

**REPORT ON THE PARTICIPATION
OF
MEMORIAL UNIVERSITY OF NEWFOUNDLAND
IN THE
ANIK B PHASE II PILOT PROJECTS**

JANUARY 1985

**Joint Project of Memorial University of Newfoundland,
Newfoundland Telephone Company, and Department of
Communications**

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ANIK B PILOT PROJECT
PHASE II



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I HISTORY

A. INTRODUCTION

Memorial University of Newfoundland (MUN) has a commitment to making its resources available as extensively as possible to all areas of the Province. Newfoundland's geography, climate and transportation challenges make it difficult to fulfill these goals to the degree desired. To address some of the problems of making centralized resources more accessible, the Faculty of Medicine at Memorial University of Newfoundland became involved in communications projects in 1972. The Telemedicine Centre developed from this interest and with the Federal Department of Communications have participated in a number of satellite experiments over the past decade.

B. HERMES

A project using the Hermes satellite, successfully demonstrated the use of one-way video and two-way interactive audio in the provision of health and education programmes. For three months in 1977, the University and affiliated hospitals in St. John's were linked with four distant hospitals - two on the Island and two in Labrador. Continuing education programmes for a variety of health professionals were offered, administrative and committee meetings were held and there was a limited consultation experience with the transmission of medical data. There was a total of 150 hours of programming.

C. TELECONFERENCE SYSTEM

The results of the Hermes Project indicated that the majority of the project's objectives could have been achieved utilizing less expensive narrowband technology. Therefore in 1979 a terrestrial 4-wire dedicated audio teleconference system, installed and maintained by the Newfoundland Telephone Company Limited (N.T.C.) was developed to link 15 hospitals in the Province. The major funding for this teleconference system was provided by the Federal Department of Supply and Services. Since the completion of this highly successful initial project, which ended in 1980, there has been a step-wise expansion of the teleconference system.

At present the province-wide System is comprised of four dedicated circuits outside St. John's and includes 85 locations in 45 communities on the Island and in Labrador, as well as numerous health and education agencies in St. John's which relate frequently to the various major user groups. Up to four teleconferences can be run concurrently using the two bridges in the Telemedicine Centre by combining any of the four circuits and St. John's sites appropriate to the teleconference.

The basic audio format programmes fall in the general categories of continuing education for health professionals and support staff, administrative meetings (50%), and general education programmes (40%). In addition there are approximately 15 medical consultations carried out each week utilizing EEG and ECG transmission units. During the academic year (September-June) there are an average of 13 hours of programmes per day.

D. ANIK PHASE I

During the early development of TCS (1979) the Faculty of Medicine and the Educational Television Centre were approved as joint experimenters with the Anik B satellite. The objective of the Memorial trial were:

- (1) to design and demonstrate a hybrid terrestrial/satellite network to expand the facilities of the Teleconference System to include 3 communities in Labrador, and
- (2) to evaluate the effect on offshore medical services of using a telephony channel (on Anik B) and a fixed (manually steerable) offshore terminal designed by D.O.C. to link a sick bay to the Emergency Department of a tertiary care hospital (the Health Sciences Centre).

The Labrador communities were provided with standard 4-wire installations including Darome teleconferencing units. The medical clinic (sick bay) on the PetroCanada drillship NEDDRILL II was supplied with a 4-wire teleconferencing unit and CVI slow scan television equipment which allowed the medic to transmit x-rays and other still pictures to the Health Sciences Centre. Programming began in the summer of 1980 (see Phase I report entitled "Memorial University of Newfoundland Anik B Pilot Project" for additional details).

The hybrid teleconference system which linked remote communities in Labrador to the teleconference network functioned successfully. Participants were pleased with the technical quality of the system and very quickly adjusted to the half second delay (due to satellite double hop). Despite the positive results all three locations have subsequently been transferred to ground-based facilities, largely for financial and maintenance reasons.

Although the link was successfully established and used for a limited period between the Health Sciences Centre in St. John's and the NEDDRILL II, there were several technical problems which prevented the completion of the project. It was concluded that to conduct a proper study of the potential of satellite usage in the offshore a second phase of the project should be undertaken utilizing a stabilized earth terminal. To this end the Faculty of Medicine initiated discussions with Mobil Oil Canada Limited (Mobil) and the Newfoundland Telephone Company to continue the study of use of satellite technology in communications in an offshore environment (See PROJECT IMPLEMENTATION p. 5 below).

II OBJECTIVES - ANIK B PHASE II OFFSHORE TRIAL

All parties wished to assess the technical performance of 12/14 GHz satellite technology using a transportable terminal system that included stabilization for various communications needs in an offshore environment.

The groups involved in the trial had the following specific objectives.

Telemedicine: To demonstrate the feasibility of using 12/14 GHz satellite technology for medical support services required in offshore petroleum exploration.

To continue and expand the development of current telemedicine applications of a hybrid terrestrial/satellite interactive audio system.

N.T.C: To demonstrate the feasibility of using 12/14 GHz satellite technology for direct distance dialing (DDD) network access from an offshore environment.

To determine reliability and maintenance requirements for a 2-wire audio communications link in the offshore.

To determine the limitations of use of a stabilized terminal for various types of data transmission.

To determine the feasibility of use of a VHF/satellite hybrid system employing a stabilized platform.

To identify and to evaluate satellite telecommunications services which could, at a later date, be made available on a commercial basis.

Mobil: To develop a more reliable and economic, more easily used communications link than is currently used offshore.

To explore the transmission of various kinds of data on the narrowband channel. These would include both medical data transmission (e.g., SSTV from decompression chambers using their inhouse video cables) and industrial transmissions (e.g., underwater shots of damaged equipment; transmission of weather maps for daily conferences between rig and shore.)

III PROJECT IMPLEMENTATION

As MUN was convinced of the importance of the offshore trial, a submission was made to the federal Department of Communications (D.O.C.) in response to the Department's request for proposals in June 1980. The Phase II trial would continue the offshore telemedicine experiments proposed for phase I utilizing a prototype stabilized terminal designed by D.O.C. for use in the offshore. (See Project Critical Path, Appendix I). During Phase II all local technical functions, which had previously been undertaken by MUN's Educational Television Centre (ETV) were assumed by N.T.C. (See Memorial University of Newfoundland Anik B Pilot Project Addendum, Appendix II). Mobil agreed to cooperate in the trial by

providing space on one of their rigs and assuring the project of the cooperation of their staff as necessary.

Subsequent to proposal submission, meetings were held with senior administrative and medical staff at Mobil to identify the rig which would house the installation, secure appropriate space for both D.O.C. and Telemedicine equipment, identify the necessary Mobil contact persons, and establish Mobil's objectives in cooperating in the trial. Mobil indicated that their onshore physicians would cooperate in the trial and come to the HSC Emergency Department as necessary to view slow scan or electrocardiograph transmissions. The rig medics and instrumentation technicians were identified as the project's contact persons on the rig. Mobil was regularly advised of project progress throughout the implementation period.

MUN's Phase II Project was approved for the period May 1982 to September 17, 1982. In August 1982 N.T.C. and Telemedicine personnel carried out a site survey on the SEDCO 706 to confirm appropriate locations for project equipment.

Developmental problems related to the gyromotors, the step tracking and the Mitel electronics package delayed the project start date.

The terminal was integrated on the SEDCO 706 in August 1983. Throughout August one channel was available, the second had a faulty VCU and so one channel was shared for both Telemedicine (4-wire) and telephone (2-wire) activities. By September 1983 both channels were functional.

However problems with the step tracking and gyromotors continued and various alterations were made to the technology to improve the tracking throughout the fall. During the period September 1983-August 1984 the critical path of the Telemedicine project was revised to compensate for delays necessitated by technical alterations to the prototype terminal.

