DOC-PROVINCIAL GOVERNMENT MSAT WORKING GROUP

SUMMARY RECORD OF SIXTH MEETING

25 NOVEMBER 1986, OTTAWA CONGRESS CENTRE

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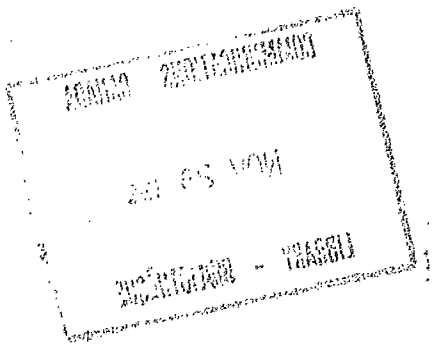


DOC-PROVINCIAL GOVERNMENT MSAT WORKING GROUP

SUMMARY RECORD OF SIXTH MEETING

25 NOVEMBER, 1986, 9:30 A.M. OTTAWA CONGRESS CENTRE

1. Introduction

The Chairman, R.W. Breithaupt, welcomed everyone to the meeting and offered his apology for the long delay between meetings primarily due to priorities such as obtaining final Cabinet approval for the program, and the resolution of spectrum issues. The program is now fully approved, and DOC wanted to report on a number of issues and to jointly plan future actions with the provinces.

2. Status Report by DOC on the MSAT Program

The Chairman introduced the topic by saying that due to the long interval between meetings, it was felt that DOC should provide a brief historical record of the program, summarize the main program results that led to the program approval under the Space Plan, and discuss some of the current issues and the Work Plan for the year. He then asked D. Athanassiadis to discuss these topics.

D. Athanassiadis noted that DOC has already invested more than $25M in defining MSAT concepts and proving its commercial viability. The system will be 100% financed by the private sector with federal government support in specific areas. It was noted that final government funding for the program was approved by Cabinet on April 29, 1986. Some 30,000-40,000 users have already identified MSAT in their future plans even though the service introduction is at least 5 years away, and in spite of the fact that many organizations are unfamiliar with MSAT and its potential. He noted the importance of MSAT as a major tool for economic and industrial expansion and reviewed the estimated industrial, economic and social benefits expected from the program. The provincial distribution of equipment sales and service, user and social benefits, investment and employment expected from the program were reviewed as well as the various capabilities needed by the manufacturing industry to meet industry targets. The MSAT program schedule and budget were also discussed as well as the nature of the space plan funding.

The Secretary then went on to highlight a number of current issues. In regards to on-going bilateral spectrum negotiations with the U.S., he noted that the FCC did not honour an existing Canada-U.S. agreement for 800 MHz spectrum and has failed so far to allocate sufficient spectrum in L-Band for MSAT. Canada now is involved in direct government-government negotiations to resolve this issue. Canada's first priority is to ensure the availability of sufficient spectrum in the 800 MHz band, in L-Band, or both.

Multilateral coordination of international spectrum assignments for Mobile Satellite service is underway for the WARC Mobile '87. The North American position will likely involve the liberalization of the present aeronautical and maritime mobile satellite bands to become a more general mobile satellite assignment.

The early licensing of the U.S. MSS operator(s) is essential to Telesat's implementation plans which require significant Canada-U.S. cooperation particularly in the design and sparing aspects. Another issue is the government-Telesat strategy leading to the evolution of full service involving pre-launch trials and interim service. A key aspect of this strategy involves the funding and development of the required ground segment equipment. To date there is considerable ground segment equipment development outstanding and a need for further Canadian manufacturing commitment due, in part, to the uncertainty of an adequate spectrum allocation, and the fact that present industry support mechanisms require that industry invest 50 percent of the development funds.

At the present time a final draft of the Joint Endeavour Agreement (JEA) between Telesat and DOC is now in circulation and is expected to be signed within the next month. Subsequently the details of a bulk service lease agreement between DOC and Telesat will be worked out for the lease of up to $126M of airtime for essential federal government use.

3. **Status Report on the Policy, Regulations and Licensing of MSAT**

E. Marquis of the Policy Branch in DOC made a brief presentation on the status of the policy, regulation and licensing of MSAT. He noted that the release of the Telecom Policy by DOC has been delayed pending further discussion of spectrum allocation and sharing arrangements with the U.S., and the clarification of the likely U.S. position at the upcoming '87 Mobile WARC.

E. Marquis summarized present Departmental thinking under the following three headings:

a) Service

In the Discussion Paper on Telecommunications Policy Proposals for Mobile Satellite Service which was issued for comment by DOC in August 1984, the Department described six different MSAT services, although it recognized that others might eventually be provided. The Department has no objection to any of them and proposes minimal regulatory restraints. Spectrum will be allocated, domestically, for

mobile applications although some non-mobile services could be carried, for example base-base communications for emergency use, and multi-point data collection applications. Trunking, for example between large cities, will not be allowed as a primary service, although some fixed trunking services may be allowed on a secondary basis where no cheaper alternative exists.

b) Service Industry

The Department will designate Telesat as the owner and operator of the space segment and of the network management and control station. It will also designate Telesat to manage the spectrum assigned. Telesat will not be obliged to be an end-user service provider, but if it does choose to be one, the CRTC will likely require it to separate this part of the business from the rest in order not to give it an advantage over its competitors. On the issue of interconnection, only entities eligible to interconnect will be allowed to do so (now restricted in some provinces by provincial regulations).

c) Equipment

Policy with respect to terminals, base stations and gateways will be consistent with what exists today. Mobiles must be type approved. There must be technical standards to ensure portability of equipment between service providers and compatibility across North America, including the U.S. In order for the equipment to be licensed, the applicant must have a contractual arrangement with an approved service provider. It will be up to Telesat to issue base and gateway equipment interface standards consistent with the space segment requirements.

Discussion

Mr. D. Sward of Telesat noted that Telesat expects to be a national service provider. Telesat intends to appoint agents across the country (eg RCCs), negating the requirement for Telesat to be located in every city and large town. Interest of the telcos in being an end-user service provider is high in Bell Telephone and B.C. Tel. As for the others it varies. Both Bell and B.C. Tel have indicated an interest in becoming an investor in the space segment.

He noted, however, that Telesat would be looking for a regulatory holiday in the first generation and questioned what the process should be. E. Marquis replied that the CRTC reacts only to a request. There is no DOC role as it has no power over the CRTC; however, DOC could appeal a decision to the Governor in Council. He suggested that it would be up to Telesat to write to the CRTC for a ruling.

D. Sward mentioned the upcoming sale of Teleglobe. It is thought that after 5 years Teleglobe might be able to provide domestic satellite services. In D. Sward's view one could eventually see two space segment operators. This could affect the manner in which Telesat is regulated.

As to the structure of rates, D. Sward mentioned that Telesat intends to test the reaction of potential service providers to various rate alternatives. The rate structure could depend, possibly, on whether or not service providers are also investors in the system. Mr. Sward raised the question as to whether certain users could declare themselves as service providers and buy airtime wholesale. E. Marquis replied that the environment now is that any large user today is eligible to become an RCC, and no change in policy is contemplated.

E. Marquis confirmed that consultation with the provinces is expected before the policy document is released.

4. **Status Report by Telesat**

Mr. D. Sward reported on work conducted by Telesat comparing L-Band with a hybrid UHF/L-Band system; and on plans for an Interim Mobile Satellite Service (IMSS) which could be offered publicly to provide limited trials and interim services using INMARSAT leased space segment facilities.

a) Comparison of L-Band and UHF/L-Band Systems

D. Sward noted that Telesat has evaluated a number of system design options involving various mixtures of UHF and L-Band. The pure L-Band option was based on a bigger bus similar to the one to be used for ANIK-E, with an eight beam coverage of North America. Four of the beams would be directed over Canada and Alaska, and four over the United States. Each country's satellite would normally radiate over the four beams reserved for communications in its territory, with provision to radiate into all beams for emergency backup. The system capacity for each alternative was calculated assuming that the mobiles must operate in a shadowing environment with fair to good subjective voice quality. The EIRP/carrier assumed was 32.3 dBw for L-Band and 26.5 dBw for UHF.

The basic conclusions of the study are the following. An all L-Band system is economically viable and has the highest Net Present Value (NPV), but a hybrid system with at least 2+2 MHz for each country at UHF is also very attractive. The additional L-Band path loss in a shadowing environment is compensated fully by increasing the satellite antenna gain through the use of narrower spot beams. The higher gain spot beams also permit the use of smaller L-Band antennas.

b) Presentation on the Interim Mobile Satellite Service (IMSS) Proposed by Telesat

IMSS is intended to offer a limited portfolio of mobile satellite services through leased space segment capacity during the period prior to the introduction of MSAT. The initial trial service would provide a test-bed facility to test the system through a limited number of technical and market trials, and also to meet the needs of several user groups who require service prior to the introduction of MSAT.

Mr. Sward noted that the provision of pre-launch trials at L-Band, via INMARSAT, is necessary to retain user interest, to prevent erosion of MSAT markets by foreign suppliers of mobile satellite services, and to help achieve market penetration prior to the launch of MSAT. In Telesat's view, the absence of IMSS would jeopardize the MSAT opportunity, and threaten the viability of the program. The prospects of further delays in the program is causing concern, not only in Telesat, but to many user groups who have included MSAT in their planning.

He mentioned in particular three high interest groups: the Ontario Air Ambulance Service (mobile voice to aircraft); East Coast Fisheries (a remote sensing application); and the Trucking Industry (for a two-way mobile data and vehicle location service).

In particular, Mr. Sward described the mobile data service now being defined by Telesat to meet the expressed needs of the trucking-industry for a two-way mobile data and vehicle location service. The service would allow for 32-64 character message, dispatcher to mobile, while in the reverse link, there would be a selection of 12-16 pre-programmed messages. Domestic service would be provided east of the Ontario-Manitoba border. An optional Loran-C vehicle location service may also be provided. A technical trial is being planned with some trucking companies for late fall of '87 or early '88, followed up by pre-operational and then later by a full operational service up to the introduction of MSAT, now scheduled for 1992.

Mr. Sward said about 3000 mobile data units could be accommodated on one channel and approximately half of these could be required by the truckers on an interim service basis. This requirement, together with the other trials now under consideration could consume most, if not all, of the capacity of the one channel that could be made available by INMARSAT.

Negotiations with INMARSAT have been underway for some time. Mr. Sward indicated that there was an indication of interest by some people in the U.S. for a similar data service using INMARSAT space segment capacity. However the MARECS satellite has only a capacity of 40 channels and most of the channels are now full. The most that INMARSAT could make available to Telesat, according to INMARSAT, is one channel, and they have indicated to Telesat officials that Telesat has first priority for this channel.

Telesat's application, however, has not as yet been accepted, as is reported to be on the Agenda for the next INMARSAT Council meeting, presently scheduled for the Spring of 1987. Mr. Sward indicated that while there would be a shortage of capacity for a couple of years, with the replacement satellites scheduled for service in 1990 the present INMARSAT capacity would be tripled, so that this bottleneck would be removed at that time.

5. Status Report on the Trials Program

H. Reekie gave a brief report on the present status of the Communications Trials Program. Originally conceived as a Post-Launch Communications (Trials) Program (PLCP), the trials program was set up to generate interest and commitment in the program. The program offered a limited set of post-launch trials and experiments to potential MSAT users, carriers, manufacturers and others. Both DOC and Telesat endorse the concept of government support for experiments, demonstrations and service trials, and have agreed to cooperate in such pursuits. Over 170 applicants have submitted requests for trials, and most have been approved.

The original DOC commitment to a trials program remains firm. However, applicants have had little DOC response in the last year or more, primarily due to spectrum policy difficulties. In the meantime, DOC has decided to broaden the original trials program to include pre-launch trials due to intense user pressure; the need to offset potential competition from other satellite operators; and also because of recent advances in data communications technology and the possibility of acquiring limited satellite capacity from INMARSAT to support a number of data trials and a limited amount of interim services.

Should DOC and Telesat proceed with the pre-launch trials, field trials could begin as early as the latter part of 1987. These trials need the development of some hardware, but most exists. The low look angle of MARECS B (to 5°) requires a careful placement of the antennas on the mobile units in order to minimize data retransmission costs.

DOC funding is now proposed to be made available for pre-launch trials depending upon the application and other factors. Provincial views were solicited on the merits of a working group sub-committee to consider the matter more fully. Provincial government reactions on the Communications Trials Program are covered under Item 7 of the agenda.

