EVALUATION OF THE ANIK B COMMUNICATIONS PROGRAM: PHASE ONE

VOLUME II
DETAILS OF FINDINGS AND CONCLUSIONS

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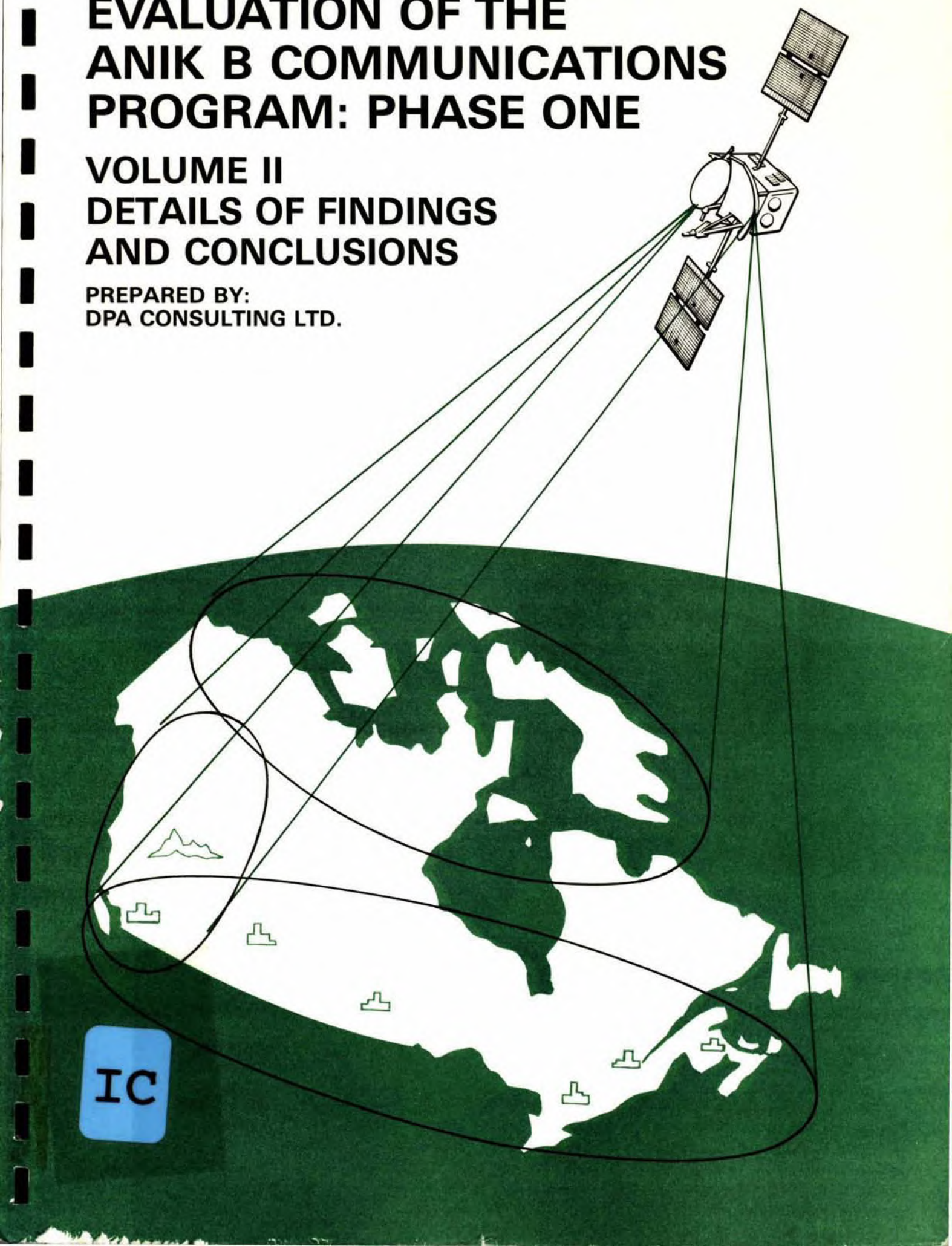

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EVALUATION OF THE ANIK B COMMUNICATIONS PROGRAM: PHASE ONE

Volume II
Details of Findings
and Conclusions

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EVALUATION OF THE ANIK-B COMMUNICATIONS PROGRAM (PHASE ONE).

VOLUME 2: DETAILS OF FINDINGS AND CONCLUSIONS

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PART F: INTRODUCTION TO VOLUME TWO

F.1 BACKGROUND

This is the final report on the evaluation of Phase One of the Anik-B Communications Program which is delivered by the Space Sector of the Federal Department of Communications (DOC). The report is issued in two Volumes: Volume 1 is a summary of the findings and conclusions of the evaluation, while volume 2 presents the detailed findings.

The evaluation began in January 1980, under DSS contract serial No.: OSV79-00063, file No.: 12SV.36100-9-0951. The client for the study is the Assistant Deputy Minister (Space) of the DOC. The study began with an abbreviated evaluation assessment, and a milestone report was issued in May 1980 in which recommendations were made on the focus of the subsequent evaluation and the type of evaluation research to be conducted.

The approach adopted was then tested on the major pilot project of the Program, the Program Delivery Pilot Project (PDPP). An interim evaluation report on the PDPP was issued in February 1981.

F.2 AN OVERVIEW OF THE ANIK-B COMMUNICATIONS PROGRAM (PHASE ONE)

A detailed profile and model of Phase One of the Anik-B Communications Program were prepared as part of the original evaluation assessment submitted to the client in May 1980. We repeat here only the major features of the Program design.

The Anik-B communications satellite was a hybrid system, operating in both the 6/4 GHz and the 14/12 GHz ranges. The entire 14/12 GHz capacity was leased to DOC by TELESAT for the purpose of conducting experiments and field trials.

The "Communications Program" refers to that part of the overall ANIK-B Program as authorized by Cabinet in 1975, that is concerned with utilizing the leased 14/12 GHz capacity to conduct

pilot projects in order to develop new communications services and industries using that frequency range.

The remaining parts of the overall ANIK-B Program delivered by DOC are concerned with broader issues, including the need to co-ordinate spacecraft procurement so as to establish a viable spacecraft manufacturing industry in Canada, and to establish a prime contractor for Canadian spacecraft.

This evaluation is concerned solely with the Communications Program part of the overall Program. Studies conducted on space prime contractors by officials of MOSST and IT&C present another perspective on the Program.

The four goals of the Communications Program (Phase One) are as follows:

- to determine the viability, on a pre-operational but continuing basis, of telecommunications services designed to meet identified requirements;

- to develop the knowledge and expertise to better utilize 14/12 GHz satellite communication technology;

- to develop and create awareness in user institutions of the potential of telecommunications to deliver new services; and,

- to contribute to policy issues.

The above four goals are not end points in themselves, but rather are envisaged by DOC management as contributing to an overall Space Sector goal of:

"orderly growth and establishment of a viable Canadian commercial satellite telecommunications systems, services and industry."

The Anik-B Communications Program was aimed particularly at developing 14/12 GHz satellite telecommunications systems, services and industry. In the evaluation assessment, two main sets of activities were identified for the Commmuncations Program: those activities aimed directly at creating and defining new markets for 14/12 GHz services, and those activities aimed at stimulating the development of an industrial and manufacturing base to service the above markets as they developed and were proven to be commercially viable by the carriers.

Within the first set of activities, five sub-activities were identified as contributing to these goals: pilot projects, demonstrations, systems tests, promotional activities, and lease-back in which part of the 14/12 GHz capacity was leased back to TELESAT so that interim commercial services could be provided immediately to users. The evaluation addressed only the first four sub-activities. The lease-back activity was excluded.

The consultant team has evaluated the first set of activities, i.e. those aimed at defining and developing markets for the 14/12 GHz technology. DOC Space Sector management established a separate DOC team to evaluate a part of the second set of activities, i.e. those aimed at creating the necessary manufacturing and industrial base. The DOC report is to be issued separately at a later date.

F.3 FORMAT OF THIS REPORT

This final detailed report consists of four parts. Part F, the Introduction, presents important background information on both the Anik-B Communications Program and this particular evaluation. In Part F.4, six key features of the evaluation approach are

described. They are important to understanding the ways in which the results of this evaluation can, and cannot, be used.

In Part G, we present the goal achievements and other effects of the pilot project activity of the Program. This activity was

the most resource-consuming of the Program activities, and the bulk of the evaluation work went into the examination of the pilot projects.

Part H contains the goal achievements and other effects of the other Program activities that were evaluated, i.e. demonstrations, systems tests and other promotional activities.

In Part I, we describe briefly the evaluation of the Program's direct industrial activities, being conducted by DOC Space officials. Their report is to be reliased separately at a later date.

F.4 KEY FEATURES OF THIS PROGRAM AND THE EVALUALTION

Several features of both the Anik-B Communications Program and the particular perspective of this evaluation must be appreciated when reading this report.

F.4.1 The Program

4.1.1 The Environment

The Program is operating in a very complex and changing environment. It is at one of the current forefronts of both technological and sociological change: communications. The host of inter-related issues such as the explosive growth of demand for a wide variety of traditional and new telecommunication services, the rapid pace of technological change and innovation, the growth of the "wired" home and city, the complex regulatory environment for communications in Canada, all combine to produce

a very dynamic and unpredictable situation in which cause and effect are often difficult to disentangle. Furthermore, in the highly-regulated communications environment of Canada, the time between cause and effect can be quite long. Closeness to the U.S. is an additional complicating factor. Being less regulated, the time required to introduce change into the U.S. is often shorter than in Canada. This can exert considerable pressures on the Canadian scene.

4.1.2 Phase One as Part of a Process

This study was aimed at evaluating Phase One of the Anik-B Communications Program. However, it is important to appreciate that Phase One is but one step in a DOC process of defining and creating a market for satellite communications services in the 14/12 GHz band and the appropriate supporting systems.

The process began with the DOC HERMES communications satellite, and its associated field trials and projects. Many of the experimenters and sponsors who used that facility are also taking part in the Phase One activities. Separating out the effects of the Phase One activity can be difficult. This will be seen particularly in the case of one pilot project for which it was important to isolate the overall significance in effecting change of the DOC sequence of Programs, from the incremental effects of the Phase One activity.

Looking forward in time, a similar situation arises. Many of the sponsors and experimenters have continued into Phase Two of the Program. The focus of this report is on the status of their work as of the termination of the Phase One project. Whenever possible, however, we support our analysis by referring to events that may have occurred since the end of Phase One.

4.1.3 The Program's Goals

The goals of the Program specify the intended ways in which the

Program is to affect its environment. Departmental officials responded to the complex environment by preparing Phase One goals that provided for the Program to make "inputs" to the communications environment. (See Phase One goals listed in F.2 above). That is, the Program was intended to stir up the general communications pot, but the specific direction of the stirring was not stated in a detailed, normative sense. For example: there is nothing in the goal statements to indicate whether a "yes" viability decision is preferable to a "no" decision, and yet the real intent of the Communications Program is to develop the 14/12 GHz market and delivery systems.

Furthermore, the Program's goals have changed over time. The current Phase Two of the Program has goals which are more specific than those for Phase One, based, in part, on experience gained in Phase One.

F.4.2 The Program Evaluation

The above features of the Program have influenced directly the nature of the evaluation that has been carried out. There are six key features of this program evaluation.

4.2.1 Focus of the Evaluation

The focus of the evaluation is on "goal achievements", i.e. on the identification of viability assessments, increases in technical knowledge and awareness, and contributions to policy issues that can be attributed to the intervention of the DOC-sponsored activities. Other third party and unintended, but possibly important, effects are also described, but the focus is on formal goal achievements. Thus, the evaluation is designed to answer the questions:

- "Did Phase One of the Anik-B Program achieve its formal goals?" and,

- "Were there other important, but unintended, Program results?"

The Phase One evaluation is not designed to answer questions such as: "As a model of government intervention to achieve industrial and communications goals, how does ANIK-B compare with the alternatives?", or "What was the opportunity cost of particular plot projects or forms of program activities?", or "What would the results have been under different levels of Program funding?" These very important questions may be addressed in the Phase Two evaluation.

4.2.2 Goal Achievements

In this evaluation, an event or achievement must pass two tests to be called a "goal achievement."

Firstly, the event or achievement must be reasonably demonstrable. For example, the claim that a viability decision was made should be backed up by evidence of serious discussion with suppliers or agencies.

Secondly, the event must be attributable to the intervention of the DOC program. The central question here is: "Did the DOC-sponsored activity cause the goal achievement, or was it due to other factors?" The nature of the goals, coupled with the complex environment within which the Program is operating, dictate that considerable judgement be exercised in deciding whether or not an effect was "caused" by the Program intervention. When such judgements are made, we identify them clearly.

4.2.3 Hierarchy of Goals

An examination of the background to the Program and its evolution make it evident that there is a hierarchy among the goals. In

particular, the recording of "viability decisions" (i.e. achievements for goal #1) is particularly important to the goal of creating markets for 14/12 GHz satellite-based telecommunications. Thus, we have attached priority to determining those viability assessment and decisions that could legitimately be attributed (See 4.2.3 above) to the intervention of the Program.

4.2.4 Achievements for all Goals

The Program goals are very general. It would be the rare activity that could not demonstrate acheivements for at least the "technical knowledge" and "awareness" goals. Indeed, all of the activities examined in this study will show achievements under these two goals. Care must be exercised in interpreting these results, as this evaluation does not examine the opportunity cost of projects or activities, i.e. goal achievements that might have resulted if the DOC resources had been used in other market sectors or other forms of activities.

4.2.5 An "End State" for the Program

DOC officials and the evaluation consultants agreed that the very general Phase One goals did not reflect accurately the true intent of the Program. It was decided that the identified goal achievements should be assessed in terms of their contribution to an "end state" that represented the link between the individual goal achievements and the overall DOC mandate for space and telecommunications. After considerable discussion, DOC Space management presented the following description of this end state:

> "the orderly growth and establishment of a viable Canadian commercial telecommunicatons system, services and industry."

Thus, in the final part of this evaluation report we present a

brief assessment of extent to which the identified Program achievements have contribued to this end state, with particular emphasis on a 14/12 GHz satellite-based system and industry.

Three specific indicators of success of the Program in achieving this end-state are examined:

- the commercial viability of the ANIK-C (14/12 GHz) satellites;

- the existence of a Canadian commercial manufacturing capability for the 14/12 GHz LCET's and related systems and equipment, capable of producing for large markets and with a proven record of sales; and

- a group of Canadian organizations using both of the services on a commercial basis.

4.2.6 The Evaluation As a Snapshot

The results of this evaluation present a "snapshot" of the status quo at a certain point in time. However, the environment within which this Program is operating is changing very rapidly. New CRTC decisions on marketing practices, technical innovations, spreading interest in telecommunications, all combine and exert powerful change forces.

Some changes can come about very quickly, and it must be appreciated that the results reported here may well have altered since the date of publication.

PART G: GOAL ACHIEVEMENTS, EFFECTS AND COSTS: PILOT PROJECT ACTIVITY

G.1 INTRODUCTION AND METHOD

This part of the report presents and assesses the reported effects of the Phase One pilot projects conducted as part of the the Anik-B Communications Program.

The reported effects are the contributions of each pilot project to the four DOC goals of the program, as reported to us by the project participants. We then assess these reported effects focusing on the extent to which the key characteristics of the project were actually responsible for achieving the effects reported. These key characteristics are:

- the extended period of "hands-on" experience afforded by the pilot project;
- the high profile nature of the Anik-B Communications Program; and,
- the particular characteristics of the 14/12 GHz band used in the projects.

Details of this approach used are contained in the Phase One evaluation assessment and the interim PDPP evaluation report. For each of the projects we also present a section on the direct costs incurred by both DOC and the participants to conduct the individual projects. The purpose in providing this information is to contribute to our final assessment of the effects of the Phase One pilot project activity on the achievement of the end state which links the program to the DOC mandate, i.e. "To contribute to the orderly growth and establishment of a viable Canadian commercial satellite telecommunications system and industry."

For the pilot projects costs reported are: capital equipment expenditures on satellite-related equipment, purchased by the experimenters, DOC manpower used directly on the individual projects, e.g. person days utilized by CRC officials as project participants but not to be used on program or systems management, DOC equipment used, and satellite usage, and, where available experimenters operating costs.

The pilot projects are classified as:

- TV Broadcasting/Distribution (2 projects);
- Community Communication (2 projects);
- Tele-education (3 projects);
- Tele-health (2 projects);
- Public Service (1 project); and
- Advanced Technology (4 projects).

Three research methods were used:

- questionnaires to be completed by experimenters and sponsors;
- structured interviews at which particular issues were probed more fully; and
- independent research by the evaluation team.

The questionnaires used were of three types, designed for the following sets of pilot projects.

- the TV broadcasting/distribution projects;

- the community communications, tele-education, tele-health and public service sets of projects; and,

- the advanced technology projects.

These questionnaires were based on the research conducted in reviewing the Phase One projects and interviewing the paricipants and DOC officials for the Milestone #1 Report of May 1980, and the interim report on the Program Delivery Pilot Projects of March, 1981. Samples of the questionnaires are presented in Annex A. A list of interviewees and respondents is contained in Annex B.

It was pointed out in Part 4.2.6 that, because of the rapid pace of change in the communications field, this report constitutes a "snapshot" of the Program effects at a particular point in time. Recent events will almost certainly have altered some of the details reported here.

G.2 TELEVISION BROADCASTING/DISTRIBUTING PILOT PROJECTS

G.2.1 INTRODUCTION

Two Phase One projects were undertaken to distribute television signals via Anik-B. These projects were termed "Program Delivery Pilot Projects" (PDPP's), East and West.

These were two of the most important pilot projects, both in terms of the expenditures devoted to them and in terms of their objectives.

In total, approximately 80 communities and homes in Ontario and the West received regular television signals. Ontario participants received the signals of TV Ontario, while the B.C., NWT and Yukon participants received the programming of BCTV and CBC.

The objectives of the two PDPP's were especially important in that the projects were intended to not only stimulate change on the part of the direct participants, but also to add weight in major international fora to certain Canadian preferences regarding the world-wide implementation of direct broadcasting services (DBS). In particular, the pilot projects were intended to add credibility to the consideration of lower-power satellites for DBS than had been considered to date. A particularly important feature of these pilot projects is that they were intended to generate commercial interest in the utilization of TELESAT's ANIK-C 14/12 GHz satellites as interim DBS vehicles in Canada.

The two PDPP's were used by the consultant team to test the evaluation approach being used. An interim evaluation of these two projects was presented to DOC Space management in February 1981. The interim evaluation concentrated on the direct effects of the pilot projects on the immediate sponsors and

experimenters. In this report, we present an update of the interim evaluation and an assessment of the impacts of the PDPP's on the broader questions of creating a market in Canada for a DBS utilizing the 14/12 GHz band.

G.2.2 PDPP EAST

The most significant changes to the results of the interim evaluation relate to Program goal #1 (viability assessments) and other effects.

G.2.2.1 Goal #1: Viability Assessments and Decision

Two viability assessments were reported in the interim evaluation report:

a. One by OECA, in which it was reported that the TVO distribution system had reached the financial cross-over point, i.e. the point at which further increased in coverage would be significantly cheaper if the basic mode of signal delivery was via satellite as opposed to a terrestrial distribution system. The Provincial Cabinet had taken note of this fact, and had authorized the OECA to transfer to a satellite mode of signal delivery at the appropriate time.

b. A second, but at the time less definitive one by MNA and MTC in which officials of both Departments were examining the potentially significant financial advantages offered by 14/12 GHz satellite systems for extending communications services to Northern Ontario.

In the intervening period, both assessments have been pushed significantly further and in our judgement constitute important achievements for the Program.

In the case of the OECA, senior officials report that the clear intent is to deliver TVO signals via Anik-C (1). The seriousness of this intent is demonstrated by the following facts:

i. OECA is continuing to deliver its programming to Northern communities via Anik-B in Phase Two of the communications Program. A cost-sharing arrangement was struck with the DOC which has OECA and MTC paying a (nominal) fee of $1419./month for the service.

ii. The OECA signal is sharing a transponder in Phase Two, resulting in a need to upgrade and in some cases, re-locate the TVRO's. Equipment purchased to date is identified as follows: twenty 3-metre antennae; three 4 1/2-meter dishes; and 2 complete sets of electronics. The source of this equipment was Andrews Antennae Ltd. Total cost of the system upgrading is $174,000; the cost is being borne entirely be various Departments of the Ontario government.

iii. Discussions are on-going with TELESAT, via Bell, on the complete roll-over of TVO's microwave leases to satellite capacity on Anik-C. Price is still to be agreed upon.

iv. OECA officials point out that the nature of the activity has changed. Their Northern signal distribution no longer emphasizes direct-to-home systems. Rather, as a step towards an established, continuing service, OECA is now emphasizing distribution to cable head-ends, institutions and low-power re-broadcasting units. The remaining direct-to-home installations are regarded as stop-gap measures, pending the commencement of the MNA activity (see below).

Senior officials of the MNA report that their Ministry has now

decided to proceed with the plan (identified in the PDPP interim evaluation report) to install LCET's and rebroadcast units for 170 communities in Northerm Ontario over a three year period. A formal announcement of this "Television Extension Assistance Program" was made on November 30, 1981. The announcement of the Program makes specific references to ANIK-C as the vehicle for transmitting the TVO signals to communities outside the Anik-B footprint. Funding of the Program is set at $3 million.

We believe that the Anik-B (Phase One) pilot project experience was a major determining factor in the decisions of these two organizations to pursue vigorously the use of the 14/12 GHz capacity both in Phase Two of the Program, and potentially in Anik-C. The evaluation of the causality issues is contained in the interim report.

To date, these decisions have not yielded direct benefits to involved Canadian companies other than that TELESAT now has another serious client for its Anik C capacity. The purchase through MNA of 170 ground units could be significant, if the tender is won by Canadian companies. We understand that, at present, the intent is to issue an open tender with only a small premium being permitted to "Buy Canadian."

G.2.2.2 Other Effects

The viability decision of OECA is having some significant spin-off benefits for other Ontario groups. Discussions are underway regarding the possible transmission throughout Ontario of specialized radio programming, such as native programs, via an audio sub-carrier on the TVO signal.

G.2.3 PDPP WEST

The interim evaluation of the PDPP West remains basically unchanged. The participants continued into Phase Two, paying a nominal fee for the transponder time. The transponder was shared

in Phase Two by BCTC, CBC and Knowledge Network.

Main benefits which we atribute to the PDPP West are as follows:

i. increase in technical knowledge, demonstrating that satellite signals could be distributed to both cable head-ends and re-broadcasting units; and,

ii. increased, and continuing, interest on the part of the CBC in regional programming utilizing the spot-beam characteristics of 14/12 GHz transmissions.

G.2.4 THIRD PARTY EFFECTS OF PDPP EAST AND WEST

Some important third party effects can be attributed to the PDPP's. In our judgement, the key ones are as follows:

i. the provision of substantial input into international fora regarding DBS regulations;

ii. stimulating interest on the part of TELESAT in DBS;

iii. the opening up of potential overseas markets for the Canadian technology; and

iv. influencing major U.S. communications companies to consider lower-power DBS satellite than they had been willing to consider beforehand. This effect has been confirmed by our independent research, and is discussed more fully below.

G.2.5 CONTRIBUTIONS OF PDPP'S TO A VIABLE CANADIAN COMMERCIAL SATELLITE TELECOMMUNICATIONS SYSTEM AND INDUSTRY

We summarize the contribution to this end state of all of the Program activities in Part G.9. However, in view of the importance of the PDPP's we also present their particular contributions separately.

It was noted in the Introduction that the formal DOC goals for the Program were seen as stepping-stones towards the end-state sought by DOC, i.e. the establishment of a viable Canadian commercial satellite telecommunications system and industry.

The PDPP's were designed to play a very important role in achieving this end-state. In particular, they were intended to define and develop a Direct Broadcasting Service (DBS) market in Canada operating in the 14/12 GHz range. There are two specific indicators of success for this DOC work:

i. committed customers for TELESAT's 14/12 GHz ANIK-C vehicles using them to deliver signals in a DBS mode; and

ii. the existence of a large-scale manufacturing capability for the LCET developed by SED Ltd. under DOC funding, and substantial sales of the LCET to the recipients of the DBS signals.

