

## Sunken treasure protected during MSAT trial

A proposal to keep tabs on a sunken ship in Lake Erie is one of the more interesting applications for MSAT services that David Halayko, Chief, MSAT Trials Program, has received.

The application comes from the Heritage Branch of the Ontario Ministry of Culture and Communications which is interested in preventing salvagers from searching for treasure rumoured to be on board the *Atlantic*, a sidewheel steamboat that sank off the tip of Long Point in 1852.

It is one of 75 projects conducted by federal and provincial government organizations under the guidance of the MSAT Trials Office. Other trials include plans to provide communications links for fire fighting control and emergency situations involving police departments. "We supply radio equipment, satellite capacity, technical support and training to potential end-users to give them a chance to evaluate mobile satellite services," explains Halayko.

The location of the trial is also unusual, says Halayko. "Although it is located in the middle of the most populated part of Canada, the tip of Long Point is more than 20 km away from any telephone or hydro lines." The site is within the Toronto/Windsor corridor, only a short drive from the 401 highway.



Jocelyne Coté of the Caravane Technologie uses an MSAT terminal to pass on information. The van, operated by La Cité Collégiale of Ottawa, Cornwall and Hawkesbury, provides Francophone high school students throughout Ontario with information about post-secondary education. The vehicle also gives the students, many of whom live far from major metropolitan centres, a chance to use information technology, including the MSAT terminal, five computers and a CD-ROM, which would not otherwise be available to them.

At the shipwreck site, a commercial X-band marine radar for the detection of anchored vessels will be hooked up to a Supervisory Control

and Data Acquisition (SCADA) terminal. In order to save energy, the radar is only active for a short period every five minutes. If it detects the presence of an anchored vessel in any two consecutive active periods, an alarm is activated and transmitted to Telesat Mobile's hub station in Ottawa. The hub station automatically relays the alarm to an OPP detachment near the shipwreck site. ■

### Inside

- Briefcase terminals prove useful 2
- Keeping in touch on the high seas 3
- The evolution of the Mobile Data System 4

- DVP: Using spectrum more efficiently 5
- Reliable communications for air ambulance 6
- Mobile satellite — making the link 7
- Updated MSAT video available 8

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## Briefcase terminals prove useful for emergency work

One +2°C July 1991 afternoon in Iqaluit, NWT, André Tremblay turned on a transceiver he was carrying in his briefcase and spoke to his home office in Quebec City as easily as if he had been only a block away.

Tremblay, who is the Quebec Regional Director of Emergency Preparedness Canada (EPC), was helping conduct one of approximately 100 tests EPC carried out with MSAT Land Briefcase Terminals (LBT) last year. During the tests, the terminal was driven all over mainland Quebec and was even airlifted as far as Baffin Island.

The LBT could make a vital difference in some emergency situations where local communications have broken down, says Tremblay. "An earthquake could wipe out everything — telephone lines, electric power and all local radio and television stations," he explains.

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The Quebec region first expressed an interest in acquiring an LBT for tests in 1988. In May 1991 an agreement was signed between EPC and Communications Canada and the terminal was delivered in early July of that year. Tremblay, along with Joseph Rosso of Communications Canada and Jean Guy Bordeleau of Sécurité Civile Québec, co-ordinated 41 days of test and demonstrations. Ease of use, transmission power, audio quality and the ability to operate the device in conjunction with other electronic equipment were evaluated.

EPC has expressed an interest in acquiring LBTs for four of its regions, as well as for its headquarters staff. ■



André Tremblay of Emergency Preparedness Canada places a call from Iqaluit on the briefcase terminal his organization tested.

## Government of Ontario co-ordinates extensive field trials

A recent Ontario government field trial demonstrated the usefulness of mobile satellite services for government officials working in remote areas.

Since January 1991, the Government of Ontario has been conducting field trials to evaluate mobile satellite services. Eight ministries are using CAL/Gandalf Mobile Earth Terminals (MET) and Skywave L-Band Briefcase Terminals for field trials and demonstrations co-ordinated by Dick Ko of the Ontario Ministry of Culture and Communications' Operations and Technology Office.

