

MARION ISLAND

FOllowing the Prime Minister's order on 17 December 1947, steps were immediately taken to provide buildings, medical supplies, protective clothing, food supplies, fuel, cooking and heating facilities, radio and meteorological equipment for the establishment of a settlement and meteorological station.

The original intention being to use military huts for the living quarters and technical accommodation, five huts were dismantled on 21 December. However, they were found to be unsuitable and the Public Works Department decided to prefabricate completely new huts. Work was started on the following day, and with double shifts the huts were completed on 6 January 1948.

The huts were designed for warmth in a cold, wet climate and to withstand high winds and heavy falls of snow. The walls were built in 10 x 10 ft. sections which, for the living quarters, consisted of weather boarding and three-ply malthoid; finally $\frac{7}{8}$ -in. wooden boarding and a layer of anti-condensation paper were added, and the space within the

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framing was filled with sprayed asbestos. Windows were designed as double-glazed fixed lights, while double ouvred ventilators with slides were provided. Copper nails, or zinc-coated nails of iron wire, as well as zinc-coated bolts, and brass screws were used throughout.

These buildings have served their purpose very well indeed, and the greatest tribute is due to all who were concerned in their construction. That the prefabricated sections for these buildings, and the innumerable items of technical and other equipment required for a long stay on the island should have been constructed or assembled, packed and loaded into a special train for transport to Cape Town within three weeks of the order to annex and occupy the island is a major achievement by any standard.

These supplies, consigned to "Met

Officer, Snoektown", 30 sappers and men of 11 Armoured Group, and a squad of coloured labourers were taken to Marion Island in the s.s. *Gamtoos*, which sailed from Cape Town on 12 January 1948. After a voyage through gales, during which her decks were awash for five days, she anchored off the island on 20 January, after having to stand off for 24 hours on account of fog.

The occupation party which had been landed by S.A.S. *Transvaal*, had constructed a landing stage which greatly assisted the off-loading operations. Weighing 500 lb., this landing stage was suspended by wires from the cliff above Transvaal Cove and hung 6 feet above the sea. It was connected to the shore by 50 feet of catwalk, also suspended by wires from the top of the

Prince Edward Island seen from the frigate *Transvaal*



cliff. In six days 130 tons of cargo from the *Gamtoos* were loaded into boats, which were brought alongside the landing stage so that the cargo could be carried ashore.

In setting up a meteorological station on an ocean island, a site should be selected where elements such as wind, cloud, and visibility may be observed free, as far as possible, from the influence of the island itself. Local orographic cloud or rain, and the distortion of the wind's direction by the physical features of the island, tend to make observations unrepresentative of the open-sea conditions which the meteorologist wants to know about when compiling his weather map. Unfortunately, on Marion Island, there was no choice of site. Transport of heavy materials or equipment for any distance over the boggy ground was quite out of the question and the weather office had, of necessity, to be built close to Transvaal Cove, which remains, incidentally, the only practicable landing place on the island.

In spite of the atrocious weather, the bogginess of the island was the most outstanding single difficulty encountered in establishing the settlement. On this account, the buildings had to be constructed on piles made of 9 x 3 inch timbers, roughly pointed and pushed down until they struck rock, at depths between 6 and 15 feet. Walking over the boggy ground was a laborious process, and to carry a load without sinking impossible. To overcome this difficulty "duckboard walks" had to be constructed to connect the settlement with the landing stage, and, for hauling heavy articles, slipways of 9 x 3-inch bearers and runners were made.

The first two buildings erected were each 30 x 20 feet, then followed the main living accommodation of 60 x 20 feet, the weather office, and, finally,

the radio station. These buildings have resisted the strongest gales with many gusts exceeding 100 miles per hour.

The cargo which could not be loaded into the *Gamtoos* arrived early in March in the 3,000-ton M.V. *Norse Captain*, on charter to the Union Government, and on 20 March 1948, with the buildings complete and joined by duckboard walks and with the weather office and radio stations in operation, S.A.S. *Natal*, the last of the guard ships which had maintained a watch over the islands since their annexation, sailed for Cape Town. Ten men under the command of Mr. A. B. Crawford, of the Weather Bureau, remained on the island. Their number included six islanders from Tristan da Cunha; they were employed as handymen.

