MSAT News
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MSAT contract awarded to Spar

Pierre Cadieux, Solicitor General of Canada (left) and Eldon Thompson of TMI at the Spar/Telesat Mobile press conference held to announce the awarding of the MSAT spacecraft contract. (Photo courtesy of Photo Features Ltd., Ottawa.)

On December 19, 1990, Spar Aerospace received the go-ahead to build a communications satellite for Telesat Mobile Inc. (TMI). The $120-million contract will provide the space segment for an integrated voice and data communications system that will supply mobile phone and specialized services on a continent-wide basis. As one official put it, "This system will blanket North America from the Panama Canal to the high Arctic."

Customers will use small satellite terminals to access such services as fax, messaging, paging and position location. "These small portable terminals represent a major technical change. We have done away with the dish," said Mike Zuliani, President of TMI.

Spar Aerospace and Hughes Aircraft Co., of California, will team up to manufacture two spacecraft with similar characteristics. Telesat Mobile and American Mobile Satellite Corp. of Washington will each own and operate one of these spacecraft. The companies have agreed on a partnership arrangement whereby each company will use the communications capacity on the other spacecraft as back-up in order to provide priority service.

Spar will construct the communications platforms for these spacecraft. Work on the project will take place at Spar's plant in Ste-Anne-de-Bellevue near Montreal. Spar expects that approximately 370 person-years of employment will be created by this project. Hughes will provide the "bus" — the main spacecraft structure — for each spacecraft. Spar President John MacNaughton, who announced details of his company's involvement, said Spar hopes to build additional units after 1994 — the scheduled launch date for the MSAT satellite.

The total cost of building and launching the two spacecraft is about $400 million; these spacecraft will have a life of 10 to 12 years. The satellite service will provide access to the 85 percent of North America outside the range of cellular and other local communications services.

"With this announcement, MSAT moves from the project stage to a commercial venture," said Eldon Thompson, chairman and chief executive officer of Telesat Mobile.

TMI expects annual revenues of $250 million by the year 2000, with 5 to 8 percent of the North American mobile communications market and 160,000 subscribers. It also estimates that the satellite service will produce a $500-million market for portable and mobile terminals.

This contract marks a major step forward for the MSAT Program.

Inside

Communications Canada
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IMSC '90 held in Ottawa

The second International Mobile Satellite Conference (IMSC '90) took place June 18 to 20, 1990 at the Ottawa Congress Centre. Conference sessions focused on regulatory issues, applications, and the technological developments necessary to meet the needs of mobile satellite system (MSS) users. Sponsored by Communications Canada and the U.S. National Aeronautics and Space Administration (NASA), IMSC '90 was a timely follow-up to a similar conference at NASA's Jet Propulsion Laboratory (JPL) in Pasadena, California in May 1988.

Approximately 500 participants attended IMSC '90, representing 145 organizations and firms from the United Kingdom, Australia, Japan, France, West Germany, the Netherlands, Italy, Mexico, Norway, Canada and the United States. The goals of the conference were to:

- encourage interaction among designers, developers and potential users from the various sectors of mobile satellite technology;
- identify issues affecting system implementation, such as standards, institutional factors and funding; and
- promote international co-operation, both in research and in service development.

During the 17 sessions, delegates presented more than 125 papers covering a wide range of topics related to the conference theme — "MOBILESAT: Expanding Communications Horizons." Staff from Communications Canada headquarters and the Communications Research Centre were responsible for some of the key papers presented.

The first plenary session provided an international update on the status of MSS, while the second plenary session presented an outlook on the future of mobile satellite communications concepts. MSS technology has indeed matured from the concept phase to the implementation phase.

The banquet speaker, Mr. David Golden, Chairman of the Board of Telesat Canada, reflected on over 20 years of domestic satcom progress.

Andrea Caruso, the recently retired Director General of Eutelsat, speaking to delegates at IMSC '90 closing luncheon.

