GEOGRAPHICAL OPERATIONS FROM EAST BASE, UNITED STATES ANTARCTIC SERVICE EXPEDITION, 1939–1941

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THE East Base of the United States Antarctic Expedition was located on a small rocky island in Marguerite Bay in latitude 68° 12′ S., longitude 67° 03′ W. The island is connected to the mainland of the Palmer Peninsula by a drifted snow slope leading to a quiescent glacier area of the continental ice. This island was eventually named Stonington Island, after Stonington, Connecticut, the home port of the sloop *Hero*, in which Captain Nathaniel Palmer first sighted the Antarctic Continent in 1820. The island is about 2,500 feet long in a northwest-southeast direction and about 1,000 feet wide. Morainic boulders and pebbles cover part of the surface, but much of the island is composed of native rock in place. Its highest point is a rocky span near the southeastern end, about 80 feet above mean low water. Directly east of the base, steep glacier slopes lead to passes in the mountains forming the western escarpment of the high central pleateau of the peninsula. The site was selected because of its accessibility to these passes, which would allow year-round travel into the interior, and because of its close proximity to a comparatively level surface inland which would serve as a flying field when the sea ice was not suitable for plane operations.

The base had a complement of 26 men, selected from several civilian departments of the Government and from the Navy, Army, and Marine Corps. Transportation facilities included 1 Curtis-Wright "Condor" biplane, 75 dogs, 1 light Army tank, and 1 light artillery tractor.

The United States Antarctic Service had been authorized by an act of Congress on June 30, 1939, and the expedition had sailed from the East Coast of the United States in November of the same year in the U. S. M. S. *North Star* and the U. S. S. *Bear*. The two ships took separate routes across the Pacific and entered the Ross Sea, where they established the West Base near the site of the base camp of the two Byrd Antarctic Expeditions in the Bay of Whales. Late in January of 1940 the ships departed from West Base, the *Bear* to make a cruise along the outside of the pack in the Pacific Quadrant, during which Rear Admiral Richard E. Byrd, commanding officer of the expedition, made several flights and discovered a section of coastline; and the *North Star* to proceed to Valparaiso, Chile, where she embarked the 600 tons of supplies and equipment for East Base. The two ships met in Marguerite Bay on the fifth of March and started a search for a suitable base site. The island site was located during a scouting flight by Byrd, Black, Snow, and Perce on March 8; and on March 11, after a delay caused by one of the easterly gales so common in this region, the task of unloading was commenced. The discharge of cargo was interrupted several times by severe blizzards and by the fact that the "top-hamper" of the *Bear* made it necessary for her to seek a safe haven at Horseshoe Island whenever a strong wind developed, and it was not until the morning of March 21 that the two ships finally cleared the base and departed for South American ports. Admiral Byrd sailed on the *Bear* and directed operations during the next year from the United States.

Living in a tent camp, all hands of East Base worked through every moment of daylight to complete the main building, and it was occupied on March 27. Attention was then given to the construction of the machine shop and generator house, and later of the science building. All the major construction was completed by late April. The sectional buildings had been designed by the construction corps of the Army and were most satisfactory. The main building was arranged like a large Pullman car, with five two-man partioned cubicles along each wall, a mess table down the center aisle, the galley in one end, and the leader's quarters and the sickbay in the other. A feature which contributed greatly to the comfort and efficiency of the building was a false, raised deck 16 inches above the insulated main floor in all except the galley. The circulation of air beneath this deck kept the floor dry and

warmer and prevented the crust of ice which is the usual carpet in a polar camp.

After the base had been made secure and all machinery necessary for the operation of the aviation and radio departments had been placed inside and in working order, a force of men started the rigging of the airplane. After several unsuccessful attempts to haul it by tractor up the first steep slope of the glacier, it was finally flown from a very restricted area on the island and landed a mile from the base on a selected portion of the glacier. A meteorological outpost had been previously established at the high field; and it was the opinion of the meteorologist, Dorsey, that an eddy in the winds falling down the several passes from the mountains had caused the slight dome of smooth snow selected as the field, and that this condition would probably be a fairly constant one. It would help to keep the crevasses of the slowly moving glacier properly bridged and to make the area suitable for operation of the plane.

