launch. It has two channels, each of which can cover a ground area approximately 965 kilometres wide.

The HERMES design centres around three major advanced technology subsystems:

(1) NASA's 12GH$_z$ TRAVELLING WAVE TUBE (TWT) AMPLIFIER delivers output power of 200 watts at approximately 50 per cent efficiency. Tubes in conventional satellites deliver roughly 6 watts at 30 per cent efficiency.

(2) A pair of lightweight DEPLOYABLE SOLAR ARRAYS (sails), studded with 27,000 solar power cells, provide 1.2 kilowatts of power to the spacecraft. The solar arrays were stowed accordion-style inside the spacecraft during launch and unfurled once the satellite was on station. Extended, each is roughly three times as long as the diameter of the spacecraft body. Their total span is 16.5 metres. Each extended sail has a sensor that controls a drive mechanism and enables the sail to track the sun.

(3) A THREE-AXIS STABILIZATION SYSTEM keeps the satellite fixed with its antennas pointed earthward (within 0.2 of a degree of variation). The solar sails independently track the sun. Conventional satellites are spin-stabilized.

The earth segment of the HERMES program is as important as the satellite. Small, moderately-expensive earth terminals function near the users. There are 18 stations with one- and two-metre antennas and two self-contained, transportable stations with three-metre antennas. HERMES's high power transmission can also send colour television to simple, low-cost ground receivers. The smaller stations receive audio broadcasting and occasionally television, as well as two-way voice communications. The larger terminals transmit and receive television, voice and data.

HERMES EXPERIMENTS

Canada and the United States began their original program of 46 experiments in April 1976. They use the satellite on alternating days. In Canada, 20 organizations have conducted 12 technical and 14 social experiments. Universities, industries, broadcasters, native associations and federal and provincial governments have worked in such areas as telemedicine, tele-education, community interaction and administrative services. Because the satellite is functioning beyond its expected life, some of the experiments are continuing and new ones have been added.

Technical experiments include those by Telesat and Bell Canada designed to evaluate the transmission capabilities, ground-station portability, reliability and maintenance requirements of advanced technology satellites. The Communications Research Centre has tested the performance of small earth terminals in order to help plan future systems.

The Canadian Broadcasting Corporation (CBC) has investigated broadcast-signal reception in large cities. HERMES's higher frequency band permits interference-free satellite communications directly to and from a metropolitan centre. Small receiving antennas can be located, for example, on the roofs of buildings. This reduces costs by eliminating the need for terrestrial relays to and from earth stations located away from major population centres. The CBC also tested HERMES's technical suitability for expanding radio services in small communities.

L'Institut de Recherche of Hydro Québec employed the HERMES system for precise control of remote power stations in northern Québec. It used telephone data transmission to synchronize clocks within 20 microseconds. According to Dr. Pierre Girard, the institute's program director, this level of precision is particularly significant in the event of a power failure. It allows the exact sequence of events — before and after the failure — to be recorded within a millisecond. Dr. Girard also foresees using satellites to communicate with temporary remote locations during such projects as constructing dams and installing new lines.

TELEMEDICINE

The goal of the HERMES telemedicine pilot projects is to improve the efficiency and capability of the overall Canadian health care system, particularly in remote locations.

Medical staff from Queens University and the University of Western Ontario make consulting visits to Moose Factory General Hospital, but specialists, such as neurologists, rarely go. A University of Western Ontario HERMES experiment made instant consultation possible by linking the London, Ontario, Health Science Centre to the Moose Factory hospital, as well as to the Kashechewan Nursing Station on James Bay. Experiments with transmitting x-ray images allowed doctors in London to diagnose a gastric ulcer using television fluoroscopy. Dr. Lewis S. Carey, a professor at the University of Western Ontario, reported, "It was the first time, to my knowledge, that such a diagnosis has been made by satellite." In another instance, a neurologist in London diagnosed and prescribed treatment for a public health nurse in Moose Factory, 1,125 kilometres away. The nurse had been reluctant to take the time to go south to see a specialist. The remote diagnosis determined that the problem was not neurological, and minor surgery at Moose Factory corrected it.

Memorial University of Newfoundland broadcast a continuing medical education program for doctors, nurses and teachers and conducted community health programs in four remote hospitals—St. Anthony and Stephenville on the island and Labrador City and Goose Bay in Labrador.

With the HERMES satellite, the continuing education project went beyond services available with educational television. It provided instruction via one-way video transmission, plus student involvement through two-way audio channels. "The ability to interact with a tutor is the essence of a good education program," according to Dr. M. House, a professor and assistant dean at Memorial University Hospital. The community health programs featured communication among remote locations over a "giant party line". A resource group consisting of a nutritionist, a dietician, a physician and a social worker led discussions on such topics as juvenile diabetes and pre-natal care. "Tele-visits" allowed patients in St. John's to see and speak to relatives and friends in remote areas.

The Memorial University projects demonstrated the emotional as well as the educational value of satellite communications. Dr. William Squires, of Stephenville, noted that the education program allowed physicians in the larger centre to keep in touch with the medical problems at the periphery and eliminated his need to regularly spend several days at the urban medical centre for continuing education. For Mrs. Pat