

## AIR SERVICES TO THE NORWEGIAN ARCTIC

[Summarised from an article in *The Times*, 3 July 1947.]

Norway, with over 1000 miles of coastline and an interior which presents many obstacles to communications, is now operating a daily domestic air service which reaches from Stavanger in the south to Tromsø in the north. Short Sandringham flying boats, able to carry thirty-seven passengers, have been used since 2 June 1947 and are proving very satisfactory. They are equipped with radar and other navigational aids and blind approach beacon systems are being installed at Stavanger and Harstad.

The route goes from Sola, the large landplane and flying boat base at Stavanger which is used by the international lines, to Bergen, thence to Oslo and finally to Tromsø. The total distance covered is 1170 miles. The flying boats take a little over five hours to fly the 937 miles from Oslo to Tromsø. The flight can be continued by Junkers 52 seaplane, three times a week, to Hammerfest and Kirkenes, taking another four hours from Tromsø to Kirkenes. Next year Norwegian Air Lines expect to have more aircraft and hope to open a summer service across the Arctic Ocean to Svalbard.

## ICE ATLAS OF THE NORTHERN HEMISPHERE

[Review of H. O. Publ. No. 550. v + 106 pp., maps and bibliography. 24½ × 24½ in. Published by the Hydrographic Office, United States Navy, under the authority of the Secretary of the Navy, Washington, D.C., 1946 \$8.00.]

This ice atlas has been compiled as a guide to ice conditions in the Northern Hemisphere. Its usefulness for this purpose is beyond question. It will also prove of considerable value to all who are interested in Arctic sea- or river-ice from whatever point of view. The preparation of the charts which comprise the atlas represents a remarkable achievement in compilation. The extent of the bibliography, citing nearly 1700 references, gives some indication of the range of observations and records which have been brought together and presented in cartographic form.

The atlas was begun in 1942 by Dr John C. Weaver, at the American Geographical Society of New York, under the auspices of the Division of Geography and Cartography of the United States Department of State. It was continued in 1943 under the State Department until the spring of 1946, when it was transferred to the Hydrographic Office of the Navy. Fortunately at this time Dr Weaver was commissioned in the Navy and appointed to the Hydrographic Office, where the atlas was completed under his guidance. Dr Weaver was assisted by Mr S. W. Boggs, Geographer of the Department of State, Mr C. B. Hitchcock of the American Geographical Society and Dr L. M. Gould, President of Carleton College, who was Chief of the Arctic Section of the Arctic, Desert and Tropic Information Center of the United States Army Air Forces Headquarters.

The charts and other data included in the atlas have been arranged in seven major sections:

- (1) Northern Hemisphere, sea-ice.
- (2) Northern Hemisphere, river-ice.
- (3) Grand Banks Region.
- (4) Baltic Sea.
- (5) Black Sea.
- (6) White Sea.
- (7) Okhotsk Sea Region.

The ice has been classified and indicated on the maps, not with any special regard to the genesis of the ice itself, but according to its navigability. Five categories are recognised:

- (1) Permanent polar pack, inaccessible to navigation.
- (2) Unnavigable sea and land-fast ice, occasionally penetrable by powerful ice-breakers.
- (3) Generally unnavigable sea and land-fast ice. Icebreaker assistance normally required, although at times penetrable by heavily built ships.
- (4) Sea and land-fast ice generally navigable by heavily built vessels.
- (5) Sea and land-fast ice generally navigable by unreinforced vessels.

In each region the limits of these various categories of ice, of which the first appears only in the Northern Hemisphere charts, are indicated by separate charts for the different seasons of the year. The Northern Hemisphere sea-ice charts show these limits plotted as an average in a separate chart for each month of the year. There are also separate charts for each month from April to August to show the extreme maximum and minimum limits of ice for the period 1898–1938.

There are three river-ice charts. On the first are plotted a series of lines (isopleths) which pass through places where the average dates of the closing of the rivers by ice is the same. The second indicates when the rivers are open again. In this way the average positions assumed by river-ice during its advance and retreat are shown for the beginning, middle and end of each month. The third river-ice chart shows the average number of days in the year when the rivers are closed.

The larger scale charts for the five other regions are plotted in much the same way, with of course the omission of any chart for those months when these regions are altogether free of ice. The data upon which the charts for these five regions have been based are listed in tables and an index gives the positions corresponding to the information contained in the ice data tables.

In the case of the Northern Hemisphere sea-ice chart and the Grand Bank chart, the positions and numbers of icebergs and growlers at different times of the year are plotted.

The compilation of the bibliography is a valuable piece of work on its own account. An index map preceding the bibliography denotes the areas into which the Northern Hemisphere has been divided for convenient grouping of all the references, with the exception of the first fifteen references which are listed under the heading "world wide".

It would be difficult to improve upon the method adopted for the presentation of the material in this atlas. The drawing and colouring are admirably simple and clear, so that the ice information, which the maps are designed to convey, stands out at once. The only criticism offered on the production of this publication is that the numbering of the pages is too inconspicuous and the separate charts are not numbered at all. The size of the atlas, nearly two feet square (and twice the area when opened out), makes it rather cumbersome, but it would clearly detract from the value of the atlas if a smaller scale had been used, and its size would be no disadvantage on a chart table.

The principle adopted for place-names is of little consequence for an atlas which would normally be used in conjunction with other maps or charts, but since places are given the names by which they are officially known locally, the addition of a glossary explaining the meaning of the Russian words for cape, island, etc. would have been helpful.

Rear-Admiral G. S. Bryan, who as Hydrographer wrote a preface to this atlas, makes some reference to the inequality of the reliability and amount of data which were available for compiling different sections of these charts. When more data are received by the United States Hydrographic Office, either from further information which already exists in the hands of individuals or institutes, or from further exploration, future editions of this atlas may be expected. The usefulness of the atlas might be considerably enhanced if, in later editions, the compilers could devise some means of indicating more clearly the relative reliability and extent of the data which have been available for each area, though it might be difficult to do this adequately without introducing either a highly complicated series of symbols, or adding lengthy explanatory notes.

This atlas will be of the greatest practical value to those who plan voyages to the Arctic. There is ample evidence of the uncertainty of ice conditions from year to year. The explorer, however, on referring to this ice atlas and, in particular, the charts showing the maximum and minimum limits of the ice during the summer months from 1898 to 1938, might find himself as liable to over-caution as to foolhardiness.

The ice categories used in this atlas cannot in the nature of the case be precise. In using the atlas, therefore, full allowance should be made for the wide diversity of opinion of the many observers whose records have been used in preparing the maps in regard to the navigability of the ice they described.

In attempting to estimate the chances of gaining access to a particular area in the Arctic, a series of charts showing the monthly ice limits in successive years might provide a suggestive indication of any trend towards advance or retreat and thus reduce to some extent the measure of uncertainty. It is a characteristic of any valuable advance in knowledge to stimulate further inquiry, and the wealth of information so clearly presented in the *Ice Atlas of the Northern Hemisphere* will serve an even wider purpose than its main object, if it prompts further research into the changes in the extent of the ice in the Arctic over a period of years.

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