6. Technology Development for Spacecraft and Ground Terminals

J. McNally provided an overview of MSAT technical developments and future planned activities. In particular, he noted a number of studies which had been completed and in progress, including:

- a study of the DAMA;
- breadboarding and testing of the UHF transponder;
- development and testing of the UHF feedhorn;
- studies of alternative payload items;
- studies of NBFM, LPC and ACSSB terminals;
- a gateway station study;
- studies of alternative mobile antennas;
- the development and licensing of an LPC Codec, ACSSB speech processor, and DMSK modem;
- the design and construction of 2 functional radio sets and several low gain antennas;
- extensive propagation measurements at UHF and L-Band;
- voice quality measurements.

Mr. McNally described work presently underway at CRC to compare the quality of voice at 800 MHz and at L-Band. Two antennas were shown, an L-Band Drooping Crossed Dipole, and an L-Band Phase Array which was developed in-house at CRC.

The L-Band/800 MHz voice quality demonstration was made based on actual propagation measurments. A helicopter source was used to simulate a satellite for both 800 and L-Band. Simultaneous measurements were taken and stored on a multi-channel tape recorder in a vehicle travelling 50 Km/hr. Propagation conditions were reproduced in the lab and segments were analysed.

Voice samples were provided for ACSSB modulated voice under the following propagation conditions:

15° Elevation Angle

UHF	-	26.5 dBw, medium shadowing and multi-path
L-Band	-	30 dBw, medium shadowing and multi-path

5° Elevation Angle

UHF	-	26.5 dBw, clear line of sight, multi-path only
L-Band	-	30 dBw, clear line of sight, multi-path only

The following conclusions were reached:

- adequate voice quality can be obtained in both L-Band and the 800 MHz band with some EIRP penalty at L-Band;

- voice quality at 5 degree elevation angle clear line-ofsight at L-Band (30 dBw) was just slightly poorer than 800 MHz (26.5 dBw);

- at 32.5 dBw (the design specs for an all L-Band system), the quality of speech at L-Band should be equivalent to that originally planned at UHF;

- equivalent performance to 15 degrees in average fading and shadowing can be obtained at 5 degrees in clear line-of-sight, which is typical of most situations in the far north where there is an absence of vegetation.

7. **Provincial Views on Program Evolution**

P. Doucet expressed disappointment in the number of delays in the program, and the uncertainty surrounding the now projected 1992 launch date. When Quebec was first asked to put a trial proposal together, the projected date was reputed to be 1988; then they were told 1989; and last year the date was changed to 1990. Now the date has slipped to 1992. With all these delays, he said, the program is losing credibility and as a result it is becoming difficult to maintain the interest of the Quebec provincial government user departments. He is reluctant to approach Quebec user departments, at this time, without something more concrete and positive to offer. He also expressed some concern about the pre-launch Communications Trials Program as proposed. The IMSS program described by Telesat lacks adequate capacity and would be restricted to the three data applications described by D. Sward. Once the trial with the trucking industry is expanded to full interim service, it would possibly preclude the carrying out further trials until the MARECS B satellite is launched some 2-3 years later. He expressed dismay that having made a proposal to DOC, the Quebec provincial government department user groups might be precluded from participating in the trials. Another concern he had, was that IMSS would be limited to data-only applications, as most of the interest in Quebec is for voice.

R. Bulger indicated that the air ambulance service trial was a priority requirement. Ontario has requested CRC to provide technical assistance in support of an experimental service to begin in March 1987, with full service available in September. Mr. Bulger stated that he was astounded to hear of the trucking application although he had heard something about it 2 weeks previous. (D. Athanassiadis reminded him that he was notified by DOC as far back as 4 months ago). It appears, Mr. Bulger said, that INMARSAT is the only ballgame in town. Given the very limited capacity available, he indicated that a working group should be set up to reassess Ontario needs. He felt that there will have to be some give and take between provinces, with room for some joint cooperation between them. He said he would be willing to go with the majority opinion, and that in his view it is important to start these discussions as soon as possible.

D. Colville stated that the lack of availability of capacity for the Atlantic provinces is a problem. Given that the two or three

applications mentioned would not likely provide any opportunities for manufacturing these terminals in Atlantic Canada, the Maritimes should at least be included in any future IMSS trials planning. He was supportive of both the trucking and fishing proposal. The real question, he said, is how the benefits of the pre-launch trials program, and the future MSAT program can be distributed, regionally, to the best advantage.

D. Sward indicated that at the present time Telesat is in the middle of negotiations with INMARSAT. The cost of the channel will be high, but what will make it affordable is that it will be a data service. The cost of the terminal will be in the order of $6,000 and the average cost of the airtime will be in the order of $300 per vehicle per month. In his view, the lack of adequate capacity is a temporary problem since it is expected that by the first quarter of 1990 the new INMARSAT satellite will be operational which would make many more channels available. Mr. Sward stated that he would be pleased to sit down and discuss the difference between voice and data with the provinces and interested groups. He stressed the very tight time schedule, and said that they should be dealing directly with potential users now. The more information they have, he said, the better position they would be in to go to INMARSAT and negotiate for more channel capacity. He suggested that DOC should advise all PLCP applicants that a trial service is planned, and that anyone who wants a chance at it should say now.

The Chairman stated that the process of selecting potential trial applicants is all important, and must be seen as giving people an equal chance. The Secretary agreed with Mr. Sward that the planning of trials should be completed as quickly as possible, but it was the responsibility of DOC. He said that DOC intends to ensure the right kind of dialogue and planning takes place between DOC, Telesat and the provinces - indeed with all interested trial participants.
Mr. Athanassiadis then went on to state that the shortage of INMARSAT capacity was indeed a significant problem and for this reason the question of service trials, using leased INMARSAT satellite capacity, should be reviewed. He said that DOC and Telesat should explore together all possible avenues for providing pre-launch trials and interim service by alternative means, and that he would report back to the provinces as quickly as possible.

As a result of these discussions, a number of action items were proposed:

Action 1. DOC To Advise All Communications Trials Program Applicants That a Limited Interim Mobile Satellite Service (IMSS) is Being Considered by Telesat and That Interested Parties Should Advise DOC of their Interest;

Action 2. Telesat to Approach INMARSAT To Determine the Availability and Cost of Additional Channel Capacity on the MARECS Satellite.

Action 3. DOC, In Conjunction With Telesat, to Investigate Alternative Ways of Supplying Some Interim Channel Capacity;

Action 4. DOC, In Reponse To Provincial Government Requests, To Duplicate Voice Demo Tapes Involving Actual Propagation Measurements at L-Band and 800 MHz Should Provincial Governments Wish To Demonstrate Voice Quality at L-Band.

8. **Other Business**

There was no other business discussed.

9. **Date and Agenda of the Next Meeting**

The Secretary is to advise all members of time and place of the next meeting, likely to be held in March, once a number of actions have been completed in response to points raised at the fifth meeting.

D. Athanassiadis
Secretary

Atts.

LIST OF ANNEXES

ANNEX A

DRAFT AGENDA

SIXTH MEETING OF DOC-PROVINCIAL GOVERNMENT

MSAT WORKING GROUP

NOVEMBER 25, 1986 at 9:30 A.M.- 4:00 P.M.

OTTAWA CONGRESS CENTRE, CAPITAL HALL 2B

55 COLONEL BY DRIVE

OTTAWA, ONTARIO

		ACTION
1.	WELCOME AND INTRODUCTION	R.W. BREITHAUPT
2.	STATUS REPORT BY DOC ON THE MSAT PROGRAM - HISTORICAL PERSPECTIVE - APPROVAL OF THE LONG TERM SPACE PLAN - CURRENT ISSUES	R.W. BREITHAUPT D. ATHANASSIADIS
	COFFEE BREAK	
3.	STATUS REPORT ON THE "POLICY, REGULATION AND LICENSING"	EUGENE MARQUIS
4.	STATUS REPORT ON SYSTEM SCENARIOS A) L-BAND ONLY B) TRIALS USING INMARSAT C) INTERIM SERVICES	D. SWARD (TELESAT)
	LUNCH	
5.	STATUS REPORT ON THE TRIALS PROGRAM	H. REEKIE
6.	TECHNOLOGY DEVELOPMENT FOR SPACECRAFT AND GROUND TERMINALS	J.L. McNALLY
7.	PROVINCIAL VIEWS ON PROGRAM EVOLUTION	
8.	OTHER BUSINESS	
9.	DATE AND AGENDA OF THE NEXT MEETING	

ANNEX B

ACTIONS OUTSTANDING

Action 1: Advise Former PLCP Applicants of IMSS Trials Program

Action by DOC pending the resolution of Actions 2 and 3, and until after the seventh meeting in February 1987.

Action 2: Availability and Cost of Channel Capacity

Telesat is approaching INMARSAT to determining whether more capacity can be made available for IMSS trials.

Action 3: Options for Supplying IMSS Capacity

DOC, in consultation with Telesat, is considering alternative options for supplying channel capacity for IMSS trial service, and their pros and cons.

Action 4: Duplicate Voice Demo Tapes

No action to be taken until provinces request a copy of these tapes.

ANNEX C
ANNEXE C

LIST OF ATTENDEES

LA LISTE DES MEMBRES PRÉSENTS

NAME/NOM	ORGANIZATION/ORGANISME	TEL. #
R.W. Breithaupt	DOC/DPM	613-990-4115
D. Athanassiadis	DOC/DPM	613-990-4111
J. McNally	DOC/CRC	613-998-0008
J. Braden	DOC/DPM	613-990-4104
H. Reekie	DOC/DPM	613-990-4099
M. Labrecque	DOC/DPM	613-990-4106
J. Werner	DOC/DPM	613-990-4103
E. Marquis	DOC/Policy	613-998-4478
D. Sward	Telesat	613-746-5920
A. Pedersen	DOC/Ont. Region	416-973-8084
C. Comeau-Anderson	DOC/Atlantic Region	506-857-6531
I. Striemer	Manitoba	204-945-8988
F. Waller	Council of Mar. Premiers	902-424-7612
D. Colville	N.S. Comms. Policy	902-424-7678
B. Bulger	MTC- Ontario	416-248-3567
D. Ko	MTC-Ontario	416-248-3567
A. Labrie	MCQ-Quebec	418-643-8096
P. Doucet	MCQ-Quebec	418-644-2695
H. Murphy	Gov't of Yukon (Ottawa)	613-234-3206

ANNEX D

MSAT - STATUS REPORT

DOC-PROVINCIAL GOVERNMENT
MSAT WORKING GROUP

NOVEMBER 25, 1986

MSAT PROGRAM

CONTENTS

MSAT

HISTORICAL PERSPECTIVE

1. MSAT STANDS FOR MOBILE SATELLITE.

2. THE MSAT SYSTEM WAS ORIGINALLY CONCEIVED BY THE DOC IN 1980.

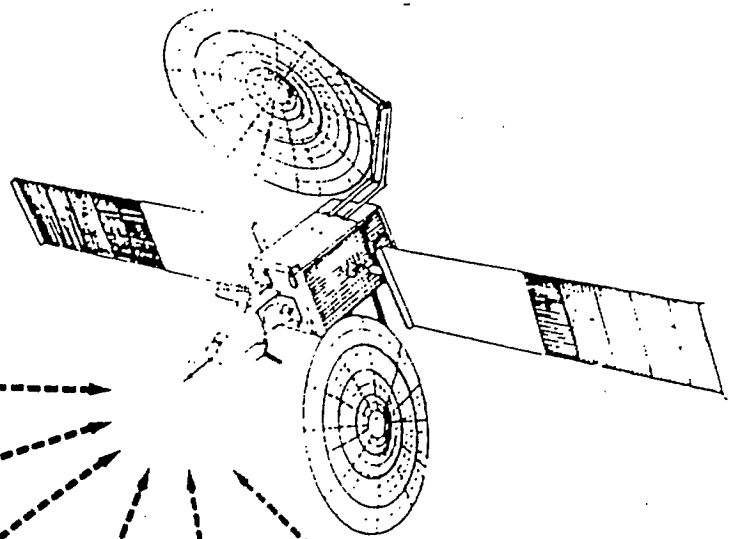
3. THE DOC HAS ALREADY INVESTED MORE THAN $25M IN PROVING THE MSAT CONCEPTS AND ITS COMMERCIAL VIABILITY.

