate. Such a facility could be readily towed about in support of a mobile operation.

After completion of the undersnow construction the dispensary was moved into a 12 foot section of the headquarters Jamesway in the new undersnow camp. Here it was possible for patients to wait in the orderly room section of the building until called by the medical officer. At the time of closing there was no stove in the dispensary section. Probably a small stove will be needed as warm air did not circulate well from beyond the partition, even with transom and windows open to the heated section.

There seems to be little need for providing bed care facilities at Camp Fistclench, unless there is a large increase in the number of personnel. The medical officer at Camp Fistclench shared quarters with other officers near the dispensary.

C. Satellite Camps

An attempt was made to provide small camps and moving parties with a first aid kit containing simple remedies and field type dressings. Parties which were accompanied by an aidman were furnished with a

simple sterilized suture kit. There were not sufficient trained aid men to supply all parties in 1957. It was also thought desirable to provide aid men with dextran or other plasma expander. There were difficulties in obtaining an adequate supply until late in the year. These materials were difficult to handle as they required protection from freezing.

V. EQUIPMENT AND SUPPLY

A. This Year

Appendix No. 1 lists the equipment and supplies originally procured in 1957. This list was based on the premise that only dispensary type facilities would be required at Camp Tuto, and that dispensary type facilities with equipment for simple clinical laboratory determinations and sufficient surgical equipment to perform an emergency operation would be adequate for Camp Fistclench. It was anticipated that replenishment of expendable supplies and supplementation of drugs and dressings would be obtained through Medical Supply, Thule AFB Hospital. This support was provided willingly within the capabilities of that installation. However, the supply problems of the hospital were such that at times the Task Force was an unwelcome drain on critical items, particularly non-standard purchases. Therefore, it is felt advisable to procure and bring to Greenland many of the needed expendable items and items which require pharmacy compounding, and thus reduce the dependence on Thule AFB Hospital.

It was felt that the medical field set should be altered for this particular situation. Many drugs, e. g., sulfa were in over abundance and never used whereas other medications were in greater need and not available. Any contemplated change would be in keeping with recommended changes in the majority of environments.

B. Next Year

Certain additions are proposed to the basic equipment of the medical section for 1958. Because evacuation from Camp Tuto has been impossible at times, due to the road being drifted in with snow, and because much time has been lost in sending patients to Thule AFB for laboratory work, it is planned to add equipment to permit emergency surgery, simple clinical laboratory work, simple physical therapy and facilities for short term bed care at Camp Tuto next year.

C. Supply Precautions

In planning an Arctic medical service precautions must be taken to protect supplies from damage by freezing during transportation and during storage. Supplies shipped by air from ZI to Thule AFB were not exposed to freezing damage en route or at either terminal if properly marked. However, a Jamesway hut unsheltered on the ground or snow surface may be warm at chest height and freezing on the floor. Solutions and other items liable to damage should be stored high off the floor during a storm.

Overice and oversnow movement is unavoidably rough. Incomplete filling and packaging of liquid materials in polyethylene or other nonbreakable containers would remove the risk of breakage from mechanical shock or from freezing.

Fire is an ever-present threat in the Arctic. Dispersal of stocks of food, fuel, communications equipment, and essential medical supplies is a precaution which would prevent disastrous total loss in case of a fire. At Camp Fistclench the nearby Air Force installation provided this standby reserve, and at Camp Tuto the Transportation Corps camp served the same function. Since there are plans for reducing both these activities in the future, provision for stand-by storage must be kept in mind next year.

The medical section finished the year with much larger stocks of supplies than it had at the beginning of the year. Some of the increase was the result of greater experience showing the need for more extensive facilities than originally planned. When prolonged isolation is a constant possibility stocks must be more extensive and varied than normal. Nevertheless wasteful overstocking should be guarded against, especially of items subject to deterioration or out-dating.

VI. OPERATIONS

A. Standard Operating Procedure

It was found useful to prepare and publish a Standard Operating Procedure for the medical section which provided routine directions on the following subjects:

- Hours of Sick Call
- Duty hours for medical personnel
- Ambulance Service

Air Evacuation
Medical support to adjacent units
Hospital Consultations
Supply
Security Medications
Dispensing
Training
Records and Reports
Sanitary Inspections

B. Emergency Evacuation

Whenever possible a medical officer should be called to the radio to talk to any party requesting emergency medical evacuation. This procedure will avoid unnecessary evacuation at times, will insure that proper preparations are made to receive the patient, and that needed equipment, such as splints, litter, evacuation bag, etc., are taken along in the vehicle or aircraft.

C. Coordination with Operations Section

During 1957 attempts were made to conduct a brief examination of all personnel going onto the Ice Cap for an extended period. To be effective this should be given several days before departure to allow time for adequate investigation of any conditions found, and for revising plans if necessary. A list should be provided the medical officer together with a trip plan so that an adequate first aid kit suited to the number of people and length of trip can be prepared.

Likewise an advance dental inspection is recommended for all persons leaving for Ice Cap duty if it is possible to arrange this with Thule AFE Hospital. Dental problems accounted for many evacuations from Camp Fistclench during 1957. Better dental attention before the units depart the ZI should lessen this problem in the future.

VII. PREVENTIVE MEDICINE

A. Introduction

The major preventive medicine activities of the medical section in 1957 fell under the headings of sanitation and safety. The immunization program of the Army Medical Service does not appear to need any special augmentation for troops on duty in Northern Greenland. Infectious diseases were a relatively minor problem during 1957.

