ANTARCTIC

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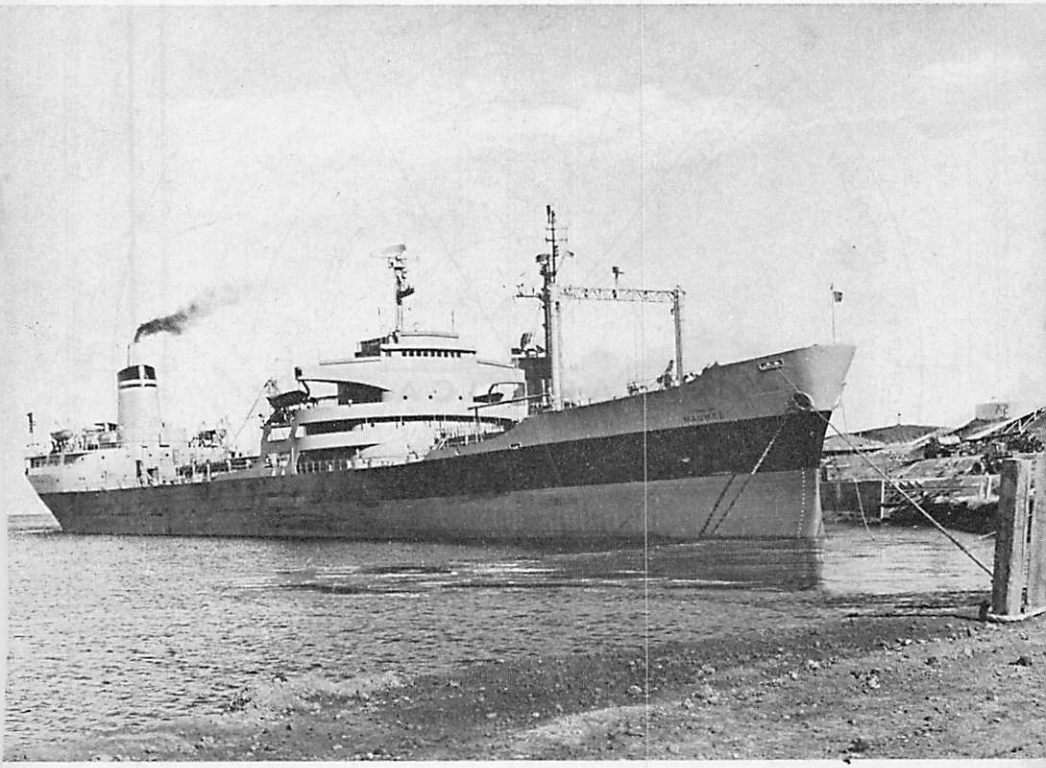
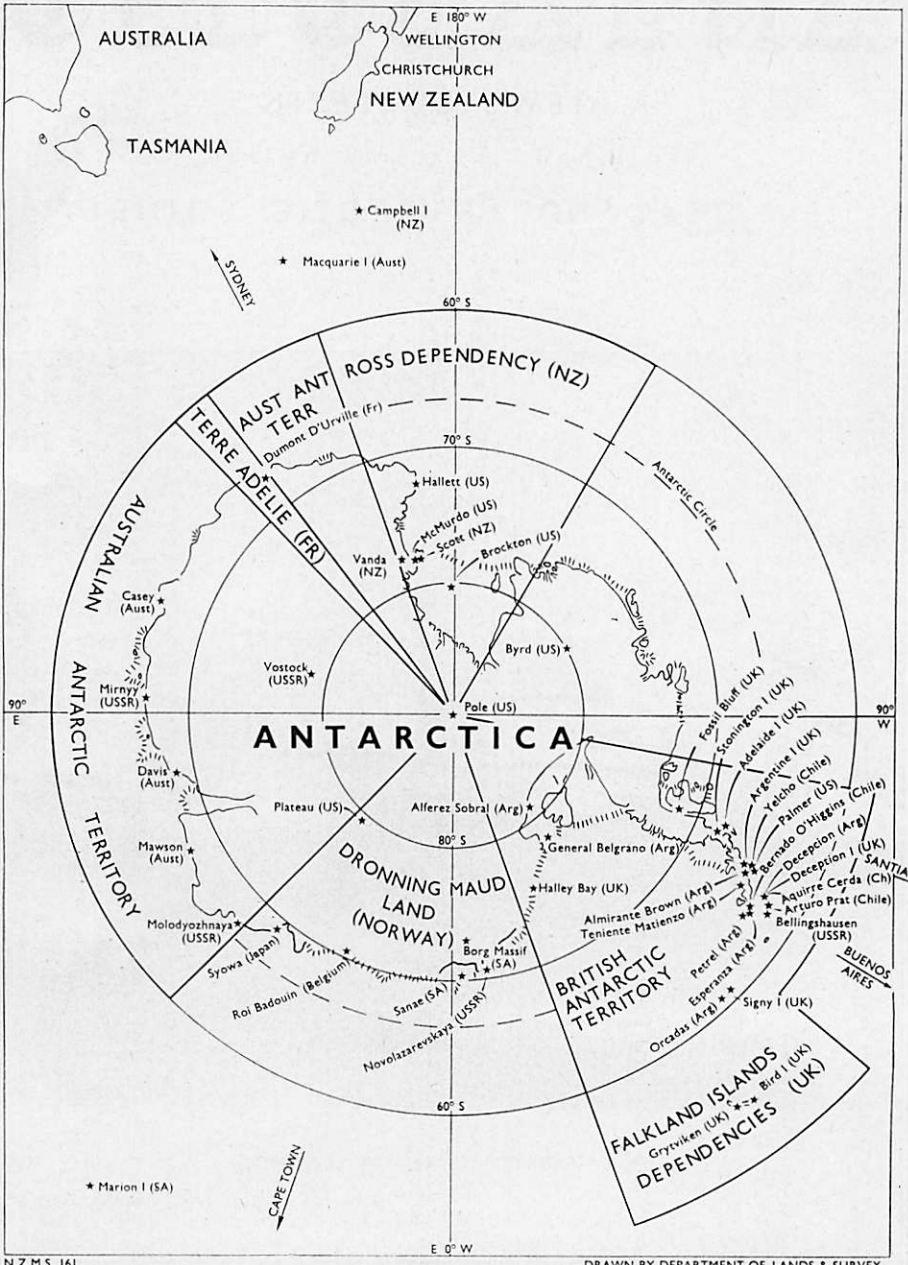


U.S.N.S. MAUMEE DOCKED AT McMURDO.

Official U.S. Navy photo.

Vol. 5, No. 9 MARCH, 1970



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EXPEDITIONS

BAD WEATHER HAMPERS ACTIVITIES AT NEW ZEALAND STATIONS

At Scott Base, Vanda Station and in the field, a very extensive summer programme was carried through despite much stormy weather and in the face of unexpected transport and other difficulties.

Leader Bruce Willis reported late in December:

"With such a splendid start to the month as the celebration of the tenth anniversary of the signing of the Antarctic Treaty, it seemed that we were set for a period of concerted activity. Instead, this has been a month of frustration. A combination of poor weather, especially around Ross Island, and mechanical trouble with helicopters has upset most field programmes and delayed work on Vanda resupply."

There were several heavy snowfalls during the month, more particularly towards the end, and much inconvenience was caused by leakage into buildings in spite of repeated sweepings of the roofs. Many of the snow falls consisted of large wet flakes with little wind accompanying.

The thaw added to the difficulties, water running down the road and filling the depressions by the dog lines, thus cutting off the route to Williams Field. NCEL drilled holes to release the the water and the maintenance staff diverted the road around the worst area.

During the month there were 21 days of ⅞ or complete cloud cover, three days of blue sky and 12 days of precipitating snow.

The new year was ushered in by bad weather which persisted for the first few days, but thereafter improved apart from a few days in the middle of the month. Thus most scheduled programmes went off with few hitches. The warm weather and water run-off continued to cause trouble with the tracked-vehicle road, necessitating the diverting of the road around the worst areas.

The highest recorded temperature of +6.8° was recorded at Scott Base on January 8 and throughout most of the month temperatures were high at Vanda.

AT TERRA NOVA BAY

Unfortunately not as much ground as expected was covered by the four-man DSIR geological party at Terro Nova Bay owing to a combination of deep soft snow and warm weather, but nevertheless it may be regarded as a most successful season.

They marked the site of Scott's Northern Party's (1912) cave at Terra Nova Bay by erecting a wooden signboard. While in the area they visited an Adélie penguin rookery at Gerlache Inlet and estimated a total of 11,000 chicks.

The party was picked up and returned to Scott Base on January 20.

WINTER AHEAD

The most important event in February was the arrival of HMNZS "Endeavour" on the 4th. Unloading started soon after tie-up with the United States Navy providing Fabco forklift and drivers. Unloading was virtually completed by 3.00 a.m., February 5, with back load stowed the same afternoon. A sports programme arranged with the "Endeavour" crew was abandoned owing to weather. During a southerly there was an extensive ice breakout in McMurdo Sound, and by February 8 water was visible from Scott Base. Later, both the "Elisto" and "Burton Island" worked in front of the Base breaking an annual ice runway. Two helicopters from "Burton Island" flew building materials to Cape Bird. Second loads were taken in on February 13. Seismo equipment was returned from Hallett and airfreighted to New Zealand. The Navy intend realigning the McMurdo/Scott Base Road, but this should cause no interference in Scott Base programmes. The last physical contact with New Zealand was on February 26 when two Hercules flew north.

VUWAE 14

The 14th Victoria University of Wellington Antarctic Expedition, a four-man team led by Vince Neall, co-operated in the early stages with the four-man University of Waikato team.

Neall and P. Kyle spent a week (November 18-25) at Cape Barne and were then transported by U.S. Navy helicopter to Cape Bird with two Waikato men for a day before being flown via Scott Base to Cape Crozier. Here an extensive mapping programme along the coast enabled the geologists to complete a geological map of the area before returning to Scott Base on December 8.

Meanwhile, Vucetich (the Expedition scientific leader) and geologist Topping had left Scott Base on November 17 for the lower Wright Valley, close to the scene of the helicopter accident reported in our December issue. The VUWAE camp was used during the emergency. On the 26th Vucetich and Topping walked the 15km to Vanda, a helicopter carrying their gear. They worked in the Bull Pass area until December 9 and were then immobilised because of helicopter problems until December 17, when they walked to the Labyrinth, where Neall and Kyle had been awaiting them since December 11.

Kyle and Topping were at Vanda from the 20th till the 27th, while Neall and Vucetich worked in the lower Taylor Valley till they were rejoined by the other two men. All four returned to Scott Base by helicopter on December 31. Vucetich now returned to New Zealand, but the other three travelled by sno-trac to White Island on January 4 and studied its geology from the northwest rock outcrops to the summit of Mt. Heine till the 8th. After further geology on Castle Rock and the northernmost outcrops of the Hut Point Peninsula, they returned to New Zealand on January 14.

C/o CAPE ROYDS

In response to an invitation from the Superintendent, Antarctic Division, the N.Z. Antarctic Society selected two members of its Canterbury Branch,

P. J. Skellerup
and **M. Orchard**

to serve as caretakers at Cape Royds. Their duties were to maintain the Shackleton Hut (restored in 1960-61), tidy up the surroundings, act as guides to visitors, prevent any incipient "souveniring" and protect the already diminished Adélie Penguin colony from any disturbance. The two men worked at Cape Royds from November 22 to December 9, and later spent three days at the Hut Point hut.

ON THE ROBERT SCOTT GLACIER

An air-drop to the six-man DSIR geological and pedological party working on the Robert Scott Glacier ran into difficulties. The glacier flows in a northerly direction from the Polar plateau to the Ross Ice Shelf in 152°E; some 70 miles east of the Axel Heiberg Glacier (Amundsen's route to the Pole), between 85° 30′ and 86° S.

The resupply materials were at Williams Field ready for the drop on December 15, but they were held for various reasons until December 21. This drop was unsuccessful owing to a 'chute malfunction. Everything was lost. The pilot landed to ascertain the reasons for the failure and back-loaded several hundred pounds of rock samples.

Again on December 24 an attempt was made, but was thwarted by low cloud and poor visibility. Finally on December 29 the drop was successful at 86° 00′ S. 153° 04′ E. The party reported that all materials were recovered. The drop included ten food boxes and some pieces of field equipment, ice axes and ropes sent out to replace damaged gear.

"COMING MEN"

The representatives of youth organisations, Burton and Ellis, Queen's Scouts, and Oliver, Boys' Brigade, added to the work force and proved very helpful around base. Local visits were arranged for them while Ellis and Oliver spent about 10 days at Cape Crozier assisting Dr. W. Sladen. They made a good impression at Crozier and Dr. Sladen wrote commending their efforts.

UNDERWATER SOUNDS

ANTARCTIC STUDY

The first University of Auckland team to work in the Antarctic made an extensive series of acoustic measurements in Antarctic waters, using hydrophones suspended beneath the Ross Ice Shelf. Mr. P. J. Burgess in this way recorded the "sea state", that is the noises made by wind waves, currents and animal life. The sea state in Antarctica proved to be relatively very low, a hundred times lower than in Auckland, New Zealand; and there was, surprisingly, a noticeable difference between the day and night states. It is thought that this difference could be caused by factors like temperature and salinity.

Noises made by seals 30 miles away, underwater seismological activity, and ice-breakers opening a channel into McMurdo Sound were among the sounds picked up on Mr. Burgess's hydrophones.

A plan to investigate the attenuation of sound through the Antarctic convergence (where warm currents meet the cold currents coming from the Antarctic) had to be dropped because explosives to have been detonated in the sea near the entrance to McMurdo Sound failed to arrive on time. It is not known whether or not the convergence acts as a barrier to the passage of sounds.

Reporters were told that the attenuation of sound through water was considerably less than through air. Water was not suitable for conversation, but it probably could be used for morse and teleprinter messages. The data could lead to developments in radio communications.

"The air channels are getting pretty cluttered now, and we'll soon have to find new ways of passing messages. The sea could be one method of solving this."

Mr. Burgess made recordings of very small detonations under the Ross ice shelf, under various ice conditions, to determine attentuation in the very cold and highly saline waters close to the Antarctic.

"The reflection of sound from these explosions reveals the shape of the under-surface of the ice," he said. "This could be important for underwater navigation. You can also determine the rudimentary structure of the sea floor."

SEMI-PRECIOUS STONES

New Zealand scientists have found two deposits of the semi-precious stone peridot at Ross Island in the Antarctic.

Samples of the stone were brought to Wellington by Professor A. T. Wilson, formerly a member of the Victoria University chemistry department, and they are thought to be the first semi-precious stones brought out of the Antarctic.

Professor Wilson had just returned from an expedition to the Antarctic and his findings are being analysed by Dr. A. M. Taylor, a geo-chemist at the university.

Dr. Taylor said the two deposits were located at Cape Bird and Cape Crozier on Ross Island in McMurdo Sound.

LARGE DEPOSITS

Both deposits were "fairly extensive" and if they had been found in a more civilised area they would have been worth extracting.

Though at the moment the field did not appear to have much commercial value it was an interesting occurrence.

Men had been working in this area for five years and this was their first find.

Some of the stones brought back were worth cutting. One was 1.7 carats.

They were of a good quality and of a good colour (green).

Dr. Taylor said peridots were valued between $1 and $40 a gram for rough stone. A small cut stone suitable for a ring would be valued at about $5.10.

CRICKET

Three New Zealanders and an American admiral introduced cricket to the South Pole this summer.

A former New Zealand cricket captain, John Reid (Wellington) produced a cricket bat and ball from his American-supplied duffle bag when a touring party including three New Zealanders, arrived at the Pole station.

Two Members of Parliament, Mr. J. L. Hunt (New Lynn) and Mr. L. W. Gandar (Manawatu), enthusiastically agreed to join in the first-ever cricket match using the Pole as a wicket.

During lunch inside the Amundsen-Scott station, the New Zealanders explained the mysteries of cricket to the commander of the United States naval support force in Antarctica, Rear Admiral D. F. Welch.

He agreed to take part, too, and the four went out to the Pole to make sporting history.

Reid was given the honour of batting first, but he was judged out first ball by Mr. Hunt, who also laid claim to having bowled the first leg break at the South Pole.

The game ended when Reid hit a six into the snow and the ball vanished.

Reid presented to Admiral Welch a cricket ball which he had hit across the world.

His feat followed on Peter Snell's achievement in running across the world at the same spot and Brian Lochore's feat in kicking a rugby ball around the world at the Pole.

MRS PAM YOUNG RETURNS

Mrs. Pam Young, the first New Zealand woman to work for a long period in the Antarctic, returned to Scott Base after 10 weeks living in a tent at Cape Bird, some 60 miles from the Base, looking "fit and bronzed".

With her husband, Dr. Euan C. Young, and three other men in a Canterbury University team, Mrs. Young assisted in research work into the habits of penguins and skua gulls at Cape Bird.

