FINAL REPORT

MEMORIAL UNIVERSITY OF NEWFOUNDLAND

ANIK B PILOT PROJECT

ADDENDUM

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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 seperate 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 consistancy 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 committments 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 alloted 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 lengthly. 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 experimentor 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 seperate 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 continous 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 preceeding 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 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

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 PROBLEM TYPE	FREQUENCY	DURATION 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 ALLOTED 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%
Accidential 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%

Alloted Satellete 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