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U.S. ANTARCTIC PROJECTS OFFICER

An account of logistic and scientific programs and current events of interest in Antarctica. Published from September through June and distributed to organizations, groups, and individuals interested in United States Antarctic programs, plans, and activities.

Rear Admiral James R. Reedy, USN
United States Antarctic Projects Officer

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Except where credit is given otherwise, all photographs are official U. S. Navy photographs.

Greenwich Mean Time is used throughout this issue unless noted.

No events after 15 October appear in this issue.

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Monthly Digest

The Bulletin for this month recounts the opening of Operation DEEP FREEZE 64 with an historic fly-in from Cape Town, South Africa, to McMurdo Sound. Previously, flights have been made from New Zealand and South America to Antarctica so that now the only significant land mass from which a flight has not been made is Australia. Readers of the article on Project MAGNET, which appeared in May 1963 issue of the Bulletin, will remember that one of its aircraft flew south from Melbourne over the Antarctic Continent in the Wilkes Land area without landing. It appears only a matter of time before this last barrier is crossed.

The success of Admiral Reedy and his colleagues inevitably arouses speculation about the future development of Antarctica. In a recent address, Mr. P. G. Law, the distinguished Director of the Antarctic Division, Ministry of External Affairs, Commonwealth of Australia, discussed the resources of the southernmost continent and pointed out some of the formidable obstacles that must be overcome before they can be developed, and in many instances even before they can be identified. Mr. Law's talk underlines the contrast between the Antarctic and Arctic, about the latter of which this issue of the Bulletin, departing slightly from its customary concentration southward, presents a short article.

Besides the impressions set forth in the article, there is the factor of time. At the turn of the present century, men first came to Antarctica to stay over the winter, and they remained only for a brief year or two. Not until near the close of World War II did they establish permanent bases to be occupied year after year. Even then the bases were few, and their location was hardly systematic. Intensive and, by comparison with earlier efforts, widespread investigation started with the International Geophysical Year. The Arctic on the other hand has been inhabited for thousands of years, white adventurers from western Europe began pushing into the area four centuries ago. The resources of the Arctic have been identified and their possibilities asserted. The Arctic stands on the threshold of exploitation, while the Antarctic is still being explored.

A review of the grants made by the National Science Foundation, as tabulated in the last issue of the Bulletin, or the subjects discussed by the Scientific Committee on Antarctic Research, as outlined in this one, reveals that Antarctica is primarily an area for scientific research. Yet, recent experience makes it hard to resist the idea that science, whether applied to the land, the sea, or the space around us, is but the prelude to use for the benefit of mankind.

Deep Freeze 64

DEEP FREEZE 64 OFFICIALLY OPENS WITH
CULMINATION OF HISTORIC FLIGHT

Rear Admiral James R. Reedy, Commander, U. S. Naval Support Force, Antarctica, officially opened DEEP FREEZE 64 operations on 1 October, at McMurdo Station, Antarctica, after a historic non-stop flight from Cape Town, South Africa in an LC-130F. A welcoming crowd of over 100 greeted the Admiral in the minus 9° temperature at windy Williams Field. The Admiral's first words were: "A great flight; a historic flight."

Two LC-130F's took off from Cape Town, each carrying 9,600 gallons of fuel and weighing 10,000 pounds more than usual. After flying 4,700 miles in 14 hours and 26 minutes, they landed at McMurdo at 0426 hours. These simple facts tell the story of weeks of preparation by Navy personnel and wholehearted cooperation of foreign nations.

The day before, 30 September, two LC-130F's flew the 2,100 mile route from Christchurch, New Zealand to McMurdo, bringing 56 relief personnel and over 2½ tons of mail to the wintering-over party there. The early arrival of this flight was planned so that facilities and aircraft could be utilized as navigational aids, radio communications back-up, and search-and-rescue, if necessary, for the Cape Town-McMurdo flight.

Cape Town preparations included a week of intensive briefing, equipment check and tune up, and radio communications tests. The South African Air Force flew weather probes, and the South African Navy stationed the frigate TRANSVAAL 1,200 miles from Cape Town in the Antarctic Ocean, along the flight line, to serve as a navigational aid, radio communications aid, and as an advance weather station.

The two aircraft lifted off at 1400 hours from South Africa's Malan Airfield and proceeded along the planned flight line of 18° 30' East longitude toward the Antarctic continent. The LC-130F's, flying at altitudes of 25,000 and 31,000 feet, with an outside temperature of minus 79°F., reached the "point of no return" at about 67 degrees South after 7 hours and 11 minutes flight time. Shortly thereafter, radar picked up the outline of the Antarctic coast and the planes continued over 1,400 miles of uncharted Queen Maud Land and the Antarctic Plateau to Amundsen-Scott South Pole Station.

Weather was perfect and the flight comfortable, with visual contact between aircraft possible at all times. Communications were excellent with contact being made with Amundsen-Scott South Pole Station as far out on course as 2,700 miles. A message of "God Speed" was received from the TRANSVAAL and an offer of assistance received from the men at Mirnyy Station.

Before departure from Cape Town, Admiral Reedy had said to a crowd of 600 well-wishing South Africans and pressmen: "This is a great venture; a great first for the United States and the Navy, and certainly an important link between many nations of the world." Indeed it was, for the flight proved the feasibility of transantarctic flights between Africa and the Southern Continent, and served to climax 25 years of aviation in the Antarctic.

SCIENTIFIC COMMITTEE ON ANTARCTIC RESEARCH

The seventh meeting of the Scientific Committee on Antarctic Research (SCAR) was held in Cape Town, South Africa from 23 through 29 September, with delegates and advisors from Argentina, Australia, France, Japan, New Zealand, Norway, South Africa, the United Kingdom, and the United States attending. Representing the U. S. as official delegate was Dr. L. M. Gould of the National Academy of Sciences. Acting as advisors were RADM J. R. Reedy, Commander, U. S. Naval Support Force, Antarctica; Dr. J. E. Mooney, Deputy U. S. Antarctic Projects Officer; Dr. T. O. Jones, Head, Office of Antarctic Programs; J. K. Allison; A. F. Blanchard; K. Rodahl; W. J. Tressler; and H. W. Wells.

SCAR is an international advisory body which functions to aid coordination and cooperation between nations in the area of Antarctic research and support activities. It is an organ of the International Council of Scientific Unions (ICSU), the organization which serves as an advisory and informative body acting between nations on matters of common scientific interest.

Items considered at the Cape Town meeting were primarily centered around reports of the various activities of SCAR over the past year. Reports on data from the Antarctic in world data centers, exchanges of information on activities in the Antarctic, conservation of natural conditions in Antarctica, proposals by ICSU to establish an International Antarctic Analysis Center, liaison with other international organizations such as the IGY/IGC Symposium and the World Health Organization were presented. Other important topics of discussion were the Antarctic Treaty, an evaluation of the level of cooperation in the Antarctic, the various SCAR symposia that have been held in the past year and the appointment of chairmen to and general consideration of SCAR working groups.

