D. Jelly

Anik B phase II : project

CANADIAN PETROLEUM ASSOCIATION

1500, 633 Sixth Avenue S.W., Calgary, Alberta T2P 2Y5 Telephone (403) 269-6721

June 3, 1983

Communications Research Centre
Shirley's Bay,
Ontario

Attention: T. KERR
ACTING DIRECTOR SPACE APPLICATIONS

Dear Mr. Kerr:

Please find enclosed the Canadian Petroleum Association's final report for the terrestrial portion of the Anik B phase II experiment. The CPA was extremely pleased to participate in this program and are very satisfied as to what has been accomplished to date. We have identified numerous issues in this report as a result of the Anik B participation that affect follow-on commercial service. These are in the areas of logistical support, technical configurations, regulatory issues and cost factors that affect the potential demand for service by our industry as well as potential Canadian Satellite manufacturing benefits.

If you have any questions or require additional documentation or clarification, please contact Brian Page at 403-232-4119.

We look forward to successful completion of the offshore program. We would appreciate an opportunity to discuss further with the Department of Communications the issues addressed in the report, and the possible implementation of our recommendations.

Yours truly,

Ian Smyth
Executive Director

CANADIAN PETROLEUM ASSOCIATION'S

ANIK B PHASE II

PROJECT

PREPARED BY

CPA COMMUNICATIONS

SYSTEMS COMMITTEE

83.06.06

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1.0 EXECUTIVE SUMMARY

The Canadian Petroleum Association (CPA) was very pleased to participate in the Anik B Phase II trials and are very satisfied as to what has been accomplished to date by the cooperation between CRC and the CPA member companies. We feel that as an industry group that we are responsible and have demonstrated that we can install, transport and maintain satellite terminals, as required to meet our specialized needs.

This report will address the issues in our application letter, the memorandum of understanding, the Anik B Phase II objectives, as well as other issues that affect the potential viability of using satellite services in Canada to meet the needs of our industry.

We have been well aware that satellites offer the potential to be well suited for the present and future needs for the Petroleum Industry in terms of state of the art communications concepts. In order for the Petroleum Industry to consider using satellite systems and technology to its fullest potential in Canada there are numerous issues that will have to be addressed and resolved from our perspective. These issues will be addressed in more detail in the report under the evaluation, administrative and financial considerations sections and are basically as follows:

I) The satellite terminal must be made easier to transport and install as significant costs are involved associated with mobilizing equipment and personnel to remote locations. A 1.8m to 2.5m diameter antenna configured as a portable terminal operating at 14/12 GH_Z anywhere in Canada appears to offer the necessary freedom required.

II) Flexibility must be given to customers so as to be able to transport, install, and perform first line maintenance. This is the only way the service can be economically viable in highly mobile and remote applications.

III) Improved diagnostics would assist non technical users to identify equipment problems at remote locations. The cooperation between CRC and CPA personnel was excellent and demonstrated that most problems and operational difficulties and trouble shooting of system problems could be handled in a very cooperative, responsible and expedient manner with no major problems or delays encountered.

IV) The cost of SCPC thin route services will have to come down to an equivalent charge per voice circuit of less than $3,000.00 per month including maintenance, earthstation equipment amortization, and space segment charges. We feel that this is achievable and is addressed further in the section on financial considerations.

V) The nature of the Petroleum Industry is such that inter-telephone company boundaries hinder implementing satellite communications for our operations that move on a daily or fairly frequent basis between their territories. Current telephone company plans appear to be going separate directions from a nation wide compatible type of satellite service terminal offering in that these companies are basically serving their regional needs. A Canada wide compatible non-telco boundary sensitive demand assigned multiple access, pay as you use and flat rate concepts, on a nation wide basis including offshore at 14/12 GH_z, similar to the BC Tel Space Link concept, is a must.

VI) Based on our finding from the Anik B experiment from a technical and economic point of view, it is our recommendation that exploration and production SCPC type satellite services be deregulated. This would allow qualified users the freedom to install, maintain, transport, as well as purchase or directly lease satellite equipment, that will offer them the most competitive advantage to reduce costs, improve the productivity and safety of their operations.

VII) The offshore programs underway apparently will be successful and will have a significant impact on our operations providing we have the freedom to provide the services required. There are issues that must be worked out to insure a viable service will result, which will also have manufacturing benefits.

VIII) Some of the Anik B offerings such as Beaufort Sea, Northern and Artic coverage will not be met by the Anik C series satellites which we understand were to replace the Anik B service offerings. This is extremely important when you consider the cost of establishing offshore services at 14/12 versus 6/4 GH_z, and must be pursued further.

IX) We also feel that the Canadian satellite manufacturing industry will benefit through developing products to meet our present and future needs. However, they must have a market in order to develop these products. A more favourable regulatory environment is required for this market to evolve, otherwise these opportunities will be lost. De-regulation of digital type satellite services that cannot be supported by current terrestrial analog facilities should be reviewed.

2.0 BACKGROUND INFORMATION

2.1 CPA OVERVIEW

The members of the CPA are listed on page 22 of the annual report attached in Appendix A. The list does not include members of the East Coast Operators Association which during the summer of 1983 will integrate with the CPA to form the Offshore Operators Division of CPA. The CPA represents about 80 percent of all crude oil and natural gas production in Canada as well as the pipeline industry. The Association's objectives are:

- To establish better understanding between the petroleum and natural gas industry and the public;
- To encourage co-operation between the petroleum and natural gas industry and federal, provincial and local governments and other authoritative bodies;
- To provide a forum for the discussion of matters affecting the welfare of its members; and
- To foster better understanding between this Association and other organizations with similar objectives and purposes.

The Communications Systems Committee, within the Association, advises on all aspects of electronic transfer of information, including radio and micro-wave systems, data communication systems, satellite communication systems, and telephone and navigational systems, and is an industry spokesgroup in this regard. Its primary objective is to promote the development of efficient and cost-effective communications to support exploration and production activities.

2.1 CPA INDUSTRY OVERVIEW

In order to address the communications needs of the Petroleum Industry, the following is intended to offer a broad insight as to the makeup, needs and mobility and technologies required to support future directions. The Petroleum Industry is characterized by 'Upstream' Exploration and Production activities, and 'Downstream' Refining, Petrochemical, Distribution, and Administrative support activities. Please refer to Appendix A for more information on the Petroleum industry requirements for a Mobile Satellite System. This paper covers in more detail the present communications systems and supplementary communications required for 'Upstream' activities.

2.2 UP STREAM ACTIVITIES

The shaded parts of figure 1 highlight Canada's prospective oil and gas-bearing areas; these areas which geologists usually call sedimentary basins. There are sedimentary basins off Canada's coasts and in the far north, but almost all of the petroleum we use today comes from the western provinces. Alberta supplies more than 85% of the oil and gas Canadians produce; Saskatchewan produces about 10% of the oil, and British Columbia supplies about 11% of the natural gas. Mineral and coal exploration activities form part of these programs.

2.2.1 EXPLORATION

Oil and gas exploration takes the form of geophysical seismic activities and exploration drilling. The current and future thrust of the Petroleum Industry is towards more remote as well as frontier and offshore exploration areas. These operations are characterized by a highly mobile "here today, gone tomorrow" type of operation. Typical modes of communications from these areas have been via general mobile telephone service and HF radio systems; if even available. New areas of frontier and offshore exploration thrusts have not been supported by any existing communications infrastructure. In all cases to date, these facilities have been established by the petroleum companies themselves in the form of absorbing the total cost associated with the implementation.

Figure 2 depicts the number of rigs and geophysical crews currently available for exploration activities. The rig count is such that a utilization factor of 50% should be applied.

2.2.2 DEVELOPMENT

The exploration phase if successful, usually leads to the production phase. This is typically a longer lead time activity and includes development drilling, and production facilities in the form of processing plants, gathering and distribution pipeline facilities. Development drilling and the construction of production facilities are typically characterized by relatively short periods of time ranging from days to several years, whereby temporary communications are required to support these activities until such time as these facilities are operational. Again, the current thrust is into the remote frontier and offshore areas that current communications infrastructures basically do not exist.

FIGURE 1

MAIN SEDIMENTARY BASIN AREAS

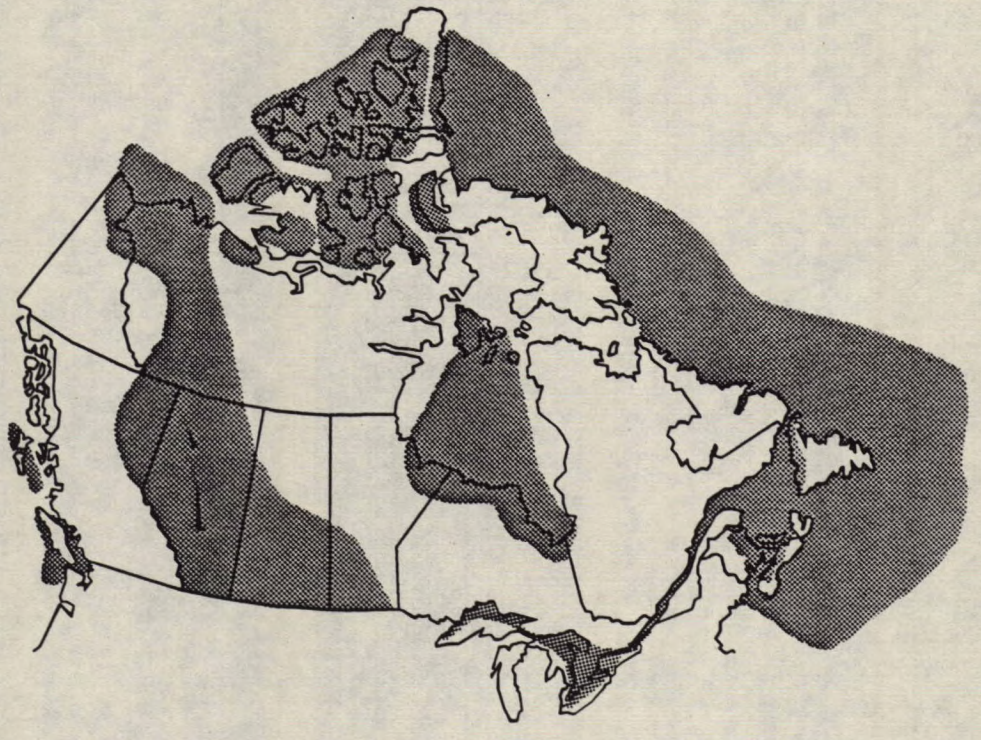


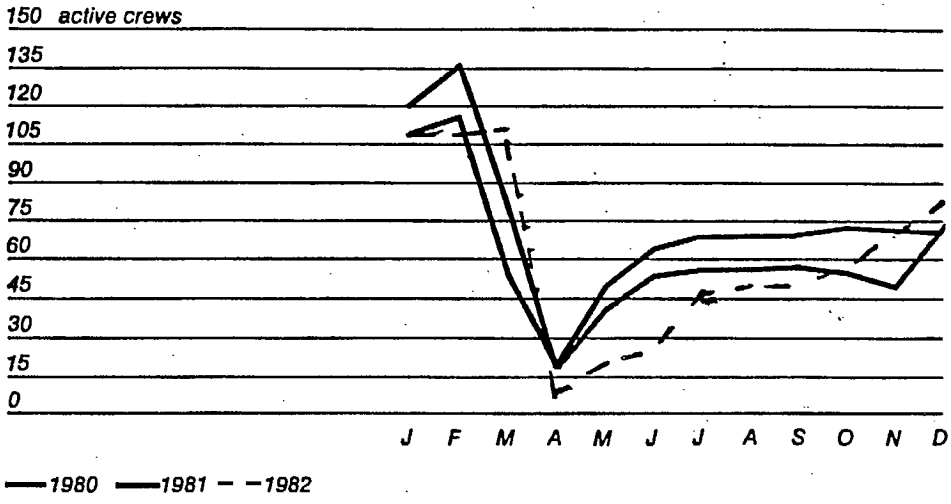
FIGURE 2

Seismic activity shows year end improvement

Geophysical activity experienced a second consecutive year of decline, although renewed activity at year end brought active crews up to 1980 levels.

Geophysical activity

Source: Daily Oil Bulletin

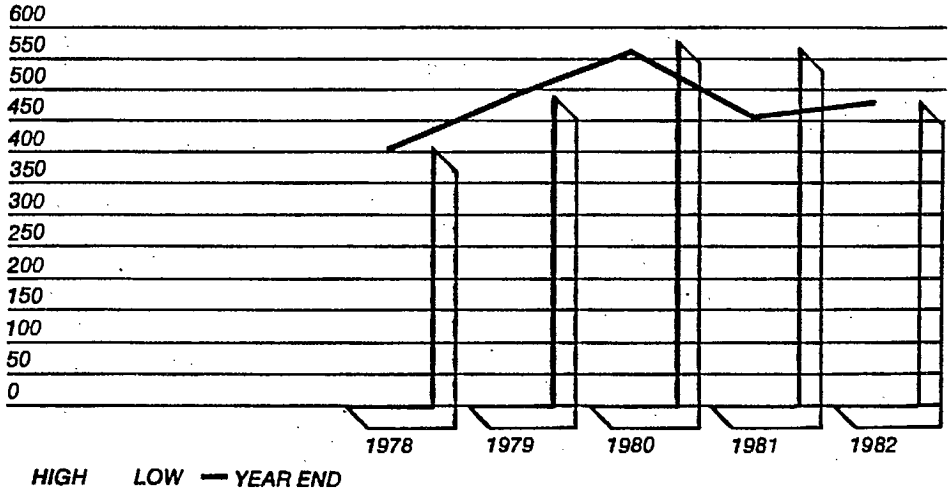


Drilling rig fleet increases slightly

The fleet of drilling rigs available in western Canada increased slightly during the year, although drilling activity generally remained below year earlier levels. Except for drilling in November and December, rig utilization was less than 50 percent. The exceptionally high year-end drilling was the result of Alberta government incentives, which ended December 31. In the new year, winter drilling declined to its lowest level since 1976.

Available drilling rigs - Western Canada

Source: CAODC



2.3 DOWNSTREAM ACTIVITES

Downstream activites take the form of refining and petrochemicals and administrative and logisitical support functions such as head office and regional offices located throughout Canada. Current requirements for communications are supported by existing analog terrestrial voice and low speed data communications systems currently in place. However, there is a trend towards improving productivity and using evolving digital technologies which the current analog terrestrial communication infrastructures are not well suited to support our future requirements.

3.0 ANIK B PROJECT REPORT OVERVIEW

3.1 COMMUNICATIONS OVERVIEW

Historically, communications to drilling, geophysical, geological, seismic and surveying operations have been less than adequate for terrestrial and offshore locations. As the costs of these operations continue to escalate, there is increasing pressure to optimize the activity through better communications to and from the field sites. The existing Anikom earth stations available from the Trans Canada Telephone System have proven inadequate for reasons of availability, maintainability, transportabililty and excessive cost. For offshore dynamically positioned vessels, the additional requirement to use expensive stabilized platforms has made usage of satellites prohibitive. Yet, through past field demonstrations, we are well aware that the use of satellites for these applications could be ideal. They would have significant impact on our overall operations if an appropriate commercial satellite service was available.

3.2 PROJECT OVERVIEW

The Canadian Petroleum Industry is well versed in the aspects of using satellite communications technology for our operations. However, satellite communications available since 1973 has not been extensively used by the Petroleum Industry for a variety of reasons. So the purpose of experimenting with the Anik B program was to address issues that concerned the petroleum industry on the use of satellite terminals. Under the Communications Systems Committee, the Satellite systems sub-committee was formed to carry out the task of implementing and administering the CPA Anik B pilot project. The project basically covered five areas and each member company that participated has prepared a report. These reports are included in the appendixes and address the issues related to their experiment. Also included is a report from the consultant used to perform some of the maintenance, installation, and removal activities on the satellite earth terminals. Member companies performed the rest of the installation, maintenance and removal activities. The offshore phase is currently underway with the Department of Communications in developing a more cost effective stabilized satellite antenna platform for offshore applications and will be completed in a separate report. A brief description of the project is included in the appendixes.

3.3 PROJECT OBJECTIVES

The primary purpose of this experiment from the CPA's point of view was to make several second generation 12/14 GH_Z telephony type earth stations, designed with a view of transportability, mobility and maintainability, available to the oil and natural gas industry to determine the viability of commercial service.

The experiment was to collect significant data with regard to the following:

(1) Level of transportability required (i.e., frequency of relocation);

(2) Feasibility of non-technical personnel positioning, operating and maintaining the terminals;

(3) Administrative overhead involved in providing service on a commercial basis, given the logistical problems our industry lives with;

(5) Degree of stabilization required - can compromises be made in offshore applications to allow for more affordable stabilized platforms.

(6) Demand for service - while the need to support drilling operations is obvious, applications for surveying, seismic, geophysical, and geological operations are less clear and will only surface after cost-effective, readily available facilities can be obtained.

Other objectives in participating in the Anik B Phase II program were to collect sufficient information pertaining to cost justifiable applications, administrative deficiencies, maintenance problems, logistical constraints and terminal equipment deficiencies so that the common carriers can respond with viable satellite service offerings and the future generations of terminal equipment can be designed to withstand a rugged and variable field environments.

The following issues will also be addressed that affect the potential for operational service (as outlined in our Anik B application letter of 80.09.22).

(1) Need for the Service

A prime objective of the experiment is to promote the development of commercial satellite services in Canada which can support the exploration and production of oil and natural gas. The existing Anikom service from the Trans Canada Telephone System has proven inadequate for a number of reasons, referred to earlier.

(2) Institutional Arrangements

The Communications Systems Committee has met with the Department of Communications, various telephone companies (A.G.T., B.C. Tel., MT & T., CNCP., and TCTS.), and manufacturers to discuss the further development of satellite technology and services in Canada.

(3) Operational Viability

It was our expectation that the service would have to be sustained continuously since the requirement for communications for these operations is on a round-the-clock basis under all weather conditions. The support of the Committee to this project was contingent upon a reasonable level of assurance that viable commercial service would follow after the completion of the experiment.

(4) Policy and Regulatory Matters

The early involvement of the carriers in this project was encouraged from the outset. Ownership of earth stations by our industry has been reviewed and is addressed in more detail with recommendations as a result of this project to facilitate easier installation and maintenance and to make commercial services viable. Such recommendations to change earth station licensing policy will necessarily be subject to the review of the Department of Communications.

4.0 PROJECT DESCRIPTION

Figure 3 depicts the typical project carried out, consisting of a double-hop configuration which had constraints imposed due to coverage of the projects and the nine meter station operational hours.

We had two 3.1 meter transportable 14/12 GH_z satellite terminals and used these units throughout various locations in Canada. As the terminals were moving from member company to member company, two options were reviewed as far as using one of the 3.1 meter satellite terminals as a homing station to provide service back to Calgary. The first option was to install the terminal on member company's building or property. This would have been a relatively expensive exercise for a short term experiment, however, it was certainly a feasible alternative for a working system. The second alternative was that AGT had offered the use of their Forest Lawn earth terminal site with dedicated facilities to provide CPA members with a 4-wire data and voice loop into downtown Calgary that could be relocated to member companies premises on an as required basis, given sufficient lead time. Another option was A.G.T. reviewed the aspect of using their Anik C station for homing; however, this was ruled out due to the costs involved.

The project schedule and description of each experiment are as follows. The remote terminal was moved from location to location. Please refer to the appendixes for more detail on the individual applications. Figure 4 depicts the geographical locations of the remote terminal experiments.

PHASE I Remote camp applications July to September 1981

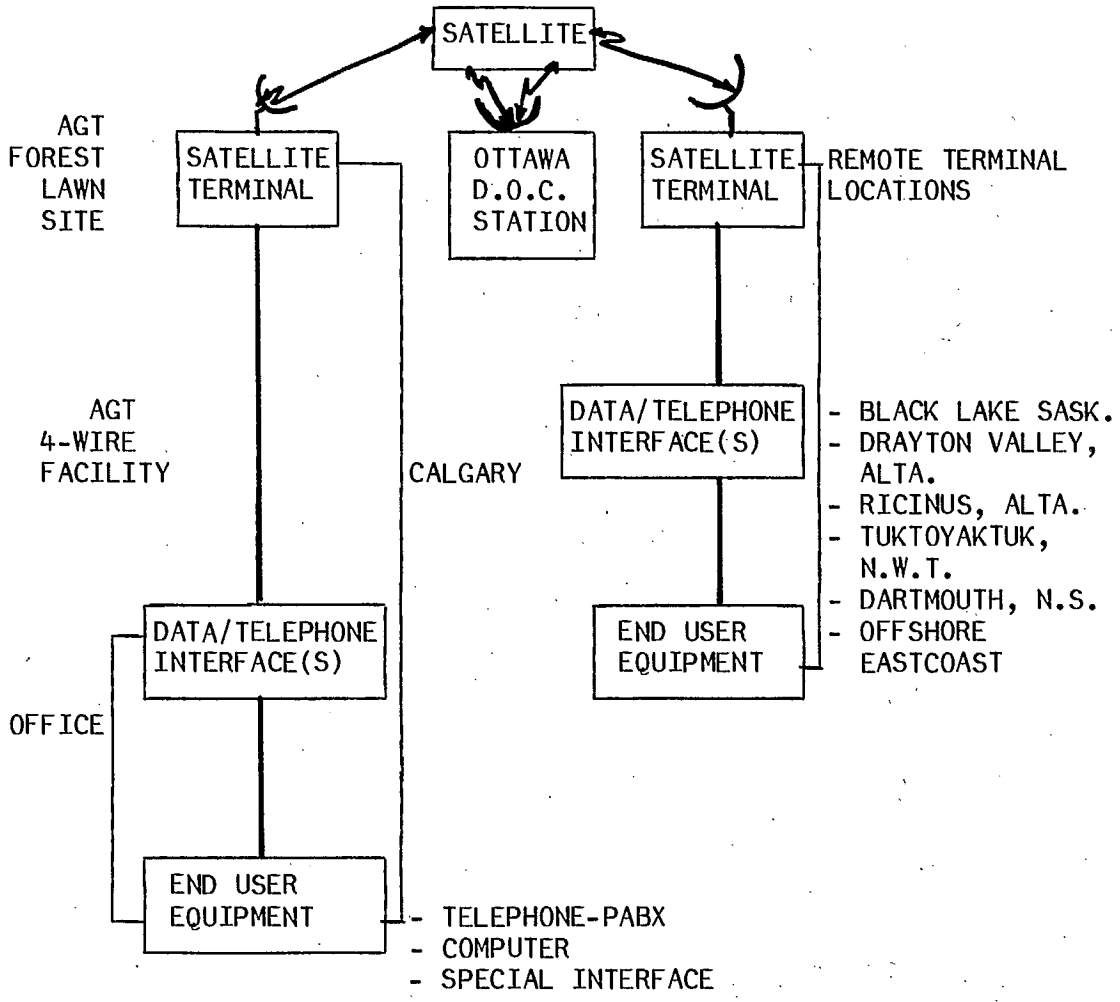
Shell Canada Resources Minerals Division utilized the system for voice communications for daily operations between their Calgary office and a remote exploration mineral camp located near Black Lake Saskatchewan. The normal mode of communications was via HF radio telephone type services which presented problems of reliability and security.

PHASE II Field data automation application September to December 1981.

The remote satellite terminal from Black Lake Saskatchewan was transported to a location in around Drayton Valley, Alberta for Amoco Petroleum Limited. Amoco utilized the system for the data transmission between their Drayton Valley computer assisted gas field and their Calgary computer to demonstrate that supervisory control functions and remote data acquisition were feasible over a double-hop satellite system. Amoco currently have a data communications link in place to support their operational supervisory control and data acquisition requirements.

FIGURE 3

TYPICAL PROJECT CONFIGURATION



PHASE III Drilling Application December 1981 to May 1982.

Amoco transported the satellite terminal from their Drayton Valley location to a Foothills drilling site in the Ricinus area of Alberta. The basic application was for data with an electronic office automation terminal located at the drilling site for access to their electronic mail system and computer systems in Calgary. Also a well service company, Slumberger of Canada Limited, demonstrated that well logging was feasible via satellite from this location.

The normal mode of communications from this location was via the general mobile telephone service which is a half duplex type of service that does not well support any form of data transmission. This location was only about 80 air miles removed from Calgary and conventional telephone service was not available. This was a unique application in that a normal well site would not have this compliment of facilities for data communications.

Analog voice scramblers were also tested over this link.

PHASE IV Beaufort application May to September 1982.

The remote terminal was transported to Dome Petroleum Limited's Tuktoyaktuk base location which is the centre of their Beaufort Sea exploration activities. They demonstrated that slow scan video and audio teleconferencing via satellite was feasible. Also some telemedicine and ice imagery experiments were carried out. Dome has an existing communications network in place. The most significant problem associated with the experiment was getting AGT telephone supplied equipment to work reliably over the satellite link. Several months were lost associated with this trial because of this.

PHASE V Offshore Applications February 1983 to October 1983.

Shell transported the remote terminal to Dartmouth Nova Scotia and this unit has been installed and was technically operational as of February 1st 1983. However, as this satellite terminal was co-located with some HF radio equipment and the switching power supply in the TWT upconverter was causing interference with the H.F. receivers co-located at the site. The terminal is now functional as of May 1983.

The intent of the program is to demonstrate the feasibility of data and voice transmission between Shell's SEDCO 709 dynamically positioned semi submersible drilling rig and Shell's Halifax and Calgary offices. Figure 4 depicts the proposed multipoint system configuration. The appendix contains a more detailed write up on the proposed configuration. The project will also demonstrate that offshore commercial T.V. reception is feasible via satellite. This experiment will use the CRC/CPA stabilized satellite antenna platform that is in the process of being integrated. An extension beyond October '83 is being requested so as to be able to test the performance over a full environmental cycle.

Shell has redundant H.F. communication links and an Inmarsat terminal available for ship to shore communications.

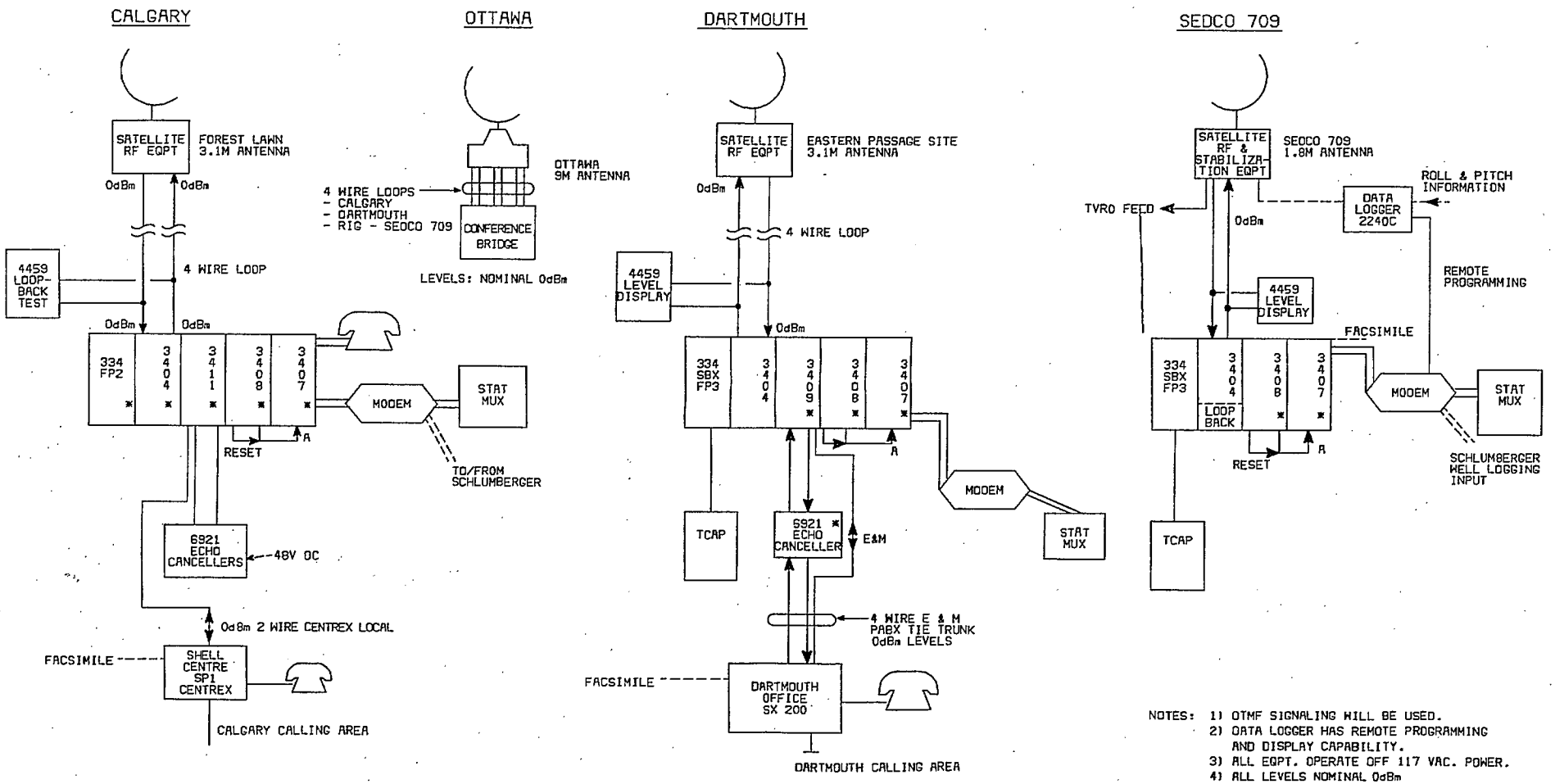
PHASE VI Evaluation of SPAR Transportable Terminal June to July 1983.

This is a new application to evaluate the transportability, performance, and applicability for SCPC service for our industry. The terminal is intended to home directly into the Forest Lawn 3.1M SCPC terminal of figure 4 (one hop system) which is a new system approach. The location of the transportable terminal will be at a drilling site near Calgary. A separate report to SPAR and CRC will be provided at the completion of this project.

FIGURE 4 SHELL CANADA RESOURCES/CPA

EAST COAST OFFSHORE PROJECT

SATELLITE SYSTEM COMMUNICATIONS CONCEPT



NOTES: 1) DTMF SIGNALING WILL BE USED.
2) DATA LOGGER HAS REMOTE PROGRAMMING AND DISPLAY CAPABILITY.
3) ALL EQPT. OPERATE OFF 117 VAC. POWER.
4) ALL LEVELS NOMINAL OdBm

M0931A

5.0 TECHNICAL SYSTEM AND OPERATIONS

Each project was carried out as a stand alone experiment. With the exception of the offshore program most data obtained is qualitative in nature. Please refer to section 6.6 and the appendixes for more detail on each experiment.

6.0 EVALUATION

The following is an evaluation summary of the five experiments conducted and basically leads to section 7.0 which identifies the needs of the Petroleum Industry for satellite communications. The experiments conducted are typical of the types of applications and situations encountered in the Petroleum Industry's 'Upstream' operations.

6.1 TRANSPORTATION

The remote terminal was transported and installed in multi-telephone company territories as per figure 5. This is fairly representative of current petroleum operations. It was preferable in all situations for the end user to arrange for transportation and perform the installation, as the logistics could be co-ordinated with member company activities.

The most significant aspect was the transportation costs and logistics associated with the remote earth terminal. Costs as high as $1,200 to ship a terminal between Calgary and Dartmouth were incurred with additional $700 expended for proper packaging. Considering the five locations for the remote terminal and the number of different users involved in the experiment the remote terminal worked in every case with no significant damage occuring as a result of tranportation. This is a must situation as the terminal must be able to withstand a rugged environment that could move on a daily basis.

The CPA will be evaluating the SPAR terminal and making recommendations that can be done to reduce the effort required and number of people required to perform the installation.

The general guidelines for a remote transportable terminal is that it should be classified as Twin Otter or Bell 206 helicopter compatible. Another mode of tranportation could be via four wheel drive vehicles.

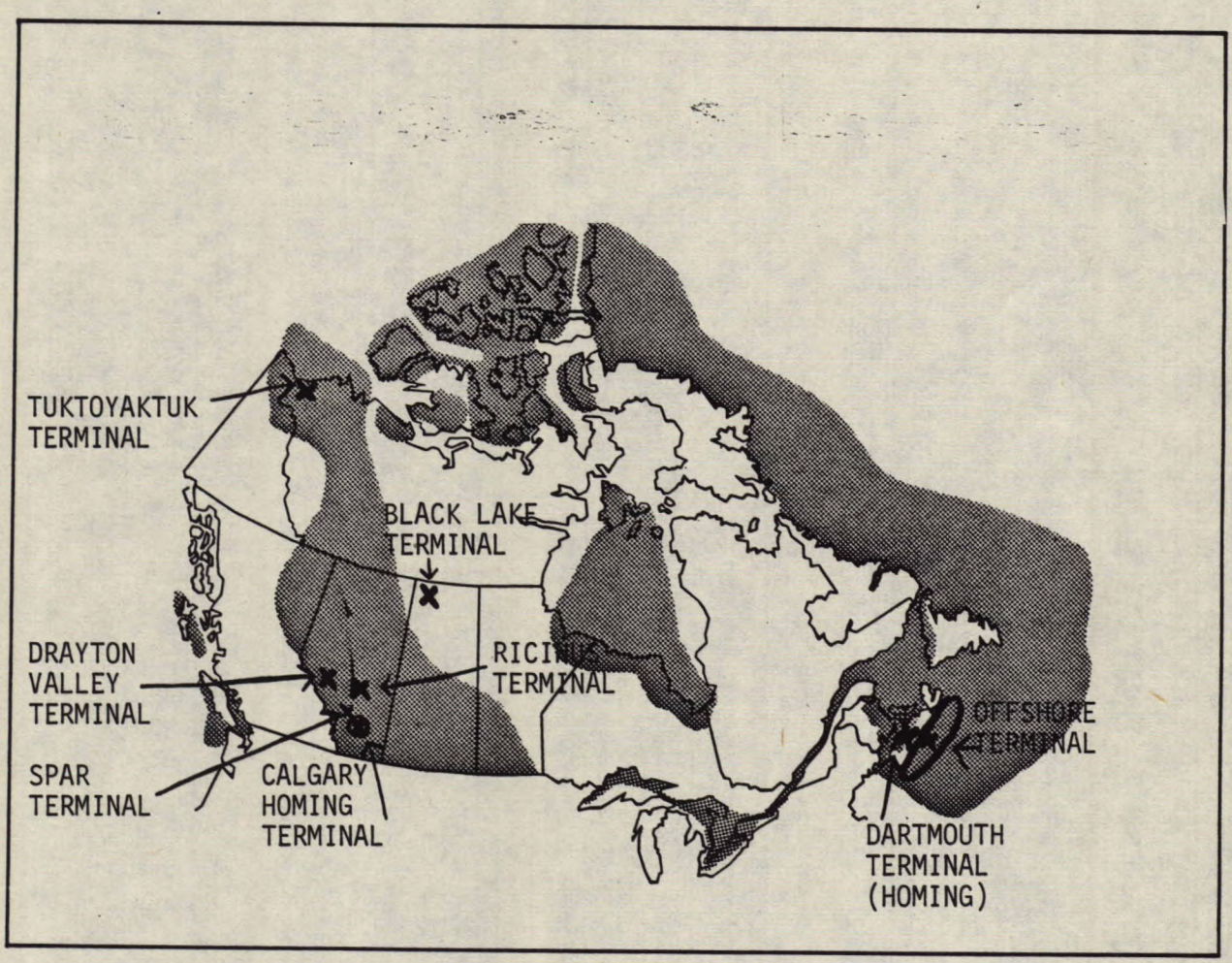
6.2 INSTALLATION

The installation, set up, and alignment of the terminals did not present any significant difficulty for the end user performing these tasks. The installation could be basically performed with one person initially and several people assisting for the final erection of the dish. The only specialized equipment required for installation was a compass for azimuth determination and an inclinometer to adjust for the elevation angle required. The polarization, vertical elevation angle and azimuth angles were coarsely set. The azimuth was swept until a peak indication was obtained on the receive pilot level indicator. A check for side lobes was performed; other adjustments were peaked. The next step was to turn on the transmitter and contact the 9m station so as to adjust the transmitter power. In no case, was the wrong satellite located and a transmission initiated on a wrong satellite. The most desirable situation is for one person to be able to setup and knock down the unit for operations that move on a frequent basis.

FIGURE 5

GEOGRAPHICAL LOCATIONS OF

SATELLITE TERMINAL EXPERIMENTS



The installation material for the foundations of the transportable earth terminal was basically a cope situation in that whatever was available would be used. The material ranged from rocks to drilling pipe to cement blocks to mounting on steel plates. The mounting arrangement must be designed with these typical parameters in mind of what could potentially be available at a remote site. This is as opposed to assuming that, for example, concrete foundations are available. We are in the process of reviewing an optimum design for our applications.

6.3 MAINTENANCE

The costs for maintaining this first generation satellite terminal equipment were not significant. Using a consultant, an average cost was around $300 per month per terminal was incurred for first line maintenance. System trouble shooting did not present any difficulty. All diagnosing of problems could be easily handled by an initial assessment at the remote site and then by contacting the CRC 9 metre earth station. Specialized test equipment was not required.

A complete spare set of major equipment was provided by CRC for maintaining the terminals on a box level replacement basis. This equipment was stored in Calgary. Appropriate sparing of equipment is a must situation. In the more remote locations, on site sparing must be addressed. Defective equipment was returned to CRC for repair. These are the concepts that we recommend for an operational system to return equipment for repair.

There was not any significant difficulty from the user's point of view in diagnosing satellite system problems with cooperation from the 9-metre station operators. Much can be done to assist with remote diagnostics in terms of remote loopbacks as well as improved local diagnostics to assist trouble shooting. This will be demonstrated in the offshore program.

6.4 SYSTEM OPERATION

The limited hours of operation did not pose any great inconvenience. Ideally a 24 hour a day seven day a week access is required, but a dedicated circuit is not necessary in that a DAMA concept would be acceptable. For example, the Black Lake circuit was available for only 2 hours a day. This was basically sufficient to handle most of the traffic requirements in that the voice traffic was re-arranged to take advantage of the 2 hour window available. Peak activities for the Petroleum Industry are typically in the morning from 7:30 to 8:30 Calgary time. This is for the morning reports and would fit in well with DAMA concepts.

6.5 SUPPORT

Although the telephone companies provided local loops and equipment which we're appreciative of. It should be noted that the most significant delays associated with getting the Black Lake circuit operational and the Tuktoyaktuk system operational were with the time required to implement the loop. Considerable time was lost as well with the time required to diagnose problems associated with the loops and the reaction time of the carrier. A 14/12 GH_z rooftop installation on customer premises would eliminate this problem. One must consider that the transportation time to remote locations was a minimum of 3 to 4 hours and could be several days for the more remote locations. This dictates that the equipment must be rugged and must be highly reliable and must work first time. Typical techniques of trouble shooting system and equipment problems on site with a "we will make it work" approach are not acceptable. The equipment must all be, where possible, checked out as a system (including telephone sets) prior to transporting it to a remote location. Should problems arise, considerable expense and time delays are involved to transport personnel and replacement equipment.

6.6 SUMMARY

The following summarizes each project. The double hop satellite delay did not present any significant problems to the user other than the fact that there was a time delay and they learned to cope with. An operational system would have to encompass only one half of this delay. The fact that the remote terminal location was in direct communications with the central location with basically no backhaul charges for distance is ideal. The most desirable situation is where we could install the terminal on the user's premises, in that it allows us considerable flexibility in meeting our requirements.

The Black Lake experiment demonstrated that the satellite communications is superior over the HF radio telephone communications which is a coping situation. The Drayton Valley experiment demonstrated that reliable data communications for SCADA is technically feasible. The terminal was well suited for construction activities and could have been used in an emergency situation such as a blow out, but is not portable. The Ricinus experiment was a situation whereby outside of Calgary there were no data communications facilities available, let alone regular telephone communications. The concepts demonstrated that online well logging and office of the future systems could evolve and form part of the day-to-day operation of the Petroleum Industry in remote locations. Other applications such as "measure while you drill" and "computer assisted drilling" could evolve.

The original intent of the Dome Experiment was to put the terminal at Tarsuit and demonstrate a new application for communications from artificial islands. However, time did not permit this to be done but the concepts demonstrated of audio and video teleconferencing and telemedicine showed promise and must be reviewed further.

The offshore experiment is now underway with communications possible between Calgary and Dartmouth with premutations to allow the offshore terminal to be able to communicate to Dartmouth or Calgary on an as required basis. Figure 5 depicts the system configuration. The logistics associated with transportation and installation have presented the greatest difficulties in terms of equipment damage.

A further outgrowth of the Anik B program is the evaluation to be performed on the SPAR terminal. The SPAR terminal will be working in a direct terminal to terminal single hop configuration. Data will be recorded on the system performance as well as recommendations made to improve transportability.

6.7 CPA GOALS

In order to meet our variable applications, we require a satellite terminal that is reliable and capable of being easily transported and set up by one person is less then 8 hours. System MTBF factors in excess of 6000 hours are a must. In all cases the cost of the service is the major factor inhibiting commercial use as a follow-on to the experiment.

Now with these experiments in mind, the report will now address the major goals of the Anik B Phase II objectives and sections 7.0, 8.0 and 9.0 cover the factors affecting commercial use by our industry.

6.8 ANIK B PHASE II GOALS

1. The Pilot Project program for the CPA supported unique experiments typical of our specialized requirements and trials that further developed awareness, knowledge and expertise that will assist in developing new services potentially using commercial satellite systems. As a result of this participation the CPA member companies are more experienced that any telephone company (Telsat excluded) in the installation, transportation and maintenance required and system engineering and performance of SCPC satellite terminals. We are now in a position to consolidate and aggregate the needs of the petroleum and resource industry and press forward. These are discussed in more detail in section 7.0.

2. In order for the Canadian Manufacturing Industry and carriers to advance Canadian capabilities in satellite communications technology and service delivery, they must have a significant domestic market available. From our point of view, to meet our needs, a more cost effective service must be available. Unless Canadian Manufacturing Industry starts immediately to develop high technology products, especially satellite, to meet future Canadian markets, these opportunities will be lost forever. If one looks to the U.S. and internationally, satellite technology, as well as other areas are ahead of Canada. If this trend continues we will be forced, eventually, to buy foreign products. It is a matter of time that the Canadian technology and manufacturing incentives are lost.

   Data is provided in sections 7.0 and 8.0 for telecommunications policy and service development that will basically not conflict with current telephone service offerings, and will assist in developing a demand for satellite services. After discussions with the carriers it is our opinion that the telephone carriers are responding to their regional needs and not national needs such as ours. This is discussed further in the sections 7 to 9.

3. The petroleum industry would use the Anik B, C, and D series satellite systems immediately if our recommendations could be implemented so that more cost effective and functional satellite service offerings would result to meet our specialized needs.

4. The CPA, as a logical extension and outgrowth of this experiment is providing data to assist with telecommunications policy and service development. As a result of this involvement as well as discussions with the satellite operator Telsat and telephone companies, we see numerous policy and technological issues that have to be addressed so a healthy Canadian satellite industry including manufacturing may be viable and meet our needs. These issues are discussed in sections 7.0, 8.0 and 9.0.

7.0 FINANCIAL & OTHER CONSIDERATIONS

The Petroleum Industry is well aware of the potential that satellite technology offers to meet our specialized needs. The challenges that we face in our Oil, Gas, Coal, and Minerals operations, are that they are becoming more remote and travel and operating costs are increasing. The Petroleum Industry is aware that we require better communications in our industry to support the industry trend towards sophisticated electronics assisting our operations in the field of "computer assisted drilling" and "measuring while you drill techniques". As well increased operating costs and a trend of centralization of experienced personnel will require more sophisticated communications networks to manage remote operations. To keep the costs down to consumer we must be able to increase productivity and reduce operating costs where possible through improvements in the rapidly advancing field of communications technology.

For the petroleum industry to seriously consider satellite technology, more extensively to achieve these goals, there exists complex situations of costs-versus-benefits. The types of service, lead time, equipment availability, location, mobility, reliability and maintenance factors are all interelated with the cost benefit analysis and have to be resolved to meet our specialized needs. Some of these factors have been identified as part of working with the Anik B trials and were addressed in the evaluation section. Our potential need for satellite services fall into two broad categories discussed in section 2.3; these could be satisfied by:

1) thin route SCPC satellite for 'Upstream' activities and
2) new medium route digital network services to support 'Downstream' activities.

7.1 UPSTREAM REQUIREMENTS

The exploration and development phases can be typically supported by 1 to 4 SCPC type circuits that are capable of supporting a voice-simultaneous-data or voice-alternate-data concepts. These activities can range from days to several years and can be classified as temporary in time and location.

Please refer to Appendix H for more detail on areas of activity, the present communications systems, and supplementary communications requirements for 'Upstream' exploration and development activities.

7.2 NATURE OF UPSTREAM BUSINESS

For example the nature of our business is that an exploration well may be drilled, but the exact timing and location may not be known until days or weeks before the operation starts. The length of the operation is only approximate and will depend on factors such as problems encountered during drilling or changes in drilling depth. This leads to the difficulty of committing to a carrier for any length of time as each situation is slightly different. The type of communications used to support the operation will depend what is available, and the lead time available for planning and the cost for the service.

For example G.M.T.S. has served the industry well as it has been relatively available in Alberta and is inexpensive and transportable. However it does not support data concepts or inter province operation, and is not available everywhere we operate and presents problems with inexperienced people.

Reliability is a concern with the more frontier, remote and offshore areas, in that the equipment must function on arrival and have a low maintenance factor as discussed in section 6.7.

7.3 AREAS OF UPSTREAM ACTIVITIES

Referring to figure 1, the potential future oil and gas exploration and producing areas are located in Alberta, B.C., Saskatchewan, the North West Territories, and offshore areas: Westcoast, Beaufort Sea, Hudson Bay, Davis Straight, and Eastcoast of Canada. The most cost effective and flexible, as well as sensible approach, would be to have as much of the service provided by one satellite keeping in mind the requirement of transportability and offshore service and the need for TV programming.

Future production activities will involve pipelines, and could include Artic tanker traffic where satellite coverage is not available at the present period (let alone other reliable communications services).

The CPA has participated with CRC providing development funding and personnel to develop cost effective 14/12 GHz terrestrial and offshore service which could meet our future exploration and production challenges, including onshore, Northern areas and Westcoast, Beaufort Sea, and Eastcoast offshore areas.

7.4 RECOMMENDATIONS

In order for a more cost effective thin route service to develop to meet our specialized needs we recommend the following issues be reviewed. There are some issues still to be resolved. These recommendations will result in increased manufacturing opportunities. This aspect is discussed further in section 7.8.

7.4.1 LOGISTICS

We do not forsee problems in qualified users transporting, installing, and performing first line maintenance of remote satellite earth terminals. This is a logical approach considering the delays and costs involved with transporting additional personnel to remote locations to perform these tasks. Telsat has been approached on this matter and are receptive to this approach. The user bears all costs associated with transportation and equipment to remote locations.