She told a Press Association reporter at Scott Base that she found living at Cape Bird little different from a normal camping trip in New Zealand, and had not thought conditions harsh or uncomfortable.

"I have really enjoyed it here and had a very interesting time, but it has confirmed what I thought already—I don't like penguins. I have found some of their habits a little disgusting.

"I think the highlight of the trip for Euan and myself was a continuous 80-hour birdwatch of the behaviour of 12 pairs of skuas. This involved taking our tent up above the normal study area and watching the skuas, four hours on and four hours off. It was really fantastic.

"Others in the field party who had been on previous all-male expeditions in Antarctica considered that having a woman in their midst had made little difference to their lives at Cape Bird, possibly because all were well known to each other before coming to Antarctica.

"I think that, particularly in this type of field work, women can fit in very well, helping in the research work as well as in the day-to-day running of the camp," she said.

NOT AT SCOTT

However, because of problems in providing full facilities for men and women, she would not recommend that women be employed as personnel in a place such as Scott Base for some considerable time. A women passing through as a member of a field party did not create such complications as a long-term base employee.

Mrs. Young does not expect to be returning to Antarctica next summer, her husband having accepted a position in Western Samoa. However, she said she knew of at least three other girls "who are just champing at the bit to get here".

SUMMER WORK FROM VANDA

NEW SHELTER HUT ERECTED

A glaciological, hydrological and survey party based on Vanda station for the summer comprised A. J. Heine (Leader and Glaciologist), A. Eskrick (Surveyor), K. Gousmett (Hydrologist), G. McGillvray (Assistant Hydrologist).

Their programme was made up of a number of separate projects, mostly at Lake Vanda, the Onyx River and on the Asgard Range in the Wright Valley.

Planning of the various projects was carried out by Heine in Wellington, with assistance from Gousmett on the requirements for a proposed weir on the Onyx River. The four men left New Zealand on November 1. Bad weather and radio blackouts caused considerable delay. The decision was made to send two men to Vanda to begin the initial excavation for the Onyx weir, while the other two awaited the arrival of material from New Zealand. This meant a delay of two weeks in the beginning of the project.

Gousmett and McGillvray flew to Vanda Station on November 15 with Heine and Eskrick following on November 23. The two latter men immediately visited the Asgard Range area and selected the site for a small shelter hut there. The airlift of material was made on November 26, using two helicopter loads of approximately 800 lb. each. Heine and Eskrick remained at the site to erect the station.

During the next two months, the four men spread their time between Asgard Station and a field camp in the vicinity of Vanda Station.

Onyx Weir

A site was selected on the Onyx River most suitable for flow measurements and the necessary excavations began. The boulder filled riverbed combined with permafrost several inches below the earth's surface made the work tedious and exhausting. A pneumatic drill was used to break up the larger rocks and eventually after two and a half weeks of slow work had excavated a 6-inch trench across the riverbed. The timber framing was then set out across the weir site.

About this time, the Onyx River began to flow down valley from the Lower Wright Glacier, and on December 3 was reported to be flowing in the vicinity of Bull Pass. With the river imminent, Heine and Eskrick returned from Asgard Station and assisted in the final construction of the weir. By the 5th the river had reached Lake Bull. The final Vee notch strips were attached to the plywood and the weir completed by 6 p.m. that day. Water reached the weir at 8.30 p.m. that evening and began to flow over the notch half an hour later.

Recording equipment was installed the following day, and continuous recording of the flow was made until February 12, when the river stopped.

Water Level

Following the establishment of permanent bench marks at the eastern end of Lake Vanda last summer, the actual water level of the lake was remeasured in November.

On December 9, Heine was working at the lake edge, when he noticed a sudden surge of the water level. Further measurements established the existence of a "seiche" like movement of the lake surface. It was then decided to establish and instal the second water flow recorder at the lake edge and endeavour to obtain a continuous record of the water level changes. When this was done it became obvious that there was indeed considerable movement. This was quickly correlated with wind speed in the valley, and it was found that under wind speeds of 30-40 knots, the lake water level would change as much as 6 to 9 inches. During windless periods, the water level would usually remain fairly constant, with about a quarter of an inch variation.

In order to establish whether the ice level rose and fell in direct relationship and to the same degree as the free water, instrumentation was set up on the floating ice. The instrument was anchored to the lake bed, and direct measurements were made of the rise and fall of the ice surface. A preliminary plot of the data showed the same general pattern as that recorded on the lake edge water level recorder, but with less extreme variations.

Measurements made this summer tend to confirm Heine's earlier conclusion that the water level measurements are not indicative of total river inflow. There are a number of additional factors, such as evaporation of water from the icefree moat and river delta and evaporation of moisture from the shore line sand.

Asgard Station

When Heine and Eskrick were transported by helicopter to the site on November 26 they immediately began the construction of the hut. A layer of foil coated tar paper was then laid down, together with a layer of wire netting. The floor of ½" plywood was then nailed direct to the timber grid. The walls and ends of the hut were then bolted together as well as to the floor, to form the complete A-frame structure.

The hut proved satisfactory for the location, that is at about 4300 feet a.s.l. (Vanda Station 512 feet a.s.l.) with December and January temperatures ranging from —15 to —5°C.

Although the floor temperature inside the hut did not rise to 0°C, at bunk level (16 inches above the floor) the temperature was high enough for comfortable living. Under windy conditions (30-40 knots) the heat loss through the ½" plywood was sufficient to cause considerable condensation inside the hut, on the windward wall.

A standard met. screen was set up nearby. A thermograph and standard thermometer were installed in the screen and observations begun on December 1. Daily observations included the measurement of wind speed (with a hand held anemometer) and direction, cloud cover and height, temperature and air pressure.

A plane table survey was made by Eskrick of the areas surrounding the Station site. This was later supplemented by theodolite observations between the major survey points set up. An offer by the U.S.G.S. to provide photo coverage of this area was accepted, and the photo run made late in January. The major glacier in the area has been tentatively named the Jeremy Sykes Glacier, after the New Zealander who lost his life in a helicopter crash at the eastern end of the Asgard Range this summer.

Following a general reconnaissance of the area around Asgard Station, systematic placing of bamboo markers was carried out on all the glaciers. Remeasured during the 1970-71 summer, they will give information on snow accumulation and ablation.

To enable a preliminary survey to be made of the Asgard Station area, geological samples were collected from most of the mountain peaks, valleys and ridges.

At Lake Vanda

In order to extend the mapping work done last summer, Eskrick established a complete survey network around Lake Vanda. Survey beacons were set up and can be used by future parties working on the lake. Certain points on the aerial photos of the lake were also identified on the ground and surveyed into the network. This field work will enable Eskrick to produce an accurate map of Lake Vanda, essential if the water budget is to be calculated.

Hydrological Survey

In order to provide background knowledge to the source of the water flowing into Lake Vanda, Heine and Gousmett travelled east from Vanda Station to the Lower Wright Glacier. Each side stream was inspected and the water flow estimated. At the same time, careful note was taken of the land route down the valley. Details of mileage, surface topography and ease of tractor travel were noted. This survey would be useful in planning emergency travel to and from Vanda Station.

Ice Shelf Study

McGillvray and Eskrick returned to Scott Base on January 20. Two days later, with C. Knott they moved out on to the McMurdo Ice Shelf. The surface elevation measurements were made in good time, and by February 1 the remaining links in the survey network were complete. The McMurdo Ice Shelf maps can now be completed, and the remaining papers written.

CHANGES AT VANDA

Following the departure from Vanda of Leader D. Lowe on January 13, A. J. Heine assumed temporary control of the station until a replacement could be found. On January 10 the Superintendent of the Antarctic Division visited the station and on January 11 H. Lowe of the summer support staff was appointed Leader. Arrangements were made for him to receive medical training at McMurdo Dispensary and this he commenced on January 13.

There were further resupply flights on January 14 and 15.

On January 20, Tomlinson, Garrick and Lusby flew in, and during their stay machinery was checked and overhauled, the wind generator returned to Scott Base for servicing, the magnetic hut built and secured, and rubber sealing strips placed between the roof panels and between the roof and wall panels. A Coleman heater was also installed.

Lusby and Garrick returned to Scott on January 29 while on January 30 H. Lowe and McKerrow went into take their places on the Vanda staff.

Much credit must go to Arnold Heine, who directed work at Vanda between D. Lowe's return to Scott Base and H. Lowe's taking over the station.

By the end of January all supplies stockpiled at the Bay of Sails had been transported to Vanda. Harold Lowe officially took over the station on February 1. On February 7, 8 and 9 two flights each day were made with Lusby going in on the 7th to work on a tractor. Another two flights went in on the 15th and mail on the 17th.

The wintering team at Vanda station comprises McKerrow, Bromley, G. Lewis and H. Lowe.

ANTARCTIC DIVISION NOW IN CHRISTCHURCH

The Antarctic Division of the Department of Scientific and Industrial Research which was set up in Wellington in 1959, has moved to Christchurch. The decision to move was made in June last year, and the final transfer was made during the first week of February.

In 1959 the division had eight full-time staff and supported 35 people working in Antarctica. Since then the staff had steadily increased, and now there are 25 permanent staff and more than 100 people working on the ice.

The superintendent of the division (Mr. R. B. Thomson) said that the reason for the move was primarily convenience and economics. Another contributing factor was the closing down last year of the DSIR district office in Christchurch.

Mr. Thomson said that in 1959 all Antarctic activities—research, stores and logistics—were centred in Wellington. But since then there had been steady changes until Christchurch had become the key centre.

All organisations, including the US Deep Freeze base, were stationed in Christchurch. Aircraft to and from the ice landed at Christchurch, and the supply ship Endeavour now operated out of Lyttelton.

"Our co-operation with the U.S. has increased tremendously over the last few years. RNZAF flights now go into the U.S. pool, and a great amount of our equipment for Antarctica goes on U.S. planes."

Mr. Thomson said that the division, because it was situated in Wellington, had missed seeing many scientists before or after their visits to the ice.

"The recent two-day visit of the NASA group to Christchurch was a case in point. These are the type of people we would like to visit our organisation, but because we have been in Wellington, they have not been able to find the time."

He said the decision late last year to close the DSIR's district office in Christchurch reinforced the need to have the Antarctic division in that city.

The division would now take over the responsibilities of the district office and administer other units of the DSIR.

The scientific side of Antarctic activity, which involved the division, all the universities and other organisations, was now mainly centred on Christchurch. The move would mean better liaison.

THE FIRST YEAR AT VANDA STATION

S. K. Cutfield

For the first year 1968/9 at Vanda Station, members of the wintering party experienced extremes in temperature, wind and comfort. The station is situated on the shores of Lake Vanda, in the Dry Valleys of Victoria Land, 80 miles north west from Scott Base.

The party of five, W. R. Lucy (leader), S. K. Cutfield (scientific officer), R. M. Craig (meteorologist), W. L. Johns (technician) and A. J. Riordan (U.S. exchange scientist) spent three summer months and eight isolated winter months in this unusual and scientifically interesting area. Being situated in a region of the Antarctic Continent devoid of ice and snow, together with the presence of Lake Vanda, great interest centred upon the scientific and meteorological data collected and the physiological changes encountered by this small wintering party.

THE ENVIRONMENT

The Dry Valleys were originally discovered in 1903 by Scott, Evans and Lashly and since the recent rediscovery by geologists Peter Webb and Barrie McKelvey in 1957, the work of summer field parties, including geologists, chemists and physicists, led to the decision to winter at Vanda Station. Lake Vanda, which is covered by ice 11-12 feet thick, is approximately four miles long and one mile wide, and contains water to a depth of 215 feet. It is fed by water from the 18 mile long River Onyx, for 51 days during the summer.

Due to a bottom temperature of the lake water of 77°F, a controversy exists as to the origin of the stored heat—geothermal or stored solar radiation. Sir Arthur Porritt, Governor General of New Zealand, in officially opening the station on January 9, mentioned our party's endeavours "to determine the lake's heat as originating from either heaven or hell".

The surrounding valley was aptly described by Sir Raymond Priestley in his description of the Lower Taylor Valley; "large patches of gravel mixed with erratic boulders of every description and size . . . segmented by water courses which are bordered by flats of gravel and spread out before reaching the sea over large alluvial fan-shaped mud-flats." Apart from the occasional scavenging skua during the summer and mummified seals in the valley, no animal life is present in the valley or lake.

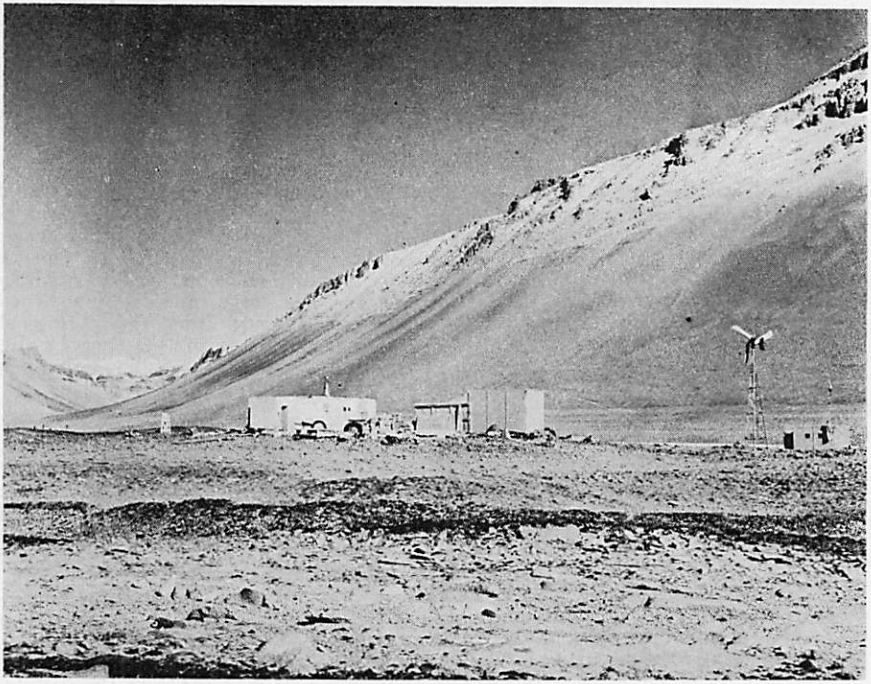
VANDA STATION

Vanda Station (77° 32'S, 161° 42'E) is situated about 70 yards from the lake edge, at the eastern end of the lake and comprises four buildings. The main living hut (33 feet by 11 feet) contained five bunks, cooking facilities, ice melter, recreational facilities (library, tape recorder), photographic darkroom and a small supply of foodstuffs. The laboratory housed the majority of the scientific instruments, others of which were installed at specific locations in the valley. The other buildings are the foodstore and refuge hut, which contained emergency food stores and field radio. Station power supply was 12 VDC provided through a battery bank, which was to be kept charged by means of a wind generator. Small petrol charging sets were provided as a backup in the event of calm conditions.

With summer temperatures reaching a maximum of 49.1°F in January, summer field parties only donned anoraks and gloves with the advent of a biting easterly or westerly. The high summer temperatures necessitated the stove being left off and the windows, escape hatch and door left open for inside comfort. However, by official sundown (April 25), temperatures had dropped considerably, and reached a minimum of —70°F in July.

SCIENTIFIC PROGRAMME

The scientific programme at Vanda Station encompassed Meteorology, Seismology, Physical, Chemical and Hydrological aspects of Lake Vanda, Earth



Wright Valley, with Vanda Station in foreground.

Currents, Magnetic studies and water sampling of Lake Vanda.

The most important programme, Meteorology, included a 24 hour coverage of wind direction and speed, cloud cover, radiation balance, and air and soil temperatures. Allen Riordan's meteorological programme included establishing wind stations towards Bull Pass, the base of Mt. Odin, the western end of Lake Vanda and on the lower slopes of Mt. Jason, to determine localised wind patterns within the Wright Valley.

Snow precipitation recorded from February to November totalled 3.37 inches, and this small amount is indicative of the ice and snow free nature of the Dry Valleys.

Small earthquakes recorded in January in conjunction with the Scott Base seismograph records indicated seismic activity in the David Glacier and Drygalski Ice Tongue region 150 miles north of Vanda. Great interest centres on this activity, but Antarctica remains less seismic than any other continent.

Temperatures and salinity of the lake water were recorded fortnightly, so as to determine the source of stored heat in the bottom waters of the lake. The majority of scientists explain the temperature of 77°F of the bottom waters as being due to stored solar radiation. A small hut was frozen into the ice surface for recording in relative comfort during the winter.

Unusual meteorological phenomena which occurred included whirling dust eddies which spiralled a zigzag path across the valley, whisking away cartons and tins; and the observation of illuminated nacreous cloud.

Aurora observed consisted mainly of pale green arcs and "hanging curtains" which were oriented towards the southeast over the Lower Wright Glacier. For a year of maximum sunspot activity, little disruption was caused to communications.