The closing luncheon speaker, Mr. Andrea Caruso, former Director General of Eutelsat, struck a cautionary note for the future of MSS. He commented on the sudden explosion of MSS filings and how they may complicate the regulatory and international positions. This theme was echoed in other sessions.

During the conference, the exhibits section provided another forum for the exchange of information. In addition to commercial booths from countries around the world, stimulating displays were mounted by Communications Canada, NASA/JPL, Transport Canada and the Canadian Space Agency. The University of Victoria and the University of Bristol (U.K.) also had static displays.

Overall, the mood of the IMSC '90 attendees was optimistic. It was generally agreed that the conference was a great success in terms of its timeliness and relevance.

IEEE Vehicle Navigation and Information Systems Conference

In September 1989, Communications Canada participated in the first Vehicle Navigation and Information Systems Conference (VNIS '89), in Toronto. The conference was run by the Institute of Electrical and Electronics Engineers (IEEE) and was co-sponsored by the Ontario Ministry of Transportation, Transport Canada, the Vehicular Technology Society, and the Toronto Section of IEEE.

Session topics included Motorist Information Systems, Vehicle Navigation and Route Guidance Systems, Digital Maps and Geographic Information Systems and Mobile Data Communications.

Papers of interest to *MSAT News* readers included:

- "The Electronic Chart — Leading or Following VNIS Technology?" by M.J. Casey, T. Evangelatos and S. Grant of the Canadian Hydrographic Service, Fisheries and Oceans Canada;
- "User Applications of Mobile Satellite Services" by A. Pedersen of the Communications Research Centre, Communications Canada;
- "Future Mobile Information Systems" by J.A. Parviainen and E.R. Case, Ontario Ministry of Transportation, and L. Soubounghi, Transport Development Centre, Transport Canada; and
- "Fleet Management Information Services for the Transportation Industry" by G. Egan of Telesat Mobile.

The proceedings of the conference have been published and limited quantities are available from Communications Canada.

MOBILE DATA SERVICE FIELD TRIALS

Off to a good start

Telesat Mobile Inc. (TMI) is off and running with a range of mobile data services for land mobile, maritime mobile and fixed SCADA (Supervisory Control and Data Acquisition) applications. TMI is marketing the services or "KITs" (Keep In Touch) under the names RoadKIT, MarineKIT and FieldKIT. These initial services will be offered on Canadian Astronautics Ltd. (CAL) transceivers interconnected with a Gandalf keyboard/display unit, or a personal computer.

One aspect of Communications Canada's support for the implementation of MSAT services in Canada is the $20-million Communications Trials Program. Under this program, the Department has purchased 300 CAL/Gandalf terminals primarily for federal and provincial government field trials. The objective of the trials is to introduce the hardware and services to potential end-users in low-risk or no-risk situations. The program also provides the initial equipment orders for manufacturers, such as CAL and Gandalf, and supports government departments with market-development initiatives that contribute to improved government services.

Among the federal government departments and agencies participating in the mobile data trials are Communications Canada, Fisheries and Oceans Canada, the Canadian Coast Guard, Environment Canada, and Energy Mines and Resources Canada. Many provincial government departments have shown a strong interest in these services and have identified a range of requirements for wide-area communications applications, including ambulance dispatch, forest-fire fighting, environmental monitoring, mobile libraries, and communications for school buses on long rural routes.

CAL and Gandalf have teamed up to produce a satellite-based mobile data system. This Gandalf keyboard and display unit are simple to use.

