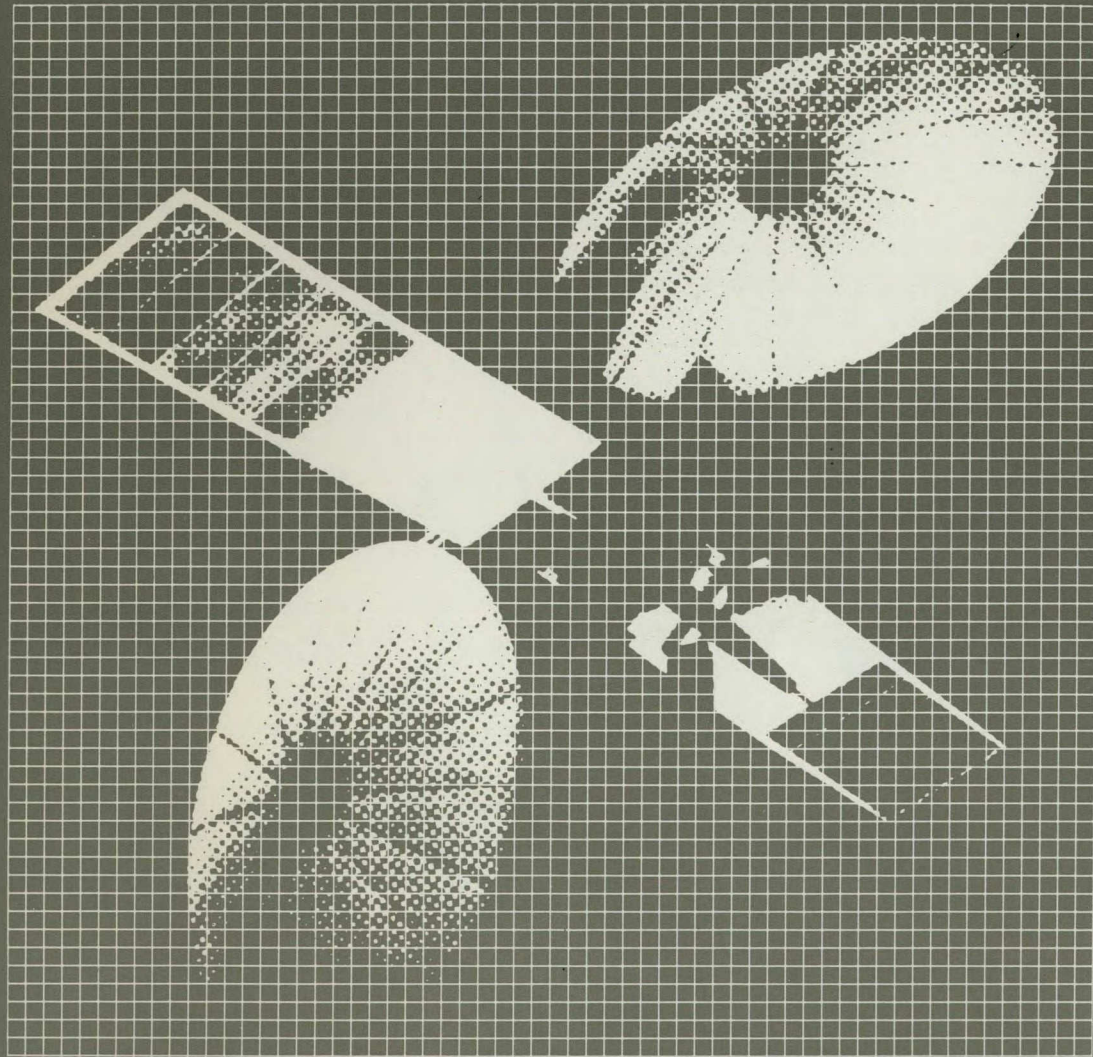




Government of Canada
Department of Communications

Gouvernement du Canada
Ministère des Communications

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1991



MSAT LEVEL I REPORT

REPORT PERIOD: AUGUST - NOVEMBER 1990

MSAT Program Level I Report

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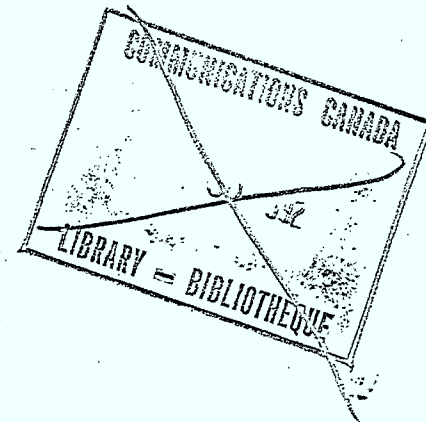
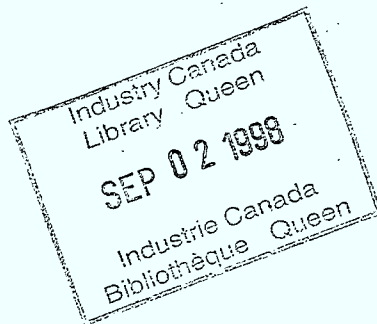
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DEPARTMENT
OF
COMMUNICATIONS

MSAT LEVEL 1 REPORT

REPORT PERIOD: AUGUST - NOVEMBER 1990



MSAT LEVEL 1 REPORT

APPROVED BY:

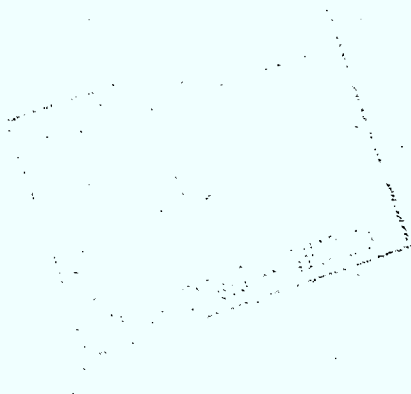
[Signature]
Director MSAT Program

RELEASED:

[Signature]
Director General
Communications Technologies
Research

DATE:

16 Jun 1991



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1. EXECUTIVE SUMMARY

The announcement of a TMI/AMSC contract award, scheduled in late October, for the manufacture of two MSAT spacecraft was delayed due to extenuating but short term circumstances. It is now expected that an award to Hughes/Spar Aerospace will be signed in December.

In addition to implementing their "Road KIT" commercial service on a trial basis with several Ontario-based trucking firms, TMI introduced their "Field KIT" and "Marine KIT" to the public in Calgary and St. John's respectively in June and October. All are two-way data communications services using leased satellite capacity from INMARSAT.

The majority of the 10 data/voice Skywave briefcase terminals, now retrofitted with 20 watt boards, were received and currently are undergoing further evaluations at the CRC hub station. Unfortunately, meaningful testing continues to be frustrated by the lack of availability of leased satellite time from INMARSAT. In mid November, the situation improved somewhat with the provision of airtime daily between 1300-1700 hrs. Procurement of the 300 MET's manufactured by CAL/Gandalf, is expected to be complete by the end of FY 90/91. Units have been distributed to Government agencies and private enterprises in order that they evaluate their potential needs for such service.

