The Department has six branches, all of which, except the Mines Branch, are engaged in mapping and/or various types of surveying: the Surveys and Mapping Branch carries out geodetic surveys and produces base maps, electoral and other specialized maps and aeronautical charts; the Marine Sciences Branch charts inland waters and carries out oceanic surveys and oceanographic research in Canada's coastal waters and in the deep ocean; the Geological Survey of Canada maps and studies Canada's geology; the Dominion Observatories and the Geological Survey carry out geophysical surveys, and the Geographical Branch is making a physical and economic appraisal of the country.

Requests for topographic, geological, aeromagnetic and other types of mapping are submitted to the Department by other federal departments, provincial governments, private enterprise and the public. In determining its mapping and survey programs, the Department gives attention to the mapping of those areas where national interests are best served, since it is impossible to fill all the requests received. Each of the provinces carries out its own mapping program in line with its capabilities and particular requirements. To avoid duplication of effort, the Department maintains a close liaison with provincial governments and industry. The provision of hydrographic and aeronautical charts is, however, the responsibility of the Federal Government only.

Survey Methods.—The mapping of Canada presents many problems to federal map-makers, the chief being those arising from the great distances to be covered and from access difficulties. In overcoming such problems, they have been greatly assisted in recent years by the use of the aeroplane and the helicopter, the use of air photography, the use of such modern devices as shoran trilateration and such electronic instruments as the geodimeter, the tellurometer and the aerodist, and by the advances made in photogrammetry, i.e., the plotting and compilation of maps and air photographs.

The highly successful combination of fixed wing aircraft and helicopters has made possible the carrying out of economic and accurate surveys in many otherwise inaccessible areas. Another highly successful combination, the helicopter and the tellurometer, has made possible the completion of 200 miles of traverse in one day, and a season's work may now be reckoned in thousands of miles instead of in hundreds. The use of the helicopter has speeded up immensely the geological reconnaissance mapping of Canada's northland and its mountainous areas, so much so that the Geological Survey expects to complete this type of mapping by 1970 instead of a few generations hence as thought previous to 1952, when the helicopter was first used for aerial geological mapping.

More recently, the addition of the aerodist, the latest development in electronic distance-measuring instruments, has facilitated the establishment of topographic survey control, from the air, over muskeg and densely wooded country. In a trial project in 1963, a topographical party in northwestern Ontario established survey control for 37,000 sq. miles of territory on a scale of 1/50,000, or approximately one mile to the inch, in a matter of 7½ days. Such a project, by conventional methods, would have taken a year to complete on not-too-difficult terrain, and years of effort on this particular terrain.

Air photography, the forerunner of all mapping, has speeded up immeasurably the process of mapping. With the exception of some 40,000 sq. miles in northeastern Quebec and northern Labrador, Canada (including the Arctic Archipelago) has been completely covered with vertical air photography, suitable for small-scale mapping. Many areas must now be mapped at larger scales for development and other purposes and to meet specialized needs. This will require some up-to-date large-scale photography and periodic rephotography for revision purposes.

One of the greatest innovations in base mapping has been the development of photogrammetry, the science of obtaining reliable measurements of objects from the aerial photography of these objects. Before photogrammetry was used in mapping, all objects had to be positioned and their heights measured on the ground. With photogrammetry, costly time in the field has been greatly reduced and much of the detailed work can be