B. Safety

1. Industrial Hazards. Many safety practices now standard in comparable operations in civilian industry were not applied by the Task Force.

a. Safety-toe Shoes. Men working in the supply section at stevedore work and men working in the maintenance section with heavy equipment were not provided with safety-toe shoes. After a few injuries were seen by the medical officer at Camp Tuto he recommended that exposed men be provided with ski boots, which offered protection because of the heavy box toe, and were also adequate protection against the cold early and late in the season. Since ski boots are a rather expensive specialized piece of footwear, it might be more economical to procure steel cap type safety-toe shoes for foot protection.

b. Hard Hats. Hard hats were worn by the workers in the Ice Tunnel operations, but were not provided for the construction workers at Camp Fistclench. There was considerable hazard during roof construction from dropped bolts, boards, and tools. Hard hats for use on Ice Cap construction jobs would need knitted liners or attached neck and ear flaps for protection of ears on cold days.

c. Welding and Cutting Torch Hazards. Until the hazard was appreciated welding and cutting torch operations on galvanized metal were not done outdoors at Camp Fistclench resulting in instances of zinc fume fever. There were a few instances of welder's conjunctivitis from improper use of protective equipment.

2. Snow Blindness. Solar conjunctivitis was a problem at Camp Fistclench until men had acquired enough experience to realize that injury from reflected and direct sunlight could be considerable before the onset of painful eye symptoms would give warning. They quickly learned the necessity of wearing sun glasses, even in the absence of discomfort. Better indoctrination, particularly of responsible non-commissioned officers, and anticipation of the problem by the medical officer would prevent snow blindness injury.

3. Prescription-ground Sun Glasses. The experience with clip-on type sun glasses for persons required to wear glasses at all times was unsatisfactory. The existing regulation should be modified to provide persons assigned to Ice Cap duty with prescription-ground sun glasses without requiring individual authorization for each order, as is now the case.

4. Contrast Glasses. Absence of shadow and dark object contrast presents a problem in visual orientation on the Ice Cap during cloudy or foggy weather when the light is diffused. This condition presents a hazard even when not so extreme as to be termed a "white-out." It is possible to walk, ski, or drive into a deep hole without seeing it. The effort to distinguish tracks on the snow surface, as in following a trail, may become very tiring. The problem is based on the fact that the shadows which give information about the relief of the snow surface are faint, and the overall level of illumination is high. Shadows on the snow appear bluish in color. Some observers have felt that the wearing of red or deep yellow glasses heightens the contrast of these faint bluish shadows. It may be that the beneficial effect is the result of cutting down on the level of general illumination, rather than the result of the specific wavelengths which are attenuated. The physiology of this apparent effect should be evaluated by qualified persons and the optimal type of glasses decided upon.

5. Carbon Monoxide. Satisfactory detection and elimination of carbon monoxide hazards will be a problem at undersnow and under-ice camps. Presently available field detectors are all affected by low temperatures, and may be unreliable on the Ice Cap. A means of accurately and reliably determining the carbon monoxide content of a gas sample should be available to use as a check against the calibration and reliability of field detectors. Equipment for determining blood saturation with carbon monoxide may prove desirable in picking up low grade chronic exposures.

The carbon monoxide problem at Camp Fistclench will be more important next year because the undersnow camp may be well sealed by the winter accumulation of snow. Certain premises about the diffusion of gases through snow will require checking, especially after a glaze has been established on the snow trench surfaces from exposure to radiant heat from buildings and equipment. This glaze had already become pronounced near snow melters and generators and adjacent to the headquarters building (which had been heated the longest) at the end of the 1957 season.

Indoctrination into the hazards of operating all types of combustion equipment in the undersnow camp must be intensive. Tractor operators tended to leave motors running while loading or unloading inside the trench system because of the inconvenience of hand re-starting. Equipping all small tractors with electrical starters would reduce this tendency. It may be wise to consider an electrically powered vehicle

for shuttling materials and fuel within the snow trenches, to reduce exhaust fume accumulation. Similar considerations apply in the ice tunnel, and there electrical vehicles have been adopted.

The automatic carbon monoxide indicator and alarm procured from the Mine Safety Appliances Company (Model DR-42160) may require modification and increase in specificity to be useful at low and variable temperatures and in the presence of diesel and gasoline fumes. The experience of the occupants of the Air Force undersnow tubes at Camp Fistclench with this equipment was so unsatisfactory that the alarms were simply turned off.

Ventilating fans and flexible tubing for conducting exhaust outside should be included in future plans, both at Camp Tuto and Camp Fistclench.

6. Fire Prevention. The fire prevention program of the Task Force was excellent and rigidly enforced. It is recommended that in planning future Ice Cap camps consideration be given to the benefits of some type of central heating. The present system of multiple individual stoves increases the fire hazard and aggravates the carbon monoxide problem. It seems apparent that the 50,000 BTU stoves installed at the undersnow camp this year will be operated at red heat much of the time. This increases the fire and carbon monoxide hazards, since carbon monoxide diffuses through red hot steel.

