THE "DEVIOMETER"

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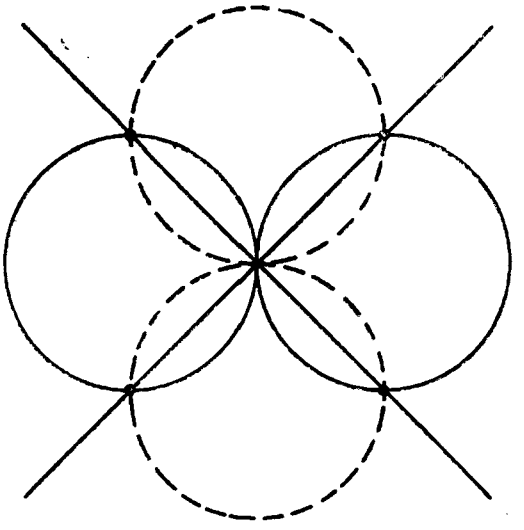
One of the auxiliary devices which the research division of the Aeronautics Branch, U.S.A. Department of Commerce, has developped to facilitate the use of the visual type range beacon is an instrument called a "deviometer".

It is known that the Aircraft Radio Beacon Tuned-Reed Course Indicators used in U.S.A. for guiding aircrafts consist of a special Radio transmitting station acting a visual tuned reed indicator placed on the aircraft.

The transmitting-station sends out 290 kc. waves on two loop antennas at right angles to each other. The h.-f. radiation from one antenna is modu-



lated at 60 cycles and that from the other at 85 cycles. Two figure-eight polar diagrams are produced, and there are two lines along which the two modulated signals are of equal intensity. A reed indicator consists of a pair of metal reeds capable of vibrating between a pair of small electro-magnets connected to the output terminals of the aeroplane receiving set. The free end of each reed carries a white vane producing two white lines close together when the reeds vibrate. Each reed is tuned to one of the modulation frequencies supplied to the transmitting antennas. The directing course of the aeroplane is along the line of equal strength of the two modulated signals, in which condition the white lines of the indicator are equal, and deviations from the course produce inequalities of the length of the lines.

Consequently the reeds vibrate with equal amplitudes whenever the aircraft flies along one of the 4 directions of equal intensity of signals passing through the radio beacon. This fact enables to fly securely towards the transmitting station.

By the use of the deviometer a pilot can follow any chosen course, within limits, on either side of the equisignal line for which the beacon transmitter is adjusted. Recent developments indicate that this device will be of considerable practical value.

In its essential form the "Deviometer" consists of an adjustable rheostat, shunted on one of the coils which activate the vibrating reeds. By means of this rheostat the intensity of the current in the coil is caused to vary in order to obtain the equalness of the effects produced on the reeds for any direction passing through the transmitting station and different from the four fundamental directions thereof. This method evidently enables to make better use of the directive station. As soon as the airplane receives the signals, it can adjust the "deviometer" so as to maintain this equalness. It is certain to head towards the transmitting station without being obliged first to stand into one of the 4 main fundamental directions of the system. The same effect is thus accomplished on the airplane as by shifting the course at the beacon.

A movement of the pointer to the right or left reduces the shunting resistance across one or the other pair of reed driving coils and shifts the course obtained to the right or left of the equisignal zone set up by the beacon. The scale over which the pointer moves may be calibrated in degrees off the equisignal course and will be correct for all beacons having similar space characteristics.

Again, on a congested radio-served airway it becomes possible to reduce the hazards of collision between aircraft during conditions of poor visibility, by setting the deviometer to, say, 2 degrees to the right of the equisignal beacon course. Traffic in both directions will therefore fly on opposite sides of the equisignal course, and any possibility of head-on collisions is thus precluded.

The Research Section has tested the "deviometer" in a great many conditions. In the course of these successive developments, experience has shown that the use of the "deviometer" is perfectly suitable for angles of 15° situated on each side of the main routes. Beyond these limits, a decrease of the directive system's sensitiveness is ascertained, because the shunted current in the rheostat is evidently lost for the receiver. Besides, the indications of departure from the route become less accurate.

A second limitation of the deviometer is the fact that the space characteristics of all beacons are not identical. This is particularly true for beacons the courses of which have been adjusted to fit several airways converging at arbitrary angles upon a given airport. However, when employed with these limitations in mind, considerable flexibility is added to the use of a radio range beacon normally giving but four beacon courses.

The following papers prepared by the Research Division give information on this instrument :

"Radio developments applied to airfcrat". J. H. DELLINGER and H. DIAMOND, Mechanical Engineering (New York, N.Y.), Vol. 51, p. 512, July 1929.

"Applying the visual double-modulation type radio range to the airways". H. DIAMOND ; Bureau of Standards Journal of Research, Vol. 4, N° 2, p. 287, Feb. 1930 and Proceedings, Institute of Radio Engineers (New-York, N.Y.), Vol. 17, p. 2.183, December 1929.

"A tuned-reed course indicator for the 4 and 12 course radio range". F. W. DUNMORE, Bureau of Standards Journal of Research, Vol. 4, N° 4, p. 473, April 1930, and Proceedings, Institute of Radio Engineers (New-York, N.Y.), Vol. 18, p. 980, June 1930.

H. B.