Radio inspector field trial gets under way

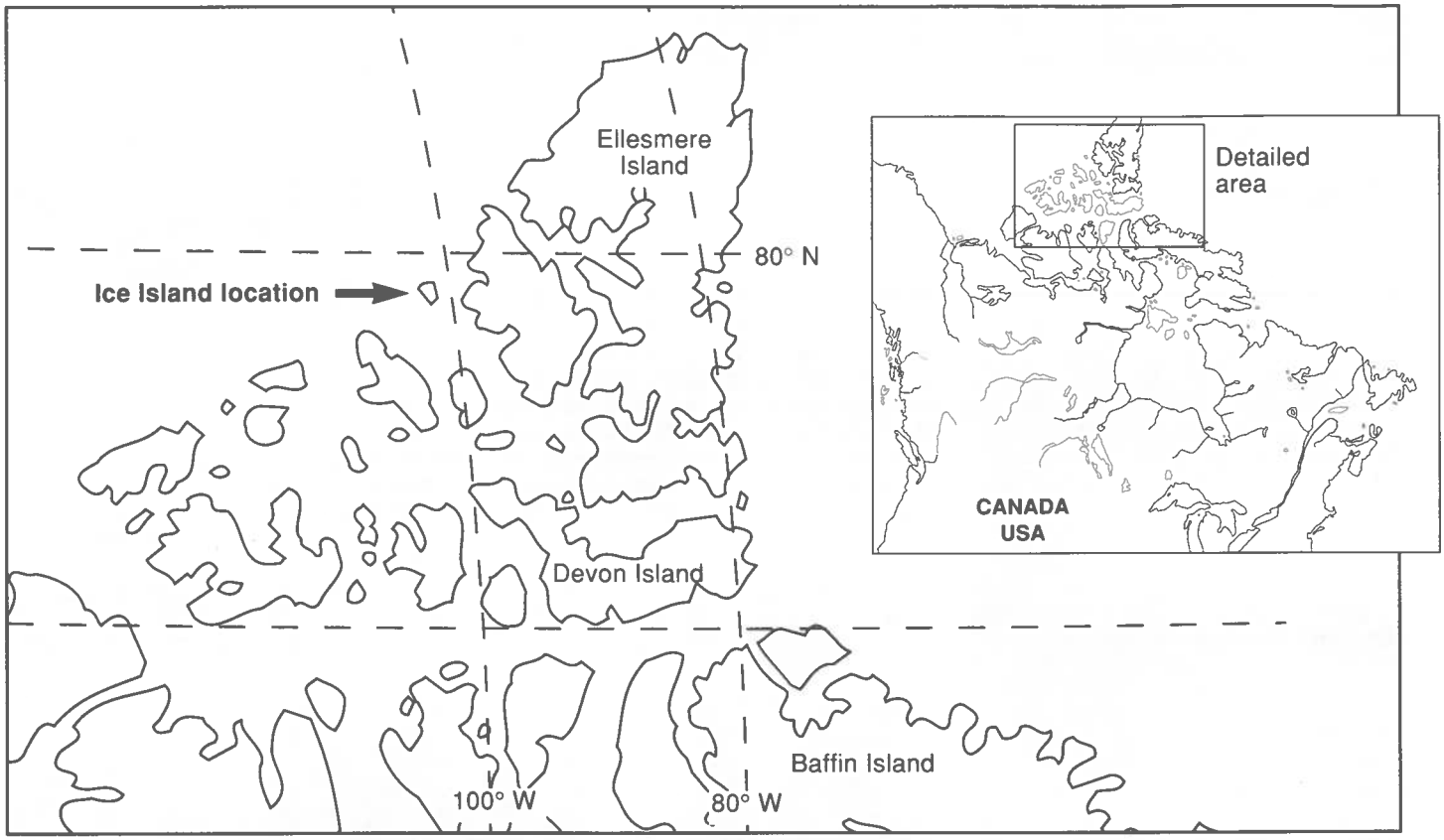
On September 13, 1990, Communications Canada radio inspectors at the Ontario North District Office in Sault Ste. Marie transmitted their first test messages over the Telesat Mobile Inc. (TMI) RoadKIT mobile data service. These test messages were part of a RoadKIT training program for the radio inspectors who provide radio spectrum management services in Northern Ontario. The Department has equipped five vehicles with RoadKIT terminals in a field trial aimed at improving the services available through offices in North Bay, Sudbury, Sault Ste. Marie, Kenora and Thunder Bay.