C. Sanitation at Camp Tuto

1. Human Waste. Latrine facilities at Camp Tuto were housed in small separate heated buildings, of the following latrine seat capacity:

Enlisted Men	7
Civilian	3
Officer	3
Officer	<u>2</u>
Total	15

According to FM 21-10 these facilities were inadequate but nevertheless seemed to meet the needs of the population, which approached 300 at times. However, the physical spread of the camp resulted in some of the enlisted men having to travel 100 yards or more, a deterrent in bad weather. This led to the practice of urinating about the doors of buildings. While temperatures were low and snow abundant this practice was not offensive, but with the coming of warm weather

offensive odors arose. The buildings did not have provision for ventilation other than the door. They were not screened. Thus during the warm weather when insects were abundant there was a tendency to prop the door open.

The latrines provided for satellite project sites were usually inadequately cared for, and in one instance no latrine was provided.

Fecal waste was accumulated in buckets made from cut off oil drums, positioned under a box seat fitted with commercial toilet seats and covered by a simple wooden top. Early in the year there was much carelessness with positioning the buckets properly, so that feces soiled the outside of the buckets and urine missed the buckets entirely. This was corrected by constructing guide slots for the buckets, metal urine deflectors, and designing the door to the bucket compartment so that it could not be closed unless the buckets were properly forward. The buckets were changed daily. Full buckets were taken to a disposal area and burned out with gasoline. Unburned residue was added to the sanitary fill and burned again. Hypo-chlorite powder was used in the urine troughs and buckets as deodorant. The trough urinals were locally constructed. The urine was collected in empty fuel drums. The metal of the troughs became corroded. The drain was placed so that emptying of the trough was not complete. These conditions gave rise to odors only incompletely controlled by the hypo-chlorite. During the insect season the latrines and the sanitary fill area were sprayed with residual effect insecticide (5% DDT).

Suggestions for Improvement - Additional latrine facilities should be provided about the camp.

Screened ventilation should be provided, with covers which could be closed in severe weather.

Enamel or non-corroding urinals be installed which drain completely.

Latrine facilities meeting acceptable standards be provided for satellite camps. A well-designed latrine mounted on a sled would be useful for project parties and separate camps.

2. Food and Kitchen Waste. Early in the year the dishwasher disposal system was frozen, so that dumped water did not percolate away as intended, but instead formed a foul frozen lake. This was

corrected with the onset of warm weather. During the year the mess hall was relocated. Provision was made to pour liquid wastes through a grease trap inside the building and then drain them away through a pipe which discharged in the center of a melt stream. This system appeared to work well so long as freezing temperatures did not occur. Some change may be necessary to avoid creating another dishwasher lake during cold weather.

Non-liquid kitchen waste was taken to the disposal area and incinerated.

3. Sanitary Fill. The shallow layer of unfrozen ground presented a problem in the construction of a sanitary fill area. However, by scraping up thawed material from a wide area it was possible to construct an elevated fill which is covered with a layer of earth after burning of combustible materials. This fill is about 3/4 mile from the camp and is located in an area where the ground water drainage is away from the camp. As with the disposal of liquid wastes the problem becomes intensified early and late in the year when all soil is frozen solidly and there is a large accumulation of snow.

Several other accepted means of field disposal were attempted but met with little success mainly because of the lackadaisical attitude of the personnel using the facility. As with waste disposal anywhere, adequate supervision and willingness of the users is essential.

4. Water Supply. Water for drinking and cooking was hauled by tank truck from the water point in Thule AFB. The ultimate source is a melt water lake which collects drainage from an uninhabited portion of the Ice Cap. This water was not filtered or sedimented but only chlorinated before distribution at the water-point. At Camp Tuto water was stored in two 1000 and one 500 gallon steel tanks. Water from these sources was cultured weekly and showed no contamination. Water for individual use was carried from these tanks to huts in five gallon cans.

Water for bathing was obtained from the overflow stream of the lake adjacent to the camp (upstream from the point of discharging kitchen wastes). This water also showed no bacterial contamination. It would seem feasible to use water from this lake for drinking after purification. However, in this case proper sanitary precautions in the drainage area where separate parties frequently operate would be essential. Hot shower water was available daily.

5. Quarters and other Buildings. Jamesway buildings 16 x 32 feet were used to house eight men, giving a floor area of 64 square feet per man. Double-decking of bunks, halving the floor space per man could be done in an emergency. Clean linen was available weekly, and clean blankets as necessary. Floors were swept daily and mopped several times weekly. Infiltration of fine loose dust was constant during periods of wind. It is assumed that this dust is largely inorganic and does not represent a serious health hazard so long as the surrounding area is not carelessly contaminated.

The mess hall was inspected regularly by the medical officer and maintained to accepted standards of sanitation.

Washing machines and buckets were available for individual laundry. QM laundry was available at Thule AFB for bed linen.

D. Sanitation at Camp Fistclench

1. Water Supply. All water consumed at Camp Fistclench during 1957 was produced by melting snow. A small quantity of water for washing and laundry was melted in huts on heating stoves from time to time, particularly during severe storms which prevented operation of the large snow melter. All drinking water was melted in diesel fired melters with 1100 gallon steel melting and storage tanks. Water was stored in the melter tank and also in a 1000 gallon tank in the mess hall building. Water was dispensed in five gallon cans for individual quarters. At the undersnow camp piping was installed to distribute water from storage tanks to latrine, showers, and the mess hall. Because of fuel restrictions water for showers could be supplied at rate of one shower per week only.