7.4.2 SCPC TERMINAL SERVICE

The Petroleum industry exploration, and some of the development and construction type activities are transient in nature by being temporary in time and location. Providing our own terminals for these activities for onshore, frontier and remote locations, would be a more practical approach to meet our short lead times and would improve the economics. This is similar to offshore situations where regular telephone service is not readily available or cost effective. These are typically short term applications whereby it is not cost effective nor reasonable to expect the telephone companies to provide a service to an area that does not currently have it. The choice of ownership of thin route type-approved SCPC terminals would result in a lower cost as well as an increased demand for satellite services. This concept does not compete with telephone company existing terrestrial offerings. This will actually increase telephone company revenues in the form of increased telephone system useage if interconnect was allowed. The carriers have the option of quoting on the SCPC satellite services, as they do now but they are not extensively used because of the costs (this is discussed further in the section on Economics).

The ideal service would be for a 14/12 GHz transportable earth terminal because of the reduced size of dish. As well the need not to perform frequency co-ordination with terrestrial systems would allow the flexibility to operate on an as required where required basis for these activities.

7.5 CARRIER ISSUES AND TRENDS

7.5.1 CANADA WIDE COMPATIBILITY

The telephone companies appear to be evolving with their own satellite networking plans that do not offer the nation wide compatibility, including offshore, we require to meet our specialized needs. Our operations typically encounter and span multiple telephone operating areas as demonstrated in the Anik B experiment. We face numerous challenges both present and future that satellite systems could solve. We have had discussions with most of the major telephone companies and Telsat and are aware of their plans. Basically their current plans do not support the concept of being able to operate Exploration and Production activities anywhere in Canada, including offshore, without having different terminals and telephone system equipment and excessive and unncessary backhaul costs for different locations. These factors have resulted in unnecessary expense and logistical burdens and will continue to be a major factor inhibiting satellite systems in our industry.

Consider that we have a considerable amount of our operations located in Northwest Telephones territory. They are not a TCTS member and this aspect will continue to present problems of co-ordination and commonality of service. An additional complication is TCTS is an association and not a legal entity and cannot administer and execute contracts.

7.5.2 COMMONALITY OF SERVICE

As a result of the Anik B pilot project we see a need for commonality of service for onshore and for offshore exploration and production activities. Wherever we may operate, we should not need a different satellite terminal or equipment to operate off Newfoundland vs. Nova Scotia vs British Columbia or Alberta. This aspect should be transparent to the user in that unnecessary delays and logistic problems as well as excessive costs will all be incurred to support different system configurations. This concept of one system has been demonstrated in the Anik B trial. We recommend that a common type-approved terminal for onshore and offshore service be developed for our industry. The ideal concept may be similar to the B.C. Tel proposed Space Link system design which we are supportive of. As a result of different telephone company offerings and our unique needs it may be more economic and reasonable for the user to have the option of providing their own homing station, located to meet their requirements; the carriers would be approached if they have a service available, depending on timing and costs. The economics are discussed in the section on Financial Considerations.

7.6 OFFSHORE SERVICES

The nature of Petroleum Industry's offshore oil and gas exploration activities is that we have exploration lease holdings that are located in domestic and international waters located from south of Nova Scotia, off the coast of Newfoundland and up to the Davis Strait and Beaufort Sea areas. The jurisdictional issues that affect our application in meeting our need for service via satellite could involve Newfoundland Telephones, Teleglobe Canada, MT & T or possibly CNCP, as well as the other Maritime Telephone Companies, B.C. Tel., Bell Canada, A.G.T., and Northwest Tel. We are in the process of addressing these issues, unless they are resolved a reasonable cost offshore service may not exist.

Space is extremely limited on an offshore drilling rig. Combined telephony, data, and TVRO services are required on the Anik C3 satellite. This has been discussed with Telsat Canada for offshore satellite services and they are receptive to our needs. In order to provide offshore services complete with TV from technical constraints and economic requirements, Telsat require that a 54 MHz transponder eventually be utilized on Anik C3. This is discussed further in the section on aggregation of needs.

There could eventually be upwards of 10 to 30 offshore drilling vessels working off Canada (depending on economic conditions) with 70 to 90 people located on a typical rig at any one time. There is a need on these rigs to provide current events from the outside world; this service currently doesn't exist. The most desirable medium is T.V. and this is in the process of being demonstrated as part of the Anik B Eastcoast offshore program in the form of TVRO. As space is extremely limited, a combined offshore message, data and T.V. service one terminal is a must on Anik C3.

This presents some interesting issues that are addressed further in section 7.10. Our needs by comparison to TCTS and Broadcasters are minimal and have been traditionally overlooked in terms of satellite systems planning and that is still evident today. Once the Anik C1 and C2 satellites become operational, it is our understanding that the TCTS member company message services will be provided on the Anik C1 or C2 satellites.

7.7 ECONOMICS

The most prevalent issue inhibiting the extensive utilization of satellite services is the costs of services obtained through the carriers versus the benefits and co-ordination difficulties. The problem is that there are excessive double mark-ups and the administrative overheads applied make these services offerings cost prohibitive (if even available to meet our needs). These rates have contributed to the non use situation and have to include a non-revenue equipment inventory component and will remain at the same level with the current rating philisophies. Especially given the current poor economic situation of the Petroleum industry.

We support the Canadian Astronautics (ref 1) analysis in that a more competitive service can be made available and would result in increased demand. The first issue is thin route SCPC type services to support exploration, construction and development activities consisting of 1 to 4 circuits. We have quotes and estimates from Canadian equipment vendors that indicate depending on quantities, frequency band (6/4 VS 14/12 GHz) and DAMA concepts, that range from a low of $45,000 in quantities of 25 terminals versus $70,000 for quantity one terminal.

Because of the Anik C series satellite system constraints and the telephone companies are doing their own thing, a 14/12 GHz Canada wide service presents a problem in considering committing to a 5-year amortization period. This time frame would assist in making a basic service more feasible. However, if the costs were low enough and our recommendations accepted, then we could plan for the following:

- Transportable SCPC earth terminal amoritization at 13.5% per annum, range from $1010/month to $1420/month; depending on quantities.

- Customer maintenance costs estimated at 15% per year of capital costs (based on improved Anik B terminal maintenance recommendations and current equipment MTBF's).

- Space segement charges leased directly from Telsat in 1% increments are $1612/month which will support 2 SCPC circuits.

- The earth station homing costs are based on one SCPC terminal and the additional per channel costs would be incremental. However if the same cost of the SCPC terminal with one circuit is assumed the following costs are projected:

- Quantity 1 SCPC system of one cct: $4380/month.

- Quantity 2 SCPC systems of one cct: $4070/month per access.

Economies of scale should result with the homing earth station as additional circuits are added and DAMA concepts evolve. As the demand for equipment increases the costs will also decrease.

Several points should be noted with respect to current carrier offerings. This is intended as a comparison based on current findings.

- A.G.T.'s Transportable 6/4 GHz Terminal Rental $6075/month plus maintenance

- A.G.T.'s Calgary homing 6/4 GHz Earth Station Access Charge $1200/month plus local loop charges

- Space segment charges (2 units of 0.2%) for SCPC service at $630/month.

  Total $9000/mo

- Rates for Telsat's Anikcom terminal are similar.

Other carrier company rates are the same or higher because of backhaul costs. B.C. Tels proposed service appears to be more reasonable with cost estimates around $3500 to $4000/month. However they are long distance charges of $0.79/min or backhaul charges of $2000/month to Calgary.

Current regulations in place required that the space segment be obtained at a minimum markup of 10% which is totally unnecessary for SCPC 'Upstream' services considering they don't compete with terrestrial services, and TCTS carriers have a vested interest in Telsat.

7.8 DEMAND AND INDUSTRIAL BENEFITS

If one looks at the offshore 14/12 GHz Anik B stabilized antenna program underway and the sudden interest by Canadian Manufacturers and carriers, this is extremely encouraging. The cost factors are such that in 1980 when the CPA started planning for this service a stabilized antenna platform for 6/4 GH_Z service was around $500,000 U.S. and manufactured in the U.S. There was little demand for use on a Canadian domestic satellite. With the cost factors at the platform expected to be reduced to around $50,000 and manufactured in Canada plus $70,000 for satellite terminal equipment, a demand of 10 to 20 of these units is realistic; providing the conditions of section 7 are achieved. Given the opportunity to provide our own homing station, a further demand of 10 onshore terminals is realistic. Couple this concept with Western and frontier based future exploration activities a potential of 10 to 30 terminals is not unreasonable. This leads to a potential increase of space segment rental by 10% to 30% in 1% increments. With the current poor economic situation of the Canadian petroleum industry it will be an extremely long time before the existing SCPC offering will be extensively used except and sporadic last alternative basis. Unless a reasonable policy evolves that will ensure for example cost effective onshore and offshore services exists, then other alternatives such as Inmarsat & HF services will continue to be used. This would result in lost manufacturing opportunities.

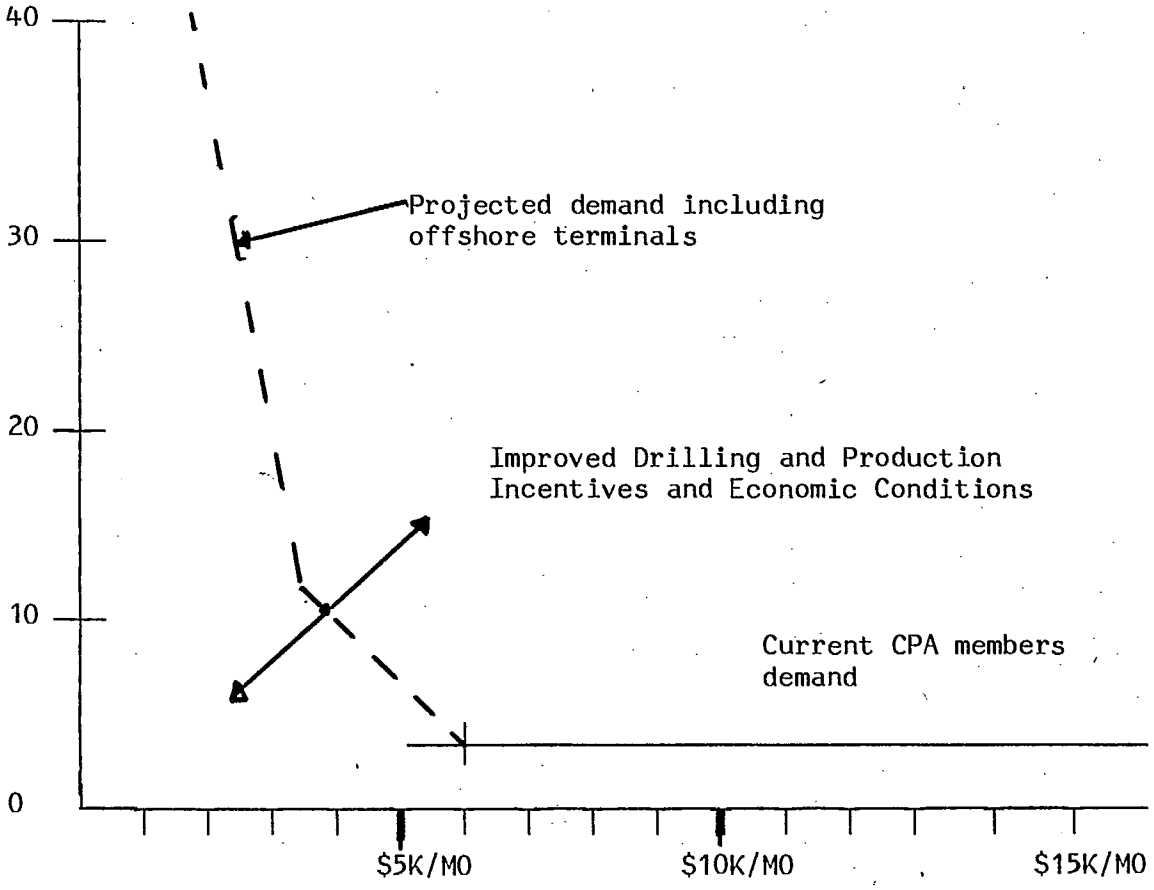
The demand for SCPC type services versus costs is depicted in figure 6 and is subject to economic conditions, political situations, and drilling incentives and technology factors. An interesting anomaly with respect to economic revenue generation, is Telsat has leased out transponders to U.S. based private carriers. We are proposing for SCPC type services that encompass our future needs as outlined in section 7 & 8 and can be aggregated as an industry group as per section 7.10. This would result in additional transponder revenue generation and is similar to the situation of these private carriers providing their own earth terminal equipment.

Based on the interrogatories filed with the CRTC, Telsat's projected demand does not exceed the 75% point by the beginning of 1987 for 14/12GH_Z transponders. The situation is even worse for 6/4 GH_Z transponders.

The satellite TVRO market is flourishing in Canada with demand increasing and costs of equipment decreasing. A similar situation would result with a more liberal earth station licensing procedure.

FIGURE 6

PROJECTED DEMAND FOR SCPC TERMINALS VS COSTS



NOTES:
1) Atypical demand: average number of terminals in service
2) Cost figures are based on an equivalent amortization of equipment, spacesegment, homing station and maintenance charges over a 5 year period
3) Offshore terminal demand is contingent of resolution of issues identified in section 7.0
4) Installation and transportation costs not included

7.9 FUTURE APPLICATIONS

The other possible application for our industry is to use satellite systems to provide new digital services between major locations in Canada such as Calgary and Toronto. Data rates between 64 Kilo bits/sec to 10 Mbits/sec are feasible by satellite but are not supported via commercial telephone company service offerings. They cannot compete with the flexibility obtained from a multi point TDMA type configurations. High speed data requirements and digitally compressed video teleconferencing transmission requirements are emerging that will require a new digital communication infrastructure such as satellite to support the evolving digital technologies. With the rapidly advancing field of digital communications, there is no longer a distinction between voice, data, and video services. This does not compete with conventional facililties, but will enhance these offerings. The only threat is running telephone voice traffic in a digital alternate/simultaneous mode. However this issue has been discussed in section 10 and the potential for Canadian manufacturing benefits far outweighs this.

Telsats current space segment charges appear to be reasonable. However, the rates and unnecessary markups associated with customer premise earth stations will continue to prohibit their wide spread use. We feel that for special digital applications a new market will evolve in the area of customer owned digital earth stations that will not significantly compete with carriers and could be integrated to support the SCPC exploration services. A typical configuration as as per figure 7. In order for this market to mature for our industry the costs must be reasonable. The TCTS ISBN offerings as it is planned, will not meet our needs and offers little incentive to use their service; the CPA has not been formally approached to provide input, on any significant scale to this date although we have offered to do this.

In discussions with Canadian vendors, cost estimates for digital earth stations indicate a considerable earth station market could emerge and would result in Canadian manufacturing and technology development. Considering Telsat's interrogatories filed in response to the R.C.C. users in the U.S., it would seem logical that the space segment utilization could be considerably enhanced by a controlled application environment and that economics would be the relevant factor to use a satellite system.

Financial options such as renting or leasing earth terminal equipment from a carrier or Telsat could still apply as short term situations will exist, along with competitive longer term financial alternatives should always be pursued.

7.10 AGGREGATION OF NEEDS

In order to support our future 'Downstream' needs and accommodate our terrestrial and offshore exploration and production activities and incorporate evolving digital communication technologies, it is necessary to aggregate the needs of the petroleum industry so as to provide sufficient demand. Northern coverage defficiencies on the Anik C series satellites present problems onshore as well as for a low cost offshore satellite service to be viable. There are from 70 to 90 people located on an offshore drilling vessel, which is typical of other offshore drill ships and drilling rigs. At this point in time direct contact with the outside world is extremely limited. We are in the process of negotiating, and have negotiated with one of the Pay TV operators to provide TV programming offshore via the Anik C3 satellite on a fee for service basis.

Please refer to section 7.9 for future applications. In order to provide sufficient demand for utilizing a full Anik C3 transponder, then the petroleum industry must plan for our future needs. It appears to be technically feasible and reasonable to incorporate SCPC type exploration services with some of the digital services all on the same earth station. Figure 7 depicts a possible system concept. This can only be accomplished if it is economic.

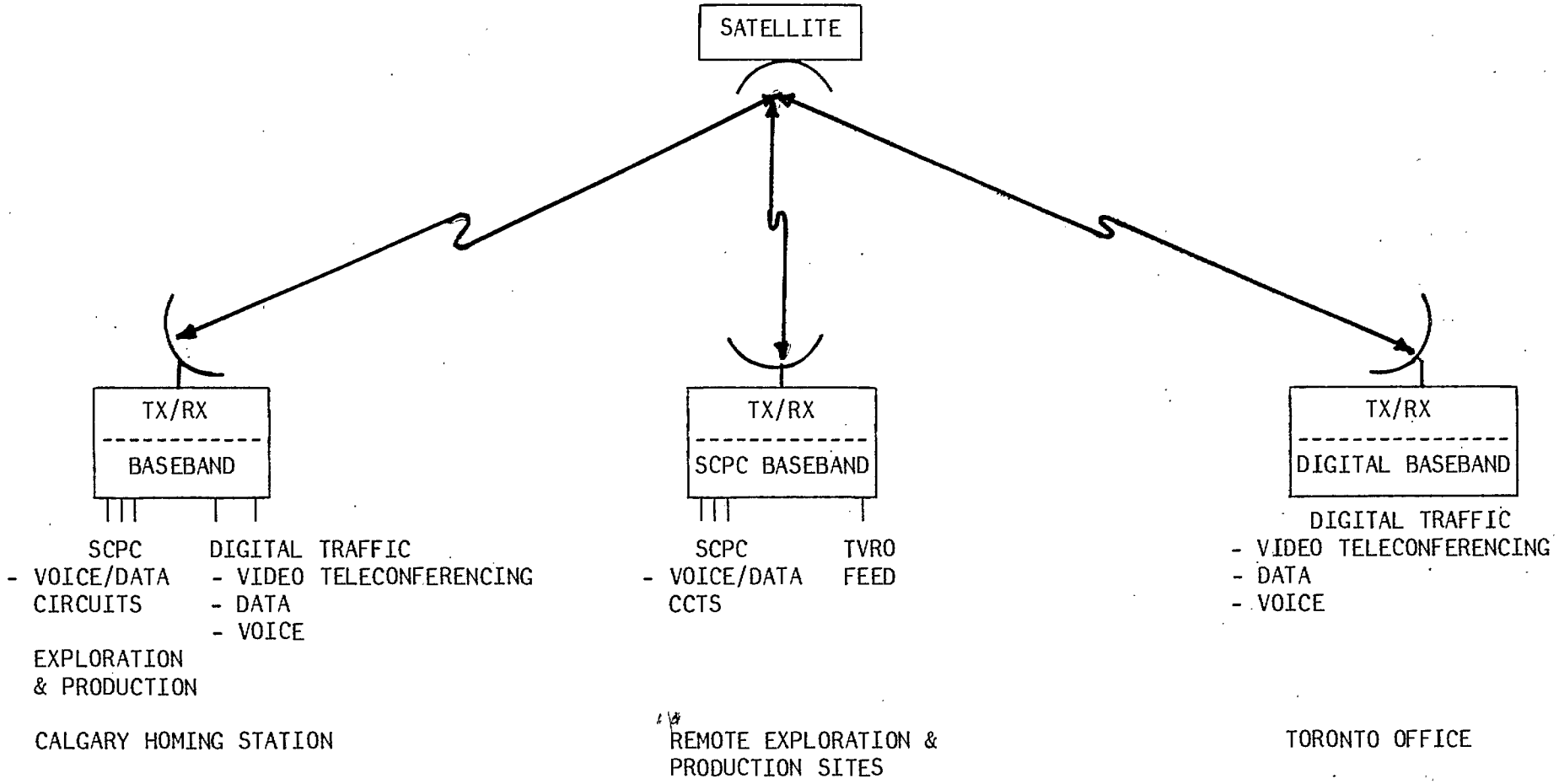
It is our understanding that space segment can be leased from Telsat in 1% increments, the user should be able to do this directly which would eliminate unnecessary "mark-up" for offshore as well as onshore exploration and production service.

We understand that D.O.C. licensing applications must be submitted in conjunction with a recognized common carrier to provide the terrestrial switched network interconnection point. However, we would like to emphasize that for the services provided via satellite to be viable, the costs and rates must be competitive, and justifiable. It should be noted that most exploration satellite services terminating at a terrestrial point and high speed digital services do not compete with the existing or planned telephone company terrestrial offerings. If the carriers wish to compete with a service offering including offshore, they should be competitive.

Based on our experience with the Anik B program, satellite equipment costs and various rates that have been filed for different types of services are excessive and constitute a stumbling block to utilization the satellites.

FIGURE 7

TYPICAL COMBINED DIGITAL AND SCPC
NETWORK CONFIGURATION



8.0 ADMINISTRATIVE CONSIDERATIONS

The Administration of our pilot project was streamlined with an overall project co-ordinator representing CPA. All necessary co-ordination with C.R.C. personnel, outside contractors and carriers and others along with the participants was on a need-to-know basis through this centralized position. This included aspects of CRC maintenance and other scheduled outages along with co-ordinating problems with maintenace and AGT carrier problems.

The CPA had established a budget of around $140,000 over the 3 year period of the program. Approximately one half of this budget was allocated for the offshore program. To date $110,000 hs been spent on consultant fees for maintenance, space segment rental from CRC and purchasing an offshore stabilized platform, test equipment and performance monitoring equipment. This budget is administered by the project co-ordinator.

The intent was to have an extremely streamlined reporting procedure to be able to expeditiously carry out the multiple phases of the programs and provide assistance and co-ordination as required. Each participant ran their own project and was responsible for the costs to transport, install and remove as well as provide or arrange for end equipment as required for their experiment. Maintenance of the satellite earth terminals was under the co-ordination of the CPA project administrator. We used a consultant on a time and charges basis for this. Approximately 1 to 2 man days per month were required for this individual to administer the project on an ongoing basis. It is extremely important to be able to react and provide timely cost effective telecommunications services for exploration and production activities. This is due to the short lead times involved in planning and short time and logistics associated with the operation and high costs involved.

In an operational system the ideal concept would be for companies to have available earth terminals that could be installed with as little as two weeks notice or within 8 hours or less in an emergency such as a blowout. The most practical solution is for the industry to aggregate our needs and interested companies would have their own basic complement of terminals including homing stations. A common type-approved terminals could be loaned in an emergency and would result in commonality of sparing.

Another option is for a specialized common carrier to be incorporated and be recognized under the guidelines of RSP 114 to provide these services on a national basis for a fee for service, with the capability of reacting to the short lead times required and after hours maintenance requirement of 7 days a week and 24 hours a day. This is similar to concepts in the U.S. and would result in minimal carrier co-ordination to what is now required.

The central earth station could be established to provide remote diagnostics and trouble shooting.

9.0 CONCLUSIONS

The Anik B experiment has generated considerable interest in that satellite communications technology can play an important part in our day-to-day operations. The freedom that we had in this program to transport, install, maintain and experiment is exactly the type of service required to meet our needs. There are numerous complicated issues that are interrelated that affect follow on commercial service which have been identified in this report.

It is our intent at this point in time to address some of these issues formally with the telephone carriers and regulators (CRTC and DOC) through the Communications Systems Committee of the Canadian Petroleum Association. However, Canada has had thin route SCPC services available since 1973 and a significant demand has not materialized.

The approach we propose, if this is agreeable in principle to D.O.C. is to issue Requests for Quotation for the required satellite terminal equipment to Canadian suppliers and include the recognized common carriers alike. Upon completion of this process we would complete the socio-economic and systems engineering submissions.

The application for licenses for SCPC type services could be sufficiently well regulated to protect the carriers in a steamlined licensing procedure consisting of letter of intent similar to RSP 113 and 114 and could be entertained on a general nature for the application basis.

10.0 OTHER CONSIDERATIONS

Current long distance analog voice message requirements and data have been served by traditional telephone company analog terrestrial message services. However, with rapidly advancing field of digital communications, there is no longer a distinction between voice, data and video services in the transmission mediums. In order for the Petroleum companies to aggregate our needs as discussed and to meet the challenges of the 1980's and beyond we must be able to take advantage of these unprecendented economies and signal qualities that will be available using Digital techniques. The challenges that we face in our Oil and Gas operations have been discussed in section 7.0.

Digital networking via satellite is potentially an answer to this challenge by improving communications at a lower cost and to support new technology such as moderate speed (400K bits/sec to 1.4M bits/sec), digitally compressed video teleconferencing and high speed data transmission which are not supported by the current telephone company offerings.

As far as the effect on revenue telephone company basic service offerings on a intra-telephone company area, there would be no decrease in revenue and may be increased by additional long distance revenues being generated within their territory. On an intra-telephone company type of application, one must keep in mind that there is obviously a distance sensitivity factor that satellite services will not prove-in economically.

For new digital services (greater than 56K bits/sec) there will not be any effect on the existing revenue base because telco's don't support it at the current time. High speed data via analog terrestrial services is passé in that it does not compete now with satellite service offerings. Existing voice service revenues may be reduced, but this is inevitable with the advent of voice concentration. Given the current tariff arrangements it may be more beneficial to the local telephone company to receive the increased message services that would result within their territories.

The effects of implementing satellite services, in a more deregulated sense, would be gradual, because of the lead times involved for implementation. This configuration would most likely have long distance services available to back up or be used in overflow situations.

We recommend that consideration be given to the licensing of customer provided earth stations with the following procedures in mind:

i The telephone companies will have the right to quote on both systems including terrestrial for comparison; if it is available.

ii. Canadian manufacturers will be requested to quote on the system configuration. Specialized equipment to enhance the satellite terminal operation that is not reasonable to expect to be produced in Canada because of low demand may have to sourced outside Canada. Every opportunity would be given to a Canadian supplier to provide equipment first.

iii. The D.O.C. would regulate the process as they are doing now via letter of intent and socio-economic applications with good system engineering practices. The socio-economic impact in terms of proposal would be basically an economic/benefits decision.

11.0 ACKNOWLEDGEMENTS

We would like to thank the following companies for equipment and services provided to support these experiments and their interest in our project.

1) Alberta Government Telephones; for the use of their Forest Lawn Satellite Site, dedicated land lines to customer premises, and data modem and VF equipment.

2) Maritime Telephones and Telegraph for the land lines provided for the Offshore project.

3) Gandalf of Canada Limited for providing high speed data modems for the Offshore project.

4) Timplex of Canada Limited for providing statistical multiplexers for the Offshore project.

5) Tellabs of Canada Limited for special contract for provision of the selective signalling system (334) and echo cancellers for the Offshore project.

APPENDIX A

CPA ANNUAL REPORT

Annual Report 1982

"Perhaps governments' responses last year have significance beyond short-term relief, and reflect a change in attitude — a degree of willingness to listen and try to understand how our industry operates, and how much we can contribute to the national and regional economies."

— *Chairman's Report page 2*

CANADIAN PETROLEUM ASSOCIATION

Index

CPA Offices

Head office
1500, 633 Sixth Avenue S.W.
Calgary, Alberta T2P 2Y5
Telephone (403) 269-6721

Ian R. Smyth
Executive Director

Hans Maciej
Technical Director

Norm Elliott
Public Affairs Director

Dan B. Macnamara
Secretary and General Counsel

Ray J. Frocklage
Financial and Administrative Director

Pipeline Division
1500, 633 Sixth Avenue S.W.
Calgary, Alberta T2P 2Y5
Telephone (403) 269-6721

Ray J. Frocklage
Administrator

British Columbia Division
602, 880 Douglas Street
Victoria, British Columbia V8W 2B7
Telephone (604) 388-4121

G. S. (Gerry) Bryson
Manager

Saskatchewan Division
1009 - 1867 Hamilton Street
Regina, Saskatchewan S4P 2C2
Telephone (306) 527-3527

W. L. (Bill) Whelan
Manager

Ottawa Office
400, 130 Albert Street
Ottawa, Ontario K1P 5G4
Telephone (613) 237-5515

James (Jamie) Deacey
Director, Ottawa

Montreal office
2002 - 1110 Sherbrooke Street West
Montreal, Quebec H3A 1G8
Telephone (514) 842-5497

Helene Poirier Tomlinson
Quebec Representative

St. John's Office
173 Water Street
St. John's, Newfoundland A1C 1B1K.

A. (Ken) Oakley
Director, Petroleum Industry
Office for Eastcoast Offshore

CANADIAN PETROLEUM ASSOCIATION

1982 public attitudes

Public attitudes toward Canada's petroleum industry improved significantly in 1982, as illustrated by responses to an attitude survey carried out for the CPA by a leading Canadian opinion research organization.

While it is difficult to assign weight to the relative influence of the many factors which influenced public opinion in 1982, the surveys — conducted as part of an ongoing assessment of the CPA's public information campaign — suggest that the campaign itself has made a significant contribution.

Nationwide public opinion studies in February and October were particularly significant. These polls involved telephone surveys of 1200 persons chosen at random to provide an accurate demographic profile of Canada. The ''no opinion'' categories are excluded from the following charts.

Government seen as taking too much

Asked ''who tends to get more than a fair share of the money from oil and gas?'' in 1982 the respondents shared radically different opinions from those of respondents in 1980 and 1981.

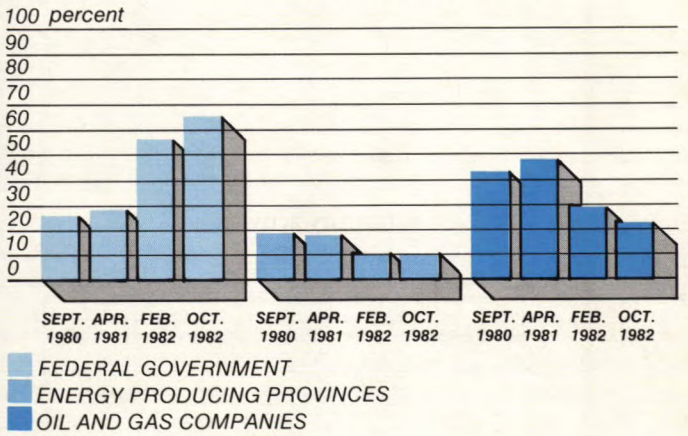
Perception of industry improves

Asked how they would describe the oil and gas industry in Canada (''competent or incompetent,'' ''honest or dishonest,'' etc.,) respondents indicated that perceptions have improved significantly since the surveys began.

Other improvements

Other survey questions indicated similar results: the numbers of people who believe the industry is accountable and contributes to Canada have risen considerably. In addition, there is an improved perception of the industry's ability to communicate with the Canadian public.

Perceptions of share in revenue distribution



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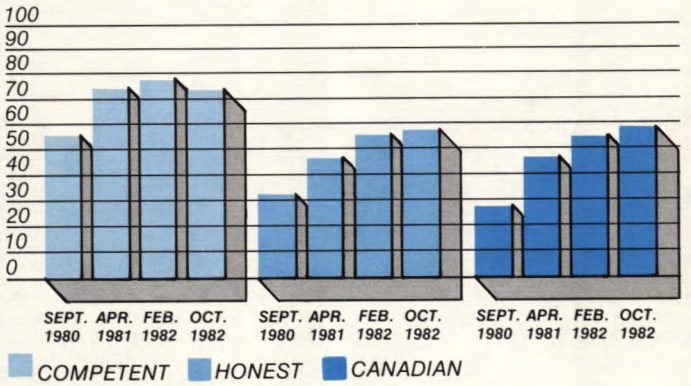

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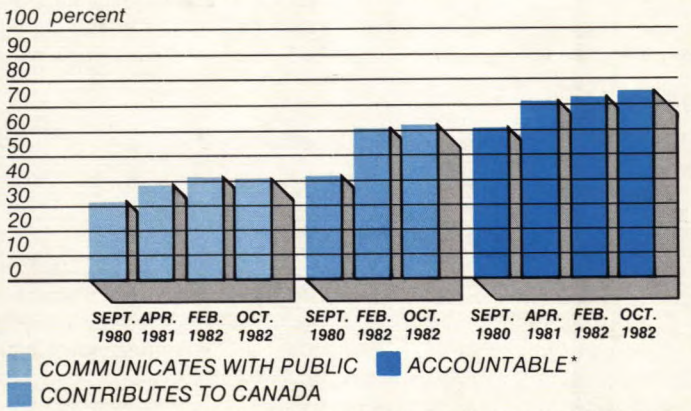


*information not available from April 1981 survey

Chairman's Report

Members of the Canadian petroleum industry must view the past year with mixed feelings. It was the second year of the most difficult period in our industry's history. Yet, in spite of this, there was reason for some optimism — encouraging signs that our governments finally are willing to listen and respond.

The National Energy Program continues to be an ill-conceived, economically painful experiment for Canadians, and serves to demonstrate the folly of punitive taxation directed at a single industry. Severely damaging in normal economic times, in a period of high interest rates, record inflation and a major economic recession, this program crippled our industry. Our only alternative was to fall back and regroup, a defensive strategy which meant cancellation of mega projects, reduction in drilling activity, severe staff cuts, and a sharp decrease in capital programs.

Finally, governments at both levels realized that with the increased Petroleum and Gas Revenue Tax (PGRT), and introduction of the Incremental Oil Revenue Tax (IORT), they had taken too much; that there are prudent limits on borrowing to compensate for lost revenues; and that without funds to reinvest, industry has no choice but to retrench.

The government of Alberta was the first to respond by announcing the Alberta Oil and Gas Activity Program, estimated at the time to restore $5.4 billion to cash flows over the period April 1982 through 1986. This responsible, welcome action by Alberta was complemented at the end of May by the federal government's NEP update which reduced the PGRT from 12 percent to 11 percent, and withdrew the IORT for one year. Saskatchewan also made moves to stimulate the industry.

The expansion of the $250 million service grant to augment drilling incentives created an upturn in drilling activity in the last quarter. When the grant funds were used up, the subsequent turndown in activity was, of course, disappointing.

The scheduled increases in domestic oil prices under the federal/provincial agreements, provided some further improvement to revenues.

The response by governments last year to our problems perhaps has significance beyond important short-term relief. I believe it reflects a change in attitude — a degree of willingness to listen and try to understand how our industry operates, and how we can make a major contribution to the national and regional economies.

Our Association has tried to use this opportunity advantageously and to encourage consultation and cooperation. In September, for example, industry and the Alberta government developed a position paper on natural gas exports which was discussed with the provincial and federal governments both by the Association, and subsequently by many of our members.

In January 1983, we were pleased to learn the National Energy Board had recommended approval of additional exports of gas to the United States and offshore. We hope this will lead to a commitment by the United States to meet some of their additional long-term needs with stable Canadian supplies.

But there are still many uncertainties facing our industry. For example, we face continuing shut-in oil production, and welcome the government's recognition of the problem through the National Energy Board's approval of 6 360 cubic metres per day of light oil exports as positive first step towards a solution.

The current international oil pricing situation is also a cause for concern, and in this respect your Association has been recommending that domestic oil prices be moved to world level.

And finally there is the uncertainty caused by the continued existence of the National Energy Program in its present form.

On May 31, 1983, the suspension of the IORT and PGRT reduction are up for review, and we hope these tax reductions will be continued. Meanwhile, the retroactive back-in provision on Canada Lands remains a stumbling block to the international investment community whose support is needed not only in the petroleum industry, but also in other sectors in the Canadian economy.

It's clearly time for Canada to put its energy house in order. We need a healthy aggressive oil and gas industry. And it can happen, if our government leaders are willing to continue to discuss and consult, and to introduce measures that will inject life into our industry, give a boost to the Canadian economy, and generate revenue both for governments and industry. If they do, the biggest winner will be the Canadian consumer.

R. H. CARLYLE

Executive Director's Report

1982 was the year in which governments recognized that the expectations and assumptions on which the National Energy Program had been structured were not going to materialize. As a result, a process of adjustment began to modify the disruptive policy shift and correct the harmful consequences of the program. The net effect of these changes was that the year ended on a note of cautious optimism, and that final 1982 statistics will not be as dismal as forecast a year ago. Nevertheless, the harmful effects of the NEP and its cost to the Canadian economy were felt for a second year.

Changes in energy pricing, taxation and royalty arrangements from the federal, Alberta and Saskatchewan governments were the major sources of good news for the industry. Taken with the decline in interest rates experienced toward year end, they resulted in improved cash flow and higher rates of activity than could otherwise have been expected.

Unfortunately, however, serious negative factors offset these fundamentally positive steps: Declining world oil prices and an industry liquidity crisis were major contributing factors to the collapse of the Alsands mega-project. A number of other factors, including the recession, conservation and energy substitution, created marketing difficulties for oil and natural gas. Both of these experienced shut-in producibility.

In 1983 the industry faces many uncertainties. The prospects of the global economy have turned from earlier optimism to much more cautious forecasts. Stability of the international price of oil is threatened and this has a direct impact on the Canadian pricing scene. This is one of the major challenges facing industry and governments, but we believe that it also offers a unique opportunity to change the Canadian pricing approach and remove domestic price regulations to the long-term advantage of governments, industry and, most important, Canadian consumers.

The other major problem of 1983 appears to be the marketing of oil and natural gas. While shut-in oil volumes are not as great as we experienced last year, the problem persists. Solutions must be found to offset the economic penalties incurred for our ongoing import requirements.

The marketing of natural gas, on the other hand, is quickly becoming a domestic as well as an export problem, and innovative approaches will be needed to provide solutions. In the investment decisions of 1983, market prospects are again a major factor. This is a dramatic change from the shortage environment of the past decade.

The radically different situation calls for a change in energy policy development in our country. Rigid attitudes against basic policy changes will need to be re-examined to avoid loss of economic opportunities.

Given the chance, we believe the petroleum industry can lead the way to economic recovery in Canada. What is crucial to that recovery is an effective energy policy planning system which, through consultation with all those who have a part to play in a successful outcome, will ensure benefits for the economy.

Consultation with regulators and policy makers demands much of our Association in the way of timely, thoroughly researched and constructive policy proposals to governments. In the consultative process we continue to depend heavily on volunteer services from our member companies through our committees and task forces. The seriousness and dedication which characterized these efforts in 1982 augur well for the CPA as we face the challenges of 1983.

I. R. SMYTH

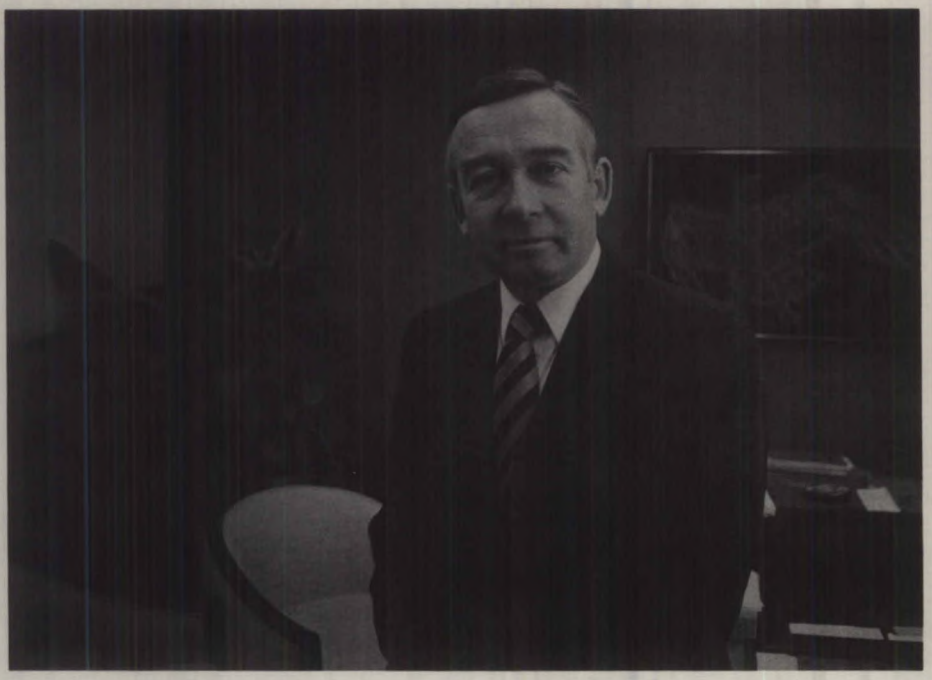
Chairman's Report: British Columbia Division

In 1982, industry activity in British Columbia declined from the low levels of 1981. Bonuses for petroleum and natural gas rights at Crown sales totalled only $16.7 million compared to $60.8 million in 1981 and $181.3 million in 1980. Geophysical activity also fell to historically low levels: Only four geophysical crews were operating at year end compared to 20 as recently as January 1981. Similarly, drilling activity continued the pattern of decline which began in 1981. One hundred and nine wells were drilled during the year versus an annual average of 382 wells for the four years ended March 31, 1981.

This low level of exploration and development activity resulted from reduced availability of investment capital as a consequence of new taxes imposed under the National Energy Program, reduced export demand for B.C. gas, and uncertainty regarding provincial government policy with respect to future wellhead prices for natural gas.

The B.C. government's commitment under the federal/provincial energy agreement to develop a formula to improve industry's share of natural gas revenues was not implemented during 1982. A four man study group chaired by Dr. George Govier was announced in October, however, and asked to advise the government on a full range of matters relating to the marketing and pricing of natural gas. The Govier report was filed in early 1983 but its contents and the government's intentions with respect to the study have not been announced.

Export sales of B.C. gas declined in 1982 to 1.8 billion cubic metres, down from 4.7 billion cubic metres as recently as 1979. B.C.'s role has essentially become that of a seasonal peaking source with attendant difficulties for producers: revenues at take-or-pay levels, no new sales from shut-in discoveries, and maintainance of maximum day capacity in the face of annual sales below minimum contract volumes.



The National Energy Board's Gas Export Omnibus decision of January 1983 potentially broadened the export market for B.C. gas when Dome's L.N.G. project was granted approval to sell 650 billion cubic metres in Japanese markets over a 15 year period.

In early 1983 the provincial government endorsed once again a project which would modestly expand markets for B.C. gas when it renewed a commitment to see the Vancouver Island gas pipeline built. The province is seeking a substantial capital grant for the $457 million project from the federal government pursuant to support promised under the National Energy Program.

During the year, the Division offered all possible assistance to the government in setting future energy policy. Several meetings were held with Cabinet Ministers; Ministry of Energy, Mines and Petroleum Resources officials at all levels; and officials of the B.C. Petroleum Corporation. In addition, reports were submitted to the government concerning pricing and marketing issues.

In addition, several Board of Directors meetings and the annual meeting were held in Victoria. These occasions provided opportunities to meet again with government officials and with the business community.

The natural gas industry has an important role to play in the province's economic well being, and could be the catalyst to get the province moving forward again. But we see no hope of significant improvements for the natural gas industry during 1983 even if appropriate measures are taken immediately. 1984 and beyond are more hopeful, but changes in provincial energy and economic policies will first have to be made.

R. C. Galloway

R. C. GALLOWAY

Chairman's Report: Saskatchewan Division

The Saskatchewan Division of CPA experienced a busy and productive year in 1982.

A new government took office in the province on April 26, and a different purpose and a change in direction were evident from the outset. The petroleum industry was invited to present its views and the Division was involved and consulted. Perhaps mindful that more than one-quarter of provincial revenues are derived from our industry, the government expressed a willingness to improve the fiscal regime and regulatory climate. Shortly after taking office, the government began to review and change the existing royalty and regulatory structure.

The Division was invited to participate in this process by developing a critique of the tax and royalty regime. A document entitled **A Study of the Tax and Royalty Regime in Saskatchewan** was completed and presented to the Minister of Mineral Resources on June 8.

The document investigated most aspects of the fiscal climate in Saskatchewan, comparing the royalty regime with the more attractive one in Alberta, and made recommendations to revitalize the industry in Saskatchewan.

The government responded quickly, announcing a new royalty regime on July 5th. Probably the most significant aspect of this was the royalty holiday - one year for all new oil wells drilled, three years for deep oil development wells and five years for deep exploratory wells. While the changes were not sufficient to restore levels of activity fully, they were encouraging.

At least as important as the royalty changes was the new government's tangible willingness to consult the industry and to improve the situation for operators in the province. Industry's response to these initiatives is probably best shown by the increase in active drilling rigs in the province from the previous year.

There are other signs that augur well for the future: for one, eastern Canadian refineries are upgrading their facilities to handle greater volumes of heavy oil; in addition, the province has modified its natural gas pricing and royalty system to increase natural gas exploration and development.

But there are also potential snags.

The Alberta royalty regime is still more favourable and we are not likely to realize our full potential in Saskatchewan until the province's situation is more competitive.

In addition, the industry faces marketing, pricing and netback uncertainties.

Also the $5 per cubic metre incentive related to oil production terminated at the end of 1982, and the lapse will adversely affect cash flow.

The best response to these issues would be to price all production at NORP rates, a move which would enable costly and cumbersome administrative machinery to be dismantled and would permit the market itself to be the regulator.

In the area of marketing, the boom and bust cycles associated with shut-in crude and the lack of incentives to develop oil and gas resources are obvious concerns. It is clearly time to reexamine Canadian export policies and procedures, and to restore the province's crude oil production as the industry's base supply rather than the swing supply.

We face many uncertainties in the year ahead. The petroleum industry can be a major contributor to an economic recovery, but this will require radical changes in energy policy to provide the needed stimulus. Through consultation with government, your Association will make efforts to achieve this change.

J. J. SULLIVAN

Chairman's Report: Pipeline Division

The Pipeline Division's major sphere of activity during 1982 centered on rate regulation.

During March, members of the Executive Committee met with key people in the NEB to present two reports commissioned by the Division: **A critical Evaluation of Liquids Pipelines Regulations in Canada** and **The place of Liquids Pipelines and the Regulatory Alternatives.** The papers were given to the NEB as research documents. Instead of making an industry submission, the Association favoured dealing with pipeline regulation in individual company hearings.

During April, discussions were held with the NEB with respect to initial approaches to the solution of problems peculiar to pipelines. Partially as a result of these discussions, a conference was held in Montreal to deal with such subjects as the declining ratebase problem, the effects of inflation on the regulation of pipelines and the implications of changing to new methods of regulation. The conference was sponsored by the NEB and the McGill Centre for the Study of Regulated Industries.

The November conference drew representatives of all companies and groups interested in and affected by the regulation of liquids and natural gas pipelines. Varied viewpoints and suggestions for regulatory change were presented and vigorously discussed. This conference laid the groundwork for improvements to the regulatory framework that will be implemented in rate hearings for some of the pipelines in 1983.

In February, the NEB announced that it would study the rapid increase in the costs of new pipeline construction, and asked for our cooperation. Although the Division did provide information wherever possible, it had little direct involvement in the project. A report entitled **Pipeline Construction Costs 1975-1985** was released in June. The study received considerable attention and the Energy Minister announced that a federal government task force would be appointed to recommend ways to better control costs.