The first field trial project was undertaken by the Ministry of Transportation's Remote Northern Transportation Office (RNTO) in Thunder Bay. One of their winter road inspectors had to report on conditions of a road which is located more than 100 km from the nearest telephone. During the winter of 1991,

the inspector was provided with a CAL/Gandalf MET installed in a four-wheel drive truck.

The RoadKIT service enabled the inspector to keep in regular contact with Thunder Bay from his vehicle. As an added bonus, the terminal's presence helped him overcome extreme loneliness during his 10-hour drives through remote forest areas. The system also ensured that he would be able to contact help if he needed it.

The RNTO testers found that the Loran-C tracking system sometimes gave poor readings; it occasionally indicated that the vehicle was in Florida, Nova Scotia, Newfoundland or Alaska. This result is not surprising because the land-based Loran-C system is not set up to cover the test area well. The new Global Positioning System (GPS), which is satellite-based, is more accurate and is now available with RoadKIT units. GPS provides world-wide coverage.

The Ministry of Natural Resources and the Ontario Provincial Police reported similar results. All three ministries found RoadKIT easy to set up and user-friendly. ■

## SCADA trials — MSAT counts cars, bugs and lightning strikes

During the next year, Canada's newest mobile satellite service (FieldKIT) will be used to communicate information from various types of metering equipment located in remote areas.

Communications Canada has received requests to provide telecommunications services for such varied tasks as measuring road use, counting insects and keeping track of lightning strikes, says Allister Pedersen, Manager of MSAT Trials Planning and Coordination. FieldKIT will enable organizations requiring information about activities in remote areas to set up their instruments and receive data using satellite communications.

MSAT provides a practical option for monitoring instruments in distant locations, says Jim Knight of Solar Computers, a firm which is developing some of the related technology for SCADA. "Until now there were really only two possibilities — set up an expensive radio-communications system of your own or send someone

out to the location every time you need data."

For example, data from traffic counters located in remote and rural areas, important for road maintenance and other purposes, is now gathered by someone who drives out to the counter and takes a reading. The Narrowband Telecommunications Research Inc. low-power SCADA (Supervisory Control and Data Acquisition) terminal will be used to communicate remote traffic counts back to a central location automatically.

MSAT will also be used to assist organizations in managing natural resources. One example of this is Mow-Tech, an Alberta company which sells equipment that monitors ground water levels. It is interested in relaying data from its instruments through MSAT. Two other projects concern the use of SCADA terminals to establish communication links for insect counters used in forestry management.

Another forestry-related application is remote lightning location detection. Most Canadian provinces and territories, as well as Parks Canada, operate systems that keep track of the number and geographic location of lightning strikes which could start forest fires. With complete

coverage of all of Canada, MSAT will provide the opportunity to establish lightning location systems in the many areas not currently served by terrestrial communication systems. ■

## Keeping in touch on the high seas

Confidentiality and reliability are MarineKIT's biggest pluses for National Sea Products' Captain Roy Dagley.

Dagley's 50-metre-long *Cape Ballard* is one of two NatSea vessels that have had trial terminals installed on board by Sea Link Ltd. of Dartmouth, Nova Scotia. Sea Link is the marine service provider for MSAT.

From the terminal on board the ship, short messages can be sent via satellite to the terminal in the NatSea office in Lunenburg, Nova Scotia. Dagley uses the system to send his morning hail and daily fish count back to the plant.

Many years experience in the fishing business has made Dagley aware of the advantages, such as confidentiality, that MSAT can bring. "We're in an extremely competitive business and it doesn't take other companies long to break codes when you transmit your messages by conventional marine radio," explains Dagley. "With the satellite, security isn't a problem."