On 22 July a storm of exceptional severity occurred and necessitated an early relief expedition to replace the stores which had been lost. These included almost all the fuel. Describing this storm, Mr. A. B. Crawford wrote: "During the months January to July 1948, north-easterly winds and swells were almost unknown on Marion Island, and we were therefore not a little surprised to hear a continuous roar coming from that direction when we awoke. Our huts shuddered and vibrated in the gale, and rain lashed at the double-thickness windows. Huge seas were pounding the cliffs a few hundred yards away, and from our quarters we could see great masses of what turned out to be seaweed being hurled high into the air by the sea. A closer examination showed that as the grey masses of water struck the dark cliffs, they exploded into huge sprays of white showers, themselves double the height of the cliffs which are some 60 feet on that part of the coast. Where 30 soldiers had camped in comparative comfort six months before, there was

a salty deluge. Father Neptune in his rage showered the grassy slopes with seaweed, starfish, corals and other forms of marine life which we had not known to exist."

Help was brought to the party on the island by S.A.S. *Bloemfontein* at the end of August. The next relief took place in March 1949, when further constructional work was carried out. The landing stage, which had been destroyed in the storm, had to be replaced. The new retractable landing stage and gangway are 60 feet long and can be raised or lowered either as a whole or in 10-foot sections by means of friction winches ("creepers"), such as are used for hanging scaffolding on the face of a building. When not in use the landing stage and gangway are hoisted to the top of the cliff for safety. Two scotch cranes were also erected, and two new buildings, one a storeroom and the other a hut for inflating meteorological balloons with hydrogen.

Owing to the unrepresentative nature of the surface-wind observations at the weather office (this was due to topography), it was felt that the installation of equipment for wind-measurements in other exposures would be a useful addition to the meteorological instruments on the island. To meet this need a short-range, automatic weather station was designed and constructed by the Council for Scientific and Industrial Research. The apparatus was designed to transmit radio signals continuously, and from them the speed and direction of the wind, and the temperature of the air could be determined. Dry batteries, requiring replacement every three months, provided the power. This equipment was erected on Marion Island in April 1949 on a steel tower. Unfortunately, in a severe gale, the $\frac{1}{2}$ -inch steel bolts attaching the apparatus to the tower were sheared off and the automatic weather station destroyed soon after it was erected.

The first attempts to grow trees were made in 1950. The island combines a number of difficult conditions for tree growth; none, on its own, is insuperable, but together they constitute a most unfavourable environment for trees. Discussing these conditions, Mr. E. K. Marsh, Chief Forest Research Officer, remarks: "The minimum temperature, which has been known to be as low as -9°C. , is not exceptional



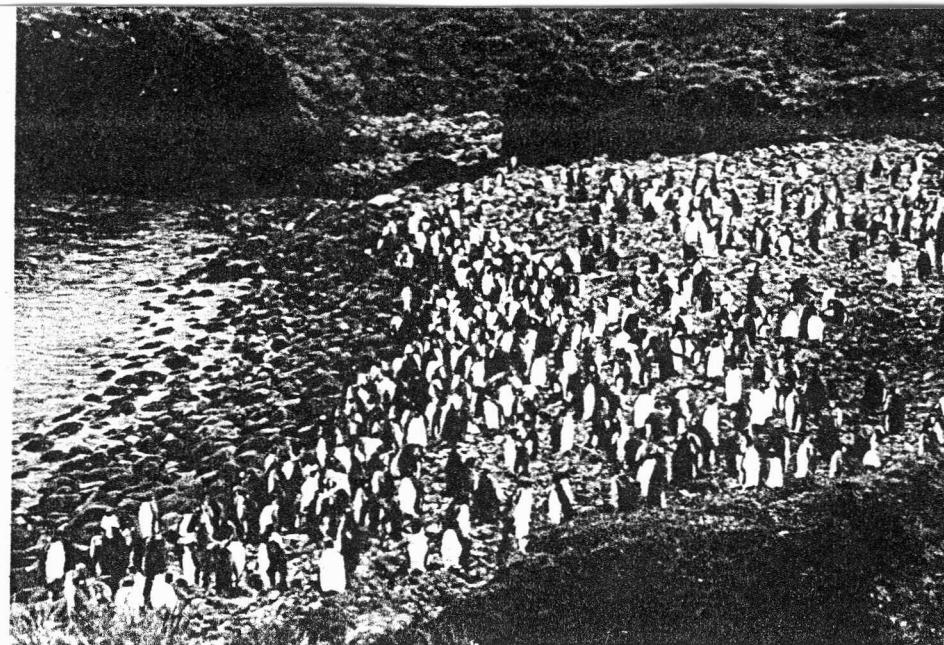
The settlement on Marion Island, seen from the anchorage

and is, of course, much less severe than that experienced in continental climates which support tree growth. Snow is mainly dangerous to trees on account of the mechanical damage which occurs through its weight. Trees resistant to damage are those in which the branches are so placed that the snow slides off. The effects of strong wind are twofold. They cause such rapid transpiration of moisture from the leaves that the roots cannot keep up an adequate supply of water, so that a physiological drought sets in. In addition, wind exercises a mechanical pressure which may uproot the tree or break its stem. Salt spray is fatal to many species of trees, as salt is a hygroscopic substance which tends to kill the leaves of trees by robbing them of their moisture. Finally, the peaty soil of the island is deficient in nutrients and very acid. There are species resistant to each of these factors, but the problem is to find one which will stand up to all these adverse conditions when they are combined as they are on Marion Island."