Personnel changes during July and October will necessitate unexpected additional staffing actions in the near future. The Project Office Manager, Mr. McNally, departed for a position in the Radarsat Program. His replacement, on an acting basis, is Mr. A. MacLatchy, who vacated the Ground Segment Manager position. In addition, the Field Trials Implementation Manager position was vacated by Mr. J.-G. Dumoulin.

2. PROBLEM SUMMARY

PROBLEM	IMPLICATIONS	ACTION
A. MSAT feeder link spectrum policy	A delay in announcing officially the assignment of feeder link frequencies may adversely affect contract details	Decide on and announce the relevant spectrum policy.
B. Spacecraft contract award	A prolonged delay in awarding the MSAT spacecraft contract will adversely affect the market for its services in Canada, and may lead to major discontent of key investors	Assist TMI in every way possible to expedite contract award negotiations for eventual sign off

NOTE: It is strongly expected that above stated problems will be resolved prior to distribution of the next Level I Report. This page will thereafter concentrate on the "COORDINATION" and "TRIALS" problems which the MSAT Program will incur as it enters a new facet of its Phase C/D development.

3. PROGRESS REPORT

WM 2 MSAT PROGRAM DEVELOPMENT

WM 2.1 Program Management

Winding up activities of the International Mobile Satellite Conference 90, held in Ottawa between 17-20 June, 1990, were completed during the period of the Report. Copies of the Proceedings afforded each delegate have proven to be unexpectedly popular, resulting in the receipt of a continuing demand for copies mainly from educational institutions and technical establishments throughout U.S. and Canada. Additional copies are currently being printed by NASA/JPL to meet the excess demand. A staffing submission was made for a new position in the Program Office, New Initiatives Planning Engineer at the ENG 5 level. It is currently undergoing departmental analysis.