As a result of the NEB report on pipeline construction costs, discussions with the NEB about regulatory costs and jurisdictional overlap were initiated. This resulted in several meetings between members and staff of the NEB and pipeline company representatives. The major subject of discussion was the degree of regulation and its cost effectiveness for operating pipelines. The Division has now agreed to make specific recommendations with respect to regulation under Part IV of the NEB Act. An *ad hoc* committee under the vice chairman has been set up, and a management firm has been contracted to assist. This project will continue through 1983.

D. R. FENTON

Operating review of industry activity

In early 1982 the petroleum industry experienced an unprecedented liquidity crisis. The situation resulted from several factors, primary among which was the National Energy Program. The NEP's Canadianization objective created a "not welcome" climate for foreign investors, depressed stock values of foreign companies operating in Canada and encouraged a high level of take-over activity, the main cause of the current heavy debt load. High interest rates syphoned off a large portion of cash flow to service debt, leaving fewer funds for reinvestment.

At the same time, revenues were reduced by oil and natural gas marketing problems.

Gas export sales to the U.S. fell well below authorized volumes. And while deliveries commenced under new authorizations with the completion of the prebuild pipeline system, total 1982 export volumes (and revenue) were only slightly ahead of those of 1981. The domestic gas market remained flat despite a highly successful off-oil conversion program. In early 1983, however, the NEB authorized additional exports of 12.2 exajoules, which included licenses to export liquefied natural gas to Japanese markets.

Early in the year the industry faced a serious shut-in oil situation. To offset production cut-backs ordered by the Alberta government at the height of the confrontation with Ottawa, refiners had contracted with overseas suppliers. These arrangements were still in place in the new year. As petroleum products demand continued to drop because of the recession, western Canadian producers temporarily became swing suppliers and were forced to shut in large volumes of light and heavy crude oil. The problem was worsened by the inflexibility and certain peculiarities of the government's import compensation program, which effectively encouraged refiners to buy on weak spot markets in preference to using domestic oil.

The federal government did take initiatives that led to an eventual solution of the difficulties and production was restored to near capacity levels in the second half. But the problem, a complex issue that involves both national security considerations and logistical constraints, has reappeared. Although the federal government is now prepared to allow light oil exports to try to solve the problem, the soft world spot market will provide quite a challenge to negotiate actual sales.

Cash flow

In April 1982, the Alberta government significantly reduced its royalty rates. The federal government followed with certain (mostly temporary) reductions in its tax take. The newly elected Conservative government in Saskatchewan also improved the fiscal environment of the industry and introduced positive incentive programs. These moves together with increases in regulated oil and gas prices and the substantial drop in interest rates improved the industry's cash flow, especially during the second half of the year.

"Western Canadian producers temporarily became swing suppliers and were forced to shut in large volumes of light and heavy crude oil."

Land sales & drilling

Government receipts from land sales — the bellweather indicator of the industry's health and outlook — fell 44 percent in 1982 after a decline of nearly 47 percent the previous year.

Drilling activity in conventional areas, another key indicator of investor confidence and industry optimism, experienced a surge at year end, attributable largely to a drilling incentives program in Alberta. But the late surge could not correct a drop in annual well completions. In April, as part of its Oil and Gas Activity Program, the Alberta government set aside $250 million to aid the service sector of the industry. The program offered to pick up a certain percentage of the maintenance and work-over costs of oil and gas wells. When it became apparent that less than 25 percent of the fund would be used, the government made development drilling eligible for assistance. Industry response was swift and the available money was spent before the program's scheduled expiry date.

Well completions totalled 6562, compared with 7186 in 1981. This represented a drop of 8.7 percent, and a 29 percent decline from the 1980 peak. Drilling metreage dropped by 11.9 percent.

Oil sands

Cancellation of the Alsands project at the end of April was a serious blow to the federal government's mega-project based economic strategy. Despite a final offer from governments of an attractive fiscal regime, the economic window had closed and the three sponsors remaining from the original eight decided to wind up the project.

There was, however, other significant oil sands activity.

Syncrude began a $180 million three-year program to increase plant capacity by 1600 cubic metres per day. The program includes debottlenecking existing mining and processing procedures.

Suncor began a $170 million program to improve the efficiency of its Fort McMurray plant and a further $185 million to mine a sizeable extra portion of the lease. This area is expected to contribute about 14 million cubic metres to total production.

Beaufort Sea and Arctic Islands

Although 1982 drilling results were disappointing, the search for a threshold oil discovery continued. The greatest

disappointment came at the Tarsiut structure in the Beaufort Sea. This structure until recently was thought to be the most likely to first produce frontier oil. Kiggavik A-43, a long step-out well about 12 kilometres from the original discovery, failed to confirm the extension of the oil zone and tested only gas. The drilling results suggest that the Tarsiut field contains only 55 million cubic metres of recoverable oil, substantially less than the minimum reserve needed to justify development.

Also in the Beaufort Sea, Nerlerk M-98 was tested and confirmed as an oil discovery. Eight tests flowed oil at varying rates up to 64 cubic metres per day. Although these flow rates were not impressive, the operator plans another test on this large structure. Construction of an artificial island was about 60 percent complete before ice forced suspension of dredging operations.

Kenalooak J-94 was re-entered in July and drilled to a total depth of 4650 metres. The discovery tested gas at estimated absolute open flow rates of 1.4 million cubic metres per day. Orvilruk 0-3 and Irkaluk B-35 were dry and abandoned.

New drilling technology is extending the drilling season in the Beaufort Sea.

Drilling began at Uviluk P-66 from an artificial island in 30 metres of water, using a new semi-submersible drilling caisson. Dome Petroleum's Single Steel Drilling Caisson (SSDC) was constructed from the forward half of a 250 000 dwt tanker. It was modified by strengthening the hull and installing a ballast system. The bow section was removed to accommodate the rig package (mounted on rails) and a 130-bed accommodation camp. The Uviluk island is equipped with ice research equipment to monitor ice conditions and ice pressure from pads placed around the hull to gather data.

Another important development in drilling technology is Esso Resources' doughnut-shaped steel caisson to be used initially to drill on the Kadluk structure in 14 metres of water.

The unit, built in Japan at a cost of $55 million, consists of eight 1500 tonne steel segments. When linked together the doughnut is 100 metres in diameter. The big advantage of the system is that it can be refloated and used at other locations. It also substantially reduces the volumes of ballast and fill material required.

Panarctic, major operator in the Arctic Islands, concluded 20 exploration agreements under the government's new Canada Oil and Gas Act. These agreements involve about $700 million in continuing exploration activity over the next five years. The agreements cover

"The Tarsiut structure in the Beaufort Sea... until recently was thought to be the most likely to first produce frontier oil."

more than 13.7 million hectares and call for the drilling of 25 wells, 17 of which will be drilled from offshore ice platforms.

At the beginning of the winter drilling season, drilling began on the first well of a four-well deep drilling program on the Sabine Peninsula of Melville Island. The program wells will be drilled to depths between 4250 and 6700 metres using a newly built rig designed for the program. A delineation well is also underway on the promising Cisco oil structure. As currently mapped, the structure could have an areal extent of over 200 square kilometres. The geology is believed to be excellent with very little faulting. The winter drilling season's 8-kilometre stepout well may reveal much more about the field and will also provide the first production tests of the reservoir. In addition, two new exploratory wells are planned for the winter season north and south of the Char gas field offshore Ellef Ringnes Island. The program budget is $115 million.

Norman Wells

Construction of the Norman Wells pipeline will begin in late 1983. The first crude oil pipeline built in the Canadian far north since the famous Canol project during World War II, the line will stretch 897 kilometres from the Norman Wells oilfield to northern Alberta. The project results from the operator's decision to expand the oilfield from 480 cubic metres per day of production to some 3975 cubic metres per day of oil and about 475 cubic metres per day of natural gas liquids. The pipeline will be built in two 90-day winter periods in 1983-84 and 1984-85; total cost is estimated at $576 million.

In 1982 Esso Resources began island construction for the expansion of the field. Four artificial islands are to be completed in 1983 and two more in 1984 at a total cost of $100 million. In addition, a waterflood program will be established. The total expansion program will require the drilling of about 150 wells and a central processing complex in addition to the river islands. The budget for the entire project is $800 million with project completion scheduled for July 1985.

Eastcoast Offshore

The eastcoast offshore continued to be a major focus of industry activity, although activity has slowed because of continuing jurisdictional conflicts over offshore resources between Newfoundland and the federal government. The Supreme Court of Newfoundland, to which the provincial government referred the question of offshore resource ownership, has ruled in favour of the federal government - a decision which is being appealed. In addition, the Supreme Court of Canada is considering a more limited question related to development at Hibernia.

At year end only one operator was active off Newfoundland, and was drilling the last appraisal well in the Hibernia field. In addition, an exploratory well had been started at North Dana J-43, a 5334 metre test 108 kilometres northeast of the Hibernia discovery.

The newly constructed John Shaw, a dynamically positioned semi-submersible drilling rig, was originally intended to drill off Newfoundland. But because of the jurisdictional dispute the operator assigned the vessel to Nova Scotia waters where she is drilling the 5791 metre Bluenose G47-A wildcat, 328 kilometres east of Halifax. The Bluenose test is on a separate structure about 17 kilometres northeast of the Venture gas discovery.

The Venture area continued to bring encouraging exploration results. The Olympia A-12 and South Venture O-59 tests, apparently on separate structures from the Venture field, flowed gas at high rates. The South Venture well tested seven zones for a cumulative flow rate from all tests of about 2.6 million cubic metres per day and 540 cubic metres per day of condensate. The highest single rate recorded was 513 thousand cubic metres per day and 144 cubic metres per day of condensate. For the Olympic A-12 discovery the cumulative flow rate from all tests amounted to about 1.58 million cubic metres per day and about 102 cubic metres per day of condensate; the highest individual flow rate was 493 thousand cubic metres per day and 17 cubic metres per day of condensate. South Venture 0-59 also set a new Canadian depth record (both onshore and offshore) of 6176 metres.

On the Scotian Shelf, negotiations of exploration agreements covering 1.94 million hectares and involving exploration commitments totalling $550 million were successfully completed. Shell Resources has contracted a semi-submersible drilling rig for a three-year term to participate in the drilling of nine commitment wells. The first well in this series, Shubenacadie H-100, drilled in 1470 metres of water at a location 230 kilometres southeast of Halifax, has been abandoned.

The 1982 Labrador drilling program wound up without results. Two wells (Rut H-11 and Corte-Real P-85) were re-entered and deepened and subsequently suspended to be re-entered and completed in 1983. Pothurst P-19 was drilled to 3843 metres and suspended, also to be re-entered in 1983.

Further north, in the inhospitable Davis Strait, Canterra tested the Ralegh structure identified by previous seismic work. Despite drilling conditions considered to be among the harshest in the world, the Ralegh well was drilled by drillship to 3858 metres in 351 metres of water in just 64 days. No hydrocarbons were encountered, although the test was just 20 kilometres from the Hekja well which found natural gas and condensate in large quantities.

At year end, exploration agreements covering over 6.88 million hectares in the eastcoast offshore had been negotiated under the Canada Oil and Gas Act proclaimed on March 5, 1982. The combined commitments under these agreements could involve exploration expenditures totalling nearly $2 billion.

"Despite drilling conditions considered to be among the harshest in the world, the Ralegh well was drilled by drillship... in just 64 days."

January

- The British Columbia government announced rebates to compensate B.C. gas producers for increased federal taxes. This measure was introduced to avoid producer netback erosion.

February

- The semi-submersible drilling rig Ocean Ranger and all 84 hands on board were lost at sea during a violent storm off Newfoundland.

- Newfoundland Premier Peckford issued an ultimatum to the federal government to put aside its claim for exclusive ownership of the offshore mineral resources if a negotiated agreement was to be successfully concluded.

- An omnibus bill entitled Energy Security Act 1982 was tabled in Parliament. The bill was designed to implement the final major elements of the National Energy Program.

March

- The governments of Canada and Nova Scotia reached agreement on offshore oil and gas resource management and revenue sharing.

April

- The federal government announced a series of measures designed to improve markets for and reduce the volume of shut-in production of western Canadian crude oil.

- The government agreed to split the Energy Security Bill into eight new energy bills to enable passage by Parliament.

- Alberta unveiled the Alberta Oil and Gas Activity Program to stimulate the conventional oil and gas sector.

- Alsands Energy Ltd. announced its decision to wind up the proposed oil sands mega project in northeastern Alberta. The wind-up of project work programs and dissolution of the project team was completed by July 31.

May

- The National Energy Board adopted more flexible procedures to determine the amount of natural gas in Canada available for export. This opened the door for consideration of some 30 applications to export natural gas.

- As part of the "National Energy Program: Update 1982," the federal government announced a package of price and tax changes for the petroleum industry.

June

- The federal government established the Petroleum Incentives Administration, responsible for administering the Canadian Ownership/Control Status Program and the Petroleum Incentives Program.

- The Prime Minister released correspondence on the Newfoundland offshore dispute and offered to resume negotiations without preconditions even though the matter was before the courts.

July

- The recently-elected Progressive Conservative government of Saskatchewan announced major revisions to the provincial royalty regime.

- Irving Oil Ltd. agreed to purchase more than 5000 cubic meters per day of light Alberta crude oil for its Saint John refinery over the July 1982 - June 1983 period. This oil, which would displace some of Irving's offshore crude supply, is delivered via the Interprovincial Pipeline system to Montreal and then by Canadian flag tanker to the refinery. The extra transportation costs are paid out of the Petroleum Compensation Fund.

- Parliament gave final approval to energy security legislation (eight bills).

- The federal government issued exploration agreements covering 1.7 million hectares on the Scotian Shelf without public competition.

August

- The Alberta government expanded its oil and gas well servicing incentives to provide cash grants to help cover the cost of development drilling.

- Syncrude reported the production of its 100 millionth barrel of synthetic crude oil since production began in February 1978.

September

- The Hon. Jean Chretien succeeded the Hon. Marc Lalonde as federal energy minister, vowing to ensure that the government's energy policy would be well understood and work smoothly.

- The eastern leg of the pre-build pipeline began transporting Alberta gas to U.S. markets.

- Dome Petroleum Limited announced agreement in principle for restructuring and increasing Dome's capitalization. The proposed financial package was negotiated with four Canadian banks and the federal government and could include a $1.5 billion cash injection into the company together

with an extension of the term of a substantial portion of Dome's existing debt to at least ten years.

October

- Petro-Canada bought BP Canada's marketing and refining business for $577.5 million.

- The Alberta government modified enhanced recovery incentives to encourage industry to pursue large enhanced recovery projects.

November

- The federal government established a Royal Commission on the Economic Union and Development Prospects for Canada. The primary task of the commission is to assess Canada's longer term economic potential.

December

- The federal and Newfoundland energy ministers resumed talks aimed at reaching an agreement on offshore resource management and revenue sharing.

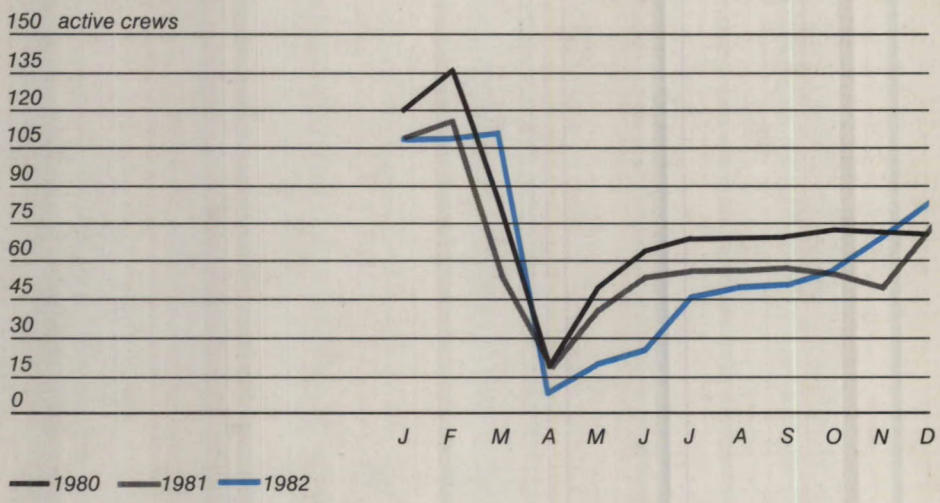
- The Manitoba government introduced legislation to create the government-owned Manitoba Oil and Gas Corporation.

Seismic activity shows year end improvement

Geophysical activity experienced a second consecutive year of decline, although renewed activity at year end brought active crews up to 1980 levels.

Geophysical activity

Source: Daily Oil Bulletin

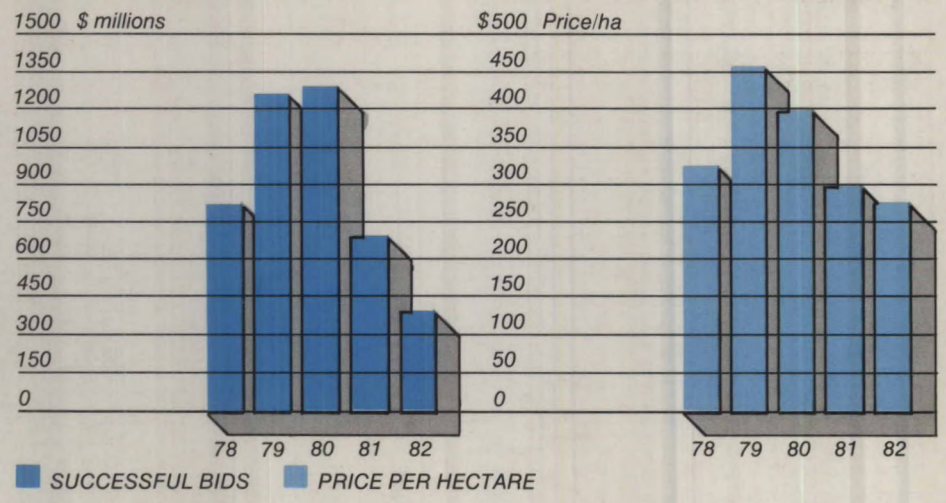


Land sales decline

Government land sales in western Canada, which had been rising rapidly in the late 1970s, continued their decline. Total expenditures for land dropped 47 percent in 1981, 44 percent in 1982. Average land prices per hectare, on the other hand, began to decline in 1980, and last year's average stood nearly 40 percent below the 1979 high. An indicator of future exploration trends, these statistics suggest there will be no major turnaround in exploration activity in the foreseeable future.

Government land sales

Source: Government Energy Departments

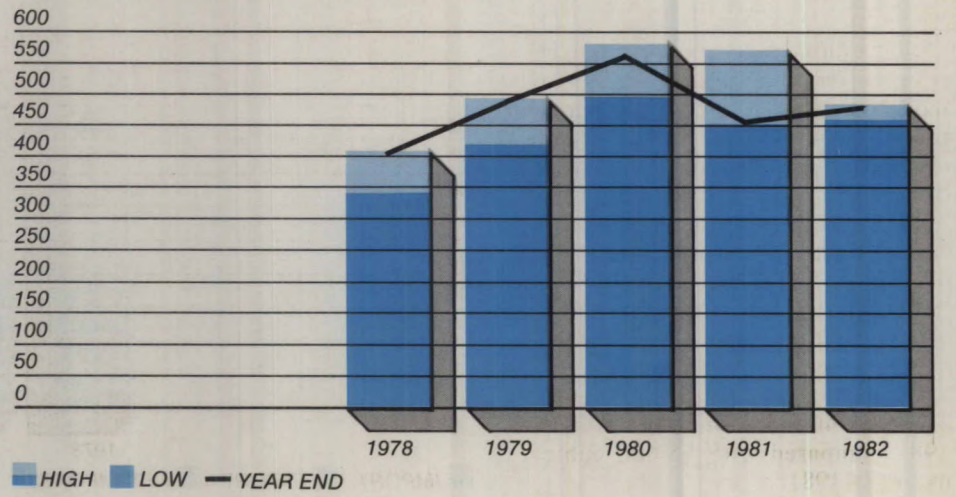


Drilling rig fleet increases slightly

The fleet of drilling rigs available in western Canada increased slightly during the year, although drilling activity generally remained below year earlier levels. Except for drilling in November and December, rig utilization was less than 50 percent. The exceptionally high year-end drilling was the result of Alberta government incentives, which ended December 31. In the new year, winter drilling declined to its lowest level since 1976.

Available drilling rigs - Western Canada

Source: CAODC

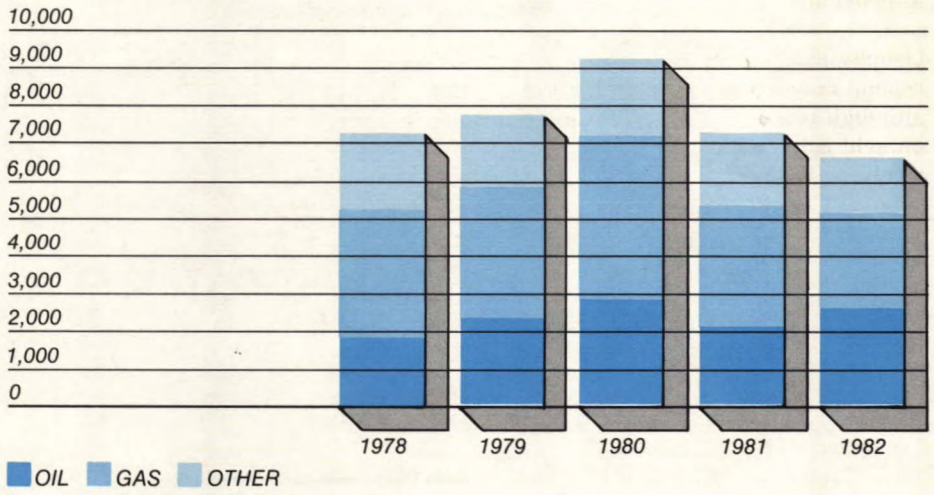


Completions decline

Alberta drilling incentives and an increase in Saskatchewan drilling in the second half were not enough to stop a further slide in well completions. While gas completions dropped by 20 percent, oil completions rose 21 percent, reflecting the industry's shift to oil exploration and development.

Drilling completions

Source: CPA

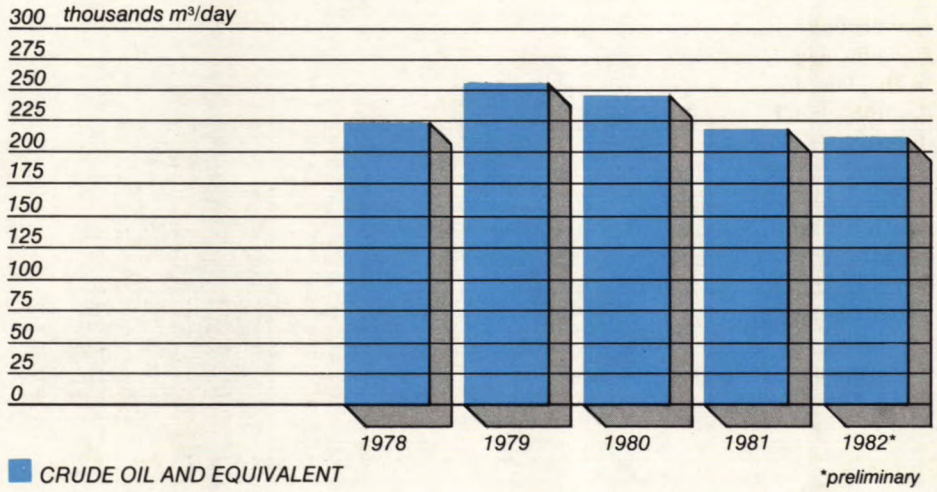


Oil production continues decline

Daily production volumes of crude oil and equivalent experienced their fourth consecutive year of decline, with preliminary estimates of production at 210 140 cubic metres per day. The lower output reflects the severe problem of shut-in production earlier in the year.

Production

Source: CPA

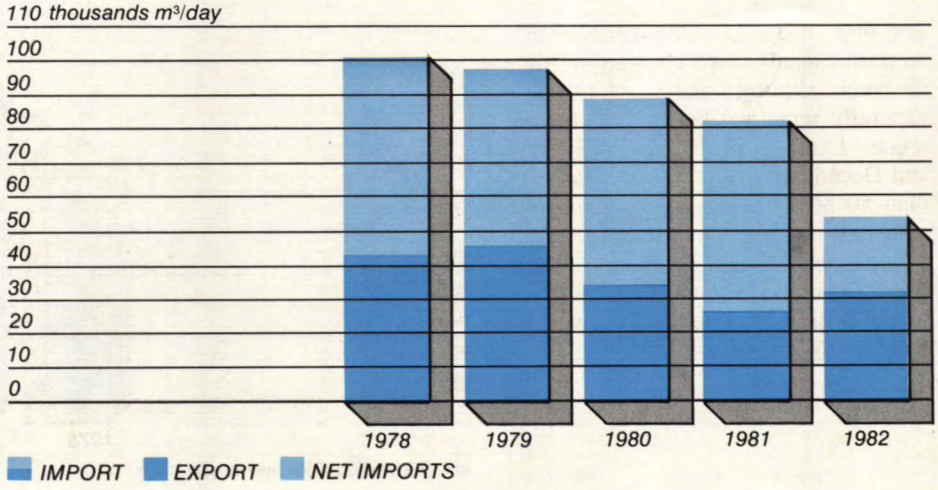


Imports reduced

A severe drop in net crude oil imports resulted largely from a recession induced decline in demand for petroleum products, and from conservation and energy substitution measures. In addition, the signing in 1981 of the federal/Alberta energy agreement restored Alberta production cutbacks. While imports declined to 54 percent of their 1978 level, heavy oil exports firmed up slightly from 1981. The above numbers include crude oil exchanges. Daily imports for domestic consumption averaged 46 900 cubic metres in 1982 compared with 55 600 cubic metres in 1981.

Crude oil imports/exports

Source: Statistics Canada

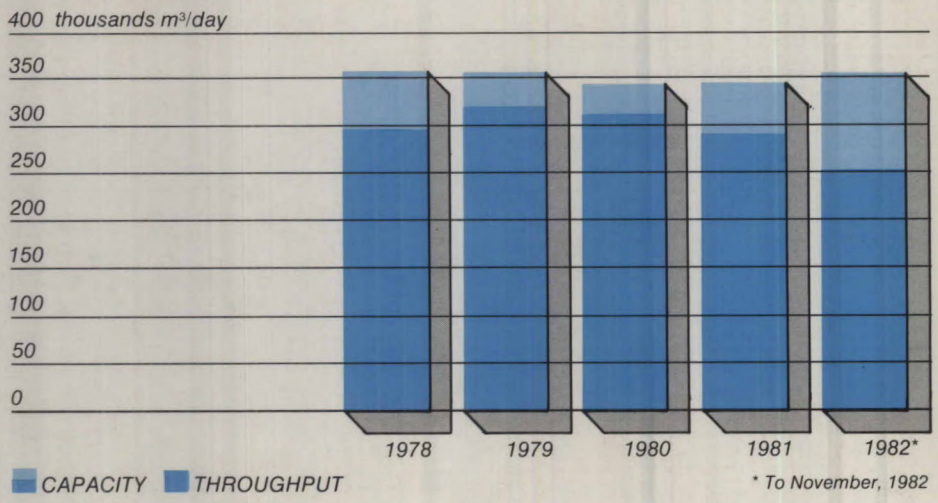


Refinery demand for crude oil declines

Based on year end operative capacity, Canadian refinery utilization rates declined to 71.2 percent during the year, and refiners made plans to close five refineries with total capacity of 44 900 cubic metres per day during 1982 and 1983. Even with these closures, utilization rates will still be less than optimal in 1983 unless refined products demand increases substantially.

Refinery utilization

Source: CPA, Statistics Canada



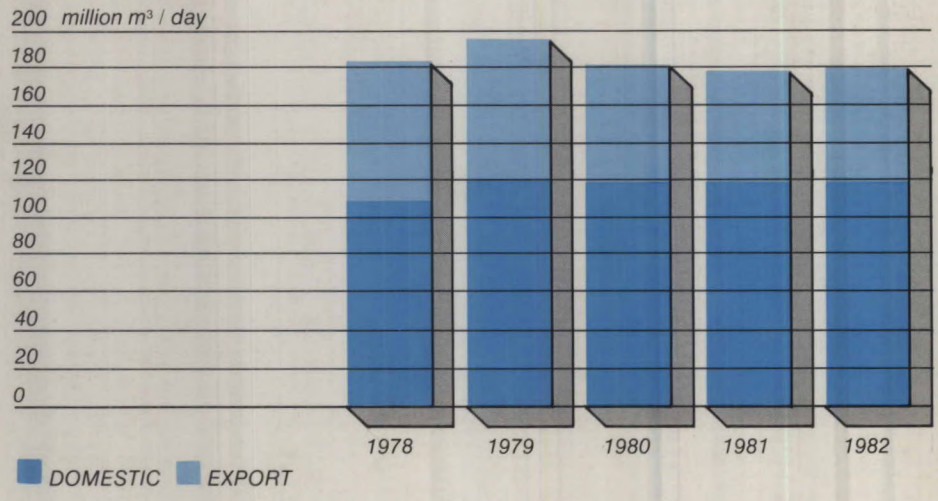
* To November, 1982

Natural gas production stays level

Although volumes of marketed natural gas were unchanged from 1981, the statistics do not reflect the drop in export volumes apart from the deliveries which began flowing through the eastern leg of the new prebuild pipeline in September. Export sales averaged only 49 percent of licensed volumes for the year. Domestic sales remained firm, primarily because new markets were developed as part of the federal government's off-oil program.

Natural gas sales

Source: Statistics Canada

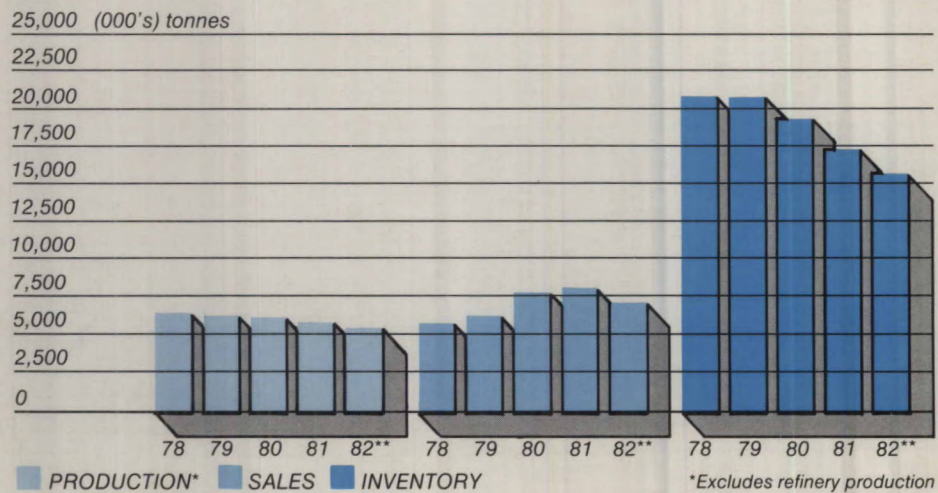


Sulphur sales drop

Inventory and production of sulphur declined for the fifth consecutive year, while sulphur sales remained relatively strong. Western Canada maintained its position as the world's single largest sulphur supplier. Although sales declined, 1982 was the fourth consecutive year in which sales exceeded production. This reduced stockpiled inventories by 24 percent from their 1978 peak.

Sulphur

Source: CPA



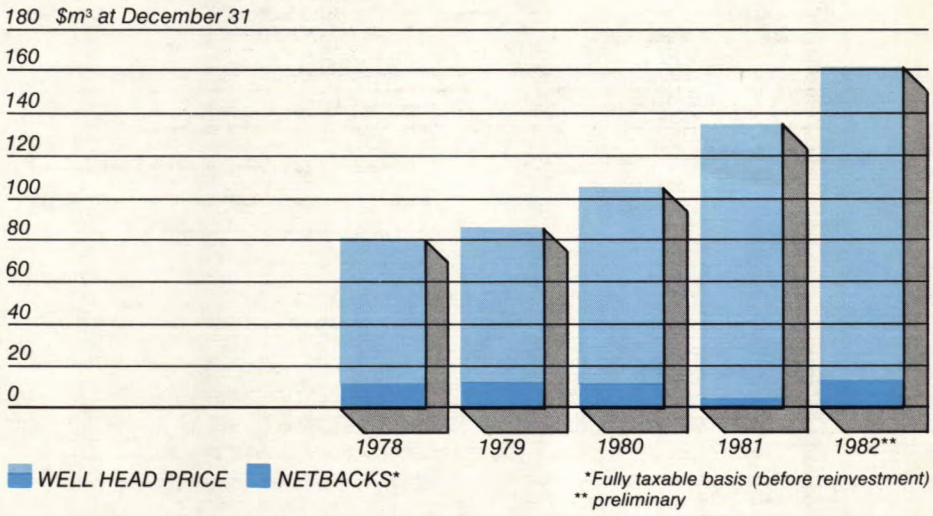
*Excludes refinery production
**1982 inventory preliminary

Old oil netbacks return to pre-NEP levels

Netbacks on old crown oil returned to the levels of 1978-1980 after a severe decline in 1981. The improvements resulted primarily from royalty reduction by the Alberta government, the suspension of IORT and a reduction in PGRT by the federal government, and increases in old oil prices.

Netbacks* on Alberta old crown oil

Source: CPA



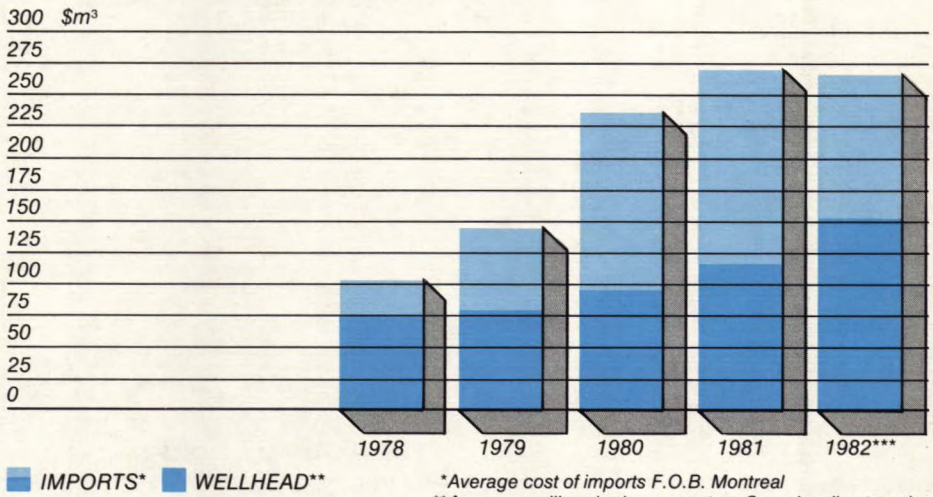
*Fully taxable basis (before reinvestment)
** preliminary

Spread between world and domestic prices narrows

For the first time since the rapid price escalations for crude oil on world markets in 1979/80, the gap between average domestic and imported oil prices began to narrow. This situation is the result of higher prices for domestic oil coincident with price declines on world markets.

Comparison of domestic/import oil costs

Source: EMR and CPA



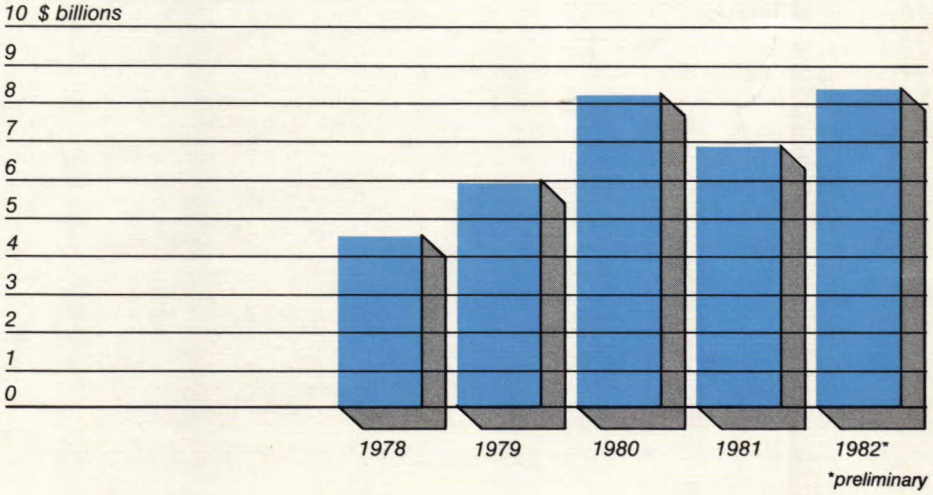
*Average cost of imports F.O.B. Montreal
**Average wellhead price — western Canada, all categories
***1982 wellhead preliminary

Spending rises to 1980 levels

Preliminary estimates of spending for exploration, development and oil sands investment were $8.4 billion, a return to 1980 levels. Frontier expenditures, supported by PIP grants, accounted for a much larger share of total spending.

Investment

Source: CPA



*preliminary

Glossary

Acronyms

COGLA - Canada Oil and Gas Lands Administration
IORT - Incremental Oil Revenue Tax
NEB - National Energy Board
NEP - National Energy Program
NORP - New Oil Reference Price
PIP/APIP - Petroleum Incentives Program/Alberta Petroleum Incentives Program
PGRT - Petroleum and Gas Revenue Tax

Terms

Exploratory well
A well drilled in unproved or semi-proved territory for the purpose of ascertaining the presence of a commercial petroleum deposit. By contrast, the term "development well" refers to a well drilled with the expectation of producing from a known productive formation. Development wells are located in accordance with spacing regulations and field development requirements.

Infill drilling
Wells drilled within the proved boundaries of a reservoir to increase production.

Land sales
The sale of mineral rights to specified parcels of land by government auction.

Natural gas liquids
Hydrocarbons found in natural gas which may be extracted or isolated as liquefied petroleum gases and pentanes plus (condensate).

Royalties
Payments made to the resource owner – governments, freehold landowners or Indian bands – usually calculated as a percentage of sales price of production

Semi-submersible drilling rig
A rig with a platform deck supported by columns which are connected to large underwater displacement hulls or large vertical caissons or some combination of the two. The columns, displacement hulls, or caissons are flooded on site.

Step-out well
A well drilled some distance away from a producing well in an effort to ascertain the extent and boundaries of a producing formation.

Waterflood
An enhanced recovery method in which water is injected into the producing formation to maintain reservoir pressure and force the oil toward the producing well bore.

Well completions
Wells completed and prepared for production as oil and gas discoveries, or drilled to total depth, found dry and abandoned.

Wellhead prices
The price paid at the wellhead for oil or gas produced.

Metric conversions

1 cubic metre (m^3) = 6.29 barrels crude oil

1 cubic metre = 35.49 cubic feet natural gas

1 exajoule (ej) = 1000 petajoules
= 0.95 trillion cubic feet natural gas

1 hectare (ha) = 2.47 acres

1 kilometre (km) = 0.62 miles
= 0.54 nautical miles

1 tonne (t) = 0.98 long tons
= 2 205 pounds

The Canadian Petroleum Association: Background

The people of the Canadian Petroleum Association have been exploring and developing Canada's oil and natural gas resources since the industry's earliest days in western Canada. The industry was drawn together by common needs and interests and just 13 years following the discovery of oil in Turner Valley, the Alberta Oil Operators Association was formed. As the industry grew and its activities broadened, so did those of its Association. The Association's name also evolved to reflect its broader role. In 1952, the organization reached the basic form it uses today, and the current name was adopted.

The industry and the Association continue to grow as Canada's northern and offshore frontiers are explored and as unconventional resources like the Alberta oil sands are developed.

Today CPA has offices and staff in six provinces. Its major responsibilities include helping to inform the Canadian public about critical energy issues, preparing technical and analytical submissions on behalf of the industry for government agencies, and gathering and disseminating operating, economic and policy information for members.

The active membership of CPA comprises companies engaged in Canada's oil and natural gas industries (other than as contractors, suppliers or marketers) and includes most major pipeline companies. CPA's members produce more than 80 percent of Canada's crude oil and about two-thirds of its natural gas. In addition, some 90 companies which support industry activity in a variety of ways are associate members.

A Board of Governors directs the affairs of the Association, develops its policies and provides liaison with provincial and federal governments. There are 34 Governors: 30 are elected from the active membership; other Governors are the Past Chairman and the Chairmen of the Association's three Divisions.

The Saskatchewan Division has offices in Regina; the British Columbia Division offices are in Victoria; and the Pipeline Division is based in Calgary. Each Division is governed by a Board of Directors. The Association's headquarters are in Calgary, and other offices are located in St. John's, Ottawa and Montreal. Thirty-three staff members provide technical support for, and coordination of, Association activities. These activities include public affairs programs, information gathering and dissemination, committee coordination, compiling and publishing annual industry data and statistics, and maintaining an industry reference library.

The Industry and the Association: A chronology

1914

Western Canada's first major gas discovery: Dingman #1 well in Turner Valley.

1927

The Alberta Oil Operators Association is founded in Calgary.

1929

The Association becomes the Oil And Gas Association of Alberta.

1936

Crude oil is discovered on the southwestern edge of Turner Valley.

1937

The Petroleum Producers Association is formed.

1938

The Oil and Gas Association and Petroleum Producers Association merge to become the Alberta Petroleum Association.

1947

The modern era of petroleum exploration and production begins with the Leduc #1 oil discovery. The Alberta Petroleum Association is renamed the Western Canada Petroleum Association.

1952

The Canadian Petroleum Association is formed in recognition of the industry's prominence on the national scene.

1958

CPA sets up an information office in Ottawa.

1960

The first exploratory well is drilled in the Canadian Arctic.

1967

The first commercial oil sands plant begins operations in the Athabasca oil sands.

1979

The first commercial oil discovery off the east coast of Newfoundland is made at Hibernia.

1981

A CPA office is established in St. John's Newfoundland in cooperation with the Eastcoast Petroleum Operators' Association.

1982

A Montreal information office is established.

CPA activities

In 1982 the Association continued the mass communications program begun in 1980, a Canada-wide campaign designed to provide information about Canada's energy situation to the general public. The program began on television, supported by newspaper and magazine advertisements, and later expanded to include radio messages as well.

As part of the mass communications campaign, and with the assistance of the Public Affairs Committee, the Association worked to provide authoritative information through other channels.

News conferences were held on several occasions, and the Association served as an important source of comment, technical and analytical information for the nation's news media. Speakers representing the petroleum industry addressed audiences in nine provinces at 128 engagements. Strong demand continued for the Association's energy publications, **Statistical Handbook** and the weekly newspaper column. The monthly **CPA Review** began publication in a well received new format.

In addition, the Association prepared an audio-visual presentation (later transferred to videotape) on Canada's petroleum industry and published a companion booklet entitled **Our Petroleum Resources.**

During the year, the Association began offering a daily radio program, produced locally in Calgary, entitled **Energy Report**.

The Association made numerous submissions, briefs and reports during 1982 to Federal and provincial governments and government agencies. The following lists, although they represent only a portion of the CPA's 1982 activities, give an idea of the depth and breadth of the CPA's involvement in industry concerns.

Reports, publications and briefs

- *Guidelines on offshore mapping surveys.*
- *A review of petroleum industry operations and other land use activities affecting wild life*
- *Urban development of lands containing pipeline easements*
- *The legislative process in Canada; passage of the Canada - Oil and Gas Act (Bill C-48)*
- *Oil pipeline performance review*
- *A critical evaluation of liquid pipeline regulation in Canada*

Submissions

- A submission to Canada Oil and Gas Lands Administration on proposed Canada Oil and Gas Pipeline Regulations
- Arctic Pilot Project Facilities Hearing
- B.C. Commissioner's Inquiry on B.C. Gas Protection Formula
- Omnibus Natural Gas Export Hearing
- Alberta Natural Gas Pipeline Hearing
- Trans-Quebec and Maritimes Rate Hearing
- Ministry of Finance Pre-budget Submission
- Petroleum Monitoring Agency regarding Operating Cost and Income Tax Reporting
- Alberta Energy and Natural Resources (ENR) regarding Exploratory Drilling and the Geophysical Incentives Program
- ENR regarding Oil and Natural Gas Royalties
- ENR regarding Incentives for Enhanced Oil Recovery
- Finance Canada regarding Extension of Customs Jurisdiction Offshore
- Finance Canada regarding Natural Gas and Gas Liquids Tax
- Submission on the Post Office Definition of a Letter
- Submissions on the Canada Oil and Gas Act
- Submission to the House of Commons Standing Committee on Finance, Trade and Economic Affairs regarding the November 13, 1981 Budget and subsequent amendments
- Submissions on Shut-in oil in Western Canada
- Submission to the Petroleum Incentives Administration regarding PIP, COR and CCS
- Submission to the Alberta Petroleum Incentives Program regarding Exploration and Development Overhead
- Submissions to Saskatchewan Energy and Mines regarding Freehold Oil and Gas Production Tax and Saskatchewan Royalties and Incentives
- Submissions regarding Petroleum Reporting in Alberta
- Submission to the Canada Employment and Immigration Commission on Manpower Planning.

Seminars

- Annual Petroleum Industry Safety seminar (Co-sponsor)
- Drugs in the Workplace seminar
- Laser Systems seminar
- Annual Environmental Workshop (co-sponsor)

In 1980 the Canadian Petroleum Association started a nation-wide campaign to inform the Canadian public about the petroleum industry. That program continued in the spring of 1982 and entered a new phase in the fall.

From the beginning the campaign has responded to interviews with people in all provinces, to bring Canadians accurate and timely knowledge about the industry, its role and its contribution to the Canadian economy.

Prior to starting the campaign, CPA surveys of Canadians showed the industry to be losing its reputation for integrity, accountability and reliability.

Since public understanding and encouragement are essential if the industry is to proceed with the many projects necessary to attaining Canadian crude oil self-sufficiency, a wide-ranging campaign was needed. Building on the principle that knowledge precedes understanding and understanding is necessary to achieve public support, the campaign was designed to provide Canadians with accurate information upon which to make informed decisions about their energy future. The 1981 campaign theme, "Energy Solutions Begin With Understanding," was replaced in 1982 with the theme "Energy Solutions Help Bring Economic Solutions".

Starting with a relatively general message to establish CPA's new presence in the media, the campaign has now moved toward specific information content.

The program has been effective: surveys conducted after the startup of the cond phase of the campaign showed ked change in public attitudes the industry, as shown in the tion of this annual report.

Honours and awards

The Association's 6th Annual National Journalism Awards Program, which honours journalistic excellence and is offered in cooperation with the Calgary Press Club, was well received by the journalistic community. Francophone and anglophone journalists submitted entries.

THE 6TH ANNUAL NATIONAL JOURNALISM AWARDS PROGRAM

David Hatter,
Calgary Herald

Gillian Steward,
Canadian Business

Peter Foster,
Saturday Night

Alain Dubuc,
La Presse

Val Christensen, John Downton,
Mobil Oil Canada Dimensions

Dave Hicks,
Norcen Explorer

Russel Felton,
Imperial Oil Review

1982 honours also included two Honourary Life Memberships and seven CPA Merit Awards.