Two or three species of tree taken from South Africa have survived these conditions fairly well up to the present, but the only one to show any promise is *Pittosporum*. Seed has now been obtained from many parts of the world where similar exacting conditions for tree growth are found, including the Straits of Magellan. The results of experiments with these seeds are awaited with interest, as the successful cultivation of some hardy species will go a long way towards ameliorating the living conditions in the years to come.

Merino sheep have been taken to Marion Island with most of the relief expeditions to provide a supply of fresh mutton. These sheep lose weight but their wool grows faster than in the Union. Pigs have done well and so have the Australorp fowls. To keep down the mice, cats now form an important part of the settlement.

The little community is made up of volunteers from the Weather Bureau, the Aeradio Branch of the Division of Civil Aviation, the Public Works Department, and there is a medical orderly from the Department of Defence. Until recently the medical orderly also acted as cook, but for the last relief expedition a qualified cook was engaged. The number of men on the island has varied from six to ten, and at present is made up as follows: three meteorological officers, a radio



King penguins on a beach near the settlement on Marion Island

operator, a radio mechanician, a diesel mechanic, a carpenter, a cook, and a medical officer. Since its occupation, 71 men have spent from six to eighteen months on the island. Until April 1952 there was a relief expedition once every six months, but the period of duty has now been increased to a year, and there is an annual expedition in March or April when the weather conditions are considered to be most favourable for the landing. The present party is the ninth relief, and there has been one special relief expedition to withdraw a man who had been taken seriously ill. Apart from this case, the health of those on the island has been very good and the medical orderly has had little medical work to do, though kept busy in his capacity of cook. All who have been stationed there have spoken highly of the comfortable quarters, rations, and protective clothing provided, and the amenities for recreation.

Marion Island is no place for the idle. Much has to be done to maintain the meteorological programme and the radio schedules, to service the many items of equipment and machinery in a climate in which frequent attention is necessary to keep the buildings in order and weather proof, and, of course, to do the household chores.

Rations are on a liberal scale and, although most are tinned, they contain the calories necessary for hard work in a cold climate, and are tasty and enjoyable. The island contributes little; the Kerguelen cabbage is unappetising, but penguin and albatross eggs provide an occasional variation for those who like them. Fresh mutton is on the menu once a month.

The library contains more than 600 books, and there are 300 gramophone records, including four complete operas.

Most volunteers are keen photographers; a camera is provided and a dark-room with an enlarger and supplies of printing paper.

The island has been granted an amateur radio operator's licence, with the call sign ZS2MI. The radio staff, on a busman's holiday, have girdled the earth and have made friends with "hams" in most countries. One of these, in California, has sent books and periodicals.

Chess is popular, and a series of games was once played with the Australians on Heard Island, one move being signalled at the end of each daily radio schedule.

Those whose duties have permitted, have made excursions round the island or to the top of Jan Smuts Peak, the highest point, or to some of the penguin rookeries, to Boot Rock, or other points of interest. Relics of previous habitation have been found. In a hut on the north-west side, the names of several South Africans, with the date "1920", are carved on the wooden bunks. In the same hut two pairs of binoculars were found, and the well-rusted remains of carpenter's tools and a rifle. Also found was a revolver with the hammer cocked.

Marion Island is in direct radio communication with the Union, and daily schedules have been maintained since 13 March 1948. There are five transmitters, the power being provided by diesel-driven generators. Each man is allowed to send and receive private

messages not exceeding 200 words per week.

Marion Island is primarily a weather station, and the weather office is equipped with a full set of instruments for making surface weather observations and for the continuous recording of temperature, pressure, humidity, and the speed and direction of the surface wind.

Soundings to determine upper air temperatures and humidities are made once daily. For this purpose Canadian radio-sonde instruments are used. The radio-sonde consists of lightweight temperature, pressure and humidity-sensitive elements, and a minute radio transmitter, all of which are carried aloft at about 1,000 feet per minute by a balloon. Signals from the transmitter are received at the ground station, and from them information about the upper air conditions to heights of 60,000 feet or more is derived. Whenever the weather permits, the course of the drifting balloon is determined by tracking it by theodolite, and the upper winds calculated from these observations.

