

MIDLANDS SURVEY . . .

camera, a product of Aero Service Corporation, Philadelphia, the film moves steadily past an open shutter, producing a continuous picture. From this photographic record, the exact track of the aircraft is later checked.

In the evaluation of Decca for position-fixing use, Decometer readings were photographed at 30-sec intervals throughout the runs, again for subsequent interpretation. The opportunity was taken to obtain a limited amount of experience, also, in the possibility of employing Decca for navigating the aircraft along the track lines (by means of the Flight Log).

A flying crew of three was carried; pilot, navigator and magnetometer operator. After the "bird" had been lowered and the magnetometer and recorder checked, the intervalometer was switched on at the beginning of each run. This provided a series of fiducial marks on the magnetometer recorder, radio-altimeter recorder and the continuous-strip film, enabling the three records to be synchronized one with another (and with the Decometer readings). For control purposes (to "tie in" adjacent sections of the area), north-south runs at six-mile intervals were also flown.

The first area to be flown was the southern sector, using (as mentioned) the technique of constant barometric height. In this sector the basement rock is rarely exposed to the surface, and the effect of the topographical changes on the magnetic readings is not significant. With excellent weather, this half of the survey was carried out in less than a month. Luton Airport was used as the operating base for part of this time.

The northern sector, involving contour or "drape" flying, was rather more difficult from the pilot's point of view, since the area included the steep slopes of the Southern Pennines. This method was required for two good geophysical reasons, however: a constant barometric height, if sufficient for suitable clearance over the high ground, would have given a lack of detail in the measurements taken over lower ground; and, an accentuating factor, the magnetic basement is exposed to the surface more extensively in this area than in the northern sector. The weather deteriorated during this second half of the survey, which took longer than the first, but the total flying programme was completed, as scheduled, in the overall time of two months.

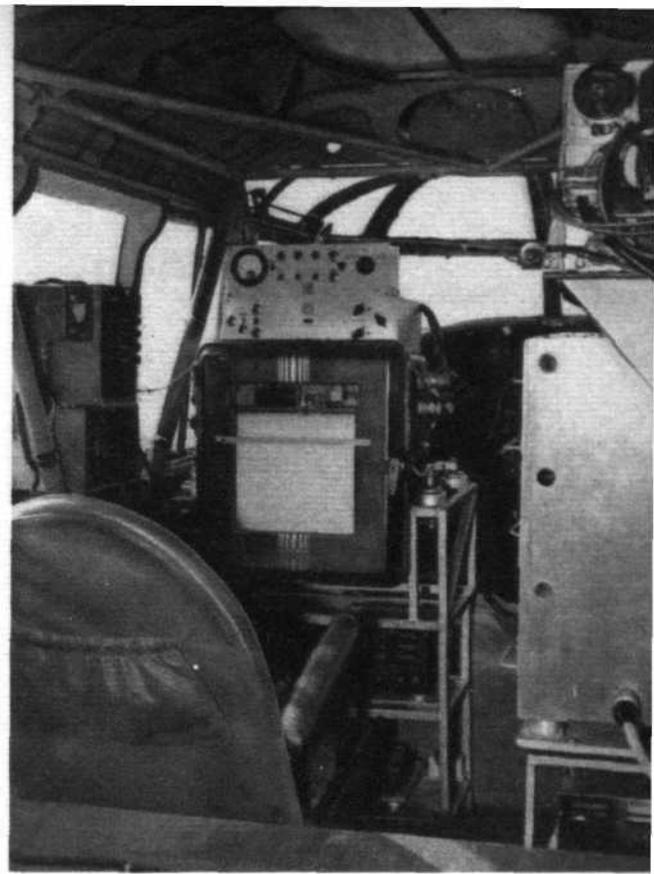
Data Processing.—Throughout this time, data obtained during the flights had been continuously passed to the C.A.S. ground unit at Derby Airport for analysis and plotting. Data chief is William DesLaurier, who has also flown as navigator on most of the survey flights. The "raw material" consisted of the recorder rolls carrying the continuous traces of magnetometer reading and radio-altimeter height respectively; the film strip showing the track flown; and the appropriate section of the one-inch map which had been used for navigation. Also available was the continuous record of a ground magnetometer located outside the building, which would indicate any major disturbance in the regional field during flights (caused, for example, by magnetic storms).

The film strip having been developed, the series of fixes at 30-sec intervals (and hence the exact track) was transferred to the one-inch map. Meanwhile, the "processing" of the magnetometer results had begun: on the actual recorder roll were drawn the basic regional variation and the "drift" occurring during the run; both of which influences were required to be subtracted from the indicated airborne measurements. Spurious values obtained when flying over heavy D.C. supplies, or magnetic concentrations in large towns, were removed; and further corrections made to the readings at the standard 30-sec intervals, enabling the final figures to be produced.

These values were then plotted along the appropriate flight

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Special equipment, brought over by Canadian Aero Service and installed in Anson G-AMDA by Derby Aviation, included (left) continuous-strip vertical camera mounted in the fuselage/wing fillet and (right) Speedomax magnetometer recorder. To the left of the recorder is mounted the intervalometer; at top right the rear of the Decca installation can be seen.



lines which had by now been transferred to what would become the final map. One such map, on a scale of $2\frac{1}{2}$ miles to the inch, was prepared for each of the two sections, for eventual reduction to the standard quarter-inch scale. From the plotted values, "contour lines" of equal magnetic field strength were drawn, at intervals of 10γ (the accuracy of the magnetometer is $\pm 2\gamma$, and the absolute value of the earth's field in this region is approximately $50,000\gamma$).

Results.—At the present time the southern-area total-field map has been completed, and work is continuing on that for the northern area and on derived-data maps for both areas. It is estimated that the data compilation will be completed by the end of this year. The results are being studied by the Geological Survey: the new maps will be compared, for example, with maps showing geological structure, gravitational-force variation, and variation of the vertical component of the earth's magnetic field (obtained from ground readings). Any correlation between the various "anomalies," or sharp distortions, will be noted, and in general a fuller picture of the nature of the country's basic geological structure will be obtained. Also, as mentioned, the Decca position-fixing method will be evaluated, by comparing the information obtained from map references with that from Decca co-ordinates.

The Geological Survey hopes to publish in due course the two new maps showing the total-force variation. A direct comparison of the time, effort and expenditure which would be involved in a comparable ground survey of this same area is not possible—valid readings by means of ground magnetometers in towns and cities, for example, would clearly be impracticable due to the many strong local distortions—but the advantage of the airborne method wherever time is a critical factor is obviously of great importance.

Canadian Aero Service has flown more than 600,000 miles on airborne magnetometer surveys in Canada. Total mileage on the U.K. survey has exceeded 13,000, excluding all positioning and return flying from and to the base. Normally, a mileage fee is paid to the manufacturers of the airborne magnetometer instrument, the Gulf Research and Development Co., of Pittsburgh, for all survey work: in view of the non-commercial nature of this investigation, however, such fees have been waived on this occasion.

Derby Aviation, Ltd., are also engaged at present on an overhaul contract for Spartan Air Services, an Ottawa associate of Canadian Aero Service. The aircraft involved are ex-R.A.F. Mosquitoes intended for high-altitude photographic survey work; an illustrated description of this activity appears on page 728 of this issue.

The faithful Annie (formerly N4877 of the R.A.F., recently rebuilt by Avros), with magnetometer bird in the stowed position. During the survey, it was based at Derby and Luton Airports.

