

**Mechanical Engineering.**—This Division works mainly in the fields of mechanics, hydrodynamics (hydraulic engineering and naval architecture) and thermodynamics. Extensive work is undertaken for a variety of industries and for government departments. Problems of improving Canadian transport facilities and equipment receive much attention.

With investigations for the St. Lawrence Seaway largely completed, it has been possible to devote more time to harbour improvements for a number of Canadian ports, notably Saint John and Port Cartier. In the ship laboratory, detailed studies were made of propeller, rudder and hull design and performance; full-scale sea trials were carried out for three vessel types. Preliminary studies are under way on improving winter navigation by water.

Rail transport studies include projects on diesel and gas turbine locomotives and improvements in rolling-stock. In the air transport field, several laboratories of the Division and of the National Aeronautical Establishment are engaged in developing new aircraft for short and vertical take-off and landing. Such aircraft would be extremely useful for both commercial and military purposes, particularly in undeveloped areas. Work has continued on anti-icing of turbojet and turboprop engines and helicopter rotor blades, and a variety of complicated instrumentation and control system problems. Possible use of ozone as the oxidant in rocket propellant combinations is being investigated.

New facilities include laboratories for instrument and petroleum qualification. A calibration machine of 100,000-lb. range, intended as a national standard of force, has been installed.

**National Aeronautical Establishment.**—The National Aeronautical Establishment, comprising the aeronautical, flight and structural activities of the Division of Mechanical Engineering, was formed as a separate NRC Division effective Jan. 1, 1959. The research program involves problems of high and low speed aerodynamics. Various aspects of short and vertical take-off and landing and civil aviation problems such as runway roughness, air traffic control and airport lighting, are being investigated.

Several projects involve fatigue and fail-safe design of aircraft components and mechanical systems. A study has begun of non-metallic structural materials resistant to very high temperatures.

Construction is under way of a new tri-sonic wind tunnel for aerodynamic research with a speed range up to a Mach Number about 4.5, which will greatly increase the Division's capacity for aerodynamic research. The tunnel is an extremely advanced piece of equipment, comparing favourably with similar tunnels anywhere in the world.

**Radio and Electrical Engineering.**—About half of the Division's work consists of defence projects and the remainder is devoted to fundamental research and engineering development in electronics, electrical engineering and radiophysics. Applications of interest to Canadian industry receive special attention.

Work has continued on the application of electronic circuitry to electronic aids to navigation in a trend toward unattended operation of remote equipment such as shore lights, resulting in simplification of equipment and greatly reduced operating costs. A project is under way aimed at unattended operation of the Sable Island West Lighthouse, using daylight-controlled acetylene valves.

In the field of medical electronics, useful devices have been put into operation for the remote monitoring of blood-pressure and heart-rate during operations, with cathode-ray tube display of these phenomena. Another useful device is for monitoring venous pressure, and controlling the pumping rate of the venous bypass pump, in heart-lung bypass procedures. An infrared scanner, producing a film record of body temperature distribution in about three minutes, was developed to assist in the thermal investigation of breast cancer.