Fig. 4. Aeromagnetic survey flight lines across southern Graham Land, 1973–74.

[face page 61

AN AEROMAGNETIC SURVEY OVER SOUTHERN GRAHAM LAND: A PRELIMINARY REPORT

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ABSTRACT. An aeromagnetic survey was flown over southern Graham Land in the southern summer of 1973–74. Equipment and navigation methods are summarized and completed flight lines shown.

TOTAL-FIELD magnetic traverses operated by the British Antarctic Survey have for many years formed an integral part of their geophysical research programme in the Antarctic Peninsula. The surveys have employed dog-sledging techniques supplemented in later years by aircraft support. It had long been realized that logistic, climatic and topographical limitations severely restrict suitable ground networks in the region and therefore it was of significance that in October 1973 the British Antarctic Survey took delivery of an airborne magnetic system.

The equipment (Fig. 1) included a Geometrics model G-803 total-field magnetometer, a

Fig. 1. Airborne magnetometer system as installed in the British Antarctic Survey's twin Otter aircraft.

Geometrics model G-704 digital data-acquisition system and an Exploranium model Mars-six analogue recorder. A wing-tip sensor was used (Fig. 2). The equipment was initially installed and flight tested at Downsview, Ontario, Canada, the home of the De Havilland twin Otter aircraft (Fig. 3), one of which was to be used during the survey. It was necessary to dismantle the aeromagnetic system for transport to Antarctica.

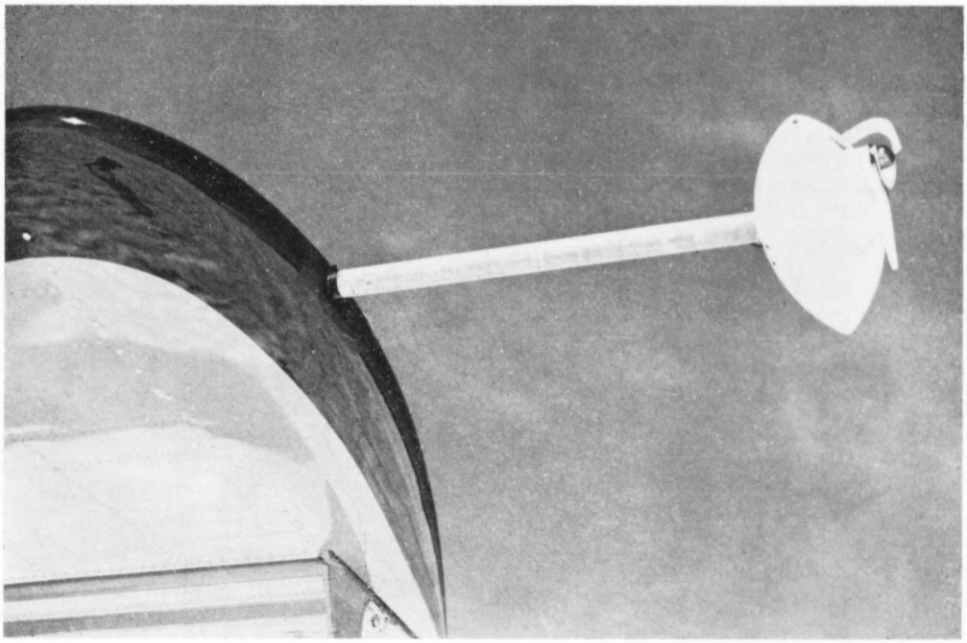

Fig. 2. Wing-tip sensor installation.

Fig. 3. De Havilland twin Otter aircraft at Adelaide Island.

The two-man aeromagnetic survey party consisting of B. J. Dikstra and the author joined the aircraft at Adelaide Island (lat. 67°46′S., long. 68°55′W.), Graham Land, the centre of the Survey's aircraft operations. The aircraft schedule during the short Antarctic summer flying season is a demanding one with constant transfer and support of field parties. In addition, due to safety and space restrictions, it was not generally practical to use the aircraft for other purposes whilst the equipment was installed. The aeromagnetic survey equipment was therefore prepared in readiness for a concentrated 50 hr. of flying mid-way through the summer season. Installation, testing and calibration of the equipment was completed by 16 December 1973 and thereafter flight lines were flown whenever weather permitted. The final line was flown on 3 January 1974, after which the equipment and sensor were removed from the aircraft.

During the survey period over 7,000 km. of regional flight lines (Fig. 4) were successfully recorded at a constant altitude of 2,500 m. Except for north–south tie lines, they were flown at right-angles to the axis of Graham Land with an average line spacing of 20 km. However, persistent cloud cover on the east coast meant that many of the lines had to be terminated earlier than planned. From previous land traverses, two areas (see Fig. 4) suggested that more detailed local surveys would be of interest: one over Horseshoe Island and the other over Neny Trough. Here the flight patterns resulted in an east–west and north–south grid network consisting of approximately 5 km. squares at a flight altitude of 1,000 m. Severe topography precluded flying at a constant terrain clearance. These detailed surveys accounted for a further 1,600 km. of flight lines. Data sampling throughout was at 1 sec. intervals with the aircraft speed at 120 kt.

Navigational control employed a variety of electronic and visual aids. A Sfim black-box flight recorder measured pitot and static pressures and outside air temperatures, while a Bonzer radar altimeter registered terrain clearance. The usefulness of the latter facility was debatable in these particular circumstances as the majority of the flights were above the 12–610 m. range of the altimeter. It did, however, provide an additional indication of vertical passes over the higher topographical features. A Shackman auto-camera was front mounted in the cockpit and operated electronically to obtain flight-path photographs. Aircraft heading was also continuously monitored. Visual navigation included vertical fixes over readily identifiable features, bow-and-beam fixes, position lines, together with dead-reckoning techniques. The estimated accuracy of flight lines is understandably variable since it depended upon proximity to mapped features. At its best along the west coast of Graham Land it should be within tens of metres, but at its worst at the edge of the Larsen Ice Shelf a radius of error of up to 15 km. can be expected.

The recording of magnetic field, flight parameters, time and navigation event marks was variously duplicated on the magnetic tape and analogue recorder in case of individual system failure. Diurnal variation data were available from the Survey's geomagnetic observatory at the Argentine Islands (lat. 65°15′S., long. 64°16′W.).

Data processing is being carried out at present using the computer facilities at the University of Birmingham. It is anticipated that the aeromagnetic survey of the Antarctic Peninsula will be extended into lesser known areas in the future.

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