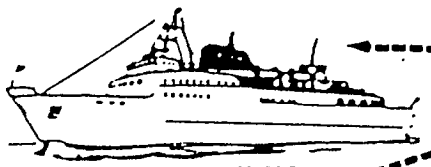
4. DUE TO ITS ATTRACTIVE COMMERCIAL VIABILITY THE SYSTEM WILL BE IMPLEMENTED AND FINANCED 100% BY THE PRIVATE SECTOR, WITH GOVERNMENT SUPPORT IN SPECIFIC AREAS.

5. MSAT IS A MODEL GOVERNMENT PROJECT - A RELATIVE SMALL GOVERNMENT INVESTMENT IS EXPECTED TO GENERATE LARGE PRIVATE SECTOR INVESTMENT AND PUBLIC BENEFITS.

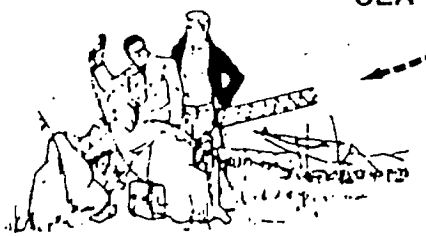
6. MSAT IS A MATURE PROGRAM - FINAL GOVERNMENT FUNDING FOR THE IMPLEMENTATION AND OPERATION PHASES WAS APPROVED BY CABINET ON APRIL 29, 1986.

M-SAT
SYSTEM CONCEPT



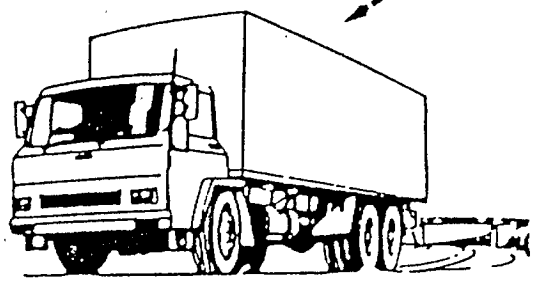


SEA MOBILES

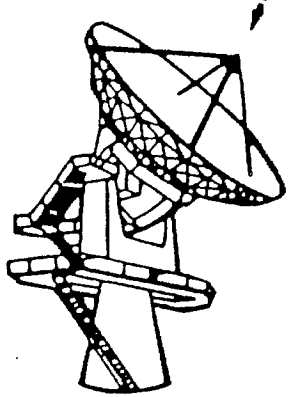


BASE STATION
OR
FIELD-PORTABLE STATION

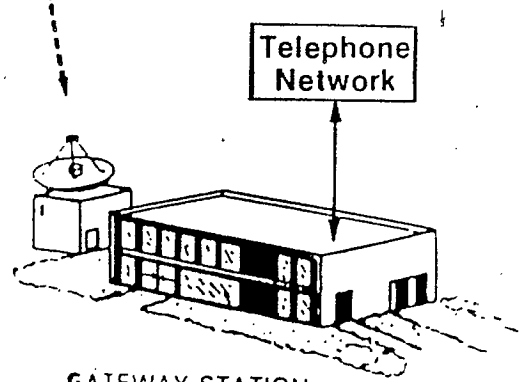
AIR MOBILES



LAND MOBILES



CENTRAL CONTROL
STATION



GATEWAY STATION

MSAT - THE NEED

- SOME 30,000 - 40,000 USERS HAVE ALREADY INCLUDED MSAT IN THEIR FUTURE TELECOMMUNICATIONS PLANS, EVEN THOUGH:
  - SERVICE INTRODUCTION IS AT LEAST 5 YEARS AWAY
  - THE SYSTEM IS NOT KNOWN TO THE GENERAL PUBLIC
- MSAT SERVICES WILL BE USED IN:

  LAW ENFORCEMENT, SAFETY, EMERGENCY, EXPLORATION, PUBLIC SERVICES, TRANSPORTATION, UTILITIES, FISHERIES, FORESTRY Etc.

MSAT - A VERSATILE TELECOMMUNICATIONS NETWORK

- MSAT WILL BE MUCH MORE THAN A NEW SATELLITE SYSTEM
- MSAT WILL BE A COMPLETE SATELLITE BASED TELECOMMUNICATIONS NETWORK WITH ELABORATE CONTROL AND DISTRIBUTION FACILITIES ON THE GROUND
- MSAT WILL BE THE WORLD's MOST VERSATILE TELECOMMUNICATIONS NETWORK BECAUSE IT WILL OFFER ACROSS ALL OF CANADA:
  - VOICE AND DATA SERVICES: SUCH AS OFFERED BY THE PUBLIC TELEPHONE NETWORK (INCLUDING CELLULAR)
  - SPECIALIZED ACCESS TO COMPUTER DATA BANKS: SUCH AS OFFERED BY TELECOM CANADA's DATAPAC
  - RADIO SERVICES: SUCH AS OFFERED BY TERRESTRIAL PRIVATE RADIO NETWORKS
  - SPECIALIZED REMOTE SENSOR READOUT AND CONTROL: NOT AVAILABLE THROUGH ANY OTHER SYSTEM

MSAT - A MAJOR TOOL FOR ECONOMIC AND INDUSTRIAL EXPANSION THROUGH COMMUNICATIONS SERVICES

- VAST AREAS OF CANADA LACK AND WILL CONTINUE TO LACK BASIC TELEPHONE OR DATA SERVICE
- CELLULAR MOBILE RADIO-TELEPHONE WILL SERVE MAINLY THE MAJOR CITIES AND PARTS OF THE MAJOR TRANSPORTATION CORRIDORS
- SOME AREAS LACK ANY FORM OF RELIABLE LONG DISTANCE COMMUNICATIONS
- REMOTE DIGITAL READOUT OF SENSORS AND CONTROL OF INDUSTRIAL DEVICES IS UNAVAILABLE
- MSAT WILL BRING TO ALL OF THESE AREAS THE SAME QUALITY AND VARIETY OF COMMUNICATIONS THAT INDUSTRY, PRIVATE USERS AND PUBLIC INSTITUTIONS ENJOY IN THE PRIVILEDGED URBAN AREAS OF THE COUNTRY

MSAT - PROGRAM OBJECTIVES

INDUSTRIAL OBJECTIVES: TO DEVELOP THE MANUFACTURING AND SERVICE INDUSTRIES REQUIRED TO SUPPLY MSAT PRODUCTS AND SERVICES DOMESTICALLY AND ABROAD (WHENEVER APPLICABLE)

ECONOMIC OBJECTIVES: TO GENERATE NEW SIGNIFICANT ECONOMIC BENEFITS FOR USERS, INDUSTRY, AND GOVERNMENTS

SOCIAL OBJECTIVES: TO DELIVER SOCIAL JUSTICE BY OFFERING NEW AND IMPROVED TELECOMMUNICATIONS SERVICES TO SOME 6 MILLION CANADIANS

SOVEREIGNTY OBJECTIVES: TO CONTRIBUTE TO THE EXERCISE OF CANADIAN SOVEREIGNTY THROUGH EFFECTIVE COMMUNICATIONS IN REMOTE AREAS OF THE COUNTRY.

MSAT

PROJECTED DELIVERABLES (BENEFITS)

1985 DOLLARS UNLESS OTHERWISE STATED

BENEFITS	TO YEAR 2000	TO YEAR 2010	BEYOND
INDUSTRIAL BENEFITS			
- MANUFACTURING INDUSTRY SALES	$ 750M	$1900M	CONTINUING
- SERVICE INDUSTRY SALES	$1400M	$2900M	CONTINUING
ECONOMIC BENEFITS			
- USER BENEFITS ARISING FROM IMPROVED PRODUCTIVITY AND EFFICIENCY	$1100M	$2500M	CONTINUING
- EMPLOYMENT (IN FULL TIME PERSON YEARS)	40,000	80,000	CONTINUING
- PRIVATE SECTOR INVESTMENT	$ 800M	$1800M	CONTINUING
SOCIAL BENEFITS			
OVERALL DOLLAR VALUE OF IMPROVED LIFE AND PROPERTY PROTECTION, WORK SAFETY AND LAW ENFORCEMENT	$ 350M	$ 750M	CONTINUING

MSAT

EXPECTED PERCENT REGIONAL DISTRIBUTION OF BENEFITS

BENEFIT	BC/YUKON %	PRAIRIES/ NWT %	ONTARIO %	QUEBEC %	ALTANTIC %	COMMENT
MANUFACTURING INDUSTRY SALES	30	5	20	45	?	LIMITED POTENTIAL FOR ATLANTIC PROVINCES
SERVICE INDUSTRY SALES	23	32	23	16	6	DEPENDS ON USER DISTRIBUTION
SOCIAL	23	32	23	16	6	"
USER	23	32	23	16	6	"
EMPLOYMENT	25	20	21	30	4	WEIGHTED AVERAGE
PRIVATE SECTOR INVESTMENT	15	12	60	10	3	TELESAT INVESTMENT DOMINATES

MSAT

INDUSTRIAL CAPABILITIES REQUIRED

1. MANUFACTURING

   - SATELLITE
   - EARTH STATION
   - MOBILE TERMINAL
   - MOBILE ANTENNA
   - REMOTE SENSOR

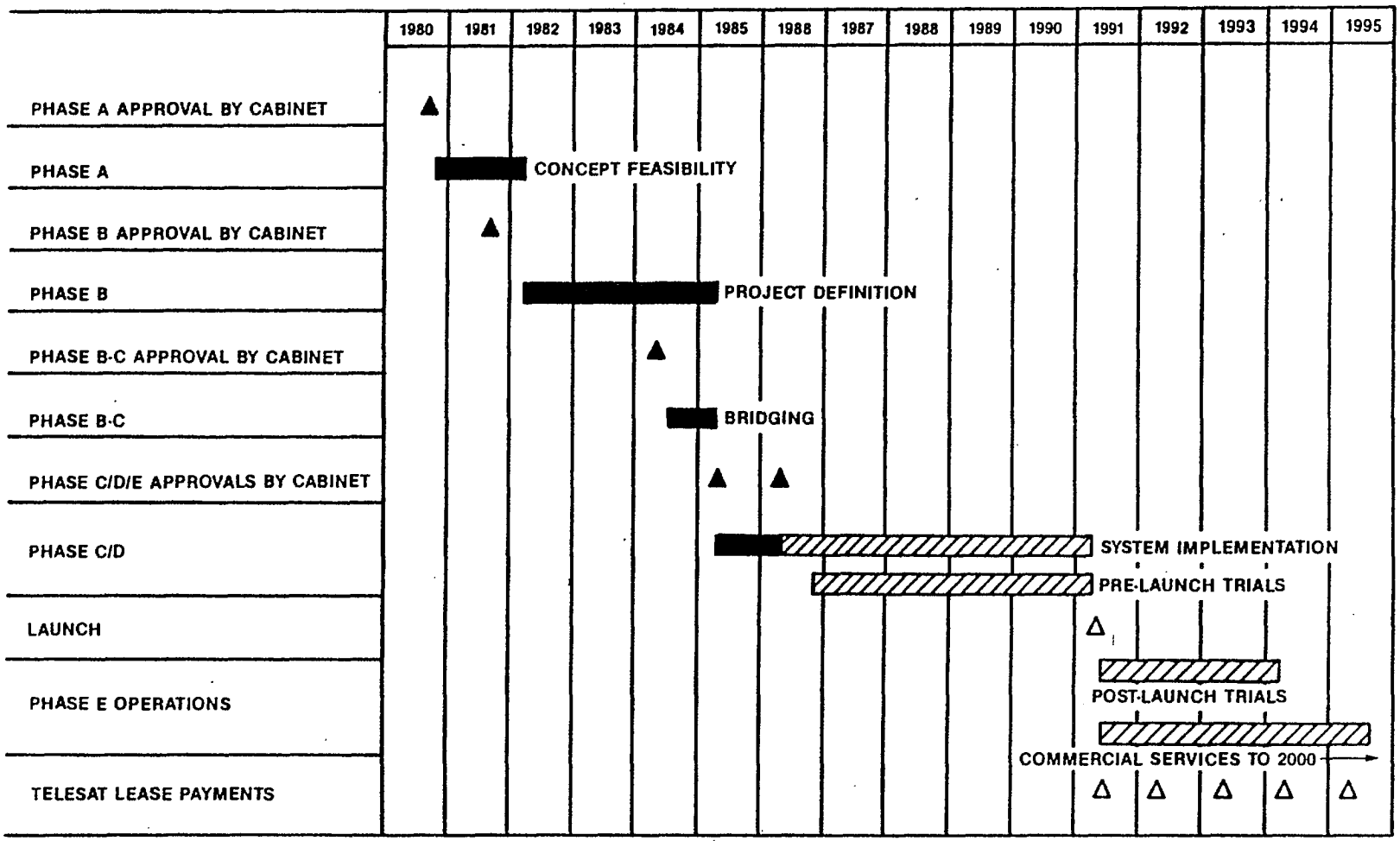
2. TELECOMMUNICATIONS SERVICES

   - TELEPHONE AND RADIO COMMON CARRIERS
   - TERMINAL EQUIPMENT WHOLESALE DISTRIBUTION AND MAINTENANCE

3. VALUE ADDED SERVICES

   - SOFTWARE DEVELOPMENT
   - COMPUTER MANUFACTURING, SALES AND MAINTENANCE

MSAT PROGRAM SCHEDULE



MSAT

PROPOSED GOVERNMENT BUDGET SUPPORT TO MSAT IN BUDGET-YEAR DOLLARS ($ MILLIONS)