Three different methods were used to procure snow for melting. Initially, snow was bulldozed onto a sled, and then hand shoveled into the melter. This was rapid and effective but there was considerable opportunity to contaminate the snow with oil drippings from the tractor. Later, snow was mined from the sides of a trench cut by the Peter Snow-Miller (a high speed rotary plow). The trench was located in an uncontaminated area upwind from camp and about a mile distant. Blocks were sawed from the walls of the trench with gasoline powered chain saws and then hand-loaded onto a ten-ton sled for transportation to camp. They were again hand-loaded from sled to snow melter. This method produced satisfactory water, but was expensive in terms of time and labor required. Exhaust gases from the saws tended to contaminate the blocks at times.

The most recent and satisfactory method was to obtain snow with the Peter plow, blowing it directly onto a ten-ton sled which was fitted with sideboards. With this method it was possible to load two sleds in about ten minutes. This provided water for three to four days. The snow was then hand shoveled into the melter as needed. If the Peter plow were equipped with a chute which could concentrate and direct the snow outflow, it would be possible to blow snow from an accumulation area inside a snow fence directly into the tank of the melter. The frequent storms would serve to keep the accumulation area refilled with fresh snow. Plows with such chutes are now available to the Task Force.

It was found to be important to keep the storage tank of the melter covered to avoid contamination with diesel fumes and soot from the stack of the melter. This seemed to be a more important source of diesel taste in the water than droppings from equipment. Any leaks in the fire tubes of the melter also gave a strong diesel contamination to the water.

The storage tank of the snow melter was not lined, and many of the five gallon cans used for individual distribution had defects in the lining paint, so that flakes of paint and rust usually were present in the drinking water. Although this presented an aesthetic disadvantage there were no instances in which health seemed to be affected.

There was no attempt to control accurately the temperature to which the water was raised in the melter, as heat sterilization was not considered necessary. However, it was the custom to heat the water more than just enough to melt the snow so that hot water would be available for showers. It is likely that temperatures were usually reached which would be lethal to vegetative forms of bacteria. Occasional cultures of water from the storage system were sterile.

2. Latrines. The latrine used at Camp Fistclench prior to completion of the undersnow camp was of the bucket type. The buckets were 55 gallon fuel drums cut off at a convenient height and fitted with simple wooden top and commercial toilet seat. Six of these were placed in a heated building. Since there were no insects at Camp Fistclench there was no need for screening or insect proof covers. The drums were hauled to the dump area daily and fired with a quart of diesel fuel. After firing the dry residue was dumped and covered with snow with the other garbage. Urine was disposed of after collection in empty drums by hauling frozen to the dump area. It was also sumped directly into the

snow through a short section of stove pipe or sewer pipe. It melted its way down through the snow to great depth.

3. Garbage and Dishwater. Dishwater was dumped into a sump hole in the snow. This hole melted to a depth of more than 120 feet after a few weeks operation. Garbage was hauled to a snow trench where combustible wastes were burned. From time to time the residues were covered with snow and a fresh trench cut. It was also necessary to cut a fresh trench after each storm, as drifting snow rapidly filled any depression.

These methods of disposal seemed satisfactory in the circumstances. The winds were nearly invariable from the quadrant 90 to 180 degrees, so there was little danger of debris being blown back into the camp area. The annual accumulation of snow was such that disposed materials became more and more deeply buried.

4. Quarters and other Buildings. Accepted standards of military neatness and cleanliness were maintained in quarters and mess hall. Sleeping bags were aired outdoors at least weekly. Floors were swept and mopped daily. Strong efforts were made to prevent indiscriminate urination about quarters entrances, which presents a great temptation in the cold. Keeping of animal pets was discouraged, although the only wild life seen was occasional birds.

E. Sanitation Aboard Tractor Swings

Tractor train travel over the Ice Cap presents some unique sanitation problems. Personnel live in wannigans - small buildings mounted on sled runners and fitted with bunks, stoves, and simple cooking and storage facilities. Conditions were invariably crowded, water for washing was limited, refrigeration space for storing fresh foods was scant, space and water for dish washing were restricted. Despite these limitations it was quite possible to maintain acceptable military standards of sanitation if the responsible commanders demanded it. It has been the custom of the Task Force to allow beards to be worn during tractor train trips. This had a tendency to discourage personal hygiene, and may not have been a wise policy.

Tractor trains were equipped with a bucket latrine. Usually personnel tended to urinate onto the snow beside the trail, and to dig shallow "cat holes" for defecation. Since it frequently becomes necessary to use trail-side snow for melting into drinking water, this practice facilitates contamination. Rules reserving one side of the trail for

defecation and the other side for drinking water are unrealistic considering the high velocity winds. Sufficient latrines should be provided for the wing personnel. Here also a sled mounted latrine building would be quite useful. The buckets should be thoroughly burned out, abandoning them if it is not desired to stop long enough for the bucket to burn and cool. Latrine buckets can be made in unlimited supply from fuel drums, so there is no reason to continue to contaminate this heavily traveled strip.

F. Sanitation at the Undersnow Camp

The sanitation facilities at the undersnow camp are described in detail in the construction report, and will be noted only briefly here. The method uses flush latrines drained to a sump hole self-melted into the snow. Shower and wash basin waste water is used to flush the latrine. No effort is made to decontaminate the feces before dumping into the sump hole.

Whether this represents adequate sanitary practice at a site which is to be occupied for a number of years is debatable. In areas where melting conditions are encountered this would be possibly dangerous, as melt streams may run beneath the surface through defects in the ice. It has also been proposed to study the usefulness of cavities melted in the ice for the storage of drinking water, fuel, and lubricants. If these methods prove useful the uncontrolled deposition of fecal material in the camp area would be quite undesirable. Such a sump hole system should be studied to determine the extent of lateral spread of material at various depths if ice cavity storage is to be done.

