



Government of Canada
Department of Communications

Technology & Industry

Gouvernement du Canada
Ministère des Communications

Technologie et industrie

REPORT PERIOD	Feb/March 1986
REPORT DATE	24 April 1986
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MSAT Program Level I Report

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MSAT

Canada

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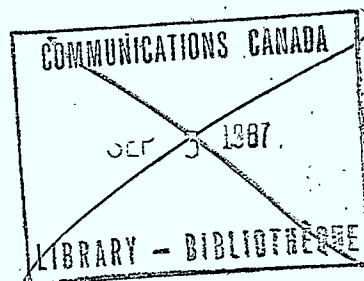
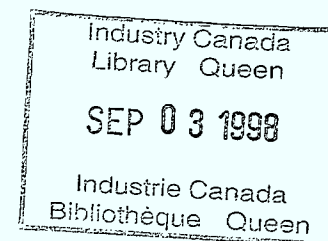
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1/1 MSAT PHASE C/D

LEVEL 1 REPORT

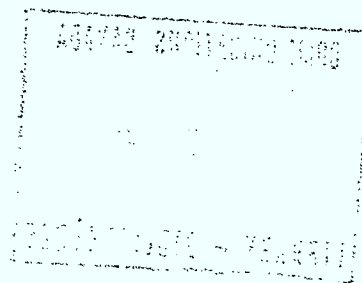


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1. Objectives and Background

The primary strategic objective of the 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.

As originally planned, this objective was to be accomplished in four major phases:

Phase A Concept Feasibility
Phase B Program and System Definition
Phase C/D Implementation
Phase E Post Launch Communications Program

MSAT Phase A Concept Feasibility

In September 1980, Cabinet approved a program of studies for FY1980/81 and FY1981/82 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 a demonstration mobile communications satellite system (MSAT) for mobile users.

Twenty-three contracts were subsequently awarded to 16 Canadian firms to carry out Concept Feasibility studies. Results of Phase A studies indicated technical feasibility, the existence of a substantial market for satellite-assisted mobile communications services and significant user benefits. The MSAT demonstration program was to develop the services, markets, policies, technologies and industrial capabilities required to satisfy the need for improved communications in rural and remote areas. It was expected that the commercial system to follow MSAT in the 1990s would prove economically viable.

Phase B Program and System Definition

On 3 December 1981, Cabinet approved Phase B of the DOC element of the MSAT Program at a cost of \$8.0M in FY1982/83 and \$9.0M in FY1983-84. This was approved by Treasury Board on 29 July 1985. In late 1982 extension of MSAT Phase B was approved, with a modified cash flow of \$6.0M in FY 1982/83, \$7.5M in FY1983/84, and \$3.9M in FY 1984/85. In July 1983 Treasury Board approved a further revised cash flow of \$3.9M for FY 1982/83, \$9.6M for FY 1983/84, and \$3.9M for FY 1984/85. In March 1984, Treasury Board approved a \$450K cash flow rephasing from FY 1983/84 to FY 1984/85.

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The main objectives of MSAT Phase B were to define and design the first generation commercial MSAT system, develop the required technology conduct commercial viability and socio-economic benefit studies, define the post launch MSAT communications program, develop cooperative arrangements, define communications policy and regulatory issues, and prepare a proposal with class B cost estimates for the government costs in the implementation phases. The change in the original MSAT Program to a commercial-led program scenario and inherent delays for approval of phases in major contracts resulted in a need for a Bridging Phase of 17 months between the originally scheduled end of the major industrial contracts in July 1984 and the start of contracts for the Implementation Phase in December 1985. Major Bridging Phase objectives included the development of an MSAT policy, licensing and regulatory plan, proof of concept for critical technology items, demonstration of the quality of service, spectrum negotiations with the U.S., negotiations of cooperative agreements with Telesat, NASA and U.S. industry, and plans for submissions for the Implementation Phases.

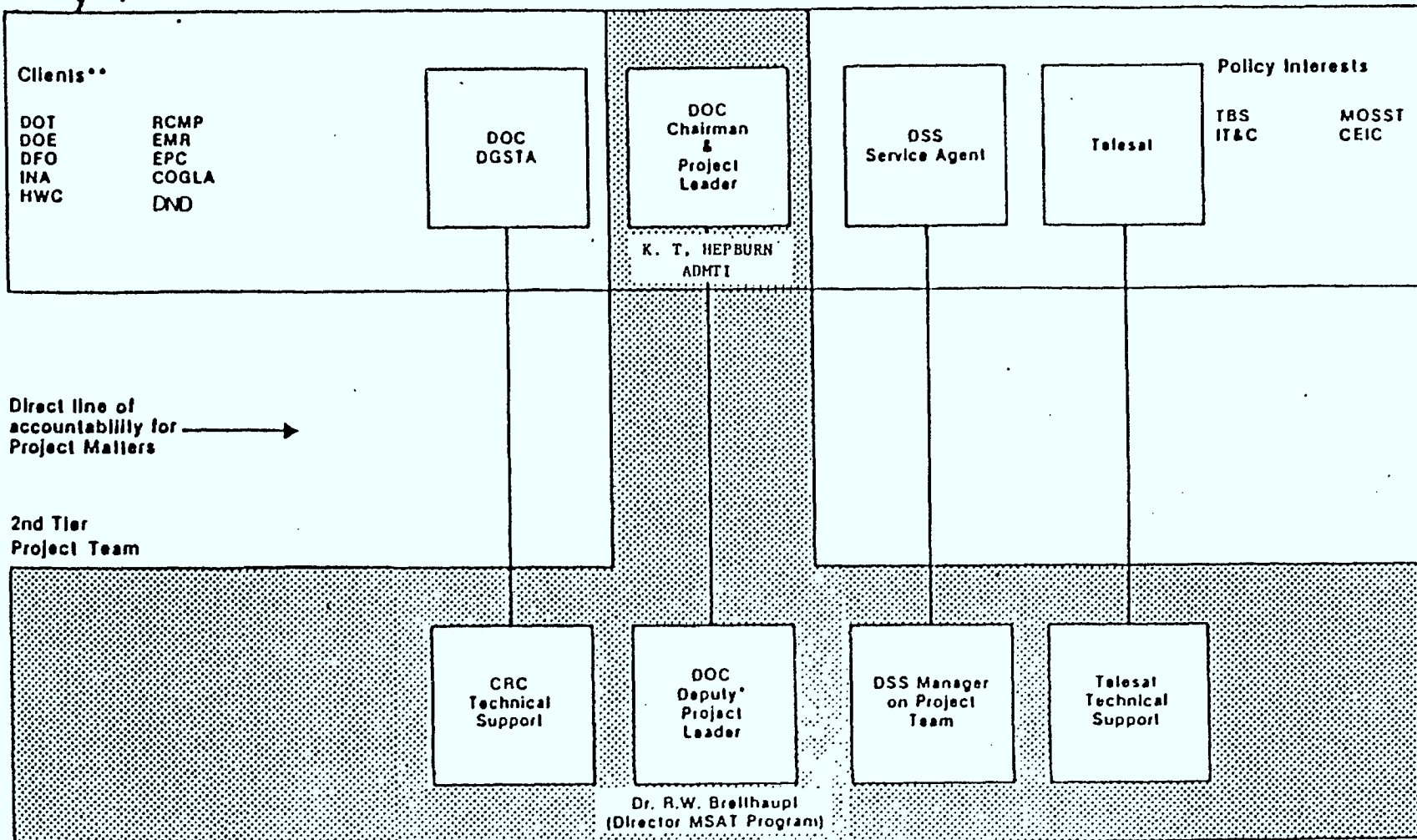
In June 1984 Treasury Board approved the MSAT Bridging Phase with funding of \$2.9M for FY 1984/85 and \$1.0M for FY 1985/86. However, significant delays in the expected completion of Phase B socio-economic studies and of the Telesat Commercial Viability Study and Business Proposal delayed completion of Phase B work by approximately six months. In addition, the FCC delayed issue of the U.S. Notice of Proposed Rule Making by about six months. The effect of these delays prevented an early start on technical development tasks in the Bridging Phase. This in turn resulted in a Treasury Board submission requesting approval to re-phase \$2.7M of MSAT Bridging Phase funds from FY 1984/85 to FY 1985/86, thereby increasing the FY 1985/86 budget to \$3.7M.