Late supplies of meteorological equipment were left by a helicopter from the U.S.S. "Burton Island" alongside a wan-

nigan in the Bay of Sails in March. A Vanda party of Bill Lucy and myself spent five arduous days attempting to negotiate the Gnat over the Lower Wright Glacier and Wilson Piedmont to collect the supplies. Due to the soft snow conditions in which the Gnat became continually bogged down, we returned to Vanda and planned a further attempt. Ten days later, after fitting tracks to our Ferguson, Bill Lucy with Warren Johns and Allen Riordan managed to winch the tractor up the icy wall of the terminal face of the Lower Wright Glacier and reach the supplies at the Bay of Sails. They returned to Vanda much relieved after an arduous three-day journey in temperatures of —26°F.

GENERAL ACTIVITIES

The year could be conveniently divided into two, summer and winter, the contrast being quite marked. Firstly the summer, bustling with helicopter supply flights, field parties—Italian, Japanese, New Zealand and American, base construction, installation of equipment and tramping. Then the winter stillness, established routines in work and recreation, with hobbies becoming more prominent.

The sustained up and down valley winds of up to 25 knots maintained the station power supply during the summer period to March, but with the disappearance of the sun, long calm spells were experienced of up to 25 days in length. Blowing snow on the plateau was generally indicative of approaching westerlies, which reached a maximum gust of 78 knots in August. Periods of wind lasted for 2-3 days up to a week, and were accompanied by a rise in temperature of up to 52°F in half an hour. This weather pattern proved very acceptable for working, especially during the winter, when we did not have to battle with a chilly westerly. However, the winter calm presented a major power problem, and the critical power supply was maintained with petrol motor generators running in temperatures down to —70° F. With the threat of switching off the scientific instruments, due to problems with the motor generators and too low petrol supplies the power demand was reduced by substituting Rockgas lamps and battery torches for electric light. While Warren Johns remained fully occupied with the station's power supply problems, Ron Craig, Allen Riordan and I revelled in the pleasant but chilly outdoor conditions for our weekly trips to the western end of Lake Vanda and base of Mt. Odin to record ice surface ablation and to attend to the changing of temperature and wind charts. All trips round the valley and lake during the winter were generally 10 miles or greater in distance and made on foot, in preference to the use of vehicles, principally to maintain body warmth and conserve fuel supplies.

Warren Johns and I made fortnightly trips down the lake to the temperature hut (commonly called "Lake Chalet") for a day's recording of the lake water's temperature and salinity. Although sceptical at first as to the comfort of working in a non-insulated hut for 10 hours at —40°F, our fears partly receded, when, with a double primus operating, we were able to work the instruments without gloves.

WATER SUPPLY

Ice parties were called every 4-6 weeks, whereon all station hands armed with ice axes descended upon the lake. Heavy down jackets, balaclavas and gloves were donned, and the ice was readily chipped from the ledge at the boundary of the frozen moat and permanent ice. Water during the summer was pumped directly from the moat to the station.

Use of the station vehicles (two Ferguson tractors and Gnat) was limited to ice parties only during the winter. The sleeping off-duty meteorological observer spent a disturbed 2-3 hours, while the booming "Herman Nelson" funnelled hot air around the tractor sump, a prerequisite for cold starting. During the summer the Gnat proved popular transport, negotiating the valley terrain with comfort and ease.

THE LIGHTER SIDE

Recreational activities revolved mainly around the transistor radio, tape-recorder, library, individual hobbies, an occasional slide show and various

forms of impromptu entertainment. The B.B.C. and Voice of America provided excellent live reception of the Apollo Moon Landing together with general news services. The Dry Valleys were described by Dr. Werner von Braun, Director of the American Space Programme, as the most likely location on Earth to resemble the Moon's surface. A replica lunar module (Rockgas cylinder) flying the New Zealand flag, appeared outside the main hut on July 21, but departed the following day leaving two skeletons imprinted on the ground, the flag and various pieces of rubbish.

Traditional festivities celebrated were sundown (April 25), mid-winter (June 21), two birthdays, and the end of isolation with the arrival of the first helicopter on October 18. Mid-winter dinner comprised an official menu containing many delicacies and a novel mid-winter cake. Messages of goodwill were passed and received across the radio, via Scott Base, to other Antarctic bases—Japanese, Belgian, French, American and British.

Cooking duties were rostered and menus ranged from Chinese delicacies and casseroles to steak, and the lack of a recipe book led to much experiment. A common sight during evenings was that of Allen Riordan outfitted in down clothing, standing in the lee of the foodstore at —54°F, beating ice cream.

Communications were maintained every six hours with Scott Base for passing the Vanda Weather Observation, which was then relayed to McMurdo Station. The establishment of a radio/telephone link with New Zealand in April enabled official calls to be made and calls to relatives 2,500 miles away, while for Allen Riordan calls to the States proved a great morale booster. Radio blackout conditions disrupted communications only three or four times for periods of two to three days.

FURTHER AFIELD

Outdoor field trips during the winter were restricted to an approximately five mile radius from Vanda Station, but with the return of twilight, trips became more adventurous. A light installed on the foodstore was visible round the valley for a circle of radius of two miles. With the temperature at —40°F on September 4, Allen Riordan and I ventured into Bull Pass, six miles eastward down the Wright Valley, and became the first of the Vandals to observe the sun for the 1969/70 summer. Weird lighting effects of the sunlight on the weathered rocks in Bull Pass gave the appearance of a lunar graveyard.

Ron Craig resumed his weekly trips up to the Dais, at the western end of the lake, and at our elevation of 1,900 feet, changing the temperature chart and returning after an eight-hour journey left him fatigued and with his face encrusted in ice.

Trips in early September to the Lower Wright Glacier were made to collect urgently required fuel and scientific replacement parts, ferried across from Scott Base by Snocat and sledge. From the first trip on September 10, Bill Lucy and Ron Craig returned to Vanda, bitterly cold, but laden with mail, a new Pelter diesel generator, oysters, whitebait, eggs and fresh vegetables. Many chuckles and comments interspersed the night from each bunk over news accummulated from eight months' isolation. Bill Lucy in a message to Scott Base expressed thanks for the machinery, mail and "goodies" received saying, "It was all much appreciated, more so than you probably imagine."

Morale and group spirit remained extremely high all year, with cooperation forming a harmonious working party. With the arrival of the first helicopter after the winter on October 18, thoughts turned to homecoming. The changeover period with David Lowe's 1969/70 party in November, introduced some lively discussions and the prospects for 1970 are for another interesting year, both personally and scientifically.

In conclusion, mention must be made of the tremendous support given by the American VX6 Helicopter unit. Ground supply having proved to be impracticable, we could not have wintered without their assistance.

HEAVY SNOW FALLS AT McMURDO BUT WORK CARRIES ON

The last three months have seen the period of maximum activity in and around the U.S. bases in Antarctica, despite the heaviest snow falls known in McMurdo since the year Scott and Amundsen struggled to reach the South Pole, some 58 years ago. Even these circumstances have not prevented another successful season, both scientifically and logistically.

To the non-scientific mind, at least, the most noteworthy event of this season has been the permission granted, and accepted, for the first-ever sustained appearance of women in this hither-to all male preserve. Scientifically perhaps the outstanding event has been the discovery of fossilized remains of a 200 million year old hippopotamus—a reptilian counterpart of the African hippopotamus. This find, considered one of the truly great fossil finds of all time, establishes proof for the previously only hypothesticised super-continent of Gondwanaland.

Air operations were off to a bad start this season, with excessive snow at McMurdo and a series of unusual maintenance problems among the helicopters, but active support of the scientific programme was under way by the end of December.

Hercules aircraft defied snow and storm conditions to continue the resupplying of inland stations and scientific groups in the field.

AT THE U.S. STATIONS

McMURDO

A major storm hit McMurdo in late October, with winds reaching 68 m.p.h., a temperature of —30°F and a chill factor of —76°, confining the 950 navymen and scientists to the huts and obliterating Williams Field runways and roads around McMurdo. The storm lasted for six days.

The largest storage tank built in Antarctica, situated at McMurdo, took two of USNS "Maumee's" seven million tons of fuel.

Another large building now standing at McMurdo is a two-storey, corrugated-steel personnel building, containing office space, McMurdo's dining hall and laundry, and living quarters for the 200 men wintering over at the station.

McMurdo is now on the air, with its own live radio station, WASA, which has been supplying station personnel with music, live news and weather forecasts since early January. Its staff are all volunteers who announce, tape, change records and conduct electronic work, following the example set last year by Journalist First Class Merv Coyner, an experienced professional and military radioman, who thought its own radio station was McMurdo's answer to its own isolation.

On February 16 Radio WASA was approved as an official Armed Forces Radio outlet, and is now entitled to official programming materials. The long Antarctic night should be the brighter for Radio WASA.

SOUTH POLE

With the present Pole buildings being crushed by the weight of accumulated snow and ice, a new station will have to be built, the erection being expected for next Deep Freeze. This year a one-tenth scale model of the proposed new station was put up half a mile from the existing one, to see how it stands up to the effects of drifting snow. The new structure will be new in Antarctic architecture, comprising three main buildings within a 52-ft. high geodesic dome.

Support buildings will be in long tunnels, while two tall vertical structures will serve as a skylab and inflation building for a weather balloon; several remote sensor nodules for scientific data collection are included in the model.

SIPLE STATION

To be named after the late Dr. Paul A. Siple, internationally known U.S. scientist and Antarctic researcher, Siple Station is a proposed camp in Ellsworth Land where magnetospheric research will be effected.

PALMER

Relief and resupply of Palmer Station on Anvers Island is carried out entirely by ship. As a result, contact with the outside world is delayed until January. This season the icebreaker, "Glacier", which was assigned to support operations in the Antarctic Peninsula area, arrived at Palmer Station with summer scientific and support personnel on January 8. On the way from Punta Arenas, it had called at three islands in the South Shetland Archipelago. An abortive attempt, which resulted in the loss of a landing craft, was made to put a small scientific party ashore on Gibbs Island. The same day, January 6, three scientists were installed on Elephant Island by a helicopter, and, on January 7, a similar sized party was taken to the Argentine base on Deception Island.

When "Glacier" arrived off Palmer Station, she found Arthur Harbour choked with ice. Because small boat operations were impossible, 50 scientific and support personnel were ferried ashore by helicopter. On January 10, the National Science Foundation's research trawler, "Hero", served as a lighter to carry "Glacier's" cargo to the station. The following day, "Glacier" departed Arthur Harbour to carry a group of scientists to the Trinity Peninsula and, herself, to investigate the ice of the northern Weddell Sea. She was back at Palmer Station in time to greet the cargo vessel, USNS "Wyandot", which arrived on January 20. Before "Wyandot" could enter Arthur Harbour, "Glacier" had to clear it of ice, a task that required 35 hours of solid work. Once this had been accomplished, landing craft could unload the cargo for the station. On January 23, "Wyandot"left Anvers Island for McMurdo Station, which she expected to reach early in February.

The next day, "Glacier" sustained serious hull damage, when she struck the underwater tongue of an iceberg. While the ship could continue to operate in the Anvers Island area, it was doubtful that she could risk the heavy ice usually encountered in the Weddell Sea. Thus, it appeared that it would be impossible to recover the deep current buoys laid down two seasons ago or to carry out this year's portion of the International Weddell Sea Oceanographic Expedition. At the end of January, plans for "Glacier's" employment during February and March were still under discussion.

SCIENCE

Following the discovery in 1967 in the New Zealand Ross Dependency, between the heads of the Beardmore and Shackleton Glaciers, of a land vertebrate fossil bone, that of a labyrinthodont, by New Zealander Peter Barrett, leader of an Ohio State University team, further important fossil finds have been made in the Antarctic, strongly implementing the theory of continental drift or of Godwanaland, the great southern continent.

A sandstone bed in the Central Transantarctic Mountains released to another Ohio State University team a variety of fossil bones, bones of several types of vertebrates including amphibians and reptiles dating back some 200 million years, and strongly supporting the continental drift theory. One bone in particular, that of the lystrosaurus, bears out the theory. The lystrosaurus, a land-dwelling reptile allied to the hippopotamus, was unable to swim and has left relics also in Africa.

Four hundred and fifty fossil amphibian and reptile bones were collected by the team during six weeks of field work in the Queen Alexandra Range, including remains of fishes and animals found in other parts of the world, and present what, to Dr. Edwin H. Colbert, a vertebrate paleontologist from the American Museum of Natural History, New

Official U.S. Navy photo.

The one-tenth scale model of the new South Pole station.

York, and the Museum of Northern Arizona, Flagstaff, Arizona, is conclusive evidence that Australia, South America, Africa, the Indian Peninsula and Antarctica were once part of a single land mass.

Another sort of history was made in the Antarctic during Deep Freeze 70, when six women collectively became the first women to set foot at the South Pole and in the Taylor Valley. Dr. Lois Jones led this all-women team in geochemical studies.

At Cape Crozier, too, a woman was in the field, where Mrs. Müller-Schwarze accompanied her husband, also a biologist from the Utah State University, to study anti-predator behaviour in the Adélie penguin.

Glaciological history of the Antarctic, an immensely long and largely hitherto unanswerable topic, has started to reveal itself in the ice-free areas of the McMurdo Sound area, which areas provide a unique and datable record of the three major glacier systems of the region.

Conclusions reached by studying this available data show that the huge ice sheet of East Antarctica had attained a full-bodied stage more than four million years ago. Whether large glaciers existed in Antarctica before the Miocene era is questionable; the ice sheet to the west of the Taylor and Wright Valleys in East Antarctica has undergone several changes in surface level during the last four million years; all four recognized Ross Sea Glaciations were confined to the last 1.2 million years; extensive ice-free areas have existed in the McMurdo Sound region throughout the last four million years, perhaps even longer, and may have served as biologic refugia.

SUPPLY

Supply operations to the Ross Sea this season took a different form. The existence of fuel storage capacity at McMurdo Sound, enough to sustain operations until about February 1, made the bringing in of a tanker in late December unnecessary, and allowed a single tanker, USNS "Maumee", capable of carrying 7,000,000 gallons of fuel on one voyage, to replace the previous two vessels making six round trips.

Ship operations were not, therefore, necessary until later than ever before in Deep Freeze history, by which time the fast ice in McMurdo was expected to have deteriorated to such an extent that fewer and smaller icebreakers would be sufficient. The larger and more powerful "Glacier" would then be freed for other duties.

USCGC "Burton Island" and USCGC "Edisto" sailed from New Zealand on December 18 and had reached Hut Point, via Campbell Island, by January 4, "Edisto" suffering a sheared rudder stock which forced her return to Wellington. The first cargo ship of the season, USNS "Pvt. John R. Towle", reached McMurdo on January 9.

MAUMEE AT McMURDO

The 35,000 ton tanker pumped its vital load ashore in just under 59 hours.

After being escorted through the McMurdo shipping channel by the U.S. Coast Guard icebreaker, "Burton Island", the "Maumee" tied up on ice opposite the tip of Hut Point at the mouth of Winter Quarters' Bay.

The 620ft. long "Maumee" sat too deep in the water to moor against the shoreline so the "Burton Island" was used as a fender for the tanker.

The commanding officer of the "Burton Island", Captain F. E. McLean, backed the icebreaker into position against the shore and tied up.

The "Burton Island's" executive officer, Commander R. P. Harmon, acted as pilot of the "Maumee". Commander Harmon edged the tanker slowly upwind of the "Burton Island" until she was parallel to the icebreaker and about 60ft. off her port side.

The "Maumee" then dropped anchor, as a small boat brought her forward and aft mooring lines ashore.

Lines were then placed between the "Maumee" and the "Burton Island", connecting them amidships. As the lines were slowly tightened, the "Maumee" eased towards "Burton Island"' until she made contact.

A similarly difficult operation was carried out after the "Maumee" had finished pumping her fuel load ashore.

The "Maumee" then headed for Wellington, New Zealand, leaving the "Burton Island" behind to finish the Operation Deep Freeze 70 season. The icebreaker was due to leave McMurdo Sound on March 1.

SEASON ENDS

Operation Deep Freez 70 will end officially March 10 when Rear Admiral David F. Welch, Commander, U.S. Naval Support Force, Antarctica, departs advance headquarters here for task force headquarters in Washington, D.C.

A total of 250 U.S. scientists and military support personnel will remain in Antarctica to maintain equipment and facilities at four stations during the austral winter.

Pole, Byrd, and McMurdo Stations were closed for the winter on February 15, 18, and 26, respectively. Palmer Station, located on the Antarctic Peninsula, is expected to be closed for the winter on March 30 when the U.S. Coast Guard icebreaker "Glacier" departs the station for Punta Arenas, Chile, on its return to the United States.

The men at the stations will be completely isolated except for radio communication until late October, when the Navy will begin to fly in personnel for Deep Freeze 71.