WM 2.2 Commercial Implementation Support

TMI/AMSC contract negotiations with Hughes/Spar for the joint procurement of two spacecraft - one Canadian, one USA - continued throughout the Report period. TMI delayed signing the contract, scheduled for 29 October 1990, pending Board approval of several related items. The tentative sign-off date has therefore been extended into the fourth quarter of 1990. Contract value for the Canadian satellite and associated launch services is expected to be approximately \$250M. TMI's Road KIT service trials are currently underway with two Canadian trucking companies, Frederick Transport and Thompson Transport. Allied Van Lines are expected to take delivery of 200 Road KIT units during 1990. In addition, TMI introduced its "Field KIT" to the oil and gas industry at the National Petroleum Show in Calgary, a service which will provide North America-wide two-way data communications from remote operations in the field to central offices. In October, TMI introduced its third mobile service "Marine KIT" on the East Coast, for use in vessel tracking and ship to shore communications by the marine industry. TMI is expected to offer voice service by mid 1991.

WM 2.3 Communications Trials Program

Although a successful government sponsored voice trial between the CRC Ottawa hub station and a vehicle was carried out during systems tests over a wide range of operating conditions, using the MARECS B satellite, other scheduled government trial programs aimed at developing a viable MSAT commercial market in Canada, were delayed and frustrated during the September - October period by the non availability of sufficient satellite time contracted from Teleglobe. The majority of the Skywave briefcase terminals were received, complete with retrofitted 20 watt boards. Deliveries of the CAL Corp. manufactured METs to DOC are underway at a rate of 20-30 per week, and all 300 are expected by the end of the FY. Distribution to date has been made to Ultimateast, DOC Sault Ste Marie, University of Calgary, Munro Engineering and Seimac.

WM 2.4 Policy Development

Spectrum policy decision on the 11/13 GHz feeder links requires resolution in the near term. Discussions continued throughout the Report period.

WM 2.5 Frequency Coordination

Meetings continued within the Department throughout the Report period to develop Canada's position on spectrum issues for tabling at WARC 92. The frequency coordination meetings between Canada and INMARSAT are very slow and the prospects for a quick agreement are very poor. Next meeting will take place in December '90.

WM 2.6 Management of Cooperative Arrangements

Nil to report.

WM 2.7 MSAT Working Groups and Committees

The joint NASA/DOC Committee completed its winding down responsibilities of the IMSC '90 Conference. Financially, conference revenues adequately met expenses incurred.

WM 2.8 Program Submissions

MSAT Progress Report #17, covering the six-month period 1 May 1990 to 31 October 1990, was drafted and is currently undergoing departmental review.

WM. 2.9 Public Information

Copy for the MSAT News publication was completed in draft form, and has been submitted to DGIS for editing prior to its translation into French.

WM.3 MSAT TECHNOLOGY DEVELOPMENT**WM 3.1 Project Management**

Staffing action to fill the Trial Manager position was successful. Mr. D. Halayko accepted the position and began work on August 7, 1990. Interviews were held in July for the MSAT Systems Manager and, as a result, Mr. Vassilios Mimis began work September 24th. Jean-Guy Dumoulin left the position of MSAT Field Trials Implementation manager and accepted a position in the DFL. The classification of Mr. Dumoulin's previous MSAT position was approved November 20th at a PM-6 level. Staffing of this position is proceeding. In the interim, the position will be filled by Mr. Terry Mayhew of Calian Technology.

WM 3.2 System Engineering Support

Systems Engineering support was provided for the development of the Dynamic Variable Partitioning algorithm which will allow the l-band spectrum to be shared by many various Mobile Services (land, marine and aeronautical).

Under the TMI/DSAT MOU arrangement, participated at the TMI/COMSAT contract review meeting.

Participated at the National Frequency Allocation working group meetings for the WARC-92 conference.

New Initiatives:

- Prepared technical papers in support of our request for spectrum allocation in the Ka-band for Mobile and PASS communications systems.
- Prepared and discussed with SPAR/Telesat a SOW to study the technical, market and policy considerations of LEO (Low Earth Orbit) satellites. The requisition has now been signed by DGRC.