G. Morale

It is felt appropriate to comment on morale factors as observed by the medical officers. Some differences between the two major camps will be noted.

1. Initial State. Members of the Task Force were for the most part efficiently trained, highly selected individuals who were well-indoctrinated as to their function and the problems of the environment prior to leaving the United States. Many were volunteers. A high level of performance was demanded and the work hours were long with little free time. Work hours were from 0700 to 1800 six days a week and from 1300 to 1800 on Sunday. At both camps there was occasionally additional work from 1900 to 2100 hours.

The personnel sent to Camp Fistclench were informed by the command that they were selected individuals, being sent to do a difficult job under trying circumstances. It was clear from the beginning that there were definite construction goals to be reached, and that the sooner the work was done the sooner the group would return to Camp Tuto.

2. Recreation Facilities. Movies were shown several nights weekly at Camp Tuto with an admission charge of twenty-five cents. They were shown nightly at Camp Fistclench without charge. A day room was available at both camps for reading, letter writing, or cards, but these buildings were later required for quarters. Baseball and football equipment was available at both camps and a few sets of skis were available at Camp Tuto. The Air Force operated a ski tow on week ends early in the season. No skis were available at Camp Fistclench for the military although the civilians occasionally used the one or two pairs available from the Air Force installation. The available sports equipment was quite inappropriate for the environment and was little used. Reading material was quite outdated and was seldom referred to for use.

3. Post Exchange. A well-stocked exchange was located at Thule AFB. It was not convenient for the enlisted men to visit this exchange because of short transportation and long working hours. A small exchange selling candy, soft drinks, beer, toilet articles, and writing materials was available at the Transportation Corps camp at Camp Tuto, and at Camp Fistclench. Beer was rationed to 24 cans per man per week at Camp Fistclench.

4. Mail. Mail service from the United States to Camp Tuto required 3 to 4 days when weather conditions were good. Service to Camp Fistclench was complicated by the fact that the majority of flights were scheduled by the Air Force for purposes other than delivery of mail. At times coordination between flight operations and the Task Force was poor so that planes arrived without mail. This proved a very depressing circumstance, especially if mail had previously been delayed by bad weather. The longest interval without mail at Camp Fistclench was of the order of two weeks. On a number of occasions a soldier being disciplined for infraction of rules would credit his misbehaviour to discouragement or discontent due to delayed or disappointing mail. Dispatch of mail was more frequent from Camp Fistclench as any outbound vehicle or aircraft could make room for a mail pouch.

5. Pay. There were numerous delays in delivery of pay to Camp Fistclench, some due to weather and some due to clerical misadventures aggravated by the dispersed nature of the Task Force. Whenever circumstances combined so that a portion of the men were paid while another portion were not there was a strong feeling of resentment. During the first half of the season this happened several times. Later the difficulties were eliminated. Pay was seldom delayed at Camp Tuto.

6. Religious Services. Religious services were held at the Transportation Corps camp adjacent to Camp Tuto and also at Thule. No religious services were available at Camp Fistclench. There was little expressed comment concerning its absence. A few men maintained religious practices, such as Scripture reading.

7. Food. Type "A" rations (fresh meats and vegetable produce) were served at both camps. The basic allowance of 4,400 Cal per man per day was increased by half for Camp Fistclench. Food service did a fine job of presenting attractive means at both camps. At times there was some shortage of salad greens and tomatoes at Camp Fistclench due to damage in shipment, but there was always an abundance of fresh frozen vegetables and citrus fruits and juices.

8. Radio and Television. A number of radio receivers were available at Camp Tuto, and television was located in the clubs. At Camp Fistclench there were three shortwave receivers (insufficient). Broadcast bands other than shortwave could not be received at Camp Fistclench.

Radio-phone contact was available for personal means via MARS to ZI for the greater part of the Task Force operation but it was impossible to reach Greenland from ZI via radio-phone for personal reasons.

Telegraph communication from Greenland to ZI and from ZI to Greenland was possible but quite expensive.

In case of an emergency Red Cross contact was possible from ZI and from Greenland.

VIII. PROFESSIONAL EXPERIENCE

A. Problems for Study

It is the impression of the medical officers that there are not many medical problems which are modified in their diagnosis, course,

or management in the Greenland environment. However, there were a few observations mostly of a qualitative nature and generally uncontrolled, which may be noted for consideration for further investigation.

1. Wound Healing. Wounds which appeared to be uninfected were noted to tend to dehisce if sutures were removed at the usual time. In most cases these wounds were in areas of skin exposed to low temperatures.

2. Wound Infection. It was felt that accidental lacerations had an increased incidence of infection, although this infection when it occurred was usually indolent, late appearing, and accompanied only by minimal signs of inflammation. If this be a valid observation it may be of some interest to determine whether the infections are indolent because of change in the characteristics of the organisms or not. It is of course possible that the increased incidence of infection may have been a reflection of poor hygiene practices in face of limited bathing facilities. The possibility that bacterial flora is altered from that usually encountered due to environmental factors is intriguing but has not been investigated.

3. Skin Texture. During the stay in Greenland there was noted a number of persons with generalized skin dryness, apparent increase in thickness of cornified layer over the elbows and knees (lichenification), and a tendency to fissuring or cracking of the skin of the hands. Since there is little reason to doubt the adequacy of the vitamin A intake these changes have been postulated as being due to the low atmospheric humidity with dehydration of the superficial layers of the skin resulting in loss of flexibility and elasticity.

