SNOW AND ICE CONDITIONS ON "EXERCISE MUSK OX" (NORTHERN CANADA)

By Lt.-Col. P. D. Baird

This exercise, held in northern Canada during the winter 1945–46, was primarily a test of mobility of oversnow vehicles and methods of air supply to a small moving force under conditions varying from Arctic Barren Grounds to spring thaw in the northern woods.

In addition to the purely military aims, some minor problems were investigated, among others data on the snow and ice conditions encountered. Due to the need for steady travel in order to keep closely to a prearranged schedule the time available for such scientific observations was very limited. Daylight halts were short and camp was nearly always made when it was too dark for snow sampling.

The snow testing kit for the exercise was made by the National Research Council of Canada and is fully described in their Technical Memorandum No. 5.* The main defect in this equipment concerns the hardness gauge. On very hard snow, where the smallest disc was used, the results suggested that a single crystal of snow was being pressed. Hardnesses above 10,000 g./cm.^{2} were measured (*op. cit.* p. 12).

Ice thickness was measured by chisel-and-scoop holes or by bee-hive (shaped charge) explosives. The former method is that of the Eskimo and takes about 10 minutes per foot to drill. An electric hot rod constructed by the N.R.C. for rapid hole drilling was not carried because the vehicle batteries were not considered adequate for the power which the rod requires.

The route of Exercise Musk Ox led from Churchill, Manitoba, past the Barren Grounds to Victoria Island and then over the sea ice of Coronation Gulf to Coppermine. The latter half of the route, from just beyond Coppermine, was through wooded country.

All the snow measurements were made on settled snow. The surface of the snow-cover in the Barrens generally consisted of a layer of small, rounded, cemented grains. These became progressively larger and more angular (with facets and needles) as the bottom of the snow layer was approached. The rounded grains had been formed by steady drifting, while the lower, more angular grains appeared to have been formed by sublimation in the snow drift after a surface wind layer had given them protection.

Sastrugi were very common throughout the barren lands where the sweep of the wind is unhindered. Only in areas of willow bush and tall grass was the snow not firmly packed.

In bush country the snow was more loosely packed and lacked the surface layer of rounded grains. The average snow depth here (in April) was usually around 22 in. of settled snow with specific gravity of 0·2 to 0·3. On the Barrens the specific gravity averaged between 0·3 and 0·4. Hardnesses were measured in thousands of grammes per square centimetre. It is an impossible task to measure snow depth in the Barrens. Deep, hard drifts are formed in the lee of eskers and rocky ridges, which remain bare all the winter, while on lakes bare ice occurs alongside sastrugi three feet high.

* Copies of this report may be obtained from Mr. D. B. Nazzer, Secretary, Associate Committee on Soil and Snow Mechanics, c/o National Research Council, Ottawa, Canada.—Ed.

Many and various ice surfaces were traversed during the exercise. The initial stage of the route was mainly along the ice foot of the shore of Hudson Bay, where the considerable tides cause frequent overflows yielding lengthy stretches of smooth ice. At river mouths there were air spaces in the ice, which was tide-heaved into a series of smooth undulations.

The lakes in the eastern Arctic were frozen to a depth of six to eight feet. The ice was only partially covered with snow. This snow cover was thinner in the northern part of the route. In the western Arctic, from Coppermine south, there was a uniform cover of soft snow. The ice of Great Bear Lake, the second largest fresh-water lake in the world that freezes completely, was over 5 ft. thick. The surface was fairly smooth, but was broken by a number of large pressure ridges running out of sight and characterized by open cracks up to 6 ft. wide often masked by drifted snow.

Great Bear River was, and always is, unfrozen where it leaves the lake, but the Mackenzie River at Fort Norman was still solidly covered with $5\frac{1}{2}$ ft. of ice on April 13th. At Simpson, however, the thaw had set in and there was a foot of slush or water above the rotting ice surface. This was characteristic of all the rivers from here south till the Fort Nelson River was reached. Here the last snow had vanished and the river was open and running swiftly.

MEETING OF THE INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

In case the note on p. 35 of No. 1 of this Journal should have misled readers, Dr. J. M. Stagg, General Secretary of the International Assembly of the Union, has written to say that the next General Assembly of the Union, and therefore of the International Association of Hydrology, will be held in Norway in September, 1948. At a meeting of the Executive Committee of the Union at the end of 1945 it seemed possible to hold the General Assembly in 1947. But by the time an Extra-Ordinary Assembly of the Union met in Cambridge in August, 1946, it was clear that post-war difficulties in many countries would still be too great in 1947 to allow a large number of delegates to meet. It was therefore reluctantly decided to postpone the Assembly until September, 1948.

The representative of Norway, the host country, explained that his National Committee hopes to arrange for the Assembly to be held afloat for the first time. The delegates will board a specially chartered ship in Oslo and the meetings of the Union and its component Associations will be held on board as the ship sails up the west coast of Norway.

Mr. Walter D. Lambert, of Washington, D.C., President of the International Association of Geodesy, has also written expressing the hope "as one interested in the success of the Oslo meeting that your organization will be represented there with special reference to the meetings of the Association of Hydrology through the appropriate British National Committee."

The Society is represented on the Hydrology Sub-Committee of the National Committee and members will be informed when, later in the year, plans have taken more definite shape. Members will also be kept informed about the constitution of the British Group of the International Commission on Snow and Glaciers (one of the Commissions of the Association of Hydrology), concerning which the Society is at present in communication with Dr. J. E. Church, President of the Commission.

Papers to be read before the International Committee on Snow and Glaciers

The following reporters have been appointed by the Hydrology Sub-committee of the British National Committee for Geodesy and Geophysics:

1. The Origin, Drift and Ablation of Icebergs as Aids in forecasting their Seasonal Appearance: Mr. J. M. Wordie.