Phase C/D Implementation

The MOSST Interim Space Plan submission concerning the Space Station and MSAT was approved by the Cabinet Committee on Economic and Regional Development (CCERD) in March 1985. This approval included government support to MSAT Implementation Phases (C/D) with funding of \$6.7M for FY 1985/86, and subject to the negotiation of cooperative business arrangements by the private sector and to final funding approval at the end of 1985. Therefore, DOC is proceeding with MSAT Phase C/D government support activity at the start of FY 1985/86. This supercedes the remaining Bridging Phase activity whose key elements will be incorporated as part of Phase C/D.

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

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MSAT PROGRAM DIRECTOR
(R.W. BREITHAUP)
DEPUTY PROJECT LEADER

PROGRAM OFFICER
(K. CROSS)

CONTRACT

SECRETARY
(V. WILLS)

WORKING GROUPS

DOC - TELESAT
DOC - NASA
DOC - CARRIERS
DOC - PROV. GOVT
DOC - FED. GOVT
DOC - CRCCA
DOC - SPECTRUM COORD
DOC - TELESAT - SPAR

MSAT PROGRAM MANAGER
(D. ATHANASSIADIS)

WP OPERATOR
(C. VIAU)
TERM

WP OPERATOR
(D. CARDIN)
CONTRACT

SECRETARY
(V. GOYETTE)

MSAT PROJECT MANAGER
(J.L. McNALLY)

SECRETARY
(CONTRACT)

COMMERCIAL DEV. MGR.
(M. LABRECQUE)

TERM

PROG. PLANNING MGR.
VACANT

TERM PY

SOCIO-ECON. STUDIES
MANAGER
(J. BRADEN)

MSAT POST LAUNCH
COMM. PROG. MGR.
VACANT

PROG. DEV. OFFICER
(J. WERNER)

TERM PY

PUBLIC INFORMATION
OFFICER
(M. LUCAS)

TERM

SYSTEMS MANAGER
(J. KENT)

DEPUTY PROJECT MGR.
(H. RAINE)
SECONDED
TERM PY

GROUND SEGMENT MGR.
(A. MACLATCHY)

PROJECT OFFICE MGR.
(J. HEAL)

TERM

CONTRACTS MANAGER
(B. GRACE)

SECONDED FROM DSS

GROUND SEGMENT ENG.
VACANT

TERM

WP OPERATOR
(D. BAILEY)

CONTRACT

APPLIED RESEARCH
6 PY SPACE
TECHNOLOGY BRANCH

MSAT PROJECT TEAM ORGANIZATION

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2. YEAR-END NARRATIVE OVERVIEW AND SUMMARY

During FY 1985-86 a number of major program objectives were accomplished. Following DOC and Telesat discussion with the Canadian financial community in the summer of 1985, it became apparent that major MSAT program financing from the private sector would become available only if the government provided support to Telesat, preferably in the form of a bulk lease arrangement. A change in system configuration to a UHF/L-Band hybrid payload and an increase in expected satellite operational life from 7 years to 10 years provided enhanced overall benefits to Canada and an increase in commercial viability for Telesat. These changes were incorporated in Telesat's revised Business Proposal submitted to DOC in December 1985. Considerable effort was expended in preparation of MSAT inputs to the federal Long Term Space Plan, which presented a very strong case for MSAT as it contained minimum government cost and risk and strong economic and social benefits to Canada. It is expected that Ministers will support the MSAT proposal in the Space Plan and formal announcement of such a government decision is expected shortly.

A major effort was focussed on DOC-FCC spectrum allocation and coordination issues. A number of DOC-FCC meetings were held, culminating in the Niagara IV meeting in March 1986 and those immediately following Niagara IV. DOC continues to remain firm in its commitment to both 800 MHz and L-Band spectrum allocations. The FCC would prefer an L-Band only allocation. Negotiations are expected to continue through April and May 1986 when the FCC is expected to make a final decision. These spectrum negotiations and delay in the announcement of federal support have introduced program delays since Telesat is unable to formulate firm plans in the absence of final spectrum allocations and of the subsequent selection of the U.S. operator(s). A major effort is continuing to resolve this spectrum issue.

It was originally planned to obtain funds for FY86/87 through a multi-year TB Submission following a program announcement and prior to the end of March 1986. Because of delay in program announcement, it was decided, as an alternative, to request release of \$1.2M MSAT funds approved previously by CCERD, but not released by TB as yet. These funds will be sought in early April, and a number of contractors will have to stop work from 1 April until that approval is obtained.

During the year major advances were made in a number of technical study areas. In particular Spar completed and performed various tests on a complete breadboard 800 MHz transponder, and also developed spacecraft antenna feeds, and an L band power amplifier. Greatly improved implementation of both LPC (digital) and ACSSB (analog) narrow-band voice coding schemes was achieved. Use of these narrow band techniques was simulated over the satellite link and voice tapes recorded for various levels of fading and

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link margins. The resulting voice quality was then assessed by BNR using their standard telco tests facility. A new high gain mobile vehicle phase-array antenna was developed by CRC for use at either UHF or L band.

Significant losses in program staff were experienced during the year, and great difficulty was experienced in replacing the lost effort, either through appointments or contracts. This situation must be remedied.

During the next two months effort will be focussed on:

- Prepare for the official announcement of MSAT by the Minister and Mr. Thompson of Telesat;
- Prepare Project Brief for remainder of Phase C/D;
- Prepare MSAT Multi-Year TB Submission;
- Support further spectrum allocation and sharing discussions with the FCC as required;
- DOC issue of MSAT Spectrum Policy;
- DOC issue of MSAT Telecommunications Policy;
- Completion of Phase B Report;
- Prepare draft of DOC-Telesat Joint Endeavour Agreement (JEA);
- Prepare draft DOC/NASA MOU for long term cooperation;
- Staffing of several key positions currently vacant;
- Proceed with planning of pre/post launch trials, particularly early trials at L Band;
- Negotiate appropriate arrangement with DRIE for funding to support spacecraft and terminal development;
- Negotiate proposals for further development with Spar;
- Continue technical development contracts undertaken in FY 85/86;
- Plan industry briefing;
- Prepare TB Semi-Annual progress report to April 30, 1986

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3. PROBLEM SUMMARY
(see previous reports for closed items)

<u>Problem</u>	<u>Implications</u>	<u>Options</u>	<u>Action Taken</u>
8. FCC may decide to coordinate no spectrum with Canada for satellite mobile service in 806-890 MHz band or may decide to allocate both UHF and L band frequencies. Canada-U.S. sharing of these bands is unknown.	<ul style="list-style-type: none"> - no commercial satellite mobile service in the 806-890 MHz band in Canada and/or the U.S. - many regional benefits lost if FCC assigns spectrum in a different band than DOC for mobile satellite services - Canada may not achieve the minimum 2 plus 2 MHz needed at 800 MHz 	<ul style="list-style-type: none"> - define overall strategy to obtain spectrum for MSAT - interact with US State Dept. through External Affairs - negotiate with or lobby the FCC to obtain equitable Canada-US sharing - support NASA and other initiatives with FCC - Spectrum Coordination Sub-Committee formed to coordinate a large number DOC activities for MSAT spectrum. - Study implementations of use of L band - press for early DOC-FCC sharing negotiation by DOC-FCC Technical Liaison Committee 	<ul style="list-style-type: none"> - all options proposed - FCC decision on spectrum expected early 1986.
13. Unknown timing of selection of US satellite operator.	<ul style="list-style-type: none"> - Telesat unable to negotiate final arrangement with US entity until FCC selection of US operator. - NASA unable to develop joint endeavour agreement - Uncertainty on final arrangements and system concept will persist until US operator selected. 	<ul style="list-style-type: none"> - Telesat to proceed with discussions with present FCC applicants pending FCC decision. - Telesat to develop preferred regional scenario with National system fallback. - Final negotiations between Telesat and US entity to take place after government approval - Telesat to release principles of cooperation to US entities 	<ul style="list-style-type: none"> - All options proposed. - FCC selection of U.S. entity expected by July 1986.