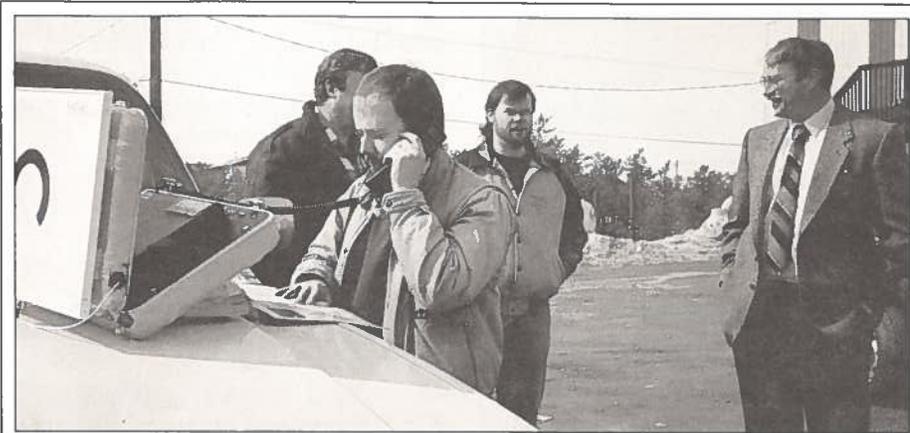
The system is also better than radio in rough weather when radio signals tend to break up, says Linda Roskell-Falle, Port Services Coordinator with NatSea. She has experienced some problems confirming whether messages have been received, however.

"The words 'message received' come up on my screen after I send a message — but that means it has gone through the satellite, not that the captain has read it," says Roskell-Falle.

Keeping in touch continues, page 8



The Canadian Coast Guard (CCG) icebreaker Sir John Franklin, shown above, is one of several federal government vessels that recently conducted sea trials of MarineKIT satellite equipment. The ships used the Sea Link/Ultimateast "Datahaul" system. Loran-C position reports were transmitted from the vessels via satellite on a regular basis. (See related story, Keeping in touch on the high seas, this page). The trials permit an evaluation by CCG staff of several new types of communications technology.



Randy Henderson, a journalist with CBC Radio, files a report from Yellowknife using an MSAT L-band Briefcase Terminal. Henderson's report was broadcast over CBC's Northern radio service. Standing behind Henderson are: (from left to right) Robert Carr, CBC Chief Technician, Kevin Woldrum, CBC Maintenance Technician, and David Halayko, Chief, MSAT Trials Program, Communications Canada.

## China expresses interest in MSAT

Officials from China have expressed interest in Canada's MSAT activities.

The Chinese face many of the same communication problems Canadians do, such as vast areas which do not have an existing communications infrastructure, says Allister Pedersen, Manager, MSAT Trials Planning and Coordination.

The Chinese interest became obvious after a presentation on the MSAT program to the Global Satellite Communications Symposium in Nanjing, China, says Pedersen. "As a result of my presentation at the symposium, I was invited to give a more detailed presentation on MSAT at a seminar for the China Broadcast Satellite Corporation (CBSC) in Beijing."

While Canada's MSAT program is intended to improve mobile communications for Canadians who may be travelling anywhere in North America, there will be demands for Canadian expertise elsewhere, explains Pedersen.

***"The Chinese government's interest could mean future sales for Canadian companies."***

Other countries or regions may also be considering their own mobile satellite systems or have an interest in Canadian equipment that is compatible with the INMARSAT system. Canadian companies currently involved in the international mobile satellite communications market include Canadian Astronautics Ltd., SED, SkyWave Electronics, Com Dev Ltd., Ultimateast Data Communications Ltd and SPAR Aerospace.

"Telecommunications exports are generally initiated through direct government-to-government contacts and the Chinese government's interest could mean future sales for Canadian companies," adds Pedersen. ■

## The evolution of the Mobile Data Service

Since the initial conception of the Mobile Data System (MDS) as a fleet management system for the transportation industry, mobile satellite communication has evolved to include better and more user-friendly features.

MDS services were limited to low-speed packet-switched data and included general messaging, preformatted messages, fixed-format coded messages and periodic vehicle position reports with an embedded coded message. It soon became obvious that more flexibility was necessary even in the limited field in which the system was used, e.g. trucking. At the same time, many other applications for MSAT technology have been developed.

One example of this response to user needs is the new features available with the next version of the Canadian Astronautics Limited (CAL) mobile earth terminal. The MET-200A will include enhanced end-of-day features, a capability to remotely update both the code and the message library in the MDIU — the Mobile Data input/output unit.

New features of the CAL MET-200A include:

- remote code updating;
- enhanced end-of-day features;

- ability to update MDIU message library;
- software package for DOS-based (palmtop/laptop) interface providing users with reconfiguration ability;
- Global Positioning System (GPS);
- briefcase terminals; and
- magnetic mount mobile antenna system.