APPLICATION OF FUNDS	86/87	87/88	88/89	89/90	90/91	91/92	92/93	93/94	94/95	TOTAL
MSAT TECHNOLOGY & PRODUCT DEVELOPMENT										
• SPACECRAFT	2.0	5.4	4.4	1.0	1.0					13.8*
• GROUND TERMINAL	0.8	2.5	4.0	3.0	1.2					11.5**
COMMUNICATIONS TRIAL PROGRAM		1.0	3.0	3.0	3.0	7.0	3.0			20.0
MANAGEMENT	0.3	0.7	0.5	0.5	0.5	1.0	1.0			4.5
GOVERNMENT SERVICE LEASE					2.5	19.5	31.7	36.3	36.5	126.5
TOTAL MSAT FUNDING	3.1	9.6	11.9	7.5	8.2	27.5	35.7	36.3	36.5	176.3

* FUNDING FROM APPROVED (GOVERNMENT-SPAR MOU) ALLOCATION (DRIE)

** FUNDING SUPPORT FROM APPROVED DRIE PROGRAMS (DIPP)

MSAT

DISCUSSION ON SPACE PLAN FUNDING

1. THE TECHNOLOGY AND PRODUCT DEVELOPMENT FUNDS WILL COME FROM ALREADY APPROVED DRIE FUNDS

   - APPLICANTS MUST SATISFY DRIE AND DOC GUIDELINES

2. THE COMMUNICATIONS TRIAL FUNDS WILL BENEFIT PRIMARILY THE USERS AND THE SERVICE PROVIDERS

   - USERS WITH VALID APPLICATIONS WILL BE GIVEN THE OPPORTUNITY TO ASSESS THE EFFECTIVENESS OF MSAT SERVICES THROUGH LIMITED USE SUBSIDIZED ALMOST 100% BY THE GOVERNMENT

   - THE MAJORITY OF THESE TRIALS WILL OCCUR IN REMOTE AND SPARCELY POPULATED AREAS

3. THE GOVERNMENT SERVICE LEASE WITH TELESAT WILL COVER SERVICE COSTS FOR GOVERNMENT DEPARTMENT USERS FOR A PERIOD OF APPROXIMATELY 10 YEARS.

   - THE MAJORITY OF THE USE WILL BENEFIT ALL PROVINCES IN THE AREAS OF TRANSPORTATION, COASTAL SURVEILLANCE, LAW ENFORCEMENT, WEATHER WARNING, FIRE FIGHTING, EMERGENCY OPERATIONS, ETC.

ANNEX E

CURRENT ISSUES

1. BILATERAL SPECTRUM NEGOTIATIONS WITH THE U.S.

- FCC DID NOT HONOUR EXISTING CANADA-U.S. AGREEMENT FOR 800 MHz SPECTRUM COORDINATION.
- CANADA INSISTS ON GOVERNMENT-GOVERNMENT NEGOTIATIONS.
- CANADA's FIRST PRIORITY IS TO ENSURE AVAILABILITY OF SUFFICIENT SPECTRUM (800 AND/OR L-BAND).
- CANADA's SECOND PRIORITY IS TO EXTRACT A MAXIMUM 800 MHz ALLOCATION (NOT LIKELY TO EXCEED 2+2 MHz).

2. MULTILATERAL SPECTRUM COORDINATION LEADING TO WARC 87

- A COMMON CANADA-U.S. POSITION AT WARC 87 IS ESSENTIAL.
- LIKELY NORTH AMERICAN POSITION WILL INVOLVE THE LIBERALIZATION OF THE AERONAUTICAL AND MARITIME BANDS TO INCLUDE GENERAL MOBILE.
- STRONG RESISTANCE EXPECTED BY INMARSAT, THE U.S.S.R. AND SOME EUROPEAN ADMINISTRATIONS.
- SUPPORT IS LIKELY FROM JAPAN, AUSTRALIA, INDONESIA, BRAZIL AND OTHERS.

3. LICENSING OF U.S. MSS OPERATOR(s)

EARLY LICENSING ESSENTIAL TO TELESAT's IMPLEMENTATION PLANS CALLING FOR CANADA-U.S. COOPERATION.

4. SERVICE EVOLUTION STRATEGY

- PRE-LAUNCH TRIALS
- INTERIM SERVICE
- FULL SERVICE

DOC AND TELESAT EXPLORING ALL POSSIBLE OPTIONS.

IDEAL OPTION WOULD SATISFY MOST URGENT USER NEEDS WHILE ENSURING SERVICE AVAILABILITY AND CONTINUITY.

SCOPE LIMITED BY THE AVAILABILITY OF SPACE SEGMENT CAPACITY.

5. EQUIPMENT AND SYSTEM EVOLUTION

- CONSIDERABLE EQUIPMENT DEVELOPMENT STILL OUTSTANDING.
- DOC MUST ENSURE THAT INDUSTRY SUPPORT FUNDS, APPROVED UNDER THE SPACE PLAN, RESULT INTO MAXIMUM BENEFIT TO CANADIAN INDUSTRY AND DELIVER APPROPRIATE AND COST EFFECTIVE HARDWARE.
- DOC AND DRIE JOINTLY RESPONSIBLE FOR MANAGEMENT OF MSAT INDUSTRY SUPPORT FUNDS. LOA IN PREPARATION.

6. DOC-TELESAT INTERFACE

- EXECUTION OF AGREEMENTS AND CONTRACTS
  - JOINT ENDEAVOUR AGREEMENT (JEA)
  - BULK SERVICE LEASE
- WORKING LEVEL INTERFACE
  - DOC-TELESAT COORDINATION COMMITTEE
  - SERVICE AND MARKETING INTERFACE
  - SYSTEM AND TECHNOLOGY INTERFACE

ANNEX F

BRIEFING TO

FEDERAL - PROVINCIAL MSAT WORKING GROUP

NOVEMBER 25, 1986

TELESAT CANADA
SSP & D

PART I

COMPARISON OF L-BAND AND COMBINED UHF L-BAND MSAT SYSTEMS

BACKGROUND

- MSAT SERVICE CONCEPT UNDER CONSTANT EVOLUTION/REFINEMENT

  GOVERNMENT FUNDED DEMONSTRATION SYSTEM
  RE-ORIENTATION TO COMMERCIAL PROGRAM
  UHF OPERATION TO LAND MOBILES
  UHF PLUS L-BAND TO LAND, MARINE AND AERONAUTICAL MOBILES

- FCC DECISION TO ALLOCATE L-BAND SPECTRUM ONLY REPRESENTS ANOTHER SIGNIFICANT CHANGE IN DIRECTION

- CURRENT U.S. SPECTRUM POLICY

  9 + 9 MHZ IN L-BAND, MSS CO-PRIMARY WITH AMSS
  4 1/2 + 4 1/2 MHZ IN L-BAND, MSS SECONDARY TO AMSS
  2 + 2 MHZ IN UHF HELD IN RESERVE OUT OF COMITY TO CANADA

KEY ISSUES

- IS MSAT STILL VIABLE UNDER L-BAND ONLY ALLOCATION?

  EXPERIMENTAL TESTS DEMONSTRATED 5-6DB PATH LOSS DISADVANTAGE AT L-BAND COMPARED WITH UHF IN SHADOWING ENVIRONMENT

- IS 2 + 2 MHZ UHF RESERVE OF ANY COMMERCIAL VALUE TO CANADA IF U.S. OPERATES IN L-BAND ONLY?

  BACK-UP PROTECTION AT UHF WILL LIKELY INCREASE CAPITAL COSTS SUBSTANTIALLY OVER PREVIOUS ESTIMATES

  MARKET FOR UHF MOBILES WILL BE BASED SOLELY ON SMALL CANADIAN REQUIREMENTS THUS INCREASING TERMINAL COSTS

MSAT VIABILITY ANALYSIS

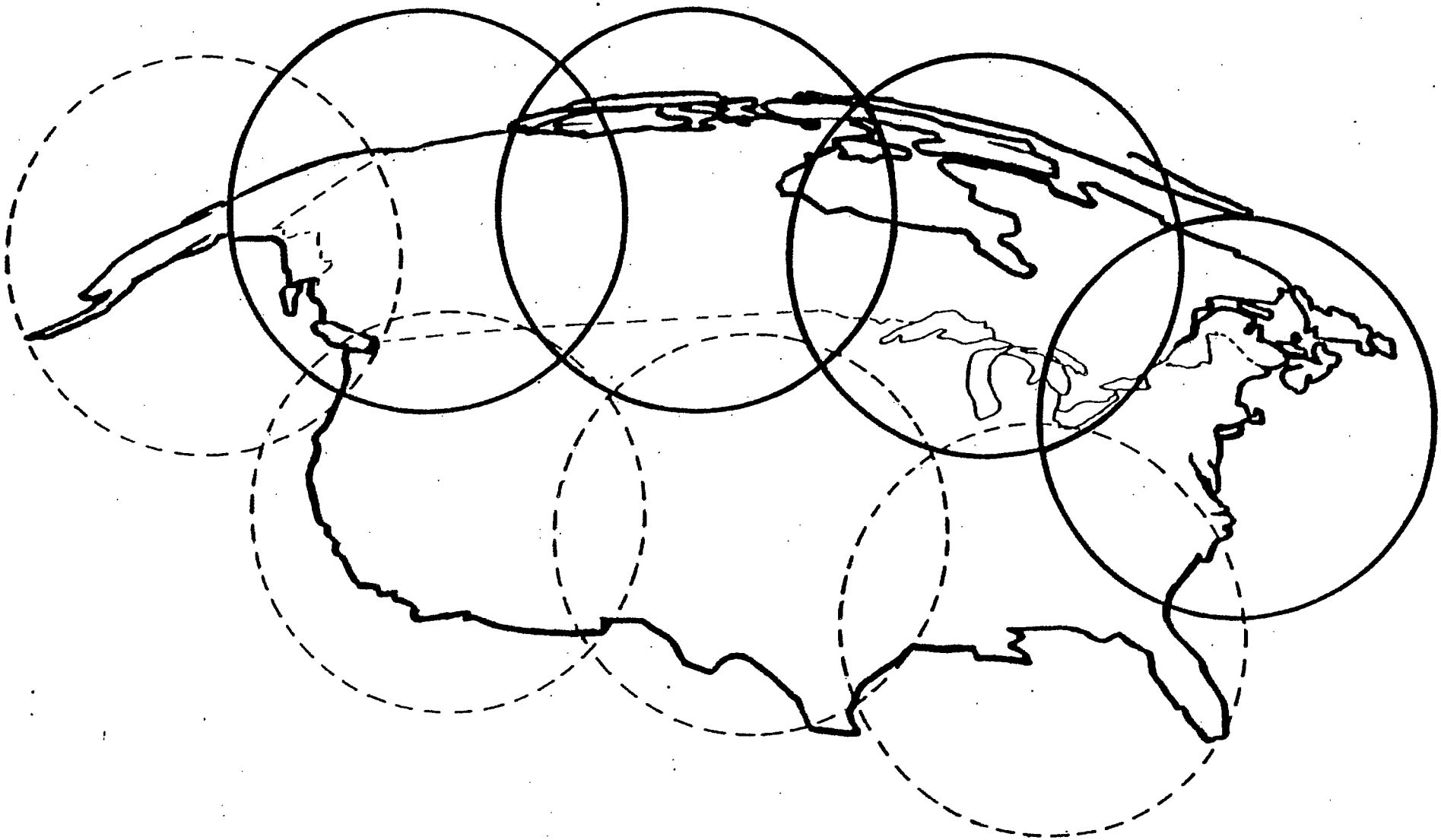
SYSTEM OPTIONS

	CANADA	UNITED STATES
OPTION A	L-BAND	L-BAND
OPTION B -- BUSINESS PROPOSAL	UHF + L-BAND (2 + 2 MHZ)	UHF + L-BAND (2 + 2 MHZ)