HONOURARY LIFE MEMBERS:

G.J. (Glyn) Evans,
Retired Chairman and President
Trans-Northern Pipelines Inc.

S.G. (Stan) Olson,
Retired President,
Hudson's Bay Oil and Gas Company Limited

MERIT AWARDS

D.K.F. (Donald) Dawson,
Mobil Oil Canada Ltd.

William Fesyk,
Esso Canada Resources Ltd.

R.L. (Ron) Findlay
Amoco Canada Petroleum Company Ltd.

I.J. (Irv) Koop,
BP Canada Inc.

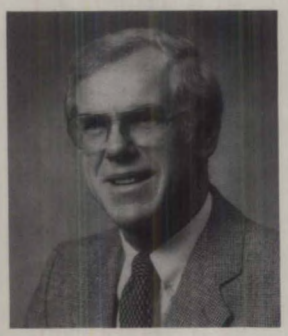
T.E. (Tom) Randall,
Gulf Canada Resources Inc.

Michael Ratuski,
Gulf Canada Resources Inc.

W.G. (Walter) Smith,
Esso Canada Resources Limited (Retired)

The organization in the year ahead

The CPA's Executive Committee and officers are chosen each year at the Association's annual meeting, usually held in March. The following summary includes the elected members for 1983, their Association responsibilities and corporate positions.



E. W. (Ted) Best
Chairman;
President,
BP Exploration Canada Limited

A. R. (Arne) Nielsen
Vice Chairman;
Chairman of the Board and Chief Executive Officer,
Canadian Superior Oil Ltd.

D. R. (Doug) Fenton
Chairman, Pipeline Division;
Executive Vice President,
Alberta Natural Gas Company Ltd.

R. H. (Harry) Carlyle
Past Chairman and Chairman, Public Affairs Committee
Senior Vice President
Gulf Canada Resources Inc.

J. J. (Jim) Sullivan
Chairman, Saskatchewan Division;
Assistant to Vice President of Production,
Union Oil Company of Canada Limited

G.L. (Gerry) Henderson
Chairman, British Columbia Division;
President,
Chevron Canada Resources Limited

W.A. (Bill) Gatenby
Treasurer and Chairman Finance Committee;
President,
Texaco Canada Resources Ltd.

D.D. (Don) Barkwell
Chairman, General Committee on Exploration;
Senior Vice President, Natural Resources,
Norcen Energy Resources Ltd.

R.F. (Dick) Haskayne
Chairman, General Committee on Resource Economics;
President and Chief Executive Officer,
Home Oil Company Limited

B.F. (Bernard) Isautier
Chairman, General Committee on Exploration and Production Services;
President,
Canterra Energy Ltd.

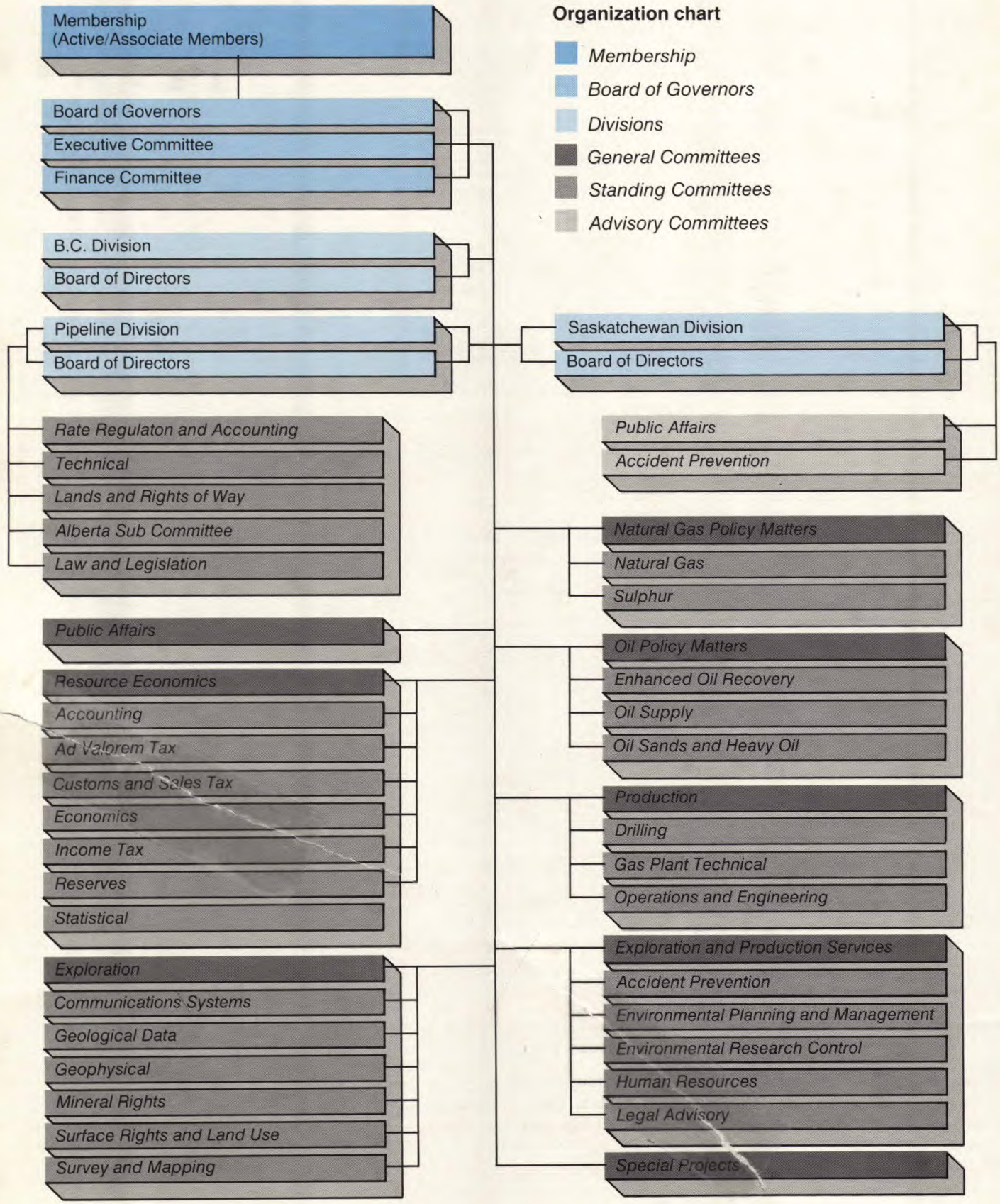
D.D. (Don) Lougheed
Chairman, General Committee on Oil Policy Matters;
Director and Executive Vice President
Esso Canada Resources Ltd.

R.Y. (Bob) Pogontcheff
Chairman, General Committee on Production;
Group Vice President,
Husky Oil Ltd.

B.B. (Bart) Rombough
Chairman, General Committee on Special Projects;
President & Chief Executive Officer,
PanCanadian Petroleum Limited

D.G. (Doug) Stoneman
Chairman, General Committee on Natural Gas Policy Matter
Senior Vice President, Oil and Gas,
Shell Canada Resources Ltd.

Ian R. Smyth
Executive Directo
Canadian Petrole


Organization chart
Membership
Board of Governors
Divisions
General Committees
Standing Committees
Advisory Committees
Membership (Active/Associate Members)
Board of Governors
Executive Committee
Finance Committee
B.C. Division
Board of Directors
Pipeline Division
Board of Directors
Saskatchewan Division
Board of Directors
Rate Regulaton and Accounting
Technical
Lands and Rights of Way
Alberta Sub Committee
Law and Legislation
Public Affairs
Accident Prevention
Natural Gas Policy Matters
Natural Gas
Sulphur
Public Affairs
Resource Economics
Accounting
Ad Valorem Tax
Customs and Sales Tax
Economics
Income Tax
Reserves
Statistical
Oil Policy Matters
Enhanced Oil Recovery
Oil Supply
Oil Sands and Heavy Oil
Production
Drilling
Gas Plant Technical
Operations and Engineering
Exploration
Communications Systems
Geological Data
Geophysical
Mineral Rights
Surface Rights and Land Use
Survey and Mapping
Exploration and Production Services
Accident Prevention
Environmental Planning and Management
Environmental Research Control
Human Resources
Legal Advisory
Special Projects

Members

Active members

AGIP Canada Ltd.
Alberta Natural Gas Company Ltd.
Alberta Oil Sands Pipelines Ltd.
Amerada Minerals Corp. of Canada
Amoco Canada Petroleum Company Ltd.
Anadarko Petroleum of Canada Ltd.
BP Canada Resources Limited
Canada-Cities Service, Ltd.
Canadian Occidental Petroleum Ltd.
Canadian Superior Oil Ltd.
Canadian Western Natural Gas Co.
Canterra Energy Ltd.
Chevron Canada Resources Limited
Columbia Gas Dev. of Canada Ltd.
Consolidated Natural Gas Ltd.
Conventures Limited
Esso Resources Canada Limited
Forest Oil Corporation
Getty Oil (Canada) Ltd.
Gibson Petroleum Company Ltd.
Gulf Canada Resources Inc.
Home Oil Company Limited
Husky Oil Ltd.
ICG Resources Ltd.
Imperial Oil Limited (Pipeline)
InterProvincial Pipe Line Ltd.
Koch Oil Company Ltd.
Mobil Oil Canada, Ltd.
Monsanto Oils Ltd.
Montreal Pipe Line Ltd.
Murphy Oil Company Ltd.
Norcen Energy Resources Ltd.
Northwestern Utilities Ltd.
Oakwood Petroleums Ltd.
Pan-Alberta Gas Ltd.
PanCanadian Petroleum Limited
Peace Pipe Line Ltd.
Pembina Resources Limited
Phillips Petroleum Company
Placer CEGO Petroleum Ltd.
Placid Oil Company
Producers Pipelines Ltd.
Quintana Exploration Canada Limited
R. Adair Oil Management
Rainbow Pipe Line Company Ltd.
Ranger Oil Ltd.
Shell Canada Resources Limited
Sohio Petroleum Company
SOQUIP
South Saskatchewan Pipeline
Sulpetro Limited
Sun-Canadian Pipe Line Company Ltd.
Suncor Inc.
Syncrude Canada Ltd.
Tennessee Gas Transmission Company
Texaco Canada Resources Ltd.
Total Petroleum Canada Ltd.
TransCanada PipeLines Ltd.
Trans Mountain Pipe Line Co. Ltd.
Trans-Northern Pipe Line Company
Union Oil Company of Canada Ltd.
United Canso Oil & Gas Ltd.
Westar Petroleum Ltd.

Associate members

A.G.T. Mobile Comm.
ARDECO GESELLSCHAFT FUER
Accurcom Engineering Ltd.
Aero Arctic Ltd.
Alberta Gas Chemicals Ltd.
Arthur Anderson & Company
BJ-Hughes Services Ltd.
Baker Lovick Advertising
Balfour MacLeod, Moss Laschuk, Kyle, Vancise & Cameron
Ballem, McDill & MacInnes
Bank of Montreal
Bank of Nova Scotia Regional Office
Barclays Bank of Canada
Baroid of Canada Ltd.
Beaver Geophysical Services
Bell, Felesky, Iverach, Flynn, Struck & McKenzie
Bennett, Jones
Bison Petroleum & Minerals Ltd.
Canadian Engineering Surveys Co.
Canadian Imperial Bank of Commerce
Canuck Engineering Ltd.
Clarkson Gordon
Collins Barrow
Compagnie Generale De Geophysique
Coopers & Lybrand
Deloitte, Haskins & Sells
Dowell of Canada
Dresser Canada Inc.
Eastman Whipstock Limited
Enertec Geophysical Services Limited
Ernst & Whinney
Farinon Canada Ltd.
Fenerty, Robertson, Fraser & Hatch
Field Title Service Company Ltd.
Foothills Printers
Foster Research Limited
Geophysical Service Incorp.
Halliburton Services Limited
Hamilton & Olsen Surveys Ltd.
Homco International Ltd.
International Aeradio Limited
Interprovincial Steel & Pipe
Johnson & Higgins Willis Faber Ltd.
Johnston Macco
Liquid Air Energy Corporation
Loffland Brothers Company of Canada
Lynes United Services Ltd.
MHG International Ltd.
MacKimmie & Matthews
Macleod, Dixon
Marsh & McLennan Ltd.
McDaniel Engineering Services Ltd.
McElhanney Surveying & Eng. Ltd.
McLaws & Company
McLeod Young Weir Limited
Mendelssohn Commercial Limited
Milne & Craighead
Mitchell & Associates Ltd.
Motorola Canada Ltd.
NL McCullough/NL Inds. Inc.
Nickle Map Service Ltd.
Nortech Surveys (Canada) Inc.
Offshore Navigation (Canada) Limited
Orhan's Reproduction & Photo Ltd.
Peat, Marwick & Mitchell & Co.
Peter Bawden Drilling Ltd.
Petrol Properties Limited
Petty-Ray Geophysical, Geosource Inc.
Price Waterhouse & Company
Prodeco Oil & Gas Company Ltd.
Prudential Steel Ltd.
Reed Stenhouse Limited
Royal Bank of Canada
Schlumberger of Canada
Sefel Geophysical Ltd.
Seiscom Delta United (Int'l) Corp.
Seismic Drills International
Smith, Lyons, Torrance, Stevenson & Mayer
Sproule Associates Limited
Stewart, Weir & Co.
Teknica Resource Development
The Algoma Steel Corporation Limited
The First National Bank of Chicago (Canada)
The Steel Company of Canada
Thorne Riddell
Thorsteinsson & Company
Toronto Dominion Bank
Touche, Ross & Company
TransAlta Utilities Corp.
TransCanada Telephone System
USS Oilwell Supply Co. Ltd.
Universal Customs Consultants Ltd.
W.D. Usher & Associates Ltd.
Western Geophysical Co. of Canada
Western Rock Bit Company Ltd.

Rapport Annuel 1982

«La correction des gouvernements à nos problèmes signifie peut-être plus qu'un important dégrèvement à court terme, et qu'elle traduit un changement d'attitude: une volonté réelle d'écouter et de s'efforcer à comprendre le fonctionnement de notre industrie, et dans quelle mesure nous pouvons contribuer largement à l'économie, tant au niveau national que régional.»

– Rapport du Président, page 2

ASSOCIATION PÉTROLIÈRE DU CANADA

Index

Bureaux

Siège social
1500 – 633, 6e Avenue S.O.
Calgary (Alberta) T2P 2Y5
Téléphone: (403) 269-6721

Ian R. Smyth
Directeur général

Hans Maciej
Directeur technique

Norm Elliott
Directeur, relations publiques

Dan B. Macnamara
Secrétaire et avocat général

Ray J. Frocklage
Directeur, finances et administration

Divisions des pipelines
1500 – 633, 6e Avenue S.O.
Calgary (Alberta) T2P 2Y5
Téléphone: (403) 269-6721

Ray J. Frocklage
Administrateur

Division de la Colombie-Britannique
602 – 880, rue Douglas
Victoria (Colombie-Britannique) V8W 2B7
Téléphone: (604) 388-4121

G.S. (Gerry) Bryson
Directeur

Division de la Saskatchewan
1009 – 1867, rue Hamilton
Régina (Saskatchewan) S4P 2C2
Téléphone: (306) 527-3527

W.L. (Bill) Whelan
Directeur

Bureau d'Ottawa
400 – 130, rue Albert
Ottawa (Ontario) K1P 5G4
Téléphone: (613) 237-5515

James (Jamie) Deacey
Directeur, Ottawa

Bureau de Montréal
1110 ouest, rue Sherbrooke - Suite 2002
Montréal (Québec) H3A 1G8
Téléphone: (514) 842-5497

Hélène Poirier Tomlinson
Agent de Québec

Bureau de Saint-Jean
173, rue Water
Saint-Jean (Terre-Neuve) A1C 1B1
Téléphone: (709) 726-7270

K.A. (Ken) Oakley
Directeur, Bureau de l'Industrie pétrolière, Gisements sous-marins de la côte Est.

ASSOCIATION PÉTROLIÈRE DU CANADA

Rapports de l'industrie traduisant l'opinion publique

En 1982, l'opinion publique envers l'industrie pétrolière du Canada s'est améliorée considérablement, comme l'indiquent les réponses obtenues lors d'un sondage d'opinion effectué pour l'APC par un important organisme canadien spécialisé dans les sondages d'opinion.

Il est difficile de déterminer de façon précise l'influence relative des divers facteurs qui ont agi sur l'opinion publique en 1982; néanmoins, des sondages menés dans le cadre d'une présente évaluation de la campagne d'information publique de l'APC, suggèrent que la campagne elle-même a apporté une importante contribution.

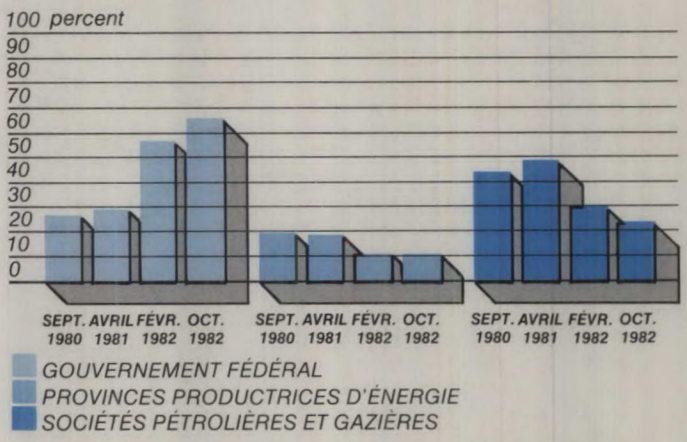
Des sondages d'opinion, effectués à l'échelle nationale en février et en octobre, se sont avérés particulièrement révélateurs. Afin de présenter un profil démographique précis du Canada, 1200 personnes ont été choisies au hasard pour répondre aux questions de ce sondage téléphonique.

Les catégories regroupant les "indifférents" sont exclues des tableaux suivants.

Le gouvernement est perçu comme s'attribuant une trop grosse part.

Lorsqu'on leur a demandé «qui tendait à recevoir plus que sa part des revenus tirés du gaz et du pétrole», les participants de 1982 ont formulé des opinions radicalement différentes de celles des participants de 1980 et 1981.

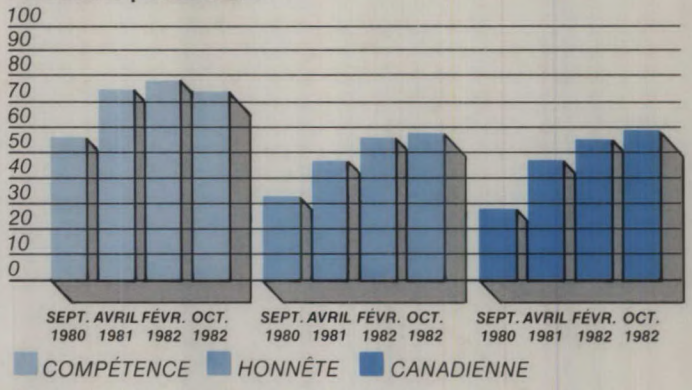
Perceptions touchant le partage des revenus



La perception du public face à l'industrie s'est améliorée.

Lorsqu'on leur a demandé comment ils décriraient l'industrie pétrolière et gazière du Canada («compétente ou incompétente», «honnête ou malhonnête», etc.), les participants ont indiqué que les perceptions se sont améliorées considérablement depuis le début du sondage.

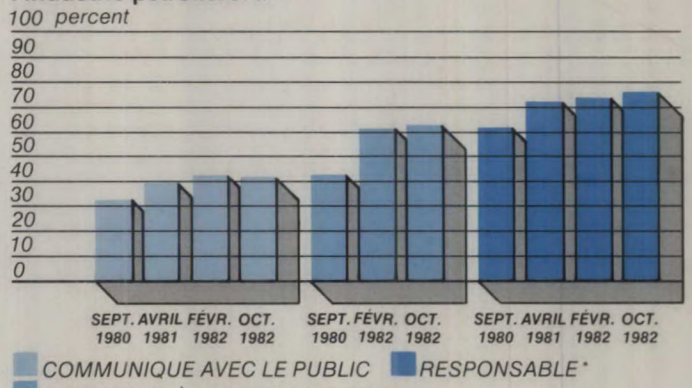
Évaluation de l'évolution dans l'image projetée par l'industrie pétrolière: I



Autres améliorations

Les autres questions du sondage ont révélé des résultats similaires: le nombre de personnes croyant que l'industrie est responsable et contribue à l'essor du Canada s'est accru considérablement. De plus, on perçoit mieux la disposition de l'industrie à communiquer avec le public canadien.

Évaluation de l'évolution dans l'image projetée par l'industrie pétrolière: II



*information non disponible de l'étude d'avril 1981

Rapport du président

Les membres de l'industrie pétrolière du Canada doivent considérer l'année passée avec des sentiments partagés. D'une part, c'était la deuxième année de la période la plus difficile qu'a connu notre industrie à ce jour; d'autre part en dépit de la situation, nous étions en droit d'afficher un certain optimisme: des signes encourageants nous indiquent que nos gouvernements sont finalement disposés à se montrer compréhensifs et à agir.

Le Programme énergétique national continue d'être une expérience fâcheuse et économiquement défavorable pour les Canadiens: il illustre bien l'absurdité d'une taxe punitive dirigée vers une seule industrie. Ce programme, déjà nuisible en situation économique normale, paralyse notre industrie en période de grave récession économique qui voit les taux d'intérêt grimper sans cesse et l'inflation atteindre des sommets inégalés. Nous n'avions pour seul choix que de nous retirer et nous regrouper. Cette stratégie défensive signifiait l'annulation des méga-projets, une réduction des activités de forage, d'importantes coupures dans le personnel, et un déclin marqué des principaux programmes.

Les gouvernements fédéral et provinciaux ont finalement réalisé qu'ils s'accaparaient une trop large part du gâteau, en augmentant l'impôt sur les revenus tirés du pétrole et du gaz (IRPG), et en créant l'impôt progressif sur les revenus tirés du pétrole et du gaz (IPRP). Ils semblent aussi avoir compris qu'il existait certaines limites à respecter quand il faut emprunter pour pallier aux revenus perdus; et que privée de fonds de réinvestissement, l'industrie n'a d'autre choix que de se retrancher.

Le gouvernement de l'Alberta fut le premier à réagir, quand il a dévoilé son programme de stimulation de l'industrie pétrolière et gazière. Ce programme visait à réinjecter $5,4 millions aux marges d'autofinancement sur une période de quatre ans, débutée en avril 1982 et se terminant en 1986. À cette mesure populaire et responsable adoptée par l'Alberta, s'ajoute en mai la mise à jour du PEN qui a vu le gouvernement fédéral réduire de 12% à 11% l'IRPG, et supprimer pour un an l'IPRP. Le gouvernement de la Saskatchewan a aussi pris des mesures visant à stimuler l'industrie.

L'extension des indemnités d'encouragement, totalisant $250 millions et s'appliquant aux coûts d'entretien, a créé une recrudescence du forage au dernier trimestre. Une fois les fonds épuisés, le ralentissement subséquent s'est bien sûr avéré désappointant.

Les augmentations prévues au prix du pétrole canadien, dans le cadre des ententes fédérales/provinciales, ont contribué à augmenter les revenus.

La réaction des gouvernements l'année passée à nos problèmes signifie peut-être plus qu'un important dégrèvement à court terme. Je crois qu'elle traduit un changement d'attitude: une volonté réelle d'écouter et de s'efforcer à comprendre le fonctionnement de notre industrie et dans quelle mesure nous pouvons contribuer largement à l'économie, tant au niveau national que régional.

Notre association a tenté d'utiliser cette chance de façon avantageuse, tout en encourageant la consultation et la coopération. Par exemple, l'industrie et le gouvernement de l'Alberta ont élaboré en septembre un document de base traitant des exportations de gaz naturel. L'association, et subséquemment plusieurs de ses membres, ont discuté de ce document avec les gouvernements fédéral et provinciaux.

En janvier 1983, nous étions heureux d'apprendre que l'Office national de l'énergie avait recommandé l'autorisation de quantités additionnelles de gaz destiné à l'exportation aux États-Unis et à l'étranger. Nous espérons que cette situation incitera les États-Unis à se tourner vers les approvisionnements stables du Canada, pour répondre à leurs besoins à long terme additionnels.

Mais notre industrie fait toujours face a plusieurs incertitudes. Par exemple, nous éprouvons une réduction persistante des niveaux de productivité du pétrole. Nous accueillons donc avec joie la réaction du gouvernement qui, par l'entremise de l'Office national de l'énergie, a autorisé l'exportation de 6360 mètres cubes par jour de pétrole léger. Cette décision représente le premier pas positif vers une solution.

La présente situation internationale en matière d'établissement des prix du pétrole est également une cause majeure de préoccupation. À cet égard, votre association a recommandé que les prix touchant le pétrole canadien soient élevés au niveau international.

Finalement, une autre cause d'incertitude s'avère, le PEN, qui persiste à exister sous sa présente forme. Le 31 mai 1983, le gouvernement doit réexaminer la suspension de l'IPRP et la réduction de l'IRPG; nous espérons qu'ils poursuivront cette politique de réduction de l'impôt. Par ailleurs, la disposition rétroactive du gouvernement touchant l'incursion des terrains canadiens demeure une pierre d'achoppement pour les investisseurs internationaux, dont le support est nécessaire non seulement à l'industrie pétrolière, mais également aux autres secteurs de l'économie canadienne.

Il est grand temps que le Canada mette de l'ordre dans le secteur énergétique. Nous avons besoin d'une industrie pétrolière et gazière qui soit concurrentielle et bien portante. Cela est possible, si nos gouvernements sont toujours disposés à discuter et à nous consulter, s'ils adoptent des mesures visant à stimuler l'industrie, à relever l'économie canadienne et à générer des revenus pour les gouvernements et l'industrie. S'ils adoptent ces mesures, le consommateur canadien en ressortira grand gagnant.

R.H. CARLYLE

Rapport du directeur général

En 1982, les gouvernements ont reconnu que les espérances et les théories sur lesquelles le Programme énergétique national avait été fondé ne se réaliseraient pas. Par conséquent, un processus de réajustement a été mis en branle, afin de modifier cette politique perturbatrice et de corriger les conséquences néfastes du programme. Ces changements ont eu pour effet net que l'année s'est terminée sur une note d'optimisme réservé, et que statistiques finales de 1982 ne seront pas aussi sombres que l'indiquaient les prévisions de l'année passée. Il n'en demeure pas moins que les effets néfastes du PEN, ainsi que le coût qu'il représente pour l'économie canadienne, ont été ressentis pour une deuxième année consécutive.

Les principales sources de bonnes nouvelles pour l'industrie ont été les changements touchant l'établissement des prix énergétiques, les impôts et les ententes relatives aux redevances conclues avec le gouvernement fédéral, et ceux de l'Alberta et de la Saskatchewan. Ces mesures, ajoutées à la baisse des taux d'intérêt survenue vers la fin de l'année, ont entraîné une meilleure marge d'autofinancement et des niveaux d'activité plus élevés que ceux qui auraient été prévus autrement.

Cependant, de graves facteurs négatifs ont malheureusement neutralisé ces étapes fondamentalement positives. Deux des principaux facteurs ayant contribué à l'effondrement du méga-projet de Alsands ont été la baisse des prix mondiaux du pétrole et une crise financière qui a frappé l'industrie pétrolière de plein fouet. Divers autres facteurs, notamment la récession, et les mesures favorisant la substitution et la conservation des ressources, ont créé un engorgement des marchés du pétrole et du gaz naturel, qui a résulté en une réduction des niveaux potentiels de productivité.

En 1983, l'industrie fait face à plusieurs incertitudes. En ce qui concerne les perspectives économiques globales, l'optimisme du début a dû faire place à des prévisions beaucoup plus réservées. La stabilité du prix international du pétrole est menacée, ce qui influence directement l'établissement des prix au Canada. Cette situation représente un des principaux défis que doivent relever l'industrie et les gouvernements; mais nous croyons que ce défi offre également une chance unique de modifier la stratégie canadienne d'établissement des prix et de supprimer les règlements régissant les prix des marchés canadiens. À long terme, ces mesures s'avèreront avantageuses pour les gouvernements, l'industrie et, ce qui est le plus important, les consommateurs canadiens.

En 1983, l'autre problème majeur semble être la commercialisation du pétrole et du gaz naturel. Bien que les volumes du niveau de productivité du pétrole sont moindres que celui de l'année passée, le problème persiste. Nous devons trouver des solutions visant à compenser ces pertes économiques subies à cause de nos présents besoins d'importation.

Par ailleurs, la commercialisation du gaz naturel devient rapidement un problème, tant au niveau canadien qu'à celui de l'exportation. Il faudra donc élaborer des stratégies innovatrices, afin de trouver des solutions. En 1983, les perspectives commerciales jouent encore un rôle prédominant dans les décisions touchant les investissements. Cela représente un changement spectaculaire, par rapport au climat de pénurie de la dernière décennie.

La situation radicalement différente nous impose une certaine évolution dans l'élaboration de la politique énergétique de notre pays. Afin de préserver les débouchés économiques, les attitudes rigides face aux changements fondamentaux de politique devront être réexaminées.

Si on lui en donne la chance, nous croyons que l'industrie pétrolière peut ouvrir la voie à la reprise économique au Canada. Un système efficace de planification de la politique énergétique est crucial, pour en arriver à une reprise économique. Ce système, en mettant l'accent sur la consultation avec tous ceux qui ont un rôle à jouer dans la réussite de l'industrie, bénéficiera à toute l'économie.

Pour qu'elle soit en mesure de présenter au gouvernement des suggestions constructives en matière de politique énergétique, notre association doit consulter ceux qui établissent les règlementations et les politiques régissant l'industrie; nous devons donc nous montrer précis, minutieux et bien documentés, dans nos recommandations. En raison de nos fonctions consultatives, nous continuons à dépendre largement de l'appui volontaire qu'offrent nos sociétés membres, par l'entremise de nos comités et effectifs. Le sérieux et le dévouement qui ont caractérisé nos efforts en 1982 augure bien pour l'APC, alors que celle-ci s'apprête à relever les défis de 1983.

I.R. SMYTH

Rapport du président: Division de la Colombie-Britannique

En 1982, l'activité industrielle en Colombie-Britannique a baissé par rapport aux déjà peu élevés niveaux de 1981. Les dividendes des droits sur le pétrole et le gaz naturel pour les ventes à la couronne n'ont totalisé que 16,7$ millions, par rapport à 60,8$ millions en 1981 et 181,3$ millions en 1980. La prospection géophysique a également chuté à des niveaux excessivement bas. Seulement quatre équipes géophysiques étaient actives à la fin de l'année, par rapoprt à 20 à une date aussi récente que janvier 1981. De même façon, les activités de forage ont suivi la courbe de déclin qui a débuté en 1981. Cent neuf puits ont été forés durant l'année, par rapport à une moyenne annuelle de 382 puits pour quatre années dont la dernière finissait le 31 mars 1981.

Ce faible niveau d'exploration et de mise en valeur est causé par l'insuffisance des fonds d'investissement, en raison des nouveaux impôts exigés en vertu du Programme énergétique national, de la demande réduite d'exportation pour le gaz de la Colombie-Britannique, ainsi que del'incertitude concernant la politique du gouvernement provincial en regard des prochaines augmentations de prix à la tête du puits pour le gaz naturel.

Durant l'année 1982, le gouvernement de la Colombie-Britannique n'a pu remplir son engagement qui, selon l'entente énergétique fédérale/provinciale, visait à élaborer une formule pour augmenter la part de l'industrie des revenus tirés du gaz naturel.

Cependant, la mise sur pied d'un comité d'étude formé de quatre membres et présidé par le Dr. George Govier a été annoncée en octobre. Ce comité devrait entre autres conseiller le gouvernement sur une foule de questions relatives à la commercialisation et à l'établissement des prix du gaz naturel. Le rapport Govier a été déposé au début de l'année 1983, mais son contenu et les intentions du gouvernement à l'égard de l'étude n'ont pas encore été rendus publiques.

En 1982, les ventes à l'exportation du gaz de la Colombie-Britannique ont chuté de 1,8 milliards de mètres cubes, par rapport à 4,7 milliards de mètres cubes à une période aussi récente que 1979. La Colombie-Britannique en est venue à jouer essentiellement un rôle de fournisseur de pointe saisonnière, avec toutes les difficultés que cela comporte pour les producteurs: revenus restreints à des niveaux de versement minimal obligatoire, aucune nouvelle vente provenant des découvertes de surplus, et maintien de la capacité quotidienne maximale

face à des ventes annuelles inférieures aux volumes stipulés par contrat.

Le projet de loi omnibus sur l'exportation du gaz, présenté en janvier 1983 par l'Office nationale de l'énergie, a possiblement élargi le marché à l'exportation du gaz de la Colombie-Britannique quand le projet L.N.G. de Dome s'est vu autorisé à vendre 650 milliards de mètres cubes dans les marchés japonais, sur une période de 15 ans.

Au début de 1983, le gouvernement provincial a sanctionné une fois de plus un projet qui développerait modestement les marchés du gaz en Colombie-Britannique, quand il a renouvelé sa promesse de voir à la construction d'un pipeline de gaz sur l'île de Vancouver. La province recherche auprès du gouvernement fédéral une subvention substantielle en capital pour le projet de 457$ millions, conformément à l'entente promettant un support financier selon le Programme énergétique national.

Durant l'année, la Division a offert au gouvernement toute l'aide possible, afin de mettre sur pied une politique énergétique de l'avenir. Plusieurs rencontres ont été tenues avec les ministres du Cabinet; le Ministère de l'énergie, des représentants à tous les paliers, du Ministère des ressources pétrolières et minières; ainsi que des directeurs de la B.C. Petroleum Corporation. De plus, des rapports portant sur des questions de commercialisation et d'établissement des prix ont été présentés au gouvernement.

Par ailleurs, plusieurs rencontres du conseil d'administration, dont la rencontre annuelle, ont été tenues à Victoria. Cela nous a fourni plusieurs occasions de rencontrer les représentants du gouvernement et ceux du secteur commercial.

L'industrie du gaz naturel a un rôle important à jouer dans le confort économique de la province. Elle pourrait être le catalyseur permettant à la province de progresser de nouveau. Néanmoins, nous ne prévoyons durant 1983 aucune amélioration marquée dans l'industrie du gaz naturel, même si des mesures appropriées sont prises immédiatement. Les activités devraient se rétablir après 1984 mais il faudra d'abord apporter des changements aux politiques provinciales touchant l'économie et l'énergie.

R. C. Galloway

R.C. GALLOWAY

Rapport du président: Division de la Saskatchewan

La Division de la Saskatchewan a connu en 1982 une année bien remplie et très productive.

Le 26 avril, un nouveau gouvernement est entré en fonction, qui n'a pas tardé à faire connaître ses objectifs et son orientation. L'industrie pétrolière a été invitée à faire valoir son point de vue; la Division est donc intervenue et n'a pas manqué d'être consultée. Peut-être conscient, que plus du quart de ses revenus provenait de notre industrie, le gouvernement s'est dit prêt à améliorer le régime fiscal et à alléger la règlementation. Peu après son entrée en fonction, le gouvernement a entrepris d'examiner et de modifier la structure des redevances et de la règlementation.

La Division a été invitée à participer à ce processus par la présentation d'un examen critique de la fiscalité et des redevances. Un document intitulé **étude de la fiscalité et des redevances en Saskatchewan** a donc été rédigé et présenté au Ministre des Ressources minérales le 8 juin.

Ce document passait en revue la plupart des aspects du régime fiscal en Saskatchewan; il établissait en outre une comparaison avec le régime plus avantageux appliqué en Alberta et formulait des recommandations propres à revitaliser l'industrie pétrolière en Saskatchewan.

Le gouvernement a réagi sans tarder: une nouvelle structure de redevances a été promulguée le 5 juillet. Les points saillants de cette nouvelle structure sont sans doute les exonérations d'un an dans le cas des nouveaux forages, de trois ans dans le cas de forages de mise en valeur de gisements profonds et de cinq ans dans le cas des forages de prospection. Même si elles n'ont pas entraîné une relance totale de l'activité, ces modifications ont eu un effet fort encourageant.

La volonté réelle de consulter l'industrie et d'améliorer la situation des entrepreneurs de la province que manifeste le nouveau gouvernement a certes eu un effet aussi marqué que l'adoption d'une nouvelle structure de redevances. C'est sans doute par l'augmentation du nombre d'installations de forage en exploitation dans la province, par rapport à l'an dernier, que pourrait le mieux se mesurer la réaction de l'industrie.

Certains autres signes augurent bien de l'avenir:

— En premier lieu, les raffineries de l'est du Canada sont en train d'améliorer leurs installations afin d'accroître leur capacité de raffinage de pétrole lourd; de plus, le gouvernement réexamine actuellement sa structure d'établissement des prix du gaz naturel et des redevances s'y appliquant, afin de stimuler l'exploration et la mise en valeur du gaz naturel.

Il reste toutefois des ombres au tableau.

Le régime albertain reste plus favorable; nous ne pourrons donner notre pleine mesure, en Saskatchewan, tant que cette province ne sera pas plus concurrentielle.

De plus, certaines incertitudes continuent de planer relativement à la commercialisation, aux prix et aux revenus nets.

De même façon, l'indemnité de $5 par mètre cube n'est plus en vigueur depuis la fin de l'année; la marge d'autofinancement des sociétés s'en ressentira.

À cet égard, la meilleure solution consisterait à appliquer le PRNP à toute la production; on pourrait ainsi démanteler tout l'appareil administratif si encombrant et laisser jouer les lois du marché.

En matière de commercialisation, l'industrie souffre manifestement des cycles d'activité intense et d'affaissement, cycles liés aux surplus de brut non extrait et à l'insuffisance des mesures de stimulation de la mise en valeur des ressources pétrolières et gazières. Il est grand temps de revoir les politiques et normes d'exportation canadiennes et de refaire de la production pétrolière le fondement de l'industrie.

Bien des incertitudes devront être dissipées en 1983. L'industrie pétrolière pourrait être l'un des principaux facteurs de la reprise économique; il faudrait toutefois pour cela que des modifications profondes soient apportées à la politique énergétique. En misant sur la consultation avec le gouvernement, c'est à cette tâche que s'emploiera votre association en 1983.

J.J. Sullivan

J.J. SULLIVAN

Rapport du président: Division des pipelines

En 1982, la Division des pipelines s'est surtout occupée de règlementation tarifaire.

En mars, certains membres du comité exécutif ont rencontré certains des membres les plus influents de l'ONE, afin de leur remettre deux rapports commandés par la Division. Ces rapports s'intitulaient **évaluation critique des règlements s'appliquant aux pipelines à liquides** et **pipelines à liquides et règlementation**. Ces deux rapports ont été remis à l'ONE à titre de document de travail. Plutôt que de remettre une présentation au nom de l'industrie, l'Association a préféré s'attaquer à la question de la règlementation dans le cadre des audiences consacrées aux diverses sociétés.

En avril, l'Association a tenu avec l'ONE des discussions visant à esquisser des solutions aux problèmes propres aux pipelines. Ces discussions ont, en partie, entraîné la tenue, à Montréal, d'une conférence consacrée notamment au déclin de la valeur de base, aux effets de l'inflation sur la règlementation des pipelines et aux répercussions de l'adoption de nouvelles méthodes de règlementation. Cette conférence était parrainée par l'ONE et le Centre d'Étude des industries règlementées de l'Université McGill.

Des représentants de toutes les sociétés y ont assisté, ainsi que des groupes qu'intéressait ou que touchait la règlementation des oléoducs et des gazoducs. Divers points de vue et suggestions ayant trait à la modification de la règlementation ont été présentés, et ont fait l'objet de discussions passionnées. Cette conférence a permis d'amorcer le travail d'amélioration du cadre de règlementation qui sera présenté en 1983 aux audiences relatives aux taux s'appliquant à certains des pipelines.

En février, l'ONE annonçait qu'il fallait se pencher sur l'augmentation rapide des coûts de construction des pipelines et sollicitait notre collaboration. Bien qu'elle n'ait pas manqué de transmettre à l'ONE tous les renseignements qu'elle pouvait lui fournir, la Division n'est guère intervenue dans ce projet. Un rapport intitulé «Coûts de construction des pipelines, 1975-1985» a été publié en juin. Fort remarquée, la présentation de ce rapport a été suivie par l'annonce du Ministre de l'Énergie d'alors, de la constitution d'un groupe de travail chargé de formuler des recommandations visant à mieux contrôler ces coûts de construction.

Ce rapport a en outre donné lieu à des discussions avec l'ONE, où il a été question

des coûts découlant de la règlementation et du chevauchement des compétences gouvernementales. Il en est résulté plusieurs rencontres entre des membres de notre Association, des représentants de l'ONE et des représentants des sociétés. Les discussions ont surtout porté sur le degré de règlementation et les répercussions qu'elle entraîne sur la rentabilité de l'exploitation des pipelines. La Division s'est engagée à formuler des recommandations précises, touchant la règlementation découlant de la Partie IV de la Loi sur l'ONE. Un comité spécial a été formé, sous la présidence de notre vice-président; on a en outre retenu les services d'une firme de gestion. Ce projet se poursuivra en 1983.

D.R. FENTON

Aperçu des activités de l'industrie

Au début de 1982, l'industrie pétrolière a connu la pire crise financière de son histoire. Cette pénurie de liquidités était due à plusieurs facteurs, le plus important d'entre eux étant le Programme énergétique national. La canadianisation de l'industrie, objectif premier de ce programme, a créé un «climat hostile» aux investisseurs étrangers, fait chuter le cours des actions des sociétés étrangères actives au Canada et favorisé les prises de contrôle massive, principale cause des niveaux record d'endettement que nous connaissons actuellement. Les taux d'intérêt étant élevés, une forte proportion de la marge d'autofinancement a été accaparée par le service de la dette, au détriment des investissements.

À cela, est venue s'ajouter la diminution des revenus prévisibles par suite de l'engorgement des marchés du pétrole et du gaz naturel.

Les exportations de gaz vers les États-Unis sont tombées bien au-dessous des niveaux autorisés. Certes, la mise en exploitation du pipeline préfabriqué a permis d'entreprendre la livraison de nouvelles quantités autorisées, mais le volume total des exportations (et des revenus) pour 1982 ont été à peine supérieurs à ceux de 1981. Le marché canadien du gaz naturel n'a connu aucune croissance malgré le vif succès du programme de conversion au gaz. Cependant, au début de 1983, l'ONE a autorisé des exportations supplémentaires de 12,2 exajoules; ces autorisations comprenaient des permis d'exportation de gaz naturel liquéfié vers le Japon.

Au début de l'année, l'industrie s'est trouvée aux prises avec d'importants surplus de pétrole. Afin de compenser les coupures de production imposées par le gouvernement albertain au plus fort de la confrontation avec le gouvernement fédéral, les raffineries avaient passé des contrats avec des fournisseurs étrangers. Ces contrats étaient encore en vigueur au début de cette année. La demande de produits pétroliers a continué de diminuer sous l'effet de la récession. Les producteurs de l'Ouest canadien en ont donc été provisoirement réduits au rôle de fournisseurs d'appoint, ce qui a entraîné la constitution d'importants surplus de brut lourd et léger. La rigidité et certaines dispositions du programme d'indemnisation des importations ont aggravé le problème; ce programme encourageait en effet les raffineurs à acheter leur pétrole sur les marchés libres où les prix tombaient plutôt que de s'approvisionner au pays.

Le gouvernement fédéral ayant pris certaines mesures, ces difficultés ont éventuellement été surmontées et la production a été rétablie presqu'à capacité au deuxième semestre. Le problème a toutefois resurgi; il s'agit en effet d'une question complexe où s'entremêlent des impératifs de sécurité nationale et des contraintes logistiques. Bien que le gouvernement fédéral soit actuellement disposé à autoriser l'importation de pétrole léger afin de résoudre le problème, les marchés libres mondiaux imposeront une concurrence féroce.

Marge d'autofinancement

En avril 1982, le gouvernement de l'Alberta a considérablement réduit ses redevances. Le gouvernement fédéral lui a emboîté le pas en procédant à des réductions de taxe pour la plupart provisoires. Le gouvernement conservateur récemment élu en Saskatchewan a lui aussi allégé son régime fiscal et lancé de bons programmes d'encouragement. Grâce à ces mesures, ainsi qu'aux augmentations des prix règlementés du pétrole et du gaz et à la diminution des taux d'intérêt, les sociétés ont pu accroître leur marge d'autofinancement, surtout pendant le second trimestre.

«Les producteurs de l'Ouest canadien ont été réduits au rôle de fournisseurs d'appoint, ce qui a entraîné une réduction importante du niveau de productivité du brut lourd et léger.»

Concessions et forages

Les recettes gouvernementales provenant de la vente de concessions, qui servent en quelque sorte d'indicateur de l'état de l'industrie, ont connu en 1982 une diminution de 44%, après avoir chuté de près de 47% en 1981.

Le nombre de forages dans les régions de gisements conventionnels, autre indicateur clé du degré de confiance des investisseurs et de l'humeur de l'industrie, était en hausse en fin d'année; cette reprise de l'activité résulte en grande partie du programme de stimulation albertain. Cette remontée tardive n'a toutefois pas réussi à compenser la diminution du nombre de forages réalisés pendant l'année. En avril, dans le cadre de son programme de stimulation de l'exploration pétrolière et gazière, le gouvernement de l'Alberta a consacré 250$ millions au secteur des services de l'industrie pétrolière. Ce programme d'aide prévoit qu'un certain pourcentage des coûts de reconditionnement et d'exploitation des puits de pétrole et de gaz sera pris à charge par le gouvernement. Constatant qu'à peine 25% de ce fonds allait être utilisé, le gouvernement y a rendu admissibles les forages d'exploitation. L'industrie n'a pas tardé à réagir; tous les fonds disponibles ont été utilisés avant la date à laquelle le programme devait prendre fin.

Le total des puits complétés était de 6562, comparativement à 7186 en 1981. Ce nombre représente une diminution de 8,7% et un déclin de 29% par rapport au sommet atteint en 1980. La profondeur des forages a diminué de 11,9%.

Sables bitumineux

Fin avril, l'annulation des projets d'exploitation des sables bitumineux a porté un dur coup à la stratégie fédérale fondée sur la réalisation de méga-projets. Malgré le régime fiscal avantageux présenté par le gouvernement fédéral dans ses offres fiscales, le «créneau» économique s'était refermé et les trois participants restant (les cinq autres s'étant déjà désistés) ont décidé d'annuler le projet. Les sables bitumineux ont toutefois suscité une certaine activité.

Syncrude a entrepris, au coût de 180$ millions, la réalisation d'un projet de trois ans visant à porter la capacité de son usine de traitement des sables à 1600 mètres cubes par jour. Ce programme prévoit notamment la suppression de certains «goulots d'étranglement» affectant les procédés d'extraction et de traitement.