4. Dental Complaints. It was the qualitative impression that dental disabilities were unusually frequent among the personnel of the Task Force in Greenland. For instance the need for dental care was the most frequent cause for evacuation from Camp Fistclench. Apparently the dental health of the members of the Task Force was checked too late to permit correction of defects found prior to leaving the United States.

5. Bacteria. In spite of the fact that numerous cultures of drinking and bathing water were made with ample opportunity for contamination, there was never any growth found when cultures were plated and incubated in the accepted manner. It would seem logical to incubate and handle these specimens in a manner more closely resembling their natural environment.

6. Gastrointestinal Complaints. Although no quantitative determination was made of the frequency of this disorder, there seemed to be an increased incidence of all gastrointestinal complaints. Several men with proven peptic ulcers in the past were seen in Greenland; one only several months after a simple closure of a duodinal ulcer. One man had tarry stools shortly after his arrival in Greenland necessitating hospitalization.

Whether the incidence of complaints is statistically increased, whether these complaints are the effect of the cold environment, isolation, etc., require investigation.

However, because of the limited medical facilities in this region it would seem wiser for these men to be positioned at a permanent base.

7. Epistaxis. For the most part this ailment was of a minor nature but occasionally was severe enough to require anterior and posterior packs and cauterization. Frequently this condition would manifest itself in persons who had not had epistaxis since childhood.

8. Diarrheal Disease. This condition was not a problem and, although no cultures were done, seemed to be primarily on an emotional basis.

9. Hepatomegaly. Enlarged livers were observed in several patients with non-associated conditions. A complete battery of liver tests on all patients was normal. Present and past history of these patients was such that liver disease would not be suspected. However, since physical examinations were not done prior to ZI departure there is no way of knowing the duration or cause of the condition other than to suggest as have others, that it may be because of increased carbohydrate storage in the liver.

10. Gingivae. Numerous subjective complaints were received regarding "recession of the gums from the teeth" although no positive physical findings were observed. Since there were no symptoms of vitamin deficiency found it was assumed this ailment was not on a dietary basis.

11. Foot Problems. These problems resulted from poor hygiene and consisted mainly of maceration of the skin between toes from excessive perspiration. Cases responded quite well to proper hygiene.

Frequently it was so warm that vapor boots couldn't be worn. Men working in the ice tunnel by necessity had to wear these boots and this further increased their problems. There seemed to be no adequate footwear during the warm, melt season.

B. Cases Seen at Camp Tuto Dispensary

Total visits (9 April to 16 September)	1,394
Total visits for respiratory infections	172
Total visits for trauma (lacerations, sprains, strains, contusions)	214
Hospital Outpatient referrals	193
X-rays	58
Dentist	54
Laboratory	31
Total number of cases hospitalized	13

C. Cases Seen at Camp Fistclench

Week	Total Visits	Total Present	Trauma	Infection	Dental	Other
12-18	13	34	8	5		
May 19-25	12	34	7	3	1	1
26-1	22	54	4	10	3	5
June 2-8	20	51	9	3	1	7
9-15	38	55	23	11	3	1
16-22	28	87	20	4		4
23-29	37	88	19	10		8
30-6	40	89	19	14		7
July 7-13	28	94	18	3	1	6
14-20	20	97	11	4	1	4
21-27	39	125	16	14		9

Week	Total Visits	Total Present	Trauma	Infection	Dental	Other
28-3 Aug	32	102	17	10	1	4
4-10	35	96	8	20	2	5
11-17	14	78	2		1	11
18-24	11	78	4	5	1	1
25-31	8	31	2	5		1
TOTAL:	397	1193	187	121	15	74

D. Cases Evacuated to United States

Number	Cause
1	Neuro-psychiatric consultation
1	Peripheral neuropathy
1	Epilepsy
1	Fracture left humerus
1	Myocardial infarction
2	Gastrointestinal consultation
TOTAL:	7

E. Cases Evacuated from Camp Fistclench to Camp Tuto

Number	Cause
3	Trauma
3	Administrative physical examination
3	Diagnostic study (2 GI, 1 Neurology)
8	Dental
TOTAL:	17

IX. RECOMMENDATIONS

In addition to recommendations discussed in connection with above sections the following recommendations are made:

A. Permanent Medical Officer for Task Force

It is strongly recommended that consideration be given to assigning one medical officer permanently to the USA Engineer Arctic Task Force for the following reasons:

1. For the most effective medical service the medical officer should be present and informed and able to give advice during the planning phases of future operations. This will become particularly important if there is expansion of Task Force activities in Southern Greenland, for it may become necessary to staff and equip a small hospital at this location.
2. The experience of 1957 showed that winter month training of enlisted aid men will be necessary to achieve the highest level of medical care. The previous experience of the aid men assigned to the unit should be evaluated and needed training outlined by a medical officer who is familiar with the objective desired.
3. Certain aspects of medical service for the Task Force will benefit from the continuity offered by a permanent medical officer. Supply and equipment procurement particularly require follow-up during the winter months, so that supplies will arrive when they are needed.
4. A permanently assigned medical officer could improve the efficiency of the unit by assisting in the elimination of unfit personnel, and by expediting the correction of remedial defects prior to departure from the United States. The 1957 experience with dental problems could have been avoided, if a medical officer had been available to push the needed care through in proper time.
5. The Task Force offers a unique opportunity to observe the human organism as is affected by alternating temperate and Arctic environment. A permanently assigned medical officer would have the advantage of being able to make control and baseline observations during the winter months when the unit is based at Fort Belvoir, which could be compared with observations made on the Ice Cap on the same individuals.