Those developments and similar enhancements to other MSAT hardware will be supplemented by other capabilities resulting from the launch of the MSAT satellite in mid-1994. These include:

- automatic interconnection with the Public Switched Telephone Network;
- Mobile Telephone Service (MTS), including Enhanced Cellular Roaming mode — automatic switch over between terrestrial cellular and MSAT service;
- Mobile Data Service;
- Mobile Radio Service (MRS), including private virtual networks to groups of subscribers and access to the PSTN;
- alternate voice data available with both MTS and MRS;
- packet- and circuit-switched data; and
- Group 3 Fax. ■

## DVP: using spectrum more efficiently

A concept called dynamic variable partitioning (DVP) will allow Telesat Mobile Inc. and the American Mobile Satellite Corporation to use radio spectrum more efficiently.

The system will allow spectrum allocated for aeronautical safety and regularity of flight services (known by the acronym AMS(R)S) to be used by other mobile satellite services (MSS) as well. MSAT Program Office engineers have been determining how to use this spectrum more efficiently because current demand on it is relatively light. With DVP they believe they have found a way to share the space and allow AMS(R)S absolute priority over MSS.

Frequent interruption of MSS calls would be very unattractive to MSS users. DVP allows MSS channels to be gracefully re-allocated to AMS(R)S service as they terminate. This greatly reduces the likelihood of pre-emption of non-aeronautical safety calls.

The MSAT Program Office has studied this scheme and determined

### How DVP works

Dynamic variable partitioning divides the AMS(R)S spectrum into two portions, one for AMS(R)S use, a second for other MSS use. A buffer of reserve channels contained within the AMS(R)S portion of the spectrum provides instant bandwidth and power for AMS(R)S use. A network operations centre holds enough channels in reserve in the buffer to respond to any additional requirements as they emerge.

The relative size of the portions allocated for each type of use and the size of the reserve buffer will change in real time, in response to actual or anticipated demand from AMS(R)S.

Pre-emption of MSS calls is possible only when all buffer channels are in use. In that case, any new call request will result in channels being taken from MSS use. DVP will not introduce any delays for aeronautical users except when it is necessary to pre-empt an MSS call. That delay is expected to be a fraction of the time that would be required if AMS(R)S users had to wait for a channel to open.

that it will meet International Civil Aviation Organization requirements for AMS(R)S, while freeing up spectrum for other MSS traffic, says John Jones, MSAT Program Officer.

The Program Office has developed an algorithm as one possible implementation of DVP. Software simulations using actual aircraft statistics have established that it will work effectively. The results of this work were submitted to CCIR in preparation for WARC-92, which was held in February 1992. ■

## Mobile terminal test bed developed at CRC

Engineers and scientists at the Communications Research Centre (CRC) have developed a test bed for mobile MSAT terminal technology.

The MSAT-LX will allow CRC and Canadian high technology companies to determine how well subsystems they develop will work with MSAT. "Newly developed devices can be easily connected to the terminal and have their performance monitored by a central computer," says Ravi Datta, the project engineer leading the LX development program.

CRC engineers will use the test bed to evaluate several types of antennas and a variety of other devices over the next year.

The LX terminal is really a group of subsystems that are controlled from a standard IBM-compatible computer, says Datta. "It is an ungainly device consisting of several racks of equipment mounted inside a mobile laboratory. But what it lacks in looks it makes up for in technical sophistication and reconfigurability," says Datta.

Test bed continues, page 8



CRC Technologist Steve Lamarche and Engineer Trish Michaud operate Telesat Mobile's FLAG (Fleet Location and Graphics) dispatch base unit. The system was developed for MSAT to enable transportation companies to monitor the location of their vehicles. The unit in the picture is being used at the Communications Research Centre to give demonstrations and training sessions to potential users.

## MSAT provides reliable communications for air ambulance service

**A**ir ambulances flying near Sioux Lookout in Northern Ontario can get in touch with doctors in Toronto as easily as most Canadians can place a phone call. To do this, air ambulance staff are using a satellite-based mobile telephone service; it is similar to what will be available after the launch of the MSAT satellite in 1994.