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3. PROBLEM SUMMARY (CONT'D)

<u>Problem</u>	<u>Implications</u>	<u>Options</u>	<u>Action Taken</u>
17. Heavy work load prior to MSAT Multi-Year TB Submission in May and loss of key Program Office and Project Office personnel.	<ul style="list-style-type: none">- difficulty in preparation for TB Submission- late issue of contracts with technical development objectives not met- other program activities jeopardized by lack of PYs	<ul style="list-style-type: none">- immediate staffing of vacant positions- expedite contract requisition processing in DOC and DSS- obtain support from Telesat where feasible- seek secondments from other DOC areas for relief during transition period	<ul style="list-style-type: none">- all options

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4. RESOURCE SUMMARY

FY 85/86 - MSAT Phase C/D

Funds

Collator 5183
Title

	Project No.	Allotment	Outstanding Commitment \$K	Expenditure \$K	Free Uncommitted Balance \$K	FY 85/86 Estimated Expenditure \$K
MSAT Director	65700	630	74	603*	-47	662
MSAT Program - Management	65701	100	6	104	-10	110
MSAT Telesat Proposal	65705	120	85	19	+16	74
MSAT PLCP	65706	30	8	-	+22	8
MSAT Benefits	65707	295	63	240	-8	294
MSAT FREQ-COORD/Public Info	65708	100	39	62	-1	99
MSAT Spacecraft	65710	2460	1007	1513	-60	2520
MSAT Systems	65720	60	11	25	24	37
MSAT Ground	65730	645	261	287	97	548
MSAT Applied Research	65750	355	81	265	9	345
MSAT Project Management	65770	500	201	336	-37	536
TOTAL		5295	1836	3454	5	5233

* Includes \$340K for term salaries

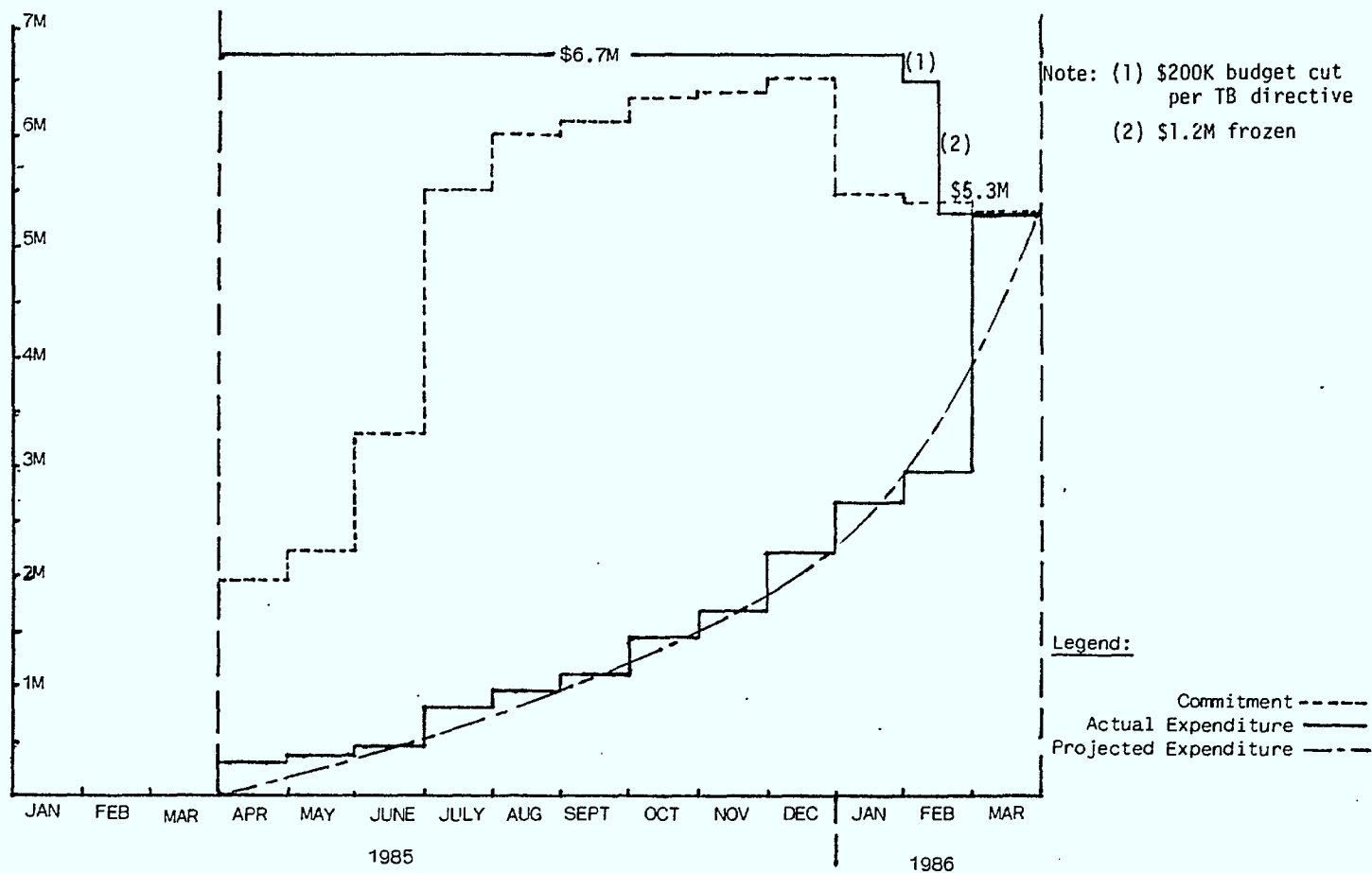
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MSAT PHASE C/D COMMITMENT AND EXPENDITURES



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STAFF

FY 85/86 Phase C/D Implementation

Total Person-Month Effort For - February/March 1986

	Actual (2 months)				Planned Allocation/Month			
	Indet.	Term	Contract	Total	Indet.	Term	Contract	Total
MSAT DIRECTOR	4.0	-	2.0	6.0	2.0	1		3.0
MSAT PROJECT Team	13.0(2)	2.3	2.75	17.75	2.0	5.0	2	9.0
MSAT PROGRAM Team	6.6(1)	8.0	2.0	16.6	3.0	6.0	1	10.0
TOTAL	23.6(1)	10.0	6.75	40.35	7.0	12.0	3	22.0
DOC DGSTA support (Part time)				14.2 (3)				

- Notes
1. Includes secondments with term backfill
 2. Includes 1.0PM of DGSTA and 4.0 PM of SSC support. Total DGSTA support for February/March was 15.2 PM. (See Note 3)
 3. Includes 2PM recovered from MSAT Program for J. Sydor.

The variation of Person-Month consumption with time, for MSAT Phase B is shown on the following graph.

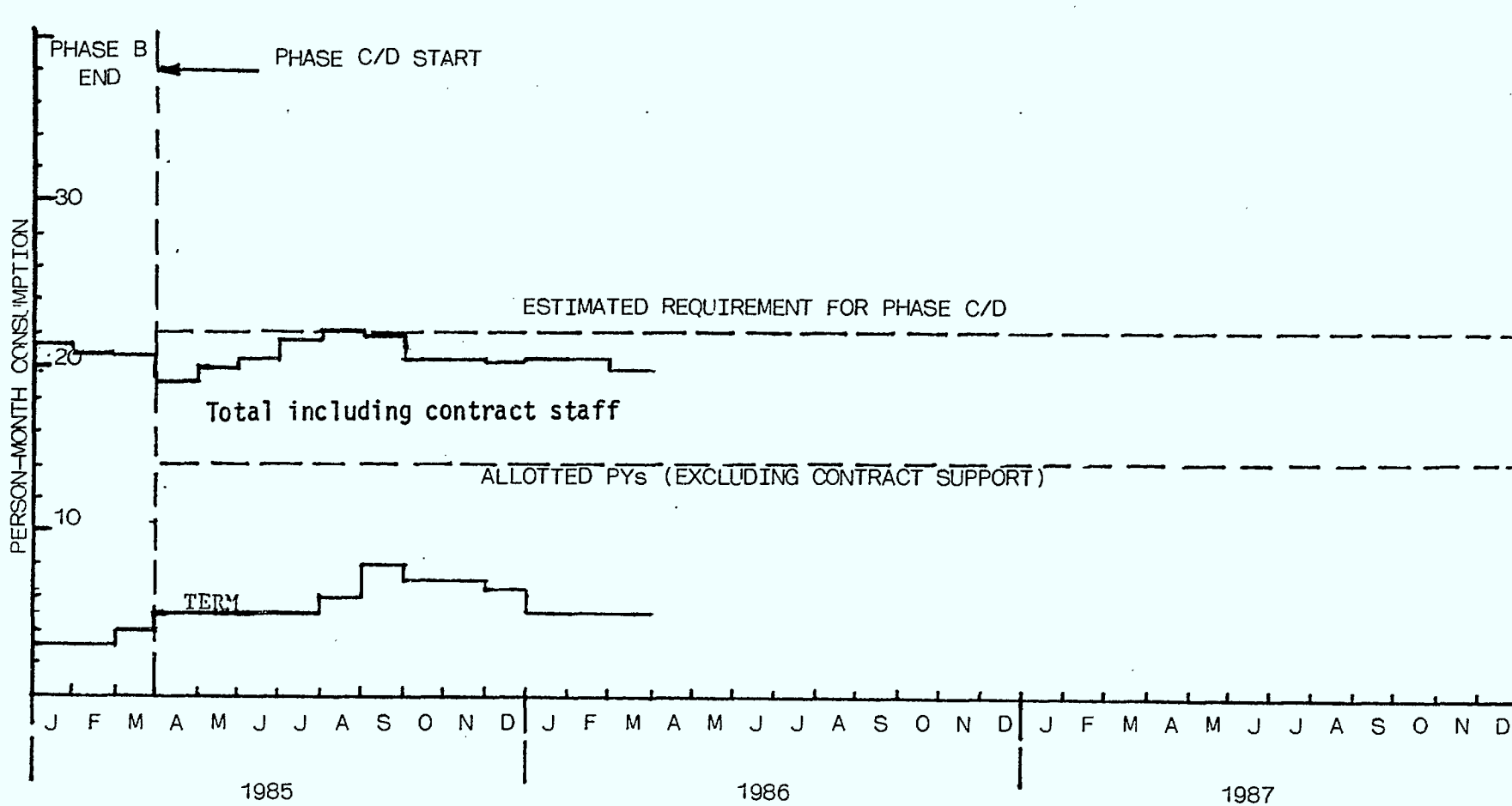
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MSAT PHASE C/D PROJECT PERSON-MONTH EFFORT



