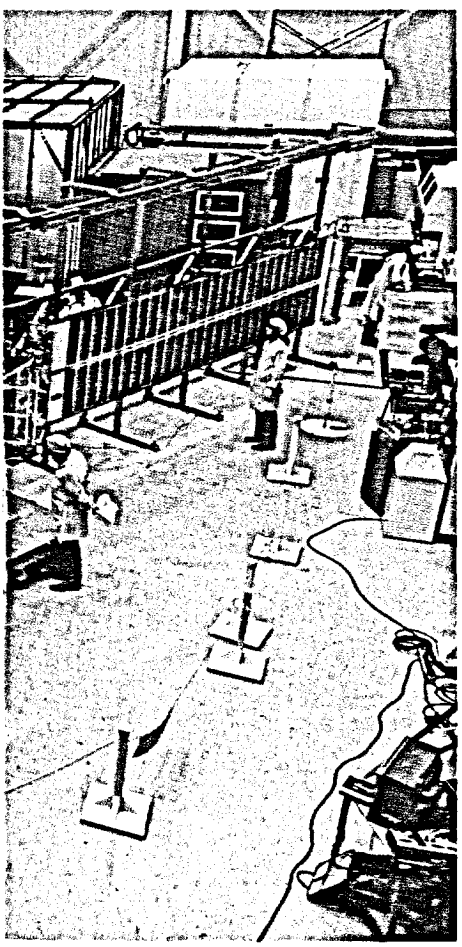
ISIS II, a research satellite, launched in 1971, is still operating.

Hermes spacecraft during solar array deployment tests at the David Florida Laboratory, Communications Research Centre, Department of Communications near Ottawa.



Canada began its satellite program with a series of four research spacecraft that studied the ionosphere, the layer of the upper atmosphere which contains electrically charged atomic particles that affect long-distance radio transmission. The research satellites were followed by the Communications Technology Satellite, later named Hermes, which revolutionized space communications by proving that spacecraft could operate effectively at higher powers and higher frequencies than existing systems.

Alouette I

For Canada, a better understanding of the ionosphere was thought to be the key to bringing improved and dependable radio communications to the people of the far North. Ionospheric disturbances there, often visible as the aurora borealis (northern lights), make long-range radio communications difficult and sometimes impossible.

Alouette I, Canada's first satellite, was launched by the US National Aeronautics and Space Administration (NASA) in September 1962 and operated for ten years. It carried out four types of measurement, including sounding of the ionosphere with radio waves. Alouette I produced considerable data about the upper section of the ionosphere, including geographic details and information about the daily, seasonal and longer-term variations in that part of the atmosphere.

ISIS

The success of Alouette I led to an agreement between the United States and Canada to build and launch a series of International Satellites for Ionospheric Studies (ISIS). Canada designed, developed and constructed the spacecraft; the United States launched them.

Alouette II, originally intended as a back-up in case Alouette I failed, was modified to improve its performance, rebuilt and became the first of the ISIS series. It was launched in November 1965 and was used to perform experiments for almost ten years. Two far more sophisticated satellites followed. ISIS I, launched in January 1969, and ISIS II, launched in April 1971, are still operating today.

The broad aim of the ISIS program was to make a comprehensive study of the upper section of the ionosphere. Alouette II and the two ISIS spacecraft provided valuable data about the ionosphere throughout a complete 11-year solar cycle. (Changing levels of solar activity cause significant variations in the ionosphere.) Two new instruments on ISIS II enabled scientists to piece together the first pictures of the aurora borealis as seen from above. Interpretation of these data led to a better understanding of the effects of the ionosphere on communications.

Another ISIS research satellite was planned, but in 1969 the Canadian government decided to redirect its space activities. Space technology had advanced to the stage where we could begin to apply our knowledge to establish a much-needed domestic communications satellite system. On September 1, 1969 Parliament passed an act incorporating Telesat Canada, the world's first domestic communications satellite company. But even as the commercial Telesat network was being developed, planning for a new type of experimental satellite was beginning. In 1970, the Communications Technology Satellite project started.

Hermes *(Communications Technology Satellite)*

In January 1976, the Communications Technology Satellite, later known as Hermes, was launched. It was and will continue to be one of the milestones in Canadian space history. Hermes' innovations set a new course for domestic satellite communications systems in Canada and have had implications throughout the world. Experiments with the satellite paved the way for many now-common commercial services, including:

- 'tele-education';
- 'telehealth';
- direct broadcasting by satellite to individual homes (DBS);
- integrated digital telecommunications.

Despite the fact that some of these applications are carried by terrestrial networks (there is no commercial satellite telehealth system yet, for example), the Hermes experiments were undoubtedly the catalyst for these services.

One of the primary objectives of Hermes was to test a system that used the super high frequency 14/12 GHz bands—reception of signals at about 14 thousand million cycles per second (14 gigahertz) and transmission back to Earth at about 12 GHz. These frequencies are reserved for satellite communications, unlike the 6/4 GHz bands used by previous satellites—and by the ground networks that carry telephone and other telecommunications traffic. By using 14/12 GHz, Hermes eliminated interference with ground-based transmissions and so could use earth stations with dish antennas measuring