THE PERSONAL NOTE

Max Conrad, self-styled "Flying Grandfather", finally reached the South Pole in his twin-engined Piper Aztec, having left Invercargill, New Zealand, on January 12 and arriving at South Pole six days later. He was unable to continue his round-the-world-via-both-Poles flight, however, when his 'plane crashed when taking off from the South Pole for Chile. Mr. Conrad was uninjured but his aircraft could not be salvaged before the end of the summer season and must remain at the Pole this winter. Mr. Conrad is the first man to make a solo flight to the South Pole.

Two Scandinavians, Messrs. Thor Tjoinveit and Ennan Pedersen, also flew, privately, to the South Pole, from Invercargill, arriving the same day as did Mr. Conrad, in a twin engined Cessna. They stayed at the Pole for about five hours before returning to McMurdo.

(See more details on page 394).

From one extreme to the other was the experience of Chief Photographer's Mate, B. M. Anderson, head of the still photography division of the Atlantic

Fleet's Combat Camera Group. Last March he left Charleston by submarine to photograph the vessel's under-ice capability test, and surfaced at the North Pole on April 6. Six months later Chief Anderson was at McMurdo, and in November photographed the first women to set foot on the South Pole. His expectations of travelling to the ends of the earth with the Combat Camera group have been literally fulfilled.

New officer-in-charge of Operation Deep Freeze wintering-over party at McMurdo is, believe it or not, Jack Frost —Commander W. L. ("Jack") Frost, who will relieve Commander W. G. Hunter after a year in the Antarctic.

BIG MONEY

In the Budget of the United States for the Fiscal Year 1971, an amount of $7,000,000 is included for Antarctic research. Almost all of the research carried out in the Antarctic is related to problems of the environment, such as global atmospheric circulation patterns, ice movement on the continent and in the Southern Oceans, ocean currents and their inter-tie with other major ocean systems, and the ecosystems of the surrounding oceans and this arid and frigid continent.

The National Science Foundation is the principal Federal agency for the development, coordination, and management of all U.S. scientific activities in Antarctica.

NUMBERS

The number of persons at the four permanent and two summer stations fluctuated little during the months of December and January. On December 3, the on-board count amounted to 1,046. The low point was reached at the end of December where there were 980. During January, the figure gradually rose. Part of this increase resulted from the return of field parties to McMurdo Station and part from the arrival of ships with summer parties at Palmer Station. On January 28, there were 1,134 persons at the various stations.

WINTER SETS IN AT SOUTH POLE

A report on March 24 said that darkness had descended on the South Pole station as the sunset and the continual blackness closed in on the area for the next six months.

To mark the sunset the flags of the 16 nations who are members of the Antarctic Treaty were lowered as the sun vanished.

A total of 21 scientists and members of the United States Navy will winter over at the Pole, and not until late October or early November will they see new faces.

The sunsetting ceremony was watched by the small party which already that week had experienced temperatures as low as —73°.

THE SOUTH POLE RE-MARKED

The location of the South Pole has been precisely marked for the first time in 12 years.

South Pole markers, because they are placed in ice about 4000ft. thick, cannot be permanent. There is no way to anchor them to bed rock.

The markers must be changed from time to time because the ice in which they are planted is steadily drifting toward the sea.

But they provide gauges of the Antarctic ice flow, which amounts to about 65ft. a year. The previous marker had shifted about 800ft. from the pole's true position since it was placed in 1957.

The new marker was needed for the new South Pole scientific base which must be built to replace the one now being crushed under many feet of accumulated ice and snow.

The new marker, a 6ft. wooden post, was planted at the request of the National Science Foundation. The pole's exact position was calculated by sighting instruments on 18 bright stars that appear fixed in the sky in relation to the earth's axis.

PACK HOLDS UP FRENCH RELIEF

SUMMER PROGRAMME DISRUPTED

The "Thala Dan", en route to effect the annual change-over of personnel and re-supply at the French base Dumont d'Urville, was on schedule until December 14, when the vessel encountered pack-ice which became thicker and thicker until it finally brought the ship to a complete halt. The captain decided to turn east and to make for Port Martin, but the ice again held the vessel up in the vicinity of Port Martin from December 15 to 25. Further efforts were now made to reach Dumont d'Urville, but "Thala Dan" was once again blocked in the latitude of Cap Jules from December 27 to January 2, and did not succeed in reaching the French base until January 9, 24 days late.

As in preceding years, "Thala Dan" was under sub-contract to the Australian Antarctic Expedition during a portion of the summer. She left Le Havre, France, on October 14 and reached Hobart, Tasmania, on December 4, to take on fresh fruit, meat, wine, kerosene, etc.

The first six members of the new wintering party left Le Bourget airport on November 26 and arrived at Hobart on the 28th. The main party of 40 left France by air on December 4, reached Hobart on December 5 and boarded the ship next day.

On January 7 an advance party was flown to Dumont d'Urville by helicopter, but the ship was not moored till the 9th, between Rostand Island and l'Ile des Petrels. Discharging of cargo was not completed until January 15, only the most urgent other work being attempted. Fifty tons of cargo was then loaded for return to France. T.A.20 now took over from T.A.19 and "Thala Dan" sailed on the 16th. Carrying 19 men of the 19th wintering party and two men of the summer party, she reached Melbourne on January 24. In March she was due to make her second voyage to Terre Adélie, return to Hobart with 23 Australians from Casey Station, the 18 summer-party men who had remained at Dumont d'Urville and the other 8 men of the 19th expedition, and three Australians from Macquarie Island, a total of 52 passengers.

Ordinary work was resumed at Dumont d'Urville on January 16 by the new winter personnel, assisted by the 8 T.A.19 men who were still at the base. "Thala Dan" was due to leave the Australian Casey Base on February 16 and to arrive at Dumont d'Urville on the 20th, "weather and ice permitting".

"Thala Dan" had carried south a cargo of 531 tons (1,032 cubic metres). Disembarkation was carried out with the help of two motor-boats of the "Thala Dan" and two others lent by the Lauritzen Company, one of them equipped with an ultra-sonic sounder, a ten-ton pontoon and the two-ton one already at Dumont d'Urville, Weasels and sledges. An Alouette II helicopter was placed at the disposal of the expedition by the French Air Force.

SCIENTIFIC PLANS

Throughout the whole voyage of "Thala Dan" aerosol measurements were carried out for the Atomic Energy Commission. Measurements of the vertical gradient of the concentration of radon were made from the helicopter above the Archipelago of Pointe Géologie in Adélie Land. On "Thala Dan" beween Australia and Terre Adélie and back, studies of the sea-water were made for French scientific bodies with reference to certain elements—iron, cobalt, manganese and copper, and salinity studies.

Visits are to be made to the bird colonies on various islands of the Pointe Géologie Archipelago for observation and ringing, using two motor-boats.

Examination and renovation of the Geomagnetic Station at Dumont d'Urville will be made in order (1) to effect some modifications in the numerical registration of the slow variations in

the earth's magnetic field, and (2) to complete the latter by the recording of a third magnetic element F., also to establish systematic control of the standards of measurement at present in use.

BUILDING PROGRAMME

The planned summer construction work had to be considerably reduced because of the immobilisation of the ship by the pack-ice between December 13 and January 9. Worst affected was the proposed installation of a new 6 kw radio transmission station, now put back till next year, unless it proves possible to carry out the work during the winter.

Also planned was the erection of Building 42, a two-storey winter quarters building with a floor space of 600 square metres.

Water installation planned involves the stoppage of the evaporator in order to facilitate the setting up of new ARCAP condensation groups and the installation of a new SIHI pump.

While "Thala Dan" was available, a reconnaissance in collaboration with the ship's captain was made to select a new mooring site for the eventual construction of a new unloading quay. Decisions had to be made regarding mooring sites on Iles Petrels and Lion, and the alignment of landmarks to assure safe access for the ship.

Other works in contemplation are: the setting up of the TBF antennae group for the Ionospheric Research Group, the installation of the new gamma spectrometry apparatus in Building 41, the erection of the photometric telecommunications cable, and the checking of the clocks indicating the time in the different laboratories.

The helicopter was to be used to make flights for the measurement of radioactivity, the photographic coverage of the Astrolabe Glacier, aerial photography of the Iles des Petrels at the beginning and end of the season, and the making of a cinematograph film showing the new installations and the commencement of work on the islands of the archipelago, especially the Cuvier and Lion Islands and Rostand Island.

AND NOW THE WINTER

Of the men to winter at Dumont d'Urville 15 are scientists and 12 maintenance personnel. The scientific programme comprises animal biology, night sky and aurora, geomagnetism, ionosphere, environmental medicine, meteorology and actinometry, radio-activity, cosmic rays and seismology.

The leader of the wintering-over party which numbers 27 is Claude Volck (35).

The 1969 winter brought snow and blizzards in July, August and up till mid-September. Everyone was kept busy on the maintenance of buildings, equipment and vehicles. "There was no shortage of work," says a Dumont d'Urville radio report.

There was a radio blackout on November 3 and 4, and a partial blackout from the 5th to the 9th.

BELGIANS AGAIN LINK WITH SOUTH AFRICANS

A Belgian team comprising Van Autenboer (geologist and leader), Decleir (geophysicist), Berkmans and Corbisier (electricians), Arnhem and Schollaert (pilots), Nicolas and Dubrey (mechanics), left Belgium on January 5. In company with the members of the South African Antarctic Expeditions they embarked on the vessel "RSA" on January 10.

The ship reached the Antarctic on January 24 after a very calm voyage, and disembarkation was carried out in very good conditions.

BUT

On January 29, however, following a landing, the Belgian Otter plane caught fire and the instruments required for the planned glaciological programme were destroyed. Fortunately crew and passengers are safe and sound.

AUSTRALIAN SUPPLY VESSEL BATTERED BY HEAVY SEAS

The Danish vessel "Nella Dan", on charter to the Australian Antarctic Expedition, had to fight extensive pack ice and high seas en route from Melbourne to Mawson Station.

When the "Nella Dan" sailed for Mawson with 47 men on December 19 she looked more like an aircraft carrier than a small Antarctic supply ship.

Tied down on deck were three Hughes helicopters, and a ski-fitted Pilatus Porter aeroplane. And they all had some hard work ahead.

One group is setting up camp at Moore Pyramid, 250 miles south of Mawson to carry out a geophysic and geological survey of the 12,000 ft. high Prince Charles Mountains—twice as long and twice as high as the Australian Alps.

Another group will fly over Prince Charles' crags to establish a forward base at Mount Cresswell, on the southern tip of the range.

And a third party will camp out on the Amery ice shelf near Davis for glaciological research.

The helicopters will transport men, food and equipment to the outposts. The Porter aircraft, fitted with special radar equipment, will be used largely to measure the thickness of the ice cap —in some places more than a mile deep.

Only after recovering from a battering by high seas could "Nella Dan" start unloading men and stores at Mawson on January 10. The ship made its way through most of the ice in Mawson harbour, after which a large party of men, working with picks and crowbars, cleared a channel through the ice so that the DUKWs (amphibious vehicles) could reach the shore. The Pilatus Porter aircraft for Mawson was also off-loaded and assembled.

The "Nella Dan" was 3½ days late reaching a point five miles off the Australian base at Davis, following a circuitous route through 112 miles of pack ice. After snow showers cleared, men and stores were airlifted by helicopter to Davis, enabling the ship to make up two days. Ration packs and drums of motor spirit were placed on the plateau near Davis for use by the 1970 field parties.

Next the "Nella Dan" sailed about 120 miles to the Amery Ice Shelf, where helicopters landed a four-man Australian party with 4½ tons of supplies and vehicles.

Informal radio communications between men of the Antarctic Treaty nations often provide an indication of the wide range of conditions being experienced in the Antarctic. Thus, an unofficial bulletin mentioned that two American ice-breakers, "Edisto" and "Burton Island", had to penetrate 10 feet of solid ice at the rate of five miles a day to lead a fuel tanker to McMurdo. The "Thala Dan" took more than two weeks over the last 20 miles before reaching the French station of Dumont d'Urville.

After relieving the French base, "Thala Dan" left for Melbourne to take the Australian 1970 wintering party to the Australian station at Casey and bring back the 1969 party. She left Melbourne again on January 27.

SANTA FLEW TO CASEY BUT . . .

The first flight of an RAAF aircraft from Australia to the Antarctic was intended to provide an unexpected Christmas present for 30 Australians stationed at Casey, in the frozen wastes of Wilkes Land, on December 3.

The Orion anti-submarine aircraft from 11 Squadron at Edinburgh Air-

field, Salisbury, was to drop a "storepedo" containing Christmas cakes, beer and magazines to members of the Department of Supply Antarctic division stationed at Casey, 450 miles from the south magnetic pole.

The C.O. of 11 Squadron (Wg-Cdr. R. N. Law) said that the 2,400-mile flight to Casey was being made as a high latitude navigation exercise.

The Orion would not land at Casey and was expected to take 13 hours to make the round trip.

However, the Casey men missed out on the expected supply drop of beer and Christmas cake.

The plane from South Australia had to turn back 100 miles short of Casey because of dwindling fuel. Headwinds up to 80 knots meant that the four-engined turbo-prop plane used more fuel than planned and it turned back after 1960 miles.

The captain, Wing-Cdr. R. N. Law, said he regretted not being able to drop the Christmas presents into Casey. But, he said, the primary object of the exercise had been achieved. Navigators had gained valuable training in unfamiliar techniques of South Polar region navigation.

The crew sighted the Antarctic coast.

TIDE STUDY

South Australian and American scientists who will make man's first attempt to measure tides in the deep oceans surrounding Antarctica left Port Adelaide in the U.S. ship "Eltanin" on December 19.

The main objective of the 60-day trip was the launching of three free-falling, deep-sea tide gauges, or capsules, along a 2,000 mile north-south track between Adelaide and Antarctica.

Tides are unusually high around Antarctica. They play a major role in exciting tides in other oceans. For example, Pacific waters flow into the Atlantic at the rate of 270 million tons a second.

N.Z. ANTARCTIC MEN HONOURED

Among the 29 members of New Zealand Antarctic teams to whom, as announced in our last issue, the Polar Medal has been awarded, are three men who are now living in Great Britain. Their medals were to be presented to

Malcolm Ford

Wally Herbert and

George Lewis

by the Queen Mother at Buckingham Palace on March 10.

ANTARCTIC CLUB DINNER

This year's dinner, which was held at the beginning of February, celebrated the 60th anniversary of the return of Shackleton's "Nimrod" expedition and the departure of Scott's "Terra Nova" party. The club paid special tribute to Sir Raymond Priestley, who was a member of both expeditions, and the occasion was honoured by the presence of the senior honorary member, H.R.H. Prince Philip. Guests included Harry Francis of U.S.A.R.P. and Victor Jabbs of A.N.A.R.E.

CAPE ROYDS NOVEL FILMED AT HOPE BAY

The Associated British Film Corporation, with the assistance of the Argentines, has been taking location shots at Hope Bay on the east of the Antarctic Peninsula for a film entitled "Forbush and the Penguins". They spent several months living at the old British base, which was evacuated in 1964, and seem very pleased with the results. Although the story might not appeal to most Antarctic men the scenery should be good. The film is based on the novel published in 1965, by New Zealander Grahan Billing, and reviewed in "Antarctic", March, 1965.

NEW RUSSIAN STATION SET UP NEAR HALLET

The Russians have announced that they have established a new station in Antarctica, on the Oates coast in the region of the joint New Zealand-United States Hallett Station.

The new station is the sixth Russian base now activated on the continent, and is approximately 200 miles from Hallett.

The Soviet Antarctic expedition headquarters at Mirny advised the American McMurdo station of the new base. Called Leningradskaya, the station is located at 60° 30′ S, 159° 23′ E.

The Russian message referred to the new station as a "temporary operating coastal Antarctic station", but said that work necessary for maintaining a permanent station, including building a house and storing aviation fuel, had been carried out.

The scientific programme for the station was listed as research into geology, geomorphology, gravity, geomagnetism and astrogeology.

"Pravda" announced on December 4 that the diesel-electric ship "Ob", which had left Leningrad five weeks earlier, had reached the region of Molodezhnaya Station.

The leader of the 15th Soviet Antarctic expedition, P. K. Sen'ko, radioed to Leningrad with the news that "Ob" having conquered the heavy belt of pack, was drawing near to the edge of the shore ice, where unloading of the ship was due to begin. An aerial reconnaissance flight had been carried out in order to ascertain their surroundings and help decide on the "Ob's" subsequent route to Molodezhnaya Station.

Two expedition helicopters, let down on to the ice from the edge of the ship, carried out several flights to Molodezhnaya. Twenty-four members of the expedition forming the new team were transported there.

On December 30 it was reported that a meeting had just taken place between the officers and crews of the "Ob" and the motor-vessel "Professor Vizet" in Davis Sea. They had transported the new team to Mirny.

The voyage to Pravda Coast from Molodezhnaya Station was carried out under difficult conditions: in Davis and Cosmonauts Seas there were accumulations of large pieces of broken ice and a lot of icebergs.