The substance of the meeting, however, consisted of the reports given by the various working groups on scientific aspects and support activities. Reports on biology, geodesy, cartography, communications, logistics, geology, meteorology, upper atmosphere physics, solid earth geophysics, geomagnetism, glaciology, and oceanography were given and discussed by participants. Among the papers presented was one on "U.S. Air Operations in the Antarctic" by RADM Reedy.

Station News

STATIONS PREPARING FOR SUMMER ARRIVALS

One of the important services of Antarctic stations which must be provided prior to the arrival of the first flights for the season is weather forecasting. During the past month, the weather bureau at McMurdo has been picking up momentum with each passing day. Shortly before the end of September, the summer weather schedule is put into effect with the wintering-over crew at the helm until the summer crew arrives. Working with the Christchurch weather office, the weather men at McMurdo begin forecasting the weather for the 2200-mile flight track. In providing surface and upper-air data for the flights, the weather bureau at McMurdo is assisted by the other Antarctic stations, the picket ship occupying ocean station position (halfway between Christchurch and Antarctica), and New Zealand and Australian weather services.

The weather reporting facilities are expanded during the summer season by opening Beardmore and Little Rockford summer weather stations. The first flights for Beardmore and Little Rockford departed McMurdo on 9 and 14 September, respectively, to reactivate the stations for DEEP FREEZE 64.

Another of the important tasks to be accomplished by the wintering-over crews prior to the arrival of their replacements is the preparation of the runway and skiways. At Williams Field, the only runway which can accommodate wheeled aircraft, it was necessary to clear the runway of snow accumulated in the two storms in late August and early September. After removing the snow, pulvimixing operations were begun. At last report, the runway at Williams Field was finished and flights were arriving from Christchurch and departing to some of the inland stations. The skiways at the other stations were in various stages of completion and should all be ready for the first scheduled flights. Byrd and Hallett Stations have already received flights and Amundsen-Scott South Pole and Eights Stations should be ready in early November.

NUCLEAR REACTOR RUNS FOR 1,134 CONTINUOUS HOURS

The PM-3A nuclear reactor completed an extended run of 1,134 hours without interruption of power, light, or heat at McMurdo Station on 3 August. The average plant load during this time was 1,250 kilowatts. Plant operation was discontinued on 3 August for modification, maintenance, and preparations for testing and was resumed on 14 August. So far this year, the plant has delivered 3½ million kilowatt hours of electricity. During the winter the men at the site were busy repairing the plant's diesel generator unit and magnetic control rod drive assembly and tracing out and labeling the complex electrical circuit systems to enable their ready identification.

Weather

STORMY AND COLD SEPTEMBER

September at U. S. Antarctic Stations was a mixture of the warmest, windiest, cloudiest, and stormiest September on record. The weather launched an all-out offensive against McMurdo, and the month truly lived up to its reputation as being one of Antarctica's worst storm months. On 31 August, after but a 24-hour reprieve from one of the hardest storms experienced during the winter, McMurdo was again feeling the fury of an Antarctic blizzard. Gale winds and blowing snow continued through 3 September, during which time winds averaged 44 miles per hour with a peak gust of 95 miles per hour on 1 September, breaking the old record established in 1958 and equaled in 1961.

September still brought cold weather to Byrd and Amundsen-Scott South Pole Stations. At the latter, temperatures during the first 2 weeks were mostly in the minus eighties. The worst storm of the season dumped a large quantity of drifted snow around the exits of Pole Station and the main ramp was almost completely closed off for a short period of time. The lowest temperature for the month was minus 89° and the highest was minus 38°, recorded on 1 and 24 September, respectively. The average wind speed was 18 knots with the fastest being recorded as 37 knots on 8 September. At Byrd Station, the temperature varied from a low of minus 67° to a high of minus 1.1° during the month. The average wind speed was 23 miles per hour with the fastest being 54.1 miles per hour on 3 September with a peak gust of 57.6 miles per hour.

At Eights and Hallett, September was not so ferocious. The highest temperature for the first part of the month at Eights was plus 7°, on 9 September, and the lowest was minus 60°, on Labor Day. The peak wind gust for the first 2 weeks was 56 miles per hour on 9 September. At Hallett, the month began with 52 mile per hour average wind with a peak gust of 104 miles per hour. After 2 September, however, there was only one other day with average winds over 10 miles per hour. The month ended with calm days and had seen a record of 15 clear days recorded, establishing this as a new September record. The average temperature for the month, minus 8°, was warmer than usual. This year at Hallett, the lowest maximum temperature of any summer, plus 40° on 6 January, was followed by the highest minimum of any winter, minus 40° on 1 July.

WEATHER PICKET SHIP IN DRYDOCK

The ocean station ship, USS HISSEM, discovered a 3-inch crack in her keel on 9 October and has returned to N. Z. for repairs in drydock. She has been relieved of ocean station duty by HMNZS ROTOITI.

Stateside News

U. S. ANTARCTIC RESEARCH PROGRAM CONDUCTS
1963 ORIENTATION SESSION

Each year, the U. S. Antarctic Research Program conducts a symposium at Skyland Lodge in the Shenandoah National Park to provide an opportunity for those involved in U. S. Antarctic plans and programs to become acquainted with past and future operations on the continent.

This year, the symposium was conducted from 16 through 20 September and consisted of a program which covered all aspects of Antarctic logistic and scientific efforts. Dr. T. O. Jones, Head, Office of Antarctic Programs, opened the conference with a presentation on the U. S. Antarctic Research Program, and Rear Admiral James R. Reedy, Commander, Naval Support Force, Antarctica, followed with a presentation on the U. S. Naval Support Force, Antarctica.

Throughout the week, participants presented papers ranging from Antarctica in International Affairs to firefighting. Other presentations included the subjects of exploration and research, biology, geology, glaciology, geophysics, oceanography, meteorology, cartography, and upper atmosphere physics, all of which are areas of investigation for the current season of scientific research in Antarctica.

The program was concluded with presentations on Antarctic Support Activities, Air Development Squadron SIX, aviation and ship operations, and survival in Antarctica.

FIRST REUNION OF "PUCKERED PENGUINS"
IS HELD OUTSIDE NAS PATUXENT RIVER

Home movies were shown at a stag party outside the Naval Air Station, Patuxent River recently, but few eyebrows were raised. The films were 8-milimeter color clips of scenes and incidents involving men of Air Development Squadron SIX and dated back to Operation DEEP FREEZE IV, the last year of the International Geophysical Year.

On hand to view them was a cadre of former members of the squadron -- all known as "Puckered Penguins" -- currently stationed in or near the Patuxent area. Some 40 members of the squadron were noted to be in the area and were all contacted for the reunion which was held on 4 October.