The present status of these two indicators is as follows:

i. subject to regulatory approval, the first ANIK-C vehicle to be launched in late 1982 is indeed heavily booked for DBS service delivery; and

ii. SED has entered into an agreement with General Instruments (G.I.) of the U.S. to develop, jointly, a much lower-cost and more "manufacturable" earth terminal based on the DOC-funded prototype. The large bulk of the initial manufacturing would take place in Canada and G.I.'s stated intent is to give its Canadian subsidiary a world product mandate for the new LCET. Estimated sales are very high, and substantial front-end development costs are being negotiated between the two partners.

However, the market for both the satellite and the LCET's is in the U.S. American communications companies will be leasing the ANIK-C capacity to tranmit in a DBS mode to U.S. communities, at least until a comparable U.S. satellite is launched in the mid-80's. As well, the major markets for the SED-G.I. terminal are projected to be in the U.S., Europe and possibly Australia.

Those Canadian participants in the pilot projects who have made a decision to utilize DBS will possibly remain on ANIK-B until C-2 becomes available.

Given the substantial effects of the PDPP's in stimulating interest in both Canada and the U.S., we judge that the PDPP's have indeed made a major contribution to the end-state of establishing a viable Canadian commercial telecommunications system and industry. Two issues remain:

a. there are still regulatory hurdles to be overcome before the potential value of the TELESAT and SED arrangements are realized; and

b. the fact that it is American, and not Canadian interests, which are seizing on this potential

market raises a fundamental issue about the design of the Program and government telecommunications policy. We discuss this further in Part G.9.

G.3 COMMUNITY COMMUNICATIONS PILOT PROJECTS

G.3.1 INUKSHUK PROJECT OF THE INUIT TAPIRISAT OF CANADA (ITC)

The Inukshuk project, conducted by the ITC, with funding provided through the DIAND and DSS, was a three year project concerned with improving communications in Inuit communities and with determining the most cost-effective communications system for these Northern Communities. The Anik-B pilot project was one component of the total Inukshuk project (see goal h below).

The final assessment conducted by the ITC on the project states,

> "The ITC proposed the Inukshuk project to gather information on appropriate communications systems which could meet the needs of Inuit Communities. Goals of the project include comparison of the cost and effectiveness of distribution systems demonstrated during the three year period." (Assessment of Inukshuk Project)

In particular the goals of the Inukshuk project, as a whole, were to:

a. provide information to Inuit about issues relevant to their lives through the distribution of videotapes and films by local screening, broadcasts, etc.;

b. assist Inuit organizations to communicate with their people, both giving and receiving information through the use of videotape and film;

c. train Inuit in the techniques of communicating information and ideas to Inuit people through the use of videotape and film;

d. train Inuit in film and video production;

e. provide support to existing Inuit broadcasting projects and film, video production centres through production contracts, training, etc.;

f. encourage the development of Inuit language and culture through the production and distribution of Inuit films and videotapes.

g. conduct research in order to plan a future communications system that is adapted to Inuit needs;

h. carry out a project on the Anik B satellite with the following objectives:

   a. to assess the usefulness and cost of instruction and information exchange for adults by satellite;

   b. to test the usefulness and cost of conducting educational classes for children via satellite;

   c. to test the efficiency of decision-making and the efficacy of meetings held via satellite and to examine the cost-benefit of these services;

   d. to test the economic viability of an Inuit television broadcasting service.

The project consisted of five phases, one of which, the operational or experimental phase, involved the use through a pilot project, of the 14/12 GHz capacity of the Anik B Communications Satellite. In this phase, six communities (in three Arctic Regions) were linked, through the satellite, into an interactive audio, one-way video telecommunications network. The network was used for meetings, educational classes and other instruction services, as well as broadcast television. Inukshuk provided 16.5 hours per week of Inuktitut television programming. Prior to this the communities had received one hour per week of television through the CBC Northern Service. As well as the satellite system, a videotape distribution system was operated. Inuit language material for both the satellite and videotape

systems was provided through training and production programs.

The Inukshuk project began in November 1979. Satellite transmission as part of phase one of the experimental Anik B Communications program commenced in September 1980 and ended in May 1981. An assessment of the project was conducted by the ITC and has provided much of the material for this evaluation.

G.3.1.1 Viability Goal: Reported Effects, Impacts and Assessment

The Inukshuk project was conducted to assess the viability of various communications services to meet the communications requirements of Inuit Communities. The formal objectives of the Anik B phase of the Inukshuk project were presented in the previous section under the Inukshuk goal "h". These objectives relate directly to the above goal of the Anik B program. Table G.3.1 presents the results of the viability assessment on these objectives. While these objectives are concerned with very specific services, other project goals have led the ITC to make broader conclusions about a communications system to meet overall northern Inuit Communications needs. Table G.3.2. presents the viability assessment of a broader communications system for the Inuit.

Table G.3.1 REPORTED EFFECTS: CONCLUSIONS ON PILOT PROJECT GOALS

VIABILITY OF	QUESTIONS ASKED	RESULTS
Satellite for Adult Education and Information Exchange	"Is video networking an effective and efficient method to instruct and inform Inuit in Northern Communities?"	. interactive video networking was highly effective for informing Inuit in Communities . 80% of local groups surveyed had no travel budget and would not have participated in discussion without Anik B Network. . videotape and television are effective for instructional purposes. . interactive video has the advantage of gathering people together with very little travel expense but the disadvantage of technical expense and impermanence.
Satellite to Deliver Inuktitut Educational Programming for Children	"Is video networking an effective method for provide Inuktitut educational programming for children in northern communities?"	. In general it is more effective and efficient to provide Inuktitut children's programs through videotape or broadcast than through interactive networking. . Videotapes or broadcast can provide permanent resources for teachers and school committees in northern communities.
Satellite for Meetings	"Is video networking an effective and efficient method to hold meetings involving northern Inuit. How and to what extent is decision-making affected?"	. Interactive broadcasting is a highly effective method for this purpose. . 40/40 respondent organizations said they would use the system if it was available. . 32/35 community groups surveyed replied that they had fully accomplished what they had intended during meetings over the satellite system. . no clear evidence exists to indicate that decision-making was directly affected.
Economic Viability of an Inuit Television Service?	"What is the economic viability of an Inuit television broadcasting service?" "Has the project provided any means of Inuktitut broadcasting in the North to become self-supporting?"	. An Inuit broadcast service would be dependent upon a source of consistent, long-term funding. . revenues from program sales, production contracts and advertising revenue cannot be expected to support an Inuit network (production contracts and sale of videotapes did not contribute significantly to the project budget).

Table G.3.2 RESULTS OF COMPARABLE COST EFFECTIVENESS ANALYSIS OF COMMUNICATIONS SERVICES TO MEET NORTHERN INUIT COMMUNICATIONS REQUIREMENTS.

MODE OF INFORMATION TRANSFER	USEFULNESS COMMENTS	COMPARATIVE COST ESTIMATES
A. NON-ANIK B		
A1 Video Tape Distribution	. cannot fully meet Inuit requirements for immediate, relevant information in Inuktitut . does not normally provide immediate feedback or general access to information videotapes are extremely useful and effective for educational settings, where they can be used within the context of a classroom, meetings or discussions	. least expensive . $70/hour (15 communities) cost per 100: $7,000
A2 On Site Meetings	. on-site communication continues to be most effective for meetings requiring decision-making, issue resolution and controversy	travel expenses, 17 participants, 10 days, 8 hours per day= $29,885.
A3 Meetings by Teleconferencing (commercial)	. effective for information transfer and meetings among Inuit . high costs limit application of system to Inuit organizations which have budgetted for the expense	6 communities $1080/hr $108,000/100
B. ANIK B SATELLITE		
B1 Anik B Satellite Network, on its own	. Audio networking excludes visual information and is effective for meetings among Inuit groups, particularly those without travel budgets . immediacy and range are key factors for above use . adding one-way video to audio network almost triples the cost and does not normally add to the effectiveness . one-way video added to two-way audio often impedes effectiveness of interaction . video transmission is highly effective for transferring broadcast information to Inuit communities . video transmission provides immediacy and general access at limited cost, and, through call-in procedures includes immediate feedback	6 communities: one way video, two-way audio= 522.56/hour 6 communities: audio only= 183.79/hour
B2 Satellite Network with on-site Small Groups	. meetings held by combining the satellite network and small on-site groups can effectively substitute for meetings requiring extensive travel	
Anik B one-way video, two-way audio		$857.10/hour
Anik B audio interaction only	. availability and convenience are important factors in relation to meeting Inuit requirements	$518.23/hour
Teleconferencing		$1054.54/hour

IMPACTS OF ACHIEVEMENTS ON ITC TELECOMMUNICATIONS PLANS

The purpose of this section is to identify the changes that have taken place in the ITC's telecommunications plans as a result of their viability assessments. We summarize below these impacts as they are reported in the ITC final project assessment.

1. The ITC has no current plans to continue direct community interaction. However, recommendations were made in the final assessment as to the most cost-effective method for providing community interaction communications services.

2. Following the project the ITC formed with the TNI the Inuit Broadcasting Corporation (IBC). The IBC has been funded for two years by the Federal government and licensed by the CRTC. Beginning in January 1982 the IBC will provide five hours per week of Inuktitut television in time slots donated by the CBC Northern services. Members of the ITC communications group are, in fact, now staff members of the IBC. The policy and lobbying efforts of the ITC are also viewed by ITC officials as having contributed to the creation of the IBC. (See goal #4, Policy Issues). It should be noted that the TNI also received funding for the purposes of the IBC, and, in fact, the former president of the TNI is now the first president of the IBC. (see TNI Pilot Project, G.3.2).

ASSESSMENT OF REPORTED EFFECTS

The pilot project experience led the ITC to make important viability assessments. The purpose of this section is to present our judgement on the extent to which these assessments were achieved as a result of the defining characteristics of a pilot project (i.e. the continuing hands-on experience with the 14/12

GHz technology).

The most important indicator of the effects of the continuing "hands-on" experience is the existence of actual changes to project operations based upon interim project results.

The ITC pilot project was proposed with no predisposed plans for end- services. As part of the project a number of surveys were conducted to determine television programming preferences and the usefulness of different modes of communications to Inuit groups. Results were recorded on the reactions of users to different telecommunications services for a variety of purposes. It required an extended period of time to collect information to judge the usefulness, in different settings of an alternate communications methods. The information was used to compare the efficiency, effectiveness and cost-effectiveness of these commmunications methods.

Changes were made to the ITC project based upon interim project results. In particular, throughout the ITC project, a number of job descriptions were revised and new positions (e.g. Programme Coordinator) were created to deal with identified needs, and individuals were trained for specific, unanticipated requirements.

During the project a set of guidelines on the use of the satellite system was prepared for use by project participants. A number of recommendations are also contained in the final ITC assessment which apply to future experimental programs like the Anik B Communications Program. As well, detailed recommendations were also made on the staffing, organization and training requirements for an operational telecommunications service for the Inuit.

The memorandum to Cabinet requesting funding of the IBC was prepared by DIAND officials. DIAND officials report that their confidence in recommending such an expenditure was based upon the

experience and expertise demonstrated by the ITC throughout the continuing Anik B pilot project.

G.3.1.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS

A technical assessment was conducted by a DOC Central Region official on the ITC pilot project in which the following points were discussed:

i. power fluctuations;

ii. the gravel pads upon which the satellite dishes were located;

iii. the platform assembly;

iv. installation;

v. inductive interference;

vi. effects of snow blowing;

vii. rebroadcasting antennae;

viii. mast structure;

ix. technical training of personnel; and,

x. outage time.

The following general conclusions were reached in the project and are reported in the final ITC project assessment.

1. The project effectively met all technical objectives and

was able to operate an extended three months beyond its initial scheduled period of operation.

2. Technical outage times were relatively small with respect to scheduled time available.

3. A high level of technical training for participants is not a prerequisite to a successful project.

Two major issues emerging from the ITC project have been identified informally, as technical issues of concern to the CRC. They are:

1. To investigate the proportionate fading characteristics of blowing snow in high altitude areas of the 14/12 GHz system. The effects of rain have been examined but little is known to date about the effects of blowing snow; and,

2. CRC should provide better assistance in the future to experimenters on ground systems.

ASSESSMENT OF REPORTED EFFECTS

The technical knowledge gained regarding the 14/12 GHz satellite system and technology lies for the most part with the CRC officials, and not with staff of ITC.

G.3.1.3 Awareness Goal: Reported Effects and Assessment

REPORTED EFFECTS

Effects here consist of effects on the ITC and effects on other organizations and individuals. Effects on the ITC with respect to this goal are achieved through the viability assessments conducted by the ITC and the knowledge gained in conducting them. Examples of other groups affected by the project are listed below:

1. Requests were made by Cominco, Collation Goldmine, and DIAND Public Communications Branch for ITC programming;

2. Three outside agencies, (Bell Canada, the NWT Legislative Assembly and Havitaine) paid ITC to use the studio and community facilities for Interactive Programming;

3. The Dene Nation and the Council of Yukon Indians consulted the ITC and the IBC regarding the formulation of their own communication proposal and plan;

4. The adult education Department of Northern Community College which participated in the pilot project submitted a proposal to the NWT Council's Education Committee to use satellite technology in providing courses;

5. The community of Igloolik which has consistently rejected CBC television service and which decided against a local transmitter has moved much closer to accepting broadcast television;

6. Results of a survey conducted during the pilot project indicated that all the responding organizations (who all used the Anik B system) would use the interactive

network were it available in the future. The importance of this finding is that the survey respondents included organizations possessing travel budgets.

7. The ITC conducted a variety of promotion and publicity activities on the project. These activities were conducted in response to the hundreds of requests reported by ITC for information on the project by both Canadian and International Organizations.

ASSESSMENT OF REPORTED EFFECTS

As noted in the comments of Goal #1, the viability assessments conducted by the ITC were a result of the continuing "hands-on" experience with the 14/12 GHz technology. The awareness of ITC officials with respect to telecommunications has been achieved through the conduct of these assessments. The evaluation team considers, therefore that the continuing hands-on experience was important to achieve increased levels of awareness in the ITC. The effects of the pilot project on others who became aware of the potential of telecommunications is viewed by the evaluation team as resulting from the hands-on experience with the project.

G.3.1.4 Policy Goal: Reported Effects and Assessment

REPORTED EFFECTS

As has been the case with other pilot projects of the Phase One Communications Program, communications policy issues are a major concern of the experimenters. In fact it is reported in the final ITC project assessment that the ITC proposal to implement a pilot project was a direct result of Inuit frustration with regard to northern communications policy.

The assessment states that prior to the project the ITC had worked without success to influence Federal agencies to meet the

needs of northern viewers through Inukshuk programming. The following table (G.3.3) is a list of the policy interventions made by the ITC throughout the Inukshuk project.

TABLE G.3.3 REPORTED CONTRIBUTIONS TO GOAL #4
(To Contribute to Policy Issues)

POLICY-RELATED ACTIVITY	ISSUES RAISED/ RECOMMENDATIONS	RESPONSES
CRTC Extension of Television to Remote Northern Communities and Pay T.V. (Feb 28/80) (April 1980)	7 main points which in summary, proposed cutting back the number of hours of CBC programming and providing 4-6 hours of weekly satellite time to an Inuit Broadcasting system for Inuktitut programming	CRTC Committee report recommends a number of measures in support of the provision of of native language programming in the north.
CBC licence Hearings (CRTC) (Dec 17/80)	ITC proposes that CRTC deny CBC's application for a second northern satellite channel until CBC has established a northern television service which meets the needs of native northerners	CBC replied that it is willing to negotiate with ITC re: the dedication of a northern satellite channel on Anik D.
Extension of Service Hearings Submission (Nov 80)	ITC files applications for a network television license to operate an Inuit Television Service ITC meets with Telesat re: requirements for Inuit Broadcasting system	CBC agreed to intervene at the hearing in support of ITC's licence appplications. CBC agreed in the interim to make satellite time on Channel B available for Inuit Broadcasting beginning Sept. 1/81.
hearing (Feb/81).	opposed introducing of additional southern channels to North without community consent and control proposed using Pay-TV revenues to support Inuit programming production facilities and a northern up-link for live northern broadcasting.	July 1981 CRTC issued a license for an Inuit broadcasting network to be established through the IBC. rejected proposal for use of Pay-TV revenues.

ASSESSMENT OF REPORTED EFFECTS

The following is a series of statements which attribute the above-noted policy contributions to the Anik B Communications program. Only those comments made about interventions made during or after the actual experimental (Anik B) phase of the project are reported:

1. Re: CBC license hearing "The Anik B experiment provided the knowledge and experience for ITC to propose a feasible alternative at the time of the interventions";

2. "The action taken by the ITC and other Inuit organizations toward licensing an Inuit broadcasting system was a direct result of Inuit participation in the Anik B programme. The Anik B experiment provided trained personnel, production resources and practical methods to allow the establishment of such a network, particular experience gained through the project determined pratical methods for a long-term television service to the North, and the success of Inukshuk re-inforced Inuit resolve to establish the service."

3. "The information experience and proposals which formed the basis of (the ITC representations...at 3 CRTC hearings) were furnished through Inuit participation in the Anik B programme."

The ITC is well known for the strength of its policy intervention and lobbying activities. It is, therefore, difficult to clearly specify the actual contributions of the pilot project's "hands-on" experience on the policy activities of the ITC. However, the effects of the pilot project on DIAND's attitudes towards the IBC, as witnessed through its preparation of the relevent cabinet memorandum and the following comment made by the

Chairman of the CRTC Committee on Extension of Services and Pay TV suggests that, in fact the pilot project did affect policy issues.

> "I believe that there is a very important idea in your brief. I heard three or four different briefs from ITC but I think in this one, from what I gather, one of the most important ideas in that brief is the creation, in fact, of a network from east to west. I understand that in the past many of ITC briefs have given concerns about delivery of programming, the distribution of programming, but I think this is the first time you are putting forth now, on account of the fact that you have the technology there, the idea of a third network and also the sharing of channels."
> (CRTC Hearings Baker Lake, 1980, p.p. 36-37).

G.3.1.5 Other Effects

A variety of the effects have been reported. Some of these effects relate to the stated goals of the project as a whole (e.g. the training, planning and staffing phases), while others are spinoff benefits which relate to telecommunications and communications in general in the North. Examples of such effects are presented below:

1. Communications may be introduced by the ITC as a topic to be included in Inuit land claims negotiations;

2. The ITC made a submission to the Federal Cultural Review committee on an Inuit broadcasting system;

3. ITC proposed that the NFB set up a Nothern Support program under the direction of Inuit production centres. This proposal was accepted by the NFB:

4. CBC did not use the system, but watched developments with great interest, while providing viewers' survey information and support for the project, and subsequently, the establishment of the Inuit Broadcasting Corporation;

5. Five communities now have operational community television with home reception capability. These operations were turned over to the communities upon project completion;

6. Communities such as Pond Inlet became more involved in issues of northern communications;

7. A proposal was made to create a Northern community college using the satellite system;

8. Sales were made of Inukshuk programs; and,

9. Interest in the system led to the setting of rental fees for the studio, community network and the Keewatin Regional Production Centre.

G.3.1.6 Costs

We requested experimenters to provide to us the costs of the project in terms of capital equipment expenditures on satellite-related equipment. These costs to the ITC were for 7 Darome indoor units totalling approximately $14,000.

DOC costs reported to us to actually conduct the ITC pilot project were:

Satellite time: 1/3 transponder, 7 hours per week from Sept 1/80 - Sept 16/81

Equipment: 1 TVRT-TM
5 TVRT's

Human Resources: 45 person days.

G.3.2 THE NAALAKVIK II PROJECT OF THE TAQRAMIUT NIPINGAT INC. (TNI)

INTRODUCTION

The TNI pilot project was concerned, like the ITC project, with the potential use of telecommunications services for Inuit in the North. It should be noted, however, that the TNI project was quite different from the ITC project in that the TNI was concerned only with television broadcasting in Arctic Quebec and not with determining the specifications for an overall Inuit Communications System. It should also be noted that the TNI, unlike the ITC, is a Communications Society with experience in northern communications systems.

The TNI project was aimed at providing Inuit television services to Northern Quebec. The project was intended to:

- introduce television in a "friendly" way and note programming preferences;
- create a uniquely Inuit television system; and
- examine the possibilities of the use of satellite to deliver regular television in five villages in Northern Quebec.

Naalakvik II was intended to test the ability of the electronic hardware used in the project to function in a Northern environment and the degree of reliability and usefulness to the Northern Quebec Inuit of the satellite service. The project involved installing and providing a local television broadcasting service to five villages in Northern Quebec on an experimental basis via Anik-B

The following presents the reported contributions of the TNI pilot project to the four goals of phase one of the Anik B Communications Program. Reported results are drawn from

interviews, using the consultants' evaluation questionnaire, with TNI officials and from the final project evaluations undertaken for TNI by a private consultant and the Quebec government. The TNI project evaluation, however, provides little information pertaining to the DOC program goals.

G.3.2.1 Viability Goal: Reported Effects, Impacts and Assessment

It was the intention of the TNI to address the following issues in the pilot project:

- the impacts of television on Inuit attitudes and lifestyles;
- to experiment with different types of programming;
- to determine whether or not the telecommunications system would work in the North and whether or not it was reliable;
- to determine whether or not Inuit would use the equipment; and
- to determine whether or not the demand for an Inuit Television service was, indeed long-lasting or simply short term.

The purpose of answering these questions was to buttress TNI's arguments in seeking funds for the establishment of an operational service.

REPORTED EFFECTS

The results reported to this evaluation team with respect to the viability of an Inuit Television service were:

- demand exists by Inuit for television service;
- for TNI, satellite is the only technical way to provide a television service to Northern Quebec;
- regulatory and cost problems inhibit the delivering, on an operational basis, of television services to the Inuit of Northern Quebec;
- the system actually works and the Inuit people can use it;
- the satellite made certain kinds of programming possible (e.g. audio interactive public affairs);
- Anik B gave people the chance to find out that they could actually use the system;
- The Anik B project provided the momentum to raise funds for such a service;
- The project provided direction, a focus and "a reason for getting on with the job";
- The project made the satellite a useful tool for the Inuit as opposed to something foreign, to be feared. It was noted that satellites are now viewed as a tool which can be adapted to Inuit need;

TNI officials added that the pilot project was necessary to see that the system actually worked in the conditions of Northern Quebec, and, importantly, that the Inuit could use it.

IMPACTS OF ACHIEVEMENTS ON TNI TELECOMMUNICATIONS PLANS

The President of the Inuit Broadcasting Corporation reported to us that through the project necessary skills to operate a TV broadcast system were developed and government officials learned that the Inuit were capable of running a system. The TNI has received funding for the Inuit Broadcasting Corporation (IBC) and the former President of the TNI is the first President of the IBC. The President of the IBC considers that the IBC would not have been created if the TNI and ITC had not conducted pilot projects on Anik B.

ASSESSMENT OF REPORTED EFFECTS

During the course of the pilot project the TNI programming was continuously revised to respond to community preferences. This modification of actual project operations is judged by the evaluation team to be an effect of "hands-on" experience, with the TNI being able to change their project end services on the basis of actual reactions to them. Most important however, the hands-on experience allowed TNI to demonstrate to important Departments and Agencies that they could operate a TV Broadcasting system. This contributed to the funding and licensing of the Inuit Broadcasting Corporation which is now delivering programming via satellite, but using the 6/4 GHz band.

G.3.2.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS

A technical assessment was conducted on the TNI project by an official of the Government of Quebec. The following aspects of the system were reported on:

- the performance of the satellite link;
- the performance of the earth station;
- the performance of the TV studio; and

- technical aspects of local TV broadcasting.

Details on the technical assessment of the TNI system can be found in that report.

ASSESSMENT OF REPORTED EFFECTS

The TNI participated in the Hermes program of experiments. As well, TNI has, for a number of years, been examining and utilizing various telecommunications technologies and systems for delivering services. Any new technical knowledge gained through the "hands-on" experience of the pilot project, then, lies with the Inuit people who became involved in telecommunications through the pilot project, and who were not formerly associated with the TNI, and with the Quebec Government officials who conducted the technical assessment.

G.3.2.3 Awareness Goal: Reported Effects and Assessment

As previously noted, the TNI is a communications society and, by virtue of this, is informed about telecommunications systems, new technological developments and their potential applications.