- Trials system engineering activity, dealing with link margin parameters and the relationship of voice quality was provided as voice trials get underway.

WM 3.3 Space Segment Technology Development

Negotiations are now complete between TMI and AMSC and a spacecraft supplier has been selected. Contract signing is imminent.

WM 3.4 Ground Segment

The four Glenayre prototype radios have voice processing software installed and are undergoing trials.

The radios have proven reliable and performed well. The order for 60 units was delayed during this period due to airtime unavailability. These units will be used for the initiation of a "stop and talk" voice service.

Nexus Engineering experienced slow progress. Nexus promised a new plan of activities because it now appears that the target market has shifted.

The 10 SkyWave units received during the last reporting period still have some minor performance problems. They were returned for modification, and the installation of the 20 watt power amplifiers is now essentially complete.

Narrowband Telecommunications Research Limited continue to work using their IRAP and B.C. government grants to develop the DACS units. An order for thirty units is under consideration.

WM 3.5 Applied Research Development

Completion of the MSAT LX terminal has been delayed until March 1991 due to commitments of higher priority. However, work is progressing well on the various subsystems to be incorporated and evaluated in this terminal,

including antenna steering algorithms, digital modem, synthesizers, plus the hardware and software needed to house and control them. Work continues on modifications to the electronics associated with the Milne antenna.

Many mobile demonstrations and tests in the van have been completed over this period involving CAPSSB and the Milne antenna.

As part of our support to TMI under the TMI/DOC MOU, many staff members gave presentations at COMSAT Laboratories, the prime contractor to TMI/AMSC for the ground segment system design.

Technical assistance is being provided to DMSAT staff in developing a simulation of Dynamic Variable Partitioning, a spectrum sharing scheme proposed as a possible solution for the contention for spectrum between Aeronautical and other users.

The "mini-hub" at Teleglobe's Weir earth station was installed and tested. It cannot become operational until Teleglobe installs a power/frequency monitoring and control sub-system. INMARSAT has approved a design proposed by CRC and technical support is being given to Teleglobe to implement it. Until this is completed, access to the INMARSAT satellite for Air Ambulance and briefcase is strictly limited.

WM 3.6 Communications Trials Program.

The department has now received approximately 225 Mobile Data Service (MDS) terminals from Telesat Mobile Inc. (TMI). Of the 225 MDS terminals, approximately 141 are committed to trials participants as shown below, and more requests are being received weekly.

All voice L-Band Briefcase Terminals (LBT's) have been received from Skywave. CRC was unable to test the LBT's until November 26 as TMI/Teleglobe have been unable to provide any satellite time for voice trials. The lack of satellite time has been a source of great frustration for trials participants and CRC. However, this will change starting December 3 at which time CRC will have access from 13:00 hrs. to 17 hrs. EST Monday to Friday. Teleglobe must still implement a monitoring system before CRC is allowed 24 hour operation. This is scheduled for early February 1991.

COMMITTED MDS TERMINALS

Organization	Number of Terminals Committed
Government of Quebec	20
Ont. Ministry of Culture and Communications	15
Canadian Coast Guard	1
DOC Ontario Region	6
Dept. of Fisheries and Oceans	3
Seimac Limited	4
Munro Engineering	1
Exhibition Transportation Services	5
University of Calgary	1
UltimateEast	10
Telesat Mobile Inc.	60
Water Resources Branch	5
C.R.C.	<u>10</u>
TOTAL	141

4. FINANCIAL RESOURCE UTILIZATION - FY 90/91

Title	Project No.	Budget \$K	YTD Commitment \$K	Expenditure \$K	Free Balance \$K
<u>5183 - Management</u>					
MSAT Director	65700	450	250.6	245.7	199.4
MSAT Program Office	65701	200	94.6	83.3	105.4
MSAT Project Office	65710	<u>150</u>	<u>137.0</u>	<u>79.0</u>	<u>13.0</u>
		800	482.2	408.0	317.8
<u>5189 - Communications Trials</u>					
Voice Trials	65711	800	520.8	268.9	279.2
Equipment Contracts	65712	2,740	3,575.2	1,761.0	(835.2)
Service Contracts	65713	350	Ø	Ø	350
Teleglobe Lease	65714	<u>Ø</u>	<u>Ø</u>	<u>Ø</u>	<u>Ø</u>
		3,890	4,096.0	2,029.9	(206.0)
<u>5173 - Administration</u>					
Director	65700	<u>260</u>	<u>260</u>	<u>Ø</u>	<u>260</u>
GRAND TOTAL		4,950	4,838.3	2,437.9	111.7