On the twentieth of May, Black (base leader), Snow (pilot), Perce (co-pilot and radioman), and Carroll (aerial mapping cameraman), Ronne, chief of staff, and Dyer, navigator, made a reconnaissance flight into the mouth of George the Sixth Sound to photograph possible sledge routes and to pick a location for an emergency cache of food and supplies somewhere south of the Wordie Shelf Ice. The next day the flight crew and Hilton (surveyor) flew a cache of man food, dog food, and equipment to latitude 69° 32′ S., longitude 66° 56′ W., and landed it on a smooth area about 2,000 feet above sea-level. This station was known as the Wordie Cache, and was so placed as to be easily accessible to parties coming back to base from journeys to the southwest or southeast, and was far enough east so that it would be on an interior sledging route which would be developed later. Rymill of the British Graham Land Expedition, working in this area in 1936–37, was handicapped somewhat by the necessity of having to return to his base before the sea ice ceased to be a safe highway, or about the first of January.

On the way home from this cache-laying flight of May 21 a short circle was made over the plateau east of the base. In passing eastward up the glaciers back of Neny Fjord, a low-altitude trough was seen to trend southeastward from Neny Glacier on an azimuth of about 140° true. It appeared that if the glacier could be attained from the sea ice and its crevassed and very steep slopes negotiated, a route across the peninsula and to the south might be found beyond. As the plane turned for home, the first glimpse of the Weddell Sea was presented to the party—a sweeping arc which must have been Wilkins' Mobiloil Bay, bounded on the north by Cape Northrup and Robinson Island, and on the south by the confused rocky masses which make up the vicinity of Cape Keeler. While the plane was circling down from the plateau, a large glacier northeast of camp was observed to have a lower gradient than the others and it was marked for later investigation as a sledge route to the crest of the 6,000-foot plateau. There appeared to be a number of icefalls which might completely block sledging, but it seemed that there were possible routes around them. During the landing the tail-ski capsized after a preventer wire broke, and the tip of the ski ploughed into the surface and caused the plane to swerve sharply to a stop, while the rear section of the ski drove up into the after part of the stabilizer assembly, causing some unfortunate but reparable damage.

In the latitude of East Base the sun is below the sensible horizon at noon from late May until mid-July, but during the hours near noon there is a considerable amount of twilight. During this period the necessary outdoor camp work was performed during the middle of the day, and the rest of the working hours were devoted to plans and physical preparations for the summer journeys into the unknown.

This portion of the Antarctic is only slightly known, not because of exceptionally low temperatures or a long winter night, but because of extremely unfavorable weather conditions during the seasons when exploration by flight and trail can be undertaken. Under a condition of light westerly winds, low cloud and fog would lie for weeks on end against the western escarpment of the Palmer Peninsula, where the comparatively warm stream of air came in contact with the ice-covered mountains. When the general direction of the winds aloft changed to easterly or southerly, bringing clear skies, it was necessary to sieze the opportunity for a flight before the velocity at the base built up dangerously as the air poured down the coastal passes from the plateau. Dorsey, meteorologist of the United States Weather Bureau, developed exceptional ability to forecast these elusive periods of suitable flying weather, and on only two occasions was the plane forced to return to base when unpredictable weather closed in suddenly.

Although the personnel and equipment of East Base were selected with its major problem in view, namely, the geographical reconnaissance of slightly known or unknown regions, men and instruments were included to attack the various problems of science usually associated with polar expeditions.

The young scientists of East Base carried on a comprehensive program during the year at the station. Dorsey recorded barometric pressure, wind direction and velocity, temperature, humidity, precipitation, and a variety of visual observations of sky phenomena. He took 1,200 synoptic observations, 370 pilot-balloon runs, aerometeorograph records during flights, tide data for the summer period, and air samples, and completed a series of radiation measurements. He planned the program of a meteorological outpost which was later placed on the central plateau of the peninsula in latitude 68° 08′ S., longitude 66° 32′ W., at an altitude of 5,500 feet. This exposed station was occupied by Lehrke and Palmer from October 26 to December 30, 1940, and twice-daily reports were sent by radio to the base. The outpost was invaluable in helping Dorsey forecast flying weather during this period, and the reports were incorporated into the daily base transmissions to the weather bureaus of Argentina, Chile, and Uruguay.