REPORTED EFFECTS

Reported effects of the TNI project with respect to this program goal are the following:

1. Awareness of satellite telecommunications as a useful workable tool has increased due to the pilot project.

2. A demand for satellite-delivered television services in Norther Quebec was created by the project.

3. Awareness of telecommunications was increased through talk shows. Organizations affected were the TNI, Kativik School Board and Canada Manpower and Immigration

which used the system to explain its programs to local residents.

ASSESSMENT OF REPORTED EFFECTS

The actual contributions of the pilot project to the reported effects, as evaluated by this project team, are the creation of demand for an Inuit television service, facilitated by actually receiving television services; and, the awareness gained with respect to telecommunications by those using the equipment.

G.3.2.4 Policy Goal: Reported Effects and Assessment

REPORTED EFFECTS

The TNI has raised, for a number of years, telecommunications policy issues such as the leasing of partial transponders and the ownership of uplinks. The concerns of the TNI with respect to policy issues have been reinforced by the pilot project. In fact, the former president of the TNI, now the president of the IBC, has raised these policy issues as major concerns for the IBC.

ASSESSMENT OF REPORTED EFFECTS

TNI officials assert that the policy problems related to operational service still continue. This evaluation team sees no evidence that the pilot project had any influence on them.

G.3.2.5 Other Effects

No other effects were reported to us by TNI officials.

G.3.2.6 Costs

The TNI costs to conduct the project in terms of capital equipment expenditures on satellite-related equipment were for 6 Darome Indoor units for an approximate total cost of $12,000.

DOC costs reported to conduct the TN1 project were:

Satellite time: 1/2 transponder, 12 hours per week from 1 Sept./80 - 15 Feb./81

Equipment: 1 TVRT-TM
4 TVRT's

Human Resources: 40 person days

G.4 TELE-EDUCATION PILOT PROJECTS

G.4.1 TELE-EDUCATION PROJECT OF THE B.C. MINISTRY OF EDUCATION CONDUCTED BY BCIT

The BCIT Interactive Instructional Television Project was aimed at determining the feasibility of using satellite-delivered interactive instructural television as a means of teaching full semester, regular program and continuing education courses to a wide range of communities throughout British Columbia. It is important to note that during the course of the Phase One project the "Knowledge Network" of B.C. was formed as a provincial agency responsible for eduction and it assumed responsibility for the project. The "Knowledge Network" is, in fact, responsible for managing the Phase Two Anik B project of British Columbia in tele-education. We make reference herein to the Knowledge Network and the effect of the Phase One project on its creation.

G.4.1.1 Viability Goal: Reported Effect and Assessment

The following material is derived from the formal evaluation conducted by the BCIT on this project, their response to our questionnaire and interviews with sponsors and experimenters.

The following is a list of issues related to this goal which were to be addressed by the pilot project:

1. What organizational accomodations would be required to bring a multitude of independent educational institutions into an effective delivery consortium?;

2. What model could be applied to planned government developments in establishing a permanent educational telecommunications system for the province?; and,

3. What were the target audiences, suitable courses, workable schedules, and instructors skills required?

BCIT officials report that none of the Institutions or individuals involved in the project had any direct prior experience with satellite hardware. It was considered, therefore, essential that local experience be gained in the erection and "first-line troubleshooting" of satellite receive equipment. As well, BCIT officials reported that while indications existed of general interest in expansion of educational opportunities throughout the province, no firm information existed on whether the public would see telecommunications as a replacement for expansion of the existing college system. "While the use of low cost earth terminals had been explored during the Hermes project, we felt it was necessary to determine the reliability of the equipment in the hands of semi-skilled personnel." (Response to evaluation questionnaire).

REPORTED EFFECTS

i) TECHNICAL ASSESSMENT

BCIT officials found the 14/12 GHz system to be more than adequate to meet their needs. The only exception reported was the difficulties created by what BCIT considered to be unacceptably poor workmanship in the Indoor Electrohome Units. The only other technical problem occured in the fringe stations during heavy periods of rainfall.

ii) TARGET AUDIENCES AND COURSES

Findings were made on appropriate courses for targetted audiences. Some of the findings on course selection and interested groups have been used to guide the programming schedule of the Knowledge Network of the West. As well, the extended period allowed the experimenters to determine that there is sufficient interest in the communities in televised education and that people are prepared to stay with properly selected programs for semester lengths.

iii) ORGANIZATIONAL ACCOMMODATIONS AND MODEL FOR A PERMANENT SYSTEM

The extended period allowed the experimenters to work through a complete educational cycle and to experiment with a series of situations to problems which appeared. By having the time to adjust administrative systems and test the impact of these adjustments on a continuing basis the experimenters were able to develop administrative systems which were becoming reasonably effective well into the project. There was also a period of time in which the receiving agencies throughout the province were working through their own administrative difficulties.

The experimenters consider that a project of much shorter duration would not have permitted the evolution of changes in their organizational structure which carried them reasonably smoothly from a group of individuals to a functioning network.

In summary, BCIT officials reported to the evaluation team that,

> "We collectively felt it was essential that the community have an opportunity to participate with us in using satellite technology. The registration statistics in our reports indicate a sharp growth of interest in the community both in terms of number of hours of programs produced by interested organization but also in the number of participants in the last few months of the project. This was partly due to a concerted effort on the part of programmers and regional staff to promote the use of the system and the confidence which was gradually developed within the receiving communities that it was a positive experience to be part of the satellite delivered education. We believe that people were able to relate to the concept of having a small dish in the community with the potential at some time in the future of having a personal satellite receive system. The 14/12 GH band and the associated equipment provided a high quality signal on equipment which was seen to be simple enough for the average individual to erect and to operate. A very common request to members of our group was for information on where members of the public could obtain similar equipment."

IMPACT OF REPORTED EFFECTS

As a result of the pilot project the following impacts are reported:

- the creation of the Knowledge Network of the West;
- the inclusion of the Knowledge Network of the West as

as a pilot project in the second phase of the Anik-B communications program; and,

- the acquisition of earth terminals by a number of communities in the province.

The knowledge Network has made provisions in its budget for commercial satellite service and expects to use Anik B until Anik C(2) becomes available. Prior to the recent announcements regarding the American use of Anik C, the knowledge Network had anticipated commercial service on it. The Knowledge Network is involved in ongoing discussions with Telesat regarding its planning tarrifs and the potential costs of commercial satellite-based services. In support of the Knowledge Network the government of British Columbia has instituted a grants program to subsidize the initial capital costs of 14/12 GHz earth terminals and rebroadcast units for communities in parts of B.C. to receive the Network's programming.

ASSESSMENT OF REPORTED EFFECTS

The evaluation team noted that during the life of the project, through continuing hands-on experience and interim reviews, the experimenters learned a number of lessons which were then applied to project operations. The experimenters were able to test different models for their education network and different types of programming to determine their acceptability to all groups. Important viability assessments were made as a result of this pilot project.

G.4.1.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS

The experimenters and sponsors considered it essential that local personnel develop understanding of the erection, operation and first-line maintenance of low cost earth terminals. In addition, the experimenters also attempted to develop some expertise in the

project team on satellite systems in general. Due to the absence, in some centres of DOC field support, it was necessary that local staff and BCIT staff be familiar enough with the operations of the TVROs and the TVRTs that simple trouble shooting could be attempted.

The experimenters consider that sufficient information was developed so that the installation of low cost earth terminals has proceeded without too much difficulty or assistance from a central organization. The bulk of the skill acquired is related to the installation and operation of the receiving equipment. Since June 1980, the uplink of the project has been staffed by a series of project employees who were trained by DOC officials. All of the 8 project operators now reside in the Vancouver area and are capable of operating such equipment.

IMPACTS OF REPORTED EFFECTS ON BCIT AND THE PROVINCE OF BRITISH COLUMBIA

The following impacts have been attributed by the BCIT to the results of the pilot project:

1. "The knowledge gained in the operations of the satellite equipment has permitted British Columbia to develop a large number of technical personnel who are familiar enough with satellite equipment to make workable installations of receive equipment and to operate transmission stations. Most of the expertise remains in the communities of the Province employed by local Colleges and cable systems and the Knowledge Network."

2. "The experimenter's confidence in those staff members allowed us to expand the number of receive sites on a continued basis as the project proceeded into its extended phase" (phase two).

3. Most of the staff members employed in the project have been re-employed by the Knowledge Network.

ASSESSMENT OF REPORTED EFFECTS

The continuing "hands-on" experience of the pilot project allowed the experimenters to test the equipment in a variety of conditions and settings and through this to gain expertise to better utilize the system independent of CRC assistance.

G.4.1.3. Awareness Goal: Reports Effects and Assessment

REPORTED EFFECTS

BCIT officials reported to the evaluation team that at the beginning of the project many staff members of participating institutions were skeptical of the effectiveness of telecommunications for educational purposes. Faculty associations within receiving institutions were concerned that the incoming signal would be a threat to their livelihood and that their institutions would become branch plants of a larger central organization.

However, attitudes towards telecommunications for educational purposes changed over the lifetime of the pilot project. In particular, it was reported by BCIT officials to the evaluation team that,

- A rapid rise in interest of regional colleges in participating in a permanent telecommunications services was experienced;
- Faculty associations are now beginning to explore and negotiate ways of ensuring that their needs with

respect to working conditions are not ignored in a permanent system;

- The BCIT statement of institutional objectives refers to the use of telecommunications to extend educational services throughout the province. This is a new feature attributed to the success of the pilot project.

With respect to new users, the BCIT evaluation report shows that the number of users grew from one programmer and six receiving institutions to in excess of twenty programmers and 15-20 specific receiving organizations, as well as the extension of the signal into cable systems and individual homes. Also,

> "The extended life of the project allowed us to generate sufficient interest in other communities that they were prepared to acquire their own LCETs and the number of receiving stations tripled and will increase by a projected 50 in the next 10-12 months."

IMPACTS OF REPORTED EFFECTS

The following is a set of impacts attributed to the reported achievements:

- The B.C. Ministry of Education and B.C. Ministry of Universities, Science and Communications are providing funds for the operation of the Knowledge Network and the establishment of an infrastructure to support the system throughout the province;

- The BCIT has begun to include funds for such a system as part of its regular operations;

- BCIT intends in January 1982 to begin sponsoring a series of telecourses and is intending to create an organizational unit to support all programming from BCIT on a permanent basis.

ASSESSMENT OF REPORTED EFFECTS

We agree with the following statement on the effects of the pilot project in achieving the above reported results:

> "The extended run of the project allowed us to keep the satellite delivery system in the forefront of discussions within our institution for a long period of time. People became used to having the satellite equipment on our campus and were concerned when plans were being made to transport the control of the program to the Knowledge Network. Although there was some skepticism at the beginning of the project, our involvement in the project became a source of institutional pride and there is strong desire to continue an involvement at a very large level of commitment and an expectation that the special interest which we developed during the management of the project will be maintained in a new format. Having the uplink equipment in studios which saw many oganizations all very positive about their involvement in the centre of our campus provided a high level of publicity both internally and externally, which has produced a remarkable amount of public acceptance and knowledge of what possibilities can be provided through satellite technology." (response to evaluation questionaire)

The evaluation team considers that, through the extended period of hands-on experience, in particular in receiving institutions, attitudes towards the use of telecommunications for educational purposes changed drastically. The actual hands-on experience of users who were skeptical at the outset of the project is considered essential to these changed attitudes.

G.4.1.4 Policy Goal

REPORTED EFFECTS

The following policy concerns were raised by the experimenters in response to our evaluation questionnaire.

> "The most commonly asked question related to policy and regulation has been the cost of transponder time. Aside from staff members of local common carriers, most people believe it should be possible for a consortium to obtain direct access to a transponder from Telesat and then to distribute the use of that transponder in a way which is

educationally and socially effective within the province. There is concern that the rates quoted are unrealistically high and that for a public service type of operation such as education that some type of preferred rate should be provided. The antenna configurations in ANIK-C which were discussed in the users' conference in Ottawa last year illustrate the concern of persons in the north who believe that the foot-print of ANIK-C will provide good service to the urban centres but not to the north. While it is understandable that engineering plans must be made several years ahead of the launch date, there is some bitterness that some of the best potential users of the 14/12 ghz system may be denied an adequate signal on ANIK-C. There is great interest in British Columbia in having permanently operating uplinks which are independent of those provided by the comon carriers. As technology moves ahead people are anticipating that there will be low cost uplinks scattered throughout the province to provide a fully functional telecommunications network. If regulations do not permit local ownership of such uplinks, the provincial network may be perceived as a one way network from the urban centres to the rural regions of the province.

The cost of satellite time is an important issue to institutional planners who may be faced with establishing fairly large operating budgets as a condition of becoming participants in the network system. As soon as the costs become integrated in the budget system of institutions they will be subjected to the same degree of scrutiny and priority setting as are other program funds and if the transmission costs are too high institutions may decide that it is not possible to participate in the given year. The fear is that this will create a lack of continuity in service to the community just as the public is becoming comfortable with the idea of receiving an educational signal. A more

important concern relates to the wish of many communities to originate a signal on a planned basis as part of their participation in the educational telecommunications network. Local institutions are very vocal on their wish to become a producer of educational programs. They wish to fulfill their mandate to extend additional programs throughout their college delivery system. Unfortunately, from their point of view, the system is now dominated by a number of large institutions located in Vancouver and Victoria. From their point of view the best breakthrough in regulatory matters would be the development of a process by which they could have access to uplink capability while still maintaining the integrity of a satellite system."

IMPACTS OF REPORTED EFFECTS

The Knowledge Network has initiated a series of study groups and advisory committees which are addressing questions related to extension of service and regulation changes.

ASSESSMENT OF REPORTED EFFECTS

The BCIT pilot project began with much skepticism on the part of a number of participants. The new level of concern by local communities and institutions about policy issues affecting operational services is attributable to the pilot project. However, as in all of the pilot projects, no vehicle exists for effecting the desired policy changes.

G.4.1.5. Other Effects: Assessment

The experimenters reported to the evaluation team what they consider to be the most interesting side effect of the project. This effect is the drawing together of individuals from three separate jurisdictions (B.C., Alberta, and the Yukon) to cooperate in satellite-teleducation activities. An example of

this is the fact that the Alberta Access pilot project utilized the B.C. uplink in their pilot project.

An additional effect of the pilot projects is that the B.C. government had identifed satellite telecommunications as an areas for industrial development.

G.4.1.6 Costs

The BCIT reported that it did not purchase any satellite-related equipment for the conduct of the pilot project. Subsequent capital expenditures on such equipment were made by the B.C. Ministry of Education for 5 earth terminals from SED. As well, some colleges also bought earth terminals subsequent to the pilot project. These were purchased from SCANDU. DOC costs to conduct the project were reported by CRC officials as:

Satellite Time: 1 Oct/79 - 31 May/80, 32 hr/wk;
June-Sept '80 30 hrs total;
Sept 80 - Feb 81; 72 hr/wk*

Equipment: 1TVT (shared with ACCESS)
5 LCET's
3 TVRO's

Personnel Resources: 26 person days (plus shared use of a full time operator with ACCESS and PDPP West projects)

* approximate figures provided by CRC officials.

G.4.2 ONTARIO EDUCATIONAL COMMUNICATIONS AUTHORITY: TELEACADEMIES

INTRODUCTION

The Ontario Educational Communications Authority (OECA) with its broadcast facility, TVO, has participated in DOC Satellite experimentation activities since the early experiments which were conducted as part of the Hermes experiment. Specifically, OECA/TVO has participated in the following experimental satellite activities:

i. A DBS field trial with the CRC and CBC as part of the Hermes Program.

ii. A short (3 month) pilot project in interactive education as part of the Phase One Anik-B Communications Program. This was the Teleacademies pilot project.

iii. The eastern portion of the Program Delivery Pilot Project (PDPP) conducted in Phase One of the Anik-B Communications Program.

In response to our evaluation questionnaire on the Teleacademies project, OECA/TVO officials reported the effects of all three activities in which the OECA participated as well as its continuing involvement with the DOC in satellite experimentation.

In the following sections we present those effects which, in our assessment, are directly attributable to the Teleacademies project itself. Part G.2.2 of this report contains the results of the PDPP including its effects on the OECA.

The objectives of the teleacademies pilot project were as follows:

1. To provide an opportunity for people living in remote communities to become involved in informal but directed

learning experiences (i.e. Academies).

2. To create a general understanding of television, its interactive dimension and its potential as a resource for learning.

3. To provide learning opportunities in remote communities in cooperation with appropriate required agencies via satellite.

The academy was designed to provide educational programming to people in the open sector (ie. informal, non-institutional settings) who:

a. had not any previous access to the TVO signal, and

b. had not considered television to be a source and resource for learning to become involved in a directed but informal learning experience.

Of particular importance in this project was its interactive dimension, this being the distinguishing feature of the academy format.

Television, telephone and satellite technologies were used to develop a one-way video, two-way audio teleconferencing system to four communities; Geraldton, Manitouwadge, Marathon and Owen Sound.

G.4.2.1 Viability Goal: Reported Effects and Assessment

While the satellite technology was an integral part of the Teleacademies project, the principal focus of the project was the new program concept, the academy.

The following effects are assessed as those resulting directly from the Teleacademies project.

1. The acceptability of the academy was tested in the four communities which participated in the project and as a result expanded uses are being made of the Academy format.

2. An understanding developed among TVO staff and cable operators that the satellite technology worked.

3. Support was given by the board of the OECA for future endeavors by TVO in satellite experimentation. Prior to the Hermes field trial and the Teleacademies project, the OECA had conducted satellite experimentation which ran into severe difficulties. The small Teleacademies project sold both the concept of the academy as well as re-establishing the credibility of OECA/TVO officials in utilizing satellite technologies with the OECA board.

4. Approval was granted by the OECA board members for TVO to participate in the Program Delivery Pilot Project conducted in Phase One of the Anik-B Communications Program.

G.4.2.2 Knowledge Goal: Reported Effects and Assessment

Effects reported in response to our questionnaire by OECA under this goal are attributed to the Program Delivery Pilot Project (East) and are reported in part G.2.2 of this report.

G.4.2.3 Awareness Goal: Reported Effects and Assessment

OECA officials reported that the phase one pilot project had significant effects on the organization and services of TV Ontario. The following is a representative list of those changes.

- In developing the project, OECA identified the greater dimensions and possibilities for the use of broadcast to serve the needs of learners.

- As a result of the project, other questions have arisen, such as separate channels for the distinct use of technology for learning opportunities, limited broadcast vs full network, the need for access to two-way audio to enhance the "learner-source connection."

- Through the phase one experience the groundwork was laid for undertaking the much more extensive phase two project convering 44 sites in Northern Ontario. The phase one pilot project led to the development of a core of staff more experienced with the technology and more aware of the needs of Northern Ontario.

- The phase one project resulted in a decision to devote the entire Outreach Ontario Project to maximizing the potential of the later DBS project. The funding provided by the Ministry of Culture and Recreation and the internal resources related to the Outreach Project afforded the OECA the opportunity to carry out intensive fieldwork with the satellite broadcast and develop a network of key people in the communities who became interested and involved in both the issues of learning opportunities plus the whole issue of television in Northern Ontario and the technology of the satellite.

- Since the Hermes experiments and the Anik B project, the atmosphere has been conducive to further technological experimentation and exploration:

  . A whole department was devoted to the potential of Telidon and management is examining the possibilities of establishing computer based programming as part of TV Ontario's services.

  . Staff members throughout the organization are involved with various aspects of incorporating new technologies into programming, print and workshop components.

  . A fairly large core of people within TVO developed a much greater understanding of the technology not only of the satellite but of all TVO delivery systems. Satellite equipment has been on display in the OECA building, and seminars are held for interested staff.

  . A number of programming changes and changes to the approach of TVO have resulted from the phase one Anik B experience, e.g. increased attention to users needs in planning processes, expanded uses of the ACADEMY format.

G.4.2.4 Policy Goal

Policy effects of OECA participation in the Anik B Phase One Communications Program are reported under the Program Delivery Pilot Project (eastern portion) (part G.2.2).

G.4.2.5 Other Effects: Assessment

For OECA, other effects were in community animation e.g. hiring of an artist in residence in Geraldton.

- In Marathon and Manitouwadge, as a result of the

Communications and Technology Academy, a proposal is going in to the regional school board requesting the development of a high school credit course in communications and computer technology along with the equipment to support such a course.

- In Marathon, after several years without the TV Ontario tape package, the satellite project has given the impetus to its reconsideration.

- Following the Academies project, Confederation College at Geraldton obtained video equipment, including a port-o-pac camera. TVO provided them with direction on its use by having them tape background shots and a group interview for the communications and technology interactive sessions. This not only gave them hands-on experience with their new equipment but it also showed how the equipment could be used to further community goals.

- While all of these communities thought they wanted more access to television, through the project, they were awakened to a whole new dimension of response to television.

- Workshops, seminars and lectures as part of other conferences and courses have been given to a wide variety of educational institutions by OECA officials.

OECA officials report that the success of the conference, workshops and other endeavours is due in great part to TVO's involvement in Anik B phase one which resulted in TVO gaining credibility and high profile through experimentation with high technologies and communications.

G.4.2.6 Costs

OECA did not make any capital expenditures on satellite-related equipment to conduct their teleacademies project. Some minimal expenditures were made on gravel pads. Subsequent expenditures of OECA are contained in the PDPP East Evaluation. DOC costs reported to us by CRC for conducting the teleacademies project were:

Satellite time: 1 transponder, 1 April/79 - 30 June/79, 11.5 hrs. per week

Equipment: a 9 metre Control Station
4 TVRO's

Human Resources: 8 person days

G.4.3 ALBERTA ACCESS PILOT PROJECT IN TELE-EDUCATION

The Alberta ACCESS was formed in 1973 as a Crown Agency responsible for providing educational media services to all educational institutions in Alberta. Note that ACCESS is different from the Ontario Educational Communications Authority (OECA) in that its main emphasis is on the distribution of programming as opposed to designing the programs themselves. The individual educational institutions which cooperate with ACCESS provide the bulk of the actual programs to their own clients.

ACCESS currently provides the following services:

- 1/2 hour TV broadcasting per day through the CBC school broadcast service;

- 2 hours TV broadcast per day purchased from local television stations;

- 139 hours per week of radio services, using ACCESS' own radio network;

- provision of program materials to five local cable consortia;

- sales of programming to broadcasters;

- audio and videotape dubbing; and

- provision to institutions at no charge of kits, slides tapes and books.

The current costs to ACCESS for their radio services and their daily two hour TV broadcasts on private stations are:

- $800,000 annually for 2 hours per day TV purchased from private broadcasters; and

- $300,000 anually for ACCESS radio network, totalling

$1.1 million annually.

The president of ACCESS reports that when ACCESS was created, a conscious decision was made to not invest resources to develop a network of television transmitters throughout Alberta. This decision was based upon the following two major assumptions:

1. that the costs foreseen for establishing such a network, in particular, one that could reach remote areas of Alberta, would be very high; and,

2. that new telecommunications technologies would shortly become accessible to ACCESS and would provide ACCESS with greater transmission capability than a traditional television network, and at lower costs.

The major purposes reported to this evaluation team by ACCESS officials for conducting the phase one pilot project were to:

i. "gain first-hand operational experience for ACCESS Alberta and its co-operating institutions;

ii. begin training of technical and programming staff in the use of 14/12 GHz technology; and,

iii. assess distance education needs with particular emphasis on rural Alberta." (response to evaluation questionnaire)

ACCESS is conducting a pilot project in phase two of the Anik B Communications Program. According to senior ACCESS management, the phase one project was basically viewed as a means for ACCESS to reserve a space to conduct a pilot project on the phase two Anik B Communications program. Senior ACCESS management also reported to us that the phase one project was a very limited

technical one, extremely different from that of phase two. ACCESS' involvement in phase one was restricted primarily to sending tapes to the B.C.I.T. (in B.C.) where BCIT used its uplink to deliver the ACCESS programming to a limited number of very small communities in Alberta. The project was straight broadcast with no interactive capability, as is provided in phase two.

G.4.3.1 Viability Goal: Reported Effects, Assessment and Future Communications Plans

REPORTED EFFECTS

ACCESS conducted three kinds of analyses to address the issues identified previously. The analyses conducted were:

- An internal management analysis of the ACCESS five year planning needs in distributing radio and TV services on a province-wide basis;

- a costing of terrestrial modes for expanding ACCESS services; and

- A testing of reponses to satellite distribution by educational Institutions and Agencies.