Although the climate is not genial, it is not as severe as that of Heard Island or Bouvet Islands, which are only very little further south. On the other hand, Marion Island is a good deal colder than places in the same latitudes in New Zealand. This may be explained by the differences found in the surface sea temperatures in the environs of these places. The climate of New Zealand is greatly modified and rendered more congenial by the warm East Australian current which sweeps southwards and surrounds New Zealand's shores. Marion Island does not enjoy the effects of a warm current, but it lies to the north of what is known as the Antarctic Convergence. This is the boundary, at the surface of the sea, between the cold and dense Antarctic surface water and the warmer and less dense Sub-Antarctic water. The Antarctic Convergence may usually be distinguished by a rapid change of 3 to 6° C. in the sea-surface temperature across the boundary. In some longitudes the change is more distinct than in others, but it is probably continuous right round the Southern Ocean. The Antarctic Convergence lies south of Marion Island but north of Heard and Bouvet Islands. On both those islands, surrounded by the colder Antarctic water, there are large glaciers which descend to the sea in many

places, but on Marion Island, in summer, the snow-line is at about 2,000 feet, and even in the winter there is no permanent snow cover on the lower slopes.

The Antarctic Convergence is also important as a line along which weather development may be expected. Air is greatly influenced by the temperature of the sea surface over which it travels, and a difference in temperature between neighbouring masses of air is a source of energy for the widespread and often tempestuous weather of the depression or cyclone. A depression may be defined simply as a part of the atmosphere where the pressure is lower than in surrounding parts. The diameter may be as much as 2,000 miles, and in the southern hemisphere winds circulate around their centres in a clockwise direction. Depressions usually move from west to east with a speed which may be as high as 600 miles a day. On the other hand, they may be almost stationary. In their movement they carry their weather with them, but it is subject to changes which may take place in the depression itself. They may deepen or they may fill, their direction or speed of movement, or both, may change to add multitudinous variables to the complex problems of forecasting the weather.

Marion Island and Tristan da Cunha lie sufficiently near the tracks of these depressions for their behaviour and movement to be studied from observations made on them. Marion Island is too far east to give direct warning of advancing systems which carry their weather to the Union, but experience has shown that observations from the island have made possible the accurate completion of weather maps in an area in which, previously, their construction had been a matter of conjecture. By so doing, the accuracy of weather maps in adjacent areas has been improved, and there can be no doubt that the influence extends as far as the Union's coast, adding greater precision to the maps of the seaward areas and accuracy to the forecasts based on them.

There is another and wider field in which observations from the island are important. This is in the study of the fundamental problem of atmospheric circulation. There are good reasons to believe that in the southern hemisphere this problem is less complex than in the northern, where the extensive land masses introduce additional complications. In the past, owing to the scarcity

of observations from the Southern Ocean and the Antarctic, it has not been possible to construct weather maps comparable with those of the northern hemisphere. It is doubtful whether this will ever be possible, but steadily a chain of meteorological stations is being established. Marion Island is an important link in the chain, and meteorologists hope that a station may one day be set up on Bouvet and some of the other islands at present unoccupied. They also hope that a ring of stations on the fringe of the Antarctic Continent may be established. Since the war there have been such stations in Queen Maud Land and in Adelie Land in operation for two years, and the Australian Government dispatched an expedition to the Antarctic Continent at the end of 1953. The chain of island stations at present comprises South Georgia, Admiralty Bay, Signy and Deception Islands in the Falkland Islands and Dependencies, Tristan da Cunha, Marion Island, Heard Island, New Amsterdam and Kerguelen Islands, and Macquarie Island, to which must be added the important contribution of whaling ships in the summer. These ships contributed more than 3,000 reports from their fishing grounds in the Antarctic during the season 1952-53.

Those who have lived on Marion Island say that the element of bad weather of which they were most conscious is the almost continuous wind, which has a most depressing influence. Records show that the wind blows at gale force about one-eighth of the time, and there have been some storms of outstanding severity. For example, there was the storm of 27 June 1949, in which there were nine gusts above 102 m.p.h., and so many above 90 m.p.h. that they could not be counted. On that day the highest speed recorded was 108 m.p.h.

August is the coldest month on record, with an average temperature of 3° C., and March the warmest, with an average temperature of 7° C. The temperature has fallen to -6° C. and risen to 20° C. There is almost always a great deal of cloud over the island and the sky was completely overcast on 30 per cent of the observations. There were only two days in three years which were cloudless. On one day in six there was fog.

In the inhospitable environment of the weather office, precipitation has

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