

and are used by Canadian and foreign air carriers flying over Canadian territory. Six regional offices located at Vancouver, B.C., Edmonton, Alta., Winnipeg, Man., Toronto, Ont., Montreal, Que., and Moncton, N.B., carry out the construction and operation of facilities. Low-frequency radio range stations, located approximately every hundred miles along airways, provide specific track guidance to pilots by means of audible signals which may also be used to obtain direction finding bearings. In addition, radiotelephone communications are available between ground and aircraft, by which means pilots may obtain weather data, air traffic control instructions and other information concerning the safety of flights. Forty very high frequency omni-directional ranges (VOR) are in operation, a type of facility that enables the pilot to select any desired course. The 40 omni-directional ranges have permitted the establishment of VOR airways across Canada and on a number of trans-border routes in co-operation with the United States. Eleven additional installations are under construction.

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 to inform the pilot when he may safely lose altitude or to indicate accurately the distance from an airport. Station location markers, similar to fan markers, are installed at most radio range sites; they enable a pilot to determine when he is exactly over the station.

Airport and airway surveillance radars (150 nautical-mile) are in operation at 16 airports for air traffic control purposes. Precision approach radars are in operation at six major airports. Instrument landing systems (ILS) provide radio signals which 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. Forty-two instrument landing systems are in operation.

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 domestic and international air carriers. Thirteen international communications stations, giving coverage from coast to coast and over the oceans, form a major contribution on the part of Canada to international aviation.

Subsection 6.—Public and Private Commercial Microwave Facilities

Canada, because of its population distribution and the vast areas served by microwave communication links, ranks second highest among the world's users of microwave communications systems on a per capita/per mile basis. Because of an increasing demand for television outlets, it has been necessary to extend microwave routes to provide television interconnections for the CBC English, French or private networks. With the use of more automated equipment by industry and various services, associated data and control information must be transmitted at rapid speeds over microwave radio-relay to wide areas of Canada. This Subsection gives a summary of the facilities existing or under construction at the end of March 1965.

Railways.*—The Telecommunications Departments of the Canadian National and Canadian Pacific Railway Companies have placed in operation a microwave system extending from Montreal to the Pacific Coast, which is used for television, telephone and data relay purposes. The railways also operate microwave facilities which link the Province of Quebec with the Maritime Provinces and Newfoundland. In addition, the Canadian National Telecommunications has installed a microwave system between Alberta and the Yukon Territory which carries telephone and data traffic and serves both civil and military

* See also pp. 826-827.