Suncor a lancé un projet de 170$ millions visant à accroître la capacité de rendement de son usine de Fort McMurray, en plus de consacrer 185$ millions de plus à l'extraction des sables sur une importante superficie du territoire visé par son bail. Suncor prévoit ainsi extraire 14 millions de mètres cubes de plus.

Mer de Beaufort et îles de l'Arctique

Bien que les travaux de prospection n'aient

guère porté fruit en 1982, on espère toujours découvrir un gisement rentable. La plus grande déception fut sans doute causée par les résultats des forages réalisés à Tarsiut, qui jusqu'à tout récemment, semblait avoir le plus de chance de devenir le premier gisement exploité en régions éloignées. Kiggavik A-43, puits d'extension foré à environ 12 km du lieu de la première découverte, n'a pas confirmé le prolongement du gisement et n'a produit que du gaz. Ces forages semblent indiquer que le champ de Tarsiut ne contiendrait que 55 millions de mètres cubes de pétrole récupérable; cette quantité s'avère substantiellement inférieure à la réserve minimale nécessaire pour justifier la mise en valeur.

Des essais ont été réalisés à Nerlerk M-98, également situé dans la mer de Beaufort; ces essais ont confirmé que le gisement contient du pétrole. Huit essais ont produit du pétrole à des débits variables et atteignant jusqu'à 64 mètres cubes par jour. Bien que ces débits ne soient pas impressionnants, l'exploitant prévoit tout de même effectuer un autre essai sur cette immense structure. La construction d'une île artificielle était terminée à 60% lorsque les glaces ont interrompu les travaux de dragage.

Kenalooak J-94 a été de nouveau occupé en juillet; les forages y ont atteint une profondeur totale de 4650 mètres. Les essais ont produit du gaz à un débit absolu estimatif de 1,4 millions de mètres cubes par jour. Orvilruk 0-3 et Irkaluk B-35 n'ont rien produit: ces deux puits ont été abandonnés.

La nouvelle technologie permet de prolonger la saison de forage dans la mer de Beauport.

Des travaux de forage ont été entrepris à Uviluk P-66 sur une île artificielle construite par 30 mètres de profondeur; ces forages sont réalisés à l'aide d'un nouveau caisson semi-submersible. Le caisson tout acier de Dome Petroleum (Single Steel Drilling Caisson) a été construit à partir de l'avant d'un pétrolier de 250 000 tonnes, dont on a renforcé la coque et que l'on a muni de ballast. La proue du navire a été enlevée afin de permettre l'installation de la tour de forage (monté sur rails) et d'un dortoir de 130 lits. L'île Uviluk est équipée d'appareils permettant de surveiller l'état de la glace et la pression qu'elle exerce contre la coque.

Autre importante innovation à signaler: le caisson d'acier en forme de beignet de Esso Resources, qui servira d'abord à des forages sur la structure de Kadluk, par 14 mètres de profondeur. Cette unité, construite au Japon à un coût de 55$ millions, consiste en huit segments d'acier de 1500 tonnes. Lorsqu'ils sont réunis, ces segments forment une structure circulaire de 100 mètres de diamètre. Le principal avantage de cette installation, c'est qu'elle peut être remise à flot et réutilisée ailleurs. Elle permet en outre de réduire considérablement le volume du ballast et du remblai.

Panarctic, l'une des sociétés les plus actives dans les îles de l'Arctique, a conclu 20 accords d'exploration en vertu de la nouvelle Loi sur le pétrole et le gaz du Canada. Ces accords ont trait à des travaux d'exploration devant être réalisés sur cinq ans à un coût d'environ 700$ millions. Les accords portent sur plus de 13,7 millions d'hectares; ils prévoient 25 forages, dont 17 seront utilisés en mer à partir d'îles de glace.

«La structure de Tarsiut dans la mer de Beaufort semblait jusqu'à tout récemment avoir le plus de chance de devenir le premier gisement exploité en régions éloignées.»

Au début de la saison hivernale de forage, ont débuté les travaux de forage du premier des quatre puits devant être forés dans la péninsule Sabine de l'île de Melville. Quatre puits seront forés dans le cadre de ce programme de forage en profondeur. Les puits auront des profondeurs variant de 4250 mètres à 6700 mètres. Ils seront forés au moyen d'une nouvelle installation spécialement conçue pour ce programme. Un puits de délimitation est également en cours de forage dans la structure pétrolière de Cisco. Selon les données cartographiques actuelles, cette structure pourrait s'étendre sur plus de 200 km^2.

La géologie semble en être excellente et ne présenter que peu de failles. Le puits latéral foré cet hiver à 8 km pourrait fournir beaucoup de données nouvelles sur ce champ; ce forage constituera en outre le premier essai de production du réservoir. De plus, on prévoit forer deux nouveaux puits de prospection l'hiver prochain, au nord et au sud du gisement de gaz de Char, situé au large de l'île Ellef Ringnes. Le budget de ce programme de travaux s'élève à 115$ millions.

Les gisements Norman

La construction du pipeline des gisements Norman commencera à la fin de 1983. Premier pipeline construit dans le Grand Nord depuis le fameux projet Canol réalisé au cours de la seconde guerre mondiale, ce pipeline transportera le pétrole brut des champs des gisements Norman sur 817 kilomètres, jusqu'au nord de l'Alberta. Ce projet a été lancé par l'exploitant, qui veut ainsi faire passer la production du gisement de 480 m^3/jour à 3975 m^3/jour de pétrole et à 475 m^3/jour de liquides extraits du gaz naturel. Les travaux de construction seront réalisés sur deux périodes de 90 jours pendant les hivers 1983-1984 et 1984-1985; coût total prévu; 576$ millions.

En 1982, Essor Resources a entrepris la réalisation d'un programme de construction d'îles afin d'accroître le champ. Quatre îles artificielles doivent ainsi être construites en 1983 et deux autres en 1984, à un coût total de 100$ millions. Un programme d'injection d'eau est en outre prévu. Outre la construction d'îles dans les cours d'eau, le programme global d'expansion nécessitera le forage de 150 puits et la construction d'un complexe central de traitement. Ce projet, qui est censé se terminer en juillet 1985, a un budget total de 800$ millions.

Côte Atlantique

L'activité reste forte au large de la côte Atlantique, malgré un certain ralentissement, résultant du différend entre Terre-Neuve et le gouvernement fédéral. La Cour Suprême de Terre-Neuve, à qui le gouvernement provincial avait demandé de statuer sur la propriété des ressources sous-marines, a rendu un jugement favorable au gouvernement fédéral; le gouvernement de Terre-Neuve a interjeté appel. De plus, la Cour Suprême du Canada examine actuellement une cause de portée plus réduite concernant l'exploitation du gisement Hibernia.

À la fin de l'année, une seule société réalisait des travaux au large de Terre-Neuve; elle procédait à un dernier forage d'évaluation du champ Hibernia. De plus, un autre forage de prospection a été entrepris à North Dana J-43; il s'agit d'un forage d'essai de 5334 mètres à 108 kilomètres au nord-est d'Hibernia. Le John Shaw, plate-forme de forage semi-submersible à positionnement dynamique récemment construite, devait initialement être utilisé au large de Terre-Neuve. En raison du différend entre cette province et le gouvernement fédéral, l'armateur a décidé de l'utiliser au large de la Nouvelle-Écosse pour procéder à un forage de 5791 mètres au

puits de recherche Bluenose G47-A, à 328 kilomètres à l'est d'Halifax. Le forage d'essai du gisement Bluenose a lieu sur une autre structure, à environ 17 kilomètres au nord-est du gisement de gaz Venture.

La zone de ce gisement a continué à fournir des indications encourageantes. Les puits Olympia A-12 et South Venture, 0-59, qui semblent être situés sur des structures du gisement Venture, ont produit de forts débits de gaz. À South Venture des essais ont été réalisés dans sept zones; ils ont produit un débit cumulatif d'environ 2,6 millions de m^3/jour et 540 m^3/jour de condensat. Le plus fort débit enregistré a été de 513 000 m^3/jour et 144 m^3/jour de condensat. Pour le gisement Olympia A-12, le débit cumulatif de tous les essais s'élevait à environ 1,58 millions de m^3/jour et à environ 102 m^3/jour de condensat. Le débit le plus fort enregistré a été de 493 000 m^3 et 17 m^3/jour de condensat. Un nouveau record canadien de profondeur sur terre et sur fond marin a également été établi à South Venture 0-59 où l'on a foré jusqu'à 6176 mètres.

Sur le plateau continental de la Nouvelle-Écosse, les négociations ont permis d'en arriver à un accord d'exploration visant 1,94 million d'hectares et commandant des engagements de 550$ millions. Shell Resources a nolisé une installation de forage semi-submersible pour trois ans afin de participer au forage de 9 puits d'étude. Le premier de ces puits, Shubenacadie H-100, foré par 1470 mètres de profondeur sur le talus continental de la Nouvelle-Écosse à 230 kilomètres au sud-est d'Halifax, a été abandonné.

Le programme de forage du Labrador n'a pas encore porté fruit en 1982. Deux puits, (Rut H-11 et Corte-Real P-85) ont été rouverts et approfondis; les travaux ont alors été interrompus, puis repris; ils seront achevés en 1983. Le puits Pothurst P-19 a été foré jusqu'à 3843 mètres; les travaux ont été suspendus mais doivent reprendre en 1983.

Plus au nord, dans le détroit de Davis où l'environnement est si hostile, la société Canterra a procédé à des essais sur la structure de Ralegh que des sondages sismiques avaient permis d'identifier. Bien que les forages y soient réalisés dans des conditions que l'on range parmi les plus difficiles au monde, le navire de forage opérant par 351 mètres de profondeur y a foré un puits de 3858 mètres en seulement 64 jours. Aucune trace d'hydro-carbures n'y a été détectée, bien que l'essai ait été réalisé à 20 kilomètres à peine du puits Hekja où de grandes quantités de gaz naturel et de condensat ont été découvertes.

À la fin de l'année, des accords d'exploration s'appliquant à 6,88 millions d'hectares au large de la côte Atlantique, avaient été négociés en vertu de la loi canadienne sur le pétrole et le gaz, promulgée le 5 mars 1982. Les engagements découlant de ces accords pourraient entraîner des investissements de près de 2$ milliards.

«Bien que les forages réalisés à Ralegh soient effectués dans des conditions que l'on juge parmi les plus difficiles au monde, le navire de forage n'a mis que 64 jours pour y forer un puits.»

Bilan de 1982

Janvier

- Le gouvernement de la Colombie-Britannique annonce que des remises seront accordées aux producteurs de gaz naturel de la province afin de compenser l'augmentation des taxes fédérales. Cette mesure visait à prévenir l'érosion des bénéfices nets des producteurs.

Février

- Pendant une violente tempête, la plate-forme de forage Ocean Ranger sombre au large de Terre-Neuve entraînant la mort de 84 membres d'équipage.

- Le premier ministre de Terre-Neuve, M. Brian Peckford somme le gouvernement fédéral d'abandonner ses prétentions à la propriété totale des ressources sous-marines, ou de renoncer à conclure un accord négocié.

- Un projet de loi omnibus, intitulé Loi de 1982 sur la sécurité énergétique est déposé au Parlement. Ce projet de loi vise à mettre en oeuvre les dernières dispositions principales du PNE.

Mars

- Les gouvernements du Canada et de la Nouvelle-Écosse signent un accord sur la gestion des gisements sous-marins de pétrole et de gaz; cet accord porte aussi sur le partage des revenus.

Avril

- Le gouvernement fédéral annonce une série de mesures visant à accroître les marchés permettant d'écouler les surplus de brut de l'ouest du pays.

- Le gouvernement accepte de fractionner le projet de loi sur la sécurité énergétique en huit nouveaux projets de loi afin d'en permettre l'adoption par le Parlement.

- L'Alberta dévoile son Programme de stimulation de l'industrie pétrolière et gazière; ce programme s'adresse aux secteurs du pétrole et du gaz conventionnels.

- La Société Alsands Energy Ltd. annonce qu'elle abandonne le méga-projet d'extraction et de traitement des sables bitumineux qu'elle comptait réaliser dans le nord-est de l'Alberta. L'abandon des programmes de travaux et la dissolution de l'équipe du projet ont été complétés le 31 juillet.

Mai

- L'Office national de l'énergie adopte des méthodes moins rigides pour calculer les quantités de gaz naturel pouvant être exportées. Cette mesure entraîne l'examen d'une trentaine de demandes de permis d'exportation.

- Dans le cadre de la «mise à jour de 1982 du Programme énergétique national», le gouvernement fédéral annonce une série de modifications s'appliquant aux prix du pétrole et aux impôts des sociétés pétrolières.

Juin

- Le gouvernement fédéral crée l'Administration des mesures d'encouragement du secteur pétrolier, organisme chargé de l'application du Programme du taux de participation canadienne et du Programme d'encouragement du secteur pétrolier.

- Le Premier ministre du Canada rend public un échange de lettres relatif au différend avec Terre-Neuve; il offre de reprendre les négociations sans conditions préalables même si la question a déjà été soumise aux tribunaux.

Juillet

- Le gouvernement conservateur nouvellement élu en Saskatchewan annonce d'importantes modifications à la structure provinciale des redevances.

- La Société Irving accepte d'acheter plus de 5000 mètres cubes par jour de brut léger albertain; ce pétrole sera raffiné entre juillet 1982 et juillet 1983 à la raffinerie que la Société possède à Saint-Jean. Ce pétrole, qui remplacera en partie le pétrole extrait par Irving de gisements sous-marins, sera acheminé jusqu'à Montréal par le pipeline interprovincial, puis par des pétroliers battant pavillon canadien. Les coûts supplémentaires de transport sont défrayés à même le Fond d'indemnisation pétrolière.

- Le Parlement adopte en troisième lecture les huit projets de loi sur la sécurité énergétique.

- Le gouvernement fédéral accorde sans concours public des droits d'exploration sur 1,7 millions d'hectares du plateau continental de la Nouvelle-Écosse.

Août

- Le gouvernement de l'Alberta étend aux forages d'exploitation l'application des indemnités d'encouragement s'appliquant aux coûts d'entretien des puits de pétrole et de gaz.

- Syncrude annonce avoir produit 100 millions de barils de pétrole synthétique depuis la mise en production de son usine en février 1978.

Septembre

- L'Honorable Jean Chrétien succède à l'Honorable Marc Lalonde au portefeuille de l'énergie. Il promet de veiller à ce que la politique énergétique du gouvernement soit bien comprise et appliquée sans heurts.

- Mise en exploitation du tronçon est du gazoduc préfabriqué reliant l'Alberta aux marchés américains.

- La Société Dome Petroleum annonce avoir conclu un accord de principe prévoyant la restructuration et l'augmentation du capital de la Société. L'ensemble de mesures a été négocié auprès de 4 banques canadiennes et du gouvernement fédéral. Il pourrait en résulter une entrée de fonds d'un milliard et demi, ainsi qu'un refinancement d'une grande partie de la dette de la Société sur au moins dix ans.

Octobre

- Pétro-Canada achète les services de raffinage et de commercialisation de B P Canada, au coût de 577,5$ millions.

- Le gouvernement de l'Alberta modifie son programme de prime à la récupération assistée afin d'encourager les sociétés à réaliser de grands projets de récupération assistée.

Novembre

- Le gouvernement fédéral crée la Commission Royale d'enquête sur l'union économique et les perspective de développement du Canada. Cette commission a pour tâche première d'évaluer le potentiel économique à long terme du Canada.

Décembre

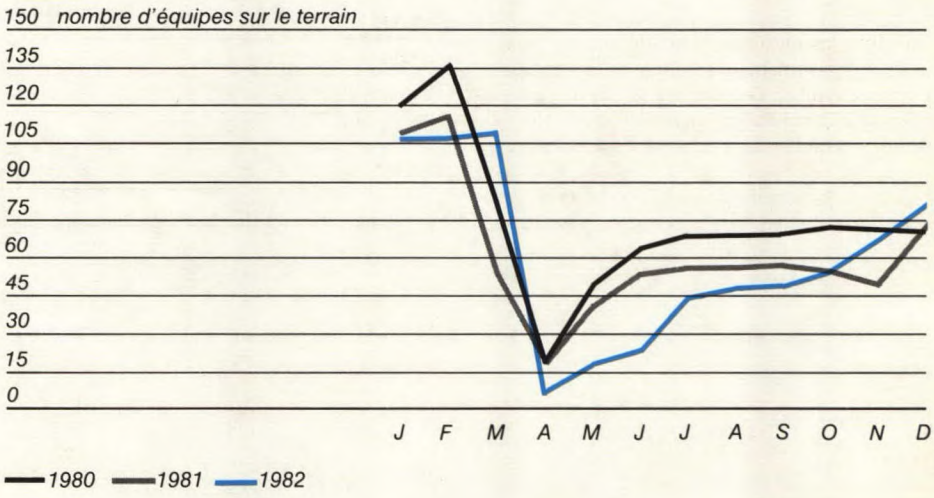
- Les ministres de l'énergie du Canada et de Terre-Neuve reprennent leurs discussions afin de tenter d'en arriver à un accord sur la gestion des ressources sous-marines et le partage des revenus qui en découlent.

- Le gouvernement du Manitoba dépose un projet de loi prévoyant la création de la Société pétrolière et gazière du Manitoba, société d'État.

Recrudescence des sondages sismiques en fin d'année

La prospection géophysique a continué de décliner pour la deuxième année consécutive, bien qu'une recrudescence ait permis en fin d'année de retrouver le niveau d'activité de 1980.

Prospection géophysique

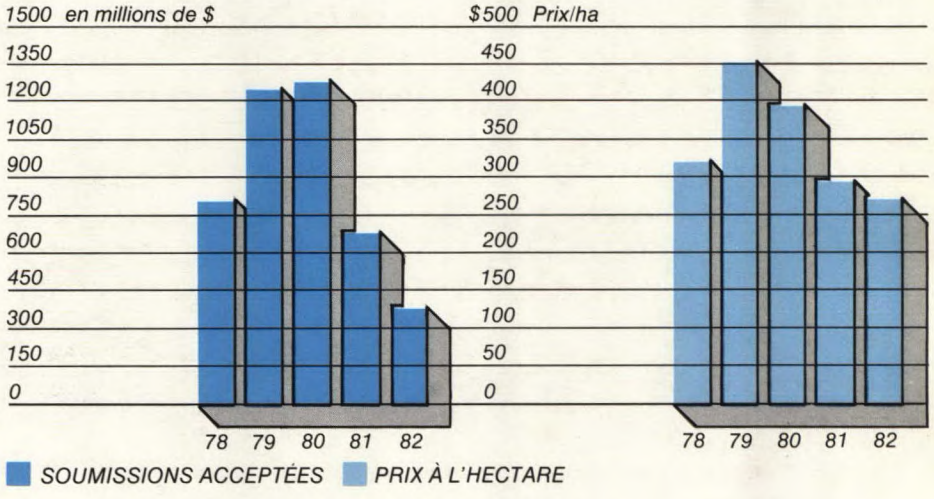


La vente des droits de prospection décline

Les concessions de droits de prospection accordées par le gouvernement dans l'Ouest ont poursuivi le déclin amorcé après l'augmentation rapide survenue à la fin des années 70. Les montants affectés à l'acquisition de concessions ont baissé de 47% en 1981 et de 44% en 1982. Le prix moyen à l'hectare avait par contre commencé à tomber en 1980; ce prix était l'an dernier inférieur par presque 40% au prix record de 1979. Ces données, qui sont un indicateur des tendances à venir en matière d'exploration, semblent indiquer qu'aucune reprise de l'activité n'est en vue dans ce secteur, dans un avenir prévisible.

Vente de droits de prospection

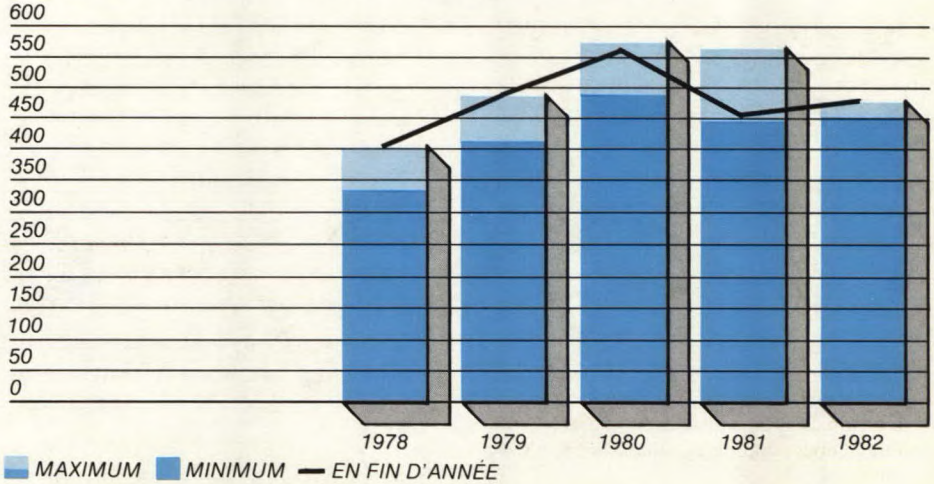
Source: Ministères de l'énergie des gouvernements



Légère augmentation du parc d'installations de forage

Le parc d'installations de forage de l'Ouest du pays a connu une lègère hausse au cours de l'année, malgré un niveau d'activité moins élevé qu'en début d'année. Sauf en novembre et en décembre, le taux d'utilisation des installations a été inférieur à 50%. Le niveau d'activité exceptionnellement élevé en fin d'année est dû aux mesures d'encouragement adoptées par le gouvernement de l'Alberta, et qui ont pris fin le 31 décembre. En 1983, les travaux de forage d'hiver sont tombés à leur plus bas niveau depuis 1976.

Nombre d'installations de forage disponibles - ouest du pays

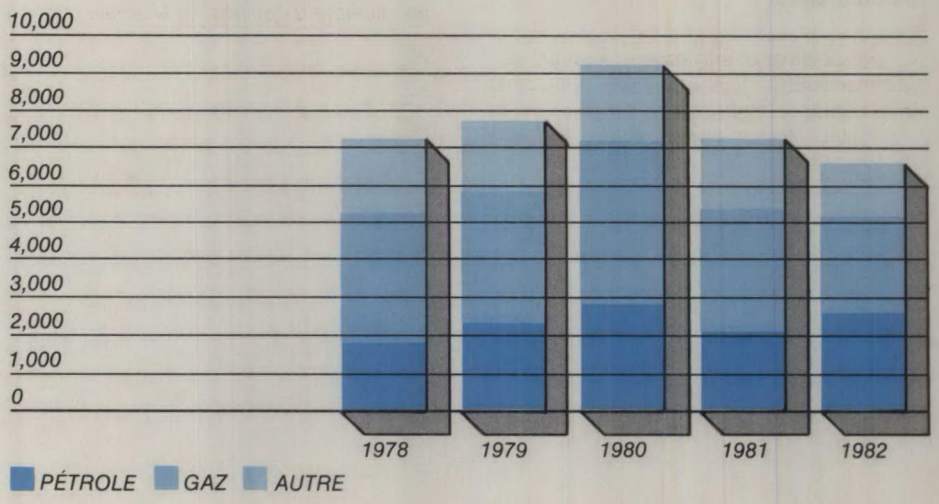


Chute du nombre de forages

Malgré les mesures d'encouragement prises par le gouvernement albertain et la reprise de l'activité en Saskatchewan, le nombre de forages complétés a encore décliné cette année. Pendant que le nombre de forages de gaz naturel a chuté de 20%, le nombre de forages de pétrole a augmenté de 21%, traduisant ainsi la nouvelle tendance de l'industrie favorisant l'exploration et la mise en valeur du pétrole.

Nombre de forages complétés

Source: APC

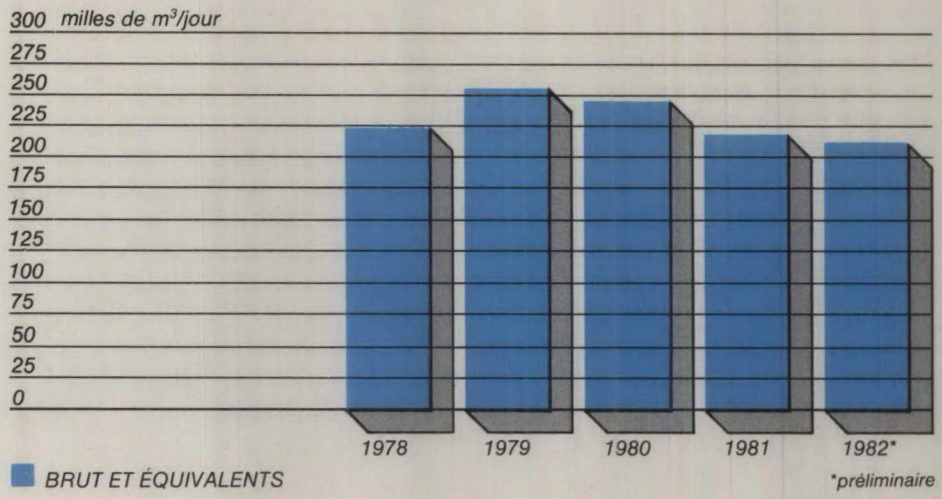


La production pétrolière continue de décliner

Le volume de la production quotidienne de pétrole brut ou équivalent a poursuivi son déclin pour la quatrième année consécutive. Selon ces évaluations préliminaires, la production aurait été de 210 140 m³/jour en 1982. Cette baisse de la production résulte des surplus accumulés en début d'année.

Production

Source: APC



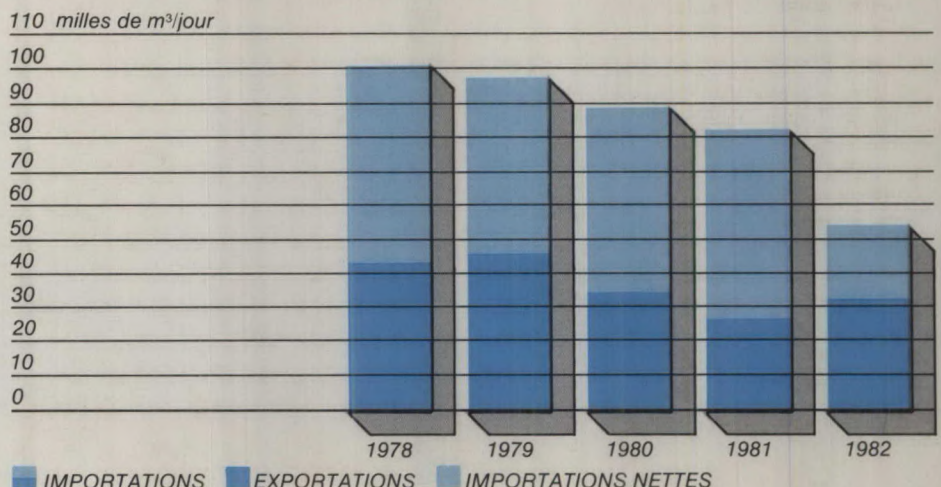
*préliminaire

Réduction des importations

L'importante réduction des importations de pétrole résulte en grande partie de la baisse de la demande consécutive à la récession et des mesures favorisant la conservation et la substitution. En outre, l'accord de 1981 entre le gouvernement fédéral et l'Alberta entraîne la levée des coupures et le rétablissement de la production de cette province. Bien que les importations correspondent actuellement à 54% du niveau de 1978, les exportations de pétrole lourd se sont légèrement raffermies depuis 1981. Les données reproduites ci-dessus tiennent compte des «échanges» de pétrole brut. Les importations quotidiennes réelles pour consommation canadienne ont été de 46,900 mètres cubes, comparativement à 55,600 mètres cubes en 1981.

Importations et exportations de pétrole brut

Source: Statistiques Canada

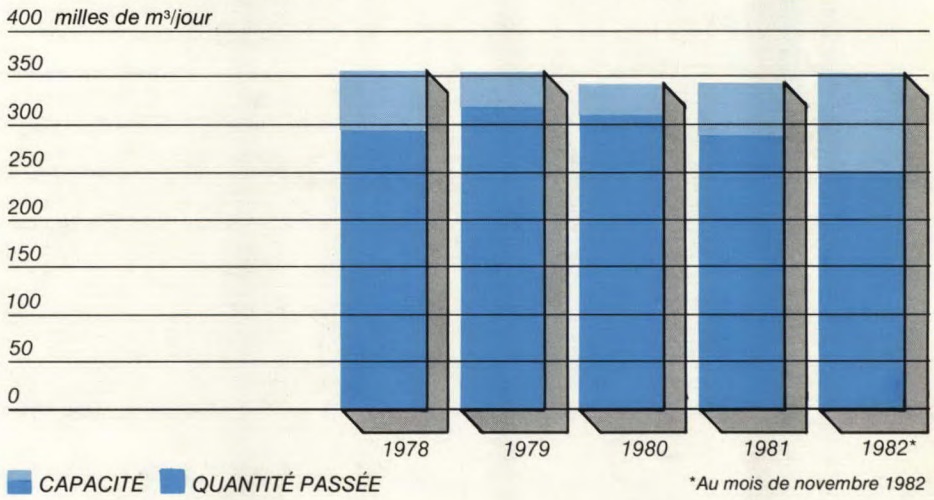


La demande des raffineries en pétrole brut décline

Calculés selon la capacité de production en fin d'année, les taux d'utilisation des raffineries canadiennes à 71,2% au cours de l'année; les raffineurs ont projeté la fermeture de cinq raffineries, d'une capacité globale de 44,900 mètres cubes en 1982 et 1983. Malgré ces fermetures, les taux d'utilisation demeureront inférieurs au niveau optimal en 1983.

Taux d'utilisation des raffineries

Sources: APC, Statistiques Canada



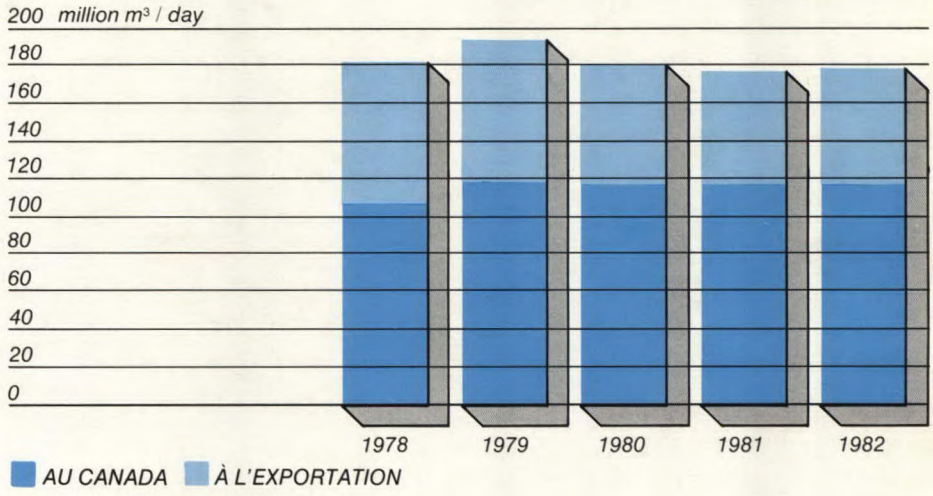
*Au mois de novembre 1982

La production de gaz naturel se maintient

Même si les volumes de gaz naturel commercialisés sont les mêmes qu'en 1981, les statistiques ne font pas état du déclin des exportations, sauf dans le cas des livraisons qui ont été acheminées en septembre par le tronçon est du pipeline préfabriqué. Les exportations représentent seulement 49% des volumes d'exportations autorisés en 1982. Les ventes se sont maintenues sur le marché intérieur, surtout en raison de l'ouverture de nouveaux marchés résultant du programme fédéral de conversion.

Ventes de gaz naturel

Source: Statistiques Canada

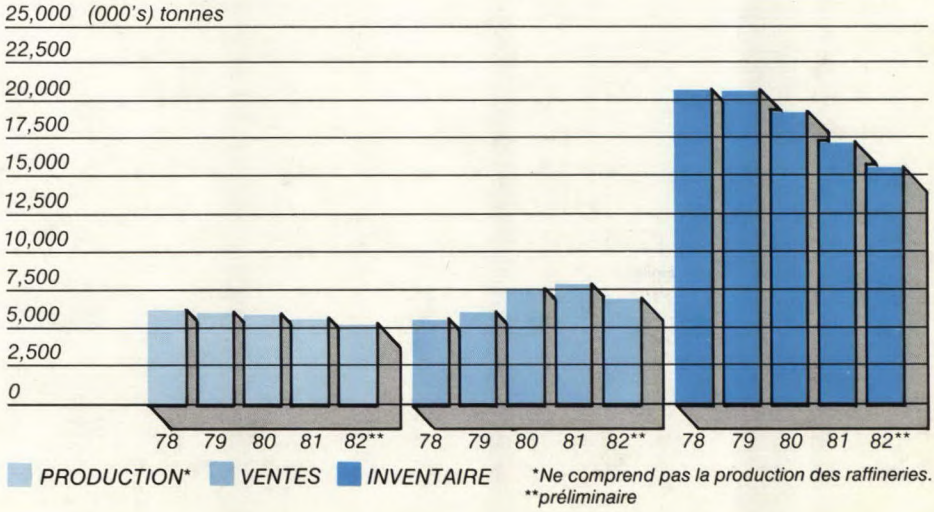


Chute des ventes de soufre

L'inventaire et la production de soufre ont décliné pour la cinquième année consécutive, même si les ventes se sont maintenues à des niveaux relativement élevés. L'Ouest canadien reste le premier fournisseur de soufre au monde. Malgré leur déclin, les ventes ont été supérieures à la production pour la quatrième année consécutive. Les inventaires ont donc été réduits de 24% depuis 1978, alors qu'ils étaient à leur niveau le plus élevé.

Soufre

Source: APC



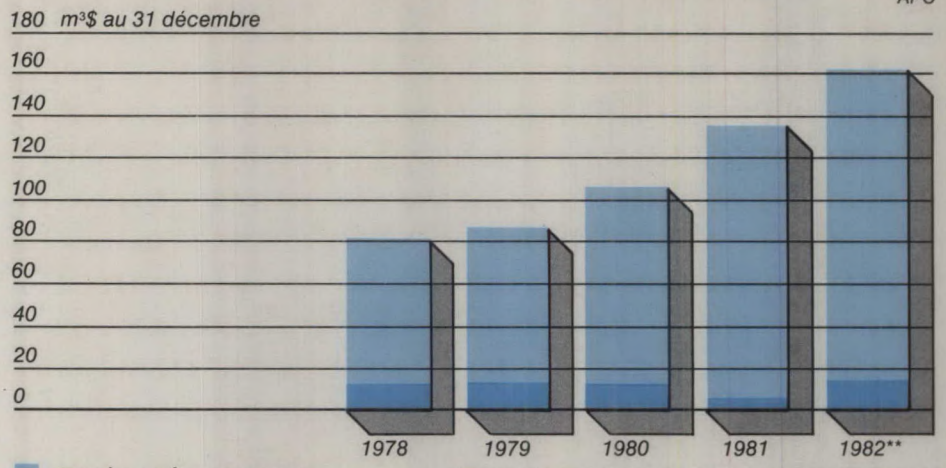
*Ne comprend pas la production des raffineries.
**préliminaire

Les bénéfices nets tirés du «vieux» pétrole retournant à des niveaux pré-PEN

Les bénéfices nets tirés du «vieux» pétrole sont remontés aux niveaux de 1978-1980, après un sérieux déclin en 1981. L'amélioration est principalement attribuable à la réduction des redevances votée par le gouvernement de l'Alberta, à la suspension de l'IPRP et la réduction de l'IRPG promulguées par le gouvernement fédéral, et à l'augmentation des prix du «vieux» pétrole.

Bénéfices nets* tirés du «vieux» pétrole extrait des terres de la couronne

Source: APC



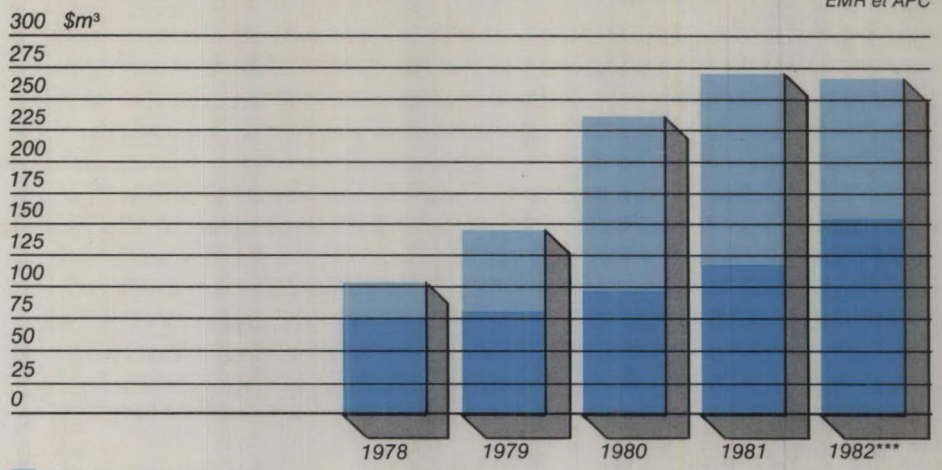
*Sur une base d'imposition totale (avant réinvestissement)
**Évaluation préliminaire

L'écart diminue entre le prix du pétrole canadien et les prix mondiaux

Pour la première fois depuis l'escalade rapide du prix du pétrole brut en 1979/1980, l'écart a diminué entre les prix moyens du pétrole canadien et du pétrole importé. Ce phénomène résulte de l'augmentation des prix du pétrole canadien et de la réduction simultanée des prix mondiaux.

Comparaison entre les coûts du pétrole canadien et du pétrole importé

Source: EMR et APC



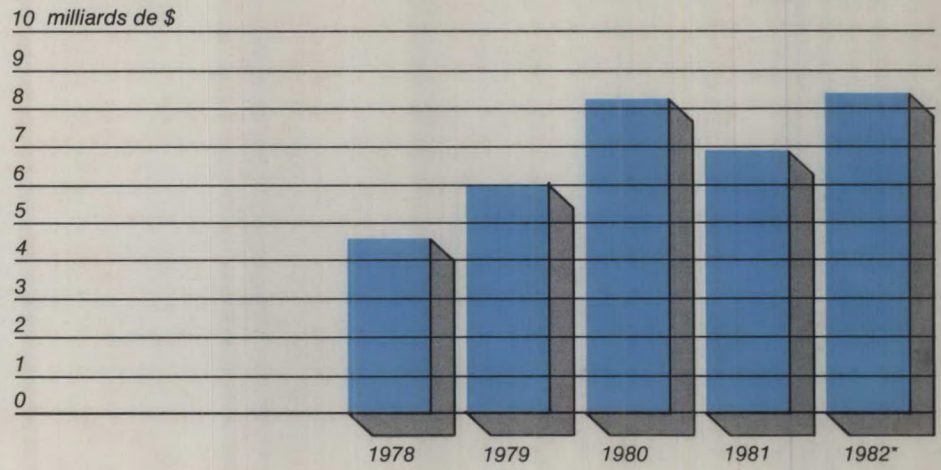
*Coût moyen des importations, F.A.B. Montréal
**Prix moyen à la tête du puits - Ouest canadien, toutes catégories.
***Au mois de septembre 1982

Les dépenses s'élèvent aux niveaux de 1980

Les évaluations préliminaires des dépenses nettes pour l'exploration, la mise en valeur et les investissements touchant les sables bitumineux sont de 8,4$ milliards, un retour aux niveaux de 1980. Les coûts pour les régions éloignées, défrayés à même les subventions du PIP, ont représenté une portion beaucoup plus importante des dépenses totales.

Investissement

Source: APC



*préliminaire

Glossaire

Acronymes

ATPGC - Administration des terres pétrolières et gazières du Canada
IPRP - Impôt progressif sur les revenus tirés du pétrole
ONE - Office national de l'énergie
PEN - Programme énergétique national
PRNP - Prix de référence du nouveau pétrole
PESP/PAESP - Programme d'encouragement du secteur pétrolier / Programme albertain d'encouragement du secteur pétrolier
IRPG - Impôt sur les revenus tirés du pétrole et du gaz

Termes

Puits d'exploration:
Puits foré en zone non prouvée ou à demi prouvée afin d'établir la présence de gisements de pétrole d'importance commerciale. Les termes «puits d'exploitation» désignent par contre un puits foré afin d'extraire le pétrole que contient un gisement connu. L'emplacement des puits de sondage est régi par des règlements d'espacement et par contraintes imposées par le gisement.

Puits supplémentaire :
Puits foré dans les limites établies d'un gisement afin d'en accroître la production.

Vente de concessions:
Vente à l'enchère par le gouvernement de droits miniers sur une parcelle précise de territoire.

Liquides extraits du gaz naturel:
Hydrocarbures présents dans le gaz naturel et que l'on peut extraire ou isoler sous forme de gaz liquéfié de pétrole, ainsi que des pentanes et du condensat.

Redevances:
Sommes versées au propriétaire des ressources (gouvernements particuliers ou bandes indiennes) et correspondant habituellement à un pourcentage du prix de vente de la production.

Installation de forage semi-submersible:
Installation de forage constituée d'un pont supporté par des colonnes fixées à leur base sur de grands flotteurs submergés à des caissons verticaux, ou à ces deux types de dispositifs. Les colonnes, coques statiques ou caissons sont remorqués jusqu'au site et submergés.

Puits d'extansion:
Puits foré à une certaine distance d'un puits productif dans le but d'établir les limites d'un gisement.

Injection d'eau:
Procédé de récupération assistée qui consiste à injecter de l'eau dans un gisement afin de maintenir la pression du réservoir et d'expulser le pétrole par la canalisation forée.

Forages complétés:
Nombre de puits forés et amenés au stade de production, ou forés à leur pleine profondeur et colmatés parce qu'ils ne contiennent pas de pétrole.

Prix à la tête des puits:
Prix du pétrole ou du gaz à la sortie du puits, avant toute autre majoration (transport, taxe, etc...)

Conversions métriques:

1 mètre cube (m^3) = 6,29 barils de pétrole brut
1 mètre cube = 35,49 pieds cubes de gaz naturel
1 exajoule (ej) = 1000 pentajoules
= 0,95 trillion de pieds cubes de gaz naturel

1 hectare (ha) = 2,47 acres

1 kilomètre (km) = 0,62 milles
= 0,54 milles marins

1 tonne (t) = 0,98 tonne longue
= 2205 livres

L'Association pétrolière du Canada: Historique

Les compagnies de l'Association pétrolière du Canada explorent et exploitent les ressources pétrolières et gazières du Canada depuis les tout débuts de l'industrie dans l'Ouest du Canada. Les premières sociétés réalisent tôt qu'elles sont liées par des besoins et des intérêts communs. Aussi, à peine treize ans après la découverte d'huile dans le gisement de Turner Valley, l'Alberta Oil Operator's Association est fondée. L'industrie croît, ses activités prennent de l'expansion; il en va de même pour l'Association. En 1952, l'Association, soucieuse de mieux traduire dans sa raison sociale le rôle plus grand qu'elle joue maintenant, devient l'Association pétrolière du Canada.

L'industrie et l'Association continuent de croître, grâce à l'exploration des gisements du Nord canadien et des gisements sous-marins, et à l'exploitation de ressources non conventionnelles telles que les sables bitumineux de l'Alberta.

Aujourd'hui, l'APC dispose de bureaux et d'employés dans six provinces. Elle a notamment pour tâches principales de contribuer à l'information du public canadien relativement à d'importantes questions énergétiques, de préparer pour le compte de l'industrie les mémoires techniques et financiers qui sont présentés aux organismes gouvernementaux, et de rassembler et diffuser auprès de ses membres de l'information statistique, économique et législative.

Les membres actifs de l'APC se recrutent parmi les sociétés constituant l'industrie pétrolière et gazière du Canada (à l'exception des entrepreneurs, fournisseurs ou détaillants); on y retrouve aussi la plupart des grandes sociétés de pipelines. Les sociétés membres de l'APC produisent plus de 80% du pétrole brut, et environ les deux-tiers du gaz naturel canadien. De plus, quelques 90 autres sociétés desservant l'industrie pétrolière de diverses façons font également partie de l'APC à titre de membres honoraires.

Un conseil d'administration préside aux destinées de l'Association, formule les politiques, et assure la liaison avec les gouvernements provinciaux et le gouvernement fédéral. Ce conseil est composé de 34 administrateurs, dont 30 sont élus parmi les membres actifs lors de l'assemblée générale. Le président sortant et les présidents des trois divisions font également partie du conseil d'administration.

La division de la Saskatchewan de l'Association a ses bureaux à Régina, la division de la Colombie-Britannique à Victoria, et la division des pipelines à Calgary. Chaque division est administrée par un conseil d'administration. Ayant son siège social à Calgary, l'Association pétrolière du Canada a des bureaux à St-Jean (T.N.), Ottawa et Montréal. Trente et un permanents assurent le soutien technique et la coordination des activités de l'Association. Ces activités comprennent la réalisation de programmes de sensibilisation publique, la cueillette et la diffusion de l'information, la coordination du travail des comités, la compilation et la publication de données et de statistiques annuelles sur l'industrie, et le maintien d'une bibliothèque de référence pour l'industrie.

Quelques jalons importants de l'histoire de l'industrie et de l'association

1914

Découverte du puits Dingman 1 à Turner Valley, dans l'ouest du Canada.

1927

Fondation de «l'Alberta Oil Operators' Association», Calgary.

1929

L'Association devient la «Oil and Gas Association of Alberta».

1936

Découverte d'un gisement de pétrole brut à la limite sud-ouest de Turner Valley.

1937

Fondation de la «Petroleum Producers' Association».

1938

Fusion de la «Oil and Gas Association» et de la «Petroleum Producers' Association», qui deviennent «l'Alberta Petroleum Association».

1947

La découverte du puits Leduc 1 marque le début de l'exploration et l'exploitation pétrolières selon des méthodes modernes.

1952

Fondation de l'Association pétrolière du Canada afin de souligner le rôle que l'industrie joue sur la scène nationale.

1958

L'APC ouvre un bureau d'information à Ottawa.

1960

Forage du premier puits d'exploration dans l'Arctique canadien.

1967

Le premier gisement de pétrole commercial débute ses opérations au puits d'Athabaska.

1979

Découverte du gisement Hibernia au large des côtes de Terre-Neuve. Il s'agit du premier gisement commercial.

1981

L'APC ouvre un bureau à St-Jean, Terre-Neuve, en collaboration avec la «Eastcoast Petroleum Operators Association».

1982

Ouverture d'un bureau d'information à Montréal.

Aperçu des activités

En 1982, l'Association a poursuivi sa campagne de communication de masse lancée en 1981; il s'agit d'une campagne publicitaire réalisée au niveau national et visant à informer le public en général de la situation énergétique au Canada. Au début, la campagne a été lancée par des messages télévisés, accompagnés d'annonce dans les journaux et les magazines; des messages radiodiffusés ont plus tard été greffés au programme de la campagne.

