

Radio and Commercial Aviation

Navigation by Wireless

ONE of the greatest difficulties which confronts commercial aviation of to-day is the lack of an efficient and independent means of air navigation. Though airways and airports are now being established in many countries throughout the world, and though aircraft are fast becoming more and more dependable and luxuriously equipped for the comfort and convenience of the air traveller, yet air traffic can still be disorganised when low visibility prevents the pilot from picking up his

bearings on the ground. In such circumstances the aviator is compelled to abandon all dependence on his senses and to navigate according to the information conveyed to him by his instruments.

A pilot can continue to fly safely in a fog by means of such devices as the altimeter, turn indicator and compass, but it is only with the aid of radio that he can be certain to keep on a given course and find an invisible aerodrome. For this purpose a radio beacon, which is a special kind of transmitter, is located near the landing ground of an airport. The conventional single aerial is replaced by two loop antennas, spaced at an angle to each other, and rigidly locked in a definite position.

The two loops are excited by a common high-frequency supply, but the in-

dividual aerial currents are modulated at different low-frequencies. The current in one loop is modulated by an audio-frequency of 65 cycles, and the other at 85 cycles per second. Each of the antennae emits a directional wireless beam, so that an aeroplane flying along a line equidistant between the two beams will receive two signals of equal intensity, one from each beam. Should the plane deviate from this line, which represents the direct route to the landing-ground, it receives a stronger signal from one beam than from the other.

An ingenious indicator on the instrument board of the aeroplane shows when the signals from the two beams are being received with equal intensity. The low-frequency modulation of the incoming waves causes two small reeds to vibrate. One, on the pilot's right, is tuned to 65 cycles per second, while the other on his left is tuned to 85 cycles per second. The tips of the reeds are painted white, so that when vibrating, each appears as a vertical white line. When the pilot is keeping to his correct course, the white lines are of equal length because the reeds are vibrating with the same intensity. Should the pilot deviate from his course, either accidentally or to avoid a stormy area, he is immediately made aware of the fact by the inequality of the two white lines, and is thus still able to locate his destination. The great advantage of the radio beacon system over other kinds of homing devices, such as compasses, is that if the machine is blown off its original course by side winds, the destination point can still be located. In foggy weather, however, the pilot's troubles are not ended when he has succeeded in keeping his machine in the invisible "permanent way." Sooner or later he will come to the "buffer stops" at the end of the journey, and his task is then to make a blindfold landing. He must be told, therefore, of the moment when he passes over the radio beacon. The indicator is intended to provide this information. As he flies over the beacon there is a sudden relaxing of the reeds, due to a region of zero signal strength immediately above the transmission tower, and he is able to locate the landing ground to within 100 feet.

A radio beacon system is in process of erection on the airways of the United States, and special receiving apparatus has been designed for use by pilots. This comprises a 10ft. vertical rod aerial, a small indicator unit on the instrument board weighing one pound, a 10lb. battery, and a receiving set weighing approximately 9lb. The latter may also be used to pick up radio telephone signals. The abandonment of the trailing wire aerial has been a source of relief to aviators. Not only was it a source of anxiety due to the risk of entanglement with objects on the ground, but it played strange directional tricks at night and at times when high winds prevailed. A great virtue of the vertical pole aerial is that it is non-directional.

WHILE a beacon system is excellent for marking out the airway routes it can give no help to the flyer on an independent course. Two methods of adapting radio to this navigational need are now in use. In the first, radio direction finding stations are maintained at various airports, and each aeroplane carries both a transmitting and receiving set. Upon request by the pilot, two or more of the direction finding stations determine the

direction of travel of wireless waves from the plane. Combining their determinations, they calculate the aeroplane's position and send this information by radio to the pilot.

The second method of helping the independent flyer is the rotating radio beacon. This is a radio transmitting station located at an airport which has a rotating directive aerial, causing a beam of wireless waves to sweep constantly around. A special signal indicates when the beam passes through north. A pilot listening for the beacon signal with his receiving set can determine his direction by the time which elapses between the north signal and the instant when the beam is heard with maximum intensity. The elapsed time is determined by means of a stop-watch, which can be calibrated to read direction.

The safety and reliability of commercial aviation would seem to depend entirely upon radio. Certainly any practical scheme for a trans-oceanic air service would require directional radio aid, particularly for a system such as that involving a number of seadromes moored at intervals across an ocean.

ACCORDING to a correspondent of "The Jewish Chronicle," the Seventh Day Adventists of Boston, in America, foresee a world flood in the near future. To prepare for this catastrophe, they are planning a luxurious and up-to-date Ark, which is to be fitted with radio apparatus. This latter, however, seems superfluous, for if the world flood does eventuate, with whom will the Ark exchange wireless messages?

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ADVISORY TRUSTEES

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