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5. Progress and Schedule Summary

This section provides an assessment of progress and schedule for individual work module elements as defined in the MSAT Phase C/D Project Brief.

An overview of progress against milestones is shown on the following graphs. The first shows major events and the remainder show milestones for each Work Module element. Progress made on these work module elements during February/March 1986 is described in the remainder of this section.

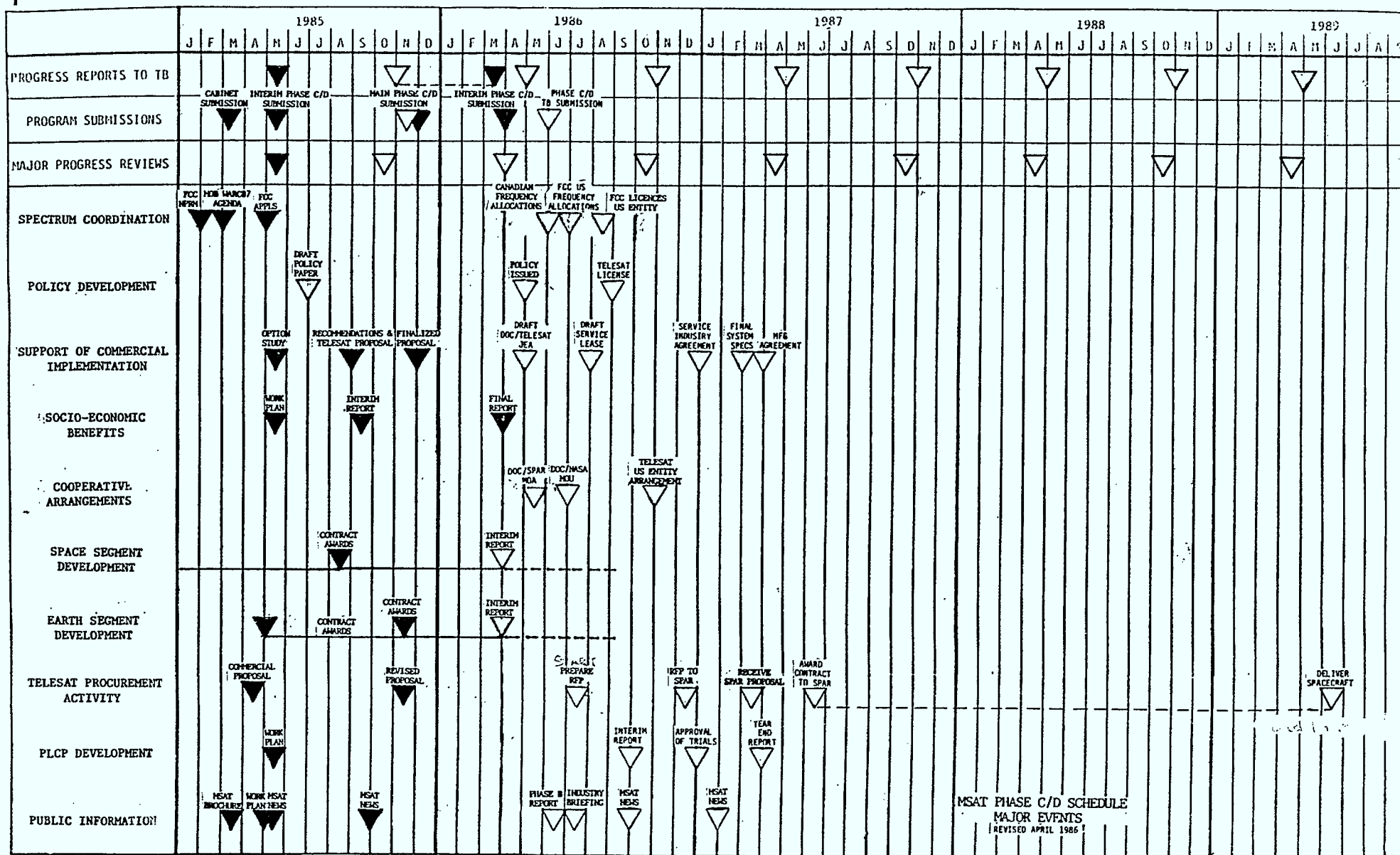
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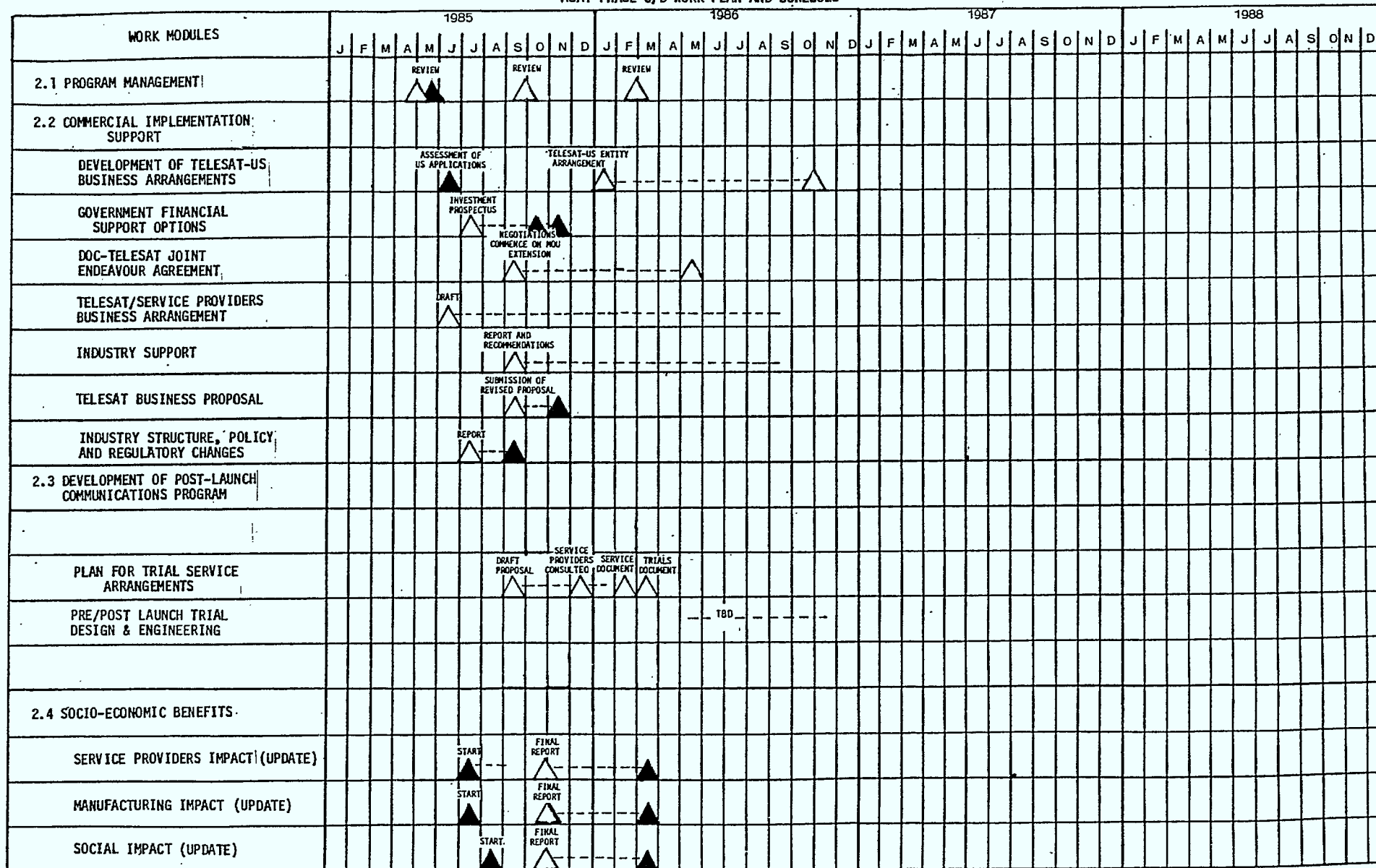
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MSAT PHASE C/D WORK PLAN AND SCHEDULE:



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MSAT PHASE C/D WORK PLAN AND SCHEDULE

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MSAT PHASE C/D WORK PLAN AND SCHEDULE

WORK MODULES	1985												1986												1987												1988													
	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D		
TELECOM CARRIERS																																																		
RADIO COMMON CARRIERS																																																		
INDUSTRIAL USERS																																																		
DOC-NASA																																																		
DOC/TELESAT/SPAR SENIOR MANAGEMENT																																																		
COMMITTEES																																																		
INTERDEPARTMENTAL PLANNING/IMPLEMENTATION																																																		
DOC POLICY STEERING																																																		
SPECTRUM COORDINATION																																																		
2.9 PROGRAM SUBMISSIONS																																																		
TB SEMI-ANNUAL PROGRESS REPORT																																																		
CABINET SUBMISSIONS (FOR MOSST SPACE PLAN)																																																		
TB SUBMISSIONS																																																		
2.10 PUBLIC INFORMATION																																																		
MSAT NEWS																																																		
EXHIBITS																																																		
INDUSTRY BRIEFING																																																		
PHASE B SUMMARY REPORT																																																		

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WORK MODULES

3.1 PROJECT MANAGEMENT:

TELESAT ENGINEERING SUPPORT

ESTEC

3.2 SYSTEMS SUPPORT

DAMA DEVELOPMENT AND SIMULATION

FREQUENCY CONTROL PLAN AND SIMULATION

COMMUNICATION SIMULATION AUGMENTATION

3.3 SPACE SEGMENT:

SPAR PHASE C

SPAR PHASE C/D

SPAR/AEROSPATIALE ANTENNA
STUDY

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MSAT PHASE C/D WORK PLAN AND SCHEDULE

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WM 2.0 MSAT PROGRAM DEVELOPMENT

WM 2.1 Program Management

Delays in a final Cabinet decision on MSAT government support and resolution of spectrum allocation and coordination issues introduced significant delays in many MSAT Program activities in FY 1985/86. However, a number of important program aspects were developed and finalized. A cooperative dialogue between DOC, Telesat and the Canadian financial community resulted in a much improved Telesat Business Proposal based on 100% private sector capitalization, improved commercial viability and greater overall benefits to Canada.

The DOC MSAT submission was incorporated in the MOSST Long Term Space Plan submission to Cabinet and final program approval is expected in early FY 1986-87.

DOC-FCC discussions on Mobile Satellite Systems (MSS) spectrum allocations continued throughout FY 1986/87. DOC and Telesat have combined effectively to oppose the FCC preference for an MSS spectrum allocation at L-band only. This issue has yet to be resolved and remains critical. Canada continues to hold a firm position for an 800 MHz spectrum allocation for MSS, as well as L band.

Several key staff positions remain to be filled but are hampered by the staffing freeze, inadequate PYs, and lack of flexibility in contracting.,

WM 2.2 Commercial Implementation Support

During 1985/86 the computerized economic model for measuring the financial impact of MSAT on Telesat, became fully operational and results of a number of runs were presented to DOC management. This model assesses the financial attractiveness of MSAT to potential investors and identifies the magnitude, type and timing of required financing. It also determines the financial impact of various forms of government assistance and provides a basis for analyzing the potential risk to government. This economic model will be helpful in future discussions with Telesat and potential investors, and can be useful in assessing the impact of changes in key study assumptions.

WM 2.3 Post-Launch Communications Program

Potential participants having been identified and the basic trial format defined further PLCP activities were suspended pending a final Cabinet decision on the amount and form of government support. Following Treasury Board approval of the multi-year MSAT Implementation Phase (C/D) submission, detailed trial definition and implementation plans will be completed, particularly for pre launch trials at L band, which could be initiated soon.

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WM 2.4 Benefits and Industry Development

All final reports or draft final reports have been received on 1985-86 contractual activities. Since completion of the original systems studies, two key system changes have resulted in improved socio-economic benefits to Canada. These were the introduction of a dual-band system concept providing services at UHF and L-Band and an increase in expected satellite operational life from 7 years to 10 years. These improved results were incorporated into the DOC MSAT submission included in the MOSST Long Term Space Plan submissions to Cabinet.

WM 2.5 Policy Development

The final draft of the Canadian Telecommunications Policy document is available within the Department but its issue has been withheld pending final Cabinet program approval and successful conclusion of the DOC-FCC bilateral spectrum negotiations.

WM 2.6 Frequency Coordination

DOC-FCC spectrum coordination activities intensified toward the latter part of 1985-87, culminating in the Niagara IV meeting in Washington D.C. in March 1986. At the end of March 1986, Canadian and U.S. positions on MSS spectrum allocations remained some distance apart. Canada maintained a firm position on a dual-band allocation at 800 MHz and L-Band with 2 plus 2 MHz minimum for Canada at 800 MHz; the FCC preferred an L-Band allocation only. The Canadian position for an MSS allocation at L-Band is being prepared for consideration at WARC 87. The DOC-FCC spectrum issue is currently the most critical program issue.

WM 2.7 Management of Cooperative Arrangements

All planned cooperative arrangements with both domestic and U.S. entities (i.e. Telesat, NASA etc.) are on hold pending final Cabinet approval on MSAT and resolution of frequency coordination issues. Drafting of the Joint Endeavour Agreement with Telesat has begun.

WM 2.8 MSAT Working Groups and Committees

During the early part of 1985-86 Working Group and Committee continued actively. In the latter part of the year, all such activities were suspended in order to focus the needed effort on the MSAT Space Plan Submission. Numerous ad hoc meetings took place concerning spectrum allocation issues.

WM 2.9 Program Submissions

The MSAT Multi-Year submission was incorporated in the MOSST Long Term Space Plan submission to Cabinet in December 1985. Delay in Cabinet decision necessitated an Interim Submission to Treasury Board requesting release of \$1.2M of previously approved funds. A favourable TB decision is expected in early April 1986. The major MSAT Multi-Year submission to Treasury Board is in preparation and a draft Project Brief will be completed in early April. Final submission to Treasury Board is scheduled for the end of May 1986.

WM 2.10 Public Information

During 1985-86, public information activities resulted in greater awareness of MSAT in both the public and private sectors. The general public, potential users, manufacturers, service providers and investors were exposed to MSAT through the many MSAT exhibits attended as well as the distribution of newsletters, publication and promotional material, and by conference papers presented.

WM 3.0 MSAT Technology Development**WM 3.1 Project Management**

During 1985-86, DGSTA continued work in response to the Support Statement of Requirements (SOR) to meet the MSAT requirements. This work was performed primarily in the area of Applied Research.

Due to the staffing freeze, the MSAT Project Manager support staff were lost. Progress on all urgent contractual action virtually halted due to the TB freeze on discretionary spending. This has resulted in long delays in the production of required reports and program documentation.

WM 3.2 System Engineering Support

Telesat presented a briefing on Task 19, MSAT DAMA, and Task 22, UHF round Terminals on 18 March 1986. Most of the tasks under the Telesat Engineering Support contract have now been completed satisfactorily. The L-Band study is to continue into FY 86/87. This revised contract should be in place in early April. A briefing on shadowing and margins was presented to the FCC, Telesat and DOC senior management on 27 March 1986. This presentation outlined the Canadian position on the use of UHF in relation to L-Band.

As with other Project Office activities, all contract work was suspended effective 31 March 1986, pending approval of the MSAT \$1.2M interim submission by TB.

WM 3.3 Space Technology Development

During the year, Spar's system work concentrated on development of the 2 UHF plus 4 L-Band beam configuration for North America. Present design estimates would serve 35,000 UHF users and 25,000 L-Band users, based on a satellite EIRP of 26.51 dBw and 28.5 dBw respectively. Spar fabricated the feeds for the Aerospatiale antenna tests and the feeds were tested at DLF. Aerospatiale has fabricated the 5M reflector and will test in April/May. The antenna and passive intermodulation tests are scheduled for June/July 1986 in France.