Radio inspectors from these one- or two-person offices are usually on the road and without mobile communications throughout most of their operating area. Now with the RoadKIT terminals, wide-area mobile data communications will soon be a reality.

Bud Campbell, District Director for Ontario North, states, "There are several benefits to the new system, including increased safety for staff travelling during extreme winter weather, improved productivity, and better service to clients. At present, radio inspectors may drive eight hours, returning from a routine inspection or interference investigation tour, only to find that they have to drive back the same route to investigate a serious radio interference problem affecting an emergency service."

Lyzette Gagnon of Communications Canada's Sault Ste. Marie office operates a RoadKIT mobile data terminal.

It is expected that similar terminals will be installed in all departmental vehicles operating in areas where existing terrestrial mobile communications provide only partial coverage.



Mobile data service tested in the Far North

One of the features of the MSAT system is its capacity to provide communications with very remote locations — including Canada's Far North. The recent use of a data channel on an L-band satellite located at 106°W — the planned MSAT location — permitted a realistic evaluation of communications capability in Northern Canada for specific applications. Recently, a data service demonstration took place from an observatory on an ice island located at 79°35'N 102°18'W. Scientists on the island, situated in the Peary Channel north of Ellef Ringnes Island, sent messages to an international meeting on Polar Resource Activity held in Fairbanks, Alaska. The ice island, some 12 km by 3 km and 46 m thick, has been moving around every summer since it broke away from the Polar Ice Shelf in 1981.

"The equipment worked very well," reported Steve Washkurak of the Polar Continental Shelf Project, Energy Mines and Resources Canada. "We had no problems contacting the Telesat Mobile data hub, despite the low antenna look angle at our ice island location."

In the North, reliable communications are important both for scientific experiments and for safety. Dave Maloley, Base Camp Manager with the Polar Continental Shelf Project, has experienced the shortcomings of high-frequency radio communications for years. "There were times when you could hear, but not reply, and you had to spell messages out phonetically. We had a short window of one to two hours per day," reported Dave. "There were periods when magnetic storms stopped HF communications for days on end. We have a rule that if two scheduled safety checks are missed, we have to dispatch a plane; it gets expensive.

"For the recent satellite test, the data terminal was really user friendly. I first figured out how to use the unit at the Communications Research Centre (CRC), Shirleys Bay. You don't really need the manual. I was able to get a message to Telesat Mobile on the first try, and you don't have to be at the terminal when receive messages are coming in — that's a real convenience. We also had a second unit at our Resolute Bay camp that we put on our 4x4 truck, and it worked just fine — all over the camp.

"We were told that the channel is available only for short periods during the day, but in practice there was less of a restriction." However, as Jean-Guy Dumoulin of CRC, who arranges many aspects of the MSAT Communications Trials Program, noted, "This is a demonstration and trials arrangement. Channel access for the trials is through a sublease from Telesat Mobile, which has leased channel access on a maritime mobile satellite from INMARSAT of London, England."

The traffic from the data terminal is sent via a leased satellite channel to a Teleglobe station at Weir, Quebec, under the terms of a contract between Communications Canada and Telesat Mobile; from there it goes by land-line to the Telesat Mobile Data Hub in Ottawa. Dave Halayko, Trials Manager for the CRC-run program, reports that the equipment at CRC is similar to that at a central location for a typical potential customer. "Just a land-line access and computer equipment. Our staff here handle messages just like any other E-mail system."

Dave Maloley was very pleased with the trial, and looks forward to a voice trial when that can be arranged.

Communications Canada supports MSAT marine data trial

Under the $20-million Communications Trials Program, Communications Canada is co-operating with Sea Link Ltd. of St. John's, Newfoundland in an MSAT field trial to test the effectiveness of MarineKIT, a service package designed to meet the specific needs of marine users.

As part of the agreement, the Department provides equipment and air time, as well as funding of one-time development and trial implementation costs. Sea Link Ltd. supplies the administrative service-provision resources to conduct the trials and is responsible for offering commercial services at the conclusion of the trial.

