Mechanical Engineering.—Although this Division of the National Research Council is concerned broadly with problems in mechanical engineering, the form of current developments in Canada naturally requires a reasonably sharp specialization within this broad field. Despite pressure in the engineering world for immediate results, it is essential that this type of work be supported by a substantial foundation of general research.

In the present vigorous stage of engineering development in Canada, the general work of the Division is being related to the thermodynamic aspects of engineering production by conventional machinery and by application of fluid mechanical principles to the generation of extreme temperatures in high pressure gases. In support of the human contribution to higher productivity, the other general body of work relates to the behaviour of the human operator—his dexterity and capability and the effects on his performance of fatigue, lack of sleep, and alcohol. The more specific activities of the Division are related to processes of production and to transportation.

Production.—The primary production activities of the Division are comparatively recent and pertain to the development of instrumentation for assisting in the refining of copper. This work is supplemented in the metallurgical field by the modelling, by computer techniques, of the refining processes for steel production.

In the manufacturing aspects of mechanical engineering, the Division has long been active in the solution of problems—both thermodynamic and mechanical—of the different kinds of heat engines and is concentrating on matters particularly pertaining to diesel engines and gas turbines. It is introducing in its Experimental Shops improvements and refinements in a number of manufacturing processes, such as the precision grinding of gearing, electrodischarge machining, and electrochemical machining, which experimental work may prove of interest and use to various manufacturers. As a subsidiary part of the work on manufacturing techniques, the Division has in hand a substantial body of development work related to the improvement of surgical instruments and apparatus, the first of which is now going into commercial production.

Transportation.—Because the dimensions, topography and trade pattern of Canada render all forms of transportation of primary consequence to the economic and social well-being of the country, there has been, for a number of years, substantial research activity in this direction. The land transport work has arisen from problems with urban bus systems and from problems (mostly mechanical) arising from railway operations. Programs are under way or completed relating to the operation of diesel locomotives on a wider range of fuels, to the improvement of air brake operation in winter, to the braking and running smoothness of long trains, and, recently, to the improvement of remote switching necessary for Central Traffic Control.

In the area of sea transport, the Division is concerned with ship design and canal and harbour facilities arrangements. In the former category, a steady procession of new designs passes through the Ship Laboratory for investigation of hull lines, propeller design, steering and rough water characteristics, supplemented by a program of work at sea on the stresses on ships due to running in rough water. Regarding the improvement of harbours, work is vigorously under way on a model of the St. Lawrence River extending from Montreal to Father Point, the object of which is to lend the maximum possible scientific impetus to the development of the Port of Montreal.

In the field of air transport, the problem confronting Canadian manufacturers is the selection of types of aircraft which can be sold in sufficient numbers in world markets to justify the development costs. Although there is always doubt concerning the best course of action to be followed in this type of venture, the activities of the Division are being concentrated on acquiring a reasonably wide-based and intimate knowledge of the possible machinery arrangements for civil vertical take-off aircraft, which are believed to represent one of the great aeronautical opportunities of the future in both rural and inter-urban types of operation.