Work at COMDEV continued on diplexer and antenna feed development. It has been generally concluded that rigid reflector antennas are preferable for the MSAT application.

All major contract work was suspended as of the end of 31 March 1986, as no approved MSAT funds were available as of 1 April 1986, pending approval of an interim TB MSAT submission.

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WM 3.4 Earth Segment Technology Development

Due to lack of approved MSAT funds being available on 1 April 1986, stop work orders, effective 31 March, were issued to all three ground segment contractors. With funding approved, contractors will commence work establishing new schedules and submit invoices to cover standby and strategy costs. The stop work orders have reduced the contractor's enthusiasm for the MSAT project and it will be difficult to re-establish the previous working relationship.

A market survey questionnaire for the Paging Terminals were mailed to 115 potential service providers. However, due to the stop work order which is now common knowledge in the industry, a minimum response is expected.

Six prototype DMSK modems plus the final test report under the Mobile Data Service Terminal contract were delivered just prior to the stop work order. A set of these modems were forwarded to Bristol Aerospace for use on their DACS and DAS contract.

Bristol Aerospace have developed a business and market plan under the DACS and DAS contract. The contractor had planned to bring a prototype to CRC for test on the CRC simulator and DMSK demodulator. However, due to the stop work order this will be considerably delayed.

Negotiations with Glenayre on the ACSSB and the LPC Terminal contracts has ben suspended pending approval of the MSAT \$1.2M Interim Submission by TB.

WM 3.5 Applied Research

The development of the link simulator has been of major assistance in evaluation of various system configurations and components and, will continue to be of MSAT program importance in future engineering evaluations.

Major progress was made on ACSSB Radio Development at CRC. The McGeehan ACSSB Board contract was successfully completed as final delivery and testing was completed and all documentation provided. In-house ACSSB terminal developments have been proceeding very well with a unit being assembled for demonstration purposes which should be ready in early 1986-87.

All contracts were completed to satisfaction and good in-house progress was reported on the UHF Power Amplifier, phase noise simulator, dual modulation for antenna diversity and in other related areas. However, some work has been held up or delayed due to the spending freeze and pending TB approval of the MSAT Interim submission, now expected in early 1986-87.

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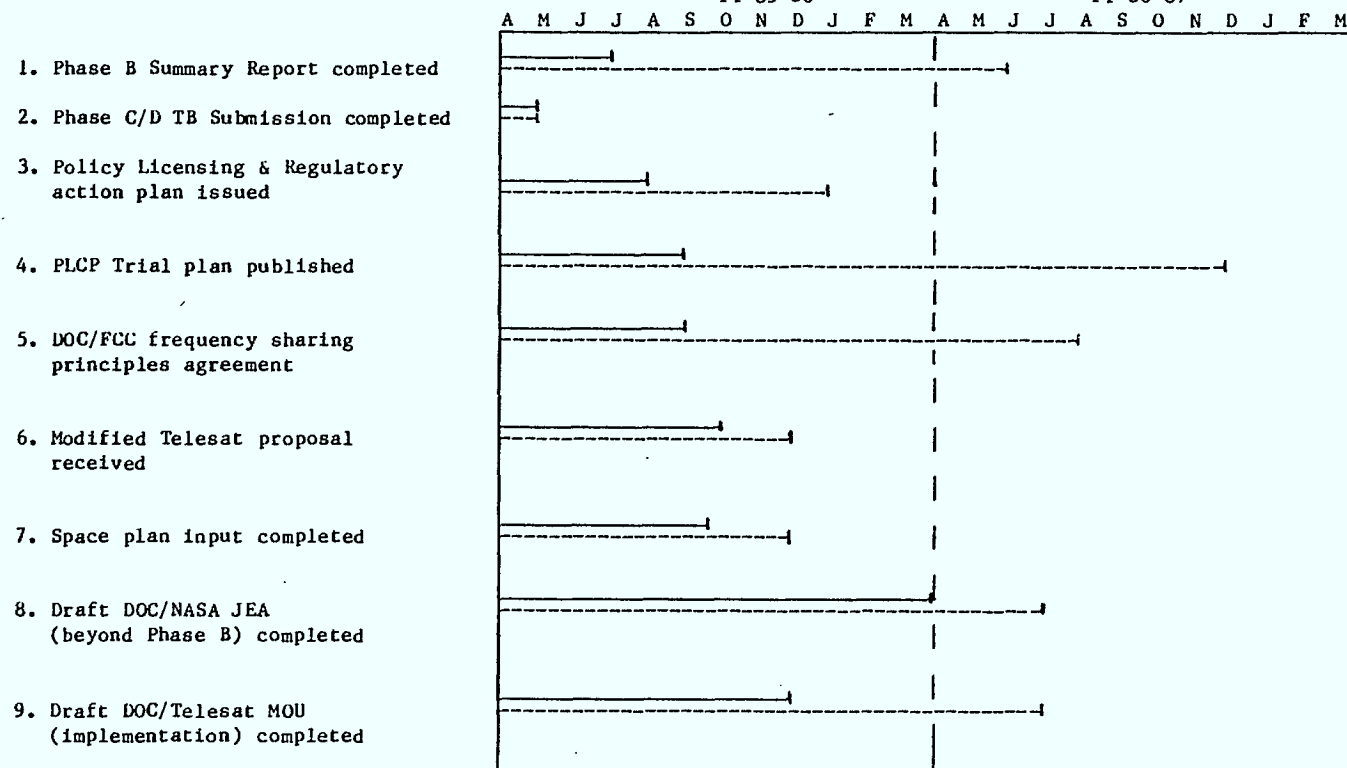
FY 85-86 VARIANCE REPORT

MSAT PHASE C/D PROGRAM DEVELOPMENT

MILESTONES

SCHEDULE
FY 85-86

FY 86-87



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FY 85-86 VARIANCE REPORT

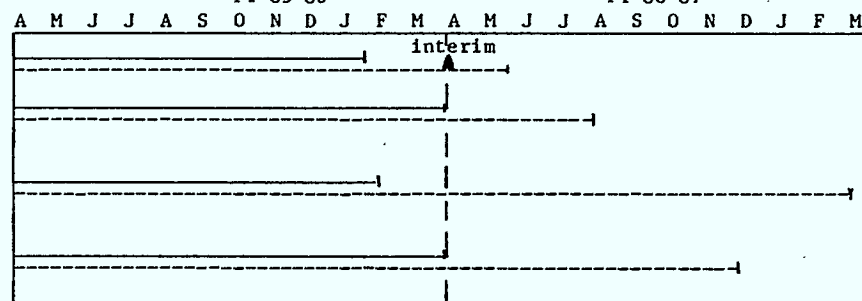
MSAT PHASE C/D PROGRAM DEVELOPMENT

MILESTONES

SCHEDULE
FY 85-86

FY 86-87

10. TB Submission for FY 86/87 funds
11. Applications of Telesat license submitted
12. Canadian industry agreements reached
13. U.S. industry agreements reached



— Proposed schedule
- - - Actual completion

COMMENTS

1. Higher priorities caused the delay in the Phase B Summary Report.
 4. The PLCP Trial Plan was not completed due to the delay of Cabinet's decision on the Long Range Space Plan.
 5. No FCC/DOC agreement can be made until the FCC decides on domestic allocation of spectrum.
 8. The DOC/NASA MOU is governed by the frequency allocation issue in both Canada and the U.S.A. and by funding availability in the Space Plan decision.
 9. 11. 12. 13.
- All these projects have been delayed while waiting for final government support to the program, and/or final domestic frequency allocation decisions and/or completed sharing agreements with the U.S.A.
13. Four preliminary agreements have already been executed between Telesat and the U.S. applicants.