Information for these analyses was gathered from contacts with Common Carriers, Telesat Canada, the DOC and from literature reviews.

The last of the above analyses is particularly important to ACCESS because these Institutions and Agencies are its direct clients. Thus, demand from these groups for satellite services is seen by ACCESS management as essential to acquiring Cabinet approval of its proposed plans regarding the operational use of satellite services.

The following effects of the Phase One project were reported to

us by ACCESS officials:

i. Response by educational institutions to satellite-delivered services is positive.

ii. The 14/12 GHz technology and systems have proven reliable and acceptable as a prime distribution mode if allowance is made for the fact that the project was conucted, for the most part, at 1/3 power from Anik B.

iii. The experience confirmed the ACCESS contention that the 14/12 GHz technology is operationally viable and this experience "firmed up" the long range corporate planning strategy of ACCESS.

iv. It is considered advisable to utilize the 14/12 GHz technology because of its direct-to-home potential and the relatively low cost of the dishes. The direct-to-home potential would expand the audience for programming delivered by ACCESS.

v. ACCESS is currently examing the potential of interactive capacity on Anik B.

vi. ACCESS' corporate plans contain specific budget proposals for Government approval of a Province-wide system for tele-education.

vii. ACCESS is looking to Anik C as a possibility for future service delivery but formal booking of Anik C time is contingent upon assurances of additional funding from the Alberta Government. ACCESS is also considering the possibility of sharing one transponder with B.C.'s KNOWLEDGE NETWORK on Anik B.

FUTURE TELECOMMUNICATIONS PLANS OF ACCESS

i) Five Year Corporate Plan

ACCESS has submitted for approval to the Alberta Government, a proposed five year corporate plan requesting funding of a multiplex telecommunications system using 14/12 GHz satellite services. The plan is a phased one, involving millions of dollars and it proposes to convert existing radio and television services of ACCESS to 14/12 GHz satellite transmission plus to develop a prototype service in Northern Alberta consisting of interactive programming, Telidon and other state-of-the art technologies. Implementation of the plan is contingent upon funding of the ground stations and systems development and establishment. ACCESS' formal booking of Anik C time is dependent upon the Provincial assurance of additional funds. A possible consideration for operational service would be the sharing of a transponder with the KNOWLEDGE NETWORK in British Columbia.

ii) Anik B Phase Two Pilot Project

ACCESS will be conducting a pilot project as part of Phase Two of the Anik B Communications Program in which it will be delivering interactive programming. ACCESS will operate its own uplink in the phase Two Project, to be located in Edmonton.

ASSESSMENT OF REPORTED EFFECTS

ACCESS has developed significant plans for the operational use of 14/12 GHz satellite technology and services. However, these plans are not identified as a result of the Phase One pilot project.

It should be noted, however, that the attention by ACCESS officials to interactive services using 14/12 GHz technology was

a result of the Phase One project. As well, given the importance to ACCESS of acceptance by educational institutions of satellite-based tele-education services, effect # i) above is an important effect of the Phase One Project.

G.4.3.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS

The following effects were reported to us by ACCESS officials regarding this goal of the Anik B phase One Communications program:

- technical staff gained first-hand knowledge in installing Low Cost Earth Terminals;

- extended "hand-on" experience provided user awareness and operational confirmation of theoretical planning.

ASSESSMENT OF REPORTED EFFECTS

The effects of the phase one ACCESS project with respect to this DOC goal are very limited due to the limitations of the ACCESS involvement on the project (i.e. sending tapes to be uplinked at BCIT).

G.4.3.3 Awareness Goal: Reported Effects and Assessment

REPORTED EFFECTS

The comments made by ACCESS officials with respect to the phase one project and this goal were:

- ACCESS had a consolidated corporate approach to the phase one project, with no major changes resulting in internal perceptions.

- Multiplexing of radio, TV, sub-carrier and interactive services are considered to be natural extensions of one-way TV transmission.

- The above possible uses of 14/12 GHz satellite systems and technology were ientified mainly through literature reviews and discussions with other Anik B users.

- Field staff envisage using the proposed system for in-service teacher workshops to cut travel costs and reduce implementation time of the proposed plan for using satellite services

- "Hands-on" experience provided tangible evidence of the delivery potential of 14/12 GHz satellite technology even though reception was limited to a small number or rural sites.

ASSESSMENT OF REPORTED EFFECTS

The contributions of the ACCESS phase one project to this DOC goal were limited. ACCESS officials themselves are highly aware of applications of communications technology. This is evidenced by the ACCESS five year plan and in particular the previously described component of this plan, the prototype in Northern Alberta. ACCESS officials have stated clearly that phase one project had virtually no effect on their proposed plans.

G.4.3.4 Policy Goal: Reported Effects and Assessment

REPORTED EFFECTS AND ASSESSMENT

The following is a list of the key policy issues of concern to ACCESS regarding the viability of operational satellite services. ACCESS' actions taken to influence these issues are also described. It is not at all evident, however, that these activities and the cognizance of them were caused by participation in phase one of the Anik B Communications Program.

- ACCESS officials observed discussions between DOC and the Canadian Council of Ministers of Education regarding a dedicated free or subsidized educational channel. This issue is reported to be a contributing factor to overall financing decisions of ACCESS for operational service.

- ACCESS observed discussions between the Council of Minister of Education and DOC on decisions to allow or disallow uplinking by others than common carriers.

- The open-skies discussions regarding unlicensed operations of TVRO's is important to ACCESS plans but ACCESS has chosen to not intervene on the issue.

- Pay TV: The outcomes of the pay TV hearings are a factor which would influence ACCESS decisions on overall financing of their planned future systems. ACCESS held discussions with regional Pay TV applicants and recommends the licensing of Alberta regional applicants because they plan to use Anik C. ACCESS assumes that such a decision would result in 14/12 GHz TVRO's being installed in all cable head-ends and possibly many apartments, hotels and homes. The benefit to ACCESS identified by ACCESS officals would be that TVRO's could receive ACCESS' services as well as pay TV. ACCESS officals consider that this would build up audience and lower costs of ground hardware.

G.4.3.5 Other Effects

No such effects were reported to us by ACCESS officials.

G.4.3.6 Costs

ACCESS Capital equipment expenditures on satellite related equipment to conduct the phase one pilot project were 5 satellite dishes from SED for $5500 a piece. Expenditures on satellite related equipment subsequent to phase one consisted of 2 ten foot dishes to feed the cable system purchased from Andrews Antenna, for approximately $10,000 each, including installation. Officials estimate that an additional $10,000 will be spent on items such as hook-ups for the phase two project.

DOC costs to conduct the ACCESS project in phase one were reported to us by CRC officials as:

Satellite time: 4 March '80 - 30 May '80,
15 Sept '80 - 17 Feb. '81,
10 hours per week
March - May '80,
6 hour/week Sept - Feb. '81

Equipment: 6 LCET's, 2 TVRO's, 1 TVT (shared with KNOW at Burnaby, B.C.)

Human Resources: 26 person days
(plus shared use of a full-time operator with BCIT and the PDPP West project).

G.4.4 MINISTRY OF EDUCATION OF QUEBEC PILOT PROJECT IN TELE-EDUCATION

The Ministry of Education of Quebec conducted a pilot project in Phase One on tele-education. We did not receive a response from the experimenters to our evaluation questionnaire.

G.5 TELE-HEALTH PILOT PROJECTS

G.5.1 TELE-HEALTH PILOT PROJECT CONDUCTED BY MEMORIAL UNIVERSITY OF NEWFOUNDLAND (MUN)

There were two separate parts to the MUN pilot project: the installation of a terminal on an off-shore drillship; and the installation of telephony terminals at three health stations in Newfoundland and Labrador, linking them with the existing terrestrial health teleconference system that connects 30-some health centres throughout Newfoundland.

The stated purposes of conducting the Phase One pilot project were to:

i. Evaluate the 14/12 GHz satellite system as a method to establish a reliable communications link to an offshore drillship. For this purpose a manually manipulated non-steerable terminal was used on the Petro Canada drillship, Nedrill. The program included a link to the rig plus a link through a switched network of the Newfoundland Telephone Company (NTC) to Petro Canada's communications office in St. John's Newfoundland. In addition to establishing a high quality voice network the project was also intended to demonstrate the capacity of the system to transmit slow scan television and other data such as electro-encephalograms from the rig. The slow scan was considered to have a commercial applications, e.g. the ability to demonstrate to the shore base a piece of broken equipment as well as to transmit x-rays and other medical data; and,

? illustrate

ii. Assess whether the satellite system could be integrated with the established ground-based health teleconference system to provide a hybrid system.

G.5.1.1 Viability Goal: Reported Effects and Assessment

REPORTED EFFECTS OF THE DRILL SHIP PROJECT

A very preliminary assessment of the benefits and costs of the system was conducted by the participants. The project leader reported that because transponder time was provided free and participants had only preliminary indications regarding the costs of an operational commercial system, MUN did not have adequate data to make a firm viability assessment and decision. The project leader reported that the following conclusions were reached regarding the provisions of the pilot project services on an operational basis:

- The link to the drillship "Nedrill" was for a brief period of time and resulted in a limited amount of data transfer, largely because of maintenance difficulties. However the experimenters were satisfied that adequate communications link could be provided ship to shore by the 14/12 GHz system.

- In discussions throughout the project, NTC officials were satisfied that the project demonstrated, in part, that this method of communications with offshore installations and drillships could be a viable commercial service, despite the high power levels utilized in some of the transmissions. Using the projected cost figures of the 14/12 GHz system for telephony channels it was estimated that the cost would be less than that of Marisat, which is currently in use by some East Coast offshore operators. Petro Canada and other oil companies have expressed interest in the commercial potential of the offshore satellite link.

- As a result of the Phase One project MUN

> experimenters were convinced of the long range capacity of the satellite system and were of the opinion that a second phase of the project should be carried out in order to lead more smoothly into commercial operations.

The project leader reported that due to the above conclusions, discussions were held with representatives of TCTS, Telesat, the NTC and other agencies, all of whom were interested in the post-pilot project operational capability. The interest was mainly in the 14/12 GHz band although not exclusively. In addition to the audio telephony link it was reported that the NTC became interested in the possible location of TVRO's on offshore rigsand ships.

REPORTED EFFECTS OF THE HEALTH TELECONFERENCING PROJECTS

Technical viability of the hybrid system was demonstrated clearly and in fact it was operated successfully over an extended period of time. As well, user acceptability of the system was established.

Upon completion of the pilot project, two of the terminals were removed. One remains at Labrador City. The pilot project link to Goose Bay has subsequently been made permanent via a terrestrial link, and Goose Bay is now part of the extensive terrestrial teleconference system maintained at MUN.

In response to a question by us as to what options MUN would pursue if interim commercial service was not available on Anik B, the project leader reported that they would provide a ground-based system into Labrador City. MUN officials have not yet been able to make a price comparison between providing a teleconference link on the ground compared to commercial service on Anik B or Anik C.

ASSESSMENT OF REPORTED EFFECTS

Drillship Project

In our judgement, viability assessments made on the basis of this project are in fact very limited and tentative. Equipment difficulties, the use of abnormally high power levels, the lack of firm costs and also the very early stages of understanding of the communications needs of offshore operators combine to yield this result. We belive that the reported benefits of this project showed be under the "Awareness" and other goals; not under the stronger goal of "Viability Assessment".

Health Tele-Conferencing

We judge this activity to have been a "service delivery", rather than a true pilot project.

Technical viability of a hybrid system could have been demonstrated at considerably less cost than was required for this project. As well, MUN officials through their 2 1/2 years experience with the large terrestrial health tele-conferences system already in place, were well-equipped to answer questions of user acceptability. Thus, this part of the Phase One pilot project was in fact an increase to a well-established service.

This judgement demonstrates clearly a factor in the terms of reference for our evaluation that must be kept in mind. The current highly-sophisticated approach of MUN to tele-conferencing is due largely to the efforts of the DOC HERMES program, the precursor to ANIK-B. However, the mandate of this study is to evaluate the objectives achievements of Phase One of the Anik-B Program which, in this case, would consist of achievements over and above those attributable to HERMES work. It is in this sense that we judge this part of the Phase One pilot project to constitute an increase in a well-established service.

We note also that the two tele-health projects (Memorial and University of Montreal) duplicated some experiments. Co-ordination between the projects could have yielded broader results.

Many tele-medicine pilot projects have been undertaken in HERMES, Anik-B and other programs in Canada and the U.S. Few have yet produced commercially viable systems. The inpediments are not the technical questions addressed in these pilot projects, but rather issues of costs, financing and regulations.

G.5.1.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS

The following effects were reported to us by MUN officials as resulting from their Phase One pilot project:

- The pilot project allowed MUN to develop a small team, consisting of an engineer and technicians in their Educational TV Centre, who understand the satellite technology. This was facilitated by actually using the equipment. The continuing relationship with the control centre at CRC allowed them to adequately manage the system.

- Part of this information was transferred to NTC as it became evident that NTC was interested in taking over the system management from MUN's.

- The Educational Television Centre trained a number of technicians; some have gone to work with other organizations such as the CBC and a private communications company.

Officials of MUN reported that the hands-on experience was necessary to gain this technical knowledge.

This technical knowledge is continuing to be used. Technical staff of NTC are now maintaining the remaining satellite links, and the accumulated knowledge is being applied to the planning of the Phase Two pilot project.

ASSESSMENT OF REPORTED EFFECTS

We conclude that valuable technical knowledge was imparted to the participants. The pre-existing high level of technical knowledge at the MUN tele-conferencing system and ETC provided a hospitable climate for this transfer of knowledge. As well, NTC has definitely benefitted from the work.

G.5.1.3 Awareness Goal: Reported Effects and Assessment

REPORTED EFFECTS

. The project leader considers that the MUN project was responsible for stimulating interest in satellites on the part of NTC. Prior to discussions between MUN and NTC, NTC officials had had little knowledge of the potential of satellite usage for offshore and isolated communities. They are now pursuing this application. At least one member of the NTC is now a member of the TCTS satellite group

. MUN also used the system to transmit encephalograms from Labrador City to St. John's.

. Visits were made to the MUN Centre by representatives from the Caribbean. As a result of these visits MUN has had requests for information on the possibility of providing satellite links between Canada and the Caribbean for health and education purposes.

. MUN was asked to consider the feasibility of providing satellite links between Canada and Uganda and Kenya.

. Because of MUN's activity with the Anik B project there is considerable interest within the University in using DBS as an alternative to microwave to distribute the University Channel throughout the Island. This would be done by locating terminals at the cable head-ends and in other communities not served by cable.

. MUN also considers that the Newfoundland Government has become interested in the possibility of using satellites for a number of purposes. Some of the Newfoundland Government personnel now interested in this possibility participated in the Hermes satellite project and have kept informed on a regular basis on MUN's activities with Anik B.

. Changes were reported to us by the project leader within MUN itself, based on a growing awareness of the potentia of satellite and of alternative communications technology. An example of this change is the substantial funding received by the Health Services Centre from the University to continue with various related projects.

. An organization is being created within Memorial, likely to be called the Memorial University Telecommunications Centre. This centre will be located within the Faculty of Medicine due to the involvement of the Project leader in the Hermes and Anik B Project. It will, however, be a university-wide resource.

. MUN has sponsored two major offshore medical health courses dealing with medical services generally and with emphasis on the potential of satellite links to deliver services offshore. International experts have attended two such meetings. In 1982 Memorial is sponsoring the first comprehensive Canadian conference on interactive telecommunications in health, education and administration.

. The project demonstrated very clearly to groups in Labrador City and Goose Bay that the teleconference link and the

capability for the transmission of data were of such value that they are now, in the case of Goose Bay, committed to financing their share of MUN's ground base system. Labrador city is considering the same type of system.

ASSESSMENT OF REPORTED EFFECTS

The MUN project leader, Dr. House, is certainly one of the most effective users, and proponents, of tele-conferencing. The terrestrial system established by him at MUN is being used by an ever-increasing variety of groups, for important uses. The high profile nature of the Anik-B Program has definitely contributed to Dr. House's ability to increase awareness amongst non-users of the potential offered by communications technologies.

G.5.1.4 Policy Goal: Reported Effects and Assessment

REPORTED EFFECTS AND ASSESSMENT

Project participants voiced the serious concern that current regulations may be so rigid as to make it impossible for farther necessary exploratory projects to take place. The result could be that satellites would be used only by very large organizations.

Three particular policy issues were identified as ones that could affect the viability of the commercial use of satellite services:

- ownership of ground stations;

- the leasing of partial transponders; and,

- the availability of transponder time.

These issues are considered to be critical because MUN, indeed most users in the Maritimes, would not be able to finance the

costs of a transponder. Sharing with other agencies and possibly universities, in the Maritimes is considered to be a possibility.

Representatives of MUN have had frequent discussions with DOC, TCTS and the NTC on the above issues. To date the MUN officials are not aware of any concrete results on them, but anticipate progress within 3-4 months. There is no evidence of any direct contribution to these issues by the pilot project and participants did not report any direct effects of the project on them.

G.5.1.5 Other Effects

The following other effects were reported by the MUN project leader:

- Involvement of MUN in the satellite projects has created a certain level of expertise in the Province which would otherwise not have developed.

- The project has had significant influence on the Provincial Government's policy in the field of communications, particularly their consideration of the use of DBS.

- The stage is now set for a group in Newfoundland to prepare for an extensive pilot project using M-SAT, using Newfoundland as a "living laboratory" to evaluate this technology.

G.5.1.6 Costs

Capital expenditures equipment on satellite-related equipment reported to us by MUN project officials were:

- $5000. per unit terminal for interface boxes (4 terminals = $20,000.)

- approximately $5000. each on 4 Darome Units = $20,000.

All of the above capital expenditures were made by Petro Canada.

A proposal to the oil companies involved in the MUN Phase Two project is currently being prepared by the MUN project leader for $200,000. Approximately $140,000. of this will be for capital equipment costs. As well, the telephone companies will be paying for interface boxes for two units.

DOC costs were as follows:

- transponder time of 34 hours/week for 36 weeks; and

- 35 person-days of DOC staff time.

G.5.2 TELEMEDICINE PROJECT OF THE UNIVERSITY OF MONTREAL

The University of Montreal project was a telemedicine project in which the Anik B satellite was used to deliver services between Montreal and "La Grande" in Quebec.

The project was designed to:

a. Study the needs relating to implementing a system of telemedicine designed to support the requirements of specialized medical care in remote hospitals and to evaluate the use of such a system for radiology, teleconference and tele-education; and

b. Study the impact of telemedicine on the functions of health personnel and on the views of isolated people working in remote regions.

G.5.2.1 Viability Goal: Reported Effects and Assessment

REPORTED EFFECTS

The experimenters conducted a number of analyses to study the above issues. They were:

.a complete bibilographical research concerning outside work in the field;

.a feasibility study for teleradiology, teleconference and tele-education; and

.tests and studies conducted as integral parts of the project which examined:

- radiograph transmittal by television, in real time and slow-scan, by radiologists;

- tests on medical teleconferencing; and

- transmission of educational courses for health personnel in remote areas.

Advice and suggestions were provided by representatives of Health and Welfare Canada and the Department of Social Affairs of Quebec.

The conclusions reached concerning the viability of introducing these services on an operational basis were:

a. The use of a system functioning in the 14/12 GHz band has permitted a good quality transmission in teleradiology. The 14/12 GHz system has eliminated interferences caused by microwave which make the interpretation of radiographics very difficult.

b. The bidirectional real-time television constitutes an ideal means of communications for all aspects of telemedicine; however, the high costs of this mode of communications does not permit it to be used on an operational basis.

c. Slow scan television in narrowband is not sufficient for a total system of telemedicine. The low resolution of the picture and transmission time are obstacles for teleradiology. The absence of substantial visual interaction makes difficult the activities of tele-education, and teleconference.

d. The main weaknesses of slow scan television could be overcome by improving the quality of the picture and by correcting the deficiencies in video interaction. Digital picture transmission and picture storage and manipulation seem to be a feasible way of improving the telemedicine system and is also showing acceptable

costs.

For the University of Montreal the high cost of telemedicine by satellite rules it out as a feasible system. As well, the actual slow scan TV techniques require improvements before becoming feasible as a method for delivering health services.

While the University has no plans to introduce an operational telehealth service, work began on a new project concerning the improvement of slow scan television applications in telemedicine. A propsoal has been submitted to Supply and Services Canada for this work. Subsequent discussions with the University of Montreal indicated to us that the proposal to DSS was turned down and work in the field of telemedicine is now a low priority of the University. It was reported to us that other groups are now working in the field and that the University of Montreal intends to leave further work in this field to them.

Representatives of the project informed us that the extended period of the project permitted an in-depth study and thorough documentation of the different aspects of the project. As well, the fact that the 14/12 GHz band avoided problems of interferences was viewed as important to teleradiology.

ASSESSMENT OF REPORTED EFFECTS

The hands-on experience with the 14/12 GHz satellite system allowed the University of Montreal to actually test the potential usefulness of telemedicine between remote and urban areas. Specific improvements which could be made were identified and concrete conclusions were reached. While a decision has been reached that the costs of such a system are too high, efforts are being made to address the problems identified. The extended period of the project was used to assess thoroughly the various aspects of the telemedicine system.

However, we note that other tele-medicine pilot projects had already established these results. The prohibitive costs were well-known beforehand, and the technical results were also being tested in the MUN experiment (See G.5.1). The benefits of this project lie under other goals, not under the strong goal of "viability assessment".

G.5.2.2 Knowledge Goal: Reported Effects and Assessment

REPORTED EFFECTS AND ASSESSMENT

The system for the project was provided and maintained by other organizations and it was reported that no knowledge was gained on the use of the 14/12 GHz technology by the experimenters.

G.5.2.3 Awareness Goal: Reported Effects and Assessment

REPORTED EFFECTS

The experimenters reported the following effects of the pilot project regarding the above:

- The 14/12 GHz band is considered to be attractive for avoiding interferences which is important to teleradiology. Applications in radiology could be considered if costs were acceptable

- The communications quality by satellite let the experimenters see the concrete possibilities of teleradiology

- The change in attitude towards teleradiology was manifested at the professional level

- New contacts were made with hospital and Government Agencies for the study of possible means of distributing health care within remote regions. Wide interest has

developed in the use of telecommunications in the health services field.

ASSESSMENT OF REPORTED EFFECTS

The pilot project provided professionals in the health care field with the opportunity to actually see that such a system of telemedicine could function usefully and that it could be beneficial to them in delivering services to remote areas. The hands-on experience was critical due to the need to test the quality of the picture for the transmission of x-rays.

G.5.2.4 Policy Goal: Reported Effects and Assessment

REPORTED EFFECTS

The experimenters reported to us the following issue of concern to them regarding the the use of satellite for operational telehealth services:

- Flexibility of use and costs: cost of buying variable time periods at accessible costs. Discussions have been held with representatives of the Department of Communications in Quebec regarding the above issue and the need to support research programs for improving the means of using telecommunications services.

ASSESSMENT OF REPORTED EFFECTS

The pilot project led to discussions with Government officials regarding ways of making a system of telehealth operationally viable and the need for research in the field. The experience of the experimenters in using such a system contributed to these activities.

G.5.2.5 Other Effects

Other effects reported by the experimenters were:

- interest was developed in the "Institute genie de Biomedicine" in the use of communications in an operational mode;

- a multidisciplinary group was formed to study the problems regarding telemedicine;

- Hospital administrators became aware of the needs of health personnel for current knowledge. As well, administrators became aware of personnel requirements.

ASSESSMENT OF REPORTED EFFECTS

The hands-on experience afforded by the pilot project led to the creation of the multidisciplinary grasp of telemedicine, providing them with information on the problems with telemedicine which would need to be addressed prior to it becoming operationally viable.

G.5.2.6 Costs

The experimenters reported to us that they did not purchase any satellite-related capital equipment to conduct the phase one pilot project. As well, no expenditures were made on such equipment subsequent to the pilot project. Costs to DOC to conduct this project were reported to us as:

Satellite time: 2 transponders (2 ways),
10 April '79 - 31 August '80
for 26.5 hours in April, 1979,
12.5 hr/week 30 April-30 June '79,
13 hr/week 1 July - 31 August '79.

