THE OBSERVER'S BOOK

ON

ASTRO-NAVIGATION

PART FOUR

(ADVANCED: WITH INDEX OF ALL FOUR PARTS)

BY

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ACTUAL EXAMPLE OF RUNNING DOWN POSITION-LINE

To illustrate the value of running down a position-line, perhaps the writer may be permitted to cite the use he himself made of it in 1931.

Required to fly from Norfolk Island to Lord Howe Island in the Pacific, a rhumbline distance direct of 478 nautical miles. This distance is only trivial for a modern bomber pilot, of course, but in this particular case extra difficulties made up for the short distance; the flight was made solo, and therefore the navigation had to be carried out while piloting the aircraft. It was in a Moth seaplane which had a cruising speed of about 75 knots and only an hour or two's petrol to spare; there was, therefore, no other land within range if the island was missed. Also the island-objective was small—about 3,200 acres—and there was reason to suspect a changed compass deviation.

Immediately after taking off, the sun's bearing at the objective at a time 6 hours later, i.e. $1\frac{1}{4}$ hours before the E.T.A. at O, was computed, and a position-line OP plotted on the chart (see Fig. 41). P was made an earlier objective and was selected so that the track to P was 10° N. of the track direct to the island.

The wind was estimated twice an hour by treble

drift, the angle of drift being judged, i.e. no instrument was used for determining it.

After 3 hours' flight the D.R. position was B.

The sun was then nearly on the beam and two observations with a marine-type box sextant gave position-lines CD at 01.55 G.M.T. and EF at 02.10 G.M.T. According to these position-lines, it was estimated that the aircraft was on the line AG after 3 hours' flight instead of on AB. This suggested a change in compass deviation or a D.R. error of 5° to the south and a correction of + 5° was made to all magnetic courses thereafter.

(It appeared on later study of the flight chart that both EF and CD were in error by $1\frac{3}{4}$ miles, or else one of them was in error by $3\frac{1}{2}$ miles.)

The observations were made in the following manner; the altitude and azimuth were precomputed for the expected time of taking sights and at a convenient assumed position, and a mock or datum position-line plotted through the assumed position. For example, the precomputed mock position-line for EF was MN through 30° S., 164° E., and precomputed for 02.11 G.M.T. The time of the actual observation did not agree with the time used for the precomputation, but the sextant altitude was adjusted for the change in altitude of the sun during the interval. (Precomputing two altitudes from the same spot but 10 minutes apart in time gives the change of altitude per 10 minutes). The position-line was then plotted parallel to the mock position-line and at a distance from it in miles equal to the difference in minutes of arc between computed and observed altitudes. The observations all consisted of one or two shots at the sun from a height of 300–1,000 feet using the sea horizon.

The flight was continued as before, but from G as a fresh point of departure. Five hours from the start, sun-observations were started again; the first of these at 04.00 G.M.T. showed that the D.R. position at H was $22\frac{1}{2}$ miles ahead of the position by sun observation on JK.

A 05.00 G.M.T. observation showed that the aircraft was on QR, 17 miles short of the line OP through the island, although according to the D.R. it had already reached S on OP. At 05.15 the course was changed 55° to the south and the aircraft flown along the position-line OP. At 05.20.15 G.M.T. another sun observation confirmed that the aircraft was headed for the island, which was sighted in a heavy storm cloud about 5 miles away at 06.25 G.M.T., $7\frac{1}{2}$ hours after the start of the flight.