The movies were taken by Lt. Jim Morrison and Kenard N. Nagel, AMC. Scenes shown were mostly of the Antarctic continent and provided the highlight of the evening. Narration was provided by other members present.

Notes

BRIEF NOTES OF INTEREST ON
SCIENTIFIC PROGRAMS

Mr. Jack L. Littlepage, a graduate student at Stanford University, observed 87 successive dives of a single Weddell seal from a hole in the 12-foot thick ice of McMurdo Sound and reported that its underwater time varied from approximately 8 to 16 minutes. It was assumed that 16 minutes was very close to the maximum submersion time because the animal appeared to be in a state of near exhaustion when it surfaced after the single dive of that duration.

There was a noticeable increase in the number of leopard seals coming ashore at Bird Island, South Georgia during July according to the Johns Hopkins University and Bernice P. Bishop Museum scientists.

Personnel of the U. S. Coast and Geodetic Survey at Byrd Station identified 79 seismic disturbances during June and 80 during July.

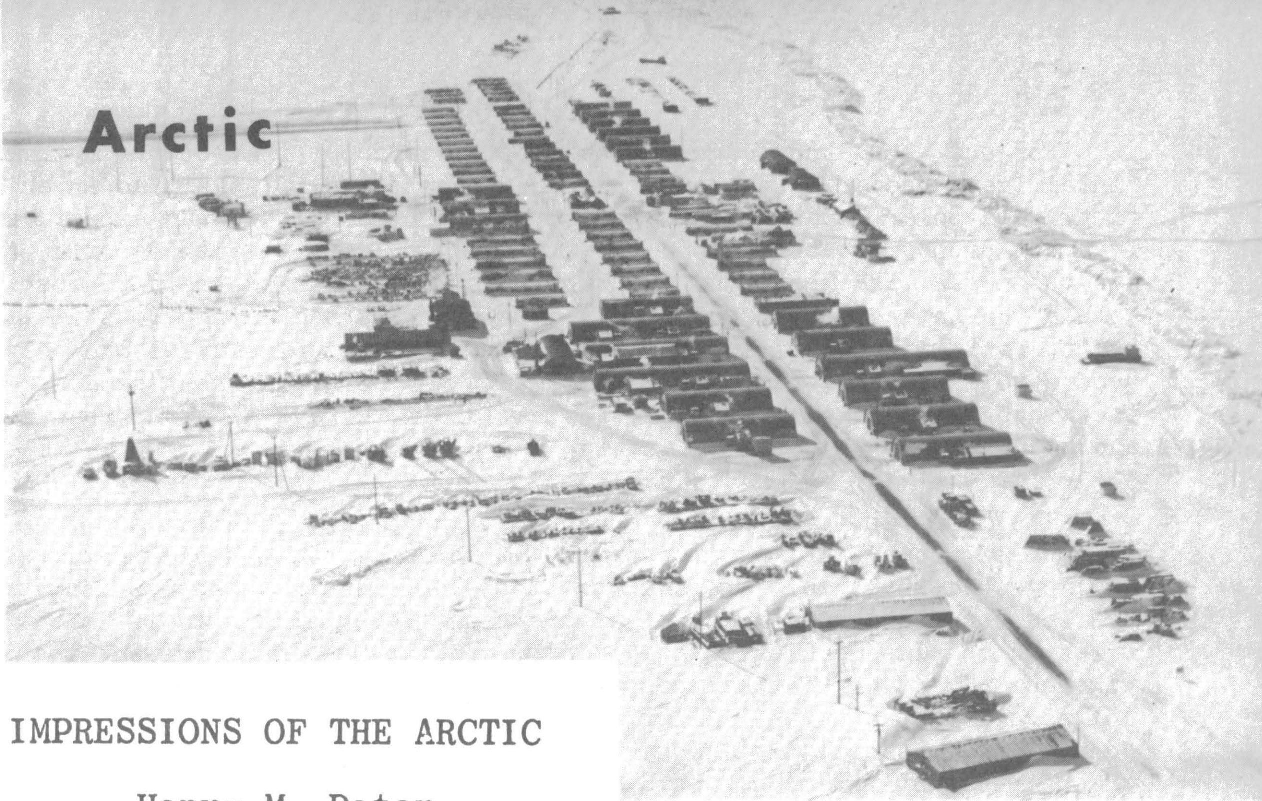
The most active and colorful auroral display observed during the winter season at Hallett Station occurred on 25 July. Intense red and green colors were observed with the green appearing behind the fast-moving red. The Arctic Institute of North America scientists at Byrd Station recorded active auroras on 10 days in June. The aurora australis was seen at Eights Station 19 August. It lasted about 4 hours and presented a display of many colors.

During clear twilight periods at Byrd Station from 10 through 14 September, 27 sighting of satellites were observed. What is believed to be the burned-out last stage of a satellite was observed on 13 September by the men at Byrd Station. It flashed with a 1-second period and appeared to tumble end on end.

BRIEF NOTES OF INTEREST FROM
U. S. ANTARCTIC STATIONS

An Emperor penguin was sighted at Hallett during the latter part of August...Six men from McMurdo made a trip to Cape Evans on 25 August to open and inspect the facilities there. From Cape Evans, they went to Cape Royds and reported the hut to be in good condition and completely snow- and ice-free inside...Byrd personnel held a scientific symposium on 20 August for the benefit of the wintering-over group. Plans are for it to be repeated for the summer personnel at a later date...One of the men at Amundsen-Scott South Pole Station has planted a garden again this year. Tomatoes, carrots, and marigolds are among some of his plants and, so far, some of the seeds have begun to sprout...Eights reports that reception of U. S. ball games and news has been very good lately...

Arctic



IMPRESSIONS OF THE ARCTIC

Henry M. Dater

The customary direction of travel for Antarcticans is south, so that, when this one received an invitation to visit the Arctic, he immediately accepted. The trip was arranged by the Arctic Institute of North America in collaboration with the Office of Naval Research for the purpose of "reviewing research activities and opportunities at several research stations in the central and western North American Arctic." Those responsible for the trip had also thoughtfully arranged that, while in Montreal, their guests attend a 2-day symposium on the Canadian Arctic sponsored jointly by the Arctic Institute and McGill University. This, for one like the author whose entire experience with the polar regions had been directed southward, turned the whole affair into a short course on the Arctic.

The guests from the United States, who were to be joined by several others in Canada, assembled for the take-off at Andrews Air Force Base on Sunday, 15 September. At 1300 local time we departed on the first leg of the 10-day, 8,300-mile journey. After the concentrated instruction in Montreal, the party, with its Canadian colleagues, resumed its travels making 1-night stands at Fort Churchill, Manitoba, and Inuvik, Northwest Territories. Next, 3 days were spent at Point Barrow, Alaska, a stop which included a survey of the Arctic Research Laboratory and a fly-over of the ice island T-3. The return journey was made first by way of Fairbanks, Alaska, where it was possible to visit the Army's installation at Fort Wainwright, the University of Alaska's research facilities, and the new Nimbus tracking center, and then by Yellowknife, Northwest Territories. On the evening of 25 September a group of weary travellers arrived back in Washington.

