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CONCEPTUAL DESIGN STUDY
SCIENCE AND APPLICATIONS SPACE PLATFORM (SASP)
VOLUME III PROGRAMMATICS, COST AND SCHEDULE REPORT

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PREFACE

This document (Volume III, Programmatics, Cost and Schedules Report) contains material prepared by McDonnell Douglas Astronautics Company on the Conceptual Design Study of a Science and Applications Space Platform (SASP); as defined in the Statement of Work for Contract NAS8-33592 by Marshall Space Flight Center, where the contact is:

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NOTE: Volumes I and II are Executive Summary, and Technical Report, respectively.

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INTRODUCTION

Starting in the mid-1980s, platforms in low-earth orbit will provide highly beneficial and adaptable accommodations for a great variety of science and applications payloads.

This document contains the results of a one-year Phase A concept study of such a platform (attached to a Power System) conducted for NASA/Marshall Space Flight Center by the McDonnell Douglas Astronautics Company-Huntington Beach.

The platform configuration conceived in this study consists of a two-part evolution as shown in Figure A. The first order platform consists of minor appendages to the Power System for improved payload viewing, whereas, the second order platform is designed to accommodate more and larger payloads.

The platform design philosophy is as follows:

- Provide a highly-modular system for:
  - low cost initial utilization with extended-duration spacelab payloads
  - conservative escalation of mission capability
  - flexible adaptation to the great variety of payload sizes, groups and orbits being planned.
- Maximize payload integration simplicity and flexibility of platform use.
- Optimize division of labor between platforms, Power System and payloads.

Such a long duration, multipayload, free-flight platform will not only be beneficial to many payloads, but also to certain overloaded mission support elements such as data relay satellites. Figure B illustrates the modular elements of the platform system.