4. HUMAN RESOURCE UTILIZATION (PM)

	A	M	J	J	A	S	O	N
MSAT PROJECT TEAM:	10	10	11	11	11	11	11	11
DSAT/DGIS SUPPORT TO MSAT TEAM:	6.5	6.5	6	6	6	6	6	6
TOTAL HUMAN RESOURCE UTILIZATION:	16.5	16.5	17	17	17	17	17	17
TOTAL MSAT TEAM REQUIREMENT:	22	22	22	22	22	22	22	22
VARIANCE (-)	6.5	6.5	5	5	5	5	5	5

DISTRIBUTION

SADM
ADMSR
ADMRS
ADMCM
DGFP
DGEP
DGIR
DGTP
DGGT
DGSTA (CSA)
DGBR
DGRC

DSIS
DSRS
DPM
DGC
DGO
DGQ
DGA
DGP
DDE
DPC
DMG
DMS
DFL
DSAT
DSE
DSM
DLS
DPT
DMSAT
A. MacLatchy
D. Athanassiadis
H. Reekie
A. Aldworth
J. Jones
E. Thompson/Telesat
M. Zuliani/TMI
D. Sward/TMI
PIC Members
Canadian Embassy (Wash. D.C.)
External Affairs - URE Section
D. Panagiotou - ROA Ontario Region

PROGRAM OBJECTIVES AND BACKGROUND**OBJECTIVES**

The primary strategic objective of the Mobile Communications Satellite (MSAT) program is to foster the development of new mobile telecommunications services in Canada. In particular, the program is aimed at satisfying urgent national needs for improved public and civil government mobile communications to under-served areas of Canada, including resource development activities in remote areas.

BACKGROUND

The major phases of the MSAT program are:

- Phase A: Concept Feasibility
- Phase B: Program and System Definition
- Phase C/D: Implementation including pre-launch trials program
- Phase E: Operations and MSAT Communications Trials Program