L-BAND SYSTEM DESIGN ASSUMPTIONS

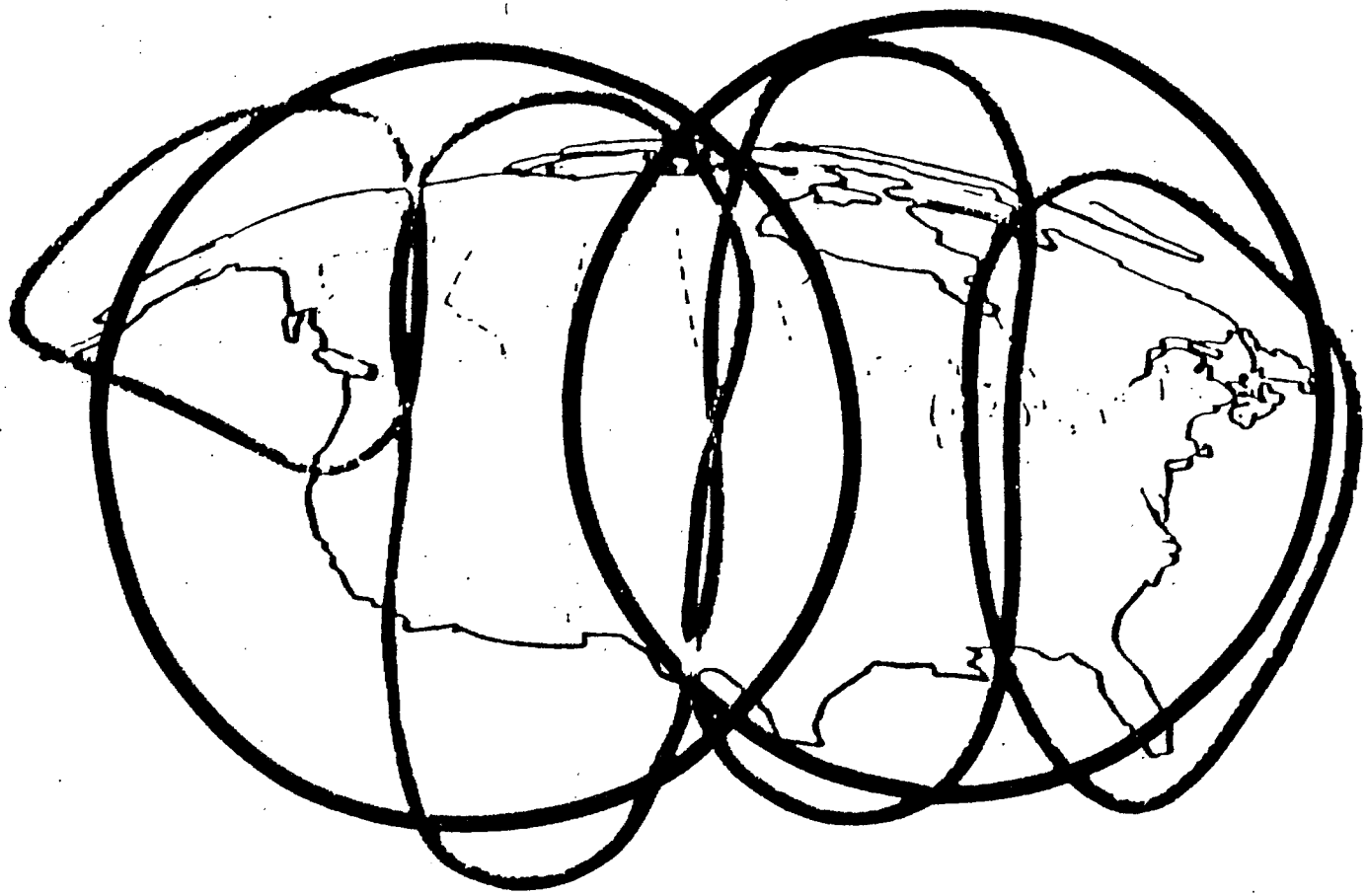
- DESIGN BASED UPON ANIK E SIZE BUS
- EIGHT BEAM NORTH AMERICAN COVERAGE
  - 4 BEAMS OVER CANADA
  - 4 BEAMS OVER UNITED STATES
  - 1 BEAM COINCIDENT
- CANADIAN SATELLITE TO RADIATE OVER CANADA ONLY
- U.S. SATELLITE TO RADIATE OVER UNITED STATES ONLY
- PROVISIONS FOR EACH SATELLITE TO RADIATE INTO ALL BEAMS FOR EMERGENCY RESTORATION OR FOR TRANSBORDER CAPACITY SALES THROUGH TRANSPONDER SWITCHING OR BEAM SCANNING
- SMALLER AND MORE ECONOMICAL MOBILE ANTENNA ADOPTED WITH REDUCED GAIN (8 DBI VS 12 DBI)
- SYSTEM CAPACITY CALCULATED ASSUMING MOBILES MUST OPERATE IN A SHADOWING ENVIRONMENT WITH FAIR TO GOOD SUBJECTIVE VOICE QUALITY

EIRP/CARRIER	32.3 DBW	L-BAND
	26.5 DBW	UHF



8 BEAM L-BAND COVERAGE

MSAT ANTENNA COVERAGE



LEGEND: ▬▬ UHF
▬ ▬ ▬ L-BAND

MSAT VIABILITY ANALYSIS

	CAPACITY (VOICE USERS)	NPV ($1993)	ROE (1993-2002)
OPTION A			
L-BAND ONLY	67,000	$ 91M	19%
OPTION B			
UHF/L-BAND	69,000	$ 80M	18.5%
4 + 4 MHZ SHARED WITH UNITED STATES			

SUMMARY

- L-BAND ONLY SYSTEM VIABILITY ALMOST IDENTICAL TO UHF/L-BAND DESIGN
- ADDITIONAL L-BAND PATH LOSS IN SHADOWING ENVIRONMENT COMPENSATED BY INCREASING SATELLITE ANTENNA GAIN THROUGH USE OF NARROWER SPOT BEAMS
- REDUCED FLEXIBILITY OF NARROWER L-BAND COVERAGE FOR BACK-UP ARRANGEMENTS AND INTERIM CAPACITY SALE TO U.S. COMPENSATED BY TRANSPONDER SWITCHING OR BEAM SCANNING
- HIGHER GAIN SPOT BEAMS ALSO PERMITS USE OF SMALLER AND MORE ECONOMICAL L-BAND ANTENNAS

PART II

INTERIM MOBILE SATELLITE SERVICE

THE IMSS PROGRAM IS INTENDED TO OFFER A LIMITED PORTFOLIO OF MOBILE SATELLITE SERVICES THROUGH LEASED SPACE SEGMENT FACILITIES DURING THE CONSTRUCTION PHASE OF MSAT, I.E. 1987 TO 1992

RATIONALE FOR IMSS

(A) TO MEET THE NEEDS OF SEVERAL USER GROUPS THAT REQUIRE SERVICE PRIOR TO 1991

(B) TO PREVENT EROSION OF MSAT MARKETS BY FOREIGN SUPPLIERS OF MOBILE SATELLITE SERVICES

(C) TO ACHIEVE MARKET PENETRATION PRIOR TO THE LAUNCH OF MSAT

(D) TO TEST THE SYSTEM THROUGH TECHNICAL AND MARKET TRIALS

THE ABSENCE OF IMSS WOULD JEOPARDIZE THE MSAT OPPORTUNITY

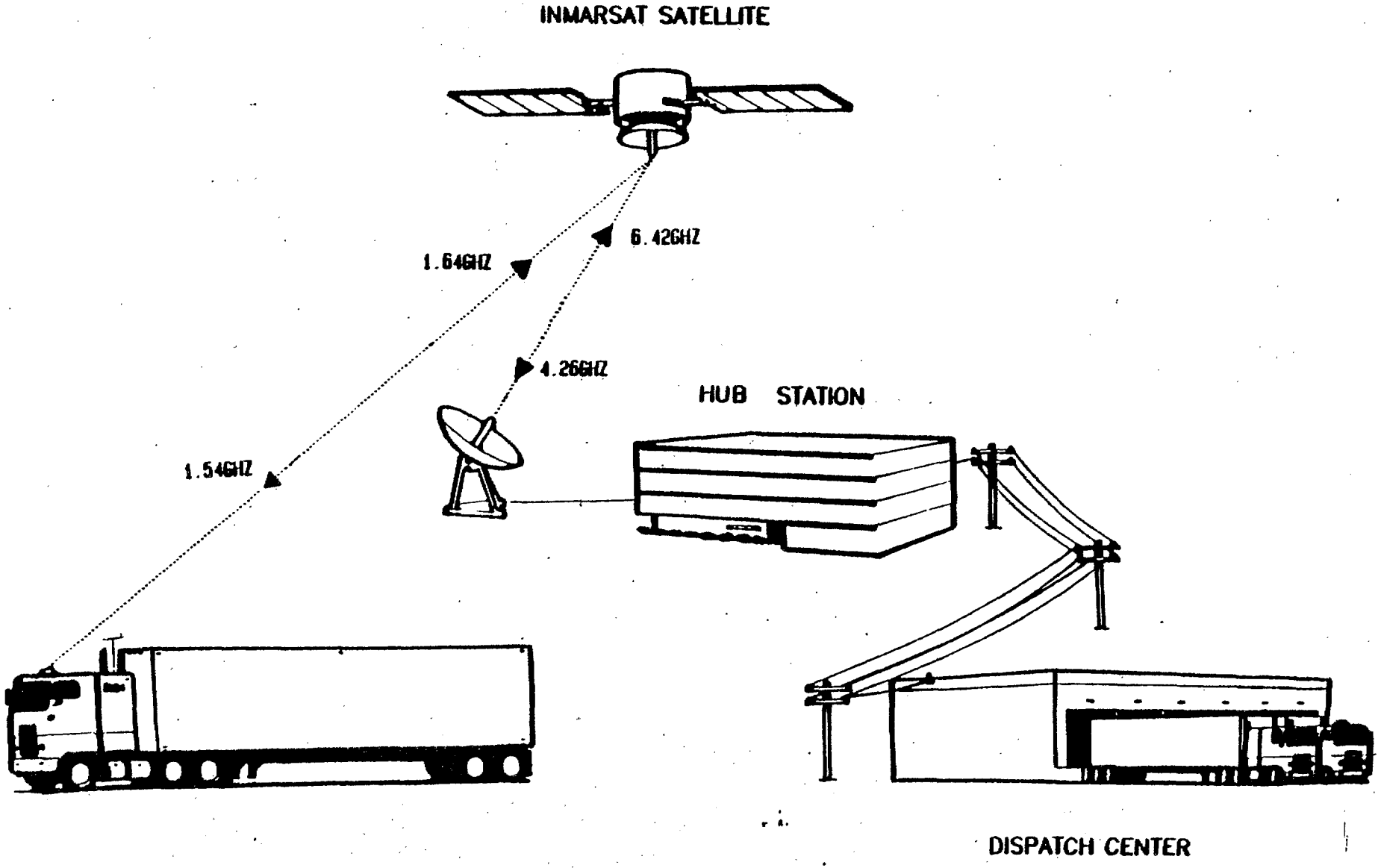
HIGH INTEREST GROUPS

GROUP	SERVICE	DISPOSITION
ONTARIO AIR AMBULANCE SERVICE	MOBILE VOICE TO AIRCRAFT	TECHNICAL TRIALS 1Q 1987 USING INMARSAT FACILITIES CRC/MOH SPONSORED WITH TELESAT PARTICIPATION
EAST COAST FISHERIES (SEA CONSULT)	REMOTE SENSING	INFORMATION EXCHANGE
TRUCK TRANSPORT COMPANIES AND ONTARIO M.T.C.	TWO-WAY MOBILE DATA AND VEHICLE LOCATION	UNDER FORMAL SERVICE DEVELOPMENT IN TELESAT