The project termination date was initially set for December 1983. There was however general agreement that it would be important to test the stabilized terminal in the winter months when winds and seas were higher. To allow adequate testing of the stabilized terminal as well as to permit installation and testing of a hybrid VHF/satellite facility between a second rig the BOWDRILL III, (See p. 18 below) a request for an extension of the termination date and permission to expand the trial to include the second rig was made in December 1983. Approval for both the expansion to the BOWDRILL III and a time extension to September 30, 1984 was granted.

IV PROJECT DESCRIPTION

A. SYSTEM DESCRIPTION

Throughout the period of the trial the project had access to two narrowband channels on the Anik B satellite. These channels were made available by D.O.C. for a total monthly charge of \$1,000 (which reflected their charge from Telesat). One channel was used primarily in a 4-wire mode to provide a 24 hour a day link between the rig's medical clinic, the Telemedicine Centre and the HSC's Emergency Department. A second 4-wire access point was available in the lounge on the SEDCO 706 but it

was not used during the trial. The second channel was routinely used in a 2-wire mode. Four telephone extensions of a local St. John's number served as the termination of this channel on the rig. They were located in

- (1) the radio room,
- (2) the medical clinic,
- (3) the Mobil (later Husky/Bow Valley) Office, and
- (4) the Instrument Technician room.

Access to the standard switched network was provided by this channel. Provision was made by N.T.C. to switch either channel from 2-wire to 4-wire operation as required.

TVRO capacity was provided on the rig. To receive television the rig terminal was manually redirected to look at Anik C. When viewing "C" project narrowband capacity was unavailable.

D.O.C. provided to the experiment

- (1) the prototype stabilized terminal located on the SEDCO 706,
- (2) a 3 metre terminal located at MUN in St. John's,
- (3) access to the 9-metre terminal in Ottawa, and
- (4) maintenance of the terminals beyond the "first line" isolation and resolution of troubles.

There was 24 hour a day access to the two channels (except for a two hour maintenance period on Mondays). The 9-metre terminal was manned from 0700 to 1730 Ottawa time).

N.T.C. provided all interface equipment between the satellite facilities, the switched network and the Telemedicine Centre. A complete technical system description will be provided by the N.T.C. in the Technical Report which will be submitted as an addendum to this report.

Telemedicine provided

- (1) access to the Telemedicine bridge and assistance with operation when necessary,
- (2) teleconferencing units, SSTV transceivers, monitors, a camera and ECG recording, transmitting and receiving units to both the rig and the Emergency Department.
(NOTE: The SSTV transceiver for the hospital end was installed in the Telemedicine Centre and images were received in Emergency via a video cable. This conserved space in the department and avoided operational problems.), and
- (3) access to Telemedicine continuing medical and nursing education programmes for rig medics.

B. OPERATIONS PROCEDURES

Procedures and responsibilities for operation, trouble shooting and maintenance of equipment were agreed upon by the various groups involved. Copies of the final protocols were circulated to all groups involved in day to day operations (See Operations Protocols, Appendix III).

C. TRAINING SESSIONS

(1) Rig Medics: Rig medics spent one day in the Telemedicine Office where they were trained on the operation of the audio equipment and SSTV and ECG transmission units. Ample time was allotted for hands on practice particularly on SSTV where operator technique is critical for high quality transmission. Arrangements were made with the hospital's ECG Department for a brief refresher on preparation of the patient for electrocardiograph testing and use of ECG equipment. Volunteer patients were arranged for the practice sessions. The medics met with physicians and senior nursing staff of the Emergency Department with whom they were likely to have contact during the trial. In addition each medic was familiarized with the various data collection forms that they were requested to complete during the trial.

Medics were provided with an information package which included instructions on operation of equipment and completion of data collection forms, and a list of standard teleconference programmes in which they might wish to participate.

A number of practice transmissions were held between the rig medic and Telemedicine during each medic's first rotation following his on-shore briefing. These sessions were largely to allow the medics to refine their SSTV transmission technique although a number of ECG transmissions were also incorporated.

(2) Emergency Staff: Complimentary equipment to that on the rig was placed in the Emergency Department. As previously mentioned the slow scan transceiver was held in the Telemedicine Centre and only the monitor and necessary control boxes placed in the Department. Given the large group of people who would have to use the equipment every attempt was made to keep the operational procedures as simple as possible. (Uncomplicated wiring diagrams and instructions were placed with the equipment.) The casualty officers and nurses on both day and night shifts were instructed in equipment use.

Emergency staff were advised to contact Telemedicine if they required assistance but very few requests were made.

D. SIGNIFICANT ALTERATIONS DURING TRIAL PERIOD

(1) Technical: During the trial there were a number of improvements to the stabilization equipment to better accommodate for rig movement in seas up to 30 feet (see Technical Addendum for details).

(2) Administration: In January 1984 Mobil terminated its lease on the SEDCO 706 and it was assumed Husky/Bow Valley (HBV). Negotiations between the various parties involved with the offshore trial and HBV led to agreement that all components of the trial would continue as planned. HBV assured Telemedicine of the complete cooperation of their rig medics and onshore physicians.

E. PROGRAMME DESCRIPTION

The 2-wire channel was used largely for business and personal calls (See Technical Addendum).

The 4-wire channel was used

- (1) as a voice link for consultation between the rig medic and emergency physicians,
- (2) to allow medics to participate in teleconferences, and
- (3) for demonstrations of the system including transmission of x-ray and electrocardiograms to various interested groups.

Patient consultations were carried out between the rig medic and physicians in the Emergency Department. It should be noted that the 2-wire channel was also used for audio-only conferences between the medics and onshore company physicians. In addition to voice communication a number of SSTV transmissions were made with each consultation usually showing various views of the injured or affected body part.

Rig medics participated in a limited number of nursing teleconferences offered on the Teleconference System utilizing interface equipment at the Telemedicine Centre still in place from the Anik Phase I hybrid experiment.

Although the SEDCO 706 did not have x-ray equipment the project wished to demonstrate the use of this technology for transmission of x-rays considered to be a critical test of the equipment capacity. X-ray films were sent to the rig and transmitted to the HSC during routinely booked test times.

V DATA COLLECTION

A. METHODS

(1) Programme Logs: Telemedicine logged all sessions that occurred on the 4-wire channel. (See Forms, Appendix IV). Whenever possible the Telemedicine operator attempted to obtain sea and wind conditions during the transmissions. The rig medics were asked to make more complete logs of each session themselves. (See Forms, Appendix IV). They sent their completed forms to the Telemedicine Centre at the end of each shift.

(2) Patient Data: The rig medic was requested to complete a "Rig Consultation Form" (See Forms, Appendix IV) for each session involving a patient (i.e., an individual form for each initial and follow up visit for each patient). Again medics were asked to send the completed forms to Telemedicine at the end of each shift. Whenever possible research staff completed a complementary form for each visit. If consultations occurred at night Telemedicine attempted to contact the consulting physician the following day to obtain the necessary information. Slow scan television transmissions were recorded on audio tape.

Electrocardiograms were transmitted directly to the Emergency Department. A physician could read the electrocardiograph immediately if necessary and inform the medic of the results. The original tape was sent in from the rig for comparison with the one received at the HSC. The consulting physician was contacted by telephone by research staff regarding management of the patient.

(3) Trouble Records: All system troubles were reported through Telemedicine (See Operations Protocols, Appendix III). Telemedicine recorded all downtime as well as causes and resolutions of troubles. (See Forms, Appendix IV).

VI RESULTS

A. TECHNICAL

The total period of the trial was 335 days. During that period the terminal was not functional for 110 days due to the rigs being off location or major repair necessary on the terminal. In addition, both channels were nonoperational for a total of 27 days for incident specific reasons; the 4-wire channel was out of service for a further 22 days and the 2-wire an additional 47 days. Of the 335 days Telemedicine had a functional 4-wire channel for 176 days (53% of time). The 2-wire channel was available 151 days (45% of time).

The major causes of downtime were:

- (1) rig in motion or under repair;
- (2) damage to terminal related to power surges;
- (3) repairs and maintenance improvement to stabilization equipment;
- (4) malfunction of indoor/outdoor satellite electronics; and
- (5) malfunction of interface equipment.