Equipment: 2 TVT's, 2 TVRT's

Human Resources: 230 Person days

G.6 PUBLIC SERVICE PILOT PROJECT

G.6.1 ONTARIO MINISTRY OF GOVERNMENT SERVICES

The Ontario Ministry of Government Services conducted a pilot project in Phase One to assess the usefulness and acceptability of teleconferencing for a variety of services and to assess the relative costs and benefits of 14/12 GHz satellite and terrestrial-bases systems of teleconferencing. The OMGS did not respond to an evaluation questionnaire but we are aware that they are conducting a pilot project in the Phase Two Anik B Communications Program on a limited basis (i.e. limited hours) and have installed an operational teleconferencing system via microwave to Thunder Bay. OMGS is interested in providing radio sub-carriers service and a terminal for providing such a satellite-based service is being developed by Telesat Canada.

G.7 ADVANCED TECHNOLOGY PILOT PROJECTS

G.7.1 90 MBPS DIGITAL LINK

G.7.1.1 Introduction

The 90 Mbps Digital Link Pilot Project was carried out to provide an evaluation of a digital satellite link in the 14/12 GHz bands, as the facility between digital switches in the existing terrestrial communications network. The project was initiated as a field trial in preparation for the introduction of the Anik C satellite communications system by Telesat Canada in late 1982. The Anik C satellite and associated earth stations will operate in the 14/12 GHz bands and initially will provide the capability of long-haul 90 Mbps digital communications links, connecting with digital switches located in major Canadian cities.

Telesat Canada and the Trans Canada Telephone System (TCTS) were joint participants in this pilot project. Tests were carried out using the Anik B satellite, Northern Telecom's DMS series of digital switches, and the first two Anik C earth stations in Montreal and Toronto. Traffic over this network was simulated using the Bell Northern Research Test and Traffic Simulator.

The technical problem which was addressed in the pilot project was divided into two phases:

Phase 1 - Evaluation of system performance and operation of 90 Mbps digital transmission on a 14/12 GHz satellite link between 2 Telesat earth stations; and,

Phase 2 - Evaluation of the integration of this link with the TCTS digital terrestrial network.

The project represents first time integration of digital satellite links with the terrestrial network using roof-mounted earth stations at telephone central offices to provide satellite

links from downtown central office to downtown central office.

The tests were completed in April 1981 and an extension of the project has been approved for Phase II of the Anik B Communications Program. The costs incurred for the pilot project are listed in Exhibit G.7.1.3 of this report.

G.7.1.2 Expected Project Achievements

A summary of the expected project achievements as reported by the participants is presented in Exhibit G.7.1.1.

EXHIBIT G.7.1.1 SUMMARY OF EXPECTED PROJECT ACHIEVEMENTS

Expected Applications of the Technology	1. High Speed transmission required to meet projected growth in capacity for TCTS message data and video services via ANIK-C 14/12 GHz frequency band.
Expected Clients	1. TCTS and member companies, to meet growth in demand for message and video services.
Expected Impacts on Telesat and TCTS	1. Ensures earliest possible introduction of operational commercial service on Anik C by enabling Telesat and TCTS to test new Anik C terminals and associated hardware and software prior to the launch of the satellite. 2. Complements expensive long haul terrestrial transmission facilities and provides additional capacity required by TCTS in future to meet growth demand. 3. Enables TCTS to meet projected growth in demand in a more effective manner. 4. Eliminates the need for TCTS to have extensive backhaul facilities to downtown city cores.
Expected Impacts on Canadian Industry	1. Demonstrated technical capability to manufacture required hardware for both domestic and export applications.
Expected Technical Results	Phase 1 1. To characterize the 90 Mbps satellite link performance (i.e. digital bit error rate and phase jitter) under varying operating conditions. 2. To verify correct performance of the earth station hardware over a satellite link. Phase 2 1. To verify end-to-end performance of the 90 Mbps digital link including operation with digital multiplex switcher. These tests include evaluation of the effects of: . satellite path length variation; and, . satellite delay on completed call attempts. 2. To determine the performance of the satellite link during a sun transit including the effects on the digital multiplier switch. 3. To compare satellite performance to that provided by the LD-4 coaxial cable between Montreal and Toronto.

G.7.1.3 Reported Goal Achievements

Exhibit G.7.1.2 presents the actual pilot project achievements as reported by the participants. The achievements are presented in terms of the four goals of Phase One of the Anik B Communications Program. Other effects of the project are also presented.

Due to the technical nature of this pilot project, achievements have been reported only under the program goals of viability and technical knowledge. No achievements have been reported under the goals of awareness and policy issues.

All technical objectives of the pilot project (as listed in Exhibit G.7.1.1) were reported to have been successfully achieved. Two technical tests identified in the questionnaire, were reported as not having been performed. These were measurements of the interactive effects between satellite link and digital echo suppressors/cancellers, and simultaneous measurements of satellite/terrestrial transmission characteristics.

These results led to four goal achievements under Goal 1, six under Goal 2 and one under Other Benefits. (see Exhibit G.7.1.2).

EXHIBIT G.7.1.2 SUMMARY OF REPORTED GOAL ACHIEVEMENTS

Goal 1: To Determine the Viability, on a Pre-Operational But Continuing Basis, of Telecommunications Services Designed to Meet Identified Requirements

Phase 1 Tests

1. Only the technical aspects of viability were examined; TCTS officials reported that the commitment has already been made to proceed with the new technology for Anik-C. The result of the pilot project; system performance of the 90 Mbps digital link was verified over the Anik B satellite. The participants responded as follows:

   "TCTS can now proceed to implement digital message services on the ANIK C satellite secure in the knowledge that no technical or operational incompatibilities with the existing network will be encountered."

Phase 2 Tests

2. Terrestrial and satellite systems integrate well.

3. Little difficulty was experienced in establishing the digital trunks over the satellite facility.

4. Overall system performance was good, and at this time, there does not appear to be a need for a further extension of the tests.

Goal 2: To Develop the Knowledge and Expertise to Better Utilize 14/12 GHz Satellite Communications Technology

Phase 1 Tests

1. Data collected includes BER vs Eb/No under various earth stations equalization and HPA back-off.

2. Long term BER performance was recorded for the satellite link operating at the optimum operating point. (Detailed results are reported in the Field Trial Report to be published in Sept/Oct).

Phase 2 Tests

3. The tests revealed that some software changes were necessary in the digital switches and these changes were made prior to completing the tests.

4. Minimal effects were observed due to path length variation. For the duration of the trial period, only one carrier slip was attributable to path length variation.

5. Trunk circuits established over the satellite facility were required to have longer guard intervals (i.e. length of time after completion of a call before another call attempt is permitted.

6. No discernible effect was observable on the digital multiplex equipment.

Note: A summary of the Phase II results is given in the technical paper "Evaluation of a 14/12 GHz Digital Satellite Link As The Facility Between Digital Switches"; by D. Gray and P. Brown.

Other Benefits:
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1. Successful operation of the earth station during the Field Trial has enhanced the reputation of the Canadian suppliers (RAYTHEON, ANDREWS, ETC.) in their international marketing efforts.

G.7.1.4 Assessment of Reported Achievments

The purpose of this section of the report is to present an assessment of the extent to which the reported goal achievements (see Exhibit G.7.1.2) were in fact due to the experience of the pilot project and depended on the continuing, hands-on experience afforded by the pilot project mode of activity.

1. The participants reported that the major goal achievement, i.e. the demonstration of technical viability, was a result of the extensive hands-on continuing experience. The reason for this type of trial was to ensure that:

> "the data that were gathered were statistically valid. The objectives of the trial could not have been achieved without the pilot project because to simulate all of the variables involved would have been an extremely complex task."

This comment applies also to the achievements reported under Goal #2 (Technical Knowledge and Expertise).

2. The other effect which can be attributed to the pilot project, i.e. the enhancement of the reputation of Canadian suppliers (Raytheon, Andrews, etc.) in their international marketing efforts, was also attributed to the successful operation of the equipment over the life of the pilot project. However, no particular successful marketing efforts were identified.

EXHIBIT G.7.1.3 PILOT PROJECT COSTS

Category	Source	Amount
1. Equipment		NIL
	Since this Pilot Project involved the pre-service testing of a commercial communications network most of the requested cost information is not relevant as the equipment was being purchased anyway.	
2. Operating Costs		
Expenses	TCTS/ Bell Canada	$ 30,000
BNR Consulting	TCTS	$200,000
Manpower	TCTS Telesat	3 P.Y. 1 P.Y.
3. DOC Costs		
Manpower	Minimal DOC satellite Coordinator/Scheduler time	
4. Satellite Usage		
Used both prime and non-prime time. Required 75% of power capacity for 1 and 2 channels at a time. DOC was reimbursed for stated usage.	TCTS Telesat	177 hours 200 hours

G.7.2 SLIM TIME DIVISION MULTIPLE ACCESS (TDMA)

G.7.2.1 Introduction

The Slim TDMA Pilot Project was carried out to develop and test a medium capacity (Slim) Time Division Multiple Access (TDMA) Communications Network designed to transmit up to 3 million bits of electronic information per second (Mbps), using only a small portion of a satellite transponder power and bandwidth, and enabling several users to simultaneously share a single TDMA carrier in the satellite transponder. The technique will enable more efficient sharing of a satellite transmission capacity among various numbers of ground stations. The Pilot Project uses part of the 14/12 GHz bandwidth of the Anik B communications satellite and draws upon recent TDMA experience using the Hermes communications technology satellite.

The Department of Communications (DOC) and Canadian National Telecommunications and Canadian Pacific Telecommunications (CNCP) were joint participants in this pilot project. A network was established between earth stations in 4 cities, Montreal, Ottawa, Kitchener and Toronto. Each earth station was equipped with a TDMA subsystem, an RF subsystem and CNCP's baseband equipment. Each of the 4 earth stations were co-located with, and connected to, a different node of the CNCP terrestrial communications system. In Montreal and Toronto, antennae were mounted on rooftops of large office buildings, while in Ottawa and Kitchener these were anchored to the ground. Field tests on the 4 stations network were carried out using low, medium, and high speed data, digitized voice and digital slow-scan video signals.

The major technial objectives of the pilot project were:

1. To establish design parameters for SLIM TDMA Earth Stations in the 14/12 GHz band;

2. To evaluate the achievable performance of such a system and its suitability for commercial data, voice, program,

and video services;

3. To develop and test the interworking and interconnection of this system with existing terrestrial facilities; and,

4. To investigate the applications of this system as an alternative to terrestrial facilities and as a vehicle for new and innovative services.

In addition, one of the stated objectives of the pilot project was to test new services and to demonstrate these as possible future offerings by CNCP.

The major advantage of using the 14/12 GHz frequency band is the economics of using roof-top terminals for high volume users over the more expensive alternative of installing a backhaul to a central terminal.

The current phase of the pilot project was originally scheduled to be completed in February 1981. However, final tests were not completed until December 1981. The analysis in this section of the report, is based both on the results of a questionaire and discussions held in the fall of 1981 before final technical results were known, and on follow-up discussions since these tests were completed. The questionnaire was sent to representatives of the key participants in the pilot project; CNCP, DOC-CRC, DOC-Program Office; and to Miller Communications Systems Ltd. (MCS), the company which developed the TDMA equipment. An extension of the pilot project to include customer service trials, has been approved for Phase II of the ANIK-B Communications Program. The costs incurred for the first phase of the pilot project are listed in Exhibit G.7.2.3 of the report.

G.7.2.2 Expected Project Achievements

A summary of the expected project achievements as reported by the participants is presented in Exhibit G.7.2.1.

Exhibit G.7.2.1 Summary of Expected Project Achievements

Expected Improvements To 14/12 GHz Communications	1. High data rate access to remote users, (who do not have a heavy traffic base) which is much less costly than alternative terrestrial delivery. 2. Variable capacity assignment so that users pay only for capacity used. (i.e. the system is inherently efficient, with high overall utilization allowing lower user costs).
Expected Clients/ Markets	1. Customers who are either remote or have a variable capacity requirement (including multiple and variable destinations). 2. Existing users of medium rate data communications presently using terrestrial systems who are in widely dispersed locations. 3. Examples of markets include: interbranch communications for industry (including the resource industry), remote printing (e.g. newspapers) electronic mail, electronic funds transfer.
Expected Impacts on Participants	1. CNCP to offer TDMA service on a commercial basis (Interim Anik B or Anik C). 2. DOC to foster the development of new satellite services (TDMA)
Expected Impacts on Canadian Industry/ Regulation	1. MCS to become a competitive Canadian source for the TDMA equipment. 2. Telesat and TCTS to develop competitive TDMA services. 3. Telesat to file rates for partial transponder power/bandwidth on Anik C services. 4. Canada-wide system interconnection with respect to satellite base services. 5. Resolution of Earth station ownership issue at 6/4 and 14/12 GHz. 6. Resolution of the Carrier's carrier status for Telesat (with the possible exception of direct retailing for broadcasting only, for full video broadcast channels). 7. Resolution of trans-border satellite communication question as many companies have, or are, subsidiaries of U.S. companies.
Expected Impacts on Users	1. Completely new service offerings 2. Less expensive service offerings

Expected Technical Results

1. Compatibility of video (FM), SCPS and TDMA signal on one transponder.
2. Interconnectability to and equal performance with, existing private line and switched network - INFOSWITCH. (Objective is to have net data through - put at least 98% of theoretical achieveable on terrestrial circuits with suitable protocols or using protocol converters).
3. Quality of voice transmission must be understandable.
4. Quality of video transmission must be sufficient for video conferencing.
5. Bit Error Rates (BER) of 2.4 X 10 **(-8) for 99.99% of the time for 7 day 24 hours tests. 1
6. 99.94% Error Free Seconds (EFS) for data transmission during available time (99.7% of total time). 1
7. Acceptable levels of BER for various energy per bit to noise density ratios. 1
8. Comparisons of Forward Error Correcting Rates (FEC) of 3/4, 7/8 and 1 on BER. 1

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1 Acceptable theoretical values for net data throughput and error rates are established in a techncial paper by G. Gothe of CNCP entitled "The Anik-B Slim TDMA Pilot Project" (1980).

G.7.2.3 Reported Goal Achievements

Exhibit G.7.2.2 presents the pilot project achievements as reported by the participants and Miller Communications Systems. The achievements are presented in terms of the four goals of Phase One of the Anik B Communications Program. Other effects of the project are also presented.

Due to the complexity and scope of the pilot project, achievements have been reported under all four goals of the Program. However, as the evaluation of the technical tests are not yet complete, no detailed technical achievements were reported. In fact only 2 achievements were reported under Goal 1: Viability. One is the successful operation of the 4 station network and its interconnection with terrestrial facilities leading to an approval for a Phase II Pilot Project to explore possible applications. The other is apparent existance of a demand for a TDMA service as evident by the entrance of TCTS into a trial service on 6/4 GHz with the Bank of Nova Scotia.

Varying opinions were reported under financial and marketing viability achievements. Both respondents from DOC indicated that they expected CNCP to offer TDMA service on a commercial basis as a result of this pilot project. However, respondents from CNCP indicated that:

> "CNCP has made no definite plans yet to offer commercial services on either an interim basis on Anik B or Anik C. This is a decision which could be made during the TDMA user service trial phase."

In addition, respondents from CNCP seemed to be reluctant to predict what new markets will develop for this new service until the second phase service trial is conducted. To quote CNCP:

> "The 14/12 Anik B TDMA experiment will stimulate telecommunication user response if it results in economically and technically sound satellite transmission of the applications currently served by terrestrial means. This will be particularly attractive in serving areas which are remote from high density population centres. Telecommunications carriers, end users, and broadcasters can potentially benefit from new satellite based services but, until the user service trial is conducted in 1982, it is pre-

> mature to speculate on new markets which could develop. During the service trial, a combination of voice, data, and facsimile applications will be tested. It is anticipated that valuable service development insight will be gained in the area of user needs and service characteristics. When this service trial data is summarized, new service applications or market opportunities could emerge."

DOC has reported that CCG has already produced a brochure describing TCTS TDMA service while CNCP has not done so yet, even though it is being planned.

One achievement was reported under Goal 2, and two under Goals 3 and 4. Two 'Other Benefits' were also reported. MCS has developed an excellent team in TDMA technology, however, it was reported that they have experienced cost and scheduling problems, the latter having been resolved with the recent successful modification to TDMA equipment required for Phase 2. They have also raised awareness in trying to market their TDMA expertise, but MCS claim that under the current regulatory environment, it is impossible to identify any Canadian customer other than CNCP which have not yet indicated an interest in a product development or its possible timing. Furthermore, MCS has reported that they have not identified any real opportunities in the U.S. for a product close to SLIM TDMA configuration.

Exhibit G.7.2.2 Summary of Reported Goal Achievements

Goal 1: To Determine The Viability On A Pre-Operational But Continuing Basis of Telecommunications Services Designed To Meet Identified Requirements.

Technical Viability

1. Final detailed results of technical viability will not be known until late April 1982. However, the following general conclusions were reached:

   a) The 4 stations were operated successfully as a network;

   b) Results of 7 day BER tests appear to be within acceptable limits;

   c) Interconnection with terrestrial facilities was achieved; and,

   d) Experience with transmission of slow scan video was gained.

Financial Viability

2. DOC reports that CNCP is still assessing TDMA viability, but that they are pleased with initial cost viability projections. CNCP reported that initial financial viability results indicate that TDMA is attractive for service at distances greater than 300-500 miles.

3. Agreement for a Phase II Pilot Project involving user service on a trial basis has been reached with CNCP. CNCP will make definite plans to offer commericial services on either an interim basis on Anik B, or on Anik C, once financial viability is determined during the service trial phase. MCS high price quotations for modifications to incorporate hitless reconfigurations and beam switching , considered essential for commercial application, have prevented incorporation of these features in the Pilot Project.

Marketing Viability

4. Although there appears to be a large potential demand for a TDMA service, viability will not be established until the service is introduced on a trial basis and financial viability established.

5. DOC officials reported that as a result of this pilot project, Telesat and TCTS, through the Computer Communications Group (CCG), have announced plans to run a trial TDMA service (Mid 1982) at 6/4 GHz with the Bank of Nova Scotia in preparation for introducing a potentially competitive service to that of CNCP.

Goal 2: To Develop The Knowledge And Expertise To Better Utilize 14/12 GHz Satellite Communications Technology

1. Final results of the evaluation of the technical tests

will not be published until late April 1982. Delays, as reported by DOC officials, were due to failures (almost entirely RF equipment) and installation problems.

2. A modification to the burst synchronizer cards had to be developed, which lets the TDMA equipment operate in an environment where interference may be induced.

Goal 3: To Develop Expertise And Create Awareness In User Institutions of The Potential of Telecommunications To Deliver New Services

1. Several users are now aware of the TDMA concept, e.g. Guaranty Trust, Bank of Nova Scotia, and GTA. Sufficient interest has been expressed to warrant CNCP to participate in a second phase of the pilot project in which the TDMA concept will be offered on a service trial basis.

2. GTA is participating in the user oriented field trial scheduled for March 1 to mid September 1982. This will involve CEIC and AES as users. There will be a total of approximately 30 circuits established. Details of the GTA test are available in "Anik-B Federal Government Telecommunications Field Trial Project Plan."

Goal 4: To Contribute To Policy Issues

1. CNCP's repeated request to Telesat, DOC and CRTC for partial transponder service and rates (from Telesat) have influenced recent CRTC thinking and their recent decision to allow Telesat to sell partial channels. These rates will affect the financial and market viability for a Slim TDMA commercial service.

2. Identification of the potential market for and the demonstration of a Slim TDMA service has raised the question of terminal ownership, i.e. can large users own their own terminals and, can private TDMA systems be offered by non-regulated carriers?

Other Benefits

1. The pilot project was the driving force in getting CNCP Engineering, Planning and Marketing involved and developing expertise and towards adding satellite services to CNCP's offerings. CNCP has 8 Engineering personnel involved with Slim TDMA where none were involved before.

2. Canadian capability to develop TDMA (and related technology) equipment was established. MCS, although unsuccessful on the bid for the 6/4 GHz TCTS TDMA trial service, (purchased equipment from DTL, a Canadian subsiduary of the MICOM Corporation), have been successful on bids for TDMA system studies with NATO and the European Space Agency.

G.7.2.4 Assessment of Reported Achievements

The purpose of this section of the report is to present an assessment of the extent to which the reported goal achievements (See Exhibit G.7.2.2) were in fact due to the experience of the pilot project and depended on the continuing hands-on experience afforded by the pilot project mode of activity.

1. It is difficult at this stage to determine how successful the Slim TDMA Pilot Project was in meeting its objectives. The major objectives as stated in Section G.7.2.1 are technical in nature and detailed technical goal achievements will not be known until late April 1982. However, a Phase II pilot project has been approved to explore possible applications. Most of the expected achievements identified by the participants (Exhibit G.7.2.2) will not be realized until well in the next phase. Financial and marketing viability decisions will be made at that stage.

2. The goal achievments reported were a result of the extensive hands-on continuing experience. The reasons for technical goal achievements are as follows:

a. To debug Technical and procedural problems associated with actual locations and with integration into INFOSWITCH;

b. to test for unexpected errors mechanisms which can only be achieved with equipment in operation;

c. to carry out long term performance measurement; and,

d. to change this from an unknown experimental technical system to one which is reliable, well understood with all protocol and interfacing resolved. Slim TDMA is an extremely sophisticated technical system with which carriers are unfamiliar.

Achievements reported under the Goals of User Awareness and Policy Issues were also a direct result of the extensive hands-on continuing experience for the following reasons:

a. It was the catalyst in customer awareness and acceptance of new telecommunication solution;

b. To evaluate customers acceptance and operational procedures; and,

c. Actual experiments highlighted potential policy/regulatory issues.

3. The participation of TCTS and Telesat in a trial TDMA Service on the 6/4 GHz, bandwidth is difficult to defend as being a direct result of the CNCP pilot project for TCTS may have introduced this service even if the CNCP had not entered into this type of service. However, the CNCP pilot project may have expedited the timing of such a trial as these are potentially competitive services.

4. The two "Other Benefits" reported are a direct result of the pilot project. However, it is still uncertain whether or not both CNCP and MCS hve demonstrated sufficient capability to compete in this type of satellite communication service offering and equipment manufacturing respectively.

Exhibit G.7.2.3 Pilot Project Costs

Category	Source	Amount
1. Equipment		
2 Earth Stations	DOC	$300,000
2 Earth Stations	CNCP	$425,000
2 TDMA Terminals	DOC	$250,000
2 TDMA Terminals	CNCP	$218,000
Interface Hardware	CNCP	$ 18,000
Test Equipment	DOC	$100,000
2. Operating Costs		
Site Preparation	CNCP	$ 30,000
A/C Power	CNCP	$ 10,000
Installation Labour	CNCP	$ 35,000
Repairs, Equipment Checks, Other	CNCP	$ 5,000 → 1,391 K
Manpower	CNCP	Not Reported
3. DOC Costs		
Manpower	DOC	7 Person Years
4. Satellite Usage		
Partial use (approx. 1/10) of a single Transponder. DOC reimbursed by CNCP	CNCP and DOC	1525 hours

G.7.3 PHASE-COHERENT LONG BASELINE INTERFEROMETER

G.7.3.1 Introduction

The main purpose of this pilot project was to establish a satellite-based long baseline interferometer and to evaluate its potential for applications to geophysical studies. The Anik B satellite was used to provide a phase link between the radio telescope located at the Algonquin Radio Observatory, Algonquin Park, Ontario; at the Dominion Radio Astrophysical Observatory, Penticton, B.C.; at the Naval Research Laboratory Observatory, Maryland Point, Maryland; and the CRC 9m terminal at Shirley Bay, Ontario. The phase coherence was established by transmitting 2 pilot tones from each station to the others via Anik B. Astronomical data was recorded on tape at each station using clocks synchronized via the Anik B transmission, and played back at a later date to obtain positional data. The frequency difference between the pilot tones was used to determine the overall accuracy.

The major participants in the pilot project included: the University of Toronto; York University; the Earth Physics Branch of the Department of Energy, Mines and Resources; the National Research Council; and the U.S. Naval Research Laboratory.

The technical problems which were addressed in the pilot project are as follows:

1. To establish an operational, phase stable, long baseline interferometer, operating between two (2) points in Canada and one (1) point in the U.S. using an ANIK-B satellite link communications channel.