Dans le cadre de la campagne de communication de masse et avec l'aide du Comité des relations publiques, l'Association s'est en outre efforcée de donner une bonne information par d'autres moyens de communication.

L'Association a participé à plusieurs conférences de presse où, en plus d'apporter ses commentaires, elle jouait le rôle de source importante d'information analytique et technique pour les médias d'information du pays. Des conférenciers représentant l'industrie pétrolière ont prononcé 128 allocutions dans neuf provinces différentes. Les publications énergétiques de l'Association continuent d'être fort recherchées; celles-ci sont **«l'annuaire statistique annuel»** et la chronique hebdomadaire intitulée «questions énergétiques». Le mensuel «CPA Review» est maintenant publié sous un nouveau format très populaire.

De plus, l'Association a préparé une présentation audio-visuelle (enregistrée ultérieurement sur ruban magnétoscopique) sur l'industrie pétrolière du Canada, et elle a publié une brochure intitulée **nos ressources pétrolières**.

Au cours de l'année, l'Association a commencé la radio-diffusion d'une émission hebdomadaire intitulée **«Energy Report»**; cette émission radiophonique est présentée dans la région de Calgary.

Durant 1982, l'Association a présenté de nombreux mémoires, dossiers et rapports aux gouvernements fédéral et provinciaux, ainsi qu'aux agences gouvernementales. Bien qu'elles ne représentent qu'une portion des activités de l'APC en 1982, les listes suivantes illustrent bien la profondeur et l'envergure de l'engagement de l'APC face aux problèmes de l'industrie.

Rapports, publications et mémoires

- *Lignes directrices portant sur les forages sous-marins*
- *Compte-rendu de l'exploitation de l'industrie pétrolière et des autres activités de mise en valeur des terrains, qui ont un effet sur la faune et la flore*
- *Développement urbain des terrains offrant un droit de passage aux pipelines*
- *Le processus législatif au Canada: adoption de la loi canadienne sur le pétrole et le gaz (Bill C-48)*
- *Compte-rendu du rendement des pipelines de pétrole*
- *Evaluation critique des règlements s'appliquant aux pipelines à liquides, au Canada*

Mémoires:

- Un mémoire a été présenté au Ministère fédéral des concessions pétrolières et gazières; ce mémoire concerne les règlements proposés, relativement aux pipelines de pétrole et de gaz
- Audiences portant sur les installations du projet pilote de l'Arctique
- Enquête du commissionnaire de la Colombie-Britannique sur la méthode de protection du gaz en Colombie-Britannique
- Enquête sur le Bill Omnibus touchant l'exportation du gaz naturel
- Enquête sur le pipeline de gaz naturel de l'Alberta
- Enquête sur les taux touchant le pipeline Trans-Québec et celui des Maritimes
- Ministère des finances relativement au budget fédéral
- Agence de surveillance de l'industrie pétrolière, relativement aux frais d'exploitation et aux revenus d'impôt
- Ministère des ressources énergétiques et naturelles de l'Alberta (REN) face aux programmes d'indemnisation sur les activités géophysiques et les forages d'exploration
- REN face aux redevances portant sur le gaz naturel et le pétrole
- Ministère fédéral des finances, face à l'élargissement de la juridiction douanière au large des côtes
- Ministère fédéral des finances, relativement à l'impôt prélevé sur les liquides et le gaz naturel
- Mémoire traitant de la définition d'une lettre, tel que précisé par le Bureau de Poste
- Mémoires traitant de la loi canadienne sur le pétrole et le gaz
- Mémoire présenté au comité permanent de la Chambre des communes, sur les questions financières, économiques et commerciales, relativement au budget du 13 novembre 1981 et aux amendements qui y ont été apportés
- Mémoires sur les niveaux de productivité du pétrole dans l'Ouest canadien
- Mémoire présenté à l'Administration des mesures d'encouragement du secteur pétrolier, relativement au Programme du taux de participation canadienne et au Programme d'encouragement du secteur pétrolier
- Mémoire présenté au programme albertain d'indemnisation d'encouragement aux activités pétrolières, concernant les frais généraux affectés à la mise en valeur et à l'exploration
- Mémoire présenté au Ministère des mines et des ressources énergétiques de la Saskatchewan, relativement à l'impôt sur le pétrole et le gaz, prélevé les redevances et des indemnisations d'encouragement en Saskatchewan
- Mémoire exposant la situation du pétrole en Alberta
- Mémoire présenté au Ministère de l'emploi et immigration Canada, portant sur les planifications en matière de main d'oeuvre

Séminaires:

- Séminaire annuel sur la sécurité dans l'industrie pétrolière (co-parrainage)
- Séminaire sur l'usage des drogues au travail
- Séminaire sur les systèmes au laser
- Atelier annuel sur l'environnement (co-parrainage)

En 1980, l'Association pétrolière du Canada a lancé une campagne nationale visant à faire connaître l'industrie pétrolière au public canadien. La campagne s'est poursuivie au printemps 1982 et est entrée dans une nouvelle phase à l'automne.

Dès le début, des entrevues ont été réalisées dans toutes les provinces, afin de donner aux Canadiens une connaissance exacte et actuelle de l'industrie, de son rôle et de sa contribution à la vie nationale.

Avant le début de la campagne, des sondages réalisés par l'APC auprès des Canadiens ont révélé que l'industrie était en train de perdre sa réputation d'intégrité, de responsabilité et de fiabilité.

Une campagne de grande envergure s'avérait nécessaire, puisque l'industrie doit absolument bénéficier de la compréhension et de l'appui du public pour mener à bien les nombreux projets nécessaires à la réalisation de l'autosuffisance en pétrole brut. La campagne a été fondée sur les principes suivants: on ne peut comprendre que ce que l'on connait et pour obtenir l'appui du public, il faut d'abord s'en gagner la sympathie. L'objectif de la campagne est donc de donner aux Canadiens une information exacte à partir de laquelle ils pourront, en connaissance de cause, décider de leur avenir énergétique. Le thème de la campagne, intitulé «Nous faisons tous partie de la solution», a fait place en 1982 au nouveau thème intitulé «Développer l'énergie c'est aider à développer l'économie».

Débutant par un message assez général visant à attirer l'attention sur la présence de l'APC dans les média, la campagne a progressée graduellement vers la diffusion d'une information plus consistante.

Le programme a été efficace: un sondage mené après le début de la deuxième phase, a démontré un changement dans l'attitude du public face à l'industrie, comme l'illustre la première partie de ce rapport annuel.

Prix et honneurs

Pour la sixième année, l'Association a présenté ses prix de journalisme nationaux. Ces prix d'excellence, présentés en collaboration avec le Calgary Press Club, ont été bien reçus dans les milieux journalistiques. Des journalistes francophones et anglophones se sont portés candidats.

6e DISTRIBUTION ANNUELLE DES PRIX DE JOURNALISME NATIONAUX

David Hatter,
Calgary Herald

Gillian Steward,
Canadian Business

Peter Foster,
Saturday Night

Alain Dubuc,
La Presse

Val Christensen, John Downton,
Mobil Oil Canada Dimensions

Dave Hicks,
Norcen Explorer

Russell Felton,
Imperial Oil Review

En 1982, des membres honoraires à vie ont de plus été intronisés et des prix de distinction ont été accordés par l'APC.

MEMBRES HONORAIRES À VIE

G.J. (Glyn) Evans,
Président sortant
Trans-Northern Pipelines Inc.

S.G. (Stan) Olson,
Président sortant,
Hudson's Pay Oil and Gas
Company Limited

PRIX DE DISTINCTION

D.K.F. (Donald) Dawson,
Mobil Oil Canada Ltd.

William Fesyk
Esso Canada Resources Ltd.

R.L. (Ron) Findlay,
Amoco Canada Petroleum Company Ltd.

I.J. (Irv) Koop,
BP Canada Inc.

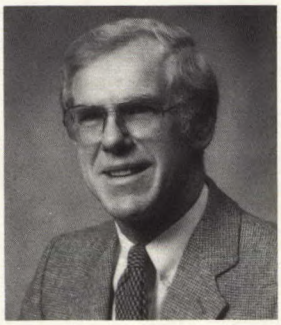
T.E. (Tom) Randall,
Gulf Canada Resources Inc.

Michael Ratuski,
Gulf Canada Resources Inc.

W.G. (Walter) Smith,
Esso Canada Resources Limited (sortant)

L'organisme au seuil d'une nouvelle année

Le conseil de direction et les dirigeants de l'APC sont choisis chaque année, lors de la réunion annuelle tenue habituellement en mars. Le sommaire suivant comprend les membres élus en 1983, leur association, leurs responsabilités et les postes de direction qu'ils détiennent.

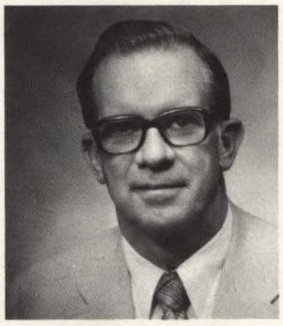


E.W. (Ted) Best
Président:
Président
BP Exploration Canada Limited

A.R. (Arne) Nielsen
Vice-président;
Président du conseil d'administration et directeur exécutif
Canadian Superior Oil Ltd.

D.R. (Doug) Fenton
Président, Division des pipelines:
Vice-président exécutif,
Alberta Natural Gas Company Ltd.

R.H. (Harry) Carlyle
Président sortant et président du Comité des relations publiques;
Vice-président senior,
Gulf Canada Resources Inc.



J.J. (Jim) Sullivan
Président, Division de la Saskatchewan;
Adjoint au vice-président, production
Union Oil Company of Canada Limited

G.L. (Gerry) Henderson
Président, Division de la Colombie-Britannique
Président,
Chevron Canada Resources Ltd.

W.A. (Bill) Gatenby
Trésorier et président du Comité des finances
Président
Texaco Canada Resources Ltd.

D.D. (Don) Barkwell
Président, Comité général de l'exportation
Vice-président senior
Ressources naturelles
Norcen Energy Resources Ltd.

R.F. (Dick) Haskayne
Président, Comité général de l'économie des ressources
Président et directeur exécutif
Home Oil Company Limited

B.F. (Bernard) Isautier
Président, Comité général des services d'exploitation et de production
Président
Canterra Energy Ltd.

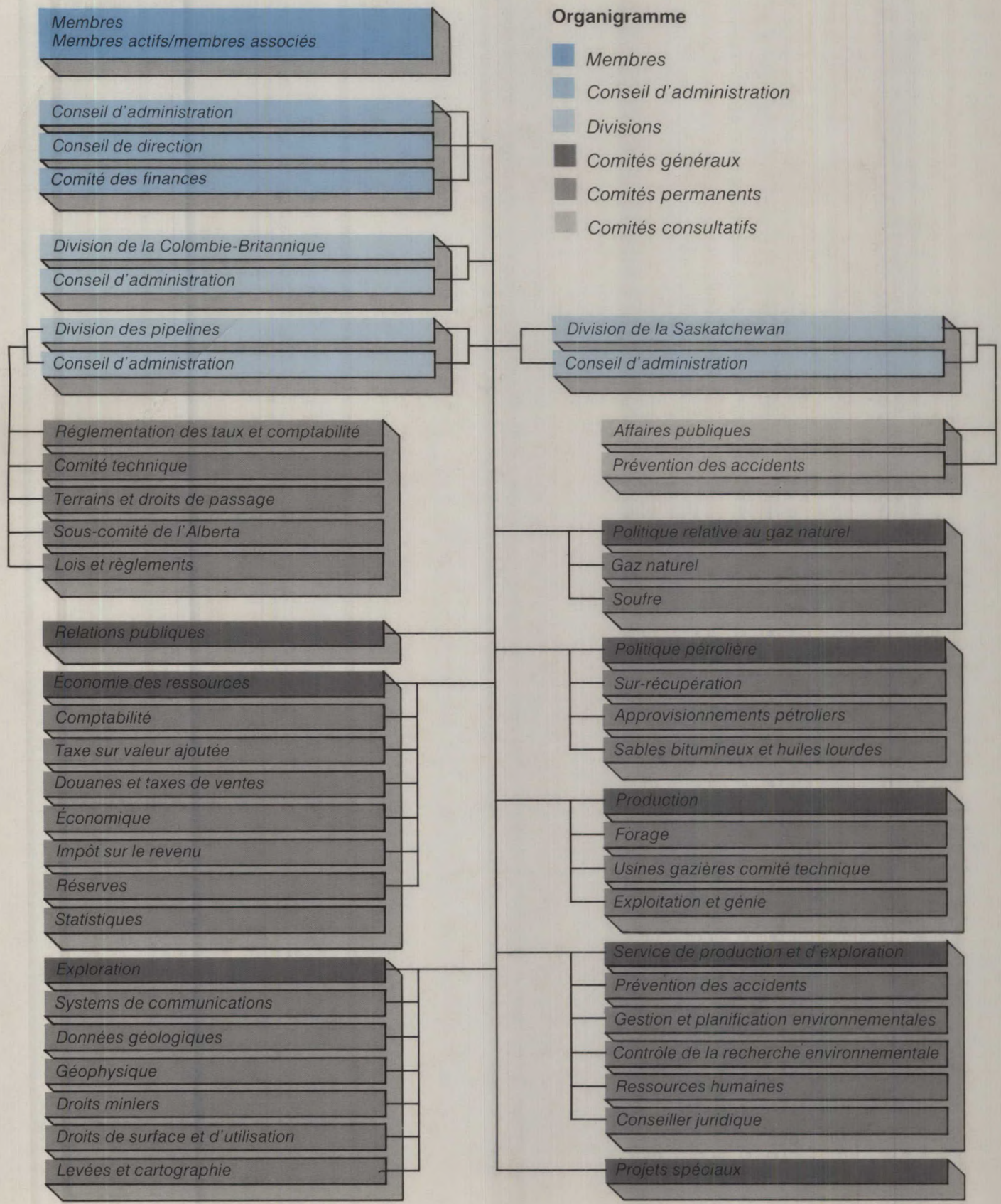
D.D. (Don) Lougheed
Président, Comité général des politiques pétrolières
Directeur et vice président exécutif
Esso Canada Resources Ltd.

R.Y. (Bob) Pogontcheff
Président, Comité général de la production
Vice président de groupes
Husky Oil Ltd.

B.B. (Bart) Rombough
Président, Comité général de projets spéciaux
Président et directeur exécutif
PanCanadian Petroleum Limited

D.G. (Doug) Stoneman
Président, Comité général des politiques relatives au gaz naturel
Vice président senior
pétrole et gaz
Shell Canada Resources Ltd.

Ian R. Smyth
Directeur général, Association pétrolière du Canada


Organigramme
Membres
Conseil d'administration
Divisions
Comités généraux
Comités permanents
Comités consultatifs
Membres
Membres actifs/membres associés
Conseil d'administration
Conseil de direction
Comité des finances
Division de la Colombie-Britannique
Conseil d'administration
Division des pipelines
Conseil d'administration
Réglementation des taux et comptabilité
Comité technique
Terrains et droits de passage
Sous-comité de l'Alberta
Lois et règlements
Relations publiques
Économie des ressources
Comptabilité
Taxe sur valeur ajoutée
Douanes et taxes de ventes
Économique
Impôt sur le revenu
Réserves
Statistiques
Exploration
Systems de communications
Données géologiques
Géophysique
Droits miniers
Droits de surface et d'utilisation
Levées et cartographie
Division de la Saskatchewan
Conseil d'administration
Affaires publiques
Prévention des accidents
Politique relative au gaz naturel
Gaz naturel
Soufre
Politique pétrolière
Sur-récupération
Approvisionnements pétroliers
Sables bitumineux et huiles lourdes
Production
Forage
Usines gazières comité technique
Exploitation et génie
Service de production et d'exploration
Prévention des accidents
Gestion et planification environnementales
Contrôle de la recherche environnementale
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Membres

Membres actif
AGIP Canada Ltd.
Alberta Natural Gas Company Ltd.
Alberta Oil Sands Pipelines Ltd.
Amerada Minerals Corp. of Canada
Amoco Canada Petroleum Company Ltd.
Anadarko Petroleum of Canada Ltd.
BP Canada Resources Limited
Canada-Cities Service, Ltd.
Canadian Occidental Petroleum Ltd.
Canadian Superior Oil Ltd.
Canadian Western Natural Gas Co.
Canterra Energy Ltd.
Chevron Canada Resources Limited
Columbia Gas Dev. of Canada Ltd.
Consolidated Natural Gas Ltd.
Conventures Limited
Esso Resources Canada Limited
Forest Oil Corporation
Getty Oil (Canada) Ltd.
Gibson Petroleum Company Ltd.
Gulf Canada Resources Inc.
Home Oil Company Limited
Husky Oil Ltd.
ICG Resources Ltd.
Imperial Oil Limited (Pipeline)
InterProvincial Pipe Line Ltd.
Koch Oil Company Ltd.
Mobil Oil Canada, Ltd.
Monsanto Oils Ltd.
Montreal Pipe Line Ltd.
Murphy Oil Company Ltd.
Norcen Energy Resources Ltd.
Northwestern Utilities Ltd.
Oakwood Petroleums Ltd.
Pan-Alberta Gas Ltd.
PanCanadian Petroleum Limited
Peace Pipe Line Ltd.
Pembina Resources Limited
Phillips Petroleum Company
Placer CEGO Petroleum Ltd.
Placid Oil Company
Producers Pipelines Ltd.
Quintana Exploration Canada Limited
R. Adair Oil Management
Rainbow Pipe Line Company Ltd.
Ranger Oil Ltd.
Shell Canada Resources Limited
Sohio Petroleum Company
SOQUIP
South Saskatchewan Pipeline
Sulpetro Limited
Sun-Canadian Pipe Line Company Ltd.
Suncor Inc.
Syncrude Canada Ltd.
Tennessee Gas Transmission Company
Texaco Canada Resources Ltd.
Total Petroleum Canada Ltd.
TransCanada PipeLines Ltd.
Trans Mountain Pipe Line Co. Ltd.
Trans-Northern Pipe Line Company
Union Oil Company of Canada Ltd.
United Canso Oil & Gas Ltd.
Westar Petroleum Ltd.

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Sproule Associates Limited
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Teknica Resource Development
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The First National Bank of Chicago (Canada)
The Steel Company of Canada
Thorne Riddell
Thorsteinsson & Company
Toronto Dominion Bank
Touche, Ross & Company
TransAlta Utilities Corp.
TransCanada Telephone System
USS Oilwell Supply Co. Ltd.
Universal Customs Consultants Ltd.
W.D. Usher & Associates Ltd.
Western Geophysical Co. of Canada
Western Rock Bit Company Ltd.

APPENDIX B

Shell Canada Resources Limited

Minerals Division

Black Lake Experiment

ANIK B - SHELL - CPA - CRC - BLACK LAKE EXPERIMENT

BACKGROUND

Shell Canada Resources Limited, Minerals Division ran a mineral exploration program around the Black Lake area of Northern Saskatchewan during the period July to September 1981. The normal mode of communications to the outside world was via H.F. radio telephone service. As a result communications at times were unreliable and unintelligible, as well security of information was a concern. As a result of this, an experimental satellite terminal was installed at this remote location to provide voice communications back to Shell's mineral exploration located in Calgary.

SYSTEM CONFIGURATION

The system was configured in a double hop set up with the Ottawa 9m station being the homing station for the Calgary and Black Lake terminals. The Calgary satellite terminal was co-located with AGT's and Telsat's earth terminal site, with AGT providing a 4 wire loop from this location to the Shell Mineral office.

PROGRAM SCOPE

The satellite hours were limited by transponder availability to 08:00 to 10:00 hours MST. The type of traffic carried was private line voice service between the two locations.

RESULTS

The concept was extremely well received; even with the limited hours as significant portions of the daily voice traffic load was re-arranged to take advantage of the satellite circuit. The quality of the circuit was a vast improvement over the H.F. radio system.

The double hop system with a round trip delay of around 1 second, did not present significant problems once the users became familiar with the system and adapted to the delay.

The two transportable earth terminals were easy to install, set up and maintain. Approximately 2 to 3 people were required for one day to set up each of the satellite terminal.

The satellite terminal equipment proved basically reliable with no failures at the Black Lake site. Several problems were noted with power bumps at the Forest Lawn site with a manual reset being required on site. Also two incidents of equipment failures at Forest Lawn were recorded, and were easy to diagnose and fix in a matter of hours.

The satellite terminal was transportable, but was not well suited to situations where high mobility is required.

.../1

SUMMARY

The applicability of using satellite terminals for this type of operation is excellent. However the economics play an important role in that commercial rates will have to be below $3K to $4K per month for the service to be economically viable.

The concept of customer installation and first line maintenance as well as system problem trouble-shooting did not present any difficulties. Most of the trouble-shooting for problems could be handled by contacting the 9m central station operator in Ottawa after an initial accessment of the problem as to whether it was power related, or low received level.

RECOMMENDATIONS

The transportability aspect could be improved so as to be able to accommodate easier installation especially for seismic camp applications, such as a one man installation. We are in a position to make information available to vendors to prove this aspect. Improved diagnostics in the form of remote loopback, LED indicators for modules that have failed would assist in trouble-shooting problems.

In order to cost justify the application, a DAMA approach, pay as you use, for space segment utilization and lower monthly costs for the remote terminals are mandatory. Also customer flexibility in transporting, installing terminals and performing first line maintenance is a must in a highly mobile remote situation to reduce costs and delays associated with transporting non customer personnel.

BP/am
Ref: 3041
1983/06/02

APPENDIX C

AMOCO CANADA PETROLEUM

COMPANY LIMITED

DRAYTON VALLEY AND
RICINUS EXPERIMENTS

MEMORANDUM TO FILE 83101ACC0153

April 11, 1983

CPA Satellite Test

INTRODUCTION

Amoco participation in the trials involved applications at two sites, the first being a district office and the second a drilling site in central Alberta. Applications at both locations primarily involved communications with the head office in Calgary. The following is a summary of the tests undertaken at these locations and the resulting recommendations.

PEMBINA AUTOMATION

On Sept. 10, 1981 the remote earth station was moved to the grounds of the Amoco Canada District Office in Drayton Valley Alberta; here, a series of tests involving data transmission between Amoco's Calgary office and their Drayton Valley office were performed.

The first phase of this trial concentrated on evaluating the satellite link in a remote automation configuration; a mini-computer in the Calgary office polled remote telemetry equipment at the Pembina office using the satellite facilities to provide the communication link.

Telemetry equipment at the Drayton Valley location was connected directly to the earth station transmit/receive units. This equipment consisted of an Amocams 600 Mini-Remote RTU (Remote Terminal Unit) equipped with a single analog point and two status points. From the Forest Lawn station, a 4-wire unconditioned telephone loop provided the link to the Amoco office in downtown Calgary where the loop terminated on an Amocams MTU (Master Terminal Unit) controlled by a Perkin-Elmer 3220 mini-computer.

Although only 3 of the RTU points were active, data was transmitted for all points on the RTU; consequently, a message from the RTU consisted of 154 bits (includes start-stop bits, parity bits, etc.). Similarly, a scan request from the MTU consisted of 66 bits of information. Transmission speed for the telemetry equipment was 600 baud.

The scan interval was varied from 1 minute down to 5 seconds at various stages of the tests; in all cases the communications was virtually error free. The limited error rates on the satellite circuit

were well below the acceptable error rates experienced with the conventional buried cable communication facilities used in most of the existing telemetry applications. The concept of remote telemetering using satellite communication proved technically feasible in this trial.

In early December, an interactive data communication study was initiated. During this test, the satellite facilities were used to link an asynchronous terminal in the Calgary office, with the automation computer in the Drayton Valley office. The main emphasis of this experiment was to determine the error performance of the communications facilities at various transmission speeds. In order to accommodate the ease of switching transmission speeds, ESE 9600 datasets were employed; these datasets are switchable from 1200 baud to 9600 baud synchronous. As the terminal and computer were both asynchronous devices, data converters were required to convert the transmission to synchronous as required by the datasets.

In order to test the performance of the satellite circuit alone, loop-back tests were performed from the Forest Lawn earth station to the Drayton Valley station. No transmission errors were encountered at data rates up to 2400 baud; 4800 baud experienced frequent errors and 9600 baud was totally unsuccessful.

The terminal located in the Calgary office was set to operate at 2400 baud and was used by field automation software analysts to perform maintenance and development on the automation computer located in the Drayton Valley office. As with the previous test, this procedure operated without difficulty using the satellite link.

CACTUS 26E EXPERIMENT

On Feb. 19 the 'roving' earth station was moved from the Pembina office in Drayton Valley to the Ricinus 10-33 lease, a drilling site operated by Amoco Canada. Here the satellite facilities were used for a number of voice and data trials involving communication with a remote drilling rig.

Locating the satellite at this site involved considerable time and effort. However, it was determined that much of this difficulty was due to incorrect readings provided by the directional equipment being used to position the dish (possibly due to ore deposits in the surrounding foothills). Problems with the IF Pilot Receiver also contributed to the difficulty in locating the satellite.

The first application involved interactive computing on the Calgary mainframe computer, using a terminal located at the rig site. An IBM 3278 CRT and controller were taken to the lease on March 10. The controller was located in the geologist's trailer along with the indoor electronics packages for the satellite terminal. From the controller, a coaxial cable was extended approx. 10 metres to the engineer's trailer in which the CRT was placed.

A series of tests were performed in order to determine the maximum operational transmission speed for the system. It was determined that

the system operated well up to rates of 4800 baud; rates higher than this encountered excessive errors and were not acceptable.

An interesting phenomenon was witnessed when viewing the data transmitted and received by the computer; as a result of the transmission delay, the computer was required to issue a request twice before a response was received from the terminal. The computer would time-out prior to receiving a reply from an initial request, it would subsequently issue a second request and shortly thereafter receive the reply from the first request.

The primary user of the CRT at the drilling site was the chief geologist; his most extensive use of the system was for EOS (Electronic Office System) communication. This Electronic Office System encompasses a wide range of office automation functions. The communication functions of the system (messaging, notes, reports, etc.) greatly enhanced communication with the district office. Communication to/from remote locations via mobile telephone or radio is difficult due to contention for services. Furthermore, 'telephone tag' is often more of a problem in such operations than it is in an office environment. Any means of obtaining immediate communication without the delays of busy circuits or no-answer is a definite asset. Extension of the EOS facility to the drilling site provided this alternate means of communication.

Another use made of the CRT was to execute a number of drilling programs (hydraulic programs, etc.) resident on the Calgary office mainframe computer system. These programs are used to assist wellsite personnel in the drilling operation.

A further application of the system was the entry of daily drilling information directly into the computer from the remote site; previous drilling reports had been called in to the district office for entry. Entering the information directly from the site has obvious advantages over having to relay the information through additional personnel; namely, the fewer people the information must be communicated through the less the possibility of error.

In general, there were few difficulties encountered with the system. In fact, the satellite facilities appeared to operate with a higher degree of reliability than conventional radio and mobile telephone systems.

The users indicated that availability of the computer system at the wellsite provided definite advantages to the operation, primarily in the area of enhanced communication with the district office. The economics of such a system are dependent on the potential of the system to reduce drilling time or in some way enhance the drilling operation. Although not all drilling sites would require such a sophisticated communication system, certain operations utilizing advanced drilling schemes could definitely benefit from such a system.

A second experiment performed at this wellsite was the transmission of well log data directly from the wellsite to the Schlumberger of Canada office in Calgary. The terrestrial circuit from Forest Lawn

was extended from the Amoco office to Schlumberger's office and a switch was installed in the Amoco office for means of directing the termination point between the two offices.

At the wellsite, Schlumberger ran a coaxial cable between the logging vehicle and the data equipment located in the geologist's trailer, a distance of approx. 40 metres. Initially, Schlumberger transmitted test tapes from the vehicle to determine transmission speeds and error rates. Speeds of up to 4800 baud were attained without significant re-transmission due to errors; however, speeds of 7200 baud and 9600 baud resulted in excessive errors and could not be used to transmit data.

During the well logging of March 20 and 21, the C.R.C. was able to arrange for the circuit to be made available for the duration of the logging. This enabled Schlumberger to transmit all well logs directly from the site to their Calgary office without interruption.

As an example of the transmission times required to transmit well log data over the satellite link, a 510 metre borehole data log was transmitted to Calgary in 7 minutes. As a result, Schlumberger was able to provide Amoco with completed well logs within 1 hour of the logs having been completed in the field. The ability to review well logs within hours of logging of the well enables the drilling operators to make more timely decisions regarding additional logging or drilling and possibly avoid additional expenses.

Schlumberger personnel were favorably impressed with the performance of the system and indicated that there are definite applications for a satellite based data transmission system for remote well logging operations. However, in order for such a system to be feasible for their operations, it would be necessary to have a highly portable earth station, ideally mounted on the roof of the logging vehicle.

As a final test at the Ricinus wellsite, the satellite channel was established as a voice circuit in order to test the operation of voice privacy devices (scramblers). The scramblers used were TCC (Technical Communications Corporation) Mark II's. As they are designed on a 2-wire basis, while the satellite facilities were 4-wire, 2-wire to 4-wire hybrids were required in order to provide the proper interface.

The primary concern with the use of the scramblers over a satellite link was the possible effect that the transmission delay might have on the synchronization of the two scramblers. If the transmission delay resulted in the scramblers timing-out prior to synchronization, it would not be possible to establish a secure conversation.

The tests conducted were successful in terms of synchronization of the scramblers; in all cases the synchronization was accomplished without difficulty. This indicated that the transmission delay did not pose a constraint to use of scramblers on satellite circuits. However, although the synchronization was successful, the conversation did experience considerable distortion from the hybrids as well as the characteristic echo involved with satellite voice communication. It is believed that proper adjustment of the hybrids and echo suppressors could eliminate these problems.

The trials performed at the rig site provided considerable support to the concept of enhanced communication possibilities at remote drilling operations as a result of satellites. The users involved with the various tests were very impressed with the operation of the systems and feel there is great potential for satellite communication in drilling applications.

CONCLUSIONS

Throughout the series of experiments, a number of problem areas and concerns were recognized. The first of these is transportability of the earth stations; although the antennae used for these trials were classified as 'transportable', they could not be classed as truly portable. Considerable time and effort was required each time it was necessary to transport the facilities to a different location. A smaller dish that can remain intact would improve the flexibility of the system.

Locating the satellite once the antenna was erected occasionally posed a problem as directional equipment was not always available. Directing the station to the satellite requires considerable precision, therefore instrumentation required for directing should be mounted directly on the dish to assist the user in a more expedient installation.

A significant determination was noted with regard to the environmental tolerance of the satellite terminal facilities. The transmit/receive units at the Drayton Valley site were housed in a non-controlled environment, therefore being subjected to fluctuations in temperature and humidity. It was determined that the units did not operate well at low temperatures and therefore should be housed in a controlled environment. As such controlled housing is not always available at some of the potential locations requiring satellite services, the component equipment must be made to tolerate a considerable degree of environmental variance.

Throughout the trials, difficulties with the satellite facilities at the remote location were common. In a situation where equipment maintenance is provided by the operating Telco or similarly authorized distributor, remedial action could involve a major delay and expense to the customer. A much more feasible alternative is to have the customer maintain the equipment on site. Furthermore, with the customer providing the maintenance on the facilities, ownership of the equipment should also be made available to the customer.

The trials demonstrated the feasibility of customer installation and first line maintenance of satellite facilities. Installation and maintenance presented no major difficulties despite the fact that no special test equipment was available with the satellite terminals. Maintenance costs, using a consultant hired by the CPA, averaged $300 per month, a relatively minor amount in comparison to the cost of the facilities.

The experiments conducted also illustrated the flexibility required in licencing of the facilities. As certain applications

could involve the facilities moving on very short notice and on a frequent basis, lengthy licencing procedures are unrealistic. A 'flexible' licence for terminals would be more appropriate for applications involving transient operations.

The primary constraint limiting the use of satellite facilities within the industry at present is the cost of such facilities. Recent quotes for SCPC voice-alternate-data channel through AGT have been approximately $8 000 per month. Few applications can justify expenditures of this amount. Justification of the costs vary significantly with the availability of more conventional communications facilties. However, users have indicated that costs in the neighborhood of $3 000 per month could be justified for certain drilling applications in which data communications capabilities are required. In general, it is felt that if the cost of satellite facilities were to be reduced, implimentation of satellite systems would become more widespread, thus promoting the development of further satellite facilities. The present costs are too prohibitive and consequently there is insufficient demand to foster increased and new development of satellite facilities.

Although the experiments did not investigate new areas of satellite communication, they did provide additional support and information to existing knowledge regarding the use of satellites in industrial applications. Some of the points identified through these trials are unique to the petroleum industry, while others affect all users of satellite facilities. The bottom line of our involvement is; satellites have a definite role to play in the future of communications within the petroleum industry, however, changes in the technology as well as the regulatory environment are required in order for the potential to be fully recognized.

R. C. Cooper

APPENDIX D

SCHUMBERGER OF CANADA

LIMITED

RICINUS EXPERIMENT

Schlumberger

SCHLUMBERGER OF CANADA
A DIVISION OF SCHLUMBERGER CANADA LIMITED
350, 717-7th AVENUE S.W.-CALGARY, ALBERTA T2P 0Z3
TELEPHONE 269-7331-AREA CODE 403

May 10, 1982

Mr. B. Page
Chairman
CPA Satellite Systems Sub-Committee
1500, 633 - 6 Avenue S.W.
Calgary, Alberta T2P 2Y5

Dear Brian:

In this letter I would like to report to you and the CPA on Schlumberger of Canada's participation in the CPA-DOC trials aimed at testing wellsite to Calgary communication via satellite link.

Schlumberger's interest in data communications is a natural outgrowth of the business that we are in. We acquire wellbore information, process it, analyze it, interpret it, and then communicate it to our clients as fast as we can. We are intensely interested in any technique that will improve our performance in any of these areas. We believe that data transmission from the wellsite via satellite is one such technique.

The particular trial that this letter deals with is the transmission of well logging data from our logging unit on the Amoco et al Ricinus 10-33-32-7W5 wellsite to our computing centre in downtown Calgary. Our immediate objectives were straightforward: evaluate the technical and operational aspects of transmitting logging data via satellite link.

The data link equipment consisted of a DOC supplied earth station at the wellsite, the Anik B satellite, the earth station at Shirley Lake outside Ottawa, the Telesat earth station at Forest Lawn, and a 4 wire line from the Forest Lawn station to the computing centre. The satellite dishes at the wellsite and Forest Lawn were 3.7 metres in diameter while the one at Shirley Lake was 8 metres in diameter. The 14/12 GHz experimental channel was used. The modems used both at the wellsite and the Calgary computing centre were supplied by Dick Cooper of Amoco.

To minimize difficulties at the actual time of logging, it was decided to do a pretest. Accordingly, on March 15 Schlumberger used their communications van to transmit benchmark data tapes from the wellsite to their computing centre in Calgary. The operation of the data link was established after about two hours of difficulty by a phone call to the satellite control station in

Shirley Lake. The benchmark tape was then successfully transmitted at 2400 bps and 4800 bps. We could not transmit it at 7200 bps. As a result of this pretest it was established that all parts of the data link were in working order and Schlumberger personnel became familiar with the satellite earth station equipment at the wellsite.

Transmission of well logging data actually obtained at the Ricinus wellsite occurred a month later on April 14. The transmission link was checked out while Schlumberger was waiting to begin logging operations. Logging began at 1:30 am on April 14. The first log was completed at 4:00 am. The data tape for this log (about 510 metres of borehole data) was sent to the Calgary computing centre in seven minutes. An hour after the digital data tape was received in Calgary, films and prints had been generated and were ready for delivery to Amoco. Data from three other logging services were sent in a similar fashion. Transmission of the last log was completed by 8:00 pm on the evening of the 14th at the the same time as Schlumberger was removing its logging equipment from the rig.

Many of the operational procedures for transmitting data from the wellsite had already been established for Schlumberger by experience with its existing methods of wellsite data transmission. However, this trial demonstrated that it was technically feasible to use a satellite link from the wellsite rather than the mobile telephone network or land lines. Further to this, Schlumberger is now actively pursuing the technical capability (for remote areas) of transmitting via satellite link using a portable earth station mounted on our logging unit. Schlumberger hopes that this and future demonstrations will help the CPA in its efforts to remove regulatory and institutional barriers restricting the use and availability of satellite service to the petroleum industry.

In closing, I would like to thank you Brian and Dick Cooper of Amoco for the cooperation given to Schlumberger during its part of the trials.

Yours sincerely,

L. M. Zanussi
SOC Technical Manager

NS:ez

cc: D. Cooper
Amoco Canada Petroleum Company Ltd.

APPENDIX E

DOME PETROLEUM LIMITED

TUKTOYAKTUK EXPERIMENT

CPA - DOME SATELLITE TRIAL

JUNE - OCTOBER 1982

DOME PETROLEUM LIMITED

P.O. BOX 200
CALGARY. ALBERTA
T2P 2H8

CPA - DOME SATELLITE TRIAL

JUNE - OCTOBER 1982

Prepared by:

Don Larsen
Walter Wong
December 1982
(0238a)

CONTENTS

1.0 INTRODUCTION

Meetings held in February 1981 between the Canadian Petroleum Association (CPA) and Communications Canada (DOC) culminated in a joint industry - government satellite evaluation program.

Together with other oil companies, Dome Petroleum Limited agreed to undertake certain field trials aimed at obtaining an industrial user perspective of the operational requirements for future commercial satellite services. Alberta Government Telephones through its Altel Data division was invited to participate in all phases and in turn offered the services of its personnel and the facilities of the Forest Lawn earth station to house equipment.

The report that follows describes Dome's involvement in the experiment and concludes with specific operational recommendations based on the findings.

2.0 DOME'S OBJECTIVES

The demonstration of a low capacity transportable satellite terminal is not in itself unique as a commercial version (Anikom) has been available from Telesat for some time. Further, the technical aspects of small 14/12 GHz earth stations and their operation have been addressed in detail previously.

What is significant however, is that hitherto, many of the benefits of satellite technology have not been realized because of complex and lengthy provisioning methods and licencing restrictions in conventional commercial offerings. The principle advantage of satellite communications as seen by the oil industry is it's potential to provide rapidly deployed, high quality communications in a cost effective manner.

Dome's experiment was therefore designed to demonstrate not only the unique capabilities of a user-installed and controlled satellite earth station but also to evaluate the benefits of a complimentary form of service carried on the system.

To that end, audio and video teleconferencing was selected as the most suitable choice.

The overall objectives therefore became:

2.1 Economics

- To determine the potential of teleconferencing as a replacement or supplement to travel.

2.2 Technical Requirements

- To develop operational specifications for a small aperture satellite earth station.

- To determine the suitability of operating both satellite terminals and teleconferencing equipment by unskilled personnel.

- To optimize various forms of teleconferencing arrangements.

- To investigate the effects of scrambling devices and assess the satellite delay on teleconferencing.

- To assess the specification and requirements for an operational teleconferencing system.

- To compare teleconferencing over satellite and terrestrial facilities.

2.3 Human Factors

- To measure user acceptance to teleconferencing.

- To gain an operational familiarity with teleconferencing using both satellite and terrestrial facilities.

2.4 Other

- To stimulate the commercial development of new satellite services.

- To develop objectives for revised licencing policy.

3.0 DESCRIPTION OF EXPERIMENT

For the experiment DOC made available to the CPA two 14/12 GHz single voice channel transportable earth stations, each equipped with 3 metre antennas.

One transportable was installed at Dome's Tuktoyaktuk base camp while the other, located at AGT's Calgary (Forest Lawn) Earth Station, was connected to AGT's cable and line conditioning equipment. A four wire cable facility with appropriate signalling and terminating equipment linked the earth station to Dome's downtown office at Place 800. This arrangement was configured as an off-premises extension (OPX) from the Tuk SL-1 switch. By means of this OPX local, any local of the Tuk SL-1 could be dialled directly. Terminal equipment connected to this local was therefore capable of being moved within the boundary of the Tuk SL-1 switch, enabling the evaluation of both satellite or terrestrial facilities. A pictorial description of the experiment is shown in Appendix 1.

The satellite's four wire facility was installed at the end of May 1982. Installation of the terminating equipment consisting of Wescom SF (single frequency) modules was completed in early June.

A log sheet to gather the events of the satellite trial was kept throughout the experiment. This log noted all operational and technical problems related to the satellite link.

The teleconferencing equipment at both ends consisted of a freeze-frame transceiver, a television camera, a black and white television monitor and a Conference 2000 (audio conferencing terminal).

4.0 SUMMARY OF FINDINGS

The experiment was carried out over a three month period. As revealed in the event log, considerable difficulty was encountered in establishing and maintaining the link itself with the most significant problems being:

1). Four Wire Cable Facilities

The four wire facilities linking Place 800 with Forest Lawn were plagued with numerous problems including incorrect levels, pair reversals and the like. These facilities were installed and controlled by AGT. Technical problems in this area were aggravated by the difficulty in coordinating activities amongst AGT, DOC and Dome; with each party having conflicting priorities.

2). SF Terminating Equipment

The failure rate of the single frequency signalling and echo suppressor equipment was unusually high. By the end of the trial, each module in the SF package had been replaced. The exception was the power supply (which had blown a fuse).

3). Satellite Link

Though most of the time the space segment was operational, outages were encountered with equipment failure at DOC's earth station in Shirley Bay.

4). Transportable Earth Station

While the transportable station at Tuk Base operated throughout the test without failure, the unit at Forest Lawn experienced frequent outages. At least one of the major components (such as the travelling wave tube amplifier) had to be replaced each month.

5). Circuit Redesign

Though the nature of the circuit requirements was straight-forward, (PBX off premises extension), the circuit was redesigned several times causing considerable delays in getting the teleconferencing tests underway.

Problems arose at the outset due to poor definition and understanding of AGT's and the CPA's respective roles in the trial.

The satellite experiment itself was carried out in four distinct stages. They were: Implementation, Miscellaneous Teleconferencing, Telemedicine demonstration, Radar Imagery Experiment.

A. IMPLEMENTATION

As discussed in Section 4, the implementation of the satellite circuit was most difficult and consumed most of the trial's time.

The transportable earth station dish antennas were sectionized for mobility. Because of the 10 foot (3.0 m) diameter, the dish itself was bulky even when it was disassembled into 3 pieces. It did not however present a major transportation problem as it was airlifted to Tuk Base aboard a large aircraft (Boeing 737).

The earth stations' electronics, which consisted of four packages, weighed between 40 to 70 pounds (18 - 32 kg) each. Two packages were co-located with the dish and the other two were located indoors.

The reliability of the station electronics was poor, especially that of the equipment located at the Forest Lawn site. One of the four electronic packages was replaced on a monthly basis. Downtime caused by each outage ranged from several days to a few hours. No attempt was made to isolate faults any further than to a cabinet level. The defective cabinet was sent directly to DOC for repairs.

The electronics were designed to accept a '0' dBm level input and output. In other words, there were no gains or losses through the satellite itself. This factor alone created confusion on the satellite loop design. Normal transmission standards specify a gain of 23 dB and input and output levels (V.F.) of -16 and +7 dBm respectively. For consistency, standard carrier levels are preferred and would be more compatible with other V.F. equipment. Lastly a modular design and reduction of the size of the electronic packages would aid in installation and maintenance of the earth station.

For the installation and disassembly of the transportable earth station at Tuk, a two man crew was required to mount the dish and electronic packages. Pointing the dish at the Anik B satellite did not create difficulties as two other satellite antennas located nearby were used as references.

The videoconference terminal which consisted of a Robot 630 transceiver, a zoom camera and a 9 inch monitor was easily set up in a matter of a few minutes. The audioconference terminal (Conference 2000) was connected quickly by means of a telephone modular jack.

B. MISCELLANEOUS TELECONFERENCING

Using the Robot 630 Transceiver configured for half duplex transmission, the limitation of the picture quality was not due to the facilities (satellite or terrestrial) but rather the video transceiver's display format of 256 picture elements by 256 active T.V. lines. Though this was adequate for general meeting purposes, an improved resolution (at least 512 x 512) is required in situations where drawings, photographs and other detailed material are used. Though increased transmission time (4-fold in this case or 140 seconds) would result, it is believed this would not be objectionable.

The Robot 630 was not equipped with an automatic muting circuit to disable audio to the Conference 2000 while receiving video. This caused some confusion as the amplifier volume had to be turned down to minimize annoyance.

The other drawback of this transceiver was the lack of picture synchronization. The video had to be transmitted twice in order to ensure a complete frame. The transmission time was around 80 seconds per completed picture. The time wasted due to this limitation was approximately 40 seconds for each picture transmitted.

Lastly, once the received video was completed, the transceiver had to be switched to the "on hold" mode to prevent noise spikes from appearing on the received video.

In general, the videoconference terminal was comparatively simple to operate and connect to the telephone line without any coupler or modem etc.

With videoconferencing, a zoom camera lens is a must. The one used (18 to 109 millimeters) was adequate. In transmitting detailed video such as printed words or schematic diagrams, high magnification is required.

Text transmissions were later investigated. Using a zoom lens, approximately one quarter of a 8 1/2 by 11 inch standard page could be sent at one time in order for the received video to be readable. Well lit rooms are required for proper videoconferencing. Both conference rooms at Place 800 and at Tuk Base were adequate using normal flourescent lighting.

The video quality was compared using both satellite and terrestrial facilities. Both displays contained similarities of granulated appearance. At times, streaks and 'snow' (herringbone effect) were observed.

An interesting observation (random lines or streaks) was noted on the received video at Tuk Base. Each picture element in each streak had been delayed causing an offset on that particular line. No streaking occurred on the received video at Tuk Base using the terrestrial facilities.

The audioconferencing portion provided by a Northern Telecom Conference 2000 produced fair audio quality. Noticeable but not objectionable background noises were heard over the satellite circuit. The delay of one half second on the half duplex audio (due to the double hop satellite facility) did not create any confusion for the users.

Scrambling devices over the satellite facility were not tried due to problems in maintaining a workable satellite link and time constraints.

C. TELEMEDICINE DEMONSTRATION

The use of the system for telemedicine was demonstrated between Calgary and Tuk Base over the satellite link. Presently, no medical doctor is available at Tuk Base. Minor diagnostics and treatments are by a consultation telephone call to medical personnel in Calgary. Patients requiring major treatment are flown to Edmonton.

During the demonstration, closeup views of a subject's facial expression (the subject's eye and face) and a hand were transmitted. The video received was judged to provide sufficient information to make a determination of the patient's vital conditions.

The advantages of being able to hear and see the patient in near-real time enables a more accurate medical diagnosis than a telephone call can provide. The use of teleconferencing may eliminate some transfers which are unnecessary while speeding the treatment of critical cases.

D. ICE IMAGERY EXPERIMENT

In the final phase of the trial, various samples of radar imagery and other remote sensing data were transmitted to Calgary from Tuk by means of videoconference system. The received picture was then compared to actual photographs. Overall, the picture quality was fair. Again limited by the freeze-frame transceiver, it was determined that a higher resolution in the received picture would be required for operational transmission of ice imagery information. For the test however, acceptable detail was obtained by zooming close in and transmitting portions of the ice photograph.