Two of the Ontario government's air ambulances are equipped with MSAT transmitters that can be used to place calls over the regular phone network, like a cellular phone. Unlike cellular service, however, satellite communications are available in the extremely remote areas the ambulances often have to fly to.

It was this feature that led the Ontario government to begin experimenting with satellite communications in 1988. Before that, a doctor had to travel with the regular ambulance crew whenever there was a critically ill patient on board. With the satellite link, the ambulance's paramedics can quickly get in touch with a hospital if an emergency arises.

***"Air ambulance staff only have to push one of two buttons to either set up or end a telephone call."***

If they need to speak to a doctor, ambulance staff power up their transmitter and they will automatically be connected to the public telephone network. They only have to push one of two buttons to either set up or end a telephone call with the medical control centre in Toronto.

A lot of sophisticated technology makes this simple operation possible. The aircraft's transmitter relays a signal through a geostationary satellite to an earth hub station, located in Weir, Quebec, which directs the call into the telephone network. This technology was developed for the MSAT program by Canadian high technology compa-



*Hank Brown of the Ontario Ministry of Health places a call using the new Ontario Air Ambulance Service Satcom terminal. MSAT Project Leader John Sydor of Communications Canada looks on while Jeff Bond of the Ontario Ministry of Communications and Culture samples the patient's perspective.*

nies, such as Skywave, Absopulse, Canadian Astronautics Ltd. and Narrowband Telecommunications Research Inc., in co-operation with Communications Canada.

The biggest surprise for most people is how small the mobile transmitter is, says Project Leader John Sydor. "The image most people have of satellite communications is a huge dish in their backyard. But the terminals we are developing for MSAT are very small and unobtrusive and can communicate from a moving plane, car or boat."

The most recent air ambulance terminal, developed at the Communications Research Centre, weighs only 50 pounds and contains some unique features, such as satellite reference signal acquisition, which allows it to be used almost from the moment it is turned on. The satellite beams its signal to INMARSAT's satellite, positioned over the Western Atlantic

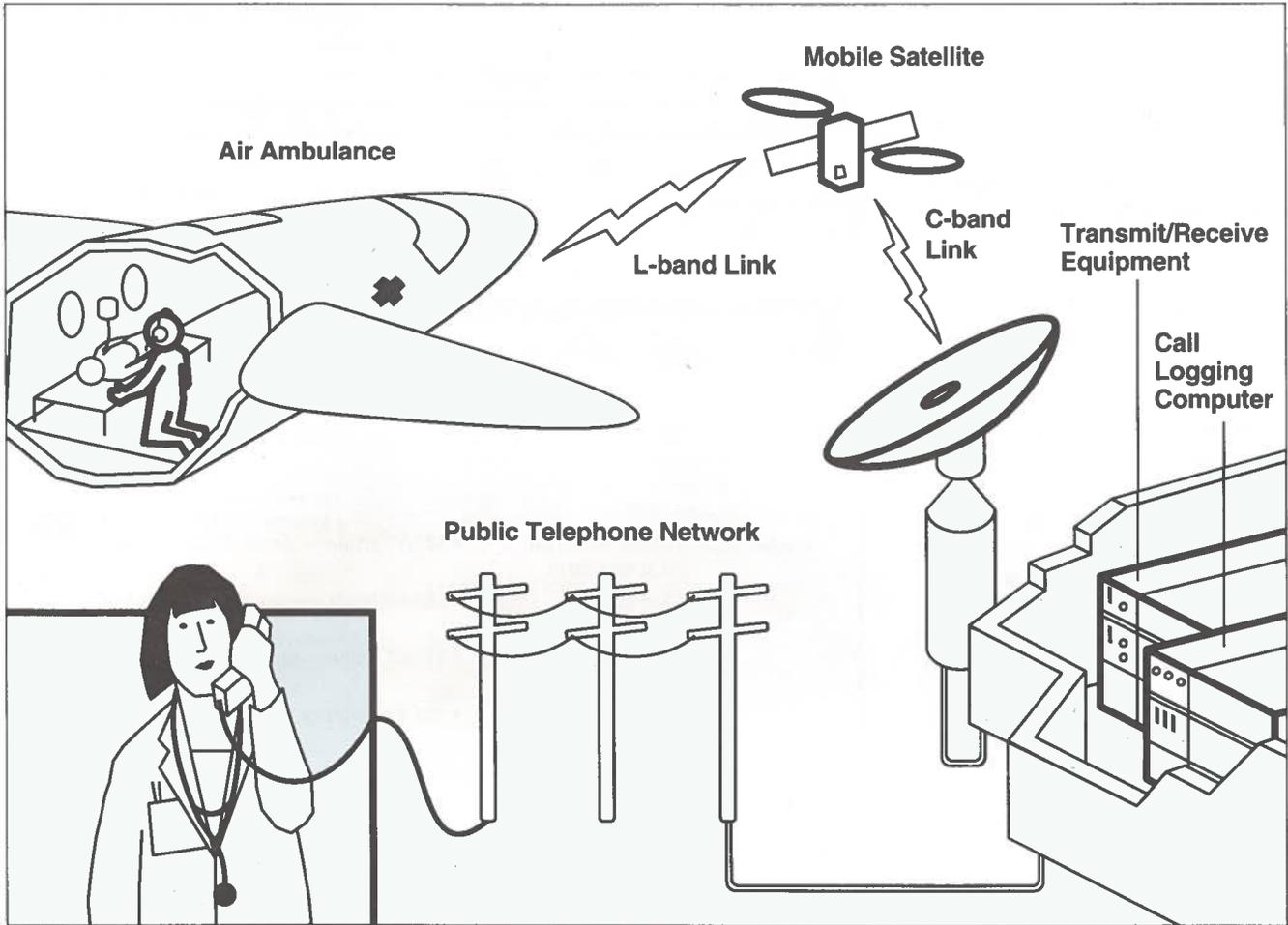
Ocean, through three antennas that fit flush against the outer skin of the aircraft. The antennas provide a wide area of coverage and are electronically steered as the aircraft manoeuvres.