(See Tables 1, 1a, and 1b, Appendix V).

B. PROGRAMMES

(1) Programmes General: During the course of the trial 99 hours of use were logged by Telemedicine and/or the rig medics. The major programme types of that 99 hours were 29 patient consultation sessions (14.7 hours), 26 demonstrations (24.7 hours), and 31 hours of educational meetings, training sessions and calls on the 2-wire line. Twenty-nine hours of the recorded time were spent in trouble isolation and resolution (See Tables II and IIa, Appendix V).

No suitable convenient method could be found to log use of the 2-wire channel. Anecdotally the 2-wire channel appeared to be in continual use during business hours as one almost always received a busy signal when attempting to call to the rig from shore. Anytime Telemedicine wished to contact the medic or instrumentation technician it was necessary to ask the shore radio operators to ask the medic or technician to utilize the 4-wire channel.

(2) Patient Consultations: Thirteen patients (a total of 26 televisits) were treated utilizing the satellite facilities. Only audio and slow scan television were employed. There was no clinical use of the ECG transmitter in the trial period. The following are a few case descriptions representing the types of medical problems treated. (See Table III, Appendix V).

- (a) The rig medic reported to the onshore company physician that a ballast control room worker had a headache and a fixed and dilated left pupil with some reduction of visual acuity. A neurological consultation, supported by slow scan transmission of pictures of the eyes, showed only a moderately enlarged left pupil and no other evidence of 3rd nerve palsy. A benign cause for the pupillary inequality was suspected. The patient was sent ashore by routine helicopter flight. Investigation on shore confirmed that the patient had an Adie's pupil. He returned to

work after being provided with corrective lenses. In all likelihood this patient would have been evacuated as an emergency by helicopter had there been no telemedicine consultation.

- (b) While exercising, a diver developed a sharp pain in the left lower lid with associated painful swelling. Slow scan pictures showed the eye to be normal. A diagnosis of a rupture of a blood vessel was made. He was followed by daily telemedicine assessments and medevac was avoided.
- (c) Bruising of the back of the hand with swelling suggested a fracture. Patient was medevaced and a fracture was confirmed.
- (d) A severe laceration of the hand was assessed by the Emergency Department physician from the shore hospital. Patient was stabilized by the medic and sent ashore by emergency medevac. He lost his index finger. It was felt that stabilization and preparation for the evacuation was enhanced by the ability to consult with shore and to transmit pictures.
- (e) A young worker developed pain and lump over the front surface of arm just proximal to the wrist joint. A slow scan picture helped to confirm that this was a ganglion and the patient was managed on board. Elective medical evacuation would probably have been necessary if the picture of the lesion had not been transmitted.
- (f) A crush laceration of the middle finger over the palmar surface of the terminal joint required three stitches. The assessment by the physician on shore, by receiving pictures, confirmed there was no tendon injury and medevac was not necessary.

On shore physicians were pleased with the quality of the slow scan and with the additional information provided by the video supplement.

(3) Demonstrations: A number of groups interested in the potential use of satellites in remote and offshore settings visited Telemedicine during the year. A total of 26 programmes were arranged to demonstrate the potential of the technology. (See Table IIa, Appendix V).

(4) Test Transmissions: Audio: SSTV: ECG: In seas higher than 30 feet transmissions usually contained "noise spikes" caused by slow speed in terminal tracking. A definable audio pattern occurred whenever the terminal lost contact with the satellite. Users quickly learned not to attempt transmission during such periods. If the tracking was lost during slow scan transmission there was a recognizable visual effect. The medic was asked to retransmit. Aside from this there were no other problems apparent which related specifically to the satellite facilities. The resolution and the quality of the slow scan video signal was limited only by the slow scan equipment. The voice quality was excellent and high quality slow scan pictures were transmitted. The ECG's could be interpreted with confidence. The original ECG tracings taken on the rig were sent by mail to the Health Sciences Centre where independent reading demonstrated no loss of information due to transmission.

(5) T.V. Receive Only (T.V.R.O.): We were advised that T.V.R.O. capacity was used only twice and functioned adequately during those periods. The general consensus was that it was better for morale to allow rig workers to use the telephone for personal calls (charges were reversed) outside business hours than to utilize the channel capacity for television viewing. Access to the telephone for personal calls were regulated by the rig medic.

(6) Industrial Programmes: A limited number of programmes were undertaken to demonstrate the potential use of the satellite communication system in an industrial setting. (The routine industrial use of the 2-wire access to the switched network was demonstrated very early in the project.) Teleconferencing supplemented by slow scan transmission was considered to have a significant potential. To demonstrate the teleconferencing capacity a 4-wire extension of the system was placed in HBV offices in St. John's. The Telemedicine Centre bridge was used to link Calgary, Halifax, St. John's and the SEDCO 706 for conferences.

Towards the end of the project HBV personnel who recognized the potential of the system took the initiative in moving towards the expansion of the System to include one or more rigs in the area of the SEDCO 706. Slow scan equipment was obtained, at the oil company's expense for a second rig the BOWDRILL III. Two VHF radio channels were provided between the SEDCO 706 and the BOWDRILL III. Different types of radio equipment were used on each channel. The 2-wire channel operated adequately. However not only did the 4-wire link not function but the installation put the existing satellite 4-wire channel completely out of service. This installation was implemented much later in the trial than anticipated due to shortages of manpower caused by the N.T.C. labor dispute. The problem on this 4-wire interface was not resolved during the trial period. (See Technical Addendum).

C. 2 to 4-WIRE CONVERSIONS

N.T.C. provided the facility, in their St. John's central office (C.O.), to switch either channel between a 2-wire and 4-wire operational mode. On a number of occasions, particularly when the 2-wire channel was nonfunctional for long periods, the 4-wire channel was switched to the

2-wire mode. Switching was performed with decreasing regularity as the trial progressed as there appeared to be considerable logistical problems in having the channel operation mode changed.

VII DISCUSSION

A number of factors influenced the maximum utilization of the system.

A. MEDICAL

Despite the fact that the operating company and its medical director supported the project, the company's local physicians (and contractor's local physicians) did not use the system as expected so that there was a very significant reduction in the potential utilization. Only when a change in operator took place was the project able to continue and then only to a somewhat limited degree. Despite this major problem there were enough consultations to demonstrate clearly the value of the system.

Although Emergency Department staff were enthusiastic and supportive it was difficult for them to incorporate use of the system into their routine as the technology was unpredictable and could be nonfunctional for long periods of time. Given that this was a prototype terminal and therefore recognizably subject to lengthy downtime due to maintenance needs and modifications requirements perhaps a less service oriented demonstration model should have been chosen for a trial.

B. TECHNICAL

Trouble resolution seemed to be delayed for a number of reasons over and above the obvious difficulties in servicing a prototype terminal.

These included

- (a) problems that arose from the different operational philosophies of the research oriented and service oriented groups involved. These were in part resolved during this trial by all parties agreeing to adhere to operations protocols designed specifically for this project,
- (b) a tendency in the early stages of the trial to attribute troubles to stabilizer malfunction even though indications pointed in other directions,
- (c) the limited number of N.T.C. staff available for repair and maintenance of the offshore equipment in combination with difficulties of scheduling helicopter transport off the rig at convenient times on occasion lead to technicians leaving the rig without adequate testing and/or repair,
- (d) a tendency not to dispatch to the rig unless one or other of the channels was actually out of service.

Considering the power characteristics in this type environment, it is our impression that considerable attention must be given to voltage protection methods with electronic equipment utilized. All Telemedicine equipment was supplied with internal and external voltage control devices to provide appropriate AC power. There were no telemedicine equipment malfunctions due to irregularities of power sources on the rig.

The 2-to 4-wire channel mode switching package was placed in the N.T.C. central office. Converting the channels from 2-wire to 4-wire operation frequently took an inordinate length of time due in part, we assume to N.T.C. design considerations and staff education. If switching capacity is required we would recommend that an operationally simple package, accessible from the field location, be provided, as was originally envisioned for this project.