One hundred and twenty-three geological outcroppings were studied in detail by Knowles. Palmer Peninsula is probably composed of a central core of massive igneous rock flanked on both east and west sides by metamorphics varying from slates to gneisses. The igneous rocks compare in composition with those of the southern Andes of South America. Dikes both basic and acidic in character are found throughout the entire region in close association with the igneous rocks. Well-defined, low-angle stratified fossiliferous sedimentary rock occurs in massive outcrops along the eastern and southern margins of Alexander the First Island. The general topography of the region of East Base is that of a mountainous glaciated land in the stage of early maturity of glacial erosion. It appears that the ice reached its maximum growth and expansion sometime in the past and is now diminishing.

Bryant, of the Bureau of Biological Survey, and Eklund, of the Department of the Interior, carried on a comprehensive program in botanical and zoological investigations. Dyer, of the General Land Office, Department of the Interior, Ronne and Hilton, of the Division of Territories of the same Department, engaged in survey work both aerial and surface, and made a series of magnetic observations. Lamplugh, Perce, and Odom, of the radio staff, stood receiving watches on transmissions from Washington to determine over a long period of time the frequencies best suited for various types and times of radio communication. In addition to their routine scientific work, most of these men engaged in long journeys of discovery, during which each co-operated with the others in collection of specimens and data in fields other than their own.

With the return of sufficient light for short journeys away from the base, the energies of all hands were directed to the problem of finding and proving initial routes for the sledging parties. During the winter planning period, *Southern Lights*, the official account of the British Graham Land Expedition, by John Rymill, had been studied by all at East Base. It represented the work of a small but eminently successful party which had been based in 1936–37 just to the north of the position of East Base, and its work had reversed the previous opinion advanced by Wilkins and supported by Ellsworth that the Palmer Peninsula was cut off from the mainland of the Antarctic Continent and divided into island groups by ice-filled but sea-level straits, with Stefansson Strait the most southerly of these. Rymill's (Stephenson's) sledge trip to the 72nd parallel of latitude in the newly discovered George the Sixth Sound had found no low pass coming through from the east.

It remained for East Base to extend George the Sixth Sound in its observed westerly trend and determine whether it ended in high lands, or continued to a junction with the sea. In the latter case its southern shore would become the continental mainland coast, and it would be the problem of the base to demark this coast to a connection with the Pacific coastline discovered by Admiral Byrd flying from the *Bear* on February 27, 1940, in longitude 90° W. Related to this work would be the survey of the south and west coasts of the large land mass which would become, in this hypothesis, Alexander the First *Island*. The second major objective would be the extension of the Weddell Sea coast beyond the elusive Cape Eielson, the southern limit of exploration on this coast.

Rymill had crossed the peninsula in latitude 69° 50′ S., but had been forced to return to base before descending to the Weddell Sea, principally because he was dependent upon the sea ice

in Marguerite Bay to get back home. He had stated that it would be impracticable if not impossible to cross the peninsula north of his crossing.

With these facts in mind, it was necessary for East Base to devise a plan and develop routes which would be independent of the sea ice (a highway which would normally disappear in early January), and allow the sledging parties a longer operating season. The aerial view of the plateau on May 21 had given reason for hope that the peninsula could be ascended and crossed in latitude 68° and that routes to the south might be found on top if a descent on the Weddell side proved impossible. It was also considered that the party or parties operating to the southwest would come home by a low-altitude route inland on the peninsula.

On July 21–22 Black, Ronne, Healy, and Carroll made a sledge trip up the Northeast Glacier to an elevation of 2,200 feet and could see a possible route for sledges up to about 4,500 feet. On August 2–3 the same party prospected the head of Neny Fjord for possible routes of ascent to the Neny Glacier, but one was not found.[1]