***"The terminals we are developing for MSAT are very small and unobtrusive and can communicate from a moving plane, car or boat."***

The MSAT satellite will be both better located for Canadian use and more powerful than the INMARSAT satellite. Lower transmitter power using the new satellite will permit smaller mobile units with lower battery drain. Existing units will continue to operate with the MSAT satellite.

**Air ambulance continues, page 7**

# Mobile satellite — making the link



The satellite is only one part of a complex system that enables MSAT users to place calls from remote areas that do not have conventional telephone service.

Each call employs a whole array of hardware and controlling software developed especially for the MSAT program. Although the technology is complex, it has been designed to make it easy to operate. For the user, the process is as simple as placing a phone call — the connections are all made automatically. Calls are set up by pushing a single button. Pushing a second button terminates communications.

For example, when an air ambulance crew member pushes the button to initiate a call, the aircraft's MSAT transmitter beams a signal to the satellite over an assigned frequency in L-Band

(1600 Mhz). The satellite retransmits the signal at a much higher frequency (4200 Mhz) to be received by a microwave dish at the hub station. The return signal is sent to the satellite in the 6400 Mhz band which translates the signal to 1500 Mhz for relay to the mobile terminal.

The hub station, which is the centre of the operation, consists of a microwave antenna and a computer which is connected to a series of telephone lines. The computer responds to telephone and satellite calls which use the correct access code. When it receives the ambulance's signal from the satellite, it engages a telephone line and dials the number. The signal then travels through the telephone network to its destination. The computer also keeps track of the length and destination of all calls so customers can later be billed.

## Air ambulance from page 6

The earth hub station to which the satellite relays the ambulance signal is the first such station devoted entirely to controlling MSAT trials communications. In addition to the two Ontario ambulance terminals, it also controls the access of 10 briefcase

terminals that are being used for other MSAT field trial projects. The system also ensures that channels are always available for air ambulance use and logs the billing information.

The software developed for the hub has received a lot of attention from the satellite communications

industry, says Sydor. "Both INMARSAT and Teleglobe Canada were quite impressed; Teleglobe so much so that they have signed a licensing agreement with Communications Canada to use it to control access to their other satellites." ■

**Keeping in touch** from page 3

On board the boat, nobody sits in front of the terminal," says Dagley. "There should be some sort of indicator to let us know a message is waiting." Some land-based mobile terminals, which are otherwise almost identical to those being used on the vessels, already have an audible beep and message indicator lamp to provide this service.