Sea Link Ltd. is an authorized service provider of Telesat Mobile Inc., Canada's domestic mobile satellite service provider. Ultimateast Data Communications Ltd. of St. John's has been contracted to do system development work, to install Canadian Astronautics Ltd.'s mobile terminals on 10 or more sea-going vessels, and to provide technical support for the marine data trial.

Phase 1 of the contract, which involved the development of a preliminary service description and the selection of trial participants, has been completed. Phase 2, system development, is under way and field trials are scheduled to start soon.

Five keen participants are taking part in the marine data trials. The Canadian Coast Guard and Fisheries and Oceans Canada will each fit two vessels with terminals supplied by Canadian Astronautics Ltd. and will use the system to transmit situation reports. Two east coast fishing companies — Fishery Products International and National Sea Products— will equip six or more vessels with the mobile satcom terminals. They plan to use their terminals to relay daily catch information, to support temperature-directed fishing, and to monitor engines and nets. The fifth participant, Marine Atlantic, which operates a passenger and freight ferry service off the east coast of Canada, will use the system to monitor vessel locations, and to relay arrival, departure, and waybill information.

The service requirements originally identified by the field trial participants will be implemented during the trial. In addition, all end-users will be offered a fleet-location service based on LORAN C or other marine-based positioning information, as well as various types of messaging services, including electronic mail. Shore-based fleet managers will have the opportunity to display the location of all their participating vessels on a high-resolution graphics display system.

Even before the trials start many organizations are expressing interest in equipping additional vessels at their own expense. While the geographical coverage area of the trial was limited to the east coast of Canada, marine operators on the west coast are also requesting an early opportunity to participate in a trial service or the full commercial service.

Communications Canada is working towards potential co-operative agreements with additional organizations interested in providing other niche services.

International frequency co-ordination — An ongoing requirement

It is time, once again, to turn our attention to spectrum availability for Mobile Satellite Services (MSS).

The 1992 World Administrative Radio Conference (WARC) on frequency allocations, to be held in Seville, Spain, is competent to change the allocations in the 1-3 GHz bands. Contrary to the situation in 1987, the majority of administrations support the assignment of additional spectrum to MSS and other mobile services — partially at the expense of the fixed service allocations presently in these bands.

However, the issue is complex and prospects for optimal allocations to MSS are by no means bright. In some cases, desired spectrum cannot be released because of the importance of the existing services. In other cases, some administrations wish to retain certain existing allocations because of the high investment in installed equipment. As a result, proposals will vary substantially and regional polarizations are likely. There is a danger that the frequencies acceptable to most administrations may lie too far from the existing allocations. This would render them technically and economically unacceptable for the future expansion of existing and planned systems such as MSAT. Nevertheless, the immediate availability of usable spectrum for planned systems is essential. This was demonstrated by the extensive difficulties encountered in recent frequency co-ordination meetings with INMARSAT, the Soviet Union and the United States.

Other factors further complicate the choice of MSS spectrum. What about personal communications, for instance? Will they complement or replace MSS services? Are future MSS services going to be delivered through geostationary or low-orbiting satellites? Will the bands above 20 GHz be the solution to personal communications via satellite in the future?

Canada is preparing for the 1992 WARC through consultations with all affected domestic interests. Once these positions are agreed to domestically, discussions with other administrations will begin in the hope of finding common ground. It will not be easy; it never is. But it is hoped that allocations can be agreed upon that will be sufficient to meet the predicted large growth of MSS services.

TECHNICAL ADVANCES

Advanced mobile satellite terminal and antenna tested at CRC

On May 30, 1990, engineers at the Communications Research Centre (CRC) successfully carried out voice communication trials during system tests between a vehicle and a ground station operating through INMARSAT's MARECS B2 satellite. Good voice communication was achieved under a wide range of operating conditions.