An attack in force on the Northeast Glacier started on August 6, when Black, Ronne, Healy, Dyer, and Knowles, comprising the main party, and Eklund, Hilton, Carroll, Musselman, and Darlington, the supporting party, started from the base with 55 dogs in 7 teams. Three 9-dog teams were to continue with the main unit after the loads had been lifted to the plateau by a strong combined party. Severe climbing conditions were met, but on the evening of August 9 the party camped on the plateau at an elevation of 5,500 feet. The spot was named "Mile High Camp" and later became the meteorological outpost previously mentioned. A violent easterly hurricane struck the region that night and continued until the night of August 11. One tent was carried away, making it impossible for the units to divide, and the party reached base on the evening of August 13. The wind at the base had reached full hurricane force (76 m.p.h.) for periods of a full minute with gust velocities probably reaching at least 85 m.p.h. Technical failure of trail radio on this journey caused concern at the base, and on August 9 a flight was made over the plateau to search for the party, with negative results. Travel during the sledge journey was limited by short daylight to periods from about 9 A. M. to 3 P. M.

As daylight increased, it became urgently necessary to make a series of short scouting flights to study further the immediate vicinity and develop a workable plan for the major exploration program. Rymill's flight of August 15 to the north end of Alexander the First Island had led to a belief that flights of moderate length could be made in late August. Most essential was a triangular flight across the peninsula, thence down the Weddell Coast a hundred miles or more, and thence northeasterly back to base along the trough which had been found on May 21. To show graphically some of the uncertainties of this period, the rough log of the base leader is quoted.

> September 3, 1940.—I think I will have a rubber stamp made before coming to this area on another expedition, reading, "Overcast—snowing—wind. No flying today." It is becoming increasingly exasperating to wait day after day for a few hours which will definitely solve the plateau sledge-route question. If we don't get the flight in within the next few days I am afraid we will have to start the party out blind to lay depots part way down the central plateau of the Peninsula. We feel quite certain the mountains are "drowned" enough to allow a party to get out to the south, but a flight and pictures might save days or weeks of back-tracking around impassable crevassed areas, etc. By all the laws of chance, there should be a good day soon, after twenty-five or twenty-six days unfit for flying.

On September 5 the aviation crew at the high field reported by radio that a 45-mile-per-hour tail wind had whipped the ailerons out of their battens and that both ailerons and a portion of the center section of the top wing had been damaged. Repair was effected by September 12, but there was a constant threat that a good day would come while the plane was out of commission.

On September 9 Knowles, Hilton, and Darlington, of the Weddell Coast Party, assisted by Healy and Musselman, started the first of two scouting and cache-laying journeys across the peninsula. The party came back to base from the second trip on October 15, after placing 2,300 pounds of dog and man food near a glacier descent they had prospected on the Weddell side.

[1] In October Dyer, Knowles, and Eklund were able to get up into Neny Glacier from the sea ice, using a precarious side-hill route found by Ronne and Carroll during a September flight, but by that time the Northeast Glacier route had been proven and some supplies had been advanced over it to the top. This Neny route was later of great importance to the safe return of Ronne and Eklund from the south.

A flight over the plateau was made on September 16, partly to try to sight the sledge party whose radio signal was apparently being absorbed by the mountains, and to fly if possible on the triangular trip. After climbing to 9,000 feet over the base and flying eastward a short distance, it was observed that drift was obscuring the plateau surface and that the plane was in a strong westerly wind which had come up suddenly after a promising balloon sounding had indicated that the winds aloft would be moderate. The plane turned for home and was immediately caught in a down draft which carried it almost to the plateau surface, and it was with some difficulty that it was made to climb again and return to base.

On September 21 Black, Snow, Perce, Carroll, Ronne, and Dyer made a flight across the peninsula and down the Weddell side to about latitude 69°, when a report from base indicated that the westerly wind had increased to 50 miles per hour, at 9,000 feet and that clouds were beginning to form at the plateau level. This meant another run for home against increasing head-winds and a difficult search among clouds to get down from the mountains. Descent was made through a pass east of Horseshoe Island, but it was decided after landing at the base that no more flights over the plateau would be attempted when any westerly wind was blowing. Photographs of all of Mobiloil Bay and much of the hinterland as far south as Mount Wakefield were taken on this flight.

