Canada's First Space Satellite

THE CANADIAN satellite called "Alouette", launched from California on September 28, 1962, as part of the international Topside Sounder Programme, became the first spacecraft completely designed and built by a nation other than the United States and the Soviet Union to be placed in orbit round the earth. Built by civilian scientists of the Defence Research Telecommunications Establishment at Shirley Bay near Ottawa, the 320-lb. satellite is circling the earth at a distance of 630-650 miles, in near polar orbit, every 105 minutes. It uses radio-sounding techniques to probe the upper regions of the ionosphere and then transmits the reflected signals by telemetry to ground monitoring stations. The signals recorded by the ground stations on magnetic tape are then transmitted to the DRTE data centre at Ottawa for processing and interpretation. The information gained is expected to increase knowledge of the composition of and disturbances in the ionosphere. These affect transmission of radio messages, especially in far northern latitudes.

The Defence Research Telecommunications Establishment, a laboratory of the Defence Research Board, has been investigating radio-transmission problems since the establishment of the Board in 1947. Radio communications in far northern latitudes are affected, and at times disrupted, by disturbances in the ionosphere that affect its reflecting properties. The ionosphere is a region of the upper atmosphere, ranging in height from about 50 to about 1000 miles, in which ultraviolet radiation from the sun splits neutral air particles into electrically-charged ions and electrons, thus creating an electrical conductor that serves as a reflecting mirror for radio waves. Reflection of a particular radio wave-length is accomplished only if the electrons are numerous enough to act as a barrier that will bounce them back.

When the ionosphere becomes disturbed following solar storms or other phenomena associated with the sun, its reflecting properties lessen or disappear temporarily. An unusual feature of the polar and subpolar ionosphere is caused by seasonal variations of the polar atmosphere's solar illumination — continuous daylight in summer and continuous night during the winter. A second feature of the ionosphere at high latitudes involves effects on ionization created by charged solar particles, which apparently cause the auroral zones. Perhaps the worst ionospheric condition, from the point of view of communications, is the so-called "polar blackout". During such occurrences, reflections cannot be obtained from the ionosphere and the result is a complete cessation of radio sky-wave transmission at high frequencies owing to absorption in the D-region.

For some years, Canadian scientists have been investigating these far northern disturbances of the ionosphere by ground-based "bottomside" radio-sounding techniques. These could not penetrate through the ionosphere. Hence consider-