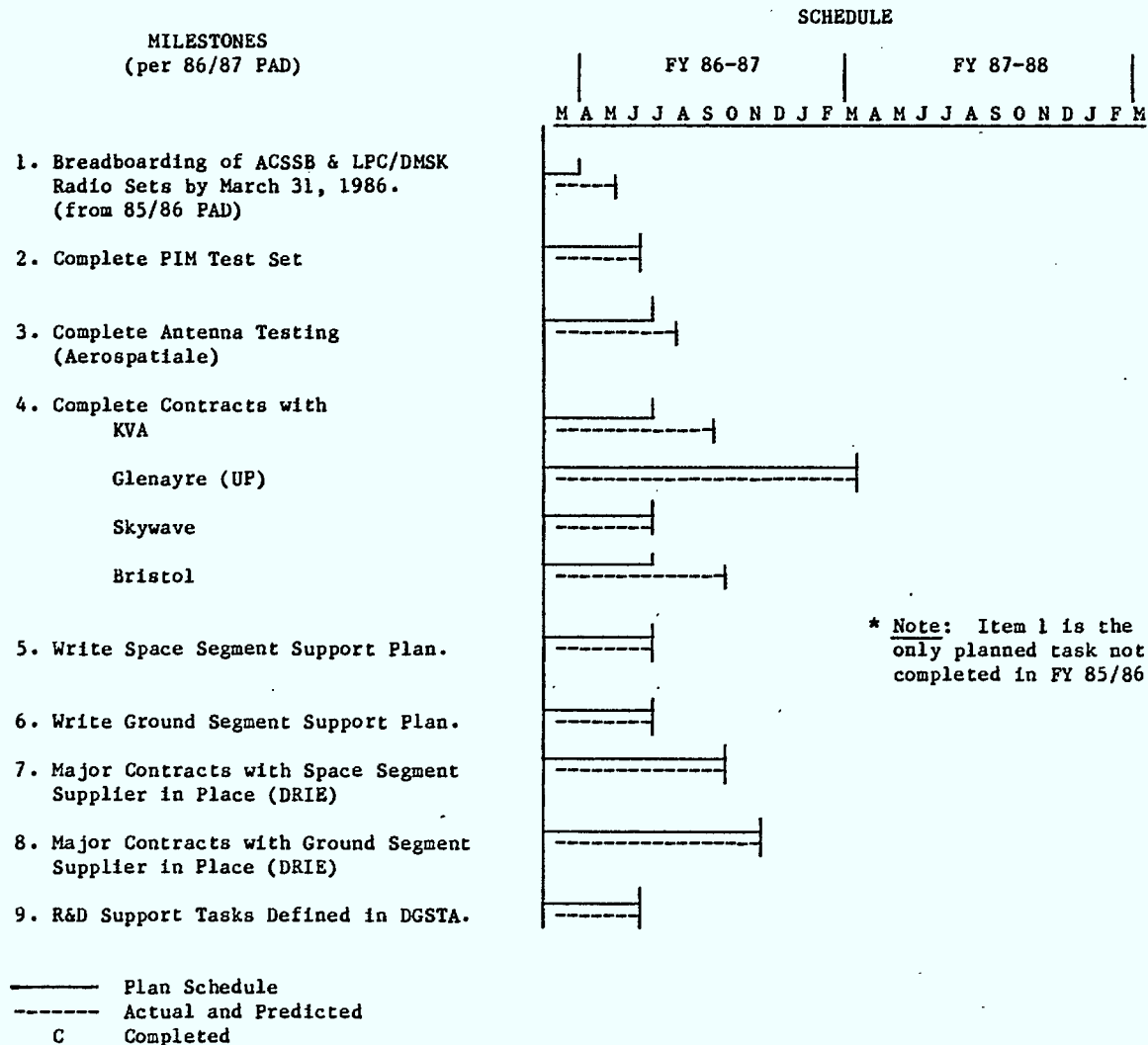
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D. Athanassiadis

DSL

DEB

J. Almond/Telesat

M. Zuliani/Telesat

E. Thompson/Telesat

PIC Members

PHASE C/D EXPENDITURES BY WORK MODULE

WM	Item	FY85/86 (Estimated) (000s)
1.0	<u>DIRECTOR</u>	
	DSS Contract Fees	130
	Term Salaries	290
	Contract Salaries	85
	Misc.	125
	Sub Total	630
2.0	<u>PROGRAM DEVELOPMENT</u>	
	Management	100
	Commercial Implementation	120
	PLCP	30
	Socio-Economic	295
	Public Information	100
	Sub Total	645
3.	<u>PROJECT DEVELOPMENT</u>	
	Space Segment	2460
	System Support	60
	Ground Segment	645
	Applied Research	355
	Management & Technical Support	500
	Sub Total	4020
	TOTAL	5295

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MSAT CONTRACT PLAN

ITEM	FY 85/86		LATER FYs	SOURCE	PROV.	NOTES/COMMENTS
	PRIORITY 1	PRIORITY 2				
DIRECTOR 65700	630					
65701-65708 PROGRAM	645					
65710 SPACE SEGMENT	2460	750				
65720 SYSTEM SUPPORT	60	350				
65730 GROUND SEGMENT	645	275				
65750 APPLIED RESEARCH	355	70				
65770 PROJECT MANAGEMENT	500	100				
TOTALS	5295	1545				

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MSAT CONTRACT PLAN

DIRECTOR 5183-65700

ITEM	FY 85/86		LATER FYs	SOURCE	PROV.	CONTRACT STATUS	NOTES/COMMENTS
	PRIORITY 1	PRIORITY 2					
CONTRACT SUPPORT	85			ADGA/ SHARON	ONT.	CONTRACT IN PLACE	
OFFICE SYSTEMS EQUIPMENT	92			CANADIAN COMPANIES		COMPLETED	
DSS FEES	130						
TERM SALARIES	290						
TEMPORARY HELP, TRAVEL, PRINTING, MISC.	33						
TOTAL	630						

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MSAT CONTRACT PLAN

PROGRAM 65701-65708

ITEM	FY 85/86		LATER FYs	SOURCE	PROV.	CONTRACT STATUS	NOTES/COMMENTS
	PRIORITY 1	PRIORITY 2					
MSAT BUSINESS PROPOSAL	120			TELESAT	ONT.	COMPLETED	
SERVICE PROVIDER IMPACT	20			KVA	ONT.	COMPLETED	UPDATE OF PHASE B CONTRACT RESULTS.(SEPARATE CONTRACT, SAME CONTRACTOR)
MANUFACTURING IMPACT STUDY	30			WOODS GORDON	ONT.	COMPLETED	UPDATE OF PHASE B CONTRACT RESULTS.(SEPARATE CONTRACT, SAME CONTRACTOR)
SOCIAL IMPACT STUDY	10			WESCOM	B.C.	COMPLETED	UPDATE OF PHASE B CONTRACT RESULTS.(SEPARATE CONTRACT, SAME CONTRACTOR)
OVERALL SOCIO-ECONOMIC STUDY	100			ECONANALYSIS ECONOSULT	ONT. QUE.	COMPLETED	UPDATE OF PHASE B CONTRACT RESULTS AND EXAMINE TAX IMPLICATIONS.(SEP.CONT,SAME CONTRACTOR)
PUBLIC INFORMATION CONTRACTS	100			CANADIAN COMPANIES		COMPLETED	
PROGRAM MANAGEMENT CASUAL SUPPORT, TRAVEL, PRINTING, MISC.	100						
AIRPHONE MARKET STUDY	25			SKYTEL		CONTRACT IN PLACE	
INSTITUTIONAL/REGULATORY ANALYSIS	15			D. FORD ASSO.	ONT.	COMPLETED	
TELCO IMPACT STUDY	80			TELECOM CANADA	ONT.	COMPLETED	
<u>TOTALS</u>	645						

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MSAT CONTRACT PLAN

ITEM	FY 85/86		LATER FYs	SOURCE	PROV.	CONTRACTS(S) STATUS	NOTES/COMMENTS
	PRIORITY 1	PRIORITY 2					
SPACE SEGMENT 65710							
SPAR PHASE C/D	1170	350		SPAR	QUE.	CONTRACT IN PLACE	
SPAR/AEROSPATIALE	606	200		SPAR/ AEROSPATIALE	QUE./ FRANCE	CONTRACT IN PLACE	\$250K TO AEROSPATIALE (NO SPAR MARKUP)
PIM TEST FACILITY	289	100		CANADIAN COMPANIES		COMPLETED	
ALTERNATE PAYLOAD DEVELOPMENT	395	100		COMDEV	ONT.	CONTRACT IN PLACE	
TOTALS 65710	2460	750					
SYSTEM SUPPORT 65720							
COMMUNICATIONS SIMULATION AUGMENTATION	13	50		CANADIAN COMPANIES		CONTRACTS IN PLACE	HARDWARE
PHASE NOISE SIMULATOR	17			CANADIAN COMPANIES		CONTRACTS IN PLACE	HARDWARE
DAMA SIMULATION DEVELOPMENT		125					
FREQUENCY CONTROL PLAN & SIMULATION	30	175					
TOTALS 65720	60	350					

