

THE ARCTIC VOYAGE OF THE "GRAF ZEPPELIN"

(Extract from *Die Arktisfahrt des "Graf Zeppelin"* by Dr L. KOHL-LARSEN.— 8vo, 200 pages, 55 fig., 1 chart. — Published by the *Deutsche Verlagsgesellschaft, Zweigniederlassung - Berlin, S. W. 19 - 1931*).

The following is an extract from the description of the Arctic voyage undertaken by the *Graf Zeppelin*. It is of interest in the study of magnetism and of navigation in the Arctic :

"The Committee on Terrestrial Magnetism of the "Aeroarctic", under the auspices of which the expedition was placed, had two problems to solve :

"To make the knowledge of terrestrial magnetism obtained up to the present time utilisable for navigating the airship, and to continue the investigation of terrestrial magnetism in the Arctic regions.

"When considering the first problem, it had to be borne in mind that only those methods of setting a course which could be quickly and easily carried out could be employed in navigating the airship at any speed. It seemed that a chart with magnetic meridians would be useful, from which the compass course could be read off directly. The deviation of the magnetic needle by iron is so slight in an airship that it is of no importance.

"The track proposed for the airship extended along the continental plateau on the Siberian and American side, between Leningrad and Nome in Alaska. For the representation of this extensive region, Geheimrat Dr A. SCHMIDT proposed conformal cylindrical projection. The LAMBERT projection was chosen with a cone tangent at the 30th meridian East, for which the net system was calculated at each degree on the scale of 1:5,000,000.

"The outlining of the coasts and the insertion of other geographical control points was carried out by Dr BREITFUSS and Dr SIEWKE at Berlin.

"Owing to alterations in the itinerary of the *Graf Zeppelin* to Novaja Semlja, Franz-Josef-Land and Sievernaja Semlja, a part of this chart had to be enlarged to the scale of 1:3,000,000.

"The second problem which the Committee on Terrestrial Magnetism had to solve consisted of the preparation for the magnetic exploration, the carrying out thereof during the Arctic voyage and the subsequent analysis of the observations.

"First a position had to be found in the airship sufficiently free from the influence of iron and electric currents, where magnetic observations could be carried out. Such a position was found in a double cabin on the port side. All steel fittings were removed and replaced by a non-magnetic metal. The oscillations of the airship when under way had to be taken into account with the object of devising magnetic instruments, as these are usually constructed for use on fixed supports or in sea vessels. It was also necessary to adapt the field of the instruments to the conditions prevailing in Arctic regions.

"One difficulty, and by no means the least, lay in the fact that the Aeroarctic did not obtain the material means for the construction of these instruments in sufficient time.

"For taking observations on the ice at landing places, the following were provided : a double BIDLINGMAIER compass for the measurement of horizontal intensity, a simple instrument for measuring vertical intensity and, if possible, an azimuth circle for the observations for variation.

"The double-compass, invented by Professor BIDLINGMAIER during the German South-Polar Expedition of 1901-03, in the *Gauss*, of which he had developed the theory in full detail, was to be the principal magnetic instrument in the equipment. Thanks to a gift of 500 Dollars by the CARNEGIE Institute of Washington, the instrument was constructed by the Askania-Werke of Berlin and adapted to and completed for the magnetic conditions of the Arctic.

"It was tested in the balloon voyages of Dr GROTEWAHL in 1930, of Professor Dr NIPPOLD and Geheimrat Dr HAUSSMANN in October, 1930, and finally, during a test trip in July 1931, shortly before the Arctic voyage, conjointly by LJUNGDAHL and HAUSSMANN.

"The principal observer on the Arctic voyage, the Swede LJUNGDAHL of Stockholm, had familiarised himself with the double compass at Potsdam before the voyage began ;

his collaborator in the observations, Commander SMITH of Washington, had also done so. ELLSWORTH joined them as voluntary collaborator; he had acquired experience during the trial trips over Lake Constance. On account of the instrument and of the ability of the observers, it was certain that the measurements of horizontal intensity made during the voyage in the Arctic, intended to test the instruments, would have not only a provisional but a permanent value. Based on reference measures carried out by Geheimrat HAUSSMANN at Friederichshafen, before and after the voyage, they enriched the existing knowledge of terrestrial magnetic conditions in the Arctic regions.

"For the measurement of vertical intensity, instead of the simple instrument originally proposed, for the construction of which funds were wanting, a galvanic instrument which was to be constructed at the Magnetic Observatory of Potsdam was considered. This apparatus was not ready in time to be tested and used during the voyage. In its place, a previously constructed magnetic balance was taken, which gave good results when the airship was swung at anchor, but which, as a consequence of the vibrations when the airship was in motion, gave false results under way.

"For the measurement of magnetic variation, an instrument constructed by HAUSSMANN himself was tested during a trial trip; it consisted of a graduated circle with a magnet suspended by a wire; the instrument was found utilisable. The shadow of the wire shows the direction of the sun with respect to the magnet direction at the time and place of observation independently of the course of the airship. For the Arctic voyage, instead of the simple model, a better instrument was used, in which the circle with needle was replaced by a THOMSON compass-card from the Stockholm Hydrographic Office, and the simple suspension by a more perfected suspension arrangement, using as thread a fibre of hemp and a metal style, for throwing the shadow, suspended to this fibre; this instrument was built in the Test Department of the ZEPPELIN works.

"With this instrument determinations of variations were made in the Arctic regions."