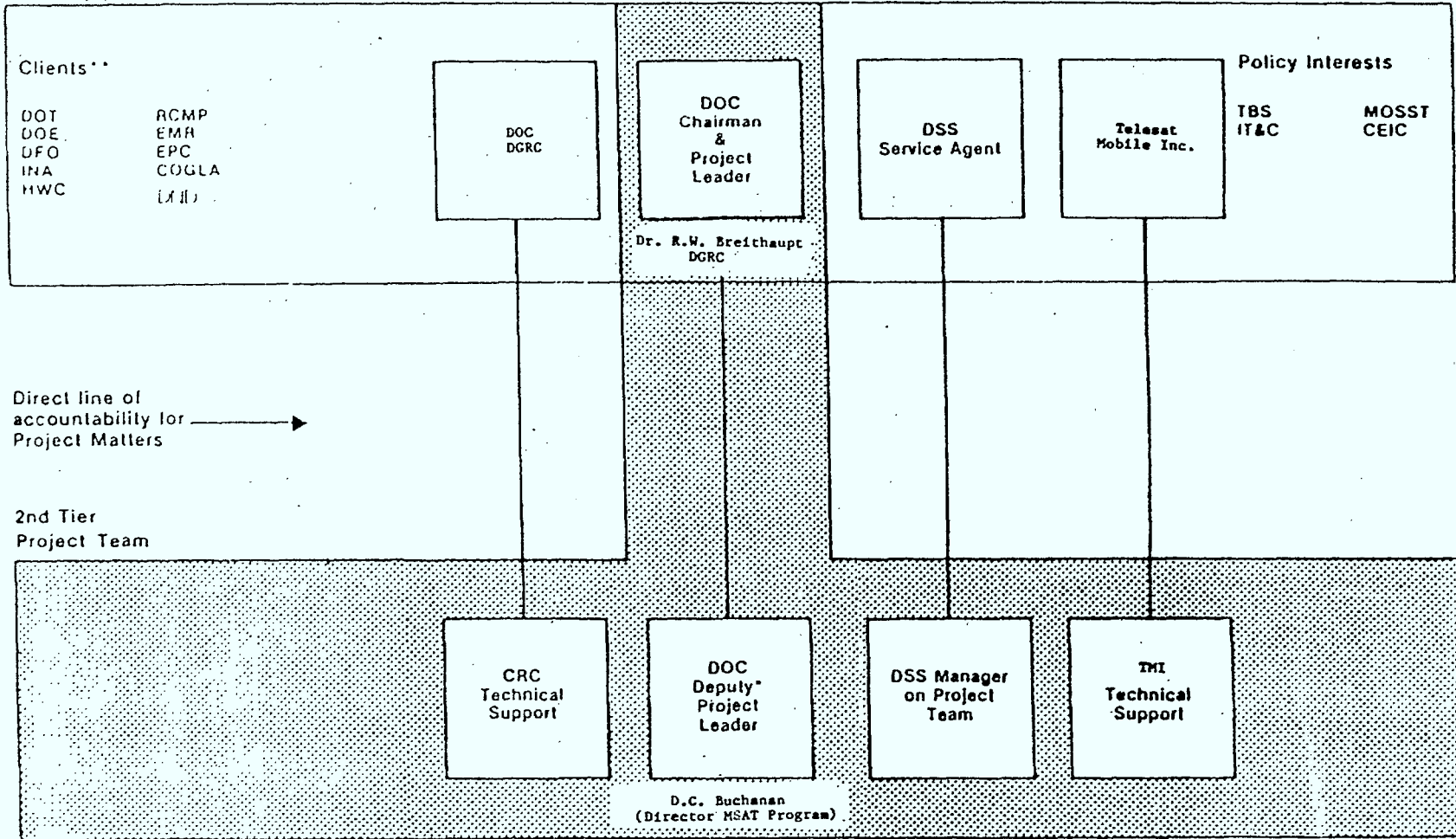
In September 1980, Cabinet approved a program of Phase A concept studies at a cost of \$2.2M to explore the use of satellites to improve mobile communications in Canada, and to define concepts and plans for an MSAT demonstration mobile system for mobile users. The results of these studies indicated technical feasibility, the existence of a substantial market for satellite-assisted mobile communications services and significant user benefits.

In December 1981, Cabinet approved Phase B system definition studies of the MSAT Program at a cost of \$17.4M for FY's 1982-84. Two years later, in November 1983, a DOC/NASA Arrangement substantially altered the direction of the MSAT program from a government led to a commercial Telesat led program in Canada. The Phase B studies, which extended to March 1985, conclusively showed that the commercial program scenario provided sufficient economic and technical prospects to continue into Phase C/D of the program, albeit with continued government support to alleviate the inherent risk factors.

On 29 April 1986, Cabinet approved the Long Term Space Plan, including \$176 million full funding for MSAT. That funding included \$25 million over the next seven years to provide technology and product development support, \$20 million to sponsor service trials for the program and \$4.5 million for management costs. In addition, the government entered into a service contract with Telesat to lease satellite capacity for government users, valued at \$126 million, payable in installments over a five-year period beginning in the early 1990's.

