Online Journal of Space Communication

Volume 2
Issue 4 *Satellite Communication in Canada (Spring 2003)*

Article 9

May 2021

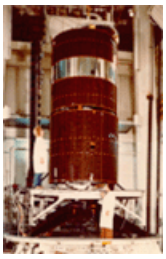
Historical Development: Anik C through F Systems (and Nimiq)

Paul Bush

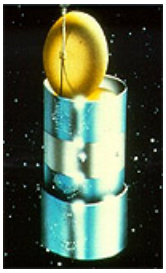
Anik C through F Systems (and Nimiq)

Systems/Applications/Markets

The Anik C and D Series



In April 1978, Telesat awarded a contract to Hughes Aircraft Company of Los Angeles for the construction of the Anik C satellites. Four Canadian subcontractors-Spar Aerospace, Toronto; SED Systems, Saskatoon; COM DEV Ltd., Montreal; and Fleet Industries of Fort Erie-were the major Canadian subcontractors and were to provide Canadian- supplied goods and services equal to approximately 40 per cent of the value of the Anik C contract.



The following year, a procurement agreement for the Anik D series of satellites was awarded to a Canadian prime contractor, Spar Aerospace Limited of Toronto.

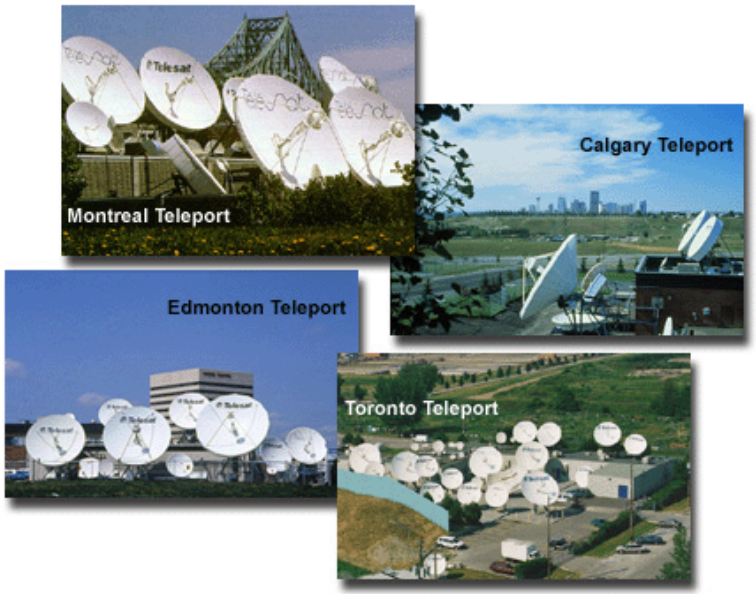
Telesat's Anik C series comprised three 16-channel spacecraft operating in the 14/12 GHz frequency band. Each channel carried two simultaneous colour television programs and their associated audio signals or their equivalent in telephone circuits. The Anik C satellites' spot beam antennas illuminated four contiguous regions extending from the Pacific to the Atlantic coasts and between the U.S. border and the 60th parallel. By slightly tilting the Anik C antennas, and in some cases by increasing the size of the receiving antennas, the Anik C footprint could be extended high into the Canadian Arctic.

Telesat's Anik C3 was placed in orbit in November 1982 by the US space shuttle Columbia. A second satellite in the same series, Anik C2, was launched in June 1983 and a third, Anik C1, was launched in April 1985.

Telesat's Anik D satellite series comprised two 24-channel spacecraft operating in the 6/4 GHz frequency band. Anik D1 was launched on 26 August 1982, replacing the aging Anik A and B satellites. Anik D2 was placed in orbit by the US space shuttle Discovery in November 1984.

In 1981, Telesat's "carrier's carrier" role had been modified by its regulator to allow the Company to market services directly to broadcasting undertakings. This was followed by the relaxation of regulations allowing private ownership of satellite earth stations, allowing the concept of satellite-to-cable or satellite-to-home distribution to blossom. By 1983, this concept had been further developed, with the introduction of Pay Television in Canada using the newly-launched Anik C satellites, which provided Ku-band service on a commercial basis. As a result, by the end of 1983, a full complement of Canadian programming was available on Telesat satellites: the CBC, educational networks, Pay TV services, and Canadian independent stations. The use of Ku-band satellite TV transportable earth stations developed into a flourishing business.