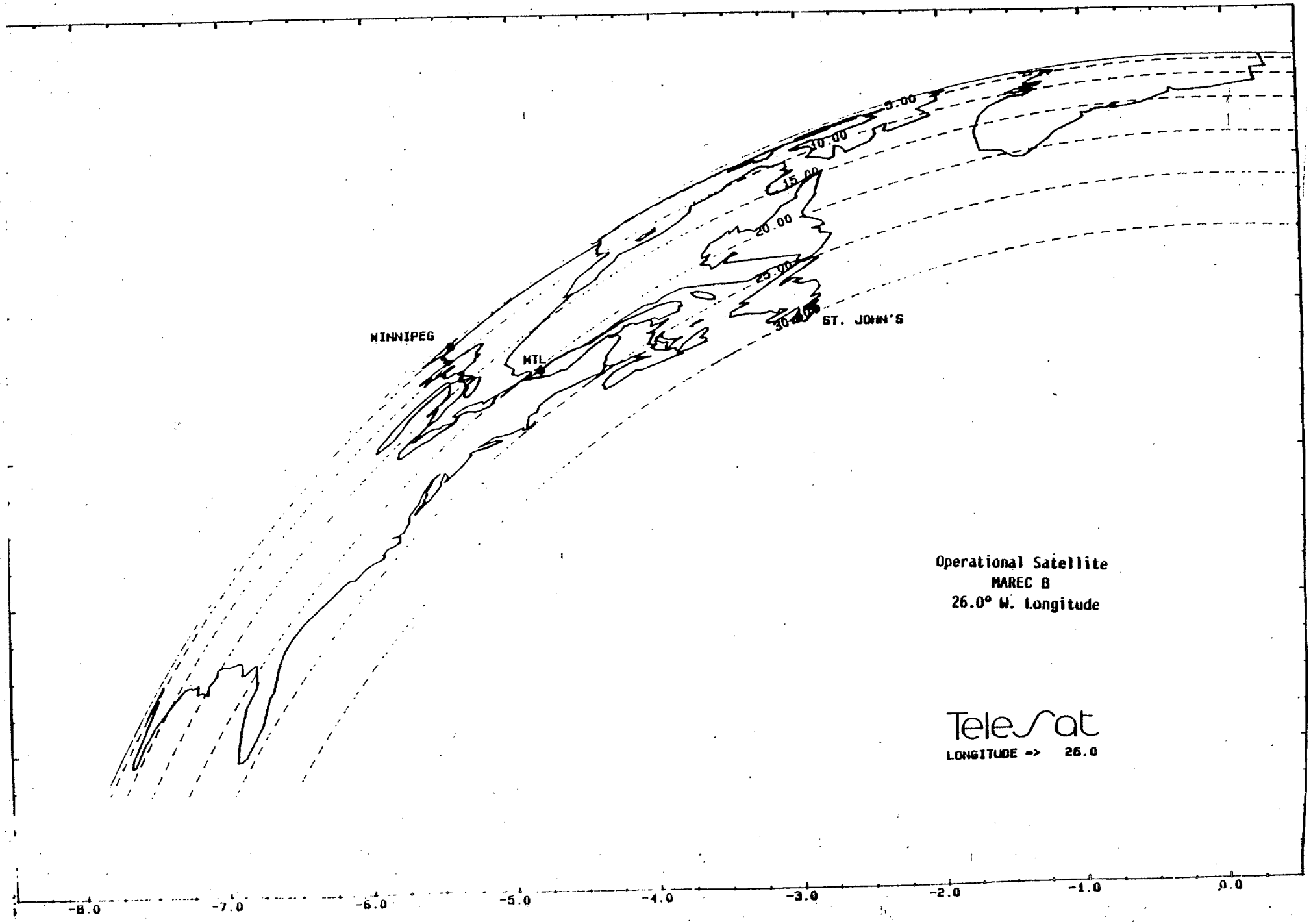
MOBILE DATA SERVICE DESCRIPTION

- SATELLITE-BASED INTERACTIVE MOBILE MESSAGING SERVICE
- 32-64 CHARACTER MESSAGE IN FORWARD LINK, DISPATCHER TO MOBILE
- A SELECTION OF 12-16 PRE-PROGRAMMED MESSAGES IN REVERSE LINK, MOBILE TO DISPATCHER
- COMMUNICATIONS PROTOCOL WOULD PROVIDE APPROPRIATE LEVELS OF MANAGEMENT I.E. ACKNOWLEDGEMENTS
- DOMESTIC SERVICE WOULD BE PROVIDED EAST OF THE ONTARIO-MANITOBA BORDER
- COMMUNICATION LINK BETWEEN DISPATCHER AND HUB STATION WOULD BE TRANSPORT COMPANY'S RESPONSIBILITY
- OPTIONAL LORAN-C VEHICLE LOCATION SERVICE MAY BE PROVIDED

SERVICE DESCRIPTION



MAREC B COVERAGE



IMPLEMENTATION PHASES

TECHNICAL AND OPERATIONAL TRIALS	PRE-OPERATIONAL SERVICE	OPERATIONAL SERVICE
NOVEMBER 87 - MARCH 88	APRIL 88 - APRIL 89	MAY 89 - MSAT
HUB STATION - CRC	HUB STATION - CRC (RED)	HUB STATION - TELESAT OR TELEGLOBE
CONTROL EQUIPMENT - CRC	CONTROL EQUIPMENT - TELESAT	CONTROL EQUIPMENT - CO-LOCATED WITH HUB
SATELLITE - MARECS B	SATELLITE - MARECS B	SATELLITE - 2ND GENERATION INMARSAT OR RE-LOCATED INMARSAT SATELLITE
TERMINALS - PROTOTYPE	TERMINALS - PROTOTYPE AND PRE-PRODUCTION	TERMINALS - PRODUCTION
6 - 12 UNITS	----------→	UP TO 3000

ANNEX G

Government of Canada
Department of Communications

Space Program

Gouvernement du Canada
Ministère des Communications

Programme spatial

MSAT

FEDERAL/PROVINCIAL
MSAT
WORKING GROUP
MEETING

25 NOVEMBER 1986
NATIONAL
CAPITAL
CONVENTION
CENTRE

STATUS REPORT ON THE TRIALS PROGRAM

1 PLCP
– the Post-Launch Communications Program

Why was it set up?

- to advise potential users
- to generate interest & commitment
- a method for DOC program promotion

2 - PLCP - where is it now?

- Over 170 applicants have submitted requests for trials, and most have been approved
- Original DOC commitment remains firm
- Applicants have had little DOC response in the last year
- Delays caused primarily by spectrum policy difficulties

3 - MSAT: the long-term service objective

- Low cost UHF or L-band service
  for voice or low-speed data

- Lightweight user terminal -
  useable in vehicle or as backpack

- Satellite EIRP - 32 dBW - 1600 MHz
  26.5 dBW - 800 MHz

- 5 kHz channels

- DAMA
  -demand-assigned-multiple-access

- Service types:
  Voice
  Data - Digital messaging -
  DACS - Paging - Positioning

4 - Pre-Launch Trials - Why?

- Intense user pressure
- Competition from other satellite services
- Very strong user interest for 2-way data & positioning systems
- Capacity on other satellite systems to support trials and interim service
- Recent advances in data communications technology

5 - Recent advances in Datacomms Technology

- Data terminals with local storage and convenient displays available
- Use presently limited to public safety, taxis
- Terminal features include:
  - + automatic message receipt
  - + originator aware of successful data transmission and of recipient's acknowledgement
  - + pre-formatted response from the mobile terminal can be used to update a database

6 - The trial choices available

*1 • Wait until 1991-1992 for agreed PLCP participation

*2 • Decide to use the limited Pre-launch Trials presently proposed

7 Pre-launch communications Trials program - features

- INMARSAT Marecs B spacecraft located at 26°W
- Visibility restricted to Eastern Canada up to Ontario/Manitoba border
- Store-and-forward short message system - 32 or 64 characters per message
- Messages routed via a data interface at the main ground station - likely to be at CRC
- Recipient will get message typically within 30 - 60 secs
- Mobile unit can vary in complexity
- Would not use INMARSAT hardware & protocol

8 - Pre-launch communications program - constraints

- Field trials - late 1987 for 1st experimenter
- If successful, trials would be expanded to others. Some interim service, for continuous usage prior to MSAT launch would be offered
- Contingent on regulatory approval
- Needs development of hardware, but most exists
- Low look angle of Marecs B (to 5°) requires critical antenna placement
- Multipath less of a problem than with voice :
  store-and-forward permits retransmission

9 - Pre-launch communications program - present effort

- DOC, Telesat, and some potential users presently spending considerable time & effort on defining needs & methods of implementation
- Depending on application DOC funding could be made available for pre-launch trials
- Present PLCP budget of $20m allocated for FY 1991 onwards
- DOC has requested TB for earlier, distributed,funding
- Pre-launch trial procedures and commitments by DOC and users will be similar to those presently in place for the PLCP

10 - Communications Trials Program - Ongoing communications

- Some provincial users have asked for more detailed continuing information on the trials
- A working group sub-committee would appear to have merit (common targets, elimination of duplicate trials &c.)
- Original PLCP applications showed a range of interest
- Which of those uses are candidates for the pre-launch trials program?
- Provincial views solicited

ANNEX H

Government of Canada
Department of Communications
Space Program

Gouvernement du Canada
Ministère des Communications
Programme spatial

MSAT

MSAT DOC-PROVINCIAL WORKING GROUP

CONGRESS CENTRE

OTTAWA

ONT.

NOVEMBER 25, 1986

J. McNALLY (1)

ACCOMPLISHMENTS & FUTURE PLANNED ACTIVITIES

AREAS OF ACTIVITY

- SYSTEMS
- SPACE SEGMENT
- GROUND SEGMENT
- RESEARCH DEVELOPMENT
- TECHNICAL SUPPORT AND TRIALS

SYSTEMS

ACCOMPLISHMENTS

- GOVERNMENT DEMONSTRATION SYSTEM DESIGN ISSUED MARCH 1983
- DECISION MADE TO CHANGE FROM GOVERNMENT LED DEMONSTRATION PROGRAM TO COMMERCIALLY LED PROGRAM.
- TELESAT ASSUMED LEAD COMMERCIAL ROLE OCTOBER 1984
- DAMA STUDY COMPLETED JUNE 1984
- PROPAGATION MEASUREMENT AT 800 MHz (HELICOPTER) AND AT L-BAND (MARECS SPACECRAFT) 1ST PHASE COMPLETED 1985

SYSTEMS

ACCOMPLISHMENTS (CONTINUED)

- EXTENSIVE VOICE QUALITY TESTS COMPLETED BY BNR MARCH 1985

- COMMUNICATIONS SIMULATOR USED EXTENSIVELY TO VERIFY SYSTEM DESIGN MARGINS SIMULATE PROPAGATION CONDITIONS, USED TO PREPARE VOICE TEST TAPES AND TO EVALUATE PERFORMANCE OF A COMPLETE BREADBOARD 800 MHz TRANSPONDER

FUTURE PLANS

- CONTINUE PROPAGATION STUDIES AT L-BAND
- CARRY OUT FURTHER DAMA STUDIES
- CONTINUE WITH VOICE QUALITY EVALUATION OF IMPROVED VOICE PROCESSORS
- EVALUATIONS OF PROPOSED MODULATION AND SYSTEM DESIGNS BY TELESAT AND POTENTIAL U.S. OPERATORS
- TAKE PART IN PRE-LAUNCH TECHNICAL SERVICE EVALUATION
- REVIEW OF TELESAT REQUEST FOR QUOTATION TO PURCHASE MSAT SPACECRAFT
- REVIEW OF TELESAT/U.S. OPERATOR ARRANGEMENTS

SPACE SEGMENT

ACCOMPLISHMENTS

- SPAR COMPLETED ALL PRE-PHASE 'C' CONTRACT TASKS AUG 31/86
- LATEST CONFIGURATION PROVIDES
  - UHF 2 BEAM COVERAGE OF CANADA/US
  - AND 4 BEAM L-BAND COVERAGE USING SHAPED BEAMS
- COMPLETE UHF TRANSPONDER BREADBOARDED BY SPAR AND TESTED AT CRC USING THE LINK SIMULATOR. TRANSPONDER MET ALL SPECIFICATIONS AT ROOM TEMPERATURE

SPACE SEGMENT

ACCOMPLISHMENTS (CONTINUED)

- UHF PASSIVE INTERMODULATION TEST FACILITY COMPLETED. (AVAILABLE AS PART OF THE DAVID FLORIDA LABS)