Having received information from an aerial ice reconnaissance by an IL-14 aircraft, "Ob" and "Professor Vizet" reached the Pravda Coast, where freight brought for the 15th Soviet Antarctic expedition was unloaded.

VOSTOK RELIEF

On December 10 a report was published concerning the start of one of the winterers' most difficult operations. This is the journey of a special sledge-tractor train from Mirny to Vostok.

The 14 members of the polar team, headed by engineer Ye. Zimin, were faced with a 1,500km crossing by powerful cross-country tractor vehicles in the most difficult conditions, to transport food supplies, fuel, materials and equipment to the station. On the way it was planned to carry out a series of scientific investigations. The entire operation was expected to take approximately a month.

Meanwhile the voyage of the scientific-research ship "Professor Vizet" from Leningrad to the Antarctic had been in

progress for about a month. The motor-vessel had reached Waterloo Island in the South Shetlands archipelago. The ship had anchored in the roads of the Soviet scientific station, Bellingshausen. The new shift of research workers, headed by the young research glaciologist I. Simonov, had been transported to Bellingshausen. The freight operations had been completed and the new settlers had taken over the watch from their predecessors. The "Professor Vizet" had left Bellingshausen Station under Captain E. Troitsky for Mirny. Mirny, Vostok, Molodezhnaya, Novolazarevskaya and Bellingshausen Stations were left to the new shift of researchers. More than 200 scientists and specialists will remain on the sixth continent.

"Ob" Reports

The Russian ice-breaker "Ob" reported in January that she was preparing to return to Fremantle for re-provisioning, and would then return to Mirny to rejoin the second Russian ship, "Professor Vizet".

Upper Atmosphere

This year Soviet scientists operating in the Antarctic have set up, and started to operate, rocket launch sites, which fire on Wednesdays—whatever the weather conditions.

Why Wednesdays? Because that is the day chosen by world geophysicists for synchronising rocket investigation of the upper atmosphere. The first Soviet firing in the Antarctic was on May 25. Since then there have been regular launches.

The Soviet effort is not only co-ordinated with the work of the international scheme. The longitude of the Antarctic station is the same as that of weather stations at Hayes Island in the Franz Josef archipelago, another in the European area of the Soviet Union, and yet another in the Indian Ocean. Rockets fired simultaneously from these sites will cut a section, so to speak, through the Earth's atmosphere along the chosen meridian.

A regular flow of inter-related information of this kind will help scientists to arrive at the laws governing processes in the upper atmosphere.

Stamps

A set of stamps with the figures 150 issued in January, commemorates the discovery, 150 years ago, by Bellingshausen and Lazarev (questioned by some) that Antarctica is a continent.

The 4 kopeck, violet, blue and claret, shows their sailing ships, the "Vostok" (Orient) and "Mirny" (Pacific) and the route of their voyage.

The 16k., sepia, green and claret, shows a modern Polar research station with a weather rocket, snow-cat and other items of equipment.

They were designed by Yury Levinovsky, and are printed by photogravure.

A third stamp, 6k., multicolour, marks the 125th anniversary of the founding of the Soviet (formerly Russian) Geographical Society.

CONTINENT OF PEACE AND SCIENCE

(From an article by B. Silkin in "Water Transport", December 2, 1969).

"Ten years ago yesterday the representatives of 12 countries taking an active part in the study of the Antarctic region signed the Antarctic Treaty. Later, three more governments joined them. The sixth continent shall be used solely for peaceful purposes. Within the principles of the study of the Antarctic are placed the international cooperation of scientists and the freedom of scientific research directed to the development and progress of all mankind."

Mr. Silkin describes Antarctica as "a continent without state borders, where among the 'population' there is the highest percentage of men with higher education in the world, where the representatives of nations greatly differing from each other uncover the riddles of the harsh land."

Mr. Silkin makes this reference to New Zealand's new station:

"The so-called Antarctic 'oases', regions among the white desert free from perpetual ice and snow, continually attract the attention of the researchers. The nature of such pieces of land, the reasons for which they have arisen, are still to a great extent little studied and at times a riddle. One of

these 'oases', Wright, is in South Antarctica, 125km from the New Zealand Scott Station.

"The New Zealand scientists have organised their scientific station in this 'oasis'. It has taken its name from the unusual Lake Vanda situated here—its bottom waters reach a temperature of +25 degrees."

We remember also the large part played by New Zealand-born and educated "Tony" Gow in the ice-drilling operations Mr. Silkin summarises as follows:

"At the American intra-continental Byrd Station a deep boring-hole has been drilled. The thickness of the glacial cover here has been more than two kilometres. From the bore-hole several five-metre ice columns have been lifted. Their lowest layers were formed from snow which fell more than 20,000 years ago. In some layers, lying at depths of 1,320 and 1,390 metres, ashes were revealed. These ashes were thrown out by volcanoes, active in the Antarctic between approximately 10,000 and 14,000 years ago."

"Ten heavy machines with sledges attached are cutting through the desert of ice. The tractor-caterpillars leave a design on its white surface. We are making our way over ice-covered sastrugi, large expanses of loose and crumbly snow. Blizzards and bad visibility make moving more difficult. The frosts are severe.

"A curious meeting took place on the journey. 283km from Mirny at a height of 2,500 metres above sea-level we caught sight of three storm-petrels. A few days before an aircraft flew over the train; an IL-14 heading for Vostok.

"In the Antarctic New Year is celebrated twice—according to local time and according to Moscow time. The difference is four hours. We will be celebrating at a height of 3,000 metres above sea-level. Half of the journey from the edge of the ocean to the South Geomagnetic Pole, which has now become the Pole of the earth's cold, has been covered."

NEW YEAR ON ICE

D. Maksutov, Leader of the 14th Antarctic expedition, radioed on New Year's Day:

"About a month has gone by since the sledge-caterpillar-tractor train left the Mirny observatory. The 14 members of the polar expedition completing their shift on the sixth continent have before them the task of transporting hundreds of tons of fuel, food supplies and equipment for the new party at Vostok Station. On the return journey to Mirny they will carry out scientific observations.

"At a New Year's holiday party in the mess-room the members of the two polar expeditions gathered together. By established tradition this is simultaneously a party send-off for those who have spent the winter and a welcome for those who have arrived. We passed on to the new team a symbolic key to Mirny observatory.

"Our expedition has fulfilled in their entirety the programmes of scientific research. For the first time meteorological rockets have flown up into the Antarctic sky from Molodezhnaya Station. The Mirny aerologists have reached a record height of radiosonde lift, improving on the results of their predecessors."

A VOICE FROM MIRNY

A newsman on a routine call at the Arctic and Antarctic Institute in Moscow was greeted by the head of the radio communication centre who said, "You're in luck. Right at this moment we are linked with Mirny."

"I put on earphones," writes the reporter, "and hear a voice from the other end of the world, and almost the same words. 'You're in luck', says the Mirny radio operator, Pyotr Mosolov. 'Today is a tremendous day for us—three hours ago we saw the ships on our approach march. An unusual spectacle. From behind a glittering iceberg appeared the delicate masts of the scientific-research ship 'Professor Vizet' and the vast body of the diesel-electric ship 'Ob'. Aircraft have already flown out on an ice reconnaissance. They will choose the best place for berthing. And our entire group rushed forward to the shore to meet the ships'."

NEW SOUTH AFRICAN BASE PROVES ITS VALUE

Good use was made of South Africa's new Borga Base, erected last year with the aid of Belgian aircraft during the joint summer expedition. The new base enables geologists to explore new areas and makes it possible to undertake research over a far greater area.

Borga Base, a 4-man wintering-over station, was established during May 1969 near Huldreslottet Nunatak (72° 50'S, 3° 48'W), some 350 km. due south of SANAE. The detailed geological investigation of the Kirwan Escarpment, particularly the Tunga region, was completed during the post-winter field-season and Antarctic history was made when the hitherto virgin region of the Escarpment between 5° and 7°W, was mapped during mid-summer 1969/70. The field parties progressed up to the south-easternmost continuation of the Escarpment and could clearly see in the distance Heimefrontfjella where British geologists mapped in previous years. The inland base has proved to be a great success and Anton Aucamp and Leon Wolmarans (geologists), Chris Muir (radio operator) and Wilfred Hodsdon (leader and veteran of three expeditions) survived the wintering over extremely well.

11th Expedition geologists and support personnel have already taken over the Base for the 1970-season, during which it is hoped to complete the detailed mapping of the Basement rocks exposed along the Escarpment and in the Juletoppane (72° 30'S, 06°W). The 11th Expedition will also establish a safe route across the Pencksokka from Borga Base on to the Polar Plateau. This will be used as the first stage of a 600-km over-snow traverse from SANAE via Borga up to the northernmost turning point of the U.S. South Pole-Queen Maud Land Traverse. It is anticipated that this geophysical-glaciological traverse will take place after the winter of 1971.

COASTAL SURVEY

Captain K. T. McNish, master m.v. R.S.A., repeated his 1964-radar survey of more than 350 km. of ice front in the King Haakon VII Sea. Significant changes in the configuration of the ice front have been recorded during the intervening five years. The most important change is the calving of nearly two-thirds (ca 1800km2) of Trolltunga, the more than 120 km. long ice tongue along the Greenwich Meridian. This event is undoubtedly of major glaciological and cartographic significance. Off-shore echo soundings have also indicated that the break-away point of the continental shelf lies at approximately 700 fathoms and that the continental slope is a very steep (1:4), linear feature. It was planned to extend the coastal survey during the present relief but close pack-ice has thus far prevented any further penetration to the east.

S.A.N.A.E. MAPS

Maps (1:1,000,000 and 1:500,000) showing the region of Queen Maud Land traversed by South African geological and geophysical parties including ice thickness and subglacial topography and bathymetry and configuration of the ice front, have been compiled and published.

TRAGEDY

1969 ended tragically with the unexpected death of Gordon Mackie, Mechanic of SANAE 10. Three expedition members, including the late Mr. Mackie, left SANAE for Borga Base to collect a broken down tractor and make magnetic observations. On December 3, 1969, having completed the observations for the day, Mr. Mackie went to look at a windscoop, fell into it and was killed instantly. He is the first member of a South African team to be killed in the Antarctic. The burial will

take place at East London, Cape Province after the RSA has returned from the Antarctic.

NEW TEAM

SANAE 11, comprising 18 members, left Cape Town on January 10, 1970, for the Antarctic. The journey was uneventful and the transfer of the four expedition members to Borga Base, as well as the offloading of the m.v. RSA, went according to plan.

The main task of the team of the Department of Public Works was to erect an emergency base for 16 members, approximately 2 km. southeast of SANAE. The existing base at SANAE was erected at the beginning of 1962 and will be replaced by a new base at the beginning of 1971. A new power shack was also erected by the PWD team.

PASSING THROUGH

Three expeditions will again be in Cape Town during March. The "Fuji" is scheduled to reach Cape Town on the 9th of March with the members of JARE 10 on board (See page 389.) The other expeditions are the returning South African Expedition, Sanae 10, together with the Belgian Summer Expedition under the leadership of Mr. Tony van Autenboer. The Belgians conducted their own programmes and this was no joint expedition as in previous years.

The French vessel, "Gallieni", also called at Cape Town for a very brief period during December 1969. They were kind enough to convey some equipment and mail to our meteorological team at Marion Island. Once again we wish to thank them for this fine gesture.

TRANSPORT

With regard to transport problems it was decided to purchase a D4 crawler tractor with 36 inch tracks and a ground pressure of approximately 3½ lbs per square inch. The vehicle was also fitted with a power take-off and Hoptoe-crane which could lift a weight of 1½ tons. This vehicle, according to reports received, has been a great success. The off-loading of the ship was speeded up considerably and presented no problems.

A further advance has been the use of heavier sledges and, with the more powerful tractor, 20 tons could be transported on each trip from the ship to the base. An experiment was also carried out with a 1200 cc. Volkswagen sedan car to modify and convert this vehicle for use at the base. The experiment proved to be successful although further modifications will be required before the vehicle is used for inland journeys, where one encounters various types of snow. One problem is the very soft powdered snow and this will necessitate further adjustments. However, confidence reigns that the vehicle will be a great success for Antarctic use.

Other forms of transport still in use are the Bombardier Muskeg and Ski-doo toboggans, which have proved quite successful for expedition use.

BUILDINGS

Planning the new main base is progressing well, and it is hoped to have it erected during January-February, 1971. The old buildings, erected in 1962, are now 35 feet under snow and ice, and are still withstanding all stresses and strains.

NEW JOURNAL

It has been decided to initiate a new journal for the publication of original scientific papers and other material related to South African research activities in Antarctica. The journal will be sponsored by the Department of Transport and published by the C.S.I.R.

Authors in the past have used the journal "Antarktiese Bulletin" for the purpose of publishing scientific material which may not have had much appeal to the majority of its readers. It is therefore recommended that in future all contributions of a more technical nature be submitted to the South African Antarctic Journal. However, articles of popular scientific interest pertaining to polar activities will still be most acceptable for publication in the "Bulletin".

JAPANESE SHIP HELD FAST BY ICE

A Tokyo report of February 26 said that the Japanese icebreaker "Fuji", carrying 223 persons, including an Australian scientist, had been trapped in the ice in Lutzow Holm Bay on the Prince Harald Coast off Queen Maud Land, 70 miles from the open sea.

The 7760-ton ship, which lost all four blades of its right screw on the 25th, was about 70 miles from the open sea and was waiting for the ice conditions to improve before making an attempt to escape.

The Australian on board is Dr. Garth Morgan, a research scientist in the propulsion and marine physics division of the Government Weapons Research Establishment.

The ship is carrying a crew of 182 and 39 Japanese expedition members. The Japanese Government advised all treaty nations using ice-breakers in the Antarctic of the "Fuji's" plight. Satellite information of ice conditions in the area where the "Fuji" was held was sent from McMurdo Station, and also the position of the two United States Coast Guard icebreakers in the Antarctic.

The "Glacier" was about 2000 miles from the "Fuji". The "Edisto" was in the Ross Sea, somewhere between Hallett Station and McMurdo Station.

"Glacier" and "Edisto" were both alerted to stand by in readiness to go to the aid of the "Fuji" if required.

"OB" TO THE RESCUE

A later message received at the American Navy base at Christchurch said that the Russian cargo ship "Ob", which has limited ice-breaking capabilities, was heading towards the "Fuji".

Japanese authorities in Washington informed the United States navy that the "Fuji" was not in any danger, only in difficulties. The United States navy informed the Japanese Government that the icebreaker "Edisto" would sail to Lutzow Holm Bay if the "Ob" was unable to free the "Fuji".

By March 6 there were two ships trapped, the Argentine "General San Martin" also being held up, in the Weddell Sea.

The United States Coast Guard icebreaker "Glacier" was attempting to rendezvous with and assist the Argentinian ship, which was surrounded by an ice field.

The trapped ship was about 15 miles from the "Glacier".

"Edisto", which was at Wellington, hurriedly prepared for a 17-day dash to free the "Fuji", and sailed on March 13. The commander of the "Edisto", Captain H. E. Steel, said his crew would try to free the "Fuji". If that were not possible 102 crewmen would be taken off and 91 left on board for the winter.

He expected that the "Fuji" would have sufficient supplies to provide for these men during the winter. "I don't know, though, what we will do with the men we take on board," Captain Steel said. "We haven't got room for anything as it is. We're working on a plan to rendezvous with another ship which would take the Japanese to their destination."

ICEBREAKER FREE

Japanese officials said in Tokyo on March 19 the icebreaker "Fuji", trapped in thick ice for 28 days in Antarctic waters, had escaped into open water under its own power. The 7760-ton ship radioed that it was able to reach open waters on the 18th by using its left propeller.

The "Fuji" was stranded in Antarctica since February 25 while on its way home from the Japanese base of Showa on Ongul Island. The ship lost power when its right propeller broke down. The officials said it will stop either at Capetown or Fremantle before returning to Japan.

"EDISTO" BACK

The U.S. Coastguard icebreaker "Edisto" left New Zealand on March 14 to free "Fuji" from the Antarctic ice pack. Five days and a thousand miles later it was notified the Japanese vessel had freed itself from ice in Lutzow-Holm Bay.

"Edisto" arrived back at Wellington, New Zealand, on March 24. A disappointed crew reported that round-the-world certificates which had been ordered for the crew had to be cancelled.

Had the ship gone a little further, to

(See foot next column)

FIELD WORK AND AIR SUPPORT BY BRITISH ANTARCTIC SURVEY

Aircraft and Ships

The twin-Otter and turbo-Beaver, which were flown south from Toronto at the end of November, arrived at Adelaide Island on December 7, and relief flights to Stonington Island and Fossil Bluff were carried out almost immediately. The Beaver then provided support for field parties working in several localities on both sides of George VI Sound, while the Otter was used for glaciological echo-sounding flights.