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MSAT CONTRACT PLAN

ITEM	FY 85/86		LATER FYs	SOURCE	PROVINCE	CONTRACT STATUS	NOTES/COMMENTS
	PRIORITY 1	PRIORITY 2					
GROUND SEGMENT 65730							
VOICE QUALITY STUDY	71	50		BNR	ONT.	COMPLETED	EXISTING CONTRACT
ROAD VEHICLE ANTENNA HI-GAIN	270	50		CMC COMDEV	ONT.	COMPLETED	PHASE I \$132K. ON COMPLETION OF PHASE I, PHASE II WILL BE IMPLEMENTED AT COST OF \$138K
GROUND SEGMENT DEVELOPMENT			MODELS AT L-BAND	COMPETITIVE BIDS		AWAITING PROGRAM APPROVAL	DEVELOPMENT OF LPC & ACSSB PROTOTYPE VOICE TERMINALS
DATA TERMINAL DEVELOPMENT	117	175		COMPETITIVE BIDS		CONTRACTS IN PLACE	3 TERMINALS: MOBILE DATA, PAGING AND DACS
MCGEERAN ACSSB BOARDS	72			MCGEERAN	ENGLAND	COMPLETED	EXISTING CONTRACT
RADIOS FOR EVALUATION AND DEMONSTRATION	115					REQUISITIONS SUBMITTED	HARDWARE
TOTALS 65730	645	275					
APPLIED RESEARCH 65750							
IN-HOUSE ANTENNA DEVELOPMENT AND TEST	100	70				\$100K FOR CRC LAB EQUIPMENT	R. MILNE PRESENTATION TO INDUSTRY IN MID-JULY FOR TRANSFER OF TECHNOLOGY
MOBILE TEST PLATFORM	18					COMPLETED	

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MSAT CONTRACT PLAN

ITEM	FY 85/86		LATER FYs	SOURCE	PROV.	CONTRACT STATUS	NOTES AND COMMENTS
	PRIORITY 1	PRIORITY 2					
DIGITAL TERMINAL DEVELOPMENT (PARTS)	74						HARDWARE
DIGITAL TERMINAL DEVELOPMENT (CONTRACT)	35			SIMON FRASER UNIVERSITY	B.C.	COMPLETED	
LPC RADIO ENCRYPTION	37			UNIVERSITY OF WATERLOO	ONT.	COMPLETED	
ACSSB TERMINAL DEVELOPMENT	85						HARDWARE
ANTENNA ROAD TESTING	6						REQUIREMENT TBD
TOTALS 65750	355	70					
PROJECT MANAGEMENT 65770							
TELESAT ENGINEERING SUPPORT	464	100		TELESAT	ONT.	COMPLETED	INCLUDES FCC PROPOSAL EVALUATION EXISTING CONTRACT FOR \$120K FROM PHASE B
ESA/ESTEC SUPPORT	3			ESTEC	EUROPE	COMPLETED	EXTENSION OF EXISTING CONTRACT
TRAVEL, PRINTING, MISC. CASUAL TEMP. SUPPORT	33						
TOTALS 65770	500	100					

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ANNEX B

4. RESOURCE SUMMARY

Funds

FY 80/81 - Phase A Studies

Title	Project No.	Allotment	O/S Commitment	Expenditure	Free Balance
MSAT Project Studies	4726-65605	430,000.		430,000.	
MSAT Program Studies	4182-37310	70,000.		70,000.	

FY81/82 - Phase A Studies

Title	Project No.	Allotment	O/S Commitment	Expenditure	Free Uncommitted Balance
MSAT Project Studies	4726-65605	1,274,760.	0	1,221,228.	
NIP (MSAT related items)	4458-37170	58,339.	0	53,300.	
ARAD (MSAT related items)	4458-37170	920,000.	0	805,000.	
MSAT Program Studies	4182-37310	340,000.	1,800.07	344,929.62	-4,929.62*
Term Salaries (3PY)		85,240.		85,240.	

Total MSAT Phase A Allocation\$2,200,000.

* covered by surplus in MSAT Project Studies

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ANNEX C

RESOURCE SUMMARY

FY 82/83 - Phase B Studies

Funds

Collator 5182 NCRFS Data

	Project No.	Allotment	Outstanding Commitment \$K	Expenditure \$K	Free Uncommitted Balance \$K	FY83/84 Estimated Expenditure \$K
MSAT Director	65700	910*		682*	228	658
MSAT Project - Spacecraft	65710	4360		2703	1657	2646
MSAT Project - Systems	65720	680		152	528	152
MSAT Project - Ground	65730	415		4	411	61
MSAT Project Product & Assurance	65740					
MSAT Project Technology development	65750	420		37	383	57
MSAT Project Management	65770	465		113	352	129
MSAT Program Management	65701	30		81	-51	67
MSAT Program Commercial Viability	65702	480		25	455	25
MSAT Program Communications Prog. & Policy	65703	130		50	80	50
MSAT Program Development	65704	110**		48	62	55
TOTAL DOC		8000**		3895	4105	3900

Collator 0870

MSAT EHF Space Segment - Comm.	65760	285	130.0	155.	0
MSAT EHF RF	65761	110	3.0	107.	0
MSAT EHF Space Segment TTCC	65762	105	105.0	0.	0
MSAT EHF Ground Control TTCC	65763	65	0.	0.	65
MSAT EHF System Engineering	65764	60	0.	0.	60
MSAT EHF Management	65765	75	0.	11.	64
TOTAL UND		700	238.	273.	189

* Includes \$380K for term salaries

** Includes \$37.5K transfer to D6IS

See Annex A for MSAT Phase B fund allocations by work plan and year.

*** FY82/83 Allotment to be reduced from \$8M to 3.9M by cash flow change Submission to TB in June 1983.

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APPENDIX D

4. RESOURCE SUMMARY

FY 83/84 - Phase B Studies

Funds

Collator 5182 Title	Project No.	Allotment	Outstanding Commitment \$K	Expenditure \$K	Free Uncommitted Balance \$K
MSAT Director	65700	707*	0	799	-92
MSAT Project - Spacecraft	65710	4912	0	4864	48
MSAT Project - Systems	65720	338	0	315	23
MSAT Project - Ground	65730	1244	0	1234	10
MSAT Project Product & Assurance	65740				
MSAT Project Technology development	65750	130	0	129	1
MSAT Project Management	65770	412	0	424	-12
MSAT Program Management	65701	103	0	114	-11
MSAT Program Commercial Viability	65702	1180		1151	29
MSAT Program Communications Prog. & Policy	65703	32	0	32	0
MSAT Program Development	65704	92	0	88	4
TOTAL DOC		9150**	0	9150	0

* Includes \$420K for term salaries. This was underspent by 71K

** Of the original \$9.6M allocation, \$450 was rolled over to FY 84/85.

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4. RESOURCE SUMMARY

FY 84/85 - Phase B Studies

ANNEX E

Funds

Collator 5182
Title

	Project No.	Allotment	Outstanding Commitment \$K	Expenditure \$K	Free Uncommitted Balance \$K
MSAT Director	65700	363*		433*	-77
MSAT Program - management	65701	100		121	-23
MSAT Program Commercial Viability	65702	957		714	233
MSAT Program Communications Prog. & Policy	65703				
MSAT Program Development	65704	25		42	-17
MSAT Project - Spacecraft	65710	1746		2066	-320
MSAT Project - Systems	65720	282		286	-6
MSAT Project - Ground	65730	588		435	148
MSAT Project - Technology Development	65740			91	-91
MSAT Project Management	65770	289		136	153
TOTAL DOC		4350	0	4350	0

* Includes \$220K for term salaries

See Annex A for MSAT Phase B fund allocations by work plan year

See Annexes, for financial resource summaries of previous FYs.

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4. RESOURCE SUMMARY

FY 84/85 - Bridging Phase

Funds

Collator 5183 Title	Project No.	Allotment	Outstanding Commitment \$K	Expenditure \$K	Free Uncommitted Balance \$K	FY 84/85 Estimated Expenditure \$K
MSAT Director	65700	310	2	214*	94	10
MSAT Program - Management	65701	40	1		39	
MSAT Telesat Proposal	65705	340			340	
MSAT PLCP	65706	50			50	
MSAT Benefits	65707	80			80	
MSAT FREQ-COORD/Public Info	65708	90			90	
MSAT Spacecraft	65710	1005			1005	
MSAT Systems	65720	200	2	2	196	
MSAT Ground	65730	515			515	
MSAT Applied Research	65750	250		40	210	
MSAT Project Management	65770	20		6	14	
		2900	5	262(1)	2633	10

* Includes \$200K for term salaries

(1) \$262K expenditure, \$52K to be charged to collator 5182



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