Qualifications - The circumstances of the Task Force in Greenland require that the medical officer assigned to Camp Fistclench, at least, be competent to handle a serious general surgical and orthopedic emergency. It is not difficult to imagine circumstances in which an appendectomy, closure of perforated viscus, or other major surgery

might be required at a time when evacuation is not possible. The medical officer assigned should have or acquire an interest in the Arctic, winter sports, mountain climbing, and glacier travel techniques, so as to be able to conduct training, and to participate effectively in rescue missions. Training in, or an interest in psychiatric diagnosis and simple psychotherapeutics would also be a definite asset, both in eliminating unfit personnel and in meeting problems which are apt to arise under the stresses of Arctic living.

B. Rescue Operations and Training

The following recommendations concerning rescue operations are made based on 1957 experience:

1. Vehicles in first class condition should be held in reserve to mount a small rescue swing at major Ice Cap installations. All equipment not subject to storage deterioration should be loaded in place to minimize delay. Vehicles in daily rough use cannot be expected to be in optimal condition for rapid travel. Probably two Weasels would be sufficient for Camp Fistclench. More could be added at the time needed if circumstances warranted.

2. A rescue plan, with assigned and alternate members of the team, should be prepared in SOP form in advance. This plan should include a detailed list of preparation activities to be done by each man and a check list of equipment, to avoid hasty omission of essential items.

3. Each Ice Cap camp should have sufficient equipment to give oversnow mobility on foot to individuals of the proposed rescue teams. This should include:

Skis

Tent (in which to take shelter in a storm)

200 pound sleds (Ahkio)

Nylon climbing ropes (reserved for rescue activities,
not abused by using for lashing
sleds, as was the case in 1957)

Ice Axes

Crampons for one or two members of team

Ice Pitons

Without equipment of this type, which was not available in 1957, a rescue mission off the trail in a crevassed or possibly crevassed area would be exceedingly dangerous.

4. The rescue team at least, and possibly the majority of the Task Force personnel, should have training in the use of this equipment. This training would have considerable appeal to some individuals for its recreational value, and might well be done during off duty time by interested persons.

5. Maps, compasses (gyro type if possible), and other equipment necessary to allow land navigation should be supplied. Without equipment of this type and training in its use no party could leave the Tuto-Fistclench trail for more than a short distance with safety.

6. All the above recommendations are based on the contingency that a rescue mission may be necessary at a time when over-snow travel is possible but when aircraft are limited or grounded by weather. Such conditions were not uncommon in 1957.

X. SUMMARY

The activities of a medical section, consisting of two medical officers and five enlisted men, in support of the USA Engineer Arctic Task Force during the 1957 summer season in Greenland is recorded. The situation of the Task Force is described; the personnel, facilities, and equipment of the medical section are detailed; matters of safety, sanitation, and morale as noted by the medical officers are recorded; and the medical care given is summarized. Recommendations are explained.

APPENDIX 1

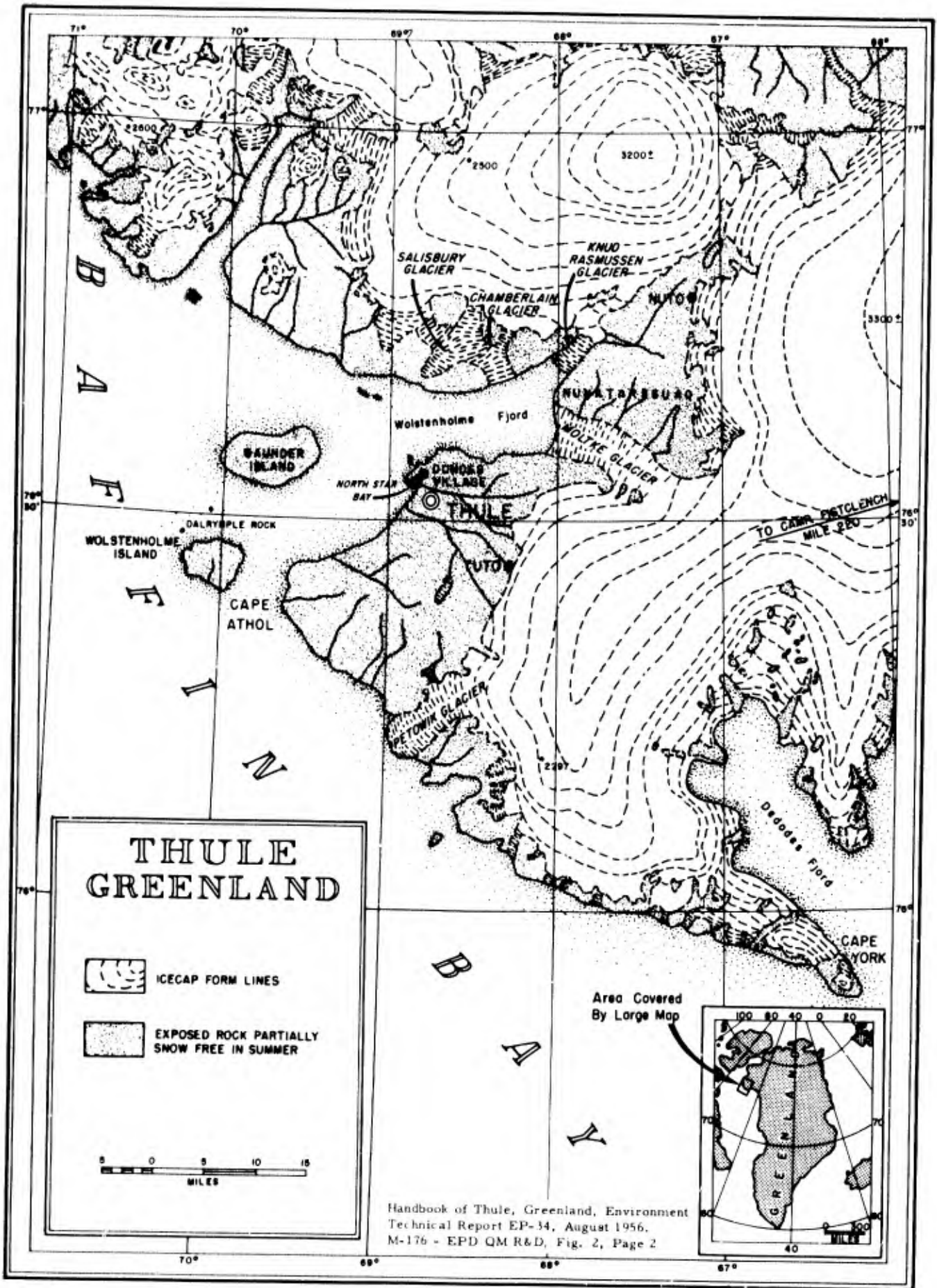
LIST OF EQUIPMENT AND SUPPLIES PROCURED FOR
1957 PRIOR TO DEPARTING THE UNITED STATES

