

and control, the development of a crash position indicator for locating crashed aircraft, atmospheric physics, and anti-submarine magnetometry.

A growing and highly diversified program of assistance to smaller industries is developing, the work relating mainly to product development, improvement or testing. Concerning aircraft utilization, efforts have been directed toward those areas of national activity where aerial methods might offer economies in cost or improvements in effectiveness, such as agricultural applications, forest fire fighting, aerial logging, high sensitivity magnetic surveys, precipitation physics, and studies of atmospheric turbulence.

The Radio and Electrical Engineering Division undertakes engineering projects of interest to Canadian industry and fundamental research in electrical science. The engineering program in the high-voltage field includes studies of corona loss and radio interference from direct-current transmission lines, and the development of current comparators for very accurate measurement of current and voltage ratios. An effort is being made to develop accurate tests of the lifetime of solid dielectrics used as insulation in high-voltage cables and components. The high-frequency laboratory is responsible for maintaining the national standards of RF power, voltage, impedance and attenuation and has recently participated in an international intercomparison of these standards. Assistance is given to industry in the design, production and evaluation of new equipment, and in the solution of such problems as the design of antennas and of microwave film and paper dryers and moisture sensors. Many devices are now in commercial production.

In the field of bio-medical engineering, new techniques in electrocardiography and echoencephalography have been developed, a study of cardiac stimulation thresholds is under way and instruments that will contribute toward the rehabilitation of handicapped persons have been produced. The Division has co-operated with members of the medical profession in the establishment of safety standards in the use of electronic equipment in hospitals for treatment and diagnosis.

Much of the research effort in the computer laboratories of the Division is concentrated on the problem of communication between man and computer. Computer graphics techniques have been adapted to provide a versatile tool for the film animator and for the composer of music. Problems arising in computer-aided learning systems are being investigated, and a touch-sensitive screen has been designed and patented, an extremely flexible input device that permits an untrained person to communicate effectively with a computer. Special data recording and analyzing systems have been developed to suit widely varying scientific programs.

Fundamental research is carried out in solid state physics, wave propagation, quantum electronics, and the behaviour of particles at ultra-high vacuum. Patents have been issued recently on a ruby laser which is self-Q-switched, and on a thermal transpiration vacuum pump.

The Astrophysics Branch of the Division is responsible for the operation of three major astronomical facilities, as well as a number of smaller observatories and observing stations throughout the country. Optical studies of stars and other celestial bodies are undertaken at the Dominion Astrophysical Observatory at Victoria, BC. The major instruments of this observatory are reflecting telescopes of 72-inch and 48-inch aperture equipped with powerful spectrographs. The Algonquin Radio Observatory in Ontario is equipped with a variety of instruments, the major one being a powerful 150-foot (46-meter) parabolic telescope. Facilities at the Dominion Radio Astrophysical Observatory in British Columbia include telescopes for low-frequency observations and for studies of neutral hydrogen in interstellar space.

Observations of radio solar emissions are made at both the Algonquin Radio Observatory and the Dominion Radio Astrophysical Observatory, and optical studies are carried out at the Ottawa River Solar Observatory near Ottawa. Other fields of research include the study of meteors and meteoric phenomena by optical and radar methods and from rockets and study of the physics of the upper atmosphere and the aurora.

The Space Research Facilities Branch develops and provides facilities to meet the needs of the upper atmosphere and space research programs of Canadian scientists in universities and government agencies. At present, its work is restricted primarily to the use of sounding rockets. The major launching site is the Churchill Research Range, a Canadian facility operated for the