MSAT Project Organization Structure

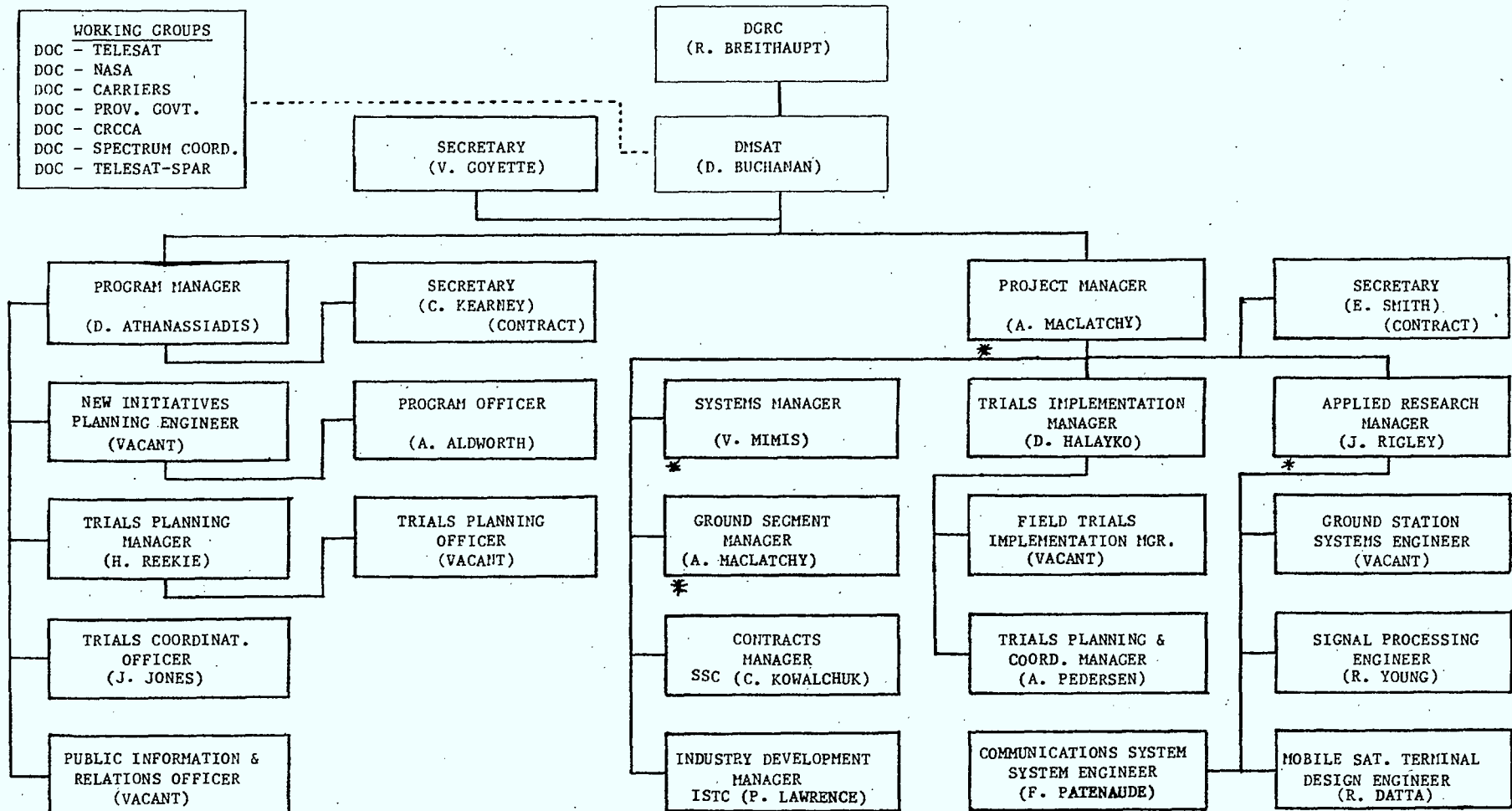
1st Tier
Planning/Implementation Committee



* See subordinate organization

** Major clients will also be represented on the project team through the working groups

MSAT PROJECT TEAM ORGANIZATION



* administratively responsible to DSAT.

