

*Aeronautical Navigation.*—Radio aids to air navigation are provided from coast to coast and from the Canada–United States border to the Arctic along and off the airways, and are used by many Canadian and foreign air carriers flying over Canadian territory. Trained engineers and technicians are assigned to six regional offices located at Vancouver, B.C., Edmonton, Alta., Winnipeg, Man., Toronto, Ont., Montreal, Que., and Moncton, N.B., to carry out the construction and efficient operation of facilities.

The principal radio aid to air navigation provided by the Department of Transport is the low-frequency *radio range station*, located approximately every hundred miles along airways. It provides specific track guidance to pilots by means of audible signals and the signals may also be used for the purpose of obtaining direction finding bearings. In addition, radiotelephone communications are provided between ground and aircraft, by which means pilots may obtain weather data, air traffic control instructions and other information concerning the safety of flights.

Twenty-six very high frequency *omni-directional ranges* (VOR) are now in operation. Unlike the low-frequency radio range stations, this type of facility does not limit the aircraft using the station to one of four distinct courses but enables the pilot to select any desired course. The 26 omni-directional ranges have permitted the establishment of VOR airways across Canada and of 17 trans-border airways. Sixteen additional installations are under construction and should be in operation by the autumn of 1961. Preliminary work has begun on three others.

*Aeronautical radiobeacon stations* provide radio signals with which pilots may use their direction finding equipment to obtain relative directional bearings. *Fan markers*, operating on very high frequencies, are usually placed on an airway so as to inform the pilot when he may safely lose altitude after passing high terrain or to indicate accurately the distance from an airport. *Station location markers* are similar to fan markers except that the signal radiated is such that aircraft may receive the same indication irrespective of the direction of flight. They are installed at the same location as a radio range to enable a pilot to determine when he is exactly over the station, thus obtaining definite indication of position. Station location markers are installed at most radio range sites.

*Airport and airway surveillance radars* (150 nautical-mile) are in operation at 11 airports for air traffic control purposes. Four additional installations are completed, to be commissioned early in 1961. A 50-mile-range surveillance radar at Gander forms part of a complete ground-controlled approach facility. Another ground-control facility is in operation at Toronto International Airport.

*Instrument landing systems* provide radio signals which, when received by special radio equipment aboard aircraft, permit pilots to approach airports for landing during periods of very low visibility. An installation normally consists of a localizer transmitter providing lateral guidance to the runway, a glide path transmitter for slope guidance to the approach end of the runway, two marker transmitters giving distance indications from the runway and a low-power radiobeacon (compass locator) to assist in holding procedures and lining up on the localizer course. The localizer and marker transmitters operate on very high frequencies, the glide path on ultra high frequencies and the compass locators on low and medium frequencies. Thirty-three instrument landing systems are in operation.

To assist in providing communication between aircraft and ground, *aeronautical radio communications stations* are located at strategic points across the country, including the Arctic. These stations, operating for the most part on high frequencies, provide communication with both domestic and international air carriers. The 13 international communications stations provide coverage from coast to coast as well as over the oceans and form a major contribution on the part of Canada to international aviation. Their functions may be grouped as follows: (1) communication for meteorological services; (2) communication for air traffic control services; and (3) communication for the benefit of airline operating agencies with their aircraft and between their despatch offices.