In 1984, Telesat introduced the teleport concept which would first be applied to carry the new Canadian specialty services. Given the developing market for the uplinking of television programming from major centres, Telesat developed an infrastructure of teleports (major earth station facilities within an urban centre) with the first such facility in Toronto. The Toronto Teleport began carrying the new specialty services in September 1984. The teleport network was later expanded to include Montreal, Edmonton, Calgary, Vancouver, Ottawa, Iqaluit and Halifax. Encryption services were introduced to protect the specialty signals from unauthorized reception.



Telesat developed and launched a new service for the radio market, named RadioNet, in 1985. This service provided low-cost, satellite-based networking capability that would have a significant impact on radio broadcasting in Canada. By 1986, the CKO radio network had implemented an all-news national radio network with stations in every major city across the country, all linked together by means of RadioNet.

A few years later, Telesat customer Novanet launched a service to provide audio and data distribution services from the Toronto Teleport. Through this satellite network, news and program syndication services are furnished to individual radio stations across the country, marking a major change in the way radio stations operate.

Telesat had now turned its attention to data service offerings. In 1986, the Company established Anikom 1000, a nationally available T-1 carrier service, designed to provide high-capacity digital data streams for businesses and government. The following year, Telesat introduced Anikom 500 which extended the benefits of satellite data transmission to lower volume private network users requiring speeds between 56 and 512 kilobits per second (kbps).

Also in 1987, Telesat unveiled Anikom 200-a revolutionary data service using Very Small Aperture Terminal (VSAT) earth stations, that provided two-way interactive data transmission at speeds of up to 64 kilobits per second. Direct installation on customer premises provided Anikom 200 users with a competitive alternative to terrestrial facilities, avoiding local loop bottlenecks, extra costs and provisioning delays. The low cost, small size and dependability of VSATs made satellite communications practical for both large and small organizations.

HDTV Mobile Production Facility

As part of Telesat's continued support of new technology development, the Company began its Advanced Television Experimental Program in 1989. Advanced Television (or High Definition Television) was, and still is, seen as a technology relying heavily on satellite distribution for its success.

In order to foster its development, Telesat constructed the world's first mobile High Definition Television (HDTV) production facility. With a series of HDTV events and demonstrations, Telesat was in the forefront of the development of this new technology.

The Anik E Series

The next series of commercial communications satellites were the Anik E's, built by Canada's Spar Aerospace Limited. Anik E2 was launched in April 1991 and E1 was launched in September 1991. The Anik E satellites are a high power dual band design with 24 channels in the 6/4 GHz band and 16 channels in the 14/12 GHz band. The Ku-band transponders are three times more powerful than those of the Anik C's. Additional Ku-band features include optional Canada-wide coverage to service Canadian customers with connections in the U.S., and a secure command system for government services. The Anik E's were deployed to replace both the Anik C and Anik D satellites.

The successful launch of the Anik E satellites had ushered in a new era for Canadian satellite telecommunications. With these high-powered satellites, and through the use of new satellite technologies, Canadian consumers had at their disposal a wide array of new business, information and entertainment services.

The most important of these new satellite technologies was Digital Video Compression, and in 1992 Telesat initiated North America's first field trials with Canadian program providers. This new technology opened the doors for new Canadian broadcast services, as transmission efficiencies increased and costs were lowered. Telesat also implemented the first technology trials to determine the earth station antenna size required for DTH reception of digitally compressed programming services.

Then, on January 20th, 1994, Telesat was faced with one of the most difficult tests of its expertise. A solar storm had simultaneously hit both the Anik E1 and Anik E2 satellites, stationed 2,800 km away from each other over the equator. A unique set of events resulted in momentum wheel failures aboard both spacecraft. Although E1 was quickly restored to service by switching to its back-up momentum wheel, Anik E2 had suffered dual wheel failures and there was no way to stabilize the direction in which its antenna pointed. However, within five months Telesat engineers had developed and implemented a sophisticated Ground Loop Attitude Control System, which successfully restored E2 to full operation… confirming the Company's position as a world leader in satellite communications and systems management.

With this ordeal now behind the Company, Telesat was able to re-focus on its Direct-to-Home efforts, an area that the Company had first began exploring a decade earlier and had, in fact, submitted its first Direct Broadcast Satellite (DBS) proposal to the federal Department of Communications in January 1984. Telesat believed a programming package could be placed on the Anik E2 satellite to reach

Canadians in under-served areas. Regulatory issues and space segment capacity had now become the major roadblocks.

Then, on March 26th, 1996, the Anik E1 satellite experienced a short circuit in its south array power system-disconnecting the power supply between the array and the payload. The satellite's total power was reduced by 50 per cent, thereby reducing its available channel capacity. This event not only further impacted the Company's DBS and DTH service provisioning plans, but also prompted a study into an early Anik F program.