Meanwhile, R.R.S. "John Biscoe" relieved South Georgia and Signy Island, but was held up by fast ice off the west coast of the peninsula. She reached the Argentine Islands on December 1, but was unable to get into Marguerite Bay until the beginning of February, and once in had difficulty in getting out again. Consequently, the planned rendezvous with m.v. "Perla Dan" had to be cancelled, and transfers of personnel will now be carried out with the help of H.M.S. "Endurance". The "Biscoe" eventually arrived at the Adelaide Island base on February 5 and at Stonington Island on February 11. "Perla Dan" was delayed by heavy pack ice in the Weddell Sea and arrived at Halley Bay a few days later than usual —on February 2. Unloading was completed in four days and the return passage was uneventful.

"Endurance" has had to make a mid-season visit to Punta Arenas to collect a new helicopter, and will be taking the Survey's director, Sir Vivian Fuchs, and Rear-Admiral Sir Edmund Irving, K.B.E., C.B., south for a brief tour of the bases.

Admiral Irving has been a good friend of the Survey for a number of years. He is chairman of the Natural Environment Research Council Antarctic Committee and was formerly Hydrographer to the Navy. Two B.A.S. stores officers are also visiting the bases.

Joint British-American Projects

In the Shackleton Range, the six-man sledging party completed the topographical survey and continued geological work, and were flown back to Halley Bay on January 25 by a U.S. Navy Hercules aircraft from McMurdo Sound. A second Hercules arrived at Halley Bay on the same day, carrying a glaciological party from the Scott Polar Research Institute in Cambridge. This party, which is led by Dr. Gordon Robin, the Institute's director, and includes Dr. Stanley Evans and David Petrie, are carrying out ice depth sounding by radar in flights across the continent. Tractor parties from Halley Bay had laid ground markers and depots in December in preparation for these flights and field trips.

Other Field Work

In addition to general survey and geological work carried out at a number of localities by parties from Stonington and Fossil Bluff, a magnetic and gravity survey was carried south to the Eklund Islands at the south-western end of the Sound. This is the first time that the area has been visited since Sir Vivian Fuchs and Dr. Raymond Adie, the Survey's chief geologist, sledged there

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the point of no return, it would have continued on to complete a round-the-world circuit, rather than returning to New Zealand.

The "Edisto" had been proceeding at best possible speed on four engines, saving the vessel's two other engines for penetration of the ice pack.

Though the ship struck no ice at its farthest point south, the journey there and back was marred occasionally by bad weather. On the journey outward the ship struck fog around Auckland Islands and was unable to get a navigational fix for four days.

For earlier news of the Japanese expedition, see p. 406.

from Stonington in 1949. Field work in this area was held up in November by extensive melting but surfaces improved again in December.

Flights in support of these parties included replenishment of a depot at the southern end of the Eternity Range, at about 71°S., 64°W. Four field parties met at this depot in mid-January and travelled back to Stonington together via the plateau. The route lay along the windswept west face of the Range, then across 40 miles of undulating plateau at about 6,000 ft., to the glaciers between Marguerite Bay and the Weddell Sea. They then travelled across the Mercator Ice Piedmont and back up to 5,000 ft., where they had superb views of the coast and the mountains of Alexander Island, then down the Northeast Glacier to Stonington Island. It was a great finish to a successful 5-month summer season.

From Halley Bay, short journeys were also undertaken to continue the local magnetic survey, glaciological levelling and physiological research. A party visited the original Halley Bay hut, which was built in 1956 for the I.G.Y., and found that it is now more than 60 ft. below the surface.

New Ship

The building of the new ship proceeds, but both the name and the delivery date are still uncertain, and alternative plans for shipping men and supplies next season are being worked out in case further delays occur. R.R.S. "Shackleton", which is at present carrying out oceanographic work for the Natural Environment Research Council, may be able to help.

A small twin-diesel vessel, which is also being built, should be ready in about June. It has a length of 52 ft., a draught of 5 ft. 9 in., twin 100-h.p. diesels and twin screws, and will be used for carrying parties around South Georgia.

DECEPTION ISLAND TODAY

(See "Antarctic", March 1968)

The first reports of an investigation into eruptions at Deception Island, just off the Atlantic peninsula, in 1967 and 1969 suggest that the instability of the area is likely to lead to more volcanic activity in the future.

In a recent issue of "Nature", scientists who explored the after-effects discuss the disturbances that created a completely new island and set off large-scale flooding by melting the permanent ice cover.

Deception Island has a long history of vulcanism, judging by present-day geological evidence. It was probably once a single volcano whose central crater has subsided to give the island its horseshoe shape. The ring of faults along which sinking occurred is dotted with a number of cones which have erupted since then.

The new island, which is in the central bay of Deception Island, is just over half a mile long. It was built up from ash and boulders thrown out by half a dozen craters during four days in December, 1967, and reaches a maximum height of about 225 feet above the sea. In the course of these eruptions, most of Deception Island was showered with the ejected material, forcing the temporary evacuation of 42 Chilean and British scientists.

Fourteen months later, after several weeks of earth tremors, another series of eruptions began. This time a three-mile fissure opened up beneath the ice and melted it. The result was a flood which carried large blocks of ice down from the higher ground of Deception Island and partially destroyed the evacuated scientific stations. In some places, the configuration of the coastline was altered—new mudflats formed as an extension of the main island.

There is little wild life on Deception Island, apart from penguins. The investigators found that some of the penguins were suffering from blistered feet, having presumably been caught unawares on hot rock when the eruptions began. Others had escaped injury, no doubt simply by standing in the sea: the temperature at the bottom of the shallower pools was probably no more than 60°C.

BUSY SUMMER MONTHS AT ARGENTINE BASES

The following report from the Argentine Antarctic Institute Publications Section covers the Antarctic activities of the Army, Navy and Air Force as well as the usual scientific activities of the Institute itself, during the 1969-70 season.

ACTIVITIES OF THE ARGENTINE ANTARCTIC INSTITUTE

Studies are being carried out on a continuing basis in the specific disciplines of the zoology of vertebrates and invertebrates; human and animal biology and the metabolism of carbohydrates, lipidos, calcium, proteins, etc.

Complementary observations: climatological, radiation and upper atmosphere.

Collection of specimens to complete scientific collections of birds, mammals and fish; also of lichens, mosses and grasses, and of coastal and deep marine specimens.

Observations covering geology, paleomagnetism, oceanography and meteorology.

General Belgrano Army Base

A scientific laboratory was installed and put into operation in the vicinity of the General Belgrano army base, to study the physics of the upper atmosphere. It comprised: a cosmic radiation unit (neutron supermonitor); ionosphere (release of sounding balloons, riometers and spectrograph); and austral aurora unit (photographic towers and laboratory) and a power unit (electric generation units for the supply of electric power and heating for the units installed).

Deception Island

Observations, studies and the collection of samples were carried out from the areas affected by the recent seismic movements to complete studies from the previous year in the disciplines of geology and vulcanology.

Studies covering the salinity and effluvium of waters from the rivers and active fumaroles.

"General San Martin" Icebreaker

Cosmic radiation observations were carried out with the neutron monitor installed in the vessel throughout its voyage, to complete information and the recording of horizontal and vertical nucleonic component.

ACTIVITIES OF THE NAVY COMMAND

Naval Hydrography Department

Tasks were carried out covering oceanography, buoying and relieving, including photogrammetry of Elephant Island by means of the aircraft from the Petrel Fleet Air Arm station.

Measurements at oceanographic stations in the Weddell Sea were continued in association with the icebreaker "Glacier" from the U.S.A.

All the Argentine bases, detachments and stations in the Argentine Antarctic sector were relieved and reprovisioned.

Antarctic Naval Force

Together with the icebreaker "General San Martin", the transport "Bahia Aguirre" operated, also the station vessel of the Maritime Province of Tierra del Fuego based at Ushuaia, "Zapiola". The Canadian polar vessel "Theron" was leased by the Argentine Government for the present programme. The Fleet Air Arm, carried on board, was equipped with Alouette helicopters of French origin, which were recently incorporated.

The Command of the force had information on the state of the ice through the Nimbus III artificial satellite, which facilitated aerial photography of the area. This was processed and analysed at the Ushuaia naval base.

The Orkneys meteorological station acted as the centre for meteorological information and as a communications point for all the forces and units deployed in the area.

ACTIVITIES OF THE ARMY COMMAND

"Alferez de Navio Sobral" advanced scientific base was de-activated for the year 1970.

By means of the polar vessel "Theron", the General Belgrano base was partially relieved. Studies and investigations are continuing on the variations in the great fissure in the Filchner ice barrier (Weddell Sea) to determine the extent of its widening and the danger that the floating ice mass on which the base is installed may become detached.

Esperanza Base

The normal programme of observations and studies in the disciplines assigned to this base were carried out, and new explorations by means of patrols to bases and installations in the area are anticipated.

ACTIVITIES OF THE AIR FORCE COMMAND

The Teniente Matienzo air base was temporarily deactivated and activities were intensified on Vicecomodoro Marambio Island, where a new base was inaugurated to handle large wheeled aircraft of the C-130 type or similar, for which two runways 30 metres wide and 1700 and 1900 metres long were prepared.

GENERAL TASKS

An Argentine film company shot scenes for short films at the Almirante Brown scientific station and in areas of the Antarctic Peninsula and Deception Island.

An Anglo-American film unit made a documentary film on the life of penguins at the Esperanza army base.

The National Directorate of Tourism organised by means of private contract tourist trips to Antarctica on the vessel "Yapeyu" of the Argentina Shipping Company. Tourists had the opportunity of visiting the main bases, stations and geographical features in the Northern and Western part of the Antarctic Peninsula.

DIAMONDS ? PLATINUM ?

Delegates at a conference of American scientists involved in Antarctic research in Washington late last year were given to understand that it was likely that valuable minerals such as diamonds or platinum would be discovered in the Antarctic, and that the scientists might not have to go very far below the rock surface to find these minerals.

The Sentinel Range of the Ellsworth Mountains of West Antarctica (78° 10'S., 85° 30'W.) was the stated location of the likely discovery in an area known as the Dufek intrusive — a geological structure similar to the Rand in South Africa. The big Dufek intrusive was caused over millions of years by a spillage of materials precipitated by volcanic action.

Though serious mineralogical exploration had not been carried out in the Antarctic as yet, direct evidence of ore had been contained in numerous rocks discovered by geologists during general reconnaissance activities.

The particular area where the discovery might be made was in the sector of the Antarctic to which no nation had laid territorial claims.

Commenting in Christchurch recently, Mr. R. B. Thomson, Superintendent of the Antarctic Division, D.S.I.R., said that the whole subject of exploitation, about which the Antarctica Treaty was curiously silent, would be raised informally by New Zealand at the next consultative meeting of the treaty powers in Japan this year. The possibility of such a discovery again raised the question of providing some legislative machinery to guard against the economic exploitation of Antarctica's resources.

FLIGHTS TO THE POLE

The last issue of "Antarctic" recorded, in a stop-press item, that 67-year-old American Max Conrad had so far succeeded in his daring attempt to fly his twin-engined Piper Aztec, "White Penguin", single-handed over both Poles as to touch down at the South Pole on January 19. This initial triumph was followed by disaster when "later" his plane crashed. The sequence of events can now be told in more detail.

Conrad celebrated his 67th birthday at the Pole Station. He took off at 7.28 p.m. on January 23 en route for Chile—but crashed five minutes later. He had, he said, been concentrating too much on the horizon, and in doing so his port propeller struck soft snow soon after take-off. He decided to turn round to land but belly-landed with the wheels up about two miles from the Pole. Mr. Conrad was uninjured except for a bruised rib, but both propellers were bent and the port wing was damaged.

The 840-mile flight from McMurdo to the Pole had taken 5½ hours. Conrad, who has flown more than 8,000,000 miles, had trouble with his navigation gear because of the cold. "I could not get navigational bearings at times," he said, "because cloud covered all features except the mountain peaks." He did not know for two hours that he was on the right course.

Salvage of "White Penguin", which cost $65,000 new three years ago, is considered "uneconomical" by its owner. A new wing, two new engines and new propellers would be required, and it would be impossible to work on the plane in the extreme sub-zero temperatures at the Pole.

(The first flight over the South Pole was made by Admiral Byrd in his tri-motor Ford in November, 1925. The first landing at the Pole from an aircraft was by Admiral Dufek from an LC-47 on October 31, 1956.)

NORWEGIANS FLY HOME

Two "Flying Vikings" arrived in Christchurch on January 12 on their way home to Norway across the two poles—they hoped—after finishing second in the London-Sydney air race.

Captain Thor Tjontveit, Norwegian-born but now an American citizen, who is a pilot with Wien Consolidated Airlines in Alaska, and Mr. Einar Pedersen, a navigator with the Scandinavian airline system on leave to make the global trip, met Rear-Admiral D. F. Welch as soon as they arrived in Christchurch.

Their Cessna 421, a twin-engined, turbo-prop plane, has a range of 4000 miles. Punta Arenas is slightly more than that. To gain their range the flyers left little space for themselves. Extra fuel tanks took precedence.

The pole-by-pole world trip had been their aim for several years, and the London-Sydney air race gave them the chance of winning some money towards the venture.

They received word from Washington on January 15 that they could land and refuel at Williams Field, near McMurdo Station, before flying to Punta Arenas, Chile, up the American continent, and across the North Pole home.

South from New Zealand

The two men took off from Invercargill airport at 10.45 a.m. on January 19 in their twin-engined turbo-prop aircraft "Roald Amundsen", and landed safely at McMurdo at 6.50 a.m. next day. Their earlier announced intention had been to fly about 50 feet over the Pole, dropping the flags of the United States and Norway, but not landing. In fact, they touched down at the Pole less than 12 hours after Max Conrad.

Back at McMurdo, the Norwegians left Williams Field, near McMurdo Station, at 4.30 p.m. on the 23rd for the 3050-mile flight.

They passed out of United States Navy control at 7.50 a.m. next day, although they were still in touch through Byrd Station.

They landed safely at Punta Arenas, Chile, at noon on Saturday, January 24, after a three-hour delay caused by head winds.

TEN YEARS AGO

At the ceremony at Scott Base on December 1 marking the tenth anniversary of the signing of the Antarctic Treaty (see December issue) a message from the New Zealand Prime Minister, Mr. Keith Holyoake, which was also transmitted to the principal bases of all the nations actively engaged in Antarctic research, was read out by a representative of the Ross Dependency Research Committee.

The text is as follows:

"The Government and people of New Zealand, on the occasion of the tenth anniversary of the signing of the Antarctic Treaty, send greetings to all men and women participating in the quest for knowledge in Antarctica. May the spirit of harmony and co-operation amongst nations which is the very foundation of the Treaty be further strengthened by your good work and the work of those who follow you in the years to come."

The significance of the Antarctic Treaty is admirably expressed in the following article published in "The New York Times", on December 9:

THE EXAMPLE OF ANTARCTICA

A decade ago the Antarctic Treaty was signed by the United States, the Soviet Union and ten other countries. With the passage of time, the example set by this treaty has grown enormously in significance.

In effect, this pioneering compact declared the Antarctic to be a continent of peace, where men would cooperate for mutual advantage and for the advancement of science, where military activities would be prohibited and where territorial claims would be outlawed for at least thirty years. And so it has worked out—thus far. Even at the times of greatest tension in the terror-filled sixties—the Cuban missile crisis and the invasion of Czechoslovakia, for example —Russians, Americans, Britons and others have continued their work in the Antarctic undisturbed. They have helped each other as necessary, shared their knowledge and resources, accepted international inspection of their activities and generally behaved as friends and colleagues. In this coldest of the continents and the iciest of landscapes, the Cold War was abolished.

There can be little doubt that this precedent helped to create the foundations of mutual confidence on which the great diplomatic landmarks of the past decade have been based, notably the test ban treaty of 1963, the space compact of 1967 and the nuclear nonproliferation pact of 1968. In effect, the Antarctic has become a political science laboratory, and the Antarctic Treaty a historic, successful experiment pointing the way for future progress toward international cooperation.

Now the task is to apply the lessons learned from that experiment to all of the great contemporary problems where needless suspicion and rivalry waste huge resources and endanger earth itself.

ROLL ON, ROLL OFF

The New Zealand Vanda summer party built a ferry by lashing oil drums together and placing planks over them, using the craft to cross the moat around the edge of the lake between land and floating ice.

The expedition leader, A. J. Heine, said of the raft: "It was really a roll-on roll-off ferry. The only way to get aboard was to roll on, and you had to be careful you did not roll off."

REALISE THIS?

Along with the Gobi and the Sahara, Antarctica ranks as one of the world's great deserts. The air above the ice-sheet is extremely dry and precipitation consists entirely of fine granular snow whose annual average water equivalent has been estimated at only 2 ins.

H. G. R. King: 'The Antarctic'.

On the Sub-Antarctic Islands

CROZET
(France)

During the 1969 winter and early spring, a new automatic weather station was installed, and a new radio reception complex came into operation during August and September. An observation shelter for the ornithologist was set up on the beach. The ornithologist also made several observation journeys (1) to American Bay, de la Hébé Bay and Pointe Basse from July 1 to 12; and (2) to American Bay on September 11.