2. To use the phase stable, long baseline, interferometer to carry out a variety of geophysical studies including:
   - earth rotation measurements;
   - nutation measurements; and

- ultra precise geodetic baseline determinations.

3. To carry out time transfer using continuous wave transmission.

The 14/12 GHz satellite frequency band provided three major advantages over the 6/4 GHz alternative for this project:

- . The availability of a wide band transponder, 72 MHz, is advantageous to the 36 MHz available on the 6/4 GHz technology;
- . Smaller ground terminal antennas; and
- . Lower error caused by Ionespheric dispersion than on 4/6 GHz channels.

This phase of the pilot project is now complete and an extension to the project for further refinement and measurements has been approved for Phase II of the Anik B Communications Program. The costs incurred for the Phase I project are summarized in Exhibit G.7.3.3 of this report.

G.7.3.2 Expected Project Achievements

A summary of the expected project achievements as reported by the participants is presented in Exhibit G.7.3.1.

G.7.3.3 Reported Goal Achievements

Exhibit G.7.3.2 presents the pilot project achievements as reported by the participants. The achievements are presented in terms of the four goals of Phase One of the Anik B Communications Program. Other effects of the project are also presented.

The major objective of this pilot project was to determine the

technical viability of using domestic communications satellites to establish a phase coherent interferometer and to use this to carry out a variety of geophysical studies. As a result, most project achievements have been reported under the Program Goal of Viability.

The participants have reported that the project was successful in meeting its objectives. Five achievements were reported under the technical viability aspects of Goal 1. In addition, 4 achievements were reported under financial viability. No achievements were reported under Goal 2, two were reported for Goal 3 and one achievement for Goal 4.

EXHIBIT G.7.3.1 SUMMARY OF EXPECTED PROJECT ACHIEVEMENTS

Expected Applications

1. Geodynamical and geophysical measurements of unprecedented accuracy including such research areas as:
   (a) fluctuations in the earth's rotation rate and their possible relationship to longterm weather prediction as well as the dynamics of the earth's fluid core.
   (b) polar motion or wobble of the earth on its rotation axis and its possible relationship to longterm weather behaviour.
   (c) ultra precise geodetic measurements and the study of tidal deformation of the solid earth, as well as intraplate tectonic studies.
   (d) precise geodetic positioning with a truly 'inertial' or absolute frame of reference.

2. A simple and efficient means of time transfer and synchronization between remotely located clocks for:
   (a) time transfer between standard time laboratories.
   (b) synchronization of digital communication network.
   (c) replacement of high precision hydrogen maser oscillators in very long baseline interferometry arreys.

Expected Clients

1. Energy, Mines and Resources, Earth Physics Branch, to conduct studies of a wide range of geophysical phenomena, including daily monitoring of earth rotation;
2. York University, Earth Science Research Group, to conduct analysis and geophysical interpretation of long baseline interferometry data;
3. University of Toronto, Electrical Engineering Department, to further develop the technique of long baseline interferometry;
4. The National Research Council, Dominion Radio Astrophysical Observatory and the Division of physics, to conduct scientific research, to undertake technological developments and to assist with the world wide system of maintaining clock synchronization;

5. US Naval Research Laboratory, Radio Astronomy Group and the US Naval Observatory, to monitor earth rotation and to assist with the world wide system of maintaining clock synchronism; and,

6. Other major universities and government institutions involved in VLBI geophysical and astrophysical investigations (e.g. Geodetic Survey of Canada).

Expected Impacts on Clients

1. The development of a phase coherent, long baseline interferometer would provide a research tool unique in the world and could allow geophysical and geometric measurements of unprecedented accuracy;

2. Replacement of the existing method (using Photographic Zenith Tubes, PZT's, across Canada) on monitoring earth rotation with one which features all weather, and real-time operation, as well as making more accurate measurements;

3. Replacement of existing methods (Laser and Doppler tracking of earth satellites) of geodetic positioning with one which is truly 'inertial', or absolute frame of reference, and which is more accurate. Also, provides a self-contained Canadian System, as the current technique of Doppler tracking requires extensive US assistance;

4. Order of magnitude increase in accuracy of clock synchronism; and,

5. Enhanced Canadian role in international Scientific Community.

Expected Impacts on Canadian Industry

1. Telesat - potential for ongoing service on a commercial satellite such as Anik C or D. However, capacity required is modest and little impact on other transponder traffic is expected.

2. Equipment Manufacturers - potential for producing satellite clock synchronization systems.

Expected Technical Results

1. Ability to measure interferometer baseline longitude to a precision of +-0.003 seconds of a degree.

2. Achieving a precision in UTI (earth's rotation) measurement of better than +-300 Usec.

3. Ability to synchronize remote clocks to an accuracy of +-50 psec.

EXHIBIT G.7.3.2 SUMMARY OF REPORTED GOAL ACHIEVEMENTS

Goal 1: To Determine the Viability on a Pre-Operational But Continuing Basis of Telecommunications Services Designed to Meet Identified Requirements.

Technical Viability

1. The project was successful in that it was demonstrated that domestic communications satellites can be used for the stated purposes.

2. Interferometer baseline longitudes were measured to a precision of +-0.004 seconds of a degree.

3. UTI (earth rotation) measurements were achieved to a precision of +-270 Usec in one day's observation.

4. Remote clocks were synchronized to an accuracy of +-50 to +- 100 psec in the presence of telecommunications traffic in the satellite channel.

5. The participants report that these results are of an unprecedented accuracy.

Financial Viability

6. Cost estimates from Telesat and TCTS are being prepared to provide a phase synchronization system for a proposed Canadian Long Baseline Array.

7. Although phase coherent VLBI has demonstrated its superiority in UTI earth rotation measurements, decisions on replacing present PZT will not be made until VLBI can be run in a routine manner. Further experiments are required to refine the system and to reach the limit of capability of the system.

8. Further routine tests are required before a decision can be made to replace existing methods with the new technology, and to achieve the impacts listed in Exhibit G.7.3.1.

9. If the satellite link long baseline interferometer can produce reliable day to day solutions of the baseline longitude with an r.m.s. error of +-0:004 seconds of a degree then it can be used to study day to day variations in UTI of the order of +-270 usec. This

would be a dramatic improvement over present day methods of measuring UTI variations. A quantum leap of this magnitude in our ability to monitor UTI variations is virtually guaranteed to lead to major new global geodynamical discoveries. The earth's rotation rate is altered by the fluid motions of the atmosphere, the oceans, and the earth's outer core. Synoptic weather observations from ground based stations and from earth satellites will provide a data set from which the contributions from the atmosphere can be removed very accurately. The residual UTI variations would have to be accounted for by fluid motions in the oceans and outer core. If future observations allow a removal of the oceanic contribution the fluid motion of the earth's core would stand revealed for the first time.

Goal 3: To Develop Expertise and Create Awareness In User Institutions of the Potential of Telecommunications to Deliver New Services.

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10. NRC time laboratory is introducing a system for time transfer among time standard laboratories based on the success of this Pilot Project. (?)

11. The world VLBI and time transfer communities have taken note of the capabilities of the technique.

Goal 4: To Contribute To Policy Issues

12. Dissemination of unmodulated carriers from user ground stations.

G.7.3.4 Assessment of Reported Achievements

The purpose of this part is to present an assessment of the extent to which the reported goal achievements (see Exhibit G.7.3.2) were in fact due to the experience of the pilot project, and depended on the continuing, hands-on experience afforded by the pilot project mode of activity.

The major objective of the pilot project, i.e. to establish the technical viability of an operational, phase stable, long baseline interferometer using a satellite link communications channel, was achieved.

The resultant goal achievements were reported to be a result of the extensive hands-on continuing experience on Anik B as it was considered necessary to gain long-term performance data before any decisions could be made to replace existing methods with satellite technology on a domestic basis.

EXHIBIT G.7.3.3 PILOT PROJECT COSTS

Category	Source	Amount
1. Equipment		
Penticton Ground Station	EMR	$ 40,000
Rubidium Frequency Standard for Penticton	EMR	$ 12,000
Radio Astronomy Receivers	Participating Institutions	$ 40,000
2. Operating Costs		
Modifications to Existing Equipment	Participating Institutions	$ 15,000
Operating Expenses	"	$ 40,000
Other Expenses	"	$150,000
Manpower	"	4 Person Years
3. DOC Costs		
Manpower	Minimal satellite coordinator/scheduler time.	
Equipment	5 Days use of 1 TWTA due to participants' equipment failure.	
4. Satellite Usage		
Used sporadically for several 24-hour days at a time. Low capacity - approx. 1/400 of channel used. DOC was not reimbursed.		Not Reported

G.7.4 14/12 GHZ PROPAGATION STUDY

G.7.4.1 Introduction

The 14/12 GHz Propagation Study was carried out to measure rain induced depolarization of a linear polarized field along earth-space propagation paths for various geometrics and climates. Studies have shown that rain depolarization is a crucial factor in the design of satellite communications systems in the 14/12 GHz frequency band. Telesat's Anik C satellite which is scheduled to be launched in the near future, will have these characteristics. The results of this project will assist Telesat in planning for the introduction of Anik C services.

The pilot project was to be carried out jointly by the Engineering Department of Telesat Canada and the Communications Research Centre of the Department of Communications. Tests were to be performed by establishing a low-level CW signal on the Anik B Satellite to simulate, as closely as possible, a stable linearly polarized satellite beacon transmitter. The change in polarization state of this signal, induced by down-link propagation through the atmosphere, was to be measured at 4 locations (Halifax, Toronto, Winnipeg and Ottawa or Montreal) using 4 receive-only terminals. Radiometers were to be co-located with these terminals in order to distinguish downlink fading from uplink fading or small signal suppression in the satellite transmitter.

The technical problem addressed in the pilot project was comprised of two parts:

1. To measure attenuation and depolarization effects caused by precipitation (a significant factor in this frequency band) on a satellite signal in the 14/12 GHz frequency band; and

2. To discover ways of improving the propagation

attenuation of 14/12 GHz satellite communications.

Some limited testing was carried out; however the project was not completed and there are no plans to continue it. The costs which were incurred are listed in Exhibit G.7.4.3 of this report.

G.7.4.2 Expected Project Achievements

Only one (Communications Research Centre) of the two participants in this project were asked to respond to the evaluation questionnaire. A summary of the expected project achievements as reported by the one participant, is presented in Exhibit G.7.4.1.

G.7.4.3 Reported Goal Achievements

No positive achievements have been reported for this project. The data which were gathered are not considered to be meaningful. Exhibit G.7.4.2 presents a summary of the reasons why the project has not been considered a success. These points are presented under Goal 2: Technical Knowledge - only of the Anik B Communications Program, due to the nature of this pilot project. Other Program Goals are considered not to be applicable and no other benefits were reported.

EXHIBIT G.7.4.1 SUMMARY OF EXPECTED PROJECT ACHIEVEMENTS

Expected Applications	1. Improved and more reliable message and video communication services via the ANIK-C satellite to those parts of Canada to be served by the satellite (i.e. south of approximately 60 degrees of approximately 60 degrees N).
Expected Clients	1. Telesat to design system requirements for future satellites using the 14/12 GHz frequency band. 2. Teleglobe and other administrations would also use the results of this study.
Expected Impacts on Clients	1. Increased technical expertise on the part of Telesat, to provide improved reception and increased propagation availability on satellite communication services in the 14/12 GHz frequency band. 2. Successful completion of this study would have provided information required for the design of adaptive systems to compensate for rain deplorization. 3. Increased requests for commercial service on the Anik-C and other future satellite systems using the 14/12 GHz frequency band.
Expected Impacts on Canadian Industry	1. None were reported.
Expected Technical Results	1. Meaningful data, uncontaminated by other users. No specific technical indicators were reported.

EXHIBIT G.7.4.2 SUMMARY OF REPORTED GOAL ACHIEVEMENTS

Goal 2: To Develop the Knowledge and Expertise To Better Utilize 14/12 GHz Satellite Communications Technology

1. It was not possible to obtain meaningful data since it was necessary to share the transponder with other users whose transmissions drove the transponder into non-linearity. For these rain depolarization measurements, it is essential that a CW linearly-polarized source be used. This was unavailable using the Anik B satellite. (These problems could have been avoided if the satellite had carried a beacon transmitter).

2. Even if a very large effort had been made to correlate transponder usage with variations of signal strength, the number of meaningful attenuation events remaining would have been insufficient to fulfil the objectives of the project.

3. DOC/CRC is aware that information required by various users cannot be provided by this experiment. Some information is available from other CRC measurements and from open literature publications. Additional tests would be useful, if a suitable satellite source could be obtained.

G.7.4.4 Assessment of Reported Achievements

No goal achievements were reported for this project. Several observations can be made as a result of the evaluation:

1. The actual status of this project has been very difficult to determine. For example, were all tests performed and was it only during the analysis stage that the results were found to be meaningless? Or was this conclusion reached before all tests were performed? If the latter is true, have all further tests been suspended or have the participants lost interest in the project? No formal notification of suspension or completion of the project has been made to the SCOPO office.

2. The initial planning for the project seems to have been changed substantially. The original proposal was abandoned, for cost reasons apparently, and a new proposal was submitted. Although the proposal contains a fairly detailed description of the project, there is no indication of the type and number of test measurements which were planned.

3. From an analysis of the participants' response in Exhibit G.7.4.2, it is difficult to understand why the project was undertaken at all. The fact that a CW linearly-polarized source was not available on Anik B must have been known before the project started.

4. Finally, it is not certain that a pilot project with extensive, continuing, hand-on experience was necessary to achieve the objectives. Comment 3 in Exhibit G.7.4.2, indicates that some information is available from other CRC measurements and from open literature publications. There is no indication what additional information this project would have provided if it had been successful.

EXHIBIT G.7.4.3 PILOT PROJECT COSTS

Category	Source	Amount
1. Equipment		
4 XPD Receiving Terminals	Had been fabricated for previous Hermes XPD experiment	NIL
4 Radiometers	Already owned by CRC	NIL
Data Recording Equipment	Already owned by CRC	NIL
1 Transmitting Terminal	Due to failure of Telesat TWTA, a CRC unit was used for most measurements	NIL
2. Operating Costs		
Equipment Modification	CRC	Not Reported
Operating Expense	CRC/Telesat	Not Reported
Data Transmission	CRC	$15,000
Manpower	CRC/Telesat	Not Reported
3. DOC Costs (in addition to above)		
Manpower	Minimal satellite Coordinator/Scheduler time	
4. Satellite Usage		
Used 1 low-powered CW line. DOC not reimbursed for time used.		Not Reported

G.8 SUMMARY OF PILOT PROJECTS ACHIEVEMENTS AND EFFECTS

The above reports on the pilot projects have documented a number of goal achievements and other effects that can be attributed to the intervention of the Phase One Program. We summarize below those achievements and effects that are likely to constitute the most important contributions to the desired end-state, i.e. a viable Canadian commercial satellite telecommunications system and industry.

G.8.1 VIABILITY DECISIONS MADE AND PURSUED

G.8.1.1 In favour of 14/12 GHz satellite communications systems

.KNOWLEDGE NETWORK of the West was created and its current budget contains provision for a 14/12 GHz satellite-based system, subject to satisfactory negotiations with TELESAT and approval by the B.C. Ministry of Universities, Science and Education. In support of the KNOWLEDGE NETWORK, the B.C. government is subsidizing the purchase by communities of 14/12 GHz earth stations and re-broadcast units. Funding for this year is approximately $1.5 million.

.OECA/TVONTARIO has received Cabinet approval to roll-over its terrestrial distribution system to a satellite-based one, subject to satisfactory rate negotiations. In support of this thrust, the Ontario government is also subsidizing the purchase by communities of 14/12 GHz earth stations and re-broadcast units.

G.8.1.2 In favour of other satellite distribution systems

. The pilot projects contributed significantly to the success of the Inuit Broadcast Corporation in being licensed by the CRTC and funded by the federal government. Inuit programming is now being delivered via 6/4 GHz satellite systems on an interim basis.

G.8.2 VIABILITY ASSESSMENTS MADE AND CONTINUING

Two of the high technology pilot projects have resulted in positive but limited viability assessments regarding the introduction of new technologies that could broaden the potential applications of 14/12 GHz communications systems:

- Technical viability of an integrated 90 mbps satellite digital link was demonstrated, and is being further explored in Phase Two;

- Technical viability of a slim TDMA network was demonstrated, and possible applications are being explored in Phase Two.

G.8.3 TECHNICAL KNOWLEDGE

All projects reported increases in technical knowledge. In terms of the potential impact on the end-state, we judge the following achievements to be particularly important:

i. the technical results of the PDPP's which contributed to the positive viability decision (see G.8.1) and influenced the sale of ANIK-C capacity for DBS usage (See G.2.5); and

ii. the technical knowledge gained by DOC officials and others in installing and operating 14/12 GHz systems.

G.8.4 AWARENESS OF POTENTIAL OF TELECOMMUNICATIONS

Again,all projects participants reported such achievements. We judge the following ones to be particularly important in terms of potential impact on the end-state.

i. the interest in off-shore communications stimulated by the MUN pilot project;

ii. increased and continuing interest on the part of Provincial educational organizations in using satellite telecommunications systems to deliver their programming, increasing their penetration for existing services and opening up new educational markets (e.g. outside of institutions). This interest seems to be backed up by funding;

iii. increased recognition by various Provincial Ministries that 14/12 GHz satellite communications systems offer the potential to equalize service delivery throughout a Province; and

iv. awareness on the part of recipients of services (broadcasting, education and health in particular) that telecommunications can provide access to new and important servies, leading to increased pressure for these services.

G.8.5 CONTRIBUTIONS TO POLICY ISSUES

All pilot project participants encountered major Canadian policy, regulatory and institutional barriers to the introduction of a 14/12 GHz satellite-based telecommunications system in Canada. As well, most participating organizations took opportunities to argue against these barriers in front of the CRTC and elsewhere. However, only one actual Canadian policy change can be said to have been aided by the Phase One experience: the CRTC decision to permit the leasing by TELESAT of partial transponder capacity to broadcasters.

Internationally, the experience of the television broadcasting projects may contribute to decisions at RARC and WARC, but is is

premature to tell.

There are two causes of this lack of more substantial policy change achievements. The first is the difficulty of effecting such changes. The second is that the DOC Program activities were not designed to identify particular policy barriers and to ensure that specific and co-ordinated steps were undertaken to deal with them.

G.8.6 OTHER EFFECTS

Major other effects are as follows:

. Increased interest, internationally, in the use of lower powered satellites for DBS applications;

. The involvement of CNCP in developing satellite expertise which could result in the addition of satellite telecommunications to the existing range of services;

. The British Columbia government has identified satellite telecommunications as a sector for industrial development in view of both the Canadian and foreign markets; and

. Networks and organizations (e.g. FOCUS) have been established between potential users of satellites, examining major issues such as the possibility of establishing consortia to share satellite capacity and thus reduce costs.

G.9 CONTRIBUTIONS OF PILOT PROJECTS TO A VIABLE CANADIAN COMMERCIAL SATELLITE TELECOMMUNICATIONS SYSTEM, SERVICES AND INDUSTRY

In G.8 above, we recorded the major goal achievements and other effects of the Phase One pilot projects. We now present a preliminary assessment of the contributions of these achievements to the establishment of a viable Canadian commerical satellite telecommunications system and industry. This assessment is "preliminary" in two senses: the results may well change as a consequence of Phase Two activities, and a final assessment will require the conclusions of the DOC evaluation of the direct industrial expenditures activity. (See part I)

The Phase One Communications Program has three indicators of success for its contribution to the above end-state. They are:

- the commercial viability of the ANIK-C 14/12 GHz satellites;
- a Canadian manufacturing capability for the LCET and associated systems and equipment, capable of producing for large markets and with a record of substantial sales; and,
- a body of users committed to, and using, this particular technology on a commercial basis.

The Phase One Program has produced real progress on all three areas.

The first ANIK-C satellite, to be launched in late 1982, is in a favorable financial situation, as reported by TELESAT; there is a real potential for substantial sales of the modified LCET being developed by SED and GI; and there is a body of influential and committed Canadian users (See G.8).

However the progress in these three areas has not been co-ordinated. The heavy committment of ANIK-C (1) is to American broadcasters; the LCET sales may be in the U.S. market to recipients of the Americans DBS signals; but the committed Canadian users are unsure as to whether their needs will be accomodated by the first ANIK-C satellite. The Program activities have contributed substantially to defining and creating a DBS market opportunity which is being seized, at least initially, by the U.S.

We believe that this situation is due in large part to the lack of a co-ordinated thrust in the DOC Phase One Program activities to achieve the required policy changes. Phase Two may change this situation.

PART H. GOAL ACHIEVEMENTS, EFFECTS AND COSTS: OTHER ACTIVITIES

H.1. DEMONSTRATIONS

H.1.1 INTRODUCTION

The Demonstration activity of the Anik B Communications Program comprises independent live demonstrations of the transmitting and receiving of a signal on the satellite system. These demonstrations are not an integral part of a pilot project. The major purposes for these demonstrations are defined to be as follows:

a. to demonstrate the potential of the technology for exploitation by industry;

b. to demonstrate new concepts over pre-operational facilities to confirm the viability of the product;

c. to demonstrate Canadian achievements and technical capabilities in satellite technology to foreign technical, political and communications-orientated audiences; and

d. to demonstrate technical achievements and research areas showing the current state-of-the art as part of international conferences.

Most of the demonstrations are carried out at the Communications Research Centre and involve showing the reception of an off-air signal on a LCET. For more specialized audiences, the demonstration is more elaborate and might include a comparison of the reception using different size antennae or different types and strengths of signal.

Other demonstrations vary greatly in the form and effort involved and do not take place on CRC premises. These may simply involve the presence of a specific audience to view the operations of a regularly scheduled activity or they may require substantial effort to install an entire system. Not all demonstrations involve active participation of DOC personnel.

Demonstrations are used to complement the more formal pilot projects by providing a quick reaction capability to non-programmed target populations. In comparison with the Pilot Project Activity, Demonstrations consume a relatively insignificant amount of the manpower and satellite resources of the Anik B Communication Program. (See Exhibit H.1.4 for a summary of the activity costs.) However, it is reported that the ability to reach a broad spectrum of the potential user market and to demonstrate the advanced nature of Canadian development has contributed to the Program Goals and has indicated areas for future pilot projects and commercial service.

In general, a large audience can be exposed to the new technology in a short period of time and a relatively low cost. Although no formal records of attendance at demonstrations are kept by CRC, the following estimates were made:

No. of Attendees	No. of Demonstrations
1-5	62
6-30	33
above 30	27
unknown	5
	127

Unlike the Pilot Project Activity, achievements attributable to this activity essentially contribute to only one Program Goal, i.e. Goal 3: To Develop expertise and create awareness in user institutions of the potential of telecommunications to deliver

new services.

H.1.2 EVALUATION FRAMEWORK

All demonstrations are approved by the proper authorities at DOC and each must be scheduled by staff at CRC. A "Special Event Request" form, containing information such as the sponsor, key personnel, objectives, plans, schedule, spacecraft configuration, and, terminal type, is completed for each demonstration. A total of 134 of these forms exist at CRC for demonstrations given for Phase I of the Anik B Communications Program. However, no formal records are kept on the amount of DOC resources used or on the number of people who attended each demonstration.

To evaluate the contribution of this activity to the program goals, CRC staff were first asked to provide a summary of all demonstrations. This summary for each demonstration, included information such as, type, location, participants, requestor, demonstrator, number of attendees, and satellite time. Each demonstration was categorized into 8 types of audiences. Exhibit H.1.1 is a summary of the results of this analysis.

Of the 134 demonstrations originally identified, 4 were cancelled, 2 were blanket approvals to All View Network I Inc. for a total of 125 hours to monitor the regular DOC demonstration signal, and 1 was a blanket approval for demonstrations to be given daily on the Minister of Communications' terminal located in his office. A total of 127 demonstrations using approximately 218 hours of satellite time were therefore identified for purposes of this evaluation. It should be noted that not all of these demonstrations required the dedicated use of a satellite transponder, and that since February 1980, the hour between 9 and 10 AM every weekday has been reserved specifically for demonstrations.