For one whose knowledge of the Arctic was about that of the mythical "intelligent reader," such an experience hardly qualifies him as an authority. Old polar hands have long been wary of the hit-and-run expert, and I do not propose to become one. Having seen only part of the Arctic, and not the areas like Greenland and Baffin Island, which are said to most resemble the Antarctic, and at each stop having learned enough to stimulate my interest without sufficient time to satisfy my curiosity, I can only record some impressions -- impressions that may be of interest because they record the reactions of one who may claim to have a better than average acquaintance with the Antarctic.

The first thing to strike an Antarctican is the relative accessibility of much of the Arctic. At the symposium in Montreal, Canadian National Railways had an exhibit showing how its telephone and telecommunications systems reached the majority of northern settlements. In fact, it was offering to place calls to these spots, and the Canadians present took vigorous advantage of the opportunity for free conversations with their colleagues in the north. All the localities visited on the trip had scheduled commercial airline service the year around, while Churchill, which is slightly farther north than South Georgia is south, has direct rail connection with central Canada. Its location on Hudson's Bay makes it a grain port through which, at the time of our visit, the Canadians were hoping, before winter closed in, to ship considerable quantities of the wheat they had just sold the Soviet Union. Inuvik, although well north of the Arctic Circle, receives its supplies during the summer by barge down the Mackenzie River, the only northward flowing waterway in North America comparable to the great river systems of Siberia. Point Barrow, alone among the far northern localities visited, depends upon ship transportation over waters, like those of the Antarctic, sometimes made uncertain by the presence of ice. Its situation in regard to its base of supplies in the northwestern United States is not unlike that of Argentine stations in their relation to Buenos Aires. It still, however, has its year-around air connection with Fairbanks and the south.

This accessibility has certain advantages both from the viewpoint of scientific administration and logistic support. In the first place, while, as in the Antarctic, the quantity and tempo of scientific activity are greater during the summer season, short term projects may be undertaken at any time of year. Second, many of the field workers in the Arctic, like their counterparts in the South Polar Region, are students at the graduate level. Their particular projects may be directed toward obtaining a degree, and, in many instances, the particular piece of research, whether the investigator is a degree candidate or not, is part of a larger project. The ability to consult with a supervisor easily by telephone, or, if the need arises, for the supervisor himself to visit the field and give expert advice, are matters of real importance in the successful completion of a program.

The line of logistic support is shorter to the Arctic than the Antarctic, and hence logistic costs are cheaper. The Arctic also has the advantage of possessing usable natural resources. Inuvik, for example, receives oil from a refinery located on the Mackenzie River at Norman Wells with which it is connected by water transportation. Point Barrow obtains heat from natural gas wells practically within sight of the station itself, and Churchill, of course, has its railroad. Perhaps of nearly equal importance in keeping down logistic costs is the existence of a local labor supply, Eskimo and Indian. More than half the permanent support staff at the Arctic Research Laboratory are Eskimos.

Of the research facilities of the far north, Fort Churchill, Inuvik, and Point Barrow, the last stood out for its current activity. Fort Churchill is a Joint Canadian Services Station administered by the Canadian Army and has a population of about 3,000. Originally, the Canadian and United States Armies used the station for cold-weather testing of equipment and conducting Arctic maneuvers. These activities moved away when the Strategic Air Command stationed an air refuelling squadron at Churchill. With technological change, the Air Force withdrew the squadron, and Fort Churchill is now largely devoted to scientific research. For this purpose it has the advantage of being located in the zone of maximum auroral frequency. The present scientific program therefore concentrates on study of the upper atmosphere. The Defense Research Board of Canada operates a laboratory with a staff of about 35, and Pan American Airways, under contract to the United States Air Force, maintains a range to monitor high altitude research rockets. These facilities are available to qualified research organizations in the United States and Canada. The range has also been used for high altitude balloon flights. Fort Churchill, of course, played an active part in the International Geophysical Year and expects to do so again during the International Years of the Quiet Sun. The support facilities, however, seem more extensive than are required by the scientific and other activities currently based on the station, and some talk of turning over part of the station to the Ministry of Northern Affairs for civilian use has taken place.

At the time of our visit, Inuvik from the viewpoint of research was a promise rather than a reality. The town is of recent origin, having been founded less than a decade ago, and was created by the Ministry of Northern Affairs as a model town in the far north and as an administrative, cultural, and educational center for the Mackenzie Delta area. Among the plans of the Ministry was the creation of a scientific laboratory which would be open to researchers from the Canadian government or from universities and other qualified organizations in the United States and Canada. Completion of the laboratory is expected about the first of the year, and its prospective manager was one of the Canadians who joined the party at Montreal. He was interested not only in examining the scene of his future labors and inquiring into the possibilities of housing for wife and family, but also in visiting the Arctic Research Laboratory at Point Barrow, which the Ministry of Northern Affairs had carefully investigated in planning its own installation.

The flight from Inuvik to Point Barrow is of extreme interest to one who has never before seen the area. Shortly after leaving Inuvik, the black spruce and white birches that are the northernmost trees, drop behind, and the true tundra appears. North of Alaska's Brooks range, it appears as an undulating coastal plain, brown in the mid-September sun. Across it wander watercourses, dry or nearly so, as the run-off has virtually ceased. From the air could clearly be seen the trails followed by the tractor trains of the oilmen, and occasionally, the aircraft would sweep low over caribou, grazing peacfully. Not visible were the smaller animals, the wolves, foxes, lemmings, and others that find sustenance in this barren land. Only the flocks of birds that rose from the tundra startled by the sound of aircraft engines looked at all like what one might find in Antarctica.

Point Barrow greeted us with one of its rare moments of sunshine, but soon the clouds rolled in and the snow drifted down reminding everyone that the autumnal equinox was upon us and winter could not be far behind. The station itself lies along the shore with a sandy beach, up which the surf was pounding. Originally built by the Navy in connection with a petroleum reserve established in 1923, Point Barrow consists of about 100 Quonset Huts with a few Butler Buildings and other structures thrown in. The Arctic Research Laboratory uses some 25 of these buildings for offices, laboratories, warehouses, and shops. The military, however, are conspicuously absent from Barrow. The few to be seen are from the Air Force and are connected with the DEW line station situated a short distance away and for which Point Barrow provides the air strip and logistic support. As a result, the camp is managed by a civilian firm under contract to the Air Force. The contractor operates the mess and store and provides other services which are used by the Arctic Research Laboratory on a reimbursable basis.