Much wind in October and November, snow in October and rain in December made conditions very unpleasant at the Crozet station, but work carried on. The No. 1 store was fitted out, the foundations of the new sick bay were laid in November. Essential maintenance work on the buildings, cable, railway and wharf was completed before the arrival of "Galliéni" on December 22. Disembarkation of personnel and unloading of cargo were carried out on the 22nd and 24th though bad weather prevented work on the 23rd. The "Galliéni" left for Kerguelen on December 26.

KERGUELEN
(France)

The French team on Kerguelen suffered a heavy blow on June 7 in the death of radio-technician Rémond, who had been admitted to hospital on May 28. He had been "an excellent comrade and a very hard worker".

Work on the interior of the marine biological laboratory was completed by September and the lab. was handed over to the scientists on the 20th. Further structural alterations completed included the mess room, building B4. In addition, numerous painting and repair jobs were carried out.

The 35KW transmitter broke down on July 1 and was not serviceable again till September.

Teleprinter communication with the three other French stations has been assured, Crozet being received on RTTY from January 1. Communication with Amsterdam, both transmission and reception, is excellent, but only "passable" with Crozet and Adélie Land. The large nest of aerials for communication with Paris collapsed following a strong wind gust in August, but transmission was kept up using a smaller nest until the main one was restored at the end of the month.

Lieutenant Dubosq and his team deserve credit for completing their heavy planned programme by the time "Galliéni" arrived on the 29th October.

CAMPBELL ISLAND
(New Zealand)

Peter Julius reports:

"The tumult and the shouting dies, the Captains and the Kings depart". This well known line is purely indicative of the last two months on Campbell Island, when the Wellington Railway Station at 5.00 p.m., would be quiet by comparison.

The party settled in well and major projects were soon under way, namely, the erection of the new Campbell Hilton Hotel for fowls. Weather up until December was wonderfully consistent, rain all the time, which made the outside work wet and dirty to say the least.

Our first ship, the U.S. CGC "Burton Island", arrived on December 20 bringing welcome mail and supplies along with a six-man U.S. A.R.P. party of botanists under the direction of Professor Henry Imshaug of the University of Michigan.

Having sighted the terrain and experienced a decent Campbell Island shower of rain, sleet and snow within minutes of arriving, they carefully accepted our offer to rough it with us in Beeman Hostel in preference to camping out and living close to nature. And so came the prelude of a warm and enjoyable month in which we succeeded in teaching the Americans the fundamentals of the English language and in return, they tried in vain to indoctrinate us in the intricacies of mosses and any hepatic result on either side was purely co-incidental.

The magnificent dinner on Christmas Day by Bryan George, our chef, marked the passing of our first milestone and prepared us for the return to harness after the New Year, when we completed 250 feet of new walkways to the Met. enclosure and new fowl-house. New concrete culverts were laid, defeating many of the problems of the run-off areas, and proving a boon.

January 20th saw a sudden and violent easterly storm which caused major damage to the wharf, and but for the prompt efforts of all hands at 1.30 a.m. would have cost us the station launch as well.

Three days after this saw a Hercules of the RNZAF overhead carrying out a parachute drop of fence posts and wire, under very gusty conditions, which considering the circumstances, was very accurate.

The twelve-man wild-life party arrived on HMNZS "Endeavour" on January 25 and replaced the U.S. A.R.P. party, who are returning to New Zealand via McMurdo Sound. Although camped at the old Tucker Cove Hostel, we saw a great deal of them and competition on the billiard table, and for the hot showers, was always keen. They succeeded in stripping our Island (with a fence) and then shot out approximately 1100 wild sheep on the northern half of the fence in a controlled long term experiment to compare the effects of actual re-growth and the Island wild life.

For that month of the year, the scene was reminiscent of the bombardment of Monte Cassino in 1944. The local ammunition companies are rubbing their hands at an unexpected dividend.

February 14 saw the arrival of the motor fishing vessel "Tua Tea" under the command of Captain Rob Rae, on charter to the Marine Department's Fisheries Board, investigating the possibilities of commercial crab fishing in the area. An eventful week followed with all members of the party taking the opportunity to go fishing and to see the Island and photograph it from offshore. Many warm friendships resulted with the crew who spent all their free time ashore with us, and the winter menu for the Station benefited by the large amount of succulent crab which was only limited by the amount of freezer space available.

HMNZS "Endeavour" was welcomed back from the ice on February 18, but owing to a damaged windlass cable could not anchor, and it was fortunate that the conditions were calm to enable her to effect the transfer of mail and supplies and leave again after only 2¼ hours in the harbour.

On March 1, we regretfully farewelled Jim Carr and Tiny Taylor, two very popular Met. boys who have finished their terms of duty, along with the wild life boys, who steamed for home on the last ship of the season, U.S. CGC "Edisto".

For the next two or three days, it was definitely a case of empty saddles in the old corral, but since then, all the wintering over, men have re-adjusted themselves, re-organised their hobbies, counted their remaining beer stocks and are well prepared for the winter hibernation.

So until the next bulletin, we will just open our hobbies, re-adjust our steins, re-organise the rum issue, and count our blessings.

MACQUARIE

(Australia)

The Antarctic relief expedition that sailed from Melbourne for Macquarie Island on November 29 took with it three pack horses named Brandy, Lime and Soda.

Horses were used by sealers on Macquarie Island about 1900. This is the first time they will be used there by an Australian expedition.

"We have been using machines in the past, but with only mixed success," the relief party leader, Mr. Graeme McKinnon said. "Despite all technological advances we are back to horses again."

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50 YEARS AGO

In 1920 T. W. Bagshawe and M. C. Lester, forming with Hubert Wilkins and J. L. Cope the British Imperial Expedition, arrived at Deception Island, hoping to investigate the eastern coast of Graham Land, now the Antarctic Peninsula. These two men were to form the smallest party ever to winter over in the Antarctic.

ANTARCTIC BOOKSHELF

ACROSS THE TOP OF THE WORLD. Wally Herbert. Longmans: 209pp. ill. 36/- stg., N.Z. price $4.30.

The first surface crossing of the Arctic Ocean by the British Trans-Arctic Expedition has been more than adequately documented by Wally Herbert's absorbing account of this pioneering journey. Readers of the author's earlier book on exploration in Antarctica will slip easily into his latest narrative as the initial chapters repeat some of his Southern experiences. Possibly full justice has not been done to the actual journey itself, commencing with the start from Barrow to landfall at Little Blackboard Island. However, most readers will appreciate the details of the planning and organisation that made this journey possible.

Not unexpectedly, Wally Herbert's own personality and temperament come through strongly in this book and it is surprising perhaps that only one obvious clash occurred between the Leader and the Organising Committee for the Expedition. To a degree history was repeating itself, but the Press did not have quite the same opportunities for speculation as in the days of the Trans-Antarctic Expedition. However, they did feast for a short while on the dispute over the evacuation of the injured party member Allan Gill. Herbert tactfully covers this crisis in the journey and old wounds should not be re-opened. The book is the better for highlighting the human elements of this episode.

The author is able to call on a wide background of experience to record the part played by his fellow expedition-members and the support provided by the Royal Canadian Air Force, the U.S. Arctic Research Laboratory and the Royal Navy. Tribute is paid to his three loyal companions and the many sterling supporters in the field by a careful blending of the story concerning each. The success of the expedition has to be shared with the forty huskies that hauled the sledges out of Barrow. Strangely perhaps, the role of the huskies is not over emphasised and this may stem from their acceptance as beasts of burden divorced from the colourful and companionable pictures usually drawn. Possibly Wally Herbert inherited something of the Amunsden attitudes after following the latter's footsteps down the Axel Heiberg Glacier. Some of the animal interest goes to the Polar bears that provided both excitement and food for men and dogs.

Readers who like high adventure against a backdrop of the harsh climatic conditions of the Arctic Ocean will thoroughly appreciate this successful British assault on the North Pole in the course of a remarkable journey across the top of the world.

THE ABOMINABLE SNOW-WOMEN. Dorothy Braxton. 201 pp, ill, maps. A. H. and A. W. Reed, 1969. N.Z. price $3.50.

As secretary of the Canterbury Branch of the New Zealand Antarctic Society the author was well prepared for her entry on the Antarctic Continent, and her account, albeit through a woman's eyes, is hard to fault. Old Antarctic explorers need not turn uneasily in bed or grave, as the author has not set out to debunk the myths and fables that have often been nurtured by the privileged male.

Dorothy Braxton went south the hard way on board Magga Dan, and only those who have struck the turbulent Antarctic seas at their worst will appreciate the lack of tourist comfort in such conditions. As a very experienced journalist the author has been able to put polish on a lively and informative narration. The book holds additional

interest because the route enabled calls to be made at various sub-Antarctic islands such as Campbell and Macquarie. These are aptly described and as a bonus there is a fairly full description of the Auckland Islands.

The near hostility towards the tourist party did not prevent the author getting full value from her visits to McMurdo Station and Scott Base. Without obvious effort she let the normal feminine inquisitiveness run its course and her book is the better for it. Useful facts of current activities are blended with excerpts from the heroic age of exploration. It is certain that neither Scott nor Shackleton would resent her intrusion into their domain. This book should spur other women to see Antarctica for themselves.

McMURDO HAS ITS OWN RADIO STATION

For the first time since the U.S. Navy established McMurdo Station in 1956, residents can listen to live, local radio on a regular basis.

Through the combined efforts of several volunteers and the McMurdo Special Services Division, Radio WASA (for Antarctic Support Activities) has been serving McMurdo residents with music, and live news and weather since early January.

Radio WASA is a 50-watt station completely staffed by volunteers who do all announcing, taping, record changing and electronics work. It was conceived last year by Journalist First Class Merv Coyner who, with eight years of professional and military radio experience, felt that a local radio station would do much to alleviate the feeling of isolation that accompanies McMurdo duty.

In past years, WASA's radio transmitter was located atop one of the hills overlooking McMurdo. Taped music was broadcast whenever someone found time to put a tape on the machine. Reception was poor, and many McMurdo residents did not even know WASA existed.

The first stage of WASA's renovation was moving the transmitter to the Recreation Hall in the centre of "town". The staff of volunteers hooked up the transmitter with a Special Services turntable and tape recorder and borrowed as many records as they could. Special Services then bought some spare tubes and a number of records. Some members of the staff who had contacts with commercial radio stations in the States wrote to ask for taped programs for WASA broadcast. Several stations contributed.

By early January WASA was ready to sign on. Coyner handled all disc jockey duties in the early days of WASA, working as much as 40 hours a week in his spare time. Before long he was joined by others with professional radio experience and Radio WASA went on the air full time.

WASA now broadcasts 16 hours a day, seven days a week. Programming varies from classical music to show tunes to rock and roll. From 8 a.m. until 7 p.m. the station's format is entirely pre-recorded uninterrupted music. The station goes "live" from 7 p.m. to midnight each evening, featuring news, weather and notes of interest.

Like other radio stations, WASA devotes some of its energy toward community projects. In January a "radiothon" was held by the WASA staff to raise funds for Navy Relief. Listeners were called on to phone in pledges and, as a result, the program raised $116.

On February 16 the radio station was approved as an official Armed Forces Radio outlet. Programming materials—including much-needed recordings—are being sent to McMurdo in time for broadcast during the seven-month winter.

Radio WASA will now continue its work providing entertainment and information for the men who will spend the long, dark winter at isolated McMurdo Station.

(U.S. Press Release, Feb. 25)

CO-OPERATION IN ANTARCTIC RESEARCH

Several notable projects involving international cooperation in the Antarctic were planned for the 1969-70 summer. As outlined late last year, here are four examples.

Using equipment developed by the Scott Polar Research Institute (SPRI), Cambridge, England, Britons and Americans will work together on an airborne radio ice-thickness survey of Antarctica. The research team plans a multi-year project designed to obtain a detailed understanding of the total ice volume and sub-ice topography throughout the continent. U.S. Navy personnel will fly the aircraft and the flights will originate from Williams Field, McMurdo Station.

Some 15 scientists from Argentina, Norway, and the United States will participate in the third year of the International Weddell Sea Oceanagraphic Expedition during February 1970. The primary objective of this year's expedition is to retrieve Norwegian buoys designed to measure and record automatically the currents and temperatures at the ocean bottom. The buoys were placed during the first year of the expedition and their recovery last year was not possible owing to ice cover. The Argentine icebreaker "General San Martin" is again expected to participate in the expedition along with the U.S. Coast Guard icebreaker "Glacier". Norwegian oceanographers from the University of Bergen and the Michelsen Institute are studying the formation, magnitude, and extent of Antarctic bottom water in the Weddell Sea.

The long standing exchange between the U.S. and Soviet Union of scientists working in the Antarctic will be continued. U.S. exchange scientist John Croom will spend a year at Bellingshausen, the Soviet scientific station on King George Island near the Antarctic Peninsula. Working under a grant to Roanoke College, Mr. Croom will study the occurrence, distribution and ecology of ciliated protozoa.

Dr. LeRoy Scharon, a Washington University (St. Louis, Mo.) geophysicist, will accompany the British Antarctic survey ships from December to April as they resupply stations on the Antarctic Peninsula, South Georgia, and the Falkland Islands. Dr. Scharon will continue his study of changes in polarity of the earth's magnetic field and will collect rock cores for laboratory analysis.

DEEP FREEZE AIRLIFT

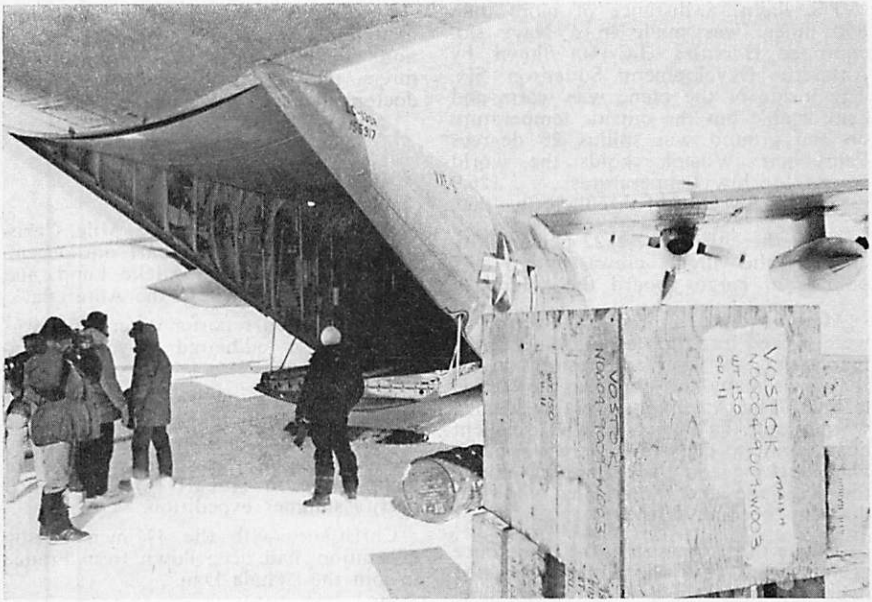
In "phase one" of one of many examples of international cooperation in Antarctic research, the U.S. Navy's Antarctic Development Squadron Six (VXE-6) airlifted 27 husky sledge dogs, six British scientists, and 8,000 pounds of cargo into the Shackleton Mountains, on November 19 last year.

The Navy was scheduled to conclude the second half of this support mission for the British Antarctic Survey on January 24 when an LC-130 Hercules crew was expected to pick up the scientists, their dogs, and equipment in the same remote area of Antarctica.

The trans-Antarctic support mission began when a ski-equipped Hercules flew from McMurdo Station, centre of U.S. Antarctic operations on the Ross Sea, to the British installation at Halley Bay on the coast of the Weddell Sea.

At Halley Bay the crew picked up the men, dogs, and supplies and refuelled the aircraft from 62 fifty-five gallon fuel drums, After four hours, they flew to an area 340 miles south in the Shackleton Mountains, where the British field party set up a camp for topographic, geological and glaciological studies.

The cargo was off-loaded in one hour and the Hercules returned to McMurdo via South Pole station where the crew stopped to refuel the aircraft.



Official U.S. Navy photo.

VOSTOK VISIT

Cargo for Vostok unloaded from tail of a United States Hercules.

JUST DROP IN

"The heavy plane slowed to a stop, the powerful engines died. The Americans stepped from the aircraft into one of the most hostile and isolated places in the world. They were greeted by 18 Russians."

A paragraph from a novel? No. But an interesting story nevertheless. The place: Russia's Vostok Station in Antarctica. The occasion: the annual flight made there by members of the U.S. Navy's Operation Deep Freeze. The significance: peaceful international cooperation.

In a world where this one continent alone has been successfully dedicated to peace, this yearly flight is a prime example of two nations working together in the cause of scientific research for the benefit of mankind.