Exhibit H.1.1 Summary of Demonstrations Performed

Classification	Number	SATELLITE TIME Hours	% of Total
1. Recipients of End Services	7	23.75	11
2. Providers of End Services	14	28.25	13
3. Broadcasters/ Distributors	9	19.75	9
4. Providers and Regulators of Telecommunications Services	28	49.0	22
5. Manufacturers/ Distributors of Satellite Related Telecommunications Equipment	5	4.0	2
6. Organizational Conducting Technical Research in Satellite Related Telecommunications	1	1	1
7. Foreign Political Technical and Trade Visitors	49	78.5	36
8. Other Participant	14	13.75	6
TOTAL	127	218.0	100

The following is a summary of these demonstrations by type as recorded on the "Special Event Request" form. Most are recorded as a basic LCET demonstration.

Summary of Demonstration By Type

Description/Type	Number	% of Total
LCET	109	86
Two Carrier Video	7	6
Teleconference/ Interactive Telephony	5	4
Scrambler	2	1
1 Way Video/Two Way Audio	1	1
BCIT Announcement	2	1
Telephony	1	1
TOTAL	127	100

The majority of the domonstrations take place at CRC in Ottawa. A summary of all demonstrations by location is as follows:

Summary of Demonstrations by Location

Location	Number	% of Total	Satellite Hours
CRC	88	69	112.75
British Columbia	12	9	33.75
Other Ottawa	8	6	35.5
Toronto	8	6	18.25
Saskatoon	6	5	6.0
Montreal	2	2	5.5
Alberta	2	2	6.25
N.W.T.	1	1	-
	127	100	218.0

It is assumed that the minimum DOC manpower associated with these demonstrations is 2 persons for the hour of the demonstration. However, for those demonstrations off CRC premises additional time and costs are incurred. Exhibit H.1.4 is a summary of those costs which are available for all demonstrations.

The demonstrations were analyzed by CRC staff, in terms of the following:

a. objectives;

b. effects, or results which were achieved; and

c. impacts, or actions which have taken place as a result of the test.

This was done on a broad category basis only. To supplement this information and to provide more specific goal achievements, a questionnaire was sent out to individuals or companies who were major participants in 10 major demonstrations. These were chosen as follows:

Classification	Questionnaire Participants
1. Receipients of End Services	Dome Petroleum
2. Providers of End Services	British Columbia Institute of Technology (BCIT) (2 different demonstrations were questionned)
3. Broadcasters/ Distributors	All View Network I Inc. Rogers Cable Systems Inc. Canadian Cable and Television Association (CCTA)
4. Providers and Regulators of Telecommunications Services	Canadian Radio and Telecommunications Commission (CRTC) Regional Administration Radio Conference (RARC) (DOC responded)
5. Manufacturers/ Distributors of Satellite Related Tele-communications Equipment	SED Systems Inc
6. Organizations Conducting Technical Research In Satellite Related Telecommunications	None
7. Foreign, Political, Technical and Trade Visitors	Australia Department of Communications (DOC responded)
8. Other Participants	None

Only 6 returned completed questionnaires but one participant (BCIT) returned questionnaires on an additional 3 demonstrations which they performed. The results of the CRC and questionnaire respondents are presented in the following section under reported goal achievements.

H.1.3 REPORTED GOAL ACHIEVEMENTS

Exhibit H.1.2 presents the goal achievements, as reported by CRC staff, for what they consider to be the most significant

groupings of demonstrations. In terms of satellite usage, these demonstrations account for approximately 75% of the usage by all demonstrations.

A total of 22 goal achievements were reported. As expected, most (21) contribute to Goal#3: To Develop Expertise and Create Awareness in User Institutions of the Potential of Telecommunications to Deliver New Services.

One "Other Benefit" was reported, ie Canadian manufacturers of satellite equipment have been used to provide advice to Australians in the design of their Domsat system, and are being considered to supply the hardware.

Exhibit H.1.3 presents the goal achievements, as reported for a sample of specific demonstrations by participants or coordinators. A total of 15 goal achievements were reported: 6, contributing to Goal 3; 7 Other Benefits; and, 2 contributing to Goal 1 - To Determine the Viability, on a Preoperational But Continuing Basis, of Telecommunications Service Designed To Meet Identified Requirements.

Exhibit H.1.2 Summary of DOC Reported Goal Achievements For Major Groups of Demonstrations

Demonstration Audience	Number of Demonstrations	Objectives	Goal Achievements	Applicable Program Goal
DOC Personnel	9	To create awareness of latest technical developments	Use of LCET's in PDPP	Goal 3
			Use of 2/3 channels per TWTA	Goal 3
			Promotion of demonstrations to outside organization by DOC staff	Goal 3
Telesat Personnel	5	To create awareness of latest technical developments	Purchase of LCET by Telesat to give own demonstrations	Goal 3
			First commercial service offering (La Sette) using half transponder	Goal 3
			Telesat intervention at CRTC hearings promoting 14/12 GHz for broadcasting to remote areas	Goal 3
RARC/WARC	3	To create awareness of kind of service possible by lower power satellite than recommended by WARC 77	Total surprise that signal quality was acceptable below threshold	Goal 3
			More accurate awareness of reception by medium	Goal 3
			Domonstration requested to RARC representatives in May 1981. (See Exhibit H.1.3)	Goal 3
All View Network I	3	To demonstrate technical feasibility and market potential to higher management, potential users, etc.	Northstar (a related co.) submitted proposal to CRTC to provide extension of service (See Exhibit H.1.3) via 14/12 GHz	Goal 3
			Bought own LCET for demonstration purpose.	Goal 3
SED/SPAR	6	To create awareness in management and potential customers of latest technical developments	Sale of 5 LCET's by SED to ACCESS (Alberta)	Goal 3
			Continuing sales of LCET's by SED	Goal 3
Carriers	3	To create awareness of potential and latest technical developments	More awareness of LCET potential	Goal 3
			Negotiations began to facilitate use of ANIK C uplinks for ANIK B pilot projects	Goal 3
Broadcasters	6	To create awareness of potential for new and improved end services, technical knowledge and policy issues	Participation of CBC, BCTV and cable companies in PDPP	Goal 3
Australia	14	To create awareness of potential for new services, technical viability, market potential, and options for systems and sources of hardware.	Decision to acquire a Domsat System	Goal 3
			Canadian sources asked for advice on hardware	Other Benefits
Other Nationalities	35	To create awareness abroad of Canadian capability	None reported	-
OECA	2	To demonstrate use of LCET before participating in PDPP and TV reception using 1/2 power signal	Participation in PDPP	Goal 3
			Acquisition of large antennae for 1/2 power operation in fall of 1981 (with a view of going operational on Anik C)	Goal 3
Dome Petroleum	1	To demonstrate technical capability	Participated in PDPP West with LCET on drill ship	Goal 3
BCIT	2	To create awareness of educational applications in BC at press announcement of Knowledge Network	None reported	-
Conferences	2	To demonstrate LCET reception and scrambling to attendees of ANIK B User Conference and FOCUS Conference.	None reported	-
ANTEC Conference	1	To demonstrate teleconference from CRC to Edmonton via video link with voice return channels.	None reported	-
GNWT	1	To demonstrate technical viability of a teleconference network for sessions of the NWT legislature	Investigated with Telesat possibility and costs of repeating the service for a later session	Goal 3

Exhibit H.1.3 Summary of Reported Goal Achievements for Specific Demonstrations

Organization Reporting	Audience (And No.)	Objectives	Goal Achievements	Applicable Program Goal
All View Network I INC	Corporate Directors Press and TV SED Systems ONT. Communications Local Condominium Directors DOC or Telesat (50)	To demonstrate reliability and quality of signal with LCET in a dense urban area	Useful in Forming North-Star Home Theatre which was the only applicant at Feb. 1981 hearings proposing direct satellite to home using Anik C	Goal 3
			Filed comments with CRTC policy hearing on service to remote areas in April 1980.	Goal 3
			Received enquiries from Europe, Australia, South America and US as leading proponent of DBS system	Other Benefits
CRTC	CRTC Commissioners and staff (30)	To demonstrate reception with LCET and the descrambling of a scrambled signal	Studies are being conducted with respect to hearings.	Goal 3
DOC re Australian Visitor	First Assistant Secretary DOC Australia	To demonstrate quality of indoor/outdoor equipment and 2 TV Programs on 1 transponder	Modelling of Australia system on Canadian pilot system	Other Benefits
			Increased No. of visits by Australian officals	Other Benefits
			Requests to DOC for assistance in technical trials	Other Benefits
			Media coverage in Australia	Other Benefits
			Canadian companies in good bidding position	Other Benefits
BCIT	BCIT Broadcast Technology Students and Loyalist broadcast students in Ont. (60)	To demonstrate 2-way video teleconference to broadcast students	Origin of Knowledge Network of the West	Goal 3
			Pressure on politicians to continue experimental services	Goal 3
			Interest expressed from potential satellite receiver equipment companies (Scandu was successful bidder)	Other Benefits
BCIT	BC Pathologists and medical staff and small audience in Ont. (65)	To demonstrate long distance diagnoses of mircoscope slides (cancer tissue) via 2 way video teleconference	As above (for BCIT)	
BCIT	Graduate nurses living in remote communities too small to provide economically regular continuing education (214)	To demonstrate telcourse capability at a distance including TVRT interactive capability (pilot project concept)	As above (for BCIT)	
			Economic viability proven for 5 of the 12 remote sites and 3 to 4 have marginal viability	Goal 1
BCIT	Employees of BC Ministry of Communications Transport and highways for refresher course in concrete technology (44)	To demonstrate telecourse capability by bringing together, for short periods of time, students from many locations. Included interactive capability and video fidelity	As Above	
BCIT	Equipment suppliers (e.g. Infofax, 3M and Xerox)	To determine technical viability to broadcast facsimile signals from central location to a no. of receiving sites.	Test was not successful and alternate methods of transforming documentations were found	Goal 1
DOC re RARC Seminar	Delegates from South America, Europe, USA and Canada from Jr. Engineers to Sr. policy makers, attending preparatory seminar for 1983 RARC (130)	To demonstrate Canadian capability of TV reception via LCET as part of week long seminar	Mexico has submitted an advance notice publication in connection with ANIK B type of satellite	Goal 3

H.1.4 ASSESSMENT OF REPORTED ACHIEVEMENTS

The purpose of this section of the report is to present an assessment of the extent to which the reported goal achievements were in fact due to the experience of the demonstration mode of activity.

1. Demonstrations have yielded definite program goal achievements, for all classes of participants. As expected, most achievements were recorded under the goal of "increasing awareness."

To quote the DOC Director of International Space Industry Coordination:

> "Demonstrations, including telephony applications, are the only way to effectively prove to foreign communications personnel the technical and operational feasibility for an operational system. From a marketing viewpoint, the value of the demonstrations could not be replaced other than by having a government satellite in 14/12 GHz moved to positions for demonstrations in various countries."

2. The more general goal achievements reported by CRC personel are supported by those reported from the sample of specific participants and in some cases are complemented by more specific examples. However, it is difficult in many cases to attribute a goal achievement solely to one demonstration. Often the effect is complemented by other modes of activity such as continuing personal contact, conferences, seminars, etc and the establishment of a pilot project(s). To quote from the participants sampled:

> "As mentioned above, the C.R.T.C. held two hearings, at which we were the only proponents of a 12 GHz television service. Various other studies have been done by Telesat and D.O.C. Most certainly, these were not as a direct result of our demonstration, but I would like to think we played a small part." (Network I)

> " Over the seven months of formal experimentation there was a continued and rapid increase in demand for specialized programs both from potential receiving groups and new programming organizations." (BCIT)

> "The knowledge Network of the West Communications Authority was a direct outgrowth of the Anik B experimental projects." (BCIT)

In the case of the Australian demonstrations, it was only one component of the visit to Canada. The goal achievements reported are a combined results of visits to and discussions with pilot project participants as well as many visits by Australians over a period of time.

3. In many cases the participants sampled stated that the hands-on experience of the demonstration was essential to achieving the results:

> "The old saw "Seeing is believing". Also, only such a demonstration or "event" would warrant news coverage. I do not believe any other means would have been successful." (Network I)

> "No other method could have provided the same impact, or have achieved the results desired." (DOC-Australian visit)

> "...The impact of meeting with a group of students who are nearly 3000 miles away being reached through satellite has an impact which is not possible to create in a simulation situation. We attempted to illustrate to the students that the presence of a satellite should have almost no effect on their ability to communicate with people through video systems." (BCIT)

> " We are attempting to demonstrate that it was possible to have consultations over great distances in a very short period of time. In cancer diagnosis several hours can be critical and the need to send tissue cultures across Canada for a firm diagnosis is of major concern to pathologists. The only current link for such a video demonstration is via satellite and only a practical experiment could have demonstrated the feasbiliity of such a long distance consultation" (BCIT)

However, in the case of the scrambling-de-scrambling demonstration to CRTC, the respondent was of the view that the same effect could have been demonstrated without the use of a satellite.

4. The BCIT demonstration on facsimile equipment, actually proved that the satellite technology was not successful:

> "There was no information available that would allow us to assume that the ANIK-B satellite could carry a

> facsimile signal from one point to a multiple number of points. The test, in fact, was not successful, and alternate methods of transferring documents were found."

However, this was more of a System Test mode of activity rather than a demonstration.

Exhibit H.1.4 Demonstration Costs

Category	Source	Amount
Equipment	None Reported as Dedicated Facilities For Demonstration Activities For Anik B Phase 1	NIL
Operating Costs	Transportation, Travel	Not Reported
Manpower	Engineer/Coordinator, Technician (assume 2 people per duration of demonstration for simple demonstration at CRC)	Partially Reported
Satellite Usage	DOC (Does not include time scheduled by All View Network 1) 1 hour per Day is Reserved Soley for Demonstrations	218 hours

H.2 SYSTEMS TESTS

H.2.1 INTRODUCTION

The Systems Tests Activity of the Anik B Communications Program comprises the various experiments and tests performed on the satellite system which are not an integral part of a pilot project. In some instances it is difficult to distinguish between a Systems Test and a Demonstration. The major purposes for these tests are defined to be as follows:

a. to demonstrate and test the technical feasibility of the satellite system for a specific pilot project application; and,

b. to test new technical concepts for feasibility and to gain knowledge for future applications;

c. to carry out routine maintenance and emergency tests.

The majority of these tests are performed at the Communications Research Centre by a limited number of Communications systems engineering and research staff. In addition, some tests are performed at other locations and by non-DOC staff.

In comparison with the Pilot Project Activity, Systems Tests consume a relatively insignificant amount of the manpower and satellite resources of the Anik B Communications Program (see Exhibit H.2.3 for a summary of the activity costs). However, the tests are an ongoing activity of the program and significant benefits are reported to have been achieved as a result.

Unlike the Pilot Project Activity, achievements attributable to this activity essentially contribute to only one Program Goal, i.e. Goal 2: To develop the knowledge and expertise to better utilize 14/12 GHz satellite communications technology.

H.2.2 EVALUATION FRAMEWORK

No formal records are kept by DOC on either the number of Systems Tests performed, or on the amount of resources used. Most tests, however, are scheduled and do appear on the Daily Schedule of Satellite Usage Report. The results of the more significant tests are usually written up in informal technical papers but no summaries have ever been produced.

To evaluate the contribution of this activity to the program goals, it was necessary initially for CRC staff to review the daily satellite schedules in order to determine what tests were conducted and to provide an approximation of the number of satellite hours consumed. Exhibit H.2.1 provides a summary of this analysis. A total of 21 major tests, or groups of tests, were identified and these were categorized under 4 major headings:

a. Non-routine technical experiments and trials;

b. Non-routine technical experiments and trials performed by DOC and Telesat before the system became operational;

c. Non-routine technical experiments performed by Non-DOC personnel; and,

d. Routine transponder measurements.

Each of the 21 major tests, or groups of tests, were then analyzed individually, by CRC staff who performed the task, in terms of the following:

a. objectives;

b. effects, or results which were achieved; and,

c. impacts, or actions which have taken place as a result of the test.

EXHIBIT H.2.1 SUMMARY OF SYSTEMS TESTS PERFORMED

TYPE	SATELLITE HOURS
1. Non-routine technical experiments and trials	
(a) Transponder Sharing and Compatability Tests	12
TDMA Compatability 3 TV Channels per transponder tests Transponder resonance tests Telephony/Telesat 91 Mbps compatability	
(b) New Ground Terminal Tests	35
LCET SPAR TVRO SCANDU TVRO LCET Field Tests	
(c) Confirmation of System Performance Tests	59
Tests of modified system at start up, 9M, Telephony, TVRT, TVRT-TM	
(d) Other Tests	8
CRC Video Scrambler Video inversion Oak Scrambler Show Scan Video	
	114
2. Non-routine Technical Experiments and Trials Performed by DOC/Telesat Before System Became Operational	
DOC	101
Telesat	-
	101
3. Non-routine Technical Experiments Performed by Non-DOC personnel	
(a) Telesat ANIK C terminals (transfer orbit, communications, interference monitoring antennas at Andrews, tests at SED)	
(b) LaSETTE	
(c) All View Network	
(d) SED	
	57
4. Routine Transponder Measurements	
(a) DOC	50
(b) Telesat - 2 hr/month	48
Total Systems Tests	370

Note: Satellite hours indicate amounts of time scheduled and not the actual time used to conduct the test.

The results of this analysis is presented in the following section under reported goal achievements.

H.2.3 REPORTED GOAL ACHIEVEMENTS

Exhibit H.2.2 presents the achievements of the 21 major systems tests, or groups of tests, as reported by CRC staff. As discussed previously, the major achievements of this activity contribute to the Program Goal of technical knowledge and expertise. However, 2 achievements have been reported under the Program Goal of Awareness. The following summarizes the reported goal achievements:

Goal 2: To Develop the Knowledge and Expertise to Better Utilize 14/12 GHz Satellite Communications Technology

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a. 4 achievements were reported under non-routine technical experiments. 2 of these (TDMA and 91 Mbps) are directly related to the establishment of 2 pilot projects and 1 is an integral part of an existing pilot project;

b. 4 achievements were reported on the performance characteristics of new ground terminals;

c. 1 achievement was reported on the performance of modified Hermes terminals;

d. 4 achievements were reported under other tests and each resulted in the use of the equipment in existing pilot projects;

e. 2 achievements were reported on the performance of the satellite before the system became operational; and,

f. achievements were reported to both Telesat and DOC under

routine transponder monitoring tests.

NOTE Specific technical results and achievements were not identified in this particular study, but are available in various technical reports.

Goal 3: To Develop Expertise and Create Awareness in User Institutions of the Potential of Telecommunications to Deliver New Services

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a. 1 achievement was reported on the demonstration to ANIK B users of the quality of a Canadian built TVRO compared to a foreign built model; and,

b. achievements were reported to 4 Non-DOC groups in terms of data gathered and experience gained, with the hands-on operations of 14/12 GHz ground terminals.

EXHIBIT H.2.2 SUMMARY OF SYSTEM TESTS REPORTED GOAL ACHIEVEMENTS

CLASSIFICATION	CRC/DOC OBJECTIVES	EFFECT OF TEST	IMPACT
1(a). Non-routine technical Experiments and Trials			
TDMA Compatibility	To investigate feasibility of sharing slim route TDMA signal with SCPC Telephony and video in one transponder.	Feasibility demonstrated sharing criteria determined.	Efficient use of limited ANIK-B resource for projects. Information gained useful for future planning of operational systems (eg., by CNCP, TCTS, etc.).
3 TV Carriers in one transponder	To examine feasibility of transmitting 3 video carriers in one transponder. This was necessary when the number of transponders in the West reduced from two to one.	As expected feasible with marginal quality.	The three users in the West preferred to continue in this mode rather than stop transmitting. Not likely to be used operationally, but provided a stop-gap measure when resources were critically short.
Transponder resonance tests	To investigate with Telesat a problem with transponder helix current trips.	Problem related to resonance effects in the TWTA for certain carrier spacing discovered.	Operational procedures adjusted to circumvent the problem. Useful information on a problem in TWTA design obtained.
Telephony/Telesat 91 Mbps compatibility	To investigate feasibility of sharing SCPC telephony and 91 Mbit data in one transponder.	Feasibility demonstrated sharing criteria developed.	Allowed efficient use of ANIK-B resources. Data obtained useful for future operational systems.

EXHIBIT H.2.2 SUMMARY OF SYSTEM TESTS REPORTED GOAL ACHIEVEMENTS

CLASSIFICATION	CRC/DOC OBJECTIVES	EFFECT OF TEST	IMPACT
1(b). New Ground Terminal Tests			
LCET	To measure performance of LCET over satellite link.	Data obtained - confirm predicted versus measured performance.	Allowed guidelines to be set for acceptable use of terminals in field.
SPAR TVRO	Acceptance tests for contracted terminals.	Performance re specifications established.	Terminals acceptable for field use.
SCANDU TVRO	To compare performance of foreign built TVRO with Canadian model.	Performance of two units very similar.	Confidence that Canadian technology in the area equal to major non-Canadian sources. Demonstrated to ANIK-B users quality of Canadian built equipment.
LCET Field Tests	Extensive test of LCET performance in the field after one year of operation.	Large amount of useful data obtained. Comprehensive report prepared.	First test of this magnitude of 12 GHz TVROs in the world. Important data for future planning of TV broadcasting obtained.
1(c). Confirmation of System Performance Tests			
9m TVRT, TVRT-TM, etc.	To confirm performance of modified Hermes terminals for ANIK-B use.	Performance confirmed.	Hermes terminals available for ANIK-B pilot projects.

EXHIBIT II.2.2 (Cont'd) SUMMARY OF SYSTEM TESTS REPORTED GOAL ACHIEVEMENTS

CLASSIFICATION	CRC/DOC OBJECTIVES	EFFECT OF TEST	IMPACT
1(d). Other Tests			
CRC Video Scrambler	To test simple video scrambler built at CRC.	Performance determined.	Scrambler used for one project as interim measure until commercial system available.
Video inversion (alternate approach)	To test simple video scrambler built at CRC.	Performance determined.	Scrambler used for one project as interim measure until commercial system available.
Oak Scrambler	To test commercial video scrambler over 12 GHz satellite link.	Performance determined.	Scramblers loaned and used by pilot project (OMGS) for several months.
Slow Scan video	To evaluate performance of a digital, slow-scan video system.	Performance determined.	Equipment loaned for use by pilot project.
2. Non Routine Technical Trials Performed by Telesat/DOC Before System Became Operational			
	To verify performance of satellite in orbit.	Performance data obtained.	Telesat able to demonstrate performance of satellite met requirements of contract with DOC.
DOC	To provide additional measure of satellite performance and gain experience with ANIK-B prior to operational start.	Telesat performance data confirmed.	Satellite determined to be ready for pilot project start.

EXHIBIT H.2.2 (Cont'd) SUMMARY OF SYSTEM TESTS REPORTED GOAL ACHIEVEMENTS

CLASSIFICATION	CRC/DOC OBJECTIVES	EFFECT OF TEST	IMPACT
3. Non-routine Experiments by non-DOC Groups			
Telesat (ANIK-C terminals, etc.)	To gather data and confirm performance of 12/14 GHz ground terminals.	Data obtained.	Many different groups able to gain experience with operation at 12/14 GHz.
LaSETTE			
All View Network			
SED			
4. Routine Transponder Tests			
Telesat	To monitor continuing in orbit performance of ANIK-B.	Data obtained.	Telesat able to demonstrate compliance with contract.
DOC	To obtain additional data at a different site.	Data obtained for main DOC Ottawa station.	Information obtained necessary to ensure continued proper systems operation.

H.2.4 ASSESSMENT OF REPORTED ACHIEVEMENTS

The purpose of this section of the report is to present an asssessment of the extent to which the reported goal achievements (see Exhibit H.2.2) were in fact due to the experience of the Systems Tests mode of activity.

1. The achievements reported under the goal of technical knowledge and expertise are a result of the System Tests performed and have resulted in the successful continuing operations of both the satellite system and pilot project activities. In this sense, the Systems Tests mode of activity can be considered as a necessary technical planning phase required to establish new pilot projects and to ensure continuing operation of existing ones.

2. The achievements reported under the goal of creating an awareness in Anik B Users, of a Canadian built TVRO compared to foreign built models would appear to be more directly attributable to the Demonstration Mode of Activity and/or to other Promotional Activities.