Scientific research began at Point Barrow in 1947 with a team of scientists from Swarthmore College using the facilities of the Naval Petroleum Reserve. From this beginning the present operation has developed under the direction of the Office of Naval Research. This office, however, does not itself manage the laboratory, but has contracted with the University of Alaska to provide the scientists authorized to use the station with board and room, laboratory space, field transportation and gear, and expert assistance. The laboratory also supports the two ice islands, T-3 and ARLIS II, and several research camps located in the general area. For this purpose it has a staff of about 64 during the summer and 54 during the winter, some 35 of whom are natives, principally employed as shopmen, mechanics, and drivers.

Support is furnished to all projects authorized by the Office of Naval Research. Some contracts are let directly by this office. Others are arranged with individuals and organizations by the Arctic Institute of North America which has an Office of Naval Research contract for research in the Arctic area. The laboratory may also be made available to other groups supported by government funds, as, for example, National Science Foundation and Public Health Service grantees.

From the beginning of this calendar year to 21 September, 59 projects have used these facilities. Some have been quite elaborate, requiring expensive equipment and a sizable staff, while others have been the concern of a single investigator. Whether large or small, a project receives the assistance it needs, and the best test of the Arctic Research Laboratory's effectiveness is the expression of satisfaction by the customers, the scientists themselves. Much of the credit must go to the director, Max C. Brewer, and his staff, who are both devoted to their work and ingenious in filling the demands put upon them.

For an Antarctican, it is interesting to note how many of the scientific projects carried on at Point Barrow are the same or related to those forming part of our Antarctic program. Indeed it is pleasant upon a few occasions to encounter investigators one has previously met in the Antarctic. The fact that the same scientific disciplines are practiced in the two areas does not mean that there is duplication, but rather that the polar regions are complementary. In fact, it is not too difficult to perceive that each has its advantages and its disadvantages and that more coordination in the work being done in both is desirable, especially in the matter of the exchange of information.

A quick survey, however, of the 59 projects reveals 13 that could not possibly be carried on in the Antarctic. These deal mostly with the biology of land animals and the archaeology and anthropology of populations and point up two of the great differences between the polar regions. Even with the most primitive technology, the Arctic possessed both a limited population and the biological resources to support it.

From Point Barrow, the party went first to Fairbanks, Alaska, and then to Yellowknife, Northwest Territories. Both these places may be said to be in the sub-Arctic, although the characterization is probably more applicable to Yellowknife than Fairbanks. The latter is a thriving small city with a flourishing university that has been active in both Arctic and Antarctic research. On the city's outskirts is Fort Wainwright, known to many by its former appelation of Ladd Field, and to which the Army moved its Arctic test activity from Fort Churchill. A few miles away is the Nimbus tracking site, which is interesting because of the information to be expected from a polar oriented satellite when one goes into operation.

Yellowknife has the distinction of being the only town in Canada's vast Northwest Territories that has a municipal government and through taxation supports its own municipal services. Its expansion goes back less than 40 years when gold mining became a thriving industry, and the town is flanked by two producing mines. In them, northern Indians and Eskimos have found employment and been, as it were, suddenly yanked into the modern age.

Yellowknife is but a forerunner of what is happening elsewhere in the part of the Arctic that I observed. The construction and maintenance of the DEW line gave opportunities for work unavailable in the native hunting economies. Everywhere the impact of modern technology is being felt, and this trend will continue. The Arctic has resources, particularly of minerals, that will repay development as the resources to the south are exhausted. A visitor comes away with the impression that the age of exploration is ending, and the age of exploitation is waiting to begin.

The governments of the United States and Canada are aware of what is happening and of the danger that the Indian and the Eskimo may be overwhelmed and lose his identity in the on-rush of civilization. Both governments are taking positive steps to meet the problem, particularly through programs of education. That is the meaning of Inuvik, for example, where the Ministry of Northern Affairs has set up a boarding school for which native children are gathered in from as much as a thousand miles away. A similar institution exists at Yellowknife, and a high school is planned for Barrow Village. A new and fascinating chapter is opening in the history of the Arctic for which no counterpart exists in Antarctica.

PERSONNEL

COMMANDER JOHN J. METSCHEL, USN

Commander John J. Metschel, USN, Commanding Officer of USS STATEN ISLAND, and Ensign James L. Wood, helicopter pilot, were killed on 15 October 1963 when their helicopter crashed and broke through the ice of the Beaufort Sea, north of Alaska. Neither body was recovered.

Commander Metschel and STATEN ISLAND participated in Operation DEEP FREEZE 63 in the Antarctic. During that operation, STATEN ISLAND assisted in opening a channel to McMurdo Station through record quantities of fast bay ice and, later in the season, carried out a remarkable survey of the Palmer Peninsula area to determine the site for a new biology-geology station. At the time of Commander Metschel's death, STATEN ISLAND was taking part in a scientific research project. His loss will be felt by the Navy, the cause of science, and the country which he served so well.

Crevasses

CREVASSES ARE WHERE YOU FIND THEM
PART I FORMATION AND DETECTION

CWO George W. Fowler, USA

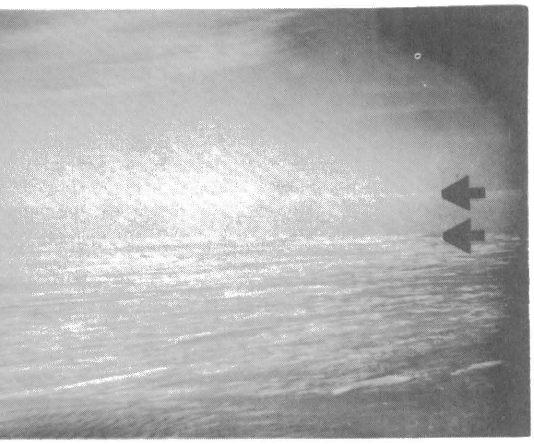
Crevasse: A fissure or rift in glacier, shelf or other land ice formations, due to temperature changes or motions of the ice. Crevasses may obtain depths of 200 to 500 feet or more--but are commonly less...

Thus, only a few words define one of the most formidable and treacherous obstacles confronting the polar traveler. The danger was recognized from the beginning of man's explorations into the world of ice, and many lives have been claimed when snow bridges have collapsed without warning, plunging men and equipment into frozen depths.

While travel by foot, ski, and dog sled requires special techniques and training to negotiate ice fields, the use of vehicle traffic and heavy equipment multiplies these requirements tenfold, and only the most prudent leader should attempt to cross crevasse areas.

Establishing safe heavy-equipment routes over permanently covered snow and ice is a comparatively new field of endeavor. With the exception of limited field experience, little guidance or information is available on this type of operation. Owing to such factors as prevailing weather, snow and terrain conditions, types of fissures and fissure patterns, extensive additional field work will be required to develop techniques of travel and methods of operation. Travel in crevasse areas will become safer as confidence is gained through information and experience.