The flight has several purposes. One is social. Also, fresh produce is delivered to the Russians as well as American equipment which will be installed at the station to record data in the upper atmosphere.

Michael Maish, a member of the U.S. Antarctic Research Programme, who has just spent the winter at Vostok, will install the new equipment and instruct the Russians on how to run and repair it. Maish will then take a Soviet aircraft to another Russian Antarctic station, Mirnyy, on the coast of the continent. From there he will go to the Soviet Union by ship for a brief visit and eventually return to the United States. Alex Vasilev, the Soviet Exchange Scientist who had just wintered the previous season at McMurdo Station, also made the flight. Alex Vasilev has been invited to visit the United States after he leaves Antarctica.

During the austral winter, the Soviet scientists will run the American equipment and maintain the data. When next year the U.S. visitors again arrive at Vostok, the data will be given to U.S. scientists so that both countries can investigate it.

The flight, a distance of more than 850 miles, was made in a Navy ski-equipped Hercules (LC-130) flown by Antarctic Development Squadron Six. The inside of the plane was warm and comfortable but the outside temperature on the ground was minus 26 degrees Fahrenheit. Vostok holds the world record for low temperatures . . . 126.9 degrees below zero Fahrenheit in 1960.

Altogether, there were 22 persons (including the flight crew) and 11,485 pounds of cargo aboard the "Herc".

After landing, all the U.S. personnel were invited into the station, some 12,500 feet above sea level and resting on ice that is as many feet thick as the station is high. The Americans were welcomed warmly and the Soviets proved excellent hosts. Prior to departure there was much hand shaking and back slapping among the Russians and Americans who had this day become friends.

After a three hour visit, the plane once again soared into the thin air, passed over the station in a wing-rocking farewell, and began the journey back to McMurdo carrying 22 people who had seen international cooperation at its best.

MORE WOMEN ?

A London report dated January 21 poses another threat to the once all-male Antarctica. Nine women explorers are searching for sponsors to enable them to make a 10-week expedition to one of Britain's remote uninhabited Antarctic outposts.

Although they think they can raise almost $6500 among themselves, they need thousands more to pay for a ship to take them to South Georgia Island, 7000 miles from London.

The expedition, which has taken four years to organise, hopes to study the island's various occupants—such as the giant albatross and the fur and elephant seals.

Several members of the party are also experienced mountaineers. They hope to explore the island's peaks in addition to their glaciological research and flora and fauna studies.

Mrs. Molly Porter, a 31-year-old Scots mountaineering guide, heads the expedition, which includes four university lecturers, two university graduates, and a doctor, all aged between 25 and 35.

FRENCHWOMAN, TOO

And this is no mere hope. Mlle. Christiane Gillet was in Hobart on December 5 on her way to Adélie Land, and it was her fifth visit to the Antarctic.

A Tasmanian reporter describes Christiane as "a red-haired 35-year-old engineer".

Apologising, unnecessarily, for her pleasantly stumbling English, Christiane found time to talk about her unusual occupation while last preparations were being made in Hobart for the French party's summer expedition.

Christiane, with the 47 men of the expedition, had been flown from France to join the "Thala Dan".

She spoke of her experiences:

"It's beautiful there during the summer, although the wind sometimes blows very hard.

"There is not much snow and the rocks are bare in the summer and it's not too cold. It's usually as 'warm' as between 0°C. and —10°," she said.

The biggest danger is the wind, which can reach 150 m.p.h. in summer.

Christiane said that her stays there were never long enough for her to grow bored.

"I have a lot of work to do and the time passes quickly," she said.

Her job—that began 12 years ago with her joining the bureau controlling the scientific expeditions—entails overall supervision of supplies, technical equipment and machinery.

How did the men treat her?

"Mostly as an equal—although they do spoil me a bit," she confessed.

When Christmas Day comes in Adélie land there will be a traditional party and dinner — "but no dancing," Christiane said.

"You can't have that very successfully when there's only one woman and more than 40 men."

ANTARCTIC TOURISM?

BRISTLING WITH DIFFICULTIES

"I am sure that tourism is going to come," said Admiral Welch recently. "But I don't think the United States Defence Department is going into the tourist business."

"If the Antarctic is opened up for tourists it will become one of the major attractions of the world," the New Zealand Minister of Tourism (Mr. Walker) said in Christchurch on February 8. However, he had two reservations.

From his experience during a recent visit to Antarctica, he appreciated "the enormous difficulties" which would be encountered, and he appreciated why it would not be reasonable to expect scientific parties to act as hosts. Tourist projects would have to be fully self-sufficient and able to cope with all emergencies.

Furthermore, he did not think tourism should be permitted at this stage if it would interfere with important scientific work—"and we would have to be guided by the scientists themselves".

Air New Zealand has been for some time investigating the practicability of inaugurating a summer service to the Antarctic area south of New Zealand.

A spokesman described it as a kind of new frontier. He said high costs would be involved if a plane was taken out of regular service. And if there were delays, as seemed likely in Antarctica, this would add greatly to the company bill.

Southbound DC8s will take between 50 and 90 passengers to McMurdo Sound, where they will be accommodated in an American-built floating hotel.

On the termination of their holiday, the tourists would be flown back to New Zealand. The season would last only six weeks because of the short Antarctic summer.

The floating hotel will be American-owned but New Zealand would derive income from the sale of air tickets and hotel bookings from passengers in transit.

New Zealand does not have a ship strong enough to negotiate the ice packs. But at the same time, it is generally accepted that commercial tourism in Antarctica is an inevitable development. It is admitted that commercial jet flights to McMurdo Sound are feasible.

DISASTER: WHAT THEN?

The problem is what happens to tourists, after they arrive in a place where virtually all significant facilities are operated by the United States Navy. While under the Antarctic Treaty no nation has any legal right to bar anyone access to the continent, the refusal by American authorities to place their facilities at the disposal of tourists would amount to an effective veto on tourism.

But it is when accidents happen—and happen they certainly will in this place of lurking dangers—that the Americans find themselves in a difficult predicament.

They could not refuse to go to the aid of tourists in distress, yet to do so might well mean the suspending of normal operations and perhaps large expenditure of money and effort. To fly Max Conrad's aeroplane back to Christchurch would cost $7000, Admiral Welch pointed out, not taking into account any disruption caused by the unavailability of a Hercules aircraft for other purposes.

ACCOMMODATION

The provision of a terminal building is one of the conditions which must be met before the civil aviation division of the Ministry of Transport will authorise any limited commercial flights taking tourists to the Antarctic.

Another of the conditions, set out in a report by three of the division's officers who visited Antarctica in November, is that the runway to be used will be Outer Williams Field, as Williams Field, five miles from McMurdo Station and built on annual ice, is unsuitable because of inadequate bearing strength for the four or five flights planned for January and February each year.

Because white-outs occur with very little warning and close the runway for from 30 minutes to three days, the division stipulates that any commercial aircraft must carry sufficient fuel to enable it to fly from New Zealand to Outer Williams field and return to an alternate New Zealand airfield without landing in Antarctica.

The division also says that a special scale of protective clothing must be supplied to passengers and crew, and that emergency food packs must be carried.

Another condition is that minimum reliance is to be placed on the fuelling, servicing, and ground transport facilities of the United States Navy at McMurdo Station.

REQUIREMENTS

The setting down by the Civil Aviation Division of requirements which must be met before tourist flights can be made from New Zealand to Antarctica was described as "absolutely essential" by the Minister of Tourism, Mr. Walker, on February 13.

"The Antarctic is such a hazardous place that specific plans and arrangements must be made—it is too risky to take chances," Mr. Walker said.

The division's conditions announced in a report by three of its officers who visited Antarctica in November cover accommodation, aircraft landing refuelling arrangements, the wearing of special clothing by passengers and crew and other factors.

"Air New Zealand, or whoever organises the flights, must have the necessary equipment to be able to get themselves out of any difficulty that can arise," Mr. Walker said.

"It is not a fair proposition if in any way they are hoping to depend on scientific project staff working in the areas."

Special requirements are also made about the use of navigational and radio aids at McMurdo station.

SCIENTISTS DUBIOUS

The scientists have two major reasons for taking an unsympathetic attitude towards tourists.

The first is simply that in large numbers tourists would be a nuisance. There would be considerable pressure from tourists, for instance, to visit the South Pole, yet at the pole there is nothing to see but a pole stuck in the snow—and the scientific facilities of the base under the snow.

The second is fear of the consequences of large-scale human invasion of the hitherto uninhabited continent.

Much of Antarctica's value to science derives from its isolation as a vast frozen laboratory, free until recently of the effects of human activity.

So far an estimated 25,000 people have visited the continent, and relatively this small number has worried the scientists because of pollution and the effects on the environment.

The director of operations with the Civil Aviation Division in Wellington said that when Air New Zealand could comply with the requirements, the Government would place the airline's proposal before the United States Government's Antarctic policy group, which directs the activities of the United States Navy in Antarctica.

Mr. Walters said that the Navy could not provide the weather forecasting, communications, and flight-following services necessary for a commercial operation without receiving a direction from the policy group.

PROOF

The importance of a terminal building at Outer Williams Field was made apparent to the five-man investigation team from the division and Air New Zealand

which visited Antarctica in November.

After their plane landed they had to stay in the aircraft at the end of the runway for seven hours because of a sudden white-out.

Mr. R. B. Thomson, superintendent of the Antarctic Division of the DSIR, says that before the Government would give permission for a New Zealand-based commercial enterprise to construct a terminal building at Outer Williams Field, the proposal would have to be discussed by the McMurdo Sound land management and co-ordination group. This consisted of himself, representing New Zealand, Admiral Welch for the United States Navy, and Mr. P. M. Smith for the American scientific community.

Mr. Thomson said he was sure a suitable locality for such a building could be found, although it might not be the first that the tour promoters suggested. There was no great operational problem to Antarctic tourism, but a potential operator would have to spend considerable sums of money to provide the necessary facilities at Outer Williams Field.

"It is no good having a half-baked effort. If it is done, then it must be done in a big way," said Mr. Thomson.

EARTHQUAKES RECORDED

Recordings of earthquakes believed to have originated in the Antarctic Continent have stimulated great interest in work being done at Vanda Station, said D. R. C. Lowe, leader for the 1969-70 programme.

It was earlier thought that earthquakes did not occur in Antarctica, and none have been diagnosed there previously.

However, small earthquakes believed to have originated in the Terra Nova Bay region, were recorded on seismological equipment at Vanda Station recently.

Although Antarctic earthquakes had not been reported previously, it was possible that some had been recorded at other stations, but the data had been misinterpreted.

To confirm the incidence of earthquakes, and assist in defining their location, seismological equipment will be installed by Mr. R. D. Maunder, of the Seismological Observatory, at the station at Cape Hallett.

AS OF OLD

Two Scott Base men recently discovered that the tales told of the hardships endured by the sledgers of the "Heroic Age" were by no means exaggerated.

Though dog-sledging has been virtually superseded by motor transport, Greenland huskies are still kept at Scott Base, where the numbers are maintained at about 24, sufficient for two full teams.

To keep adult dogs fit and to train younger dogs, the base dog handler takes teams on frequent training runs in the vicinity of Scott Base. Recently he has been making longer trips of up to three days, accompanied by one of the other 10 men who are spending the winter at Scott Base.

On one journey the two men travelled a total of almost 30 miles in two days in temperatures as low as minus 27 degrees centigrade.

The wind was particularly chilly, and in spite of mukluks—heavy insulated polar boots—their feet were numbed by the cold. All feeling was lost from their hands, and their breath froze in icicles to their beards.

"I ran beside the sledge some of the way, just to forget how cold I was," said one of them on his return.

"I didn't light my pipe once on the way back. That shows how cold it was," said the other, who is seldom seen without his smoking briar between his teeth.

For all but one of the men at Scott Base, this will be their first winter in Antarctica. However, until the last few days, conditions have not been nearly as harsh as they expected.

Now, at least two of them realise what a hostile place Antarctica can be.

JARE 10

The research programme of the Japanese 10th Antarctic Research Expedition was carried through as planned.

A traverse party led by Hisao Ando, ten in all, including a press reporter from Radio Japan (NHK), made the over-snow traverse from Syowa Base to the Yamato Mountains and returned safely. The trek began on November 1, 1969, and returned to Syowa on January 29, 1970, after covering about 2,000 kilometres with two large KD-60 vehicles (the same model as that used by the JARE-9 traverse to the South Pole the previous year), and two small KC-20's. The main task was to establish a strain grid band along 72°S. lat., from 43°E. to 36°E., where the southernmost part of the Yamato Mountains is located. The trek took about 40 days, struggling against constantly blowing, drifting snow.

The "Fuji" was expected to arrive at Cape Town on March 9. The expedition members were scheduled to leave Cape Town on the 11th and to arrive at Tokyo via Europe and the North Polar route on March 24. The Leader of JARE-9, Dr. Kou Kusunoki, expected to visit polar organisations in Paris and London en route.

The plan to launch two sounding rockets during the summer was delayed because of bad weather and instrumentation troubles. The last report to reach us said that it was hoped to launch the rockets on February 9, weather permitting.

SEQUEL TO TRAGEDY

The Antarctic film scheduled to be produced by the New Zealand National Film Unit as a successor to the highly successful 1964 film "140 DAYS UNDER THE WORLD" was not completed, owing to the death of the Director in charge of the production in a helicopter crash in the Taylor Valley on November 19. The sequences which were shot have now been examined in Wellington, and it is proposed to issue a short edited version, in colour, under the title **"ONE LONG SUMMER'S DAY".**

53 YEARS LATER

The Australian Government has decided to give Australian holders of that rare award for gallantry, the Albert Medal, a gratuity of $250 per year.

One of the six recipients is **R. W. RICHARDS** (76), of Point Lonsdale, Victoria. In 1917 'Dick' Richards was awarded the Albert Medal for his heroism during the perilous sledge journey to lay depots for Shackleton's projected crossing of the Antarctic Continent. Joyce, Richards and Wild, although themselves scurvy-stricken, dragged their helpless comrades, one, Spencer-Smith, for 300 miles before he died, and saved the lives of the two others, Mackintosh and Hayward.

SURVIVAL SCHOOL

(An Operation Deep Freeze news release)

Antarctica — with today's dependable transportation and large stations for shelter — has become relatively comfortable. But for those doing scientific and support work in remote areas the hostility of this icy continent is more evident. In order to be fully prepared for an emergency or survival situation, formal schooling is the order of the day.

Each year, volunteers from the New Zealand Mountain Rescue Service are flown to McMurdo Station to conduct training for scientists of the United States Antarctic Research Program and the Operation DEEP FREEZE Pararescue Team, a unit which can be flown to an emergency area and parachuted in to provide aid.

In the two-day course, the five instructors cover the special problems posed by Antarctica — freezing temperatures, treacherous crevasses and miles of lifeless terrain. Included in the training are lectures and practice sessions outside under actual conditions. There they learn to use ropes, ice axes and shoe spikes for negotiating icy slopes. They also become amateur mountain climbers in one of the more difficult exercises, getting out of a crevasse.

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Some other issues are in very short supply. Copies of available issues may be obtained from the Secretary of the Society, P.O. Box 2110, Wellington, at a cost of 50c per copy meanwhile. Indexes for volumes 1, 2 and 3 are also available, 30c each.

Copies of our predecessor, the Antarctic News Bulletin, are available at 50c per copy, except for numbers 9 and 10. The copies of numbers 1, 2, 3, 4, 7, 11, 17 and 18 are authorised reprints.

The New Zealand Antarctic Society

comprises New Zealanders and overseas friends, many of whom have seen Antarctica for themselves, and all of whom are vitally interested in some phase of Antarctic exploration, development, or research.

The Society has taken an active part in restoring and maintaining the historic huts in the Ross Dependency, and plans to co-operate in securing suitable locations as repositories of Polar material of unique interest.

There are currently two branches of the Society and functions are arranged throughout the year.

You are invited to become a member. **South Island** residents should contact the Canterbury secretary, **North Islanders** should contact the Wellington secretary, and **overseas** residents the secretary of the New Zealand Society. For addresses see below. The membership fee includes subscription to "Antarctic".

New Zealand Secretary

Mr. V. E. Donnelly, P.O. Box 2110, Wellington.

Branch Secretaries

Canterbury: Mrs. B. Burley, P.O. Box 404, Christchurch.

Wellington: Mr. V. E. Donnelly, P.O. Box 2110, Wellington.

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Subscription for non-members of the Antarctic Society, NZ$2.50, Overseas NZ$3.00, includes postage. Details of back issues available may be obtained from the Secretary, New Zealand Antarctic Society, P.O. Box 404, Christchurch, New Zealand.

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New Zealand Secretary

Miss J. Garraway, P.O. Box 404, Christchurch.

Branch Secretaries

Canterbury: Miss J. Garraway, P.O. Box 404, Christchurch.

Wellington: Mr P. Wilson, P.O. Box 2110, Wellington.

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