3. The second achievement reported under the goal of creating awareness and expertise in user institutions is most likely attributable to System Tests carried out by the 4 non-DOC groups in relation to specific pilot projects. The exact tests performed, and results achieved have not been reported in this section but are discussed under the assessment of the pilot project.

Exhibit H.2.3 Systems Tests Costs

Category	Source	Amount
Equipment	None reported as dedicated facilities for Systems Tests	NIL
Operating Costs	Transportation, Travel, Computer Analysis	Not Reported
Manpower	Engineer, Technician	Not Reported
Satellite Usage		
Capacity Utilization Varies - Those requiring Full Channel Often Are Done Off Normal Hours	DOC/Telesat	370 Hours

H.3 OTHER PROMOTION ACTIVITIES

H.3.1 INTRODUCTION

Other Promotion Activities' comprises all other activities which are performed by DOC personnel, aimed at developing expertise and creating an awareness of the Anik B 14/12 GHz satellite communications facility. These activities are numerous, and for evaluation purposes are classified into 8 major groups:

1. Seminars, User Meetings and briefings sponsored by DOC;

2. Speeches, presentations and participation in panel discussions, conferences, seminars sponsored by other than DOC;

3. Development of service opportunities;

4. Informal and ad hoc contacts with potential users, providers and recipients of satellite services and equipment;

5. Articles, papers, etc for publications, new letters, R & D reviews and magazines;

6. Media relations, e.g. interviews, informal contacts with press;

7. Press releases, radio and TV coverage; and

8. Displays and Exhibits.

These activities are carried out essentially by all DOC personnel connected with the Anik B Communication

Program, including the Program Office, SCOPO, International Marketing staff, Information Services and technical staff at CRC involved in specific pilot projects.

H.3.2 EVALUATION FRAMEWORK

An evaluation framework based upon the above eight groups of Other Promotional Activities was set up and major DOC participants in this activity were asked to analyze each group in terms of the following:

a. objectives;

b. effects, or results which were achieved; and,

c. impacts, or actions which have taken place as a result of the activity.

It is the understanding of the Evaluation Team, that due to the numerous activities and personnel involved, it was not feasible to complete this analysis. As a result, no specific conclusions on goal achievements can be drawn. However, general findings have resulted from discussions held during the evaluation.

H.3.3 GENERAL FINDINGS

Aside from several large events, most activities are of a short time duration and consume a relatively small portion of DOC personnel workload. Of those interviewed, there was no common, understanding of the precise objectives for this activity nor of what specific tasks are involved. There was an expressed need for a "promotional" plan or focus for this activity. However, it was the general opinion that this activity has a significant impact on the overall Anik B

Communications Program. This has been supported by comments made by some of the respondents to the Demonstration questionaire. To quote:

> " I became aware of the program from a small press report, early in 1979, of a speech given by Colin Billowes of the D.O.C., which sparked my interest in the potential of satellite television delivery direct to the home." (All View Network One)

> " The British Columbia ANIK-B Communications Project grew directly from the earlier Hermes Project and is based on application made by the Ministry of Education, B.C. for consideration as potential experimenter with ANIK-B as soon as ANIK-B became available. All activities grew out of the direct contact with DOC personnel in Ottawa". (BCIT)

Much of this activity is related closely to the other activities of the total Program, in particular the pilot projects. Several key events were sponsored by DOC including two Anik B User Meetings with all pilot project participants, and meetings with provincial and territorial governments in the framework of initiating the Program. These have led to a greater awareness of the types of potential services which can be offered and have resulted in a greater number of proposals for participation in pilot projects. In addition, it has been stated that promotional activities performed by pilot project participants have a significant impact on Program Objectives.

A related benefit that would probably be attributable to the "Other Promotion Activities" is the success DOC officials had in assisting the Globe and Mail to utilize satellite technology to deliver the newspaper across the country.

H.4 SUMMARY OF GOAL ACHIEVEMENTS AND EFFECTS

H.4.1 AWARENESS GOAL

Demonstrations have yielded definite program goal achievements. However, it is difficult in most cases to attribute a goal achievement solely to one demonstration. Often the effect is complemented by other modes of activity such as continuing personnal contact, conferences, seminars, etc. Following are the major achievements:

- Demonstrations have preceded participation of several users in pilot projects, e.g. OECA, Dome, CBC, BCTC and several cable companies;

- Demonstrations have shown technical and operational feasibility of 14/12 GHz systems to foreign communications personnel e.g. Australian Visitors, and have enhanced Canada's export opportunities;

- Demonstrations encouarge ALL VIEW NETWORK I to purchase their own LCET for demo purposes. This was used to convince their Board of Directors and others of the potential of satellite broadcasting services which in turn resulted in the establishment of North Star Theatre and submissions to CRTC hearings.

- The decision of the Globe and Mail to utilize 6/4 GHz satellite systems to transmit their paper across that country was influenced substantially by the "other promotional" efforts of DOC personnal.

H.4.2 TECHNICAL KNOWLEDGE GOAL

Two significant goal achievements can be attributed to the systems tests actively:

- Systems Tests activity is a necessary planning phase to establish new Pilot Projects and to ensure continuing operation of existing ones: and

- Extensive test of LCET equipment in the field after 1 year of operation provided a large amount of useful data for future planning and TV broadcasting, and represented first such large-scale test anywhere of 12 GHz TVTO's.

PART I: EVALUATION OF DIRECT INDUSTRIAL ACTIVITIES

In Section F.4 ("Key Features of this Evaluation") it was noted that the Program consisted of two distinct, but related, sets of activities that were intended to contribute to the desired end state, i.e. the orderly growth and establishment of a viable Canadian commercial satellite telecommunications system, service and industry.

These two sets of activities were:

- the pilot projects, demonstrations, promotions and systems described in the previous parts of this report; and,

- the direct injection of funds and technical knowledge into the companies that would constitute the "industry" part of a "viable Canadian satellite telecommunications systems and industry."

The first set of activities was designed to define and develop markets for particular satellite telecommunications services. The second set was to ensure that the industrial base existed to capitalize on these markets as they materialized.

The consultant evaluation team undertook to study only the first set of activities. The second set of activities, involving the granting of direct research contracts, hardware development studies, etc. have been evaluated by officials of the DOC Space Sector. However, the results of both studies must be considered in determining the contributions of the Program to the above end-state.

The thrust of the DOC evaluation has been to determine the extent to which the DOC support has resulted in the creation of a new technological service or capability related to 14/12 GHz satellite services that is continuing and showing signs of being

commercially viable. In carrying out this research, DOC officials have also estimated the "stimulating" effects of the government contribution on the plans of participating companies, as well as direct results such as employment generated.

DOC officials will be releasing the results of their study separately at a later date.

APPENDIX A

SAMPLE OF EVALUATION QUESTIONNAIRES

A.1 Sample Questionnaire for Evaluation of The Community Communication, Tele-Education, Tele-Health and Public Service Pilot Projects

Questionnaire For Evaluation of the Pilot Projects of Phase One of the Anik B Communications Program

A. Purpose of the Evaluation

The purpose of the evaluation of Phase One of the Anik B Communications Program is to identify for DOC management, the contributions of the various program activities to the four goals of Phase One of the program. Program activities consist of: pilot projects conducted by a range of organizations; demonstrations conducted by DOC personnel; and technical systems tests conducted by DOC personnel. The Phase One goals of the program are listed as an Annex for reference.

B. Purpose of this Questionnaire

The purpose of this Questionnaire is to assist pilot project sponsors and experimenters to delineate:

(i) the contributions of the individual pilot projects to the four goals of the program (see Annex A); and,

(ii) other and third party effects/benefits of the pilot projects which may have been unanticipated or not formally stated as part of the project objectives (see Section I).

A second, shorter, questionnaire dealing with costs of your pilot project will be sent to you shortly.

Note that:

The goals of phase one of the Anik B Communications Program (see Annex), for the most part, served as the basis for the formulation of the individual objectives established for each of the pilot projects. Thus, in most cases, achievement of individual pilot project objectives can be considered as contributions to at least one of the goals of the Anik B Communications program. It is understood, however, that sponsors and experimenters do have other objectives for their pilot projects which may be quite unrelated to those of the DOC. Contributions of your pilot project to these other objectives can be listed in section I, "other effects."

C. Structure of this Questionnaire

This questionnaire contains 5 sections of questions:

- section E contains questions on the project contributions to goal #1 of the program (viablity, assessment and decisions);
- section F contains questions on the project contributions to goal #2 of the program (knowledge and expertise to better utilize the 14/12 GHz satellite communications technology);
- section G contains questions on the project contributions to goal #3 of the program (increase expertise and awareness of the potential of telecommunications);
- section H contains questions on the contributions of the pilot project to goal #4 of the program (policy issues); and,
- section I contains questions on other effects of the pilot project. Other effects are explained in that section.

D. Things To Keep in Mind In Answering This Questionnaire

D.1 In determining the effects that can be truly attributed to Phase One of the Anik B Communications Program, we are attempting to isolate the specific role in achieving these effects of the following main features of this program:

- the continuing "hands-on" experience afforded by the pilot project activity;
- the high profile nature of the Anik B Communications Program; and,
- particular characteristics of the 14/12 GHz band used on the pilot project.

D.2 In as many questions as possible please provide evidence, through specific examples, of the impact on your organization of the pilot project and its results.

E. Contributions of Pilot Project to Goal #1:
"To determine the viability on a pre-operational but continuing basis, of telecommunications services designed to meet identified requirements."

The following questions are aimed at determining the specific issues on viability that your pilot project attempted to answer; the method or research used in attempting to answer these questions through the pilot project; and finally the answers to these questions and their impact on your organization.

1. Please describe the particular questions that your organization planned to answer on the basis of the result of the pilot project. For instance, was it your intent to use the pilot project results to resolve:
   - organizational changes required to deliver services via the 14/12 GHz satellite system?
   - questions on technical system configurations to deliver end-services via satellite?
   - questions on the end-services to be provided via telecommunications ?
   - questions on the financial viability of delivering services via 14/12 GHz satellite systems, other satellite systems, other telecommunications or non-telecommunications methods?
   - the desireability of social impacts of satellite telecommunications and 14/12 GHz satellite telecommunications ?
   - questions on the desireability and feasibility of delivering totally new end-services by using the 14/12 GHz satellite telecommunications systems?
   - others (please specify)?

2. What specific analyses have been or are being conducted to provide the information required to make these decisions? For example:
   - Cost-benefit analysis comparing 14/12 GHz satellite and earth systems to other modes of providing your end-service;
   - analysis of alternative systems configurations;
   - assessment of organization and management issues related to the use by your organization of satellite telecommunications services;

- assessment of the social impacts of providing a new service;
- assessment of the social impact of telecommunications technology;
- assessment of the impact of telecommunications technology on your end-service;
- feasibility analysis of delivering completely new services;
- assessment of the impact of not providing the service of the pilot project on a continuing operational basis

3. In conducting the analyses, which of the following information sources are being or have been used?
   - CRTC;
   - Common Carriers;
   - Telesat;
   - Other pilot projects;
   - Specific tests and surveys conducted throughout the pilot project;
   - Others, please cite.

   Who conducted these analyses?

4. What specific conclusions have been made about the viability of providing the pilot project services on an operational basis:
   (i) via the 14/12 GHz satellite system and services?
   (ii) via other satellite systems?

5. In the planned uses of telecommunications by your organization, what have been the effects of conclusions reached in the analyses conducted? Have your plans changed as a result of the conclusions reached in the pilot project? If yes,

please describe these changes.

6. As a result of the pilot project has your organization approached Telesat, the CRTC, common carriers or funding agencies concerning the operational use by your organization of satellite service?
   - in the 14/12 GHz band?
   - other bands?

7. As part of your organization's decisions and analyses did you consider or are you considering the possibility of using interim commercial service on Anik B when your pilot project is over?
   - if no, why not?
   - if yes, have you contacted DOC? Telesat?

   What have been the results of these discussions?

8. What would you do if interim commercial service was not available on Anik B? What alternatives would you pursue?

9. For each of the effects (e.g. assessments of viability, telecommunications plans, etc.) described in questions 4,5 and 6, we would like to get an indication of the actual contributions of:
   (a) The extended period of "hands-on" experience afforded by the pilot project. Here the emphasis is on the importance in achieving your identified effects of both the continuing nature of the pilot project and the actual use of the satellite system by the experimenters themselves.

(b) The high profile nature of the Anik B Communications Program, as a whole; and

(c) The particular characteristics of the 14/12 GHz band used in the pilot project.

Please list the contributions of the above features (a,b, and c) to the effects described in reponse to questions 4,5, and 6.

F. Contributions of Pilot Project to Goal #2:

"To develop the knowledge and expertise to better utilize the 14/12 GHz satellite communications technology".
Here we would like to identify specific examples of knowledge and expertise gained in utilizing the 14/12 GHz satellite and related technology.

10. What particular knowledge was gained through the pilot project about the operation of the 14/12 GHz satellite and earth station technology?

(i) None, equipment was provided and maintained by others;

(ii) Some, please give specific examples such as knowledge regarding terminal equipment, system configurations, etc.

11. How and by whom has this knowledge been applied

- in your organization?
- by other organizations involved in the pilot project?

For example:

- to change the pilot project operations;
- on your plans for operational service.

12. Again, please describe the characteristics of the program which, in your view, were instrumental in gaining this knowledge and expertise, i.e.
    - the extended period of "hands-on" experience;
    - the high profile Anik-B Communications Program as a whole; and,
    - the particular characteristics of the 14/12 Ghz band and associated earth stations used in the pilot project.

G. Contributions of Pilot Project to Goal #3:

"To develop expertise and create awareness in user institutions of the potential of telecommunications to deliver new services". In determining the contribution of the pilot projects to this goal we are looking for examples of:

- new uses of telecommunications services and technology which are being examined by organizations involved in the pilot project;
- new users in your organization who are using or considering using telecommunications as a result of your pilot project; and,
- examples of changes in attitude by members of your organization towards the use of telecommunications, (e.g. more frequent consideration of telecommunications to conduct activities).

New Uses

13. Your pilot project was designed using the 14/12 GHz satellite and related technology to deliver a particular service. Please describe any new uses of telecommunications in your organization as a result of the pilot project.
- other applications of the 14/12 GHz?
- other satellite services?
- other technologies?

14. How were these possible uses identified?
- by observing your pilot project?
- by observing other pilot projects?
- through discussions about the pilot project with others in your organization or outside of your organization?
- as a result of the analysis conducted in the pilot project?
- other means (please specify)?

New Users

15. Are there any individuals and groups in your organization who are now considering using telecommunications as a result of coming into contact with your pilot project? If yes, please describe.

Changes in Attitudes

16. In your opinion, has the pilot project experience changed the attitudes or levels of awareness of members of your organization toward conducting activities:

- via satellite?
- via other telecommunications technology?

Please provide evidence, describing which functions and levels in your organization have been affected in this way by the pilot project experience.

17. Have any organizational changes taken place in your organization as a result of these changes in attitude or awareness? For example:
- hiring of a telecommunications specialist;
- creation of organizational unit responsible for telecommunications;
- sponsoring of courses and demonstrations to individuals and groups on the potential uses of telecommunications;
- others, please specify.

18. Please list the most important features of the pilot project which have contributed to the above examples of increased awareness of the potential of telecommunications, by members of your organization, i.e.
- the extended period of "hands-on" experience afforded by the pilot project;
- the high-profile nature of the Anik-B communications program as a whole; and,
- the particular characteristics of the 14/12 GHz band used in the pilot project.

H. Contributions of Pilot Project to Goal #4: "To Contribute to Policy Issues"

A fourth goal of the Phase One Anik-B Communications Program is to contribute to policy issues.

19. What, in your opinion, are the major policy/ regulatory factors which could affect or have affected the possibilities of using the 14/12 GHz satellite to deliver your services on an operational basis?

20. How critical, relative to other factors, are these policy/regulatory issues to the viability of delivering your services via the 14/12 GHz band on an operational basis?

21. What actions have you taken to influence decisions on these issues? What have been the results of these actions?

22. What specific recommendations would you make in order to resolve these issues?

23. How has your experience in the pilot project affected your views on these issues?

I. Other and Third Party Effects of the Pilot Project

In closing, we would like to identify other effects of the pilot project which do not necessarily relate to the goals of the Anik-B Communications program or the formal objectives of your pilot project. For instance:

- effects which were not necessarily intended but which you consider to be important to the plans of your organization or others regarding telecommunications services;
- third party effects i.e. the effects of the pilot project on other organizations/individuals who are not directly involved in the pilot project but who have been in touch with it, e.g. community councils and groups, government Departments,

educational institutions, regulatory bodies.

Please describe any effects which you consider to be important and have not recorded under the goals of the program. Include here those effects which have contributed to objectives of your organization but which may be unrelated to those of the DOC. (see section B).

A.2 Questionnaire for Evaluation of Demonstrations

Anik-B
Phase I Communications Program
Questionnaire for Evaluation of Demonstrations

Purpose of the Evaluation

The purpose of the evaluation of Phase One of the Anik-B Communications Program is to identify for DOC management, the contributions of the various program activities to the four goals of Phase One of the program. Program activites consist of: pilot projects conducted by a range of organizations; live demonstrations of the transmitting and receiving of a signal on the 14/12 GHz band of the Anik-B satellite; and, technical systems tests conducted by DOC personnel. The Phase One goals of the program are:

1. To determine the viability, on a pre-operational but continuing basis, of telecommunications services designed to meet identified requirements;

2. To develop the knowledge and expertise to better utilize 14/12 Ghz satellite communications technology;

3. To develop expertise and create awareness in user institutions of the potential of telecommunications to deliver new services; and,

4. To contribute to policy issues.

Purpose of This Questionnaire

The purpose of this questionnaire is to obtain information on the contribution of the demonstrations to the four goals of the Anik-B Communications Program, and on other or third party effects/benefits, which may not have been anticipated, but which can be attributed to the demonstrations.

All demonstrations conducted during Phase 1 of the Anik-B Communications Program (i.e. before February 19, 1981) were categorized according to the audience for whom the demonstration was given. A small sample of these audiences has been selected as the target for this questionnaire. You, as an individual are being asked to complete the questionnaire either because of your direct participation in the particular demonstration, or group of demonstrations, or because of your role as a requestor, or coordinator, for the particular demonstrations.

In as many questions as possible, please provide evidence, through specific examples, of the impact of the demonstration on your organization, or on the organization of the targetted audience of the demonstration.

QUESTIONNAIRE ON DEMONSTRATIONS

1. Name:

2. Organization:

3. Functional Responsibility:

4. Appropriate Demonstration(s) to Which the Questionnaire is Directed:

5. Your Role in these Demonstrations (e.g. participant, requestor, coordinator, etc.):

6. How did you become aware of the demonstration facility of the Anik-B Communications Program? (e.g.: DOC promotional material; personal contact with DOC; etc.).

7. Please specify in detail, the audience for whom the demonstration(s) (identified in Question 4) was conducted (e.g.: organization; functional responsibilites; approximate number in attendance; etc.).

8. Demonstrations are conducted to convey certain information which will satisfy some known or perceived need(s) of the audience attending. What was the specific need(s) of the audience (as identified in Question 7) for whom the demonstration(s) was held? (e.g.: Was there a specific operational problem faced by the audience, that could be ameliorated by 14/12 GHz satellite communications? Was there a need for a change in attitude towards 14/12 GHz satellite communications? Was there a need to learn of Canadian capability in 14/12 GHz satellite communications? etc.).

9. What specific features (please describe fully) of the 14/12 GHz technology, systems, or services, were successfully demonstrated? (e.g.: operating characteristics of low cost earth terminals (LCET); teleconferencing; general operating characteristics of the Anik-B Satellite system; etc.).

10. (a) Why was it necessary to have a hands-on demonstration to achieve the purposes described in questions 8 and 9?

(b) Please describe any means other than demonstrations which could have achieved the same results.

11. What specific effects, or indicators, have you observed to date, to suggest that the purposes stated in questions 8 and 9 have been achieved? (Please specify, for example, such effects as inquiries to DOC, Telesat, others, for more information; inquiries for commercial service; requests for bids from Canadian industry to supply satellite-related equipment; media coverage; etc.).

12. Have any decisions been made, or investigations begun, as a result of the demonstrations, about the introduction of 14/12 GHz satellite technology as an operational service? (Please be as specific as possible, including the names of the appropriate organizations).

13. Do you have any other comments to make regarding the demonstration facility of the Anik-B Communications Program?

APPENDIX B

LIST OF INTERVIEWEES AND RESPONDENTS

List of Interviewees and Respondents

Department of Communications

Mr. A. Curran, Assistant Deputy Minister (Space)
Mr. J. Fournier, Senior Assistant Deputy Minister (Policy)
Mr. R. Giroux, Assistant Deputy Minister, Financial Management
Dr. R. Breithaupt, Director Communications Satellite Program
Mr. T. Kerr, Communication Coordinations, CRC
Mr. J. Palmer, Fixed Satellite System
Mr. R. Huck, Communications System Engineering, CRC
Ms. D. Jelly, Communications Coordination, CRC
Dr. J. Chambers, Director Space Program Planning
Dr. C. Franklin, Director-General Space Program
Mr. R. Halliday, DOC Vancouver
Mr. Threinen, Applications,
Mr. L. Jurgens, Applications
Mr. J. Brookfield, Communications Coordination, CRC
Mr. M. Bryan, Information Services
Mr. D. Wright, Information Services
Mr. R. McCullagh, Director International Space Industry Coordination
Mr. K. Brown, Space Program Planning
Mr. R. Maynard, Director Space Systems, CRC
Mr. G. Hindson, Space Systems, CRC
Mr. P. Nuspl, Space Systems, CRC
Mr. W. Robertson, Space Systems, CRC
Mr. J. Strictland, Radio Propagation Lab, CRC
Mr. D. Rainboth, Director - Extension of Services Policy
Mr. R. Bennett, Network Development National Telecommunication Branch
Mr. P. Warnock, Director Program Evaluation
Mr. A. Silverman, Comptroller
Mr. G. Davies, Director Space Communications, CRC
Dr. J. Day, Communications System Engineering, CRC
Mr. O. Roscoe, DBS
Mr. D. Fortin, CRC

TNI

Mr. J. Padlayat
Mr. P. Lumsden

ITC

Ms. L. Greene
Mr. D. Simailak
Ms. G. Valiskakas

DIAND

Mr. G. Abrahamson
Mr. J. MacDonald
Mr. H. Taylor

OECA

Mr. P. Bowers
Ms. S. Birkenmeir
Mr. A. MacGregor
Ms. W. Wright

Alberta Access

Mr. L. Shorter
Mr. I. James

Knowledge Network of the West

Dr. W. Hardwick
Mr. D. Roach

BCIT

Mr. W. Robertson

BCTV

Mr. E. Rose, Vice-President Engineering
Mr. T. Negoro

CBC

Mr. J. Landsbers, Vice-President, Policy

Ontario Ministry of Transporation and Communications

Mr. R. Bolger

Ontario Ministry of Northern Affairs

Mr. Robertson

Ontario Ministry of Government Services

Mr. Chung Yan

Universite de Montreal

Dr. F. Roberge, Le directeur de I'Intitute de genie biomedicale

Memorial University of Newfoundland

Dr. M. House and staff

Newfoundland Telephone Company

Mr. A. Brait, President and staff

Petroleum Industry Office for East Coast Offshore

Mr. K. Oakley, Director

Telesat

Mr. E. Thompson, President
Mr. P. Norman
Mr. D. Weese

Council of Ministers of Education Canada

Mr. L. Desmarteau

Health and Welfare Canada

Dr. R. Baron
Mr. D. Martin

Miller Communications Systems Ltd.

Mr. A. Miller, President

Government of Newfoundland

Ms. P. Hall, Director of Communications

Department of Education, Newfoundland

Mr. N. Harris

G.I. (Canada) Ltd.

Mr. W. Lambert, Vice-President

Mr. E. Jarmaine, Toronto, Ontario

SED Systems

Mr. M. Hodgins, President

CRTC

Mr. R. Zietoun, Policy and Planning

All View Network I

Mr. C. Lewis, President

CNCP Telecommunication

Mr. C. Webster, Vice President, Engineering
Mr. S. Daly, Vice President, Planning
Mr. G. Gothe, Engineering

TCTS

Mr. R.D. Fildes, Projects

York University

Mr. W.H. Cannon, Physics

University of Toronto

Mr. J.L. Yen, Electrical Engineering