While teaching a course in cold weather operation, an instructor (a gentleman of Finnish extraction with many years of experience) addressed these opening remarks to the class: "Gentlemen, snow is the same the world over, it is white and it is cold and when..." The remainder of this classic statement was followed by laughter. Theoretically, this was true; scientifically, it was not fact. Perhaps a like statement could be made about crevasses. They are fissures in the ice and they are deep but here, scientifically, the similarity ends.



ndulating surface appears as false orizon. (The area between arrows.)

pproaching suspected crevasse area ear nunataks. (Arrow at nunatak.)

Photographs by author

Crevasses are found on both isolated mountain glaciers and on the periphery of areas permanently covered with snow and ice. Examples of isolated crevasse systems can be seen in Alaska and parts of the mountain chain in the Western United States. Of the areas permanently covered with snow and ice, the Antarctic Plateau and the Greenland Icecap are the largest and most outstanding examples. Both areas contain large crevasse systems, distributed chiefly around the coastal or marginal areas of the ice.

The formation of crevasses is dependent upon the interaction of land mass and ice and is determined by the topographic nature of the bedrock or terrain beneath the ice, the thickness of the ice, and the direction and rate of its movement. As the ice moves over irregular terrain, tension and compression areas develop.

A system of crevasses can be either transverse or logitudinal to the direction of ice flow. Transverse crevasses are simple tension cracks which occur at nearly right angles to the direction of flow and are usually found across slopes. Longitudinal crevasses form downslope or parallel to ice flow, being caused by a spreading-out of the ice mass in two directions. Severe crevasse patterns form in marginal areas and at glacier points where ice flows out to land or water.

In Greenland, the formation of crevasses is limited to an area 40 to 100 miles wide, extending around the entire edge of the icecap. The inland area is crevasse-free.

Crevasse systems in the Antarctic occur on the plateau, on ice shelves, and on sea ice adjacent to the land or shelf ice. They may occur in patterns consisting of a multitude of parallel crevasses or in complex multi-layer formations.

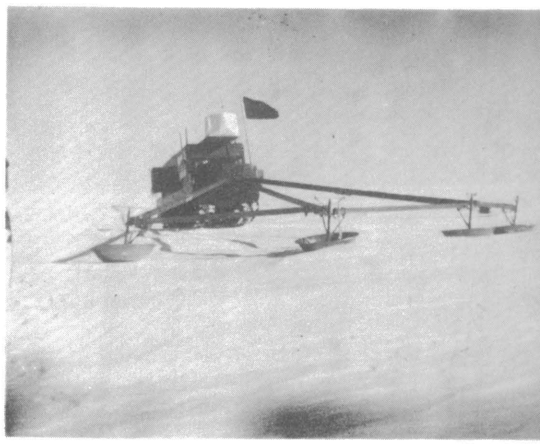
The general conditions causing crevasse formations have been outlined, but there are a few specific rules that can be used to assist in detection of suspected areas. Valleys and depressions on shelf ice indicate tension areas which are likely to be crevassed. The valleys and depressions on inland ice are indicative of compression areas or active glacier drainage basins. The compression areas are usually safe and are sometimes spotted by compression ridges, a ridge-like protrusion in the ice surface generally running perpendicular to the direction of flow. Active glacier drainage basins are always suspected areas and can be spotted by crevasses at some point along their outlets.

Rough sastrugi and wind-drift patterns on Antarctic plateau.

Tension areas will be found on inland ice in drainage basins, along the lower side of benches and, as a rule of thumb, on ridges where slopes incline at a rate of 200 feet per mile or more, and finally, the presence of nunataks and/or differences in elevation will always indicate suspected areas.

Successful detection of bridged crevasses is dependent on a thorough well-planned program. The greater the number of techniques employed, the more the likelihood of finding the most feasible route and the greater the chance of successfully completing the crossing. When several methods of approach are available, they should all be used, as each will provide additional information about the terrain in question. It is recommended--for safe detection of crevasses--that a well coordinated air-surface program of reconnaissance be undertaken. Such programs, with each of their techniques adding to the general store of information have been followed with outstanding results.

The electronic crevasse detector used for surface reconnaissance.



Photographs by author

Aerial reconnaissance provides the best means for overall study of terrain features. From the air, crevasses can be spotted by a shadow which results from a slight depression in the snow surface caused by sagging of a snow bridge, and open crevasses will appear as dark shadows or holes. Care should be taken in analysis, because compression ridges may cast shadows similar to those crevasses.

Experience has led to a rather simple but accurate system for aerial reconnaissance. Observers on either side of the airplane take terrain notes by recording the time of observation and by using a predetermined set of ice and crevasse symbols. Watches are syncronized and observation starts at a signal from the air navigator when the plane is on a predetermined flight line. The air navigator's times and flight line are then entered on a reconnaissance chart to which observer's notes are added.

Single line flights, fanning out from a fixed position, are more accurate than triangular or multi-leg flights. This method also has the added advantage of allowing the observers to see the terrain on the outbound and return trips.

Photography of individual areas, when evaluated, will avoid the confusion of mistaking crevasses for wind-drift patterns and sastrugi which are difficult to distinguish from the air.

Investigating a suspected crevassed area by hand-probing with rods.

Crevassed area indicated by shadows and depressions. (See arrow.)

Photographs by author

Surface reconnaissance, long the traditional approach to crevasse detection, is a slow, time-consuming activity. While suitable for sledging, it is not sufficient for rapid development of trails; but when combined with an air program and the use of modern equipment such as the electronic crevasse detector, surface reconnaissance can be speeded up and at the same time remain reasonably safe. The success of planning and execution of surface investigation is largely dependent upon a knowledge of general rules governing crevasse detection and of equipment capabilities.

Geophysical research has made available an electronic crevasse detector of sufficient reliability to be an asset in trail development. By applying low-frequency (60-400 cycles) alternating current to a system of surface electrodes, a "displacement current" is established in the snow or ice. A device for measuring potential difference is connected between the detection electrodes so that current density in the surrounding ice is measured. Crevasses distort the current pattern, thus distorting the original field and allowing the variation to be recorded.

Surface investigation is largly dependent upon knowledge of terrain, visual observation, and probing. The same depressions resulting from sagging snow bridges seen from the air can be detected from the trail; low-angle sunlight being particularly favorable for spotting. Once a field has been located, concealed crevasses can often be anticipated by a careful study of the terrain features and a comparison made with the crevasse patterns. Fissures do not end abruptly, but taper off. A visible crevasse disappearing into featureless snow while it is still wide will continue for an unknown distance. Before trying to circumnavigate, all crevasses must be probed in their entirety.