The vehicle's antenna tracked the satellite using data derived from a flux-gate compass; high-speed digital switching techniques were used to control both the directivity and the pointing of the antenna. The equipment was designed and developed at CRC. The antenna is elegantly simple in concept and inexpensive to manufacture. The Canadian tests were followed by demonstrations and testing with INMARSAT in England. Further tests are planned with AUSSAT in Australia in 1991.

The mobile voice terminal used in the trials was one of four recently delivered to CRC by Glenayre Electronics of Vancouver, British Columbia. The advanced constant average power single side band (CAP-SSB) modulation scheme was used for full-duplex voice calls made from a small van travelling around CRC in areas with varying degrees of shadowing from trees and buildings.

Glenayre Electronics of Vancouver supplied the mobile voice terminal used in the trial.

CAP-SSB differs in several ways from other amplitude companded single side band (ACSSB) modulation schemes developed for mobile satellite applications. When speech is present, the average transmitted power is constantly within 1 dB of a predetermined level. Also, peak amplitude excursions are controlled so that the "speech-present" average power can be within 4 dB of the power amplifier's saturation point. The CAP-SSB modem includes a soft voice-activation algorithm that results in an "idle" transmit power level that is 7 dB below the "speech-present" average power.

SKYWAVE BRIEFCASE "ONE OF A KIND"

SkyWave briefcase terminal demand exceeds supply

Communications Canada officials are facing some difficult decisions in response to overwhelming demand for field trials of the SkyWave Electronics Ltd. L-band briefcase terminal.

The Department ordered 10 briefcase terminals from SkyWave Electronics as one component of the $20-million Communications Trials Program, in support of various market-development activities. While the briefcase terminals were being manufactured, departmental representatives met with potential end-users in government and the private sector to determine their interest in participating in a field trial. The response was overwhelming. One end-user organization alone requested 80 percent of the available field trial capacity.

The briefcase trials program will see the use of 10 terminals by more than 30 federal and provincial government departments and agencies, as well as a few private-sector organizations involved in resource development and news-gathering. The briefcase trials program will operate for approximately six months using a Teleglobe Canada earth station at Weir, Quebec and leased satellite capacity from INMARSAT.

Some demonstrations were given during testing of the first 10 briefcase terminals and the Teleglobe Canada earth station. Potential end-users who participated in the demonstrations immediately recognized the unique capabilities of the SkyWave terminal. It is the only terminal of its kind that is entirely self-contained in one package. The unit can be operated from a built-in rechargeable NiCad battery supply and weighs less than 15 kg — half the weight of the next smallest transportable terminal currently available. Typical applications will involve organizations requiring wide-area voice and data (2400 bps) communications for which immediate set-up and operation is essential.

Some of the briefcase trial applications to be supported under the Communications Trials Program include forest-fire fighting, federal and provincial government law enforcement, news-gathering, mineral exploration, fisheries patrols and Canadian Coast Guard operations. The trials program provides manufacturers with their first equipment orders, affords service providers an opportunity to implement new services and allows potential end-users to evaluate new services and give feedback to manufacturers and service providers.