The Nimiq Series Direct Broadcast Satellites

In April 1997, the Canadian government approved Telesat's new proposal to build a new, high-powered DBS satellite to operate in Canada's 91-degree WL orbital position. Telesat awarded a contract to Lockheed Martin Corporation to deliver the 32 channel Ku-band satellite in orbit by November 1998.

In the tradition set in 1969-when the Department of Communications selected "Anik", which means "brother" in the language of the Inuit, to name Canada's first communications satellite-Telesat launched a national contest to name the nation's first direct broadcast satellite. The winning entry, one of 40,000 suggestions received from coast to coast, was submitted by a physiotherapist from Nepean, Ontario. The selected name, "Nimiq", also from the Inuit language, is a word used to describe any object or force that unites things or binds them together.

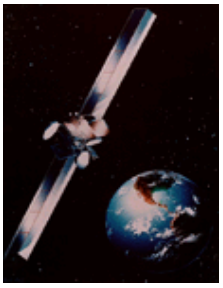
Following delays in construction, Nimiq 1 finally launched on May 21st, 1999, aboard a Proton rocket from the Baikonur Cosmodrome in Kazakhstan. Hundreds of channels of direct-to-home satellite television could now be offered to Canadians from coast to coast, dramatically expanding the frontiers of home entertainment.

In June 2001, Telesat signed again with Lockheed Martin Commercial Space Systems for construction of the Nimiq 2 satellite. Launched in December 2002, Nimiq 2 will provide continuity of service and a platform for growth.

Anik F Series

Telesat already had its plans in place by February 1997, when the World Trade Organization (WTO), consisting of 68 countries including Canada, reached agreement on a significant pact to liberalize global trade in telecommunications services. The agreement called to end Telesat's Fixed Satellite Services monopoly on the provision of domestic and cross-border traffic on March 1st, 2000, while providing the Company with access to the U.S. market.

In March 1998, following the federal government's agreement to allocate two orbital slots to Telesat, the Company authorized Hughes Space & Communications International to proceed with the construction of the Anik F1 communications satellite. By the end of 1998, the majority of North American capacity on Anik F1 had been pre-sold, two years before launch-illustrating the growing market demand for high-quality satellite communications services.



Anik F1 is a 15-kilowatt HS 702 model spacecraft, equipped with 84 communications channels of which 32 operate on the Ku Band and 24 on the C-band for North America; the remaining 16 Ku Band and 12 C band channels serve South America. Telesat's next generation and sixth series of FSS satellites, F1 was

launched on an Ariane rocket from the Guiana Space Centre in Kourou, French Guiana, on November 21st, 2000.

In April 2000, Telesat authorized Hughes Space & Communications International to proceed with the construction of the Anik F2 satellite. Meanwhile, Telesat and industry partners COM DEV of Cambridge, Ontario and EMS Technologies of Ste. Anne De Bellevue, Quebec, joined the Canadian Space Agency in announcing a $109 million initiative to bring satellite multimedia services to Canadians via a state-of-the-art digital payload on board the Anik F2 satellite, scheduled for launch in the latter half of 2003.

Anik F2 will commercialize the use of the Ka band, making it ideal for the delivery of multimedia services such as high-speed Internet, tele-medicine, tele-learning, tele-working and e-commerce. Anik F2 is a triple band, body stabilized, high power communications spacecraft, designed to provide a 15 year service life. It will cover the North American continent, using a Boeing 702 high power service module. The Anik F2 communications subsystem consists of a C-band, Ku-band and a Ka-band payload. There are 24 C-band channels and 32 Ku-band channels. The 38 active Ka-band channels also provide North American coverage, employing 45 small spot beams and 6 Gateways. The Ka-band payload will include a demonstration on-board processor providing a flexible channel allocation capability. The C- and Ku-band payloads will replace existing capacity of the Anik E satellite when they reach the end of their service lives.

In June of 2001, the Government of Canada approved Telesat's proposal to design, build and launch Anik F3-to deliver a wide range of telecommunications, broadcasting and Internet services to Canadians from coast to coast-from Canada's orbital position at 118.7 degrees West. As part of the proposal, Telesat

will make two channels on the new satellite available - at no cost - for the federal government to use to serve public institutions in remote and/or underserved areas of Canada. For example, the two channels, or transponders, would be able to provide enhanced multimedia connections to hundreds of remote communities. Construction has not yet commenced on the F3 satellite.