Black, Snow, Perce, Carroll, and Ronne flew on September 28 to the Wordie Cache area, thence easterly on a course which passed just north of the Wakefield Mountains, intersecting the Weddell Coast in latitude 69° 20′, thence photographing the coast to latitude 68°, and returning to base over the peninsula in that latitude. The Weddell Coast Depot Party was seen toiling up the Northeast Glacier as the plane dropped down toward the camp. The aerial mapping photographs taken on this flight, tied to the accurate ground control survey made by Hilton, of the Weddell Coast Party, have solved the numerous pleasant controversies arising from the difficulty in identifying features seen first by Wilkins and later by Ellsworth. The only previous ground survey of a portion of this region was by Rymill in 1936, and the findings of East Base check admirably with his work. With a complete ground survey of the entire controversial region in hand, it remains for an international geographical conference to assign to the proper features of the coast the names originally given by Wilkins. It is not the purpose of this paper to enter the controversy, since the surveys of Base are not yet ready for publication.

After the above flight, a period of unsuitable weather prevented the execution of a plan to fly caches to the vicinity of Charcot Island and to the limit of Rymill's exploration in George the Sixth Sound. With these caches in place, and after a preliminary flight around the northern portion of Alexander the First Island to determine that sledging would be possible from the Charcot Cache to the one in the sound, it was intended to fly Ronne and Eklund and 15 dogs to the Charcot Cache. Eight 2-dog crates had been constructed of reinforced plywood in shapes that would allow their stowage in the cabin of the plane. Each dog would be in a reclining position with no room to extend his legs and force the crate. Tests had been made to prove that the dogs would lie quietly for periods of several hours, even when disturbed by noise and movement.

Flying was not possible until the fourth of November, and then there was not sufficient time to effect the preliminary caching flights necessary to the safety of the party, and the whole program of sledging operations had to be revised.

On November 4 Black, Snow, Perce, Carroll, and Ronne flew from the sea ice between the base and Neny Island and laid a course for the north tip of Alexander the First Island. It was found on this first leg that a sledging party might cross Marguerite Bay and ascend the piedmont of Alexander Island at several points near Cape Nicholas. Uncertainty of moving around the north end to the strait east of Charcot Island without a cache in the field, and the fact that a wide system of open-water leads existed from the south end of Adelaide Island to the north end of Alexander, combined to prevent a sledging attack in this direction.

In continuation of the flight, the mountains of the north end of Alexander Island were photographed, and a strait 6 to 10 miles wide, with bergs frozen into its sea ice, was found between the main mass and the mass formerly called Cape Rothschild, making this feature become Rothschild Island. Thick and low overcast coming in from the northwest prevented a view of Charcot Island, and the flight turned southerly and then southeasterly, mapping the coast of the bay reported by Rymill in the west side of Alexander, and observing a

coast sweep southerly and thence westerly to a distant cape south of Charcot. On this cape stood about ten rounded mountain features. The course then continued southeasterly until George the Sixth Sound was entered in latitude 71° 13′ S., longitude 68° W. Observation and a photographic circle at this point indicated that the sound trended far to the west, and to the south and southeast, beyond the sound depression, high land and many rugged peaks could be seen. The sound was filled with a low overcast whose creamy white contrasted with the rest of the surface and helped to identify its westerly sweep. Return was made along the high eastern flank of the sound, and two large mountain masses were observed south of the group which was identified tentatively as the Eternity Range. The northernmost of these newly discovered masses, a gigantic double mountain, is mentioned later in the account of the flight of December 30.

Under the revised plan of surface operations, on November 6 Ronne, Eklund, Dyer, Healy, and Musselman, supported by Knowles and Hilton who would return from the Wordie Shelf Ice, started south over the sea ice on the main southern operations. On the twelfth Black, Snow, Perce, and Carroll flew a cache of gasoline and man and dog food to a point in the sound in latitude 71° 45′ S., longitude 67° 50′ W. This was called the Batterbee Cache because of the proximity of the Batterbee Mountains. On November 15 Knowles and Hilton reached base after assisting the southern party, and departed again on the eighteenth with Darlington to pick up their cache on the plateau and engage in their main journey south along the Weddell Coast. On the sixteenth, after finding that the Wordie Cache had drifted over and could not be found by the southern party, it was necessary for Black, Snow, Perce, Sims, and Sharbonneau to fly a replacement of emergency supplies to the party at the Wordie Cache location. Photographs of the inland or trough route, some of them taken on the twelfth, were also given to the party, since the return of part of them at least would be after the sea ice would be gone.

