crops, as well as various type of forests or different forms of urban development.

The Canada Centre for Remote Sensing has two main operational programs, the earth resources technology satellite program known as ERTS, and an airborne remote sensing program using four aircraft equipped with various types of sensors. It also funds the development of novel sensors for specific applications.

The ERTS satellite is owned and operated by NASA, and circles the earth at a height of 500 miles in a polar orbit fixed in space, while the earth rotates underneath it. It uses a multispectral scanner which continuously scans the earth's surface under the satellite in a 100 mile swath. It takes 18 days to scan the whole earth in each of the four spectral bands: blue-green, red, and two bands in the near infrared. There are four orbits a day over Canada producing about 65 scenes, each scene covering 10,000 square miles in area.

Canada negotiated a special agreement with the United States three and a half years ago whereby we read out and disseminate the date for Canada from a satellite receiving station situated in Prince Albert, Saskatchewan. In order to do this, the Canada Centre designed and had built a ground data handling centre for converting the satellite signals into images for sale to government, university and industry users as well as for the public in general. There are about 1,000 regular customers throughout Canada.

One of the most important users of ERTS imagery is Ice Central of the Atmospheric Environment Service, Department of the Environment. Quick look pictures are sent by facsimile from Prince Albert to Ice Central in Ottawa, where information on Arctic and Labrador Sea-ice is extracted, added to other information from ice reconnaissance aircraft, and then sent to Arctic shipping in the form of charts. Such timely information saves the Canadian ice breakers and shipping companies several millions of dollars a year in transit time to and from Arctic ports. Looking at the first item in the estimates of some $7 million a year, at first glance one would not think it had a direct effect on shipping in the Arctic, but it does.

Foresters find important applications in their work. The multispectral feature of the ERTS sensor allows them to categorize and map different forest types in a matter of days rather than months. The ERTS imagery saves the provinces many thousands of survey dollars a year in assessing damage done by fires. Outbreaks of forest infestation such as spruce budworm are being detected and monitored with ERTS data. Pulp and paper companies and provincial governments use ERTS to measure yearly cuttings.

One of the most promising applications of ERTS is to use the data, along with meteorological satellite date, in a world crop early warning information system. Henry Kissinger announced the United States intention at the World Food Conference in Rome last fall to investigate the feasibility of such a program. A team of Canadian officials went to Washington to confer with NASA and the U.S. Department of Agriculture on means of carrying out a test for North America during the next growing season. If it is successful, an attempt will be made, in co-operation with the FAO, to develop a world-wide crop information system. The World Food Conference passed a resolution recommending some kind of early warning system on potential food shortages and famine areas to avoid last minute crises such as exist in the Sahile area of Africa and in India and Bangladesh. Such a system, if set up on an operational basis, should also give a measure of long term climatic changes as predicted by some scientists.

Land use and land classification is an important application of both the airborne and ERTS programs. The digital form of the data stored on magnetic tapes makes possible rapid and accurate analysis by computer, rather than having to rely on the slower and subjective visual analysis of conventional photo interpreters. With a special computer analysing device known as "Image 100", it is possible to use a computer to categorize land use into eight different sub-divisions custom-picked by the interpreter. An ERTS image 100 x 100 miles, covering an area of 10,000 square miles, can be categorized and mapped in 48 hours whereas conventional techniques took months and sometimes years to produce a published map. Since the system is interactive, ground truth information can be easily integrated into the product to ensure the accuracy of the interpretation.

A co-operative program is now being developed with the Canada Land Inventory for updating their present maps and extending the program into the unmapped northern areas of Canada. Such an accelerated program is desperately needed by planners for the multiple use planning of lands, whether for agriculture, urban use, the development of transportation corridors, parks and so on.

Although ERTS is primarily aimed at the land, it does have application to the fresh water inventory of Canada and to oceanography. For example, it is possible, using ERTS data and the "Image 100" system, to accurately and instantaneously measure the total surface water area in any 100 x 100 mile ERTS scene. This could be done three or four times a year in each drainage basin to monitor flooding, water supply, and to predict run-off. Such information is invaluable to hydrologists and power companies in the management of water resources. The snow cover on the land and the area of melting snow can also be measured and monitored in a similar manner.

In the Great Lakes, scientists of the Canada Centre for Inland Waters at Burlington and the Ontario Water Resource Commission use remote sensing to monitor the chlorophyll content and the turbidity of the water. The chlorophyll content is a measure of the state of eutrophication of the lakes. Information on the turbidity gives advance warning as to where dredging and shore erosion control is necessary.

Aircraft from the Canada Centre for Remote Sensing, at the request of the CCIW, Environment Canada, survey the Great Lakes several times a year with an infrared line scanner to map and measure the thermal plumes emanating from nuclear power plants, oil refineries, and other industrial plants. This information helps to monitor the number of calories of heat per day that are dumped into the lakes.

● (2020)

The Airborne Division of CCRS offers a service to users across Canada, both government and private, with a variety of sensors and aircraft. Each user pays for the flying