CONCLUSION AND RECOMMENDATIONS

This experiment enabled Dome Petroleum to gain an operational familiarity with teleconferencing using both satellite and terrestrial telecommunications facilities.

For this demonstration, the transportable satellite earth station should have been located at Dome's office building in Calgary. This would have eliminated the most severe problem plaguing the trial; that being the co-ordination in the backhaul portion of the circuit. The overall reliability of the satellite link was poor due mainly to the older technology of the transportable earth station.

Though it did not pose a logistical problem in this trial, for general remote area application more compact packaging of the earth station would be required. A suitable criteria would be that no individual package be bulkier or heavier than can be carried and erected by two men. Transportation of the entire station should be possible in a single load in a typical STOL aircraft or light helicopter. Further, for installation in an urban rooftop environment, sizing of the individual packages should be done with consideration of typical freight elevator dimensions and doorway/stairwell handling limitations.

In a commercial application, Dome's typical requirements would be for 1 to 3 voice channels plus a full period synchronous data circuit of 4800 bits per second. The present service offerings and pricing structure (eg $8500/month for a single channel installation) make the use of satellite systems cost-prohibitive in all but extreme situations.

The use of teleconferencing for telemedicine was shown to provide advantages over the present method of handling remote medical evaluation. Prior to implementation of an operating telemedicine system however, a more in-depth study and field trial should be undertaken to determine specific requirements such as for telemetry and color video. Such a study should conclude with a cost/benefit analysis.

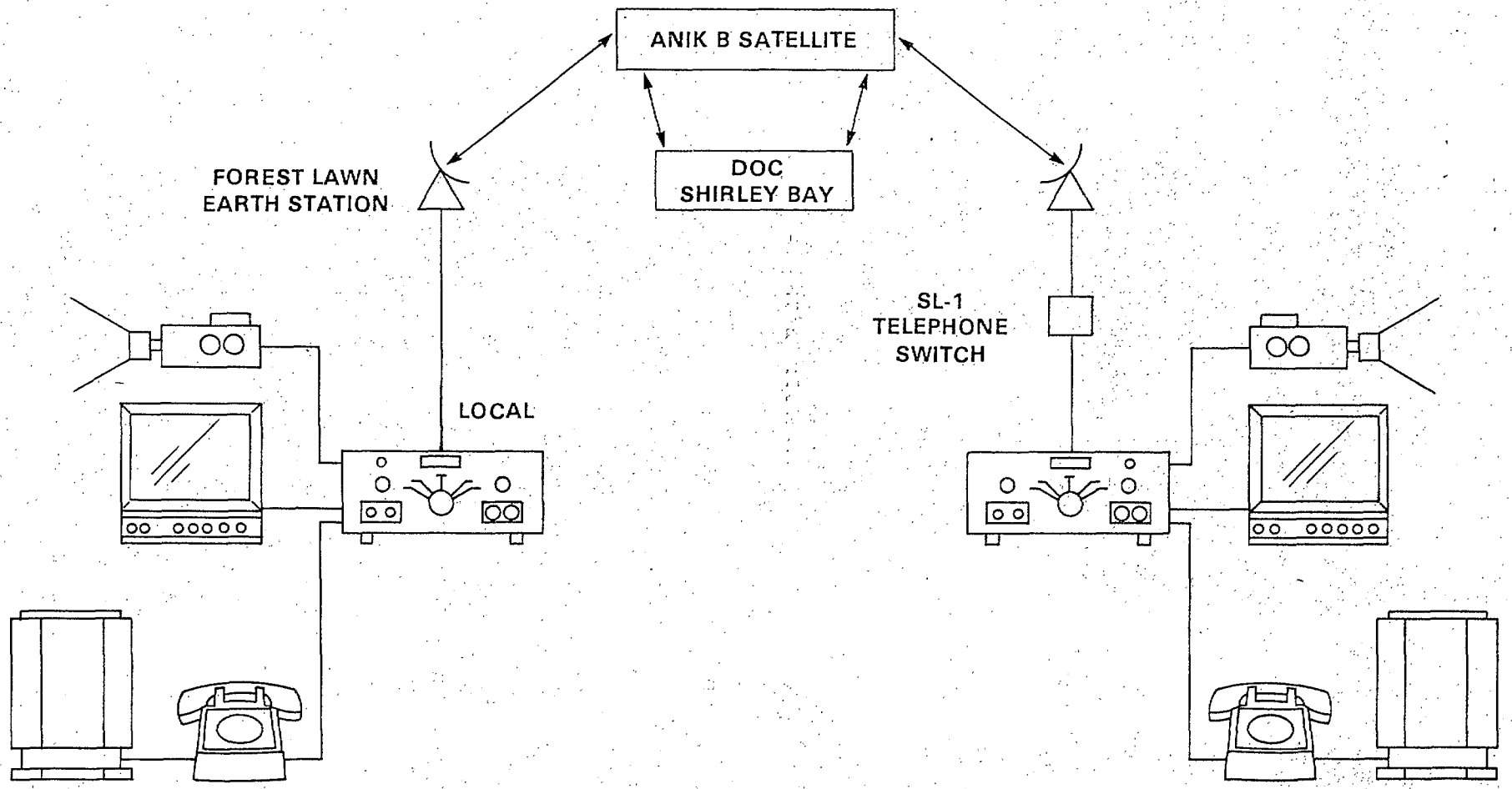
Throughout the trial, half duplex transmission was employed thus preventing simultaneous operation of both video transmitters. As well, the return audio path was disabled while picture transmission was occurring. This prevented interrupting the sender to notify of problems. While simultaneous video and audioconferencing would be desirable it was not deemed necessary; however, the capability of full duplex transmission should be provided in any working system.

APPENDIX

1. Facility Layout
2. Log Sheet
3. Trial Photographs
4. Trial Equipment

CPA DOME SATELLITE PROJECT

APPENDIX 1
HALF DUPLEX VIDEO OR AUDIO SYSTEM



NOTE:
THE SATELLITE FACILITIES COULD BE REPLACED
WITH TERRESTRIAL FACILITIES.

A. Log Sheets

82-05-25

- Altel installed the 4 wire loop from Forest Lawn Earth Station to 17th floor Place 800.

82-06-03

- Altel sent a S.F. package with a wrong SF card to Tuk.
- Blown fuse on power supply at Calgary end.
- Line amp (401 Wescom) was wired backward at Forest Lawn Earth Station.

82-06-08

- Altel designed wrong levels on the 4 wire loop at Calgary. The facility was designed at data level instead of voice levels.

82-06-11 to 14

- Satellite link working but levels are low. At time, calls could be generated from the Calgary location.

82-06-15

- Satellite link is not working due to levels.

82-06-23

- Altel adjusted levels at Calgary.
- A line amp (401) was added to circuit at Place 800 to compensate for additional cable losses.

82-06-24

- Space segment outage, reasons unknown.

82-06-25

- Call Shirley Bay in regards to satellite link.
- Apparently bad thunder storm at Shirley Bay knocked out the link.

82-06-28

- Altel adjusted line amp and set up level to Tuk.

82-06-29

- Satellite link working to Tuk PABX.
- Level was low at Forest Lawn Earth Station.

82-07-05 to 08

- Satellite link not working.
- The SF frequencies are shifting. Therefore, no calls could be made from Calgary to Tuk.

82-07-12

- The SF frequencies were monitored at Tuk.

82-07-14

- Shifting of SF is noted at Tuk.
- Ottawa (Shirley Bay) was contacted to sectionalize problem.

82-07-27

- Echo suppressor not working at Calgary.
- SF levels still drifting.

82-08-02

- Link down for a week as per Shirley Bay.

82-08-09

- Transmit problem - could not receive from Tuk.
- Meeting with B. Page and Altel to redesign loop and set up end to end test.

82-08-16

- Transmit problem.

82-08-25

- Altel done end to end test.
- Circuit finally working.

82-08-30 to 82-09-06

- Arrange for slow scan equipment.

82-09-07

- SF problem again on the link.
- Unable to dial up any Tuk local.

82-09-16

- SF problem.
- Could transmit one way only.

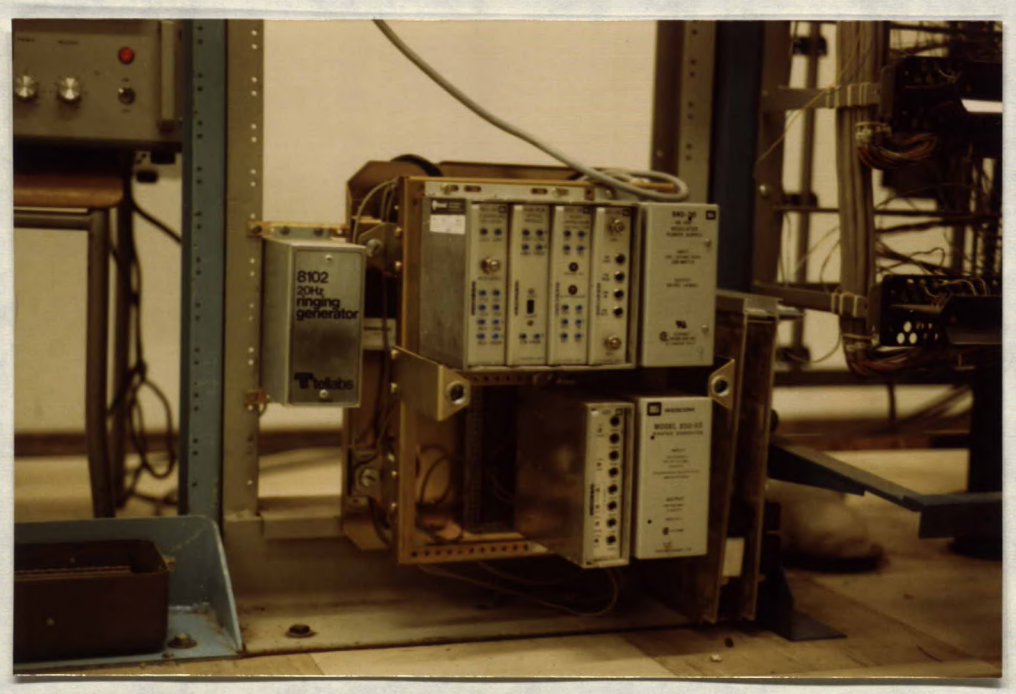
82-09-23

- Replace TWT at Forest Lawn Earth Station

82-09-25

- Trial underway.

TRANSPORTABLE EARTH STATION AT TUK BASE.
The large dish is the TVRO. The one in the middle is the CPA trial. The one on the right is Dome's high speed data link (56 kbps).



SF CENTRAL OFFICE PACKAGE AT THE TUK SL-1 TELEPHONE SWITCH.

SLOW SCAN VIDEOCONFERENCING EQUIPMENT AT TUK
Conference 2000, 9 monitor and Robot 630 Transceiver

AUDIOCONFERENCING TERMINAL
Logic 1 c/w Conference 2000

FOREST LAWN EARTH STATION AT CALGARY
The dish on left is 14/12 Ghz. The next one is a 12' transportable earth station. The largest dish is for 6/4 GHz. The one on right is the CPA trial.

SIDE VIEW OF FOREST LAWN EARTH STATION

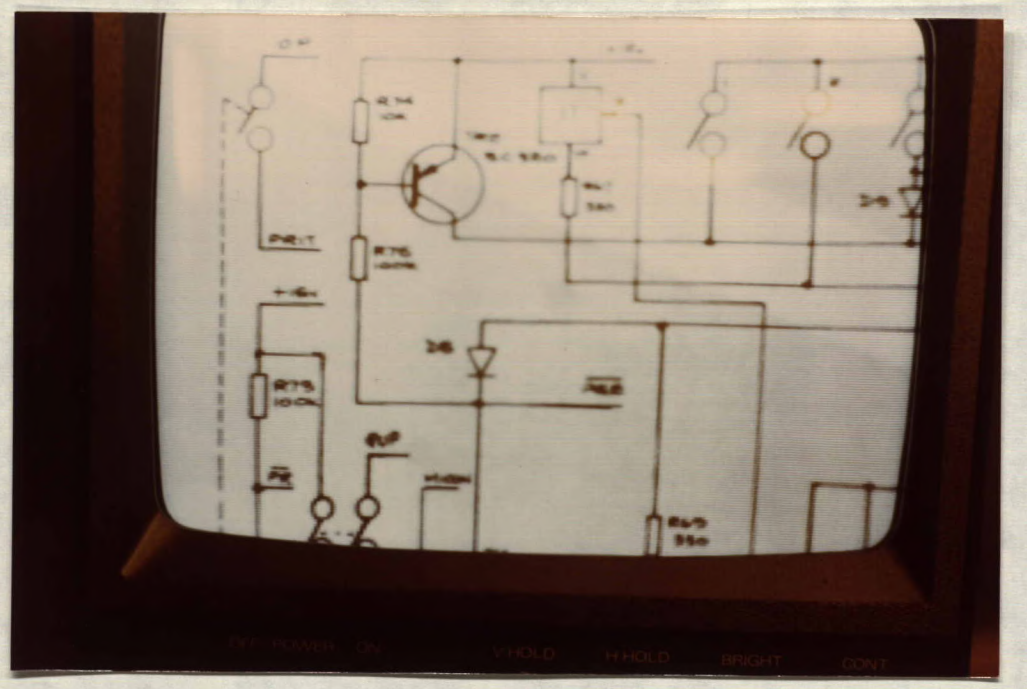
TRANSPORTABLE EARTH STATION USED FOR CPA TRIAL AT FOREST LAWN EARTH STATION.

CLOSER VIEW OF TRANSPORTABLE

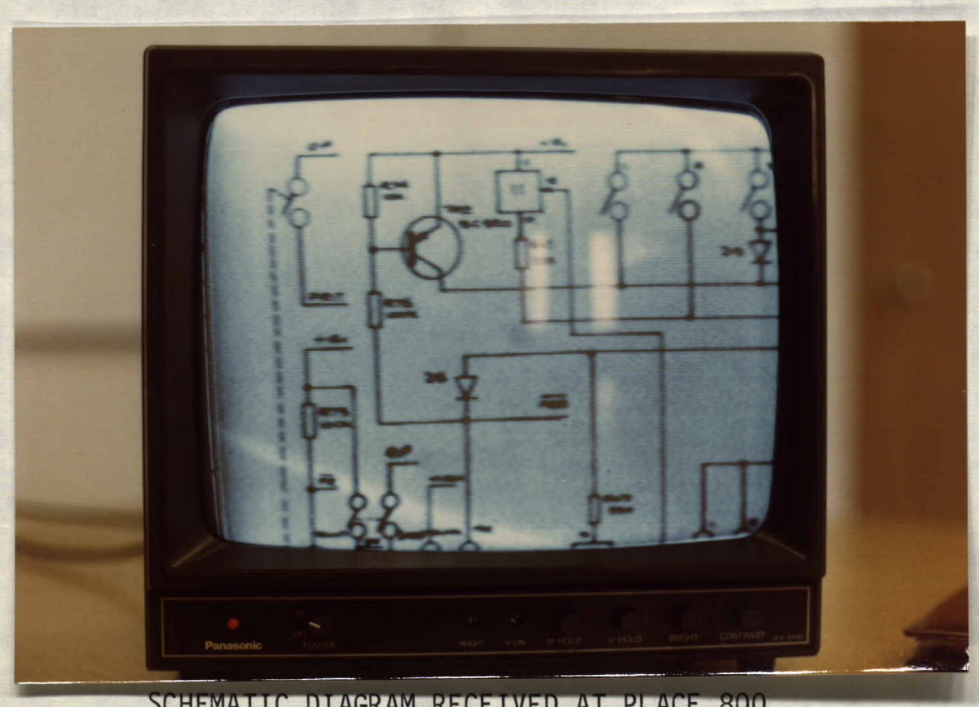
THE IF PILOT RECEIVER AND TIU/VCU PACKAGES AT FOREST LAWN EARTH STATION.

TELEMEDICINE DEMONSTRATION

Picture received at Place 800 from Tuk



SCHEMATIC DIAGRAM SENT FROM TUK WITH SATELLITE FACILITY

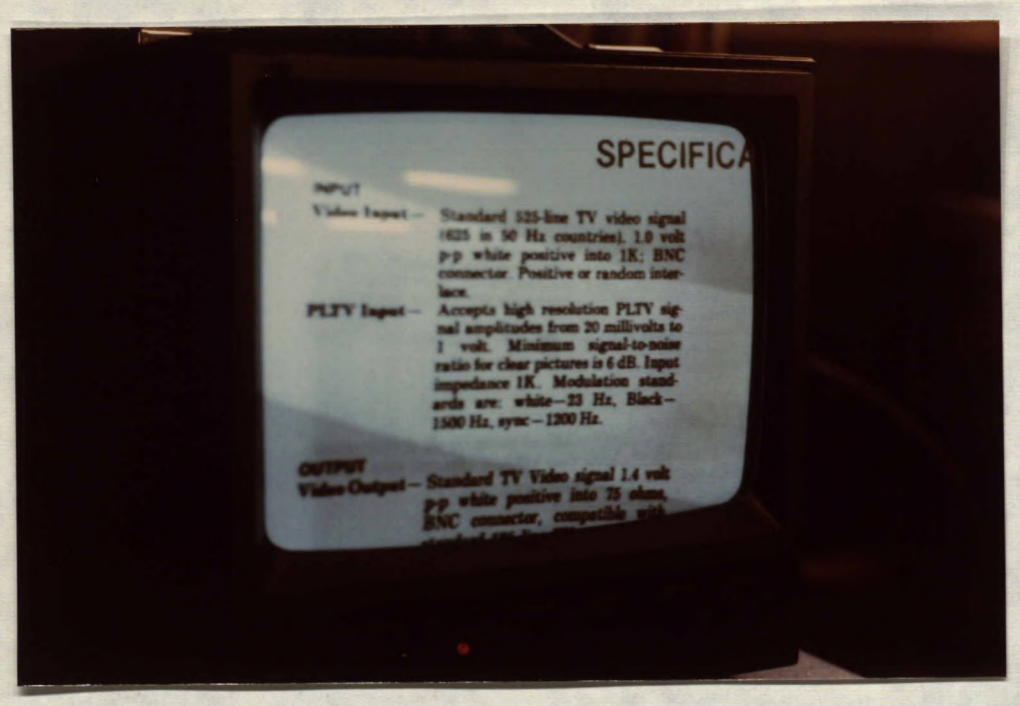


SCHEMATIC DIAGRAM RECEIVED AT PLACE 800
Electronic values are not readible

OUTSIDE VIEW AND SLOW SCAN SETUP AT TUK

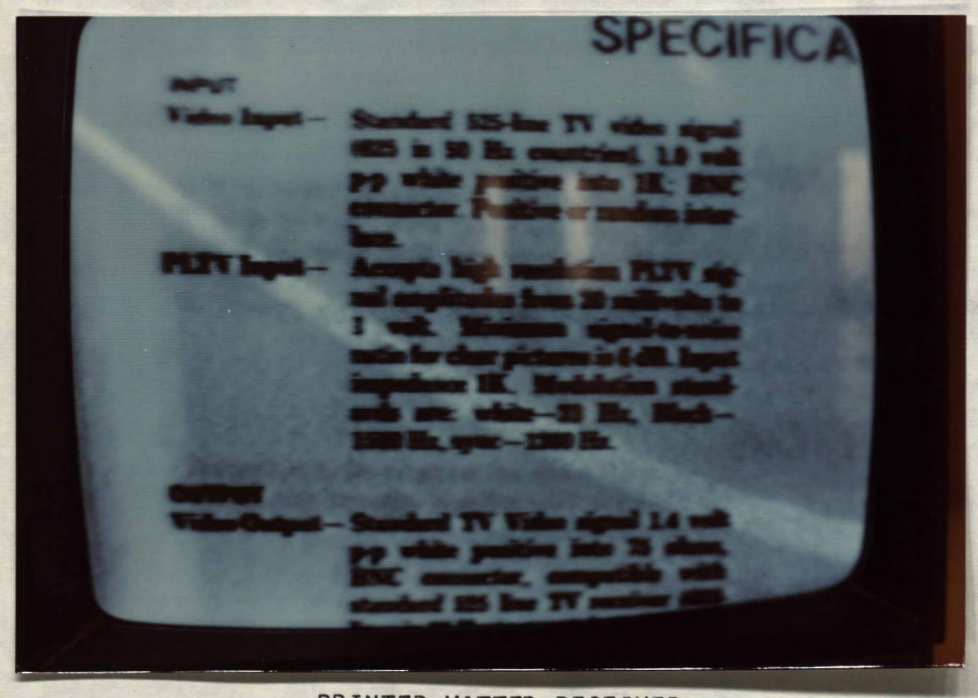
PICTURE RECEIVED FROM TUK AT PLACE 800

The streaks on the left side top corner of the photograph were created intentionally because the slow scan equipment did not have automatic shutoff after completion of video transmission.



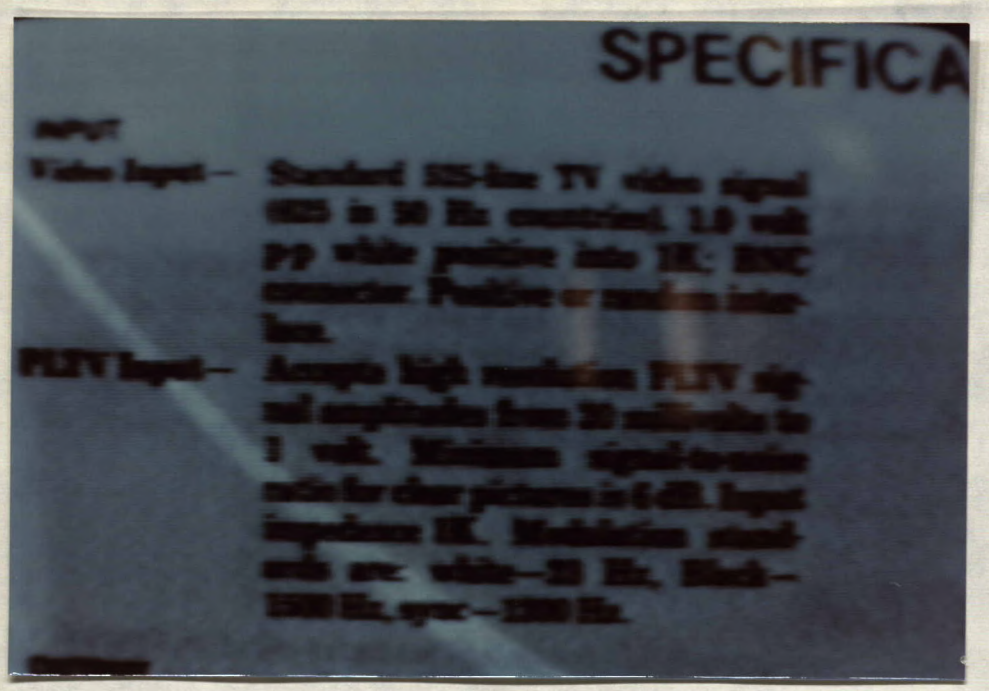
PRINTED MATTER DEMONSTRATION

Printed information sent from Tuk. Note the clarity of the control information. The white and grey contrasts on the photograph are reflections of the room lighting.



PRINTED MATTER RECEIVED

Printed words are recognized but not easily read. Letters on words batched closely and some smearing occured because of the equipment resolution. (slow scan)

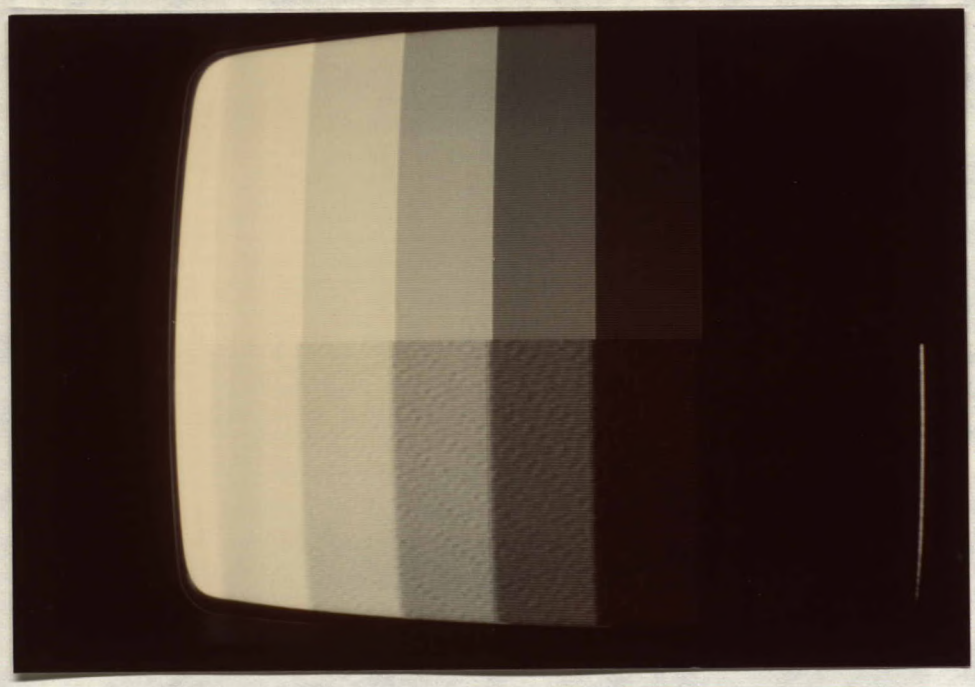


PRINTED MATTER DEMO

This is a closer view of the information received. The larger prints are much more distinguishable over the smaller prints.

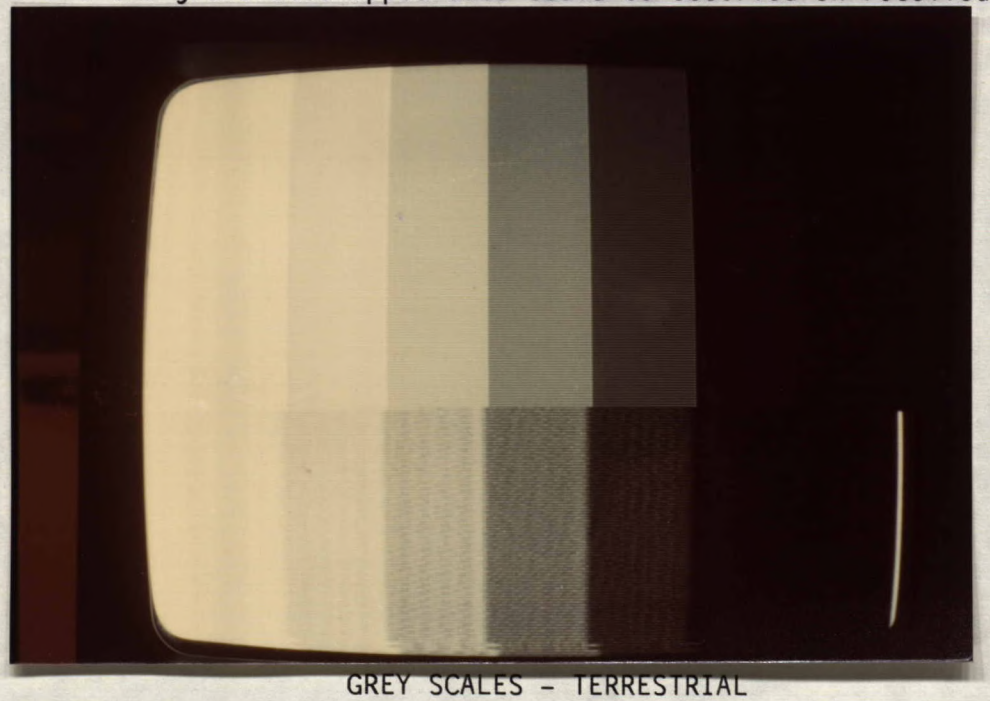
PRINTED MATTER DEMO

Slow scan setup at Place 800 with information received from Tuk as displayed on monitor.



GREY SCALES - SATELLITE

The top half of grey scales is video received from Tuk over the satellite facility. The bottom grey scales are scales off the Local camera. Both streaks and the granulated appearance could be observed on received video.



GREY SCALES - TERRESTRIAL

Both pictures received either by satellite or terrestrial facilities are similar.

RADAR IMAGERY DEMONSTRATION

A magnified radar (ice) imagery received from Tuk. The display's low resolution is caused by the limitation of the slow scan transceiver and not by the satellite link.

RADAR IMAGERY DEMONSTRATION

A comparison of the actual photograph and video received from Tuk.

SLOW SCAN DEMONSTRATION

Slow scan setup and display transmitted from Place 800 using either satellite or terrestrial facilities.

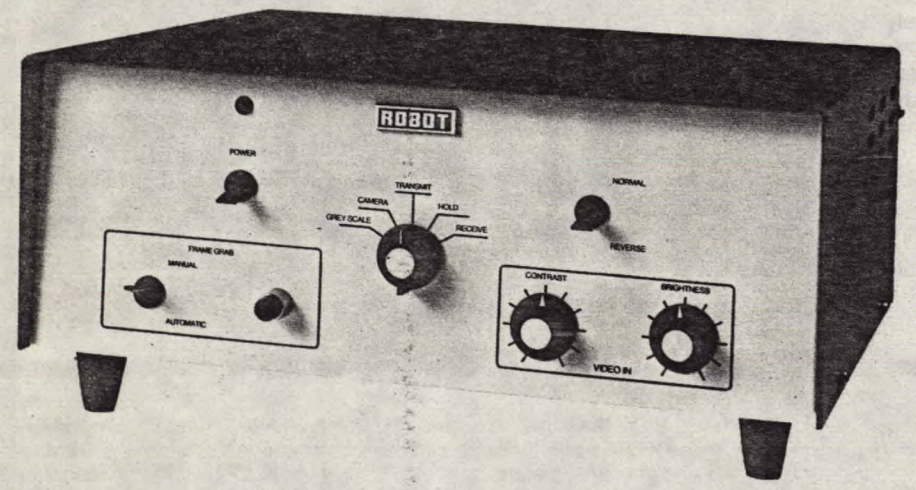
SLOW SCAN TERRESTRIAL
Video Received at Tuk Base

SLOW SCAN SATELLITE

Video received at Tuk. Note streaks running across the monitor cause either by satellite or SF package.

ROBOT MODEL 630 HIGH RESOLUTION PHONE LINE TV TRANSCEIVER

For Sending or Receiving High Resolution Frame-Freeze TV Pictures Two-Way Any Distance by Telephone



- **256-LINE PICTURES**
- **64 GREY SHADES**
- **FRAME-FREEZE FROM STANDARD CCTV CAMERA**
- **PICTURE DISPLAY ON STANDARD CCTV MONITOR**
- **4:3 ASPECT RATIO**
- **PICTURE CONVERSION TO AND FROM AUDIO FOR TRANSMISSION ANY DISTANCE BY TELEPHONE**
- **TRANSMIT OR RECEIVE IN 35 SECONDS**
- **ALL SOLID STATE**

The ROBOT Model 630 Transceiver grabs and frame-freezes video fields from any CCTV camera, converts the stored picture to audio tones, and transmits the picture tones any distance over the dial telephone network.

The Model 630 also receives these audio Phone Line TV (PLTV) picture tones transmitted over any distance by telephone, and converts the picture information to video for display on any TV monitor.

The standard Phone Line TV (PLTV) signal consists of audio-FM. This signal is insensitive to wide variations in line attenuation, and has a "capture" effect in the presence of noise that insures good reception over most telephone connections.

The standard high resolution Phone Line TV (PLTV) format consists of a 256 by 256 array of picture elements transmitted and received in 35 seconds. A multiple speed option is available which allows selection of lower resolution, faster frame rate modes by means of a rear panel switch. These alternate modes are a 128 line by 256 element 17 second picture, or a 128 line by 128 element 8.5 second picture. In the ROBOT Model 630 each picture element is represented by one of 64 grey shades in all solid-state digital memory.

The Phone Line TV (PLTV) signal produced by the ROBOT Model 630 Transceiver is 0 dBm nominally into a 600 ohm load impedance. The signal can be stored on any audio reel or cassette tape recorder.

When sending or preparing to send high-resolution PLTV pictures, the ROBOT Model 630 Transceiver frame-grabs and stores single standard TV fields (1/60 second) from a CCTV camera or other video source. This may be automatic, in which case frame-freeze occurs at the beginning of each PLTV picture (every 35 seconds). Or it may be manual, in which a video field is grabbed whenever the operator presses a switch.

In receiving PLTV picture tones from the telephone line, the Model 630 will accept any signal amplitude from 20 millivolts to 1 volt. This allows for up to 40 dB total attenuation on the telephone line from end to end.

The Model 630's connection to the telephone line serves for both receiving and transmitting pictures. The method of connection to the telephone line varies in different countries depending on government regulations. In some countries, specific modifications have been made to the 630 to meet these requirements, and in others, the use of an approved coupling device may be required. Details of specific requirements are available on request. Simultaneous voice and PLTV over the same audio channel is not possible. PLTV signal output meets published Bell System tariffs for voice couplers.

The ROBOT Model 630 Transceiver includes controls for setting the stored grey level range of the TV pictures grabbed for transmission, for inserting a grey scale pattern for test purposes, and for receiving blacks and whites in the displayed picture.

NOTICE

The heart of the ROBOT Model 630 is a 393,216-binary-bit solid state memory. The displayed picture consists of an array of 256 picture elements along each TV line, and 256 active TV lines in every field. The format is 4:3, corresponding to standard TV. Each picture element is coded into one of 64 grey shades. Digital "quantization" effects are virtually eliminated by the small size of the picture elements and small grey shade increments; the picture quality closely resembles that of broadcast TV received on your home TV set. A typical picture stored in the memory of the Model 630 and displayed on a standard TV set is reproduced at right.

SPECIFICATIONS

INPUT

Video Input—Standard 525-line TV video signal (625 in 50 Hz countries). 1.0 volt p-p white positive into 75 ohms; BNC connector. Positive or random interlace.

PLTV Input—Accepts high resolution PLTV signal amplitudes from 20 millivolts to 1 volt. Minimum signal-to-noise ratio for clear pictures is 18 dB. Input impedance 600 ohms. Modulation standards are*: white—2300 Hz, black—1500 Hz, sync—1200 Hz.

OUTPUT

Video Output—Standard TV Video signal 1.4 volt p-p white positive into 75 ohms, BNC connector, compatible with standard 525 line TV receiver (625 lines in 50 Hertz countries).

PLTV Output—High resolution PLTV modulation 1200 Hz to 2300 Hz audio-FM, 0 dBm nominally into 600 ohm load.*

CONTROLS, CONNECTORS AND INDICATORS

Front Panel Controls—A front panel selector switch chooses among five possible operating modes. In **RECEIVE,** the unit is set to receive PLTV picture signals from the telephone line and produce video for TV display. In **HOLD,** memory up-dating is discontinued and the currently stored picture is retained for video display as long as power remains on. In **TRANSMIT,** the unit grabs TV fields from the CCTV camera input and produces PLTV picture signals on the rear-panel **TELEPHONE** jack; video supplied to the rear-panel **TO VIDEO MONITOR** jack is from the stored picture in memory. In **CAMERA** position, used primarily for TV camera adjustment, no transmission or reception occurs; the video supplied to the rear-panel **TO VIDEO MONITOR** jack is the camera's real-time video after being quantized to 256 by 256 picture elements and 64 grey shades (exactly as it is presented to the memory for storage and transmission). In **TEST,** an internally generated grey scale replaces the TV camera's input to memory; the grey scale appears on the video display and can be converted to PLTV and presented for transmission on the rear-panel **TELEPHONE** jack in the **TRANSMIT** position. The front panel **FRAME GRAB** switch is activated in **TEST, CAMERA** or **TRANSMIT** modes. When in the **AUTOMATIC** position, it frame-grabs (1/60 second) from the camera video or grey scale test pattern at the beginning of each high resolution PLTV picture (every 35 seconds). In the **MANUAL** mode, it frame-grabs whenever the operator actuates the **FRAME GRAB** push button. The two front panel **VIDEO IN** controls are effective in **CAMERA** and **TRANSMIT** modes. They adjust the input video **CONTRAST** and **BRIGHTNESS** to match the memory input range; the effect of these controls can be viewed in the **CAMERA** position of the selector switch.

Rear Panel Connectors and Controls—**FROM CAMERA VIDEO** is BNC connector for input of standard CCTV video signal to Model 630. TO **VIDEO MONITOR** BNC connector supplies standard video selected by front-panel switch for viewing on CCTV monitor. **TELEPHONE** receptacle is standard 2-wire 1/4" phone jack fully isolated and d.c.—blocking for transmitting or receiving PLTV audio-FM signals to or from the telephone line. **REMOTE FRAME GRAB** jack parallels **FRAME GRAB** switch on front panel, for plugging in a cord and remote switch (not supplied). **TAPE** jack provides for recording transmitted or received PLTV picture signal on audio or cassette tape recorder.

OTHER CHARACTERISTICS

Power Input—Line voltage range is 105 to 125 volts AC or 210 to 250 volts AC (specify), and 50 or 60 Hz (specify). Power consumption is 25 watts.

Mechanical—Width: 14½ in.; Depth: 13 in.; Height: 7 in.;

Weight: 15 pounds (shipping weight: 18 pounds).

Construction—All solid state circuits on glass epoxy circuit boards. Two-tone blue all-aluminum cabinet.

ROBOT

ROBOT RESEARCH INC.
7591 Convoy Court
San Diego, Calif. 92111 U.S.A.
(714) 279-9430

*This specification may be preset to a different value from that described above in order to meet certain foreign regulations.

P1011179

APPENDIX F

ACCUCOM ENGINEERING

CONSULTANTS INSTALLATION

AND SETUP REPORT

Accurcom Engineering Ltd.

752 Willamette Drive S.E., Calgary, Alberta T2J 2A2 (403) 271-0733

April 11, 1983

File: 8038

Brian Page, P. Eng.
Chairman Satellite Project Sub-Committee
Canadian Petroleum Association
c/o Shell Canada Limited
P.O. Box 100
Calgary, Alberta, T2P 2H5

ANIK-B Pilot Project Report

Dear Brian:

Please find enclosed one (1) copy of the Report on ANIK-B Pilot Project, revision 0, dated April 8, 1983. This report has been published by Accurcom Engineering Ltd. and summarizes their activity, findings, and recommendations on the ANIK-B field trials.

Yours very truly,

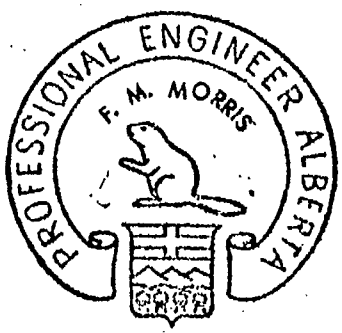
F. M. Morris, P. Eng.

CANADIAN PETROLEUM ASSOCIATION

REPORT

ON

ANIK-B PILOT PROJECT



Prepared by: Accurcom Engineering Ltd.
752 Willamette Dr. S.E.
Calgary, Alberta, T2J 2A2
403-271-0733

Project 8038
Revision 0, April 8, 1983

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

Accurcom Engineering Ltd. was retained by the Canadian Petroleum Association (CPA) to assist the member companies of the association with the installation, start-up, and maintenance of the satellite terminals that were used for the ANIK-B field trials. Accurcom Engineering did not get involved in the design, planning, or implementation of any of the experiments that were conducted by the CPA member companies. The implementation of these experiments was handled by personnel from each member company. The function of Accurcom Engineering in the ANIK-B field trials was that of an installer/maintainer, and therefore, this report will discuss the CPA ANIK-B field trials from the installation/maintenance point of view.

In July 1981 a 3 metre satellite terminal was set up at the Alberta Government Telephones earth station facilities located in Forest Lawn, just east of Calgary, Alberta. (Refer to photographs at the end of this report). This terminal was made semi-permanent because it remained stationary throughout the ANIK-B field trials.

A second 3 metre satellite terminal was moved from location to location in the field, as CPA member companies conducted their experiments. The field locations and CPA member companies that were involved in the field trials were as follows:

LOCATIONS	PERIOD	CPA COMPANY
Black Lake, Saskatchewan	Jul.-Sep.'81	Shell Canada Resources
Drayton Valley, Alberta	Sep.'81-Feb.'82	Amoco Canada Petroleum
Sundre, Alberta	Feb.-May'82	Amoco Canada Petroleum
Tuktoyaktuk, NWT	May-Oct.'82	Dome Petroleum

Photographs of all the installations listed above, except Tuktoyaktuk, are included at the end of this report.

All the experiments conducted by the CPA member companies were based on telephony or frequencyshift keying (FSK)techniques. No wideband video experiments were conducted.

2.0 TECHNICAL SYSTEM AND OPERATIONS

2.1 GENERAL

The two satellite terminals used in the ANIK-B field trails were identically the same. They each were composed of the following equipment:

QTY	DESCRIPTION
1	Parabolic dish antenna, 3 metres in diameter, including feed horn and waveguide filters.
1	Timber base for the antenna.
1	TWT up-converter
1	Low noise amplifier (LNA)
1	RF Unit
1	IF pilot receiver
1	TIU/VCU
2	Coaxial cable, 30 metres long
1	Control cable, 30 metres long.

One satellite terminal was installed at Forest Lawn, just east of Calgary, Alberta. The second terminal was moved from user-company to user-company in the field. The RF signal path went from the remote field terminal through the ANIK-B satellite to the Communications Research Centre (CRC) 9 metre satellite station located at Shirley Bay, near Ottawa, Ontario. At Shirley Bay the signal was cross-connected, and sent via the ANIK-B satellite to the terminal located at Forest Lawn. Thus, the system was configured as a double satellite hop.

2.2 INSTALLATION

The installation of a terminal began by determining the azimuth setting of the antenna using a magnetic compass. The required azimuth setting and elevation setting for a particular site were

supplied by the Communications Research Centre. The compass was used to establish the orientation of the timber base on which the antenna is mounted, to meet the azimuth setting supplied by CRC. The selection of the antenna site was also influenced by the azimuth setting, in that, an unobstructed view of the sky must also be established for the antenna.

Once the antenna site was selected, and the azimuth orientation for the timber base determined using a magnetic compass, the timber base was bolted together. Next, the antenna support legs and brackets were bolted together and also bolted to the timber base. Then the bottom section of the dish antenna was fastened to the support legs. Next, the middle section of the dish antenna was bolted to the bottom section of the dish antenna. This was physically, the most difficult work because it required 3 men: two to hold the middle section of the antenna while the third man bolted it to the bottom section. We had to support the partially assembled dish with wooden stilts because it was too heavy to lay on the azimuth adjusting supports. It also took 3 men to bolt the top section of the dish antenna to the middle section. Again, two men had to hold the top section, while the third man did the bolting. Finally, the completed dish antenna was raised into place, and the elevation adjusting support leg fastened to the timber base.

The elevation angle was set using a spirit level and a protractor, by laying the level and protractor along the side of the dish antenna, and adjusting the elevation support to the angle that was specified by the CRC.

The TWT up-converter, the RF unit, and the LNA were mounted on the back of the dish. The IF pilot receiver and the TIU/VCU were installed inside the satellite terminal building. The 30 metre coaxial cables plus the control cable were installed

between the equipment on the back of the dish and the equipment inside the building.

The equipment in the building was plugged into a standard 120 VAC, single phase, duplex receptacle, and turned on for the receive mode only. A multimeter was connected to TB2 on the RF unit. Using the azimuth vernier adjustments, the dish was swung through the azimuth angle and set to the position that gave the highest D.C. voltage reading on the multimeter. The elevation angle was then adjusted in a similar manner.

It was found that the elevation angle could be more accurately set using the spirit level and protractor, than could the azimuth setting using a magnetic compass. Therefore, the easiest way to find the satellite was to set the elevation angle, and swing the dish through the azimuth angle, rather than vice versa. It was also found that metal structures or ore deposits in the area where a magnetic compass was used, influenced the compass readings sufficiently to be misleading when pointing the dish antenna.

Once the antenna was pointed at the satellite, the TWT up-converter was energized. The TWT output level was set by talking to CRC in Shirley Bay on the satellite voice circuit, and having them direct the raising or lowering of the TWT signal level based on them monitoring the satellite output at Shirley Bay. At this point, the satellite terminal was operational and ready for use.

A typical satellite terminal installation took 1½-2 days to complete.

2.3 MAINTENANCE

Maintenance of a satellite terminal was done on a "black box" basis. Whenever there was an equipment failure, only the major assemblies (TWT up-converter, RF unit, LNA, IF pilot receiver, or TIU/VCU) were replaced with spare units. The only signal level adjustment that was required was to set the TWT up-converter output level under the guidance of the CRC at Shirley Bay.

No attempt was made to repair any of the major assemblies when they failed. The faulty units were shipped back to the CRC at Shirley Bay. In return, the CRC sent out one spare, working, unit for each major assembly.

All the field maintenance was done using standard tools (e.g. screw driver, wrenches, etc.) and a multimeter. No other test equipment was used.

2.4 TRANSPORTATION

When disassembled, the satellite terminal was easily transported by small truck or the Twin Otter type aircraft. The bulkiest item was the 3 metre dish antenna which was broken down into 3 horizontal sections.

With the exception of the 3 sections of the dish antenna, all the other equipment had wooden packing crates that were used to transport the equipment from site to site. Everything was small enough that no more than 2 men were required to load or unload the equipment.

3.0 EVALUATION

3.1 INSTALLATION

With the exception of the 3 metre dish antenna and its timber base, all the equipment was very easy for personnel having limited knowledge of the equipment, to install. All the signal and control cable connection points were clearly labelled. All the control cable connectors were different, or they were keyed differently, so that it was impossible to make a wrong connection.

The 3 metre dish and its timber base were difficult to install. There are too many pieces in the timber base, and it is too much like a jigsaw puzzle to facilitate easy assembly. The dish antenna is difficult to assemble because each section is heavy and 3 men are required to bolt it together. With the exception of the 3 metre dish, all the installation work can be done by one person. This is an important factor to consider, especially when a terminal must be installed in a remote area.

Finding weights to place on top of the timbers is not always easily done. For the terminal that was installed at Sundre, Alberta, there were no large boulders in the area, no spare water drums, and cement blocks were not readily available. Sections of drillstem were used (see photographs at the end of this report) but they had to be put in place with a fork lift because they were too heavy for humans to lift.

Future satellite terminals that are designed for remote areas, should use a dish antenna that is no larger than one metre. This size antenna will be easy to transport in small vehicles or aircraft (e.g. helicopter) and will be easy for one person to install. The smaller antenna will also reduce the requirements of the antenna base. If the satellite RF output power dictates that a larger size antenna is required, then the antenna

should be made as light as possible with a simple base that does not require a lot of weight to hold it down. This could partially be accomplished by reducing the wind load to 100 kilometres per hour instead of 161 kilometres per hour. At a temporary installation, there will be more problems to worry about than just the antenna, if the winds blow at 161 kilometres per hour. For permanent installations, the 161 kilometre per hour wind speed can be considered because a permanent installation warrants a concrete base or pilings and also a mechanically stronger antenna.