On November 22 the southern party under Ronne released the supporting party at a point about 45 miles due south of the Wordie Cache, Ronne and Eklund with 15 dogs steering south to descend to the sound at the Batterbee Mountains. Dyer, Healy, and Musselman, with two teams, turning southeasterly to make detailed surveys in the vicinity of the Eternity Range before returning to base.

Low overcast and generally bad weather prevented any flights until December 20, when Black, Snow, Perce, and Carroll took off from the sea ice heavily loaded for the main southeastern or Weddell Coast flight. The dog party under Knowles was well south of Cape Eielson, in latitude 71° 10′ S., longitude 60° 43′ W., and the weather looked good for the attempt. While flying eastward from a point just south of the Wordie Cache and with only 3,700 feet of altitude because of the heavy load, the surface of the plateau was found to be climbing faster than the plane, and it was necessary to reel in the trailing antenna and circle for altitude. This happened three times as easting was attempted, and it was finally necessary to give up the flight when about 15 miles west of Mount Wakefield. It had been impossible to turn and try to get through north of the Wakefield group because of a large patch of overcast lying on the surface in that lower area.

On a midnight radio schedule, December 21–22, Ronne and Eklund, who had been sledging westward in the extension of George the Sixth Sound and had been finding increasing evidence that the sound was opening to a western sea, sent a dispatch to the base that they had come out upon a barrierlike point of the coast and were viewing open sea to the north, with no ice to the horizon. Their camp at the time of this report was in latitude 72° 32′ S., longitude 76° 51.5′ W. They had left the sea ice of the sound a few days earlier and had been travelling on the higher rim of ice-covered land which was now proven to be the mainland coast of the continent. This westward opening of the sound to a great ice-free sea could mean only that Alexander the First Land would henceforth be called Alexander the First Island.

Four hours after this message of discovery was received, the plane started on the main southwestern or Pacific Coast flight. Snow, the pilot, was in command, with Perce and Carroll completing the crew. Partly because of a hip injury which had given some trouble in the past few days, and partly to allow more gasoline to be carried in an attempt to close the gap in the Pacific coastline, the base leader and his emergency flight gear and food were not in the plane. Heading for the north end of Alexander Island, the plane encountered overcast halfway across Marguerite Bay and had to circle four times to get over it. The tops of the mountains on Rothschild Island were standing through the

overcast when the plane passed over on a south-southwesterly course, and it was not until the mountains on the southwestern extension of Alexander Island were reached that most of the overcast was left behind. The western mouth of the sound was crossed and the mainland coast intersected just to the east (30 miles) of Ronne and Eklund, who did not see nor hear the plane, and a westward course along the coast was followed for an hour and a half, when a turn was made and a course was laid for the Batterbee Cache. Overcast was again encountered on the return, covering the area of the cache and all of the mountainous region west of it. It was necessary to land in the sound in about latitude 71° and pour gasoline into the tanks from cans carried in the cabin. The plane landed at the base at 6:30 P. M. The coast had been seen to trend generally westward from the turning point in approximate latitude 72° 55′ S., longitude 78° 50′ W., and was of low ice-covered land with occasional tongues of shelf ice, with a gradual slope southward to a rolling escarpment punctuated by mountain masses with their northern faces of black rock. In a bay in longitude 78° was a rock island surrounded by large leads and patches of open water, with the leads joining the open sea outside the bay.

On December 28 Black, Snow, Perce, and Carroll took off from the high field, the sea ice having become dangerous since the last flight, and flew south along George the Sixth Sound, planning to go south or west from the Batterbee Cache, depending upon the weather indications at that point. Overcast was observed to the south, and the flight turned west to photograph both sides of the sound extension to longitude 77° 12′ W. Ronne heard and logged the plane on both outward and returning legs, and features observed on December 22 were tied in to the ground control. Control for the earlier flight had been largely lost because of the heavy overcast covering much of the track.