C. GENERAL

To mount the kind of project described a large number of agencies and organizations were involved. Phase I was supported financially by PetroCanada Incorporated. Financial support for Phase II came from Mobil Oil Canada Incorporated and from Esso Resources. Further, Mobil Oil made available their contracted rig SEDCO 706, as well as providing logistic, administrative and technical support. Such support continued when the rig was transferred to Husky/Bow Valley. The medical director of HBV was largely instrumental for the continuing utilization of the system by the rig medics and local company physicians. The support of the rig medics and technicians proved invaluable. In particular the assistance and continual cooperation of the instrumentation technicians contributed significantly to this project. The General Hospital, which has been designated by the Newfoundland Department of Health as the coordinating emergency centre for offshore health care, made its resources available to the project as requested and has made a commitment to ongoing telemedicine activities.

In the brief period during which all aspects of the project functioned well it was shown that satellite telephony channels should improve the level of communication in the offshore environment.

VIII CONCLUSIONS

The results of this experiment demonstrate that

- (1) with further improvement in the stabilization system, which would allow the terminal to function in higher seas, this type of technology could be used successfully to improve communications to offshore rigs and hence enhance medical support to the offshore,
- (2) satellite services are needed to provide communication links to more isolated areas in which terrestrial systems are unavailable, impractical or impossible,
- (3) one or more telephony channels can give a high quality voice link to support industrial, health and education needs in remote areas,
- (4) slow scan (freeze frame) television can significantly enhance the capacity of voice links in the support of health care,
- (5) other forms of medical data can be transmitted effectively by telephony channel,
- (6) the development of a satisfactory telemedicine service will depend on the cooperation and commitment of shore based and offshore based personnel responsible for health care,
- (7) dedicated satellite telephony links can meet some education, entertainment and personal communications needs of remote workers,
- (8) continuing research in the offshore use of satellites, telemedicine, education, and industrial use is required if the full potential of this mode of communication is to be reached.

To make Telemedicine use economically feasible it would be necessary to share a channel with industrial users. This could be logistically feasible if 2-wire capacity was utilized exclusively or if convenient 2 to 4-wire switching capacity was provided.

The potential for education appears to be equal to that of Memorial's ground-based system. In a commercial mode it is anticipated that the stabilized terminal will provide a reliable voice link and allow the transmission of various forms of data for both medical and industrial purposes. The question of cost effectiveness of this 12/14 GHz system is yet to be answered clearly but there is early evidence to suggest that for combined industrial health and education uses it will be significantly less expensive than other services and will be economically practical.

APPENDIX I

PROJECT CRITICAL PATH

PROJECT CRITICAL PATH

June 1980 Phase II proposal submitted

1980/82 Negotiations with N.T.C. and Mobil

1982

May Initial approval date for start of project

July Initial target date for arrival of offshore terminal

October Training of rig medics

November 9 Initial arrival offshore terminal in St. John's

December 8 Arrival of stabilizer in St. John's

1983

January 10 D.O.C. personnel to test offshore terminal between St. John's and Ottawa. Testing revealed problems with

- (a) Mitel electronics which were returned to Ottawa.
- (b) stabilizer, both motor and balance; which were ultimately repaired by having C-Tel technician come to St. John's from California, and
- (c) TWT which was replaced with a new one during this debugging period.

July 19 D.O.C. and N.T.C. install terminal on the rig

July 29 N.T.C. return to rig to work on power problem on their equipment.

August 2-4

- D.O.C. return to rig to move indoor package into instrument room. Installation had been in radio room and it was thought that transient spikes were interfering with transmissions.
- One gyromotor goes faulty and a second one disabled to balance therefore, steptracking is still a problem.
- One VCU transmit card not functioning, therefore using only one channel (1579 in 2-wire)

August 8

- (a) Access to the one working channel given to Telemedicine.
- (b) Begin testing SSTV including use of alternative

video source than Dage SSTV camera i.e.,
underwater camera and mini computer
(c) T.V. cable run to lounge.

August 26-September 2 (a) Faulty TWT removed and brought to Ottawa
for repair.
(b) D.O.C. personnel travel to rig to:
(1) replace gyromotor
(2) replace VCU transmit card
(3) replace faulty TWT

September 2 Both channels (2-wire (1575) and 4-wire (1579)
made available)

September 6 DTMF encoder for 2-to 4-wire conversion of channel
1579 (4-wire) grounded until it could have
deenergized state altered

September 24 DTMF encoder deenergized state altered on
4-wire channel

October 27 Stabilizer connected to ship's compass. (No
noticeable change in response of stabilizer.)

December 9 Problem reported on ship

December 19 N.T.C. personnel installed a replacement ship.

1984

January 13 VHF extension and expansion to BOWDRILL III proposed

January 17 Rig pulled anchor to Halifax. Working with Ottawa
to locate satellite. Moved to Halifax for
retrofitting and N.T.C. initial install of VHF
interface equipment for SEDCO 706.

January 27 ETV terminal blown over in wind storm.

February 6 Husky/Bow Valley officially take over SEDCO 706.

February 10 D.O.C. replaced and balanced gyromotor on 706.
N.T.C. completed VHF installation for 2-wire
extension to BOWDRILL III.

February 12 706 left Halifax to return to site.

February 13 Repair on ETV terminal complete.

February 26-27 706 off location

March 5-April 5 Rig transmitter not functioning. Sent to Ottawa for repairs

April 23-28 Rig off location due to weather and ice conditions.

May 2 First time able to transmit SSTV from Telemedicine to
rig using 280 Telemed transceiver

June 12-15 Rig off location

June 27-August 7 Indoor/outdoor package and LNA in Ottawa for repair.

APPENDIX II

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

ANIK B PILOT PROJECT

ADDENDUM

FINAL REPORT

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

ANIK B PILOT PROJECT

ADDENDUM

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Date : August 9, 1983

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I INTRODUCTION

At the completion of the Memorial University of Newfoundland Anik B Pilot Project Phase I experiment approval in principle was sought and obtained to maintain use of the four terminals located in the province (Goose Bay, Makkovik, Labrador City, St. John's). Memorial's Phase II experiment would consist of two sections

- Part A: Labrador Activities
- Part B: Offshore Activities

This addendum to the Memorial University of Newfoundland Anik B Pilot Project Phase I report covers only Part A above. Discussion of all the activities related to the offshore terminal (Part B) will be covered in a separate report at the completion of that stage of the project.

The programme data included in the Phase I report did not extend beyond March 31, 1981, although some of the technical discussion extended to May 31, 1982. For completeness therefore, and consistency in this section, both programme and technical data is reported from April 1, 1981 to August 13, 1982. The information is considered in two sections

Period A: April 1, 1981-August 31, 1981 - 4 terminals
operational

Period B: September 1, 1981-August 13, 1982

- only St. John's
and Labrador City
terminals operational

II OBJECTIVES

During the April 81-August 82 period the system was used:

- (a) for delivery of interactive programming in areas such as continuing education for health professionals, administrative meetings and university credit courses,
- (b) to provide test facilities for equipment being designed or used for application in the offshore environment,
- (c) to provide a facility of continue the investigation of transmission of medical data on instruments being tested for use in the offshore.

III SCHEDULE OF EVENTS

The following schedule does not attempt to include all activities, but indicates only those which had a significant impact on technical, coordination or operational activities.

- | | |
|------------------------|--|
| May 31, 1981 | Completion of Phase I programming. |
| June 1-7, 1981 | Transfer of local technical maintenance component to Newfoundland Telephone Company (NTC) from the University's Educational Television Centre (ETV). |
| June 1-August 31, 1981 | Operation of 3 terminals in Labrador and 1 in St. John's. |
| September 1-5, 1981 | Decommission Goose Bay and Makkovik terminals |
| | - Agreement on category I (non pre-emptable) and category II bookings. |
| | - Begin time sharing and resulting coordination procedures with Ottawa. |
| | - Available hours shortened 0900-1830 hours on Fridays only. |

- 1900-2030 Monday-Friday time period
routinely assigned to CBC for SNG
news gathering project.