The simplest and safest procedure of hand probing was developed by the Alpinist. The lead man is roped to two or more members of the party at 25 to 30-foot intervals and they are prepared to belay him in case of accident. Skis or snowshoes will reduce ground pressure and decrease the likelihood of a man breaking through a snow bridge. A light-weight rod, approximately 15 feet in length and ½-inch in diameter is ideal for probing. This rod is jabbed vigorously into the snow at short intervals; when the snow is solid, the probe will penetrate only 4 to 6 feet, but when over a crevasse, it punches through the snow bridge. Once a crevasse is located, the surrounding area should be probed until the width and direction are clearly known.

Effective visual inspection and surface probing, even when accompanied with the use of an electrical crevasse detector, will depend primarily on the state of visibility and cloud coverage. Bright sunlight and clear skies give such relief to the snow surface as to make minor depressions of cracks and snow bridges clearly visible by their telltale shadows. However, when light is reduced, by heavy overcast, whiteout, or the Antarctic "white day," ground definition disappears and these signs are not visible.

There are few crevassed areas which cannot be recognized as potential danger zones by experienced observers, but newcomers to the polar regions may easily miss the tell-tale signs. Lack of knowledge, sometimes accompanied by fear of the unknown, will prevent successful detection and, thus, completion of the mission. Before entering polar regions, the traveler will do well to acquaint himself with the experience of those who have preceded him into these areas. This information may be found in the accounts of explorers, reports of previous operations, articles in professional journals, and books on operations in polar regions. Do not <u>assume</u> anything that can be <u>ascertained</u>.

Editor's Note: This article is Part I of three parts on crevasses prepared by CWO George W. Fowler, USA, who has participated in exploratory and scientific expeditions in both the Arctic and Antarctic since 1955. In the remaining two articles, CWO Fowler will present the development of techniques of crossing crevasses, and travel and rescue operations in crevassed areas.

Library

ADDITIONS TO THE LIBRARY COLLECTION

CHILE

Puigcerver, Manuel; Diaz, Patricio, Resultados Meteorologicos de la Primera Expedicion Antartica de la Universidad de Chile - 1961. 1. Observaciones de Superficie. Publicacion N.° 30, Ano 1963, Santiago Chile, tables, figs., 39p.

UNITED STATES

Janetschek, Heinz, On the Terrestrial Fauna of the Ross-Sea Area, Antarctica (Preliminary Report), Reprint, Pacific Insects, Vol. 5, No. 1, pp. 305-311, Apr. 30, 1963, figs.

Mercer, John H., Glacial Geology of the Ohio Range, Central Horlick Mountains, Antarctica. The Ohio State University Research Foundation, Columbus, Ohio, Inst. of Polar Studies, Report No. 8, April 1963, prepared for National Science Foundation, Project 1258, figs., 13p.

National Academy of Sciences, Committee on Polar Research, Science in the Arctic Ocean Basin. 1963, tables, appendixes, maps, 52p.

National Academy of Sciences, National Research Council, United States IGY Bibliography. World Data Center A, IGY General Report, No. 18, April 1963, Publication 1087, 391p.

Needleman, Stanley M., Pressman, Albert E., Site Location in the Arctic Region by Airphoto Analysis. Reprint, The Military Engineer, May-June, 1962, pp. 189-191, figs.

Potts, Rinehart S., Library Service for the Martian Exploration Expedition. May 1963, mimeo.

Quartermaster Research and Engineering Center, Earth Sciences Division, South Pole Micrometeorology Program, Part II: Data Analysis. Report No. 20, Inst. of Polar Studies, Ohio State Univ., Columbus, Ohio, June 1963, charts, figs., tables, 94p. (Technical Report ES-7).

Richards, Leverett G., VX-6: DEEP FREEZE Airline. In: Flying, July issue, pp. 32-33, illus.

Rodriguez, Raul, Development of Glacier Subsurface Water Supply and Sewage Systems. U.S. Army Engineer Research and Development Laboratories, Fort Belvoir, Virginia, 8 Feb. 1963, Projects 14 and 15, U.S. Army Corps of Engineers, Appendixes, tables, figs., 48p.

Sherwood, G.E., Pioneer Polar Structures - Accessories for the Jamesway Shelter. U.S. Naval Civil Engineering Lab., Port Hueneme, Calif., 28 May 1963, figs., 56p., Technical Report R-241.

Stoertz, George E, Needleman, Stanley M., Report on Operation Groundhog North Greenland, 1957, Investigation of Ice-free Sites for Aircraft Landings in Northern and Eastern Greenland and Results of Test Landing of C-124 at Bronlunds Fjord, North Greenland. Air Force Cambridge Research Center, Air Research and Development Command, Oct. 1957, maps, tables, figs., 40p.

Task Group 43.1, Report of Operation DEEP FREEZE - 63, Palmer Peninsula Expedition. Mar. 17, 1963, charts.

U.S. Department of the Interior, Military Geology Branch, Geological Survey, Preliminary Report of the Mt. Chamberlin - Barter Island Project, Alaska 1958. Aug. 1959, photos, charts.

USS GLACIER, Operation DEEP FREEZE 63. Oct. 1962-March 1963, 1 plate.

USS STATEN ISLAND AGB5, Operation DEEP FREEZE 63. Individual Unit Report, Serial 43, track charts, narrative.

USS STATEN ISLAND AGB5, Operation DEEP FREEZE 63. March 14, 1963, track charts.

Vandiver, Frank E., John J. Pershing and the Anatomy of Leadership. The Harmon Memorial Lectures in Military History, No. 5, U.S. Air Force Academy, Colorado, 1962, 21p.

Zumberge, James H., Swithinbank, Charles, The Dynamics of Ice Shelves. Reprint, Antarctic Research, Geophysical Monograph Number 7, American Geophysical Union, 1962, figs.

ADDITIONS TO THE MAP COLLECTION

CHILE

The following maps on the Palmer Peninsula area have been received from Major Martin Selinfreund, USAF, Official U.S. Representative to the 1962-63 Chilean Antarctic Expedition.

No. 1400 Isla Eletante - Isla Trinidad
Territorio Antarctico Chileno
Pol la Armada de Chile
Sondas Y Alturas en Metros
Escala 1:500,000
En Latitud Media 62° 27' 30"S.
Proyeccion Mercator
Valparaiso, Publicado por la Armada de Chile en 1947-51-61

(An outline map with some form lines and place names. Land and ice areas in grey; sea, white; shoal, light blue. Soundings and elevations in meters.)

Sector Antartico Chileno
Desde El Meridiano 53' Hasta El 90°W.
Por la Armada de Chile
Sondas Y Alturas En Matros
Escala 1:5,000,000
Proyeccion Asimuthal Equidistante
Valparaiso, Publicado por la Armada de Chile en 1947-56
Impreso en el Departamento de Navegacion e Hidrografia

(Corrected to 31 October 1959. Area includes Southern part of South America, Falkland Islands, Palmer Peninsula, and the Weddell, Bellingshausen, and Amundsen Seas. Pack ice areas in light blue; land areas, both rock and snow, in yellow, and shelf ice, green and striped. Ocean bottom contours shown and soundings given in meters. Major place names and some form lines presented. Chilean claim from 53°W to 90°W outlined.)