The last exploratory flight was made on December 30. Black, Snow, Perce, Carroll, and Dyer as navigator engaged in this operation. Because of heavy load, soft surface, and the 5 per cent upgrade into the prevailing wind on the high field it was necessary to make the take-off downhill. There was a 10-mile-per-hour tail wind, and the plane did not take the air until the grade steepened for the final drop to the sea ice. It was known from the experience of December 20 that the peninsula could not be crossed with a heavy load, and the flight went south through George the Sixth Sound until a pass through the east was found in latitude 70° 45′ S. Pursuing a southeasterly course, the plane climbed fast enough to keep the rising surface at a comfortable distance of several hundred feet. Soon the Eternity Range was sighted to the northeast, and as the crest of the 7,000-foot plateau was reached, the large double mountain feature first seen on November 4 was picked up just off the port bow. The southern mountain of this mass, lying in latitude 71° 31′ S., longitude 63° 34′ W., was later found from the calculation of Dyer's surface survey to be 13,700 feet in height.

An area of overcast was avoided by turning south, and a great range was gradually sighted, trending roughly north to south and forming a barrier to the Weddell Coast. After half an hour of southerly travel, a depression was found cutting eastward through the range, and this was followed to an intersection with the Weddell Sea coastline in latitude 72° 32′ S., longitude 60° W., or about 130 miles south of Cape Eielson, the previous limit of discovery on this coast. Knowles, Hilton, and Darlington had sledged almost to latitude 72°, but on the day of this flight had reached a point 30 miles north of Cape Eielson on their way to the base, where they arrived on January 17.

The plane flew south along this new coast to latitude 74° 42′ S., longitude 61° W. The track was over a narrow piedmont of low snow-covered land, with crevassed, rounded escarpments dropping to a shore lead of open water at its eastern edge, and rocky escarpments rising to high mountains on the west. In a few places, especially in front of deep fjordlike depressions between ranges, the ice beneath looked like shelf ice. Radiating from the shore lead at intervals of several miles were narrower open leads running easterly to the horizon, indicating a south to north current along the coast. At the turning point a photographic circle was made. The developed film failed to show clearly the chain of high mountains continuing on to the south, or the dark water-sky over leads to the southeast, but these features were observed by all in the plane. The mountains seemed to be thinning out slightly and were possibly somewhat lower farther to the south. It was estimated that from the 8,400 foot altitude of the plane, the mountain chain if not the actual coast could be seen to about latitude 77°.

The return flight was by way of the Weddell

Coast to the area just south of Cape Keeler, thence northwesterly through the major valley depression into the "traffic circle"[2] and through the 140° or Neny Trough to the base. A pin in the main drive shaft of the aerial camera sheared just as the circle was completed at the southern limit of the flight, but Carroll was able to cover the coast between the plane's point of entry and Cape Eielson with a Graflex camera.

The cape which East Base identified as Eielson lies in latitude 70° 30′ S., longitude 61° 30′ W., and is not nearly the impressive geographical feature shown on charts of the region. Stefansson Inlet almost disappears as a coastal feature, but a great valley depression goes inland north of Cape Eielson. The cape is in reality the coastal abutment of the Eternity Range, and the Stefansson feature is a moat in front of its northern ramparts. Dyer crossed the head of this depression just northwest of his camp in latitude 70° 40′ S., longitude 64° 20′ W., and found its floor near that position to have an elevation of 5,900 feet.

At the conclusion of the flight of December 30, East Base had discovered a total of over 1,500 nautical miles of new coastline, much of it tied to ground control developed by the two major surface parties.

Ronne and Eklund had trouble with pools of melt-water while sledging eastward through the sound. These pools froze into a broken-glass-like surface after sunset and cut the dogs' paws leaving a trail of blood behind. There was nothing to do but end the sufferings of the less hardy ones. They reached Batterbee Cache with seven out of the fifteen dogs in harness, because the last part of the distance had been traversed in the higher altitude of Alexander Island where a soft snowy surface was easy on the dogs' feet. They could not stop until the cache was reached, where food for a resting period would be available, and they could not carry a large number of disabled dogs on the sledges. To further complicate the situation, radio contact with them was lost on January 7 because of a faulty hand-generator.