- UHF FEEDHORN DEVELOPED BY SPAR AND TESTED WITH MESH REFLECTOR DESIGNED BY AEROSPATIALE (FRANCE) PATTERN & PASSIVE INTERMODULATION (PIM) TESTS WERE COMPLETED ON AEROSPATIALE RANGE IN CANNES. TESTS SHOWED THAT PIM WAS PRESENT AND IS TIME DEPENDENT

- STUDIES COMPLETED ON ALTERNATE PAYLOAD ITEMS BY COMDEV
  - PATCH FEED SYSTEM
  - LOW LOSS DUPLEXER

SPACE SEGMENT

ACCOMPLISHMENTS (CONTINUED)

- L-BAND RECEIVER FRONT END SUCCESSFULLY BREADBOARDED
- L-BAND HIGH POWER AMPLIFIER MODULES BREADBOARDED FURTHER DEVELOPMENT NEEDED BY TRANSISTOR SUPPLIER TO INCREASE EFFICIENCY FOR HIGH POWER CLASS A/B OPERATION

SPACE SEGMENT

FUTURE PLANS

- SPACE SEGMENT DEVELOPMENT NOW BEING DONE AT SPAR UNDER GOVERNMENT/SPAR MOU ($13.5 M HAS BEEN APPROVED VIA THE SPACE PLAN)

- DEVELOPMENT OF TECHNOLOGY CONTINUING AT SPAR

- SPACECRAFT REQUIREMENTS COORDINATION BETWEEN TELESAT, POTENTIAL U.S. OPERATORS, AND SPAR

- LARGE ANTENNA DEVELOPMENT INCLUDING DUAL BAND FEEDS AND PIM CONTROL

- SUBCONTRACTOR DEVELOPMENT

- SUCCESSFUL RESPONSE BY SPAR TO TELESAT RFQ FOR SPACECRAFT PROCUREMENT

GROUND SEGMENT

ACCOMPLISHMENTS

- NARROW BAND FREQUENCY MODULATION (NBFM) TERMINAL STUDY COMPLETED JULY 1984 (NBFM NO LONGER UNDER CONSIDERATION)

- LINEAR PREDICTIVE CODING (LPC) TERMINAL STUDY COMPLETED AUG. 84

- AMPLITUDE COMPANDED SINGLE SIDEBAND (ACSSB) STUDY COMPLETED SEPT. 85

- GATEWAY STATION STUDY COMPLETED JULY 1984

- VOICE QUALITY STUDY (300 MHz) COMPLETED JAN. 1986

- MOBILE TERMINAL (GENERIC NARROW BAND TECHNOLOGY) TERMINAL CURRENTLY UNDER DEVELOPMENT AT GLENAYRE

GROUND SEGMENT

ACCOMPLISHMENTS (CONTINUED)

- TWO MOBILE ANTENNA STUDIES COMPLETED
  CANADIAN ASTRONAUTICS DEC. 83
  ANTECH LIMITED SEPT. 84

- HI GAIN STEERABLE MOBILE ANTENNA DEVELOPED IN HOUSE READY FOR COMMERCIAL PRODUCT DEVELOPMENT

GROUND SEGMENT

FUTURE PLANS

- CONTINUED DEVELOPMENT OF USER TERMINAL BY CANADIAN INDUSTRY USING DRIE/DIPP FUNDING
- DEVELOP BOTH LOW GAIN AND HI-GAIN STEERABLE ANTENNA
- DEVELOP SPECIFICATION FOR USER TERMINALS
- DEVELOP SPECIALIZED USER EQUIPMENT SUCH AS DATA COLLECTION PLATFORMS, PAGERS, PACKET SWITCHERS ETC.
- PROCURE EQUIPMENT FOR EARLY TRIAL AND SERVICE DEVELOPMENT
- EQUIPMENT TYPE APPROVALS
- LICENCING
- $15.5M DRIE/DIPP FUNDS APPROVED BY THE SPACE PLAN FOR GROUND SEGMENT USE

RESEARCH & DEVELOPMENT

ACCOMPLISHMENT

- THE FOLLOWING EQUIPMENT HAS BEEN DEVELOPED AT CRC AND LICENCED TO INDUSTRY

  LPC CODEC

  ACSSB SPEECH PROCESSOR

  DMSK MODEM

- EVALUATION OF SPAR UHF TRANSPONDER

- BUILT UHF AND L-BAND PROPAGATION SIMULATOR

- EXTENSIVE PROPAGATION MEASUREMENTS AT UHF AND L-BAND

- PRODUCTION OF VOICE TAPES FOR VOICE TESTING

RESEARCH & DEVELOPMENT

ACCOMPLISHMENTS (CONTINUED)

- DESIGN AND BUILT OF FUNCTIONAL RADIO SETS (2 COMPLETED)

- DEVELOPED & BUILT SEVERAL LOW GAIN MOBILE ANTENNAS, CONICAL LOG SPIRAL, QUADRIFILAR HELIX, DROOPING DIPOLE

- EXTENSIVELY INSTRUMENTED MOBILE VAN TO TAKE PROPAGATION MEASUREMENTS

RESEARCH & DEVELOPMENT

FUTURE PLANS

- CONTINUE OPTIMIZATION OF ANALOGUE & DIGITAL VOICE PROCESSORS
- CARRY OUT VOICE TESTING TO DETERMINE ALLOWABLE ADJACENT CHANNEL & CO-CHANNEL INTERFERENCE (PROTECTION RATIO MEASUREMENTS)
- CONTINUE PROPAGATION MEASUREMENTS AT L-BAND USING HELICOPTER
- COMPLETE BUILD OF UHF RADIO SET-BUILD L-BAND RADIOS FOR DEMONSTRATION PURPOSES
- CARRY OUT FIELD TRIALS USING INMARSAT
- CARRY OUT SYSTEM SIMULATIONS AS REQUIRED

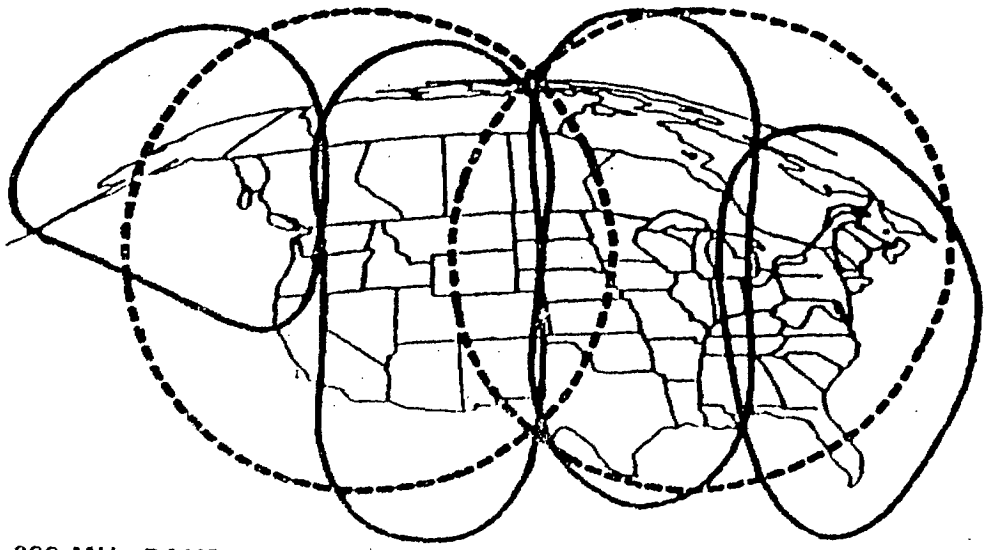


FIGURE 2 - MSAT BEAM COVERAGE

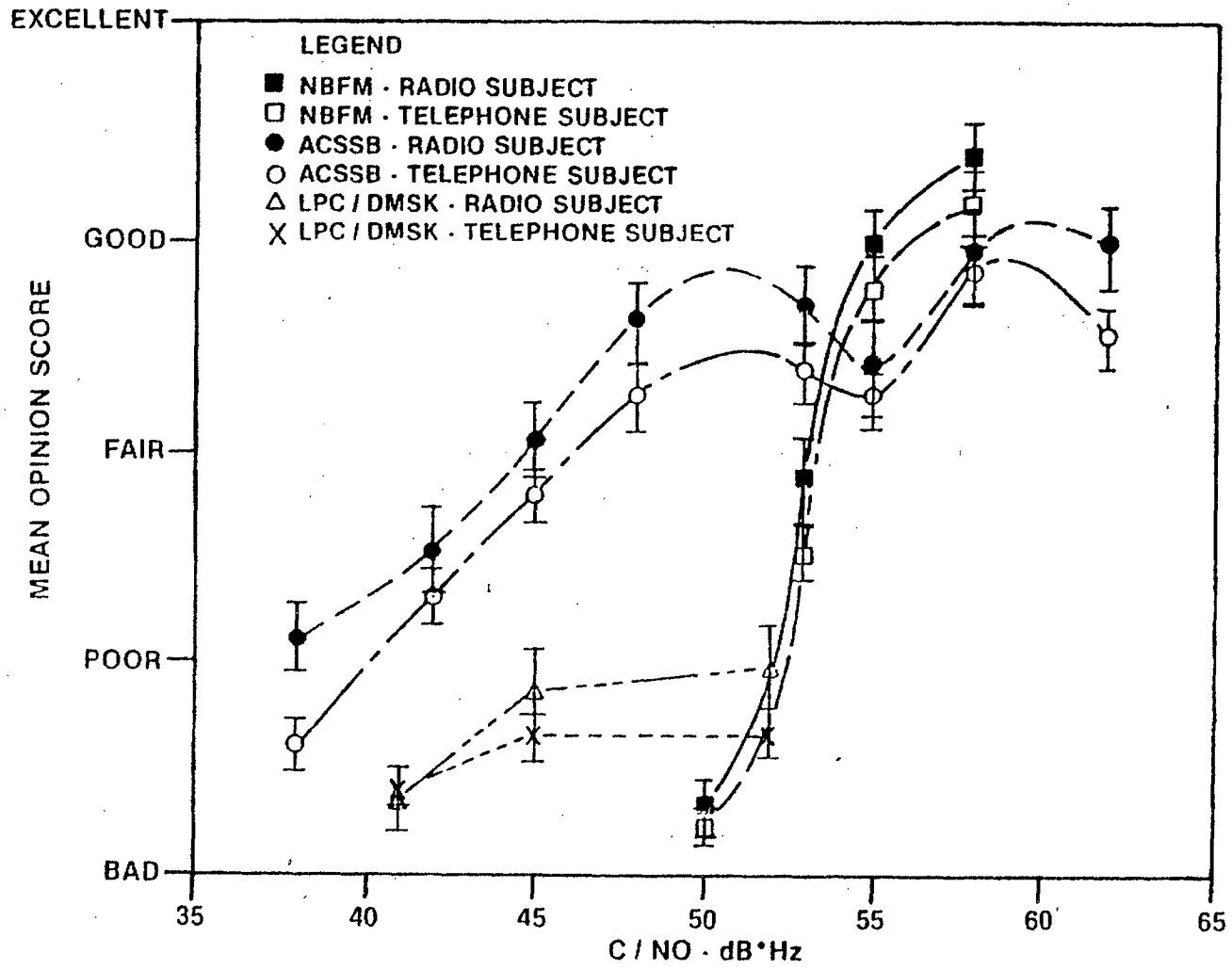
FORWARD LINK: SHF BASE TO MOBILE

SERVICE:		800 MHz BAND MRS	800 MHz BAND MTS	L-BAND MRS
SHF UPLINK C/No	dB Hz	58.9	61.9	58.9
UPLINK C/Io	dB Hz	63.8	65.0	63.8
SATELLITE EIRP	dBW	26.5	29.5	28.5
DOWNLINK PATH LOSS	dB	183.2	183.2	188.2
MOBILE TERMINAL G/T	dB/K	-19.1	-19.1	-15.8
DOWNLINK C/No	dB Hz	52.8	55.8	53.1
DOWNLINK C/Io	dB Hz	56.8	58.8	56.8
OVERALL C/(No+Io)	dB Hz	50.4	53.1	50.6