NEW ZEALAND

New Zealand manuscript of the Beardmore - Axel Heiberg Regions Survey by New Zealand Geological and Survey Expedition, 1961-62 (Southern Party). Scale approximately 1:250,000 (2 pieces).

UNITED STATES

The following maps and charts relating to the Palmer Peninsula Expedition of DEEP FREEZE 63 have been received:

1. Potter Cove
2. Ash Point
3. Paradise Harbor
4. Seymour Island
5. Cape Welchness
6. Pleneau Island
7. Argentine Base
8. Port Lockroy
9. Cuverville Island
10. Piedmont
11. Lockroy Site
12. Pleneau Island Site
13. Petermann Island Site
14. Lockroy Site-Goudrer Island
15. Danco Island
16. Alcock Island Site
17. Cuverville Island-Site Bravo
18. Ardley Peninsula
19. Welchness
20. Alcock Island
21. East Kallar Peninsula Site
22. Bonaparte Point-Site Bravo
23. Site Area-Norsel Point
24. Hope Bay
25. Antenna Site-Norsel Point
26. Bonaparte Point-Site Alfa
27. Rothers Point
28. Dorian Bay
29. Site A-Collins Harbor
30. Ash Point, Discovery Bay
31. North Cove, Ardley Site
32. Potter Cove (Large)
33. UK Site T Adelaide Island
34. Spit Point-Yankee Harbor
35. Yankee Harbor
36. Falkland Islands D.S.
37. Cuverville Island Site
38. Bldg at Arthur Harbor
39. Graham Land
40. South Shetland Island
41. Boudet & Irizar Island
42. Adelaide Island (S.C.)
43. Shoreline N. Cuverville
44. Adelaide Island
45. Hope Bay

Chronology

12 Jul 63 - SS Pioneer Star departed U. S. for Port Lyttelton, N.Z.

14 Jul 63 - C-121J departed U.S. for Christchurch, N.Z.

20 Aug 63 - First air operations commenced at McMurdo with two helicopter flights (lower to upper pads).

29 Aug 63 - One LC-130F departed U.S. for Christchurch.

4 Sep 63 - C-135 departed U. S. on first turnaround flight to Christchurch.

7 Sep 63 - Representative, USARP, Christchurch, office reactivated.

16 Sep 63 - USS HISSEM arrived Port Lyttelton.

17 Sep 63 - C-135 departed U.S. on second turnaround flight to Christchurch.

USS HISSEM reported for operational control to Commander Task Force FORTY THREE.

18 Sep 63 - C-121J departed U. S. for Christchurch.

19 Sep 63 - Two LC-130F's departed Andrews AFB for Cape Town, S.A., to take RADM Reedy and party to SCAR meeting.

20 Sep 63 - Two LC-130F's departed U. S. for Christchurch.

Two LC-47's departed U. S. for Christchurch.

22 Sep 63 - One LC-130F arrived Cape Town, S.A., from U.S. (RADM Reedy aboard.)

One LC-130F arrived Pretoria, S.A., from U.S. (having been diverted from Cape Town due mechanical troubles.)

C-54Q departed U. S. for Christchurch.

Two LC-130F's arrived Christchurch from U. S.

23 Sep 63 - LC-130F departed Pretoria and arrived Cape Town, S.A.

USS HISSEM departed N.Z. for Ocean Station.

C-135 departed U. S. for Christchurch for USAF support.

24 Sep 63 - C-121J departed Christchurch for U.S.

C-135 departed U. S. on third turnaround flight to Christchurch.

Representative, Commander Antarctic Support Activity established at Davisville, R.I.

25 Sep 63 - Administrative Office, U. S. Naval Support Force, Antarctica, established at Christchurch.

Commander, U. S. Naval Support Force, Antarctica, Representative Washington, established.

USS HISSEM arrived Campbell Island.

C-135 departed U. S. on fourth turnaround flight to Christchurch.

27 Sep 63 - Deputy Commander, U. S. Naval Support Force, Antarctica and staff arrived Christchurch.

Commander, Antarctic Support Activities arrived Christchurch.

LC-47J departed McMurdo for Skua tracking.

USS HISSEM arrived Ocean Station.

USNS ELTANIN arrived Valpariso.

29 Sep 63 - Two LC-130F's (with Deputy Commander, U. S. Naval Support Force, Antarctica and Commander, Antarctic Support Activities aboard) departed Christchurch and arrived McMurdo.

Two LC-47H's departed U. S. for Christchurch.

Helicopter flights commenced to Cape Crozier and Cape Royds from McMurdo.

30 Sep 63 - Two LC-130F's departed Cape Town for McMurdo.

1 Oct 63 - Two LC-130F's (with Commander, U. S. Naval Support Force, Antarctica and party aboard) arrived McMurdo at 0426 hours from Cape Town.

2 Oct 63 - Four LC-130F's departed McMurdo for Christchurch.

HMNZS ROTOITI arrived Port Lyttelton.

C-135 departed U. S. for Christchurch for USAF support.

4 Oct 63 - C-130E departed U. S. for Christchurch.

5 Oct 63 - Detachment ALFA, Air Development Squadron SIX, McMurdo, disestablished and Air Development Squadron SIX Detachment, McMurdo, established.

C-135 departed Christchurch for U. S.

6 Oct 63 - One C-121J departed U. S. for Christchurch.

Three LC-130F's departed Christchurch for McMurdo.

HMNZS ROTOITI departed Port Lyttelton for Ocean Station.

7 Oct 63 - C-130E departed U. S. for Christchurch.

LC-130F departed Christchurch for McMurdo.

8 Oct 63 - C-130E departed U. S. for Christchurch.

C-135 departed U. S. on fifth turnaround flight to Christchurch.

9 Oct 63 - First flights of season to Beardmore Summer Station.

First flight of season to Hallett Station.

10 Oct 63 - Byrd Station skiway ready for flight operations.

USS HISSEM reported crack in keel and departed Ocean Station for drydock in Dunedin, N.Z.

12 Oct 63 - HMNZS ROTOITI arrived Ocean Station.

13 Oct 63 - First flight of season to Little Rockford Summer Station.

First flight of season to Byrd Station.

First USAF C-130E turnaround flight to McMurdo.

USS HISSEM arrived Dunedin to enter drydock.

14 Oct 63 - RADM Reedy returned to McMurdo on first USAF C-130E flight.

C-121J commenced Christchurch - McMurdo turnaround flight.

15 Oct 63 - USS HISSEM entered drydock in Port Chambers, N.Z.

Mobile Construction Battalion EIGHT reported to operational command of Commander, Task Force FORTY THREE for Antarctic duty.

First LC-130F flight of season from McMurdo to Hallett.