<u>Stock No.</u>	<u>Item</u>	<u>Quantity</u>
6505-132-5181	Oxygen, USP, 95 gallon	2
6515-360-3490	Retractor, Abdominal, Deaver	1
6530-919-5700	Evacuation Bag, Casualty, Insulated	2
6545-919-1500	Medical Instrument and Supply Set, Dispensary, Field	2
6545-926-1460	Laboratory Equipment Set, Field	1
6545-927-4200	Surgical Instrument and Supply Set, Combat	1
6545-927-4400	Medical Supply Set, Field, Supplemental Supplies	1
6545-927-4960	Surgical Instrument and Supply Set, Individual	4
6545-952-6975	Splint Set, Telescopic Splints	1
6545-958-0200	Surgical Instrument Set, Field, Operating Small	1
6665-429-5500	Indicator, Carbon Monoxide, Portable	1
6665-429-5505	Spare Parts and Supply Set, Combusti- ble Gas Indicator, Carbon Monoxide	1

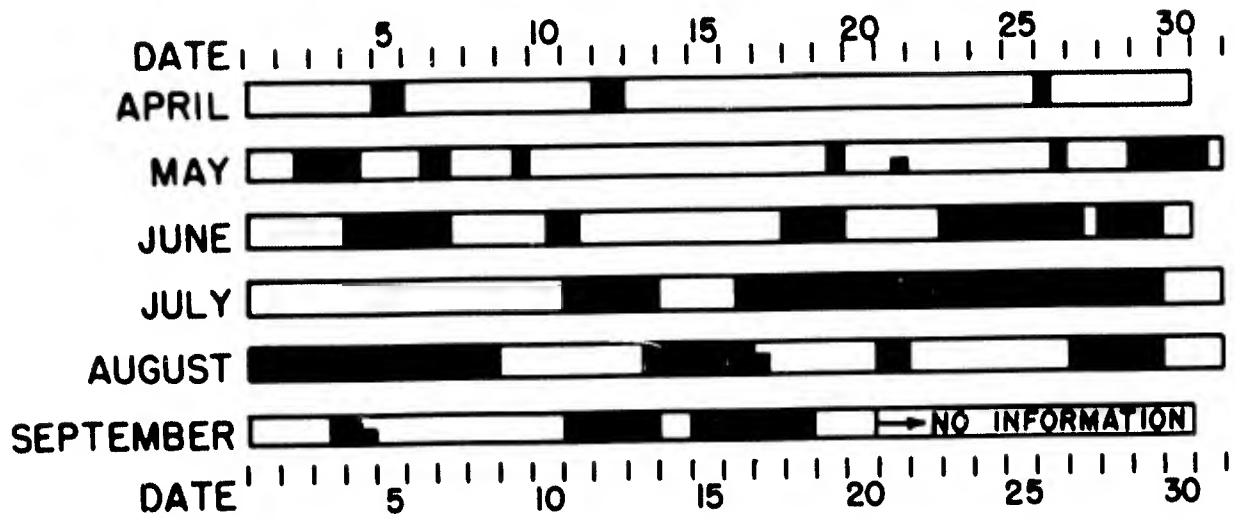
Following item had already been ordered by Task Force supply section
at time above list was submitted:

6530-783-7905	Litter, Folding, Rigid Pole, Aluminum Pole	10
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Quartermaster blankets were also available from Task Force property.



AIR TRAVEL IN GREENLAND



Dates when air travel between Thule air base and camp Fistclench was impossible due to weather conditions during 1957 summer season.

Fig. 2. Air travel in Greenland