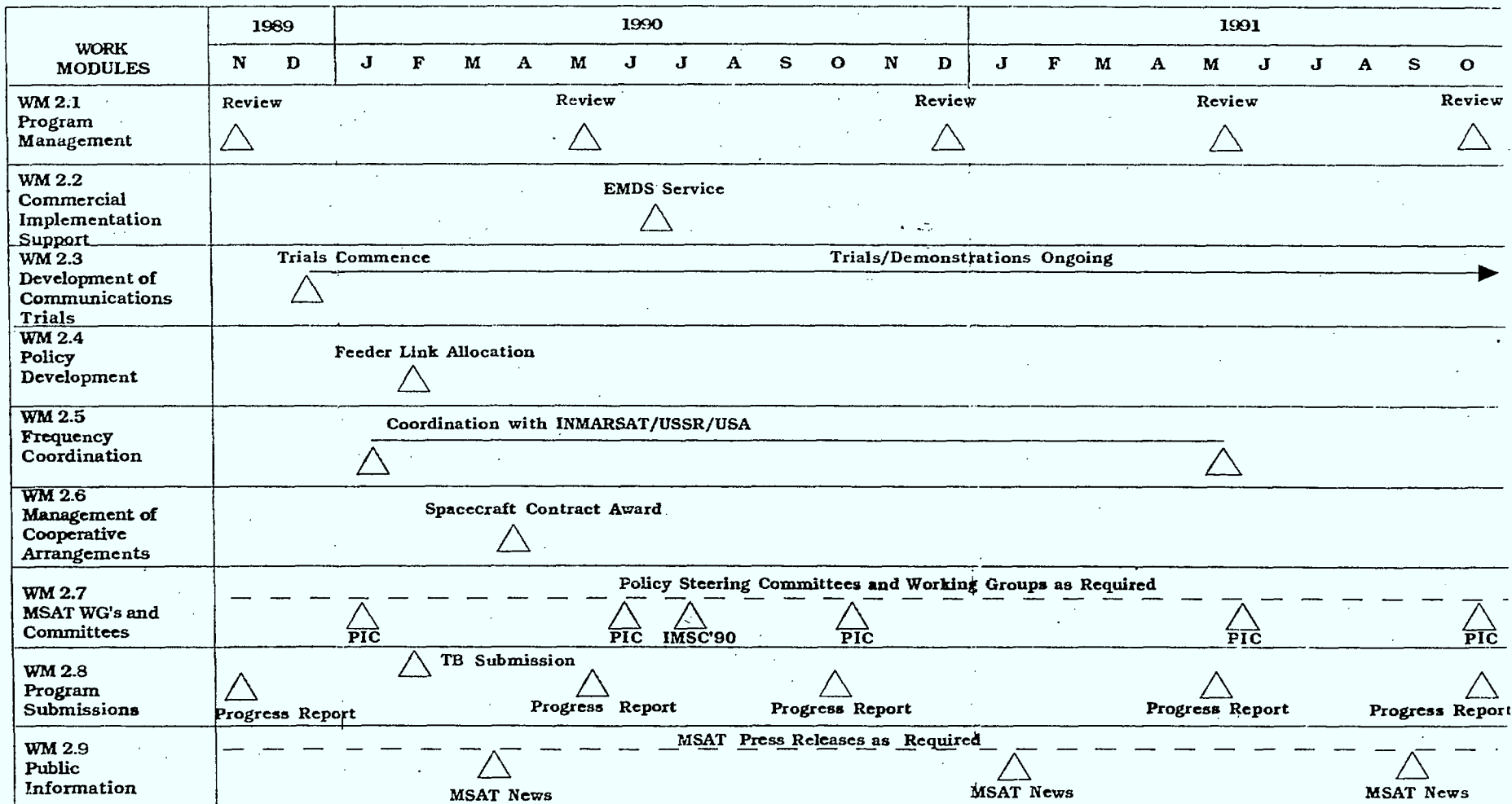


FIGURE 5.1: MSAT PROGRAM DEVELOPMENT SCHEDULE

WORK MODULES	1989		1990												1991											
	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O		
WM 3.1 Program Management					△ Review								△ Review											△ Review		
WM 3.2 System Engineering Support	International L-Band Frequency Coordination →																									
WM 3.3 Space Segment Technology Development (Led by Spar as Prime Contractor with MOU Funding).	Phase C DIS&T/DIPP Agreement (Development of L-Band Components)																									
	▲ Subcontracts let to:																									
	Evaluate and Coordinate with Telesat →																									
WM 3.4 Earth Segment Technology Development (DIS&T/DIPP Funding)	Spacecraft Requirements Coordination with AMSC →																									
	Glenayre L-Band Terminal																									
	Nexus HPA/ANA → △ Delivery of Prototypes																									
	DAMA and Gateway Stations → △ Critical Design Review △ Delivery																									
WM 3.5 Applied Research	△ CAL Mobile Terminals																									
	Continue work on Modulation Techniques																									
	Continue Propagation Measurements																									
WM 3.6 MSAT Trials and Service	L-Band Lab Model Radio																									
	Trials Coordination →																									
	▲ Ontario Air Ambulance Service (transferred to Teleglobe)																									
	Telesat EMDS Road Kit →																									
	RCMP → △ Seimac Marine Data Trial →																									
	▲ Development Start → Field Trial using CRC Tracking Antenna →																									
	Ultimatecast Data Trial →																									
	▲ Development CAL Mobile Terminals																									
▲ Development →																										
Delivery of 50 units each month (May 12, June 12, July 12). →																										
Delivery of 50 units each month (November 12, December 12, January 12). →																										

FIGURE 5.2: MSAT TECHNOLOGY DEVELOPMENT SCHEDULE