Participation in the MSAT trials program allows end-users to identify required features which can usually be incorporated by the MSAT service providers and/or the equipment manufacturers.

NatSea also has some requirements beyond the existing services and the firm is eagerly awaiting the launch of MSAT. With significant power and capacity improvements over the present satellite channel, NatSea will be able to send Dagley marine weather, Coast Guard notices, processing plant prices and perhaps even news and sports reports in response to his morning hail. ■

**Test bed** from page 5

The computer will conduct such "housekeeping" tasks as setting and monitoring communication frequencies. In addition, it will be used to develop and test software that will steer the antenna beams. "The MSAT terminal will have to be able to track the satellite from a moving vehicle using an intermittent reference signal from the satellite," says Richard Young, a digital processing engineer who is developing the MSAT-LX digital subsystems.

The terminal is also equipped with a 50-watt L-Band transmitter amplifier developed by Canadian Astronautics Ltd. which allows the terminal to be tested over existing L-Band mobile satellites. The final MSAT terminals will have much smaller amplifiers, requiring only seven to 10 watts of output power. ■

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## Updated MSAT video available

**A** video describing the range of MSAT communication opportunities is now available.

The 20-minute VHS video, initially produced for communication managers and those responsible for

remote communications across Canada, will be of interest to other audiences — from schoolchildren to senior citizens. It highlights five situations where MSAT communications will make a difference and has recently been revised to cover the newest developments in the program and related technology.

For further information, contact Hugh Reekie at (613) 990-4099. ■

### For further information

If you would like further information on the topics discussed in this newsletter contact:

#### Communications Canada

300 Slater Street,  
Ottawa, Ontario,  
CANADA K1A 0C8

- |           |                                     |                                     |
|-----------|-------------------------------------|-------------------------------------|
| Contacts: | Allister Pedersen<br>(613) 998-2011 | • MSAT trials — general information |
|           | Dave Halayko<br>(613) 998-0007      | • MSAT trials — general information |
|           | Michel Ouellet<br>(613) 998-8532    | • MSAT trials — general information |
|           | John Sydor<br>(613) 998-2388        | • Air Ambulance System              |
|           | Hugh Reekie<br>(613) 990-4099       | • MSAT News — comments, back issues |
|           | John Jones<br>(613) 990-4117        | • Dynamic Variable Partitioning     |

#### Telesat Mobile Inc.

- |          |                                |  |
|----------|--------------------------------|--|
| Contact: | Janis Millar<br>(613) 736-6728 | • Mobile Satellite Services —<br>general information |
|----------|--------------------------------|--|

#### Canadian Astronautics Ltd. — CAL

- |           |                               |  |
|-----------|-------------------------------|--|
| Contacts: | Ian Menzies<br>(613) 820-8280 | • general information on<br>CAL MSAT products                      |
|           | John Kent<br>(613) 820-8280   | • technical information on new generation<br>Mobile Data Terminals |

#### Ultimateast Data Communications Ltd.

- |          |                             |                 |
|----------|-----------------------------|-----------------|
| Contact: | Rod White<br>(709) 576-4747 | • Marine trials |
|----------|-----------------------------|-----------------|

#### SkyWave Electronics Inc.

- |          |                                  |                              |
|----------|----------------------------------|------------------------------|
| Contact: | Peter Rossiter<br>(613) 592-0908 | • SkyWave Briefcase Terminal |
|----------|----------------------------------|------------------------------|

#### Sea Link Ltd.

- |          |                              |                 |
|----------|------------------------------|-----------------|
| Contact: | Nils Helle<br>(709) 334-2405 | • Marine trials |
|----------|------------------------------|-----------------|

#### Solar Computers

- |          |                              |                           |
|----------|------------------------------|---------------------------|
| Contact: | Jim Knight<br>(519) 621-7250 | • SCADA MSAT Applications |
|----------|------------------------------|---------------------------|

#### Narrowband Telecommunications Research Inc.

- |          |                                    |                        |
|----------|------------------------------------|------------------------|
| Contact: | Mahmoud El Banna<br>(604) 294-8577 | • SCADA MSAT Terminals |
|----------|------------------------------------|------------------------|