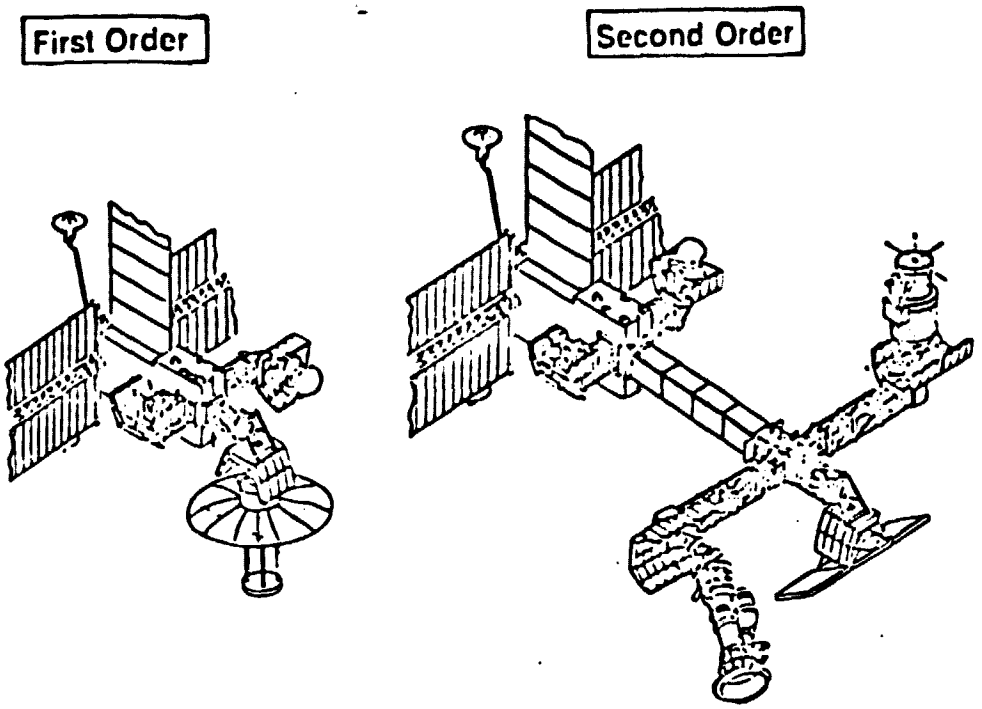

FIGURE A

EVOLUTIONARY PLATFORM CONCEPT

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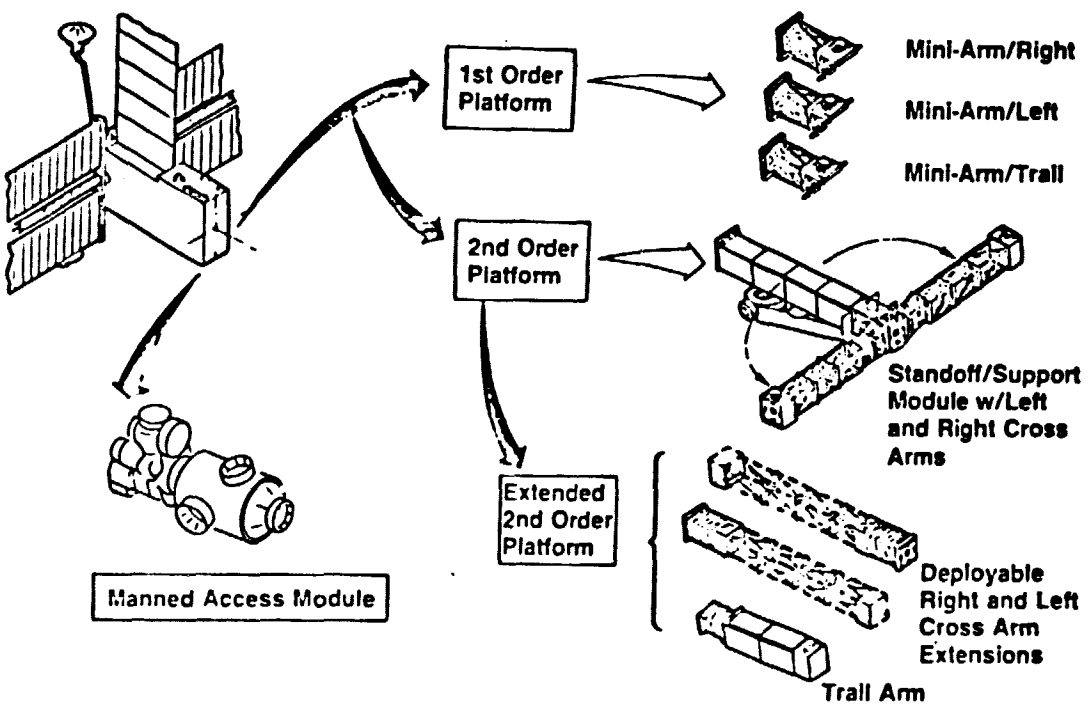


FIGURE B

PLATFORM PARTS CATALOG

Payloads which will particulary benefit from platform flight include the following:

- Payloads which have similar orbit altitude and inclination requirements.
- Payload whose budgets preclude investment in dedicated free-flyers.
- Payloads which have previously flown on Spacelab pallets for short durations in the Shuttle sortie mode and desire long duration flight, a more benign environment than Shuttle and minimal transition for payloads and their original pallet installation.
- Payloads whose flight durations are in a range of a few months to a few years, or those requiring periodic earth return, on-orbit modification, maintenance or replenishment; wherein, costs of dedicated spacecraft and multi-rendezvous Shuttle services would be prohibitive for solo-flown payloads.
- Payloads which when grouped for maximum synergism are of significant size and constitute a multi-Shuttle delivery operation and thus, require a centralized orbit rendezvous, assembly and resource facility.

In general, the platform provides economics for the payloads community by virtue of (1) the centralized provision of resources, (2) long-term availability as a "rental" facility for long or short-term users, and (3) a single orbital address for Shuttle to support a number of payloads as opposed to the multiple rendezvous prospects of separate spacecraft per payload.

Although the platform has a broad spectrum of potential utilization, it is not generally conceived as a vehicle for those payloads which have extremely unique orbits or payloads which would have or create untenable interfaces with the platform by virtue of physical or operating features or sensitivities.

This Phase A study followed and capitalized on an extensive Pre-Phase A study by NASA in-house at MSFC, and also paralleled a major portion of a TRW study of platform payload prospects.

The overall objectives and flow of the study covered in this document are shown in Figures C and D; the latter expanded in a detailed task flow in Appendix A at the end of this document.

The overall conclusions of the study are as follows:

- The platform configuration shown in Figure A can effectively support from 80-85% of the NASA/OSS and OSTA payloads planned for the mid-to-late eighties from a performance standpoint (earlier NASA programmatics analyses indicated considerable cost benefits for payloads with the platform mode versus dedicated free-flyers for each payload).
- The modularity shape and size of the recommended platform concept offers:
  - a low-investment, early capability option to demonstrate system performance
  - flexibility for conservative growth as needs or funds permit
  - adaptability in configuration arrangement to a great variety of multi-discipline, dedