THE AVERAGING SEXTANT

by

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Transoceanic flying will make greater use of celestial navigation and the weakest link in this method is the bubble sextant with the large bubble error for individual sights. It has been established, however, that an average of a dozen or more observed altitudes gives surprisingly accurate results. Since the work of averaging a series of observations is somewhat difficult, several independent efforts have been made to develop a sextant which will automatically average several observations.

Such an averaging sextant has been designed by P.F. EVERITT and made by Henry Hughes & Son of London. The procedure in taking a series of six observations is as follows: An approximate altitude is observed and the index is turned back to read about 2° less than the altitude, a stop is locked at this point and the averaging mechanism put in operation by means of a clamp. Next an observation is made in the usual way after which a clamp is released and the sextant index is turned back against the stop. The clamp is again locked and an observation made, after which the clamp is released and the index is once more turned back to the stop. A third observation is taken in the same way, after which the time is noted and then three more observations are made as before. Finally the reading from the averaging device added to the even degree to which the index stop is locked gives the *average* of the six observations.

The time noted between the third and fourth sight will be sufficiently close to be used as the mean of the six times of observations. The mean of results from two or more series is used to guide the plane, which by this method should be kept to within 5 miles of the proper course.

In addition to the averaging sextant just described, at least two of American design are being developed. One which is creating keen interest in the navigation field is one invented by First Lieutenant T.L. THURLOW, Air Corps, at Wright Field. The Thurlow device is light, compact, and in no way interferes with the normal reading of the sextant. To operate the averaging mechanism, it is only necessary to turn the averaging counter to a zero reading and then to press a spring-loaded plunger after each of 10 observations. When the plunger is depressed to the limit of its travel and released, one-tenth of the normal sextant reading is indicated on the counter, and therefore after the tenth observation taken in the same way, the arithmetical average of 10 observations is indicated directly on the counter. It will be noted that the average is given directly rather than the average of the excess of movement above an arbitrary amount.

The average of the times of start and finish of a series, or the time taken between the fifth and sixth observation should be suffciently accurate where the series of 10 observations is taken without interruption and within a period of, say, 2 or 3 minutes. Since it is not necessary to take separate readings of the sextant or watch after each observation, the entire series should be completed (under average conditions) within 2 minutes. The better types of bubble sextants are practically as easy to operate as the marine type sextant. Any of a dozen available methods for reducing observations to position will be found satisfactory.

It has been demonstrated repeatedly that where individual errors run as high as 50 miles or more, the average of a dozen or more observations reduces the average error below 5 miles.

The proper technique is to compute the altitude in advance so that the position, or altitude difference when working with one body, is given immediately when the altitude is observed.