FIGURE 3/A

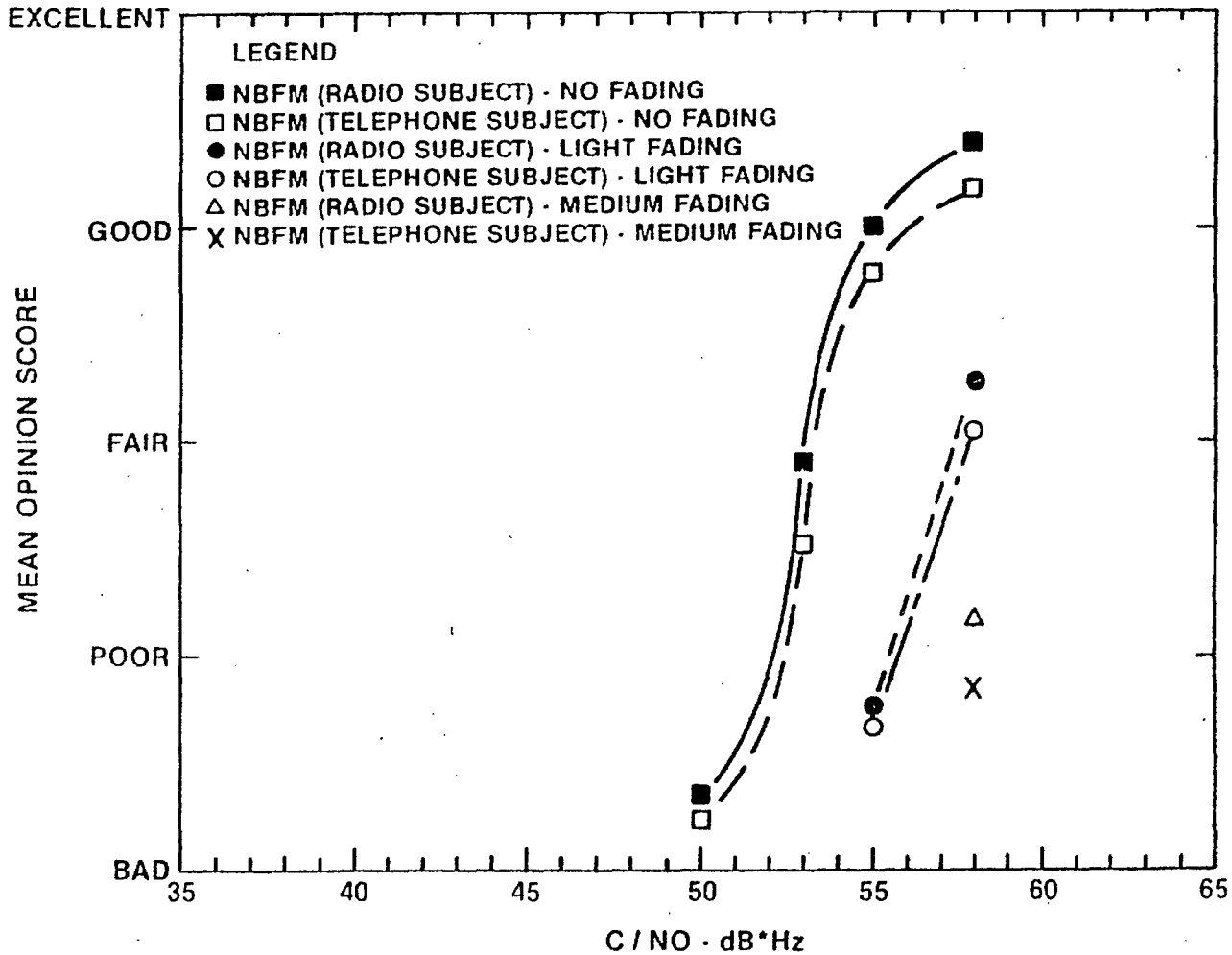
RETURN LINK: MOBILE TO SHF BASE

SERVICE:		800 MHz BAND MRS	800 MHz BAND MTS	L-BAND MRS
MOBILE TRANSMIT PWR	dBW	3.5	8.5	5.3
MOBILE ANTENNA GAIN	dBIc	7.5	7.5	12.3
MOBILE EIRP	dBW	11.1	16.1	16.7
UPLINK PATH LOSS	dB	182.8	182.8	188.7
SATELLITE G/T'	dB/K	-2.0	-2.0	0.3
SATELLITE C/No	dB Hz	54.9	59.9	56.9
UPLINK C/Io	dB Hz	59.8	59.8	59.8
SHF DOWNLINK C/No	dB Hz	57.3	57.3	57.3
DOWNLINK C/Io	dB Hz	58.3	58.3	58.3
OVERALL C/(No+Io)	dB Hz	51.2	52.7	51.9



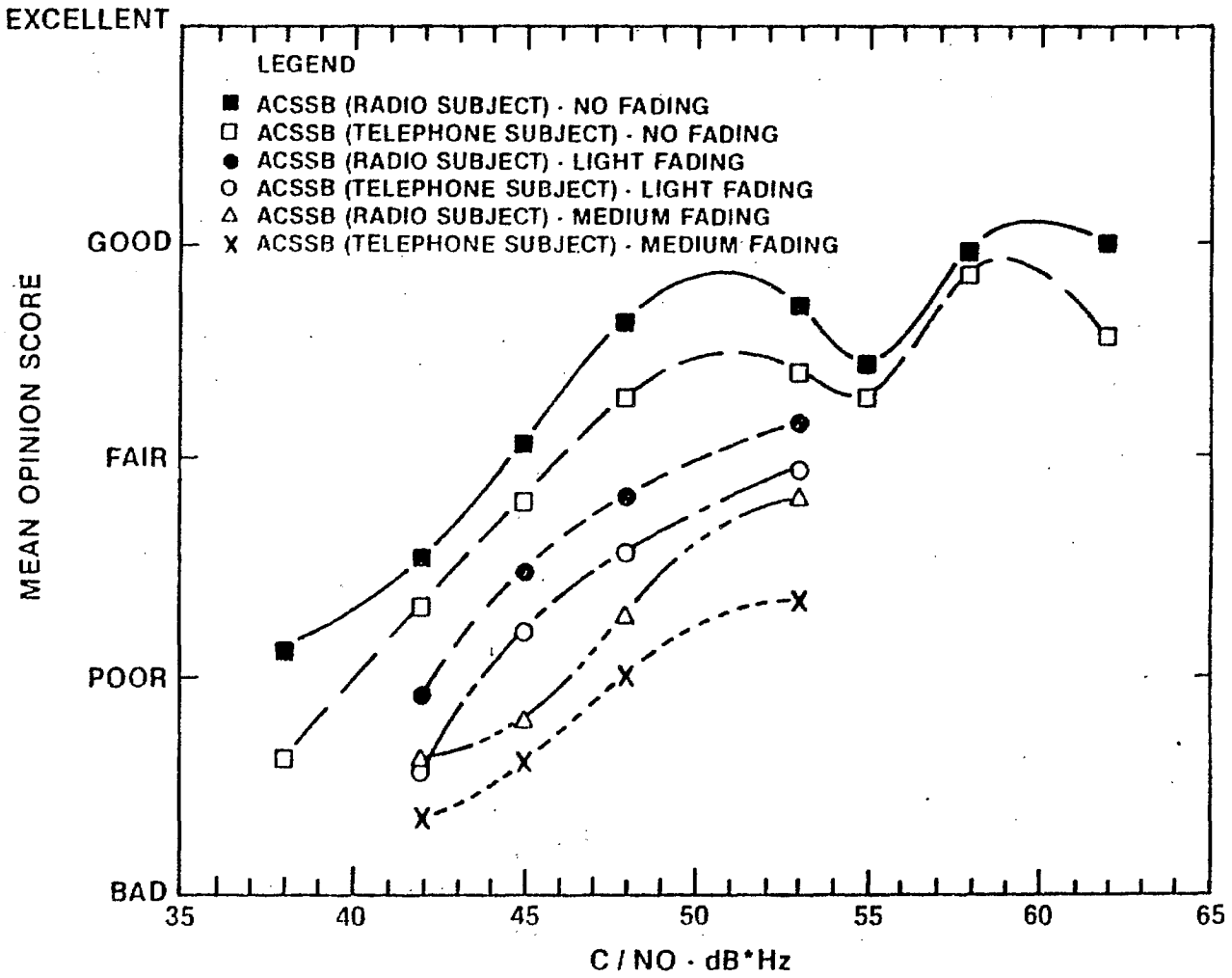
TEST 1: C / NO VERSUS SUBJECTIVE QUALITY

FIGURE 4



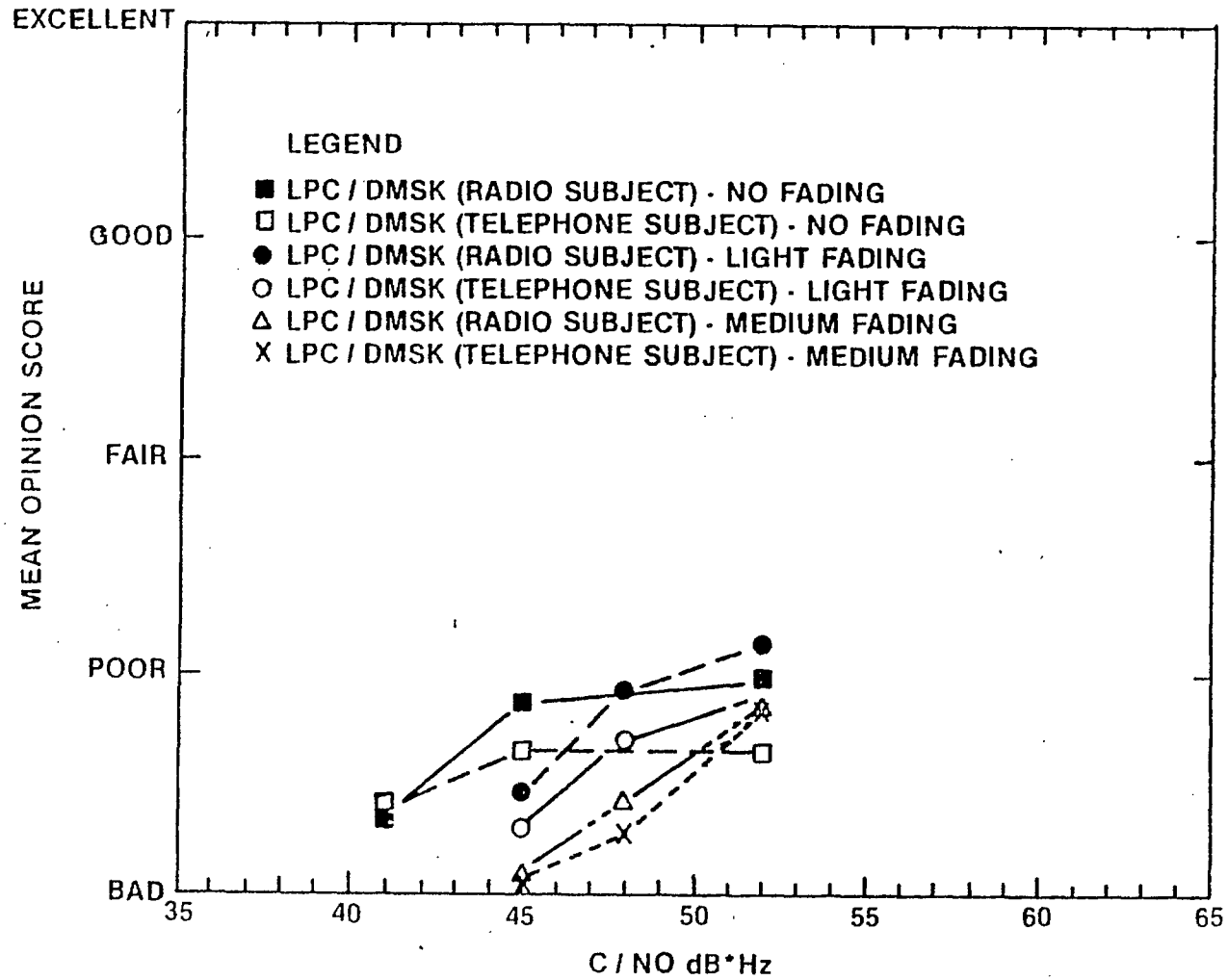
TEST 2: SUBJECTIVE QUALITY OF NBFM WITH FADING

FIGURE 5



TEST 2: SUBJECTIVE QUALITY OF ACSSB WITH FADING

FIGURE 6



TEST 2: SUBJECTIVE QUALITY OF LPC / DMSK WITH FADING

FIGURE 7