Bad weather would not allow a flight to this party until January 19, and on that day, during the taxi out to the take-off area, the port ski of the plane broke through a softened crevasse bridge and the propellor cut two feet from the end of the ski. The plane came to rest with much of the weight on the trailing edge of the port lower wing. It was thought that the plane was damaged beyond repair, and Black, Knowles, Hilton, and Healy started with 33 dogs by way of the Neny Trough to try to contact the returning party. It was planned that Black and Healy could remain in the field two months and that the other two would return from the Wordie Cache. Broadcasts on the regular schedules were sent out so that the party in the sound would be apprised of activities in case their receiving apparatus was working, as it later proved to be. After two false starts, featured by the loss of two tents in a gale and the wrecking of a sledge in the Neny Glacier, the party met Ronne and Eklund in the Neny Trough on the twenty-seventh of January 21 miles from base. They had jettisoned all but essential equipment and food and had made a record journey over an inland route never before traveled. This was at the end of a sledge journey of 1,264 miles covering a period of 84 days.

The *North Star* and the *Bear* arrived in the vicinity of Marguerite Bay the middle of February, 1941, after relieving the West Base in January. The pack ice outside was heavy, and no penetration could be made south of Adelaide Island, where Rymill's *Penola* entered in 1937. The ships went north to save fuel by lying at anchor in Andersen Harbor, and the *Bear* made a weekly cruise to observe conditions at the entrance to the Bay. When the pack seemed to thicken and advance more to the north along Adelaide Island's west coast, and when early March failed to bring enough of the violent easterlies needed to break up the ice and clear the bay, it began to appear that an emergency evacuation of the personnel by air might be the only solution.[3] The period of thaw pools and rotted sea ice had passed, and colder nights had frozen 6 inches of new ice over the pools and leads, so that it was less likely that heavy winds would move the ice. Winter snow had begun to accumulate again on the base island, which had become almost clear through melting during the summer.

On March 20 the *North Star* proceeded toward Punta Arenas, Chile, under orders from Washington, to take on food for a year and a full load of fuel, and to drop off most of the men of West Base, so that she would be able upon returning

[2] *Cf.* R. A. J. English. Preliminary account of the United States Antarctic Expedition, 1939–1941. *Geog. Rev.* 31 (3): 466–478, 1 map, 1941.

[3] The damaged plane had been repaired and test-flown in February.

south to take advantage more safely of any easing of the ice situation to make a dash in and relieve the base. The next day the *Bear* was able to get to an anchorage near Mikkelsen Island, of the Biscoe Group, outside most of the pack and just north of the Antarctic Circle. She was able to see from her crow's-nest that there was a possible landing field for the East Base "Condor" on the snowfield topping the island, and in radiophone conferences it was decided that the personnel would be evacuated in two flights if cold and clear weather developed in the morning, as the forecast indicated. Clear weather would be essential for flying, and it was expected that the thawed crust of a new 11-inch accumulation of snow would harden under a dropping temperature and make more secure the crevasse bridges weakened by the recent summer weather.

At 5:30 on the morning of March 22, with Snow and Perce at the controls and with 12 men[4] crowded into the cabin on top of their records and emergency equipment, the "Condor" took off after a long and bumpy run, and without circling for altitude laid a course for Mikkelsen Island, about 120 miles away. An hour later the *Bear* announced that an officer and several men had reached the field and were ready with smoke-pots to give wind direction to the pilots. Other men were busy anchoring two lines to assist in lowering equipment and personnel down the 400-foot sheer rock and snow face of the island to the boat from the ship. At 7:15 the men at the base heard over the radio the joyful tooting of the siren of the *Bear* as the plane came in to a safe landing.

The pilots returned to the base, and at about 11:30 tried to take off with the remaining 12 men and their gear. The surface had softened enough to make a take-off impossible with the heavy load, and it was necessary to order lightening of the plane by throwing out several hundred pounds of clothing, food, and miscellaneous emergency equipment. At 12:15 P. M. a second attempt was made, and the plane took the air after a run of 1 minute and 10 seconds. All were aboard ship by twilight, and the *Bear* sailed out through 40 miles of heavy pack to the open sea.

[4] First flight: Darlington, Dolleman, Dyer, Healy, Hill, Hilton, Odom, Morency, Palmer, Pullen, Sharbonneau, Steal (Snow and Perce, pilots). Last flight: Black, Bryant, Carroll, Collier, Dorsey, Eklund, Knowles Lamplugh, Lehrke, Musselman, Ronne, Sims, Snow, and Perce.