April 1, 1982

Completion of CBC project 1900-2030
time again became available to Telemedicine
on a routine basis, however, time
sharing and associated coordination
procedures continued.

July 1982.

Decision not to repair Labrador City
terminal until required for UNISPACE '82
programme (see p. 10).

August 1982

UNISPACE '82 programme
Decommission Labrador City terminal.

IV MANAGEMENT AND COORDINATION

Dr. A.M. House continued to direct the project with day to day operations falling under the Telemedicine & Health Office. Local technical maintenance was carried out by NTC component of the Phase II offshore experiment. The Telemedicine site contact handled all coordination and initial trouble identification activities on site. The site contact worked only with the Department of Communications (DOC) or the Telemedicine Office on trouble isolation. All contacts with the Telephone Company were made by the Telemedicine technician.

Time Availability

From June 1-October 30, 1981, access to the satellite channels was available as agreed in the Memorandum of Understanding (M.O.U.). The October 1981-August 1982 period satellite time was available to the project only as requested. Booked time was classified into the following two categories:

- Category I: time for ongoing series of programmes on pre-emptable
- Category II: time booked on an ad hoc first come first serve basis. It was agreed that if there was conflict, for specific time requests the Telemedicine Office would consult with Labrador City to confirm that participants would attend as the first step in resolving the issue.

Written notice of known category I bookings were sent to DOC in October 1981. Ongoing requests for category II time and confirmation of the following week's combined schedule were discussed weekly by DOC and Telemedicine coordinating staff. As the change in availability of satellite time was known early, Telemedicine was able to alter its category I bookings to accommodate the CBC-SNG project time requirement from 1900-2030 (Nfld. time). Since, however each time Telemedicine requested a category II booking in the 1900-2030 period DOC was able to make the time available, for the purposes of this report, this time is considered as part of this project's routine allocation.

V PROGRAMMING

General Programming

Please see Appendix I Tables I & II for a breakdown of the programmes and a list of groups who used the system, during time periods A & B. The tables show both the programmes for which the sites were eligible to participate (E) and those in which they actually participated (P). During period A Labrador City and Goose Bay participated in approximately 60% of the programmes for which they were eligible and Makkovik participated in approximately 20%. Makkovik was a much smaller institution with fewer staff members and therefore it was more difficult for them to schedule staff to attend conferences. Anecdotically Makkovik reported in response to a request regarding appropriateness of programmes to their site, that they frequently attended programmes without reporting their presence. During period B Labrador City participated in 56% of the programmes for which they were eligible.

In the period A Goose Bay participated in 26%, Labrador City in 19% and Makkovik in 6% of their conferences using the alternate land line facilities rather than satellite. (The land lines were used as a back-up service when the satellite terminals were not operational). During period B Labrador City participated in 7% of their conferences on land lines. There was a certain hesitancy on the part of the sites to use the land line back up service for elective programming, such as continuing education programmes due to the long distance charges incurred.

Slow Scan Television (SSTV)

A small number of slow scan transmissions were made prior to May 31, 1982. Discussion related to implementation of SSTV trial was covered in the Phase I report section 3 pp. 17-19.

Electroencephalogram (EEG's)

During the SSTV study the need for regular transmissions of other types of medical data was identified. Therefore an EEG trial which lead to an ongoing service was implemented. Equipment was sent to the Labrador City hospital. A technician from Labrador City received one week's training in St. John's. By the fall of 1981 the EEG's were routinely transmitted to the Health Science Centre at a rate of two per week (each transmission took approximately 1/2 an hour).

Electrocardiograms (ECG's)

In September 1981 a brief ECG trial, using standard in house ECG equipment and Qwip facsimile units was undertaken. The facsimile machine scanned an existing ECG trace sheet at the remote site, transmitted the image as an analog signals, a second facsimile unit reconstructed this image of the ECG tracing at the receiving station and duplicated it on paper. A series of ECG tracings were obtained and read in the Health Sciences Centre. These same tracings were subsequently used for all three sections of the trial.

Optimum speed and contrast settings were established, and some technical and operational modifications were implemented during a bench trial. The same prerecorded tracings used in the bench tests were then transmitted from St. John's to Labrador City and back to St. John's using a loop back feature in the experimenter's package in Labrador City (Telemedicine Anik B Project Section: Satellite Equipment Interface Box). Preliminary results indicated continued study would be advised, therefore one facsimile unit and the prerecorded tracings were sent to Labrador City in October 1981. The tracings were transmitted from Labrador City and read by a cardiologist in St. John's in this third section of the trial.

There were no significant difficulties encountered specifically related to the transmissions on the satellite channel. However, the combined technologies were unable to provide sufficient differentiation between the graph paper markings and the ink tracings to allow diagnostic evaluation of the tracing. Therefore, it was decided to terminate this particular trial in mid November and to investigate the possibility of purchase of equipment specifically designed for transmission of direct output from ECG machines. It was anticipated that such equipment would be used in the Anik Phase II experiment.

VI TECHNICAL MANAGEMENT

General

Due to other commitments ETV was unable to continue their participation after the initial Phase I period ending May 31, 1981. Prior to this date negotiations were opened with NTC, which lead to their acceptance of local terminal maintenance from June 1981 to May 31, 1982. NTC saw this undertaking as providing an opportunity

for (a) staff education on satellite systems,

(b) working experience prior to their proposed involvement in the Anik B Phase II trial.

Areas of Responsibility

During the period May 31, 1981 to August 1982 the Newfoundland Telephone Company

- (1) covered all maintenance responsibility formerly undertaken by ETV,
- (2) employed their local maintenance technicians to carry out repairs including replacement of such DOC equipment as was previously handled by the TCS technical contact at each site.

Telemedicine

- (1) worked with the site contact and DOC to identify and isolate any apparent troubles,
- (2) performed daily level tests to each of the three ground terminals in Labrador and reported irregularity to NTC.

DOC and NTC

- (1) negotiated directly regarding which agencies would effect each repair and proceeded as agreed,
- (2) updated Telemedicine regularly on the status of trouble resolution.

VII OPERATIONS REPORT

General

Tables III-VI in Appendix II give a summary of the trouble and downtime experienced during periods A & B. These tables display the data both in terms of actual allotted time and in days. During the period A there were 1359 satellite hours allotted to the

Newfoundland experiment, with a total of 12 troubles reported. The average length of downtime per trouble was 51 hours of allotted service time (high 203 hours; low 1 hour). The Goose Bay terminal was non-operational 15% of the allotted time, St. John's 14%, Labrador City 9.5% and Makkovik 6.5%.

During period B, Labrador City was out of service for a total of 360 hours (13.5% service time) or 56.9 days caused by troubles on either of the three terminals in the configuration (see Tables V and VI). There were 14 troubles on all three terminals. The average length of downtime per trouble in this period was 32 hours of allotted service time (high 330 hours; low 1.5 hours).

The majority of troubles in both period A and B were on DOC equipment. As table V-VI indicate, there were few troubles but they tended to be fairly lengthy. The high turn around time on troubles was due at least in part to the fact that all spare DOC equipment had to be shipped in from Ottawa, with occasional second shipments required when the first part did not rectify the problem.

Two troubles worthy of note as they significantly increased the downtime figures were (1) Makkovik (May 25-June 1, 1981; 89.5 hours), when a flood in the nursing station shorted the cables, which subsequently took a long time to repair; and, (2) Labrador (January 18-January 28; 110 hours), when the terminal went down in a severe storm. A state of emergency was declared in the city and there were delays in affecting repair as restoring other communications systems took priority.

A number of short duration troubles 17 in total (see Appendix II Table VII) were not included in the above statistics or reported to either DOC and NTC as they were thought to be minor operational problems e.g., failure to turn the satellite channels over to the experimenter at programme time for category II bookings. The Labrador City terminal required frequent recycling particularly in the final 6-8 months of operation. This procedure caused loss of a short amounts of programme time particularly in the period when the satellite channel was being time shared, as the channel was not turned over to Telemedicine until immediately prior to programme start time.