The ANIK-B terminals that the CPA are currently using were easy to install because there was no requirement for the installer to set levels (other than the TWT RF output level) or deviation. These were all preset. As mentioned above, the cable connections were clearly designated, making cable connection easy. This philosophy should be maintained in new terminal design. By doing this, user-personnel can easily install a satellite terminal and set it into proper operation. This is particularly important for remote installations. It means that highly qualified personnel do not have to be transported to and maintained at a remote site. User-personnel can do all the installation and start-up using readily available tools (e.g. screwdriver, wrenches, compass, spirit level, etc.) and a multimeter.

It was found that the IF pilot receiver and the TIU/VCU were cold temperature sensitive. As the temperature dropped, the noise in the transmit circuitry of these units increased substantially. This factor became evident at the Drayton Valley installation where the IF pilot receiver and TIU/VCU were housed in an unheated shed (see photographs at the end of this report). Future equipment designs for remote areas should be designed to at least -30°C. because the equipment may be housed in unheated buildings.

3.2 MAINTENANCE

The ANIK-B terminals that the CPA are currently using were easy to maintain because all failures were rectified by replacing "black boxes" (major assemblies) with spare units. This philosophy of maintenance should be maintained on future remote terminal designs because user-personnel (e.g. electrician, or technician) with limited knowledge of the satellite terminals, can easily do the replacements. The only test equipment used for maintenance was a multimeter. Having user-personnel maintain remote satellite terminals is a very important factor to be considered in the on-going development of satellite communications. It saves having highly qualified personnel travel to remote sites to perform maintenance functions. Many remote sites are not accessible by commercial transportation so that chartered transportation must be arranged. This can result in highly qualified personnel spending several days travelling to perform an hours maintenance once they arrive at the job site.

The philosophy of replacing failed components by replacing major assemblies is another important factor to be considered. By keeping this philosophy in future systems, it further supports the user maintaining his own terminals because the user does not have to invest in sophisticated test equipment, nor train personnel on using sophisticated test equipment.

When there was a failure of the ANIK-B terminals, it was very obvious whether the failure was in the transmit portion of the equipment or the receive portion. This was most easily ascertained by simply trying to voice communicate with the CRC at Shirley Bay. If they could hear you then you knew your transmit circuitry was operating. If you had a reading on the IF pilot receiver meter and you could hear CRC talking to you, you knew the receive circuitry was operating properly. However, what was more difficult to ascertain, was which unit had failed if you did have a failure. During the ANIK-B field trials, a trial-and-error approach was used i.e. if the failure was in the receive section of the

terminal, the LNA was replaced, if that did not cure the problem, the RF unit was replaced, and so on. On future systems it would be very helpful if D.C. voltage test points were designed into each unit so that a signal could be tracted from unit to unit. As an example, if the test points on the LNA read properly, but the tests points on the RF unit did not, then the maintainer would replace the RF unit or the cable between the LNA and the RF unit.

One maintenance problem that arose 3 times at Forest Lawn, was the semi-rigid coaxial cable that ran between the local oscillator on the RF unit and the local oscillator on the TWT up-converter. This cable is short and therefore, cannot be tied down to the antenna frame anywhere. This cable vibrated in the wind and eventually the outer shield broke away from one of the connectors. In future designs, the semi-rigid coaxial cable should be tied down to prevent vibration.

Another problem that was common to Forest Lawn, was a large number of helical trips. We believe these were caused by prime power "bumps" at the site, although this was never investigated that carefully. Future equipment will probably not use TWT's, but similar characteristics should be avoided in future equipment designs.

Forest Lawn also had a chronic problem of TWT up-converter failures which resulted in low or no RF output. From January 1982 to April 1983, the TWT up-converter was replaced 5 times. This was the only equipment reliability problem that was encountered throughout the field trials.

3.3 TRANSPORTATION

The philosophy of packing the equipment in wooden crates for shipment is good and should be maintained for future systems. It should be noted though, that after being used several times, some of the crates became dilapidated.

4.0 FINANCIAL CONSIDERATIONS

Future satellite terminal design should be based on the user installing and maintaining the equipment. If the equipment is designed on a "black box" basis, qualified personnel at the equipment supplier's depot can pre-tune and adjust the equipment for proper operation. As has been demonstrated with the ANIK-B pilot project, user personnel can install and maintain the equipment in the field. This represents a cost saving to the user because the user will already have personnel at a satellite terminal site performing other duties, and will not need to hire and transport highly qualified personnel to install and maintain the equipment.

Having the user maintain his own terminals will require a larger quantity of available spare assemblies, than would be required if highly qualified personnel maintained the equipment. For each terminal, or system installation, the user will need to give some serious consideration to the terminal availabliity level he needs to maintain. Since availability is a function of mean-time-to-repair, the quantity, and stationing of spare assemblies must be considered very carefully.

In a system where there are several satellite terminals, it may be possible to station the spare assemblies in a central location. This will help to reduce the quantity of spares that must be maintained. It may be possible to organize a sparing arrangement with the equipment supplier. He may have many terminals in service but divided among several users, and this would also help to reduce the quantity of spare assemblies.

If availability of 99% is required for a satellite terminal, then equipment redundancy with either automatic or manual switchover must be installed. Equipment redundancy is a significant financial consideration. Therefore, the equipment availability that is required should be determined by the user and not the supplier.

Although the user can maintain a satellite terminal by changing major

assemblies, the equipment supplier is probably the best company to repair failed equipment. The equipment supplier will already employ the qualified personnel and have the sophisticated test equipment, required to trouble-shoot and repair the major assemblies.

By allowing the user to maintain his own equipment, the user can determine his own maintenance priorities. If he has an equipment failure in the middle of the night, on a weekend, the user can decide whether it is necessary to call out maintenance personnel right away or not. One common complaint of common carrier supplied equipment, is that they decide the maintenance priorities based on all their customers, and it can be some time between the reporting of a trouble, before that trouble is repaired.

5.0 ADMINISTRATIVE CONSIDERATIONS

Although this report advocates user installation and maintenance of the satellite terminals, it is essential that a governing body monitor, and police the satellite terminal technical requirements; particularly radiated RF bandwidth and radiated RF power. Because the current multi-user satellite design is sensitive to improper RF bandwidth (intermodulation) and improper RF radiated power, it is essential that a governing body monitor the satellite at all times, to make sure that all users have their equipment properly adjusted. This same governing body can assist the user in the initial set up of a satellite terminal by verbally guiding the installer when he is adjusting the terminal RF output power. The governing body can notify users if they see the user equipment drifting outside permissible operating limits, so that the user can immediately affect repairs.

It would be a good idea if the governing body could, by remote control, shutdown a terminal that was improperly adjusted, particularly in the situation where the terminal was interfering with the proper operation of the satellite.

The governing body need not be a government agency. It could be Telesat Canada, or it could be the Canadian Petroleum Association if they could see the advantage of putting their own satellite in orbit to be shared by the member companies.

6.0 CONCLUSION

There is no doubt that satellites are going to play a major role in the communications systems of the future. There is already a need for this service in the remote areas of Canada where the common carriers have little or no terrestrial facilities. The satellite systems of the future should be designed with the following criteria in mind:

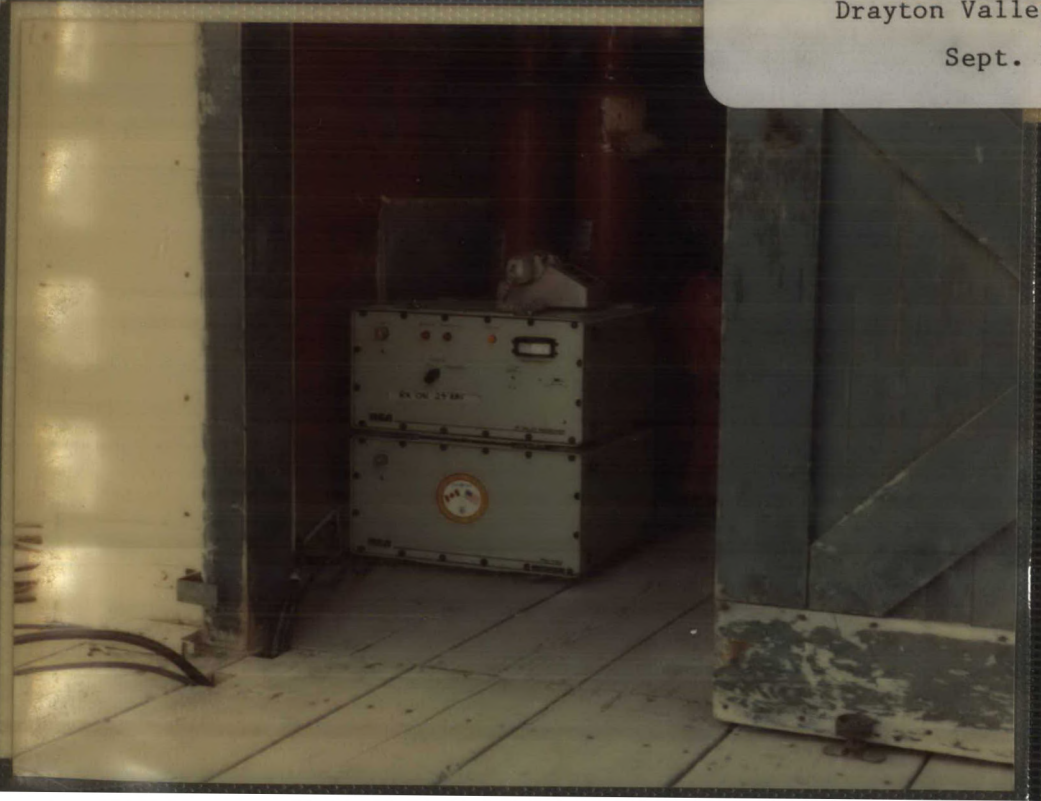
(a) User installation and maintenance
(b) Smaller, lighter, antennas, preferably one metre in diameter
(c) Modular design, factory tuned and aligned.
(d) Remote location terminals designed for operation to -30°C.
(e) Installer requires normal complement of tools, magnetic compass, spirit level and protractor.
(f) Maintainer requires normal complement of tools and a multimeter. No special or sophisticated test equipment is required.
(g) Easily transported, preferably by helicopter
(h) Remote location terminals to be installed by one person.

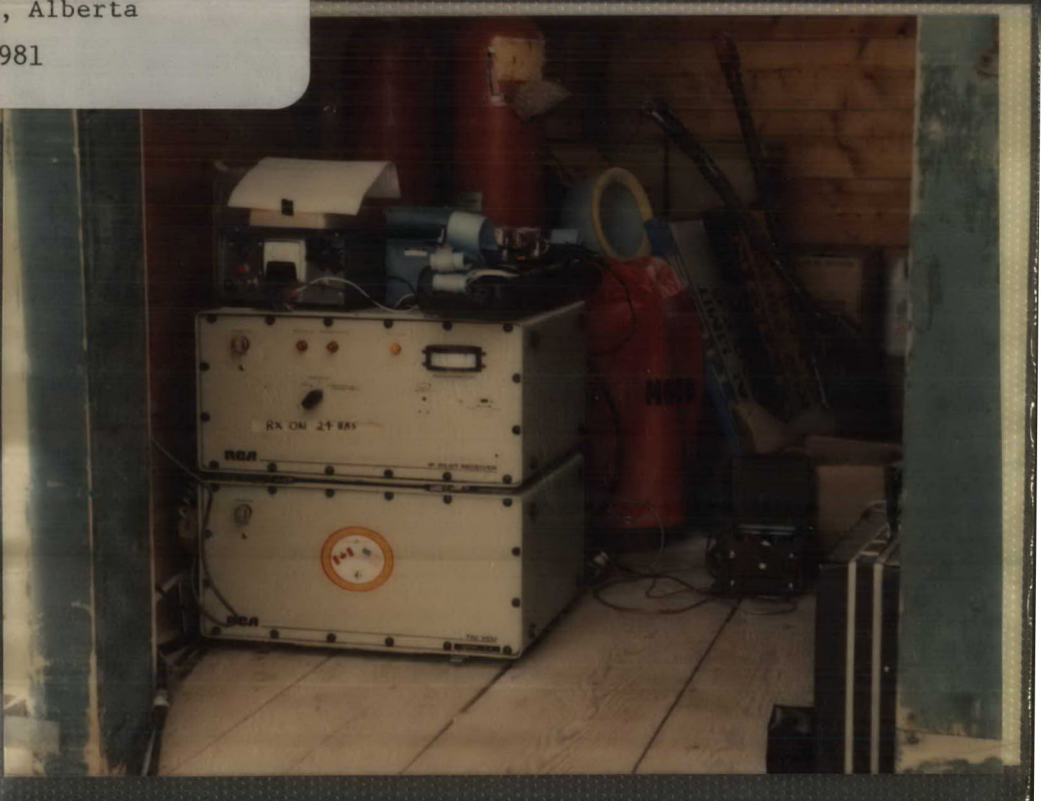
Shell Canada Resources Ltd.

Black Lake, Saskatchewan

Sept. 1981

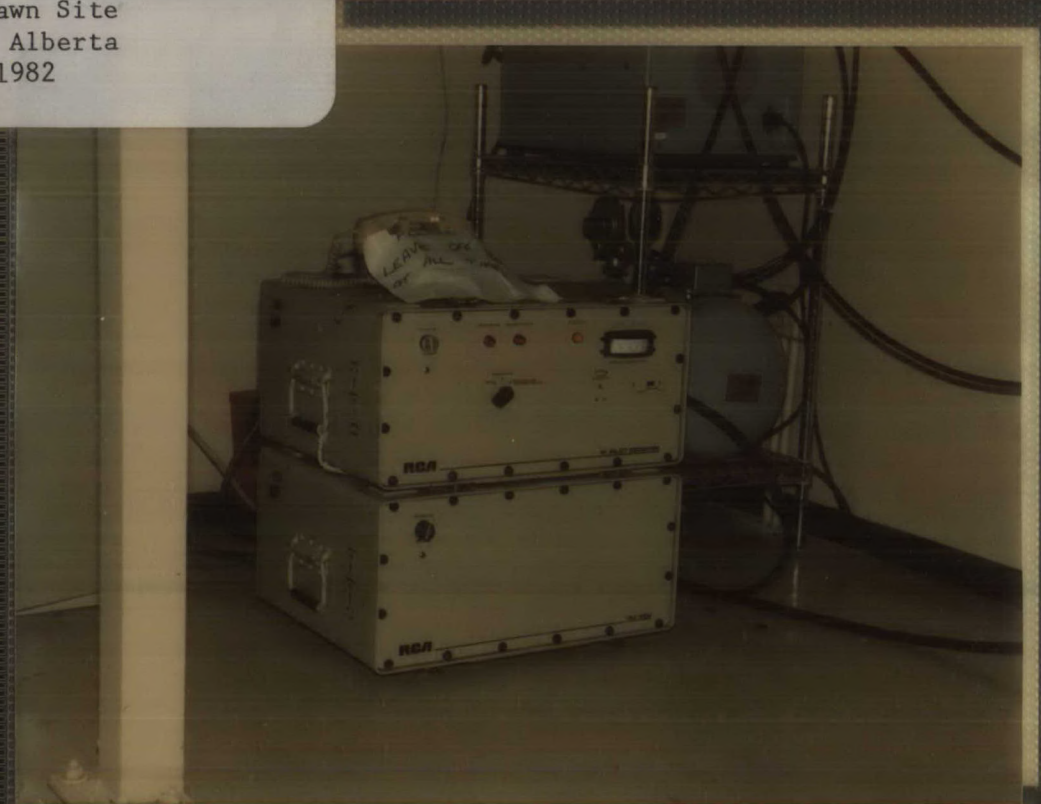
Amoco Canada Petroleum Company Ltd.
Drayton Valley, Alberta
Sept. 1981





Amoco Canada Petroleum Company Ltd.
Sundre, Alberta
Feb. 1982

Alberta Government Telephones
Forest Lawn Site
Calgary, Alberta
Oct. 1982



APPENDIX G

SHELL CANADA RESOURCES LIMITED

EASTCOAST OFFSHORE PROJECT/

STABILIZED ANTENNA PLATFORM

ANIK B
SHELL CANADA RESOURCES - CPA - CRC
OFFSHORE EXPERIMENTAL PROGRAM

Shell Canada Resources Limited, the Communications Research Centre, and the Canadian Petroleum Association are in the process of demonstrating the feasibility of cost effective telephony, data, and TVRO satellite communications to offshore drilling vessels. MT & T and A.G.T. have been invited to participate in this experiment.

The experiment will be using 14/12 GH_Z SCPC satellite terminals with a prototype stabilized antenna platform. The program will operate on the Anik B satellite and will run from May through October 1983; with an extension requested beyond this date so that the platform design may be tested over the winter period.

The results of this program are expected to enable offshore users to access the Anik C3 satellite for domestic telephony and data communications, as well as TV reception at reasonable costs.

Figure II depicts the proposed system configuration.

The proposed earthstations will be a 14/12 GH_Z SCPC telephony and data earth station complete with TV receive only capability. The offshore terminal will use a 1.8m antenna mounted on a micro processor step track gyro stabilized antenna platform, enclosed in a radome; with performance specifications as per C.R.C.'s development program suitable for use on semi submersible drilling rig or drillship.

The terminal could basically be operating anywhere off the Eastcoast of Canada where Shell and our partners have exploration lease holdings. Transportability has been designed into the mounting arrangement, the terminal could also be moved to another Shell operated rig. The other terminals are SCPC terminals with 3.1m antennas and higher power amplifiers for use as homing stations for the offshore terminal.

The intent of this project is to establish experimental SCPC telephony, data and TVRO services on the Anik B domestic satellite system with the terminating location for the circuit at Shells East Coast Exploration Office in Dartmouth. It is also desirable to have the ability to be able on a demand assigned basis to bring well logging information back to Calgary directly from the rig. This concept will be demonstrated as part of the Anik B experiment currently underway. Communications between Calgary and Dartmouth will also be demonstrated via satellite.

We intend to collect received signal level data as part of the Anik B experiment and try to correlate the effects of weather and operating areas so that optimum operational system margins for 14/12 GH_Z services can be determined. These results will not be known for several months to a year.

Figure 1 is a picture of the stabilized antenna platform, c/w radome that we propose to use.

Figure 2 depicts the Anik B system configuration that functionally we would like to duplicate for an operational system and we are currently requesting a license for operation on the Anik C3 satellite system.

The nature of the requirement for service is to provide a cost effective and reliable alternative to the current mode of communications via H.F. radio and Inmarsat. Inmarsat is a very expensive operation at $12/minute of useage.

The planning for this service has been under way since 1980 in conjunction with the Communications Research Centre, the Canadian Petroleum Association and member companies including Shell Canada Resources Limited as part of the Anik B Phase II experiment. The purpose of the offshore phase of the Anik B phase II program was to provide an inexpensive and reliable satellite communications system for offshore semi submersible drilling rigs, and drill ships for the petroleum industry accessing a Canadian domestic satellite. This was to use a designed in Canada philosophy. This program was also to encompass future offshore oil and gas production platforms.

The utilization of the SCPC circuits will be on a continuous basis, 24 hours a day, 7 days a week operation. The offshore location is temporary in nature. The rig will be moved on an average basis between 3 mo to 9 mo depending on the location of the hole, water depth, drilling depth and degree of difficulty encountered in drilling. The exploration drilling program is set out for a 2 to 3 year period, with extensions possible beyond this, depending on the success of program and economics of world oil prices. Additional exploration rigs requiring satellite terminals may be a possibility as well.

Also the offshore terminal may be moved to another rig such as the SDS Vinland depending on where it is operting it if HF radio coverage range or possibly to a seismic exploration vessel. The terrestrial based terminal(s) will be required as long as the offshore terminal(s)are required.

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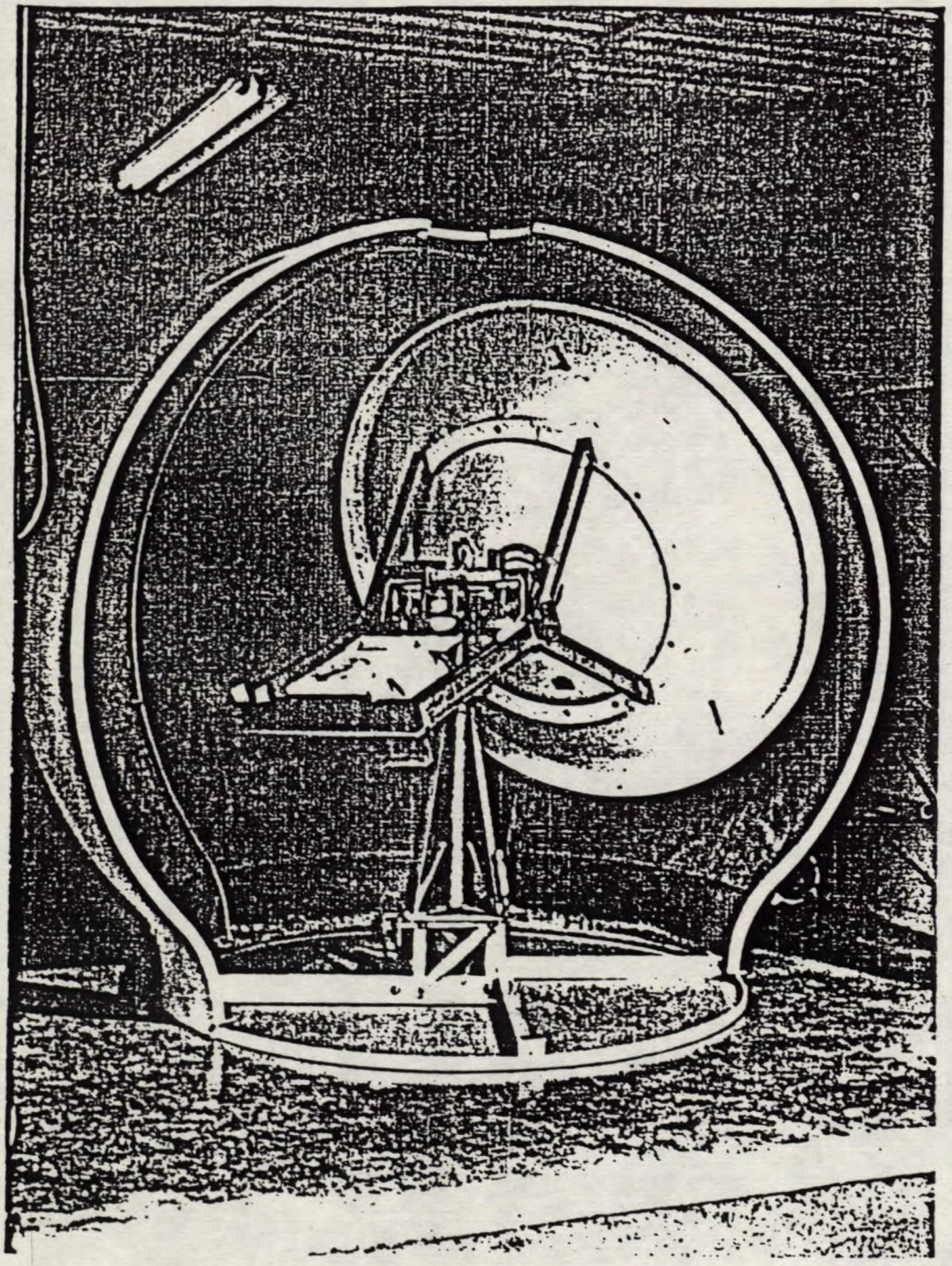
MARIPED SALES COMPANY

EQUIPMENT AND TECHNOLOGY

AGENTS FOR SEATEL, INC.
DIRECT MECHANICAL STABILIZATION OF
ANTENNA PEDESTALS



SEATEL MODEL 7282 DMS* PLATFORM AND 1.8 m ANTENNA
2.8 m LOW RF LOSS RADOME (CUTAWAY)

*direct mechanically stabilized

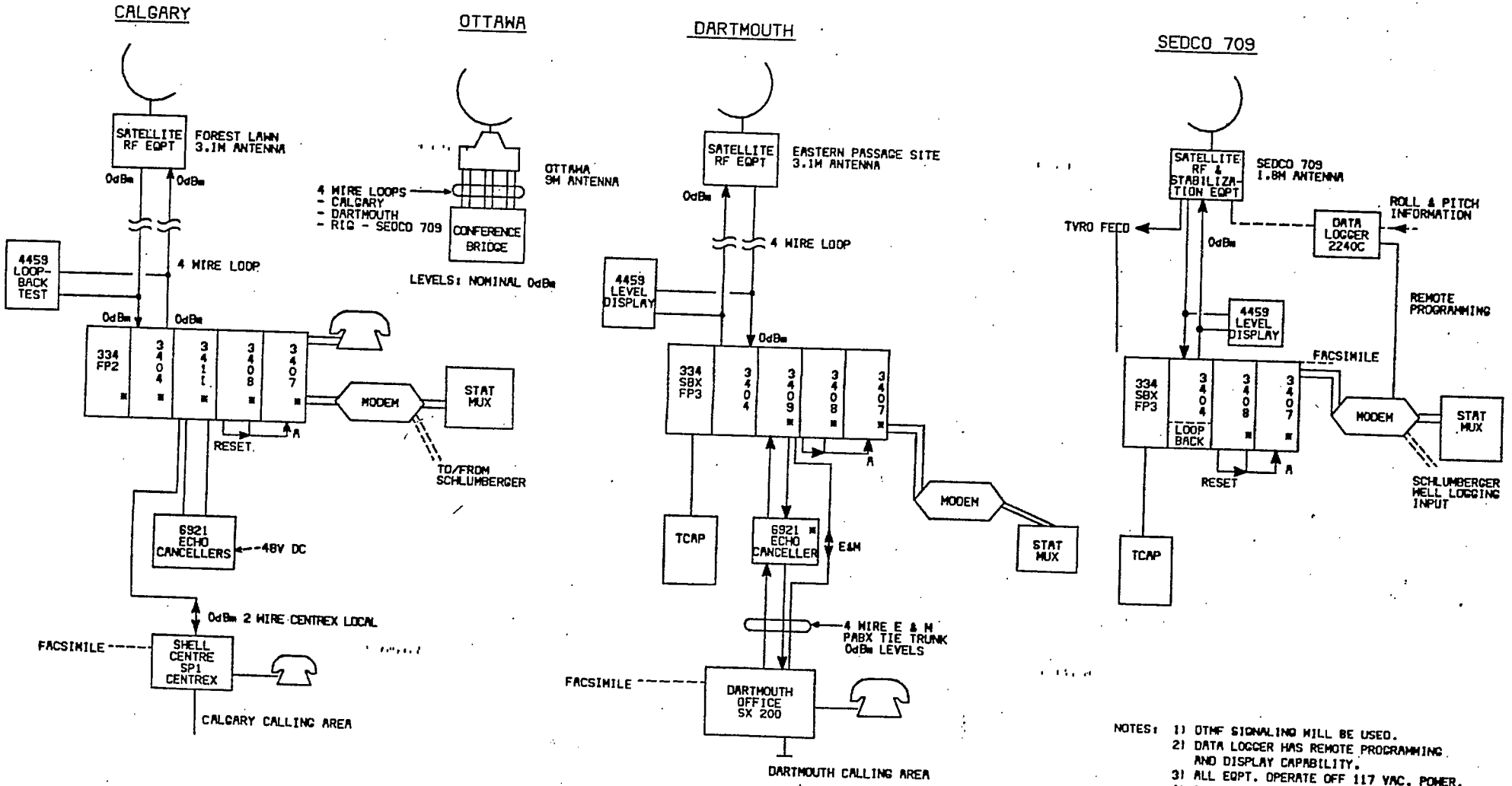
FIGURE I

2384 San Diego Ave. • Suite 2 • San Diego, California 92110 • Telephone 619-299-8431

FIGURE II

ANIK B EXPERIMENTAL

SATELLITE SYSTEM COMMUNICATIONS CONCEPT



NOTES: 1) DTMF SIGNALING WILL BE USED.
2) DATA LOGGER HAS REMOTE PROGRAMMING AND DISPLAY CAPABILITY.
3) ALL EQPT. OPERATE OFF 117 VAC. POWER.
4) ALL LEVELS NOMINAL 0dBm

M0931A

APPENDIX H

CANADIAN PETROLEUM INDUSTRY

MOBILE SATELLITE REQUIREMENTS

PETROLEUM INDUSTRY REQUIREMENTS FOR A MOBILE SATELLITE SYSTEM OPERATING IN THE 806-890 MHz FREQUENCY BAND

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1. EXECUTIVE SUMMARY

The purpose of this report is to provide the Department of Communications with an insight into the operational requirements of the oil and gas industry for a mobile satellite communications service. This report presents an overview of industry activities being conducted in the various geographical regions of Canada, and identifies the differences in the types of communication systems required to adequately support these activities.

A previous study conducted by the Canadian Petroleum Association estimated that expenditures in the order of $230 billion will be required if Canada is to achieve crude oil self-sufficiency by 1990. To achieve this goal, the level of activity on the East Coast or in the Beaufort Sea may equal or surpass that of the North Sea. To emphasize the magnitude of this undertaking and to place the potential growth of Canada's petroleum industry in its' proper perspective, the material in this report contains comparisons made between Canada and other countries where resource development is of primary concern.

Those resource companies presently involved in the Beaufort Sea exploration program employ approximately fifteen hundred personnel on site to support their operations. An effective communications system is of utmost importance to these companies who must cope with such concerns as safety, morale and logistics and technical support. Sophisticated communication systems are required which will integrate onshore, marine and aeronautical operations into a single functioning entity.

Highly trained technical staff are employed by resource companies who must install and maintain such diverse equipment as: marine radar and radio microwave systems; nondirectional beacons, radar transponders, VOR/DME airport installations, microwave landing systems and mobile radio repeater systems; PABX equipment, synthesized HF radio systems and meteorological equipment; data acquisition systems and communicating wordprocessor equipment.

MSAT would not only complement existing communication systems and services, but it would also provide a medium for the further development of present and future technological applications. The lack of adequate communications systems to serve the under populated regions of Canada, particularly areas of resource exploration, have created a bottleneck for the incorporation of this new technology and its' use. Institutional issues that further impede the implementation of new technology, particularly those that have a detrimental effect on the safe operation of a frontier program, must also be resolved. The petroleum industry needs autonomous control over the ownership, installation and maintenance of its' communication systems in order to effectively respond to operational requirements.

This report identifies the deficiencies of present communication systems and substantiates the requirement for a mobile satellite service. The need for: constant communications with aeronautical and marine support craft; emergency and disaster communications; marine and aeronautical traffic control; a host of other applications that require a land, sea and air interactive communications service emphasizes the role that MSAT will play in the future development of Canada's resources.

2. GEOGRAPHICAL AREAS OF ACTIVITY

2.1 ATLANTIC/PACIFIC (Canadian Offshore)

2.1.1 GEOPHYSICAL PHASE

Climatic conditions on Canada's East Coast restrict the operation of seismic vessels to the summer months. The actual timing is dependant upon the latitude where the vessel will be operating. The actual number of vessels engaged in gathering seismic information will vary over the summer and fall and depends upon the length and number of individual operations. In 1980, four vessels were engaged in seismic operations in this area. In 1981, a similar level of activity was experienced with two vessels beginning their program in April, reaching a maximum of ten vessels conducting operations during June and August.

Seismic vessels are employed internationally and may never enter a Canadian port, but will usually proceed directly to the assigned area of operations. When the program is completed, approximately six weeks, the vessel proceeds to the next assignment.

There are two problems associated with this type of operation. An operating seismic vessel continuously gathers data at a 2.4 Mb/sec data rate for eight out of every twelve seconds. This data is stored on magnetic tape and at the completion of the program, it is shipped to the respective petroleum companies for evaluation. There is no present means of transmitting that data to the mainland for real-time evaluation. As a result, should the integrity of some of the data be questionable, or should an analysis indicate that further delineation of the geological prospect should have been carried out, the only recourse the petroleum company has, is to return the following year and conduct a second seismic survey.

Because of these two problems, several companies are investigating the practicality of transmitting seismic data to shore in real-time. This is particularly the case for northern waters where climatic conditions dictate a short and expensive operating season. Current investigations include the use of compression techniques that may allow seismic data to be continuously transmitted via satellite at a 1.544 Mb/sec (T1) rate.

The National Ocean Industries Association (NOIA), in the United States is also pursuing the option of a 72 Mb/sec satellite channel through Marisat for the transmission of offshore seismic data.

The significance of these two developments indicates a high degree of interest by petroleum companies for real-time evaluation of seismic data. The inclusion of a pay load on MSAT capable of supporting this type of activity as well as maritime mobile communications, should be the subject of further consideration.

2.1.2 DRILLING PHASE

The cost of drilling an offshore deep-water well has a significant impact on the size of an operation a single company can support. Day rates for world class semi-submersibles have climbed to the $85-$95,000 (US) range and for severe environment jackups, day rates are as high as $65,000 (US). In addition, each rig may require two supply vessels, one that may also function as an iceberg towing vessel. Total operation costs may run as high as $250,000 each day and amount to approximately $25,000,000 (CAN) for each well drilled.

Exploration wells on Canada's East Coast are being drilled up to 200 nautical miles offshore. The high cost of providing logistics support in the form of aeronautical and marine operations demand a high level of communications.

2.1.3 DEVELOPMENT PHASE

As offshore production becomes a reality on Canada's East Coast, the prospect of a significant increase in exploration and development drilling must be considered in relation to the effect it will have on existing communication facilities.

The majority of the world drilling fleet (603 Rigs), is engaged in exploration and development drilling in such producing areas as the North Sea (60 Rigs), the Gulf of Mexico (180 Rigs) and the Arabian/Persian Gulf (49 Rigs).

As the Atlantic Provinces add to their discoveries and move into the production phase, we should anticipate a significant increase in offshore acitivty. The number of vessels required to support each additional rig would place an even higher demand for ship-to-shore communications. The prospect of a North Sea operation developing in Eastern Canada should be considered a very real possibility.

Similarly, should the 1972 moratorium on seismic, exploration and development activity be lifted from Canada's West Coast, a surge of activity equalling that of the East Coast may well develop.

2.2 BEAUFORT SEA

2.2.1 GEOPHYSICAL PHASE

Seismic activity in the Beaufort Sea is conducted by vessels that are permanently stationed in that area. The climatic conditions are, as on the East Coast, very severe with operation limited to a few weeks during the summer. The capability to transmit seismic data would again prove to be highly beneficial to the operating companies in this area.

2.2.2 DRILLING PHASE

A number of encouraging oil and gas discoveries have been made in the Mackenzie Delta/Beaufort Sea regions of the Northwest Territories. These discoveries have been made by conventional land based drilling rigs, offshore drilling vessels and wells drilled from artificial islands located in shallow waters offshore.

The construction of artificial islands demands a high level of communications to assist in ongoing surveys of the islands during construction and the accurate dumping of fill material dredged from borrow pits up to sixty miles away. Because of this high level of construction activity, the degree of logistics support far exceeds that of a conventional offshore drilling operation. The unpredictability of local weather and its effect on the polar ice pack increases the demand for efficient and effective communications.

2.2.3 DEVELOPMENT PHASE

The possibility of large scale development and production is presently being reviewed under the Federal Environment Assessment and Review process. The three main operating companies, Dome Petroleum Ltd. Esso Resources Canada Ltd. and Gulf Canada Resources Inc. have prepared preliminary development plans to facilitate the government review process.

The very large production area and the differences between offshore and onshore production methods may dictate that both tanker and pipeline transportation systems will be required. An indication of the magnitude of the expenditures involved is that by 1990, Dome Petroleum Ltd., expects to spend approximately $40B to develop the Beaufort producing areas, and may require as many as 70 vessels to accomplish that task.

Should a pipeline be constructed to transport the oil, it would extend about 2,250 kilometers from the Beaufort Sea to Edmonton. Construction would take four years to complete the main pipeline system, require two million tons of equipment and supplies, and would employ approximately 12,000 during the peak construction period.

MSAT would certainly complement existing terrestial systems in the Mackenzie Valley corridor as well as probably providing the only means of communications in several of the producing and construction areas.

The tanker transportation system will also require a high level of communications support and a definite need for a maritime mobile system exists in this area. The cost of supporting a terrestial system that would be capable of supporting a high level of marine activity over such a wide area and in a very hostile environment would be extremely expensive.

2.3 ARCTIC ISLANDS

2.3.1 GEOPHYSICAL PHASE

Geophysical activity in the Arctic Islands has been reduced significantly with the discovery of large gas reserves in the western provinces and the successful exploration efforts being carried out in the Beaufort Sea and East Coast regions. Only one or two seismic crews are currently active in this area. These crews must rely on HF-SSB communications to support and staging areas such as Panarctic's Rea Point base camp and the community of Resolute Bay.

The Geological Survey of Canada estimates that Canada's north may contain an estimated 200 to 285 trillion cubic feet of natural gas. This vast area of Canada will require an exploration and development effort that will continue for many decades into the future. MSAT may well be the only means of providing the area coverage that will be required to support this development of Canada's northland.

2.3.2 DRILLING PHASE

Exploration in the Arctic Islands comprises of both onshore and offshore activity. Drilling operations offshore requires the flooding of existing ice to build an ice platform thick enough to support a rig. The vast distances involved for logistics support from centrally located base camps makes conventional mobile radio systems, VHF or UHF, expensive and impractical. MSAT would prove to be a far more beneficial system for communication with rigs and highly mobile construction camps than the existing HF-SSB systems.

2.3.3 DEVELOPMENT PHASE

Significant reserves of oil and gas have been discovered in the Arctic Islands and preliminary plans for a Polar Gas Pipeline Project are now being reviewed by the Federal Government. The proposed route of this pipeline is southeast from King Christian Island to the northeast corner of Great Bear Lake. A spur from this point to the Beaufort Sea will carry MacKenzie Delta gas to be included in the main line that will continue down in a southeastern direction to intersect the northeast corner of Saskatchewan, continuing on across Manitoba and finally intersecting the Trans Canada Pipeline at a point northeast of Thunder Bay, Ontario. The proposed construction of this pipeline will open a vast area of Canada's north and require a massive amount of material and logistics support.

2.4 WESTERN PROVINCES

2.4.1 GEOPHYSICAL PHASE

There are approximately seventy geophysical crews active in the western provinces at the present time. Seismic data is recorded on magnetic tape and transported to the clients geophysical offices for evaluation. Satellite transmission of seismic data is not recognized as a requirement for land based operations largely because of the economics involved with transmitting such large amounts of data and because most seismic operations are relatively inexpensive when compared to those being conducted offshore. Seismic and geophysical crews rely on the Mobile Telephone System for communications because of the mobility of their operations.

2.4.2 DRILLING PHASE

Examination of drilling activity over the past twenty years indicates that a fairly consistent level of exploration drilling has been maintained. From 1961 to 1976, the average rig fleet (number of rigs available for contract) hovered around 300 in number. From 1977 to 1981, the fleet increased in size to a peak of 567 in September of 1981.

Canada compares to Latin America in terms of total fleet size where 475 land based rigs were available for contract in 1981. The United States, on the other hand, is anticipating a total of 6,100 land based rigs in its fleet by the later part of 1982.

The Mobile Telephone System is the primary means of communications for the majority of land based rigs. This in turn dictates a high level of usage by the service industry who must have a common means of communication with the drilling rigs. DOC licence data will support the pyramid effect of this dependency on a common communications system that begins with a relatively small number of drilling rigs at the top, and spreads to a wide base of service companies and support services that depend on drilling operations for their livelihood.

2.4.3 DEVELOPMENT PHASE

Once a field has been discovered, and production drilling and construction activity begins, the Telephone company for that province generally provides the required telecommunication services. A small mobile system is implemented by the operating company for mobile to mobile and base to mobile communications. The drilling rigs involved in workover and completion work generally still rely on the Mobile Telephone Service for their support requirements.

3. PRESENT COMMUNICATION SYSTEMS

3.1 MOBILE TELEPHONE SERVICE (MTS)

The cost of drilling an exploration well in the western provinces averages about $2,000,000. Approximately three hours are spent each operating day on telephone communications for logistic and technical support.

Should unexpected problems arise, for instance a well control (Blowout) problem, the communication needs accelerate rapidly. The Mobile Telephone Service, although the communication mainstay of the petroleum industry, does not provide the level of communications required for effective and consistent support of drilling activities.

Drilling locations are selected on the basis of seismic interpretation and not on the availability of communication networks. Consequently, they may be located outside of MTS coverage areas or in shadow areas created by the local topography. The drilling supervisor may have to drive several miles before being able to use his vehicle mobile. This severely hampers communications from the rig and makes it almost impossible for anyone to place a call to the rig. In these cases, the supervisor and wellsite geologist spend a large percentage of their available time attempting to communicate with service companies and their office, instead of supervising the various aspects of the drilling operation.

The difficulties in providing communication to these locations is compounded by the short lead time for planning and the length of time spent on location, which may vary from a few weeks to several months.

The development of a 'hot spot', where the prospect of a large petroleum discovery is identified, results in the rapid deployment of a large number of drilling rigs in record time. Several of these exploration plays such as Elmworth, Alberta Deep Basin, Pembina and Claresholm have become well known nationally.

This increase in activity in a particular area places an inordinate strain on the MTS facilies. The result is a long waiting time for an available channel and a high level of frustration among users.

Elmworth is a particularly good example of an adequately served area until a gas discovery occurred. Although AGT managed to increase the number of Mobile channels to eight, the presence of approximately sixty drilling rigs and numerous seismic and service companies completely inundated the facility.

Oil scouts are routinely employed by exploration companies to obtain information about wells being drilled by rival companies. The information is gathered by visual and electronic surveillance methods and has resulted in the widespread use of voice and facsimile scramblers. the average cost of these units is about $16,000.

The scramblers protect the confidentiality of well data being transmitted to head office, where scramblers are also installed. However, the real need is a scrambled link for all calls regardless of their nature or their destination.

The current usage of the MTS by the resource industry, although extensive, is largely because of the lack of an alternative means of communications. MSAT would solve many, if not all, of the problems associated with field communications. It would certainly encourage the implementation of 2.4Kb/sec data transmission of well data and logistic support systems. The lack of consistent communications has long impeded the effective use of these systems in field operations.

3.2 POINT-TO-POINT MICROWAVE SYSTEMS

Private microwave systems have evolved from the need for wide area coverage in under-served frontier regions. Dome Petroleum Ltd. and Esso Resources Canada Ltd. each maintain radio-relay sites in the Beaufort Sea to support the large scale construction and exploration activity being carried out in that area.

Each radio-relay site is strategically located to provide telephone communications and mobile radio repeater coverage over a particular area. Air/ground radios are also installed in some of these sites and remoted back to the flight planner in the respective base camps. This provides continuous communications with helicopters and other support aircraft.

The disadvantages associated with this system is the high capital outlay, the high maintenance costs, and the fact that it only supports the inshore operation activity. The greater portion of both the Dome Petroleum and Gulf Canada acreage lies outside of the land based radio-relay coverage area.

The Beaufort Sea/Mackenzie Delta region of Canada's Arctic presents an ideal application for MSAT. The term 'microwave' has been used in a generic sense only, and most of the wideband frequency assignments are in the 150-170MHz, 400-420MHz band, 450-470MHz band and the 900-950MHz band. This has been necessitated by hops extending up to sixty miles in length, but all available spectrum has been used up and expansion of the present systems is going to be very difficult to achieve.

3.3 HF-SSB COMMUNICATION SYSTEMS

HF Communications is being used, to differing degrees, in the Arctic Islands, in the Beaufort Sea and off the East Coast. A limited number of frequencies are available for use by the petroleum industry which, in turn, may only adequately support a limited number of users. However, for operators in these regions, there is no other real alternative. Because the efficiency of SSB communications is most directly influenced by the number of users, the East Coast operation scenario is of primary concern.

It is becoming increasingly difficult to find suitable remote antenna farms in the eastern provinces, that are in low noise areas and also have cable plant to facilitate back-haul to an operations base in either Halifax or St. Johns.

The high capital outlay and maintainance costs associated with such a facility are also a significant factor when evaluating communication costs in this area. However, the necessity for establishing a high quality SSB system is justified by the importance attached to maintaining constant communications with helicopters flying rig crews up to 200 miles offshore and providing the drilling operation with synoptic weather forecasts and logistic and technical support.

The role of MSAT in the continental shelf area should be to complement SSB communication systems, but in a private network configuration. In other words, MSAT would provide the interactive communications that are required between the land based control centre, helicopters, supply ships and drilling rigs. The Telecom and Data communication requirements would be met by conventional SATCOM terminals.

Certain jurisdictional responsibilities between Telesat and Teleglobe must be delineated and MSAT must be assigned a prominent role in providing offshore communications for resource exploration and development.

3.4 SATELLITE SERVICES

Satellite earth stations have been used to support exploration drilling in the western provinces, particularly in remote areas where the mobile telephone service was not available. The high cost for satellite service, $13,800/month including back haul charges from Allan Park, as well as the limited number of terminals available for industry use, certainly acted as a deterrent to universal acceptance by industry. Problems were also experienced in areas of equipment reliability, maintenance support and transportability of the equipment.

Nevertheless, these earth stations are being utilized in the Arctic Islands particularly, as a means of providing effective communications to the south.

For most operations where two or three hours of communication are required during the course of a normal business day, MSAT would certainly be more viable than conventional earth stations. This is particularly the case in certain offshore applications where the space limitations as well as the need for stabilized antenna platforms makes conventional satellite communications very impractical and expensive.

3.5 MOBILE RADIO COMMUNICATIONS

Exploration activity in Canada's frontier regions demands a high level of support by land, air and sea. The distances between support bases and construciton and drilling locations may often be several hundred kilometers. The often harsh climate and geographical hazards demand close and efficient communications.

The ability of a terrestial communications network to support frontier operations is limited by the vast areas and distances involved, and in many cases, paticularly offshore, completely impractical.

MSAT would effectively service such diverse applications as: ice and pipeline patrols by aircraft; ship-to-shore communications for marine dispatchers; air/ground communications for flight planners; communications to advance camps that travel overland, and in some cases over the frozen expanse of the Arctic Ocean, to prepare airstrips and base facilities to support the ongoing exploration and construction activities.

Another application for MSAT is in the area of emergency and disaster communications. In the event of an oil spill, contingency plans are immediately activated. An Emergency Headquarters is established in the nearest city or support base where logistics support can be staged and expedited to the scene.

Crews are dispatched to the affected area and a line of communications must be immediately established to headquarters to facilitate the rapid provision of equipment and supplies.

Close communications with other vessels and aircraft in the area, including the Canadian Coastguard and possibly Search and Rescue Operations, may also be required at the scene.

MSAT would provide the commonality in communications that is required in this type of situation, and in addition would ensure that a communications line to a support base would always be available, regardless of the geographical location of the emergency situation.