Portable briefcase radio demonstrated at UN Crime Prevention Congress

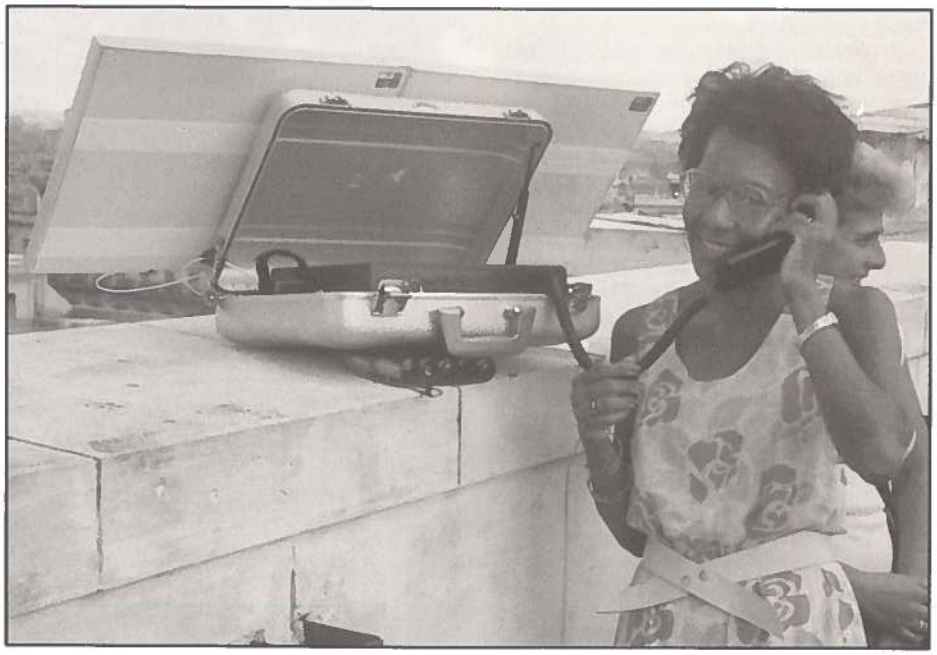
A battery-operated portable briefcase radio terminal was demonstrated in August in Havana, Cuba at the fifth UN Congress on Crime Prevention and the Treatment of Offenders.

The self-contained unit weighs only 15 kg and meets the requirements for aircraft carry-on luggage. It can be set up in minutes to provide almost instantaneous voice and data communications from anywhere in South America, Africa, Europe and North America.

The SkyWave briefcase radio operates through an INMARSAT (International Maritime Satellite Organization) satellite, and a Teleglobe Canada earth station located in Weir, Quebec. The earth station provides the interconnection with the public switched telephone network.

Because of its small size, easy set-up, wide coverage area and standard voice telephone calling procedures, the terminal is ideal for diplomatic communications, disaster relief, resource development and crime prevention.

Representatives from more than 20 countries visited the Communications Canada exhibit at the congress; it featured the briefcase radio and a text/graphics database on stolen art and artifacts. Allister Pedersen, Manager of MSAT Trials Planning, outlined the capabilities of the terminal to interested parties and provided special demonstrations for the Cuban Ministry of Communications and the Cuban Academy of Sciences. As an engineer from the Academy stated, "I didn't believe it was possible to communicate via satellite with such a small radio so easily."



An employee of the Cuban Academy of Sciences tests the briefcase radio terminal during the UN Crime Prevention Conference in Havana.

Canada's MSAT program is creating new opportunities for manufacturers and service providers within Canada and abroad.

MSAT services requested for Ontario forest fire

The Ontario Ministry of Natural Resources (MNR), one of the participants in the MSAT Communications Trials Program, requested mobile satellite service support from the Department's Communications Research Centre during the 1990 forest-fire season. The reason: a stubborn forest fire in northwestern Ontario posed a potential threat both to the terrestrial public switched telephone services and fixed satellite services in the immediate area. MNR's request during this potentially life-threatening situation was approved even though the developmental briefcase service was not to be tested fully until the fall of 1990.

When the terminals are fully operational, firefighters will carry portable voice terminals by 4x4 truck or aircraft to their firefighting locations. The units will allow full co-ordination of fire-fighting efforts over a wide-area, contributing to operational effectiveness and safety.

In addition to serving 18 briefcase terminals, the demonstrations being inaugurated as part of the MSAT Communications Trials Program will have the capability of serving two Ontario air ambulances; the 18 briefcase terminals, manufactured by SkyWave Electronics, have an operational area that covers most of North America, South America, Africa and Europe. Telesat Mobile Inc. (TMI) has proposed, subject to satisfactory negotiation of satellite capacity from INMARSAT, a "stop and talk" voice service for mobiles and transportables. Truly mobile voice services will be available from TMI with the launching of Canada's MSAT in 1994.

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