The Labrador City terminal became non-operational in late July 1982 and a decision was made at that time not to attempt to repair it until the Unispace '82 programme (see p.11).

NTC Maintenance Contract

During the fall of '81 NTC indicated that terminal maintenance particularly in Labrador City (60 hours in the August-October period) was consuming significantly more staff time than the Company had anticipated. This coupled with DOC trouble shooting procedures which required frequent dispatch to the site during each trouble led an agreement that after May 31, 1982 NTC would charge Telemedicine at the rate of \$45.00 per hour for maintenance on the terminals. The total cost during the June 1-July 30 period was \$1,180.

Decommissioning

A separate sub-contract was maintained with ETV to decommission the Goose Bay and Makkovik terminals in September 1982. The Labrador City terminal was decommissioned by NTC and DOC following the Unispace '82 programme in August 1982.

VIII UNISPACE '82 DEMONSTRATION

Telemedicine was asked by DOC to act as the Canadian demonstration for the Unispace '82 conference in Vienna. Planning for this demonstration began in January 1982. The programme was a joint effort of DOC, CBC and MUN with NTC providing 4-wire links between the CBC studio's and the Teleconference System head end. As part of the 15 minute live one way video, two way audio conference between St. John's and Vienna an electroencephalogram was transmitted from Labrador City. To permit the transmission of this programme a 3 metre terminal was installed on the CBC property and the Labrador City terminal was repaired.

IX RESULTS/DISCUSSION/RECOMMENDATIONS

1. The technical quality of the satellite service was considered by the users to be equal to that of the microwave system. In Labrador City where the alternate telephone transmission system used troposcatter the satellite facility was far superior. At the end of the experimental phase in Labrador City a decision was made to transfer from the satellite service to a limited dial access telephone classified as Voice Com I, because,

(a) figures at the time indicated that the cost of a 4-wire dedicated telephone circuit would be less expensive than a similar satellite service. Telemedicine was advised that a commercial

satellite telephone channel would cost approximately \$2,000 per month and each ground terminal would be approximately \$5,000. 4-wire dedicated service from our nearest location would cost approximately \$20,000 per annum. This cost could have been shared by the one other community enroute.

- (b) The telephone facilities on troposcatter were not of a sufficiently high caliber to allow inclusion on the 4-wire network without decreasing the overall quality of the network.
- (c) As satellite services were not available through the common carrier, trouble resolution and maintenance would pose significant problems in attempting to maintain a continuous service.

2. Time availability and coordination between St. John's and Ottawa did not appear to present difficulties during the period when the channel was time shared. On occasion however the satellite turn up time was missed on category II programmes (i.e., bookings that were made weekly).

3. Slow moving (graphic type) data transmissions (i.e., EEG's) of a quality adequate for clinical diagnosis could be successfully carried out with a minimum of modification to the equipment.

4. Transfer of the responsibility for local terminal maintenance from the University based ETV centre to the service oriented Telephone Company had certain difficulties, which are outlined below.

- (a) DOC's trouble shooting procedures seemed to require multiple dispatches to the site during a single trouble isolation. NTC practice dictates that technicians are dispatched to work on troubles sequentially. Once the technician was reassigned, he could not return to work on the trouble until the preceding ones were handled. Obviously delays in trouble isolation resulted.
- (b) It was DOC policy (due to a quite legitimate concern to maintain uniformly on the units) to ship whole units for replacement when a trouble was isolated rather than allow repair on site. As NTC had entered the experiment to familiarize their staff with satellite technology prior to their official involvement in the offshore Anik experiment, this maintenance procedure produced some frustrations.
- (c) The procedure of shipping "black boxes" was a lengthy one, taking anywhere between three and nine days. This resulted in (i) considerable programme downtime and (ii) kept trouble open on Telephone Company books for what appeared to be long periods. It was thought that trouble resolution would be considerably expediated if spare units should be kept if not on site, at least in the area.

5. The practice of shipping all DOC equipment to the same person in a given areas would be highly recommended. Considerable delays were experienced in Labrador City due to (a) varying shipping procedures, and, (b) apparent insufficient information flow in between the 3 agencies involved in the transfer.

6. The loop back unit on the experimenter's package was found to be valuable in identifying troubles, particularly those that originated at the 9 metre terminal in Ottawa reducing the amount of on site activity required in trouble isolation.
7. Given the different mandates of the agencies involved Telemedicine found it beneficial both from the programming and technical viewpoint to act as the interface between DOC and Telephone Company personnel.

X CONCLUSIONS

Our experience indicates that a high quality communications service can be provided by satellite narrow band channels. Where microwave and other adequate ground facilities are not available from the common carriers or are impossible to provide (e.g., offshore), satellite services will be cost effective and efficient.

APPENDIX I

USE DATA
AND
USER GROUPS

TABLE I

HOURS OF PROGRAMMING BY SITE

April 1-August 31, 1982

PERIOD A

Programming Type	TIME IN HOURS					
	Goose Bay		Labrador City		Makkovik	
	E	P	E	P	E	P
Health Education						
Physicians	62	21	52	1	42	8
Nurses	5	--	5	2.5	4	1
Other Health Groups	4	1	--	--	--	--
University Credit Courses	48	45	45	43	--	--
Other University Courses	--	--	--	--	--	--
Meetings						
Health	47	28	27	12	8	--
Education	12	11	11	11	--	--
Other	23	19	17	15	4	--
Medical Data TX						
SSTV	NA	NA	3	3	NA	NA
EEG	NA	NA	14	14	NA	NA
Project Administration	32	18	31	20	29	9
Technical/Testing	--	--	1	1	--	--
Other	3	3	3	3	--	--
	236	145	208	131	87	18
% of programmes in which site participated	62%		63%		21%	

E Programmes in which site was eligible to participate.

P Programmes in which site actually participated.

TABLE II
HOURS OF PROGRAMMING IN LABRADOR CITY
September 1, 1981-August 13, 1982

PERIOD B

Programme Type	TIME IN HOURS	
	E	P
Health Education		
Physicians	120	4
Nurses	82	53
Other Health Groups	7	
University Credit Courses	153	116
Other University Courses	3	2
Meetings		
Health	46	31
Education	13	7
Other	88	50
Medical Data Transmission		
SSTV	---	---
EEG	85	55
Project Administration	53	9
Technical/Testing	4	4
Other	---	---
Total	653	366
% of programmes in which Labrador City participated		56%

E Programmes in which Labrador City was eligible to participate.
P Programmes in which Labrador City actually participated.

SELECTED LIST OF USERS

USERS

Newfoundland Hospital Association

Newfoundland Pharmaceutical Association

Newfoundland Speech & Hearing Association

Health Care and Organization of Management - Correspondence Students

Department of Social Services

Part Time Credit Studies

Memorial University Extension Services

NASHE

Department of Health/Public Health

Association of Registered Nurses of Newfoundland

Adult Education/Department of Education

Early Childhood Development Association

Physicians/Surgeons

Nurses/Memorial University Nursing/Infection Control/Poison Control

Dietitians

Patients/Technicians

Personnel Officers

Health Care Educators

Teleconference System

Faculty of Medicine/Continuing Medical Education

Physiotherapists

Social Workers

Radiology Technicians

Newfoundland Telephone Company

Newfoundland Teacher's Association

Newfoundland Medical Association

APPENDIX II

TROUBLE INFORMATION

-50-
TABLE III

SUMMARY OF TECHNICAL PROBLEMS BY SITE AND TYPE OF TROUBLE

April 1, 1981 - August 31, 1981

PERIOD A

EXPRESSED IN ALLOTTED SATELLITE TIME

SITE PROBLEM TYPE	FREQUENCY	DOWNTIME (HOURS)	DOWNTIME AS A % OF TOTAL ALLOTTED TIME
Ottawa			
DOC Equipment	2	4	.5%
Outside Factor* ¹	1	1.25	

St. John's			
DOC Equipment	2	189.5	14%

Labrador City			
DOC Equipment	2	123.5	
Outside Factors* ¹	1	1	9.5%
Other	1	4	

Goose Bay			
DOC Equipment	1	203	15%
Human Error* ²	1	.3	

Makkovik			
DOC Equipment	1	89.5	6.5%

TOTAL	12		

Alloted satellite time: 1359 hours

*¹ weather conditions

*² terminal not turned on

TABLE IV

SUMMARY OF TECHNICAL PROBLEMS BY SITE AND TYPE OF TROUBLE

April 1, 1981 - August 31, 1981

PERIOD A

SITE	FREQUENCY	DURATION
PROBLEM TYPE		Days/Hours
Ottawa		
DOC Equipment	2	4 hours
Satellite	1	1.25 hours
St. John's		
DOC Equipment	2	22 hours
Labrador City		
DOC Equipment	2	11 days 7 hours
Outside Factor	1	1 hour
Nothing Found Out	1	4 hours
Goose Bay		
DOC Equipment	1	22 days
Human Factor	1	.3 hours
Makkovik		
DOC Equipment	1	10 days
TOTAL	12	

Experiment time: 153 days

TABLE V
SUMMARY OF TECHNICAL PROBLEMS
BY SITE AND CATEGORY OF TROUBLE
DURING ALLOTTED SATELLITE TIME
September 1, 1981 - August 13, 1982*
PERIOD B

SITE PROBLEM TYPE	FREQUENCY	DOWNTIME (HOURS)	DOWNTIME AS A % OF TOTAL NUMBER OF DAYS
Ottawa			
DOC Equipment Satellite	1	13	.5%
St. John's			
DOC Equipment	2	75.5	4%
Accidental cable cut in St. John's	1	35.5	
Labrador City			
DOC Equipment	9	330	12%
Weather Conditions	1	1.5	
TOTAL			
Downtime experienced in Labrador City due to any cause	14	360 hours	13.5%

Allotted Satellite Time: 2,683 hours

The

* The downtime after July 25, 1982 is not included as a decision was made not to attempt to repair the terminal prior to the Unispace '82 programme.

TABLE VI

SUMMARY OF TECHNICAL PROBLEMS
 BY SITE AND CATEGORY OF TROUBLE
 September 1, 1982 - August 13, 1982*
 PERIOD B -

SITE PROBLEM TYPE	FREQUENCY	DURATION DAYS/HOURS
Ottawa		
DOC Satellite	1	1 day
St. John's		
DOC Equipment	2	16 days
Human Factors	1	3 days
Labrador City		
DOC Equipment	9	39 days
Weather Conditions	1	15.5 hours
TOTAL (downtime due to any cause)	14	56 days 19.5 hours

Alloted Satellite Time: 328 days

* The downtime after July 25, 1982 is not included as a decision was made not to attempt to repair the terminal prior to the Unispace '82 programme.

TABLE VII

MINOR TROUBLES NOT REPORTED
LABRADOR CITY TERMINAL

DATE	TROUBLE TIME IN HOURS
November 18	1
January 4	1.5
January 11	1.5
February 16	1.5
February 24	7 minutes
March 2	1.5
March 12	1
March 15	1.5
April 15	1.0
April 21	5.0
May 6	1
June 3	1
TOTAL	17.5 hours

APPENDIX III

OPERATION PROTOCOLS

SSOC/NTC - ANIK B TROUBLE REPORTING PROTOCOLS

1. All troubles will be reported to SSOC (726-0077) by MUN. (MUN will also advise to SSOC if DOC is experiencing trouble on DOC equipment if it effects system operation.)

2. SSOC clears access time on both circuits through MUN.

3. SSOC refers problems to testboard or toll as appropriate.

4. Testboard or toll works with duty technician in Ottawa (613-523-9154) and/or instrument technician on rig, as appropriate to isolate and then resolve trouble.

NOTE: First line maintenance will be carried out by the rig instrument technician upon request. Instrument technician can be reached by telephone on satellite channel or via Husky/Bow Valley radio operator on H.F. phone patch (722-0308).

5. If trouble unresolved and NTC craftsman is required to be dispatched NTC contacts Brian Garner for travel arrangements.

6. SSOC gives reasonable status reports to MUN and advises MUN when trouble isolated and resolved.

7. MUN advises Husky/Bow Valley, Sedco of downtime and clearance.

TROUBLES ON DOC EQUIPMENT

1. If DOC requires assistance from NTC in trouble isolation and/or resolution they will call the NTC testboard technician directly (737-1176).

NOTE: SSOC should already have been advised of DOC trouble by MUN.

2. DOC advises MUN when trouble is resolved.

3. MUN advises SSOC.

RIG PERSONNEL - ANIK B TROUBLE REPORTING PROTOCOLS

TROUBLE REPORTING

1. Any person identifying a trouble should report same instrument technician.
2. Instrument technician checks earth station for orientation and determines, if possible, if both channels are efficient.
3. Instrument technician advises Rig Medic and other rig personnel as appropriate if trouble not resolved.
4. Either Medic or technician reports trouble to Memorial University (MUN) who determine if trouble originates with MUN equipment.
5. If trouble not with MUN equipment, MUN reports trouble to SSOC (726-0077).
6. MUN will give status to rig medic or technician and Husky/Bow Valley, Sedco as appropriate regarding downtime isolation and resolution.
7. Rig technician or medic will advise other rig personnel as appropriate.

TROUBLE ISOLATION/DOC

1. The instrument technician may be contacted directly by DOC to help in initial trouble identification. If the trouble is not cleared and needs to be referred to MUN, DOC will request that the technician do so.
2. Revert trouble reporting protocol, above, at step 3.

TROUBLE ISOLATION/NTC

1. The rig instrument technician may be contacted directly by NTC to assist in isolation and/or first line maintenance.

PROCEDURE FOR SWITCHING BETWEEN ANIK B FOR TELEPHONY AND MEDICAL USE

TO ANIK C FOR TELEVISION:

1. The changeover to television after 6 p.m. shall be at the discretion of the Husky B/V Supervisor on the Sedoc 706.
2. At this time the instrument technician will orient the antenna to Anik C using the co-ordinates shown on the front panel of the relay rack.
3. The switch to route the AGC signal from the pilot receiver to the television receiver will have to be thrown. These two steps will route the video signal to the VCR and television in the recreation room.

MUN - TROUBLE REPORTING PROTOCOL

1. Reports all troubles to SSOC.
2. Clears all system access time.
3. Provides all status and trouble resolution reports to Husky/Bow Valley and Sedco rig personnel.
4. Advises SSOC of DOC troubles and their resolution as appropriate.

PROCEDURES FOR CONVERTING 2-WIRE-4-WIRE SERVICE

NOTE: ALL CHANGES MUST BE REQUESTED THROUGH THE TEST BOARD
TECHNICIAN (737-1176)

CIRCUIT 1579: DE-ENERGIZED/ROUTINE STATE = 4-WIRE

- (a) Upon request to convert to 2-wire the test board technician will insert the SF unit and dial the 3 digit code 112.
- (b) Upon request to convert back to 4-wire the test board technician will remove the SF unit from the circuit and dial the 3 digit codes 113 followed by 115 (reset).

CIRCUIT 1575: DE-ENERGIZED/ROUTINE STATE = 2-WIRE

- (a) Upon request to convert to 4-wire the test board technician will remove the SF card and dial the 3 digit code 112.
- (b) Upon request to convert to 2-wire test board technician will replace the SF card and dial the 3 digit code 113 followed by 115 (reset).

MUN/NTC/DOC
ANIK B PHASE II INFORMATION SHEET

NTC CIRCUIT NO. SNED-1575

- normal mode 2-wire
- Direct Dial 753-9897

NTC CIRCUIT NO. SNED-1579

- normal mode 4-wire
- If in 2-wire IB number = 726-7442

SSOC Trouble Number	=	709-726-0077
MUN	=	709-737-6654
DOC (duty operator)	=	613-596-9435
Husky/Bow Valley Switchboard	=	722-6209
Husky/Bow Valley Radio Room Phone Patch	=	722-0308

DEPARTMENT OF COMMUNICATIONS - TROUBLE REPORTING PROTOCOL

RIG - SEDCO 706

1. Works with rig instrument technician as appropriate in isolation and resolution of troubles related to SEDCO terminal.
2. Advises MUN of downtime and resolution as appropriate.

ST. JOHN'S

1. Reports all system troubles related to the St. John's terminal or which require NTC assistance to MUN.
2. MUN arranges that the appropriate NTC person calls DOC to work on isolation and/or resolution.

9-METRE - OTTAWA

1. Advises MUN of troubles anticipated downtime and resolution on carriers and/or DOC equipment. MUN will advise NTC and Husky/Bow Valley , Sedco as appropriate.

APPENDIX IV

DATA COLLECTION
FORMS

ANIK B
RIG LOG

Date

Day		Month		Year	

Start Time

Hours			

Reason for Transaction

Transmission Mode Used

<input type="checkbox"/> Audio	<input type="checkbox"/> SSTV	<input type="checkbox"/> ECG
--------------------------------	-------------------------------	------------------------------

Number of Transmissions.

_____	_____
-------	-------

Number of Close Ups

_____	_____
-------	-------

Overall quality indicate
good (g), fair (f), poor (p)

_____	_____	_____
-------	-------	-------

Rig Conditions

Wave Height _____

Pitch _____

Roll _____

Heave _____

Wind Speed/Direction _____

Stop Time

Hours				

Other Comments

RIG CONSULTATION FORM
ANIK B PHASE II

For Office Use Only

1. DATE
 day month year

2. Consultation Start Time

3. Patient ID _____

4. Presenting Complaint _____

5. Time and Date Incident Occurred
 day month year time

6. Equipment
Applicable audio SSTV EKG
Functioning Yes
 No

7. Quality of Audio Reception
 Good Fair Poor

8. SSTV Use
a. Description of Transmission _____
b. Total number of Transmissions
c. Number of these where close up lens required.
d. Average number of attempts per transmission before adequate reception reported.

9. ECG Use
a. Number of ECG Transmissions.
b. Number Acceptable.

10. Other Data Transmitted
a. Type _____
b. Number of Transmissions.
c. Number Acceptable

11. Action Recommended _____

12. Consultation Finish Time

13. Weather Conditions: _____

14. Comments: _____

APPENDIX V

TABLES

TABLE I

DOWNTIME OF EITHER AND BOTH CHANNELS *

Channel	Time in Days/Hours
2 wire	47 days 3 3/4 hours
4 wire	21 days 22 1/2 hours
Both	26 days 19 3/4/ hours
TOTAL	95 days 22 hours

* Does not include the 110 days due to rig being off location or major repair to terminal.

TABLE Ia

MAJOR CAUSES OF DOWNTIME BY CATEGORY

CHANNEL	CAUSE	DURATION DAYS
2 wire	individual troubles	47 days 3 3/4 hours
4 wire	individual troubles	21 days 22 1/2 hours
Both	individual troubles	26 days 19 3/4 hours
	Rig retrofitting and St. John's terminal blown over by wind	41 days
	Repair outdoor package (power surge)	25 days
	Rig moving locations	8 days
	Replace divation amp.	1 day
	Repair indoor/outdoor package, LNA, Voice	35 days

TABLE 1b

CAUSES OF INDIVIDUAL TROUBLES
DOWNTIME BY CATEGORY

CAUSE	DOWNTIME IN DAYS & HOURS		
D.O.C. Equipment			
Rig	21 days	13	hours
Ottawa	3 days	11	hours
St. John's	2 days	8	hours
TCS Equipment		22	hours
N.T.C. Equipment	62 days	2 $\frac{1}{4}$	hours
N.F.O.	2 days	5	hours
Weather	3 days	8 $\frac{3}{4}$	hours
TOTAL	95 days	22	hours

TABLE II

RIG PROGRAMMING-TELEMEDICINE

September 1983-July 31, 1984

Category	No. of Programmes	Hours of Programmes
Patient data consult	29	14.7
Continuing Education	3	3.2
Rig Medics Course	2	1.9
Medic training	3	3.8
Demonstrations	26	24.6
Meeting AMH/rig personnel	10	5.5
Miscellaneous	16	7.5
Training-industrial	5	4.6
<hr/>		
SUBTOTAL	94	66.7
<hr/>		
2-wire calls (general)	36	4.3
Testing Periods	62	29
<hr/>		
TOTAL	192	99.1
<hr/>		

TABLE IIa

AGENCIES RECEIVING
DEMONSTRATIONS

1. MOBIL
 - Local Managers
 - Company Physicians
2. HUSKY/BOW VALLEY
 - Vice President - Health & Safety
 - Area Manager
3. HEALTH SCIENCES CENTRE - Chief of Medicine
4. REPRESENTATIVES OF ROYAL COLLEGE OF PHYSICIANS & SURGEONS
5. COMMISSIONERS OF THE OCEAN RANGER ROYAL COMMISSION ON THE MARINE DISASTER
6. DELEGATES FROM THE UNIVERSITY OF THE WEST INDIES VISITING CANADA TO EXPLORE DISTANCE EDUCATION DELIVERY METHODS
7. REPRESENTATIVES OF COGLA (Canada Oil and Gas Lands Association)
8. JOURNALISTS REPRESENTING VARIOUS CANADIAN AND AMERICAN NEWSPAPERS, JOURNALS, TELEVISION, AND RADIO STATIONS VISITING ON THE SEDCO 706.
9. THE PREMIER OF NEWFOUNDLAND AND LABRADOR.
10. NEWFOUNDLAND AND LABRADOR PETROLEUM DIRECTORATE
11. HEALTH FAIR (Medical School Demonstration for the Public)
12. CBC NATIONAL NEWS REPORT.

PATIENT TRANSMISSION RECORD

Patient No.	Presenting Complaint	No. of Sessions	No. of Transmissions When Used SSTV	Management
1.	Dilated pupil and headache. ?cerebral aneurysm	1	1	Evacuated on next routine helicopter. Consultation averted Medevac.
2.	Swollen ankle.	1	1	Strapped and handled on rig.
3.	Infection on amputated finger.	2	1 (not seen)	Handled by company physician using 2 wire circuit.
4.	Cyst under right lower eye lid	6	3	1st. cyst lanced slightly. Second cyst developed left upper lid. Evacuated next routine helicopter.
5.	Hand injury caused by rope. Skin not broken.	1	1	Required x-ray to determine fractured or only badly bruised. Routine helicopter just leaving. Evacuate. Fracture diagnosed on shore.
6.	Diver with sudden onset Swelling/bruising under eye.	6	4	Ruptured blood vessel caused by exercise. Treated on board with ice pack, prophylactic ampicillin and eye drops. Routine evacuation avoided.
7.	Diver. Blood in left ear canal. Ulceration on left tympanic membrane (TM) Bulging TM on right ear	3	0	Suspect otitis media treated on rig cloxicillin sudafed and ear drops. No diving until cleared. Routine evacuation probable

Patient No.	Presenting Complaint	No. of Sessions	No. of Transmissions When Used SSTV	Management
8.	Hand cut between thumb and index finger. Suspect tendon cut?	1	1	Treatment started Medevac
9.	Hand crushed between drum. Superficial laceration dorsal side of middle finger.	2	2	Stiches administered on rig. SSTV enabled to confirm tendon in tact.
10.	Severe laceration on arm.	1	1	Medevac
11.	Ruptured ganglion on palm side of wrist.	2	2	Treated (A-strapped) on rig
12.	Crush injury middle finger. Severe damage to finger nail.	3	3	Treatment started Routine evacuation recommended. Weather prevented evacuation Patient monitored daily.
13.*	Patient 13 requested his ECG be read.			

One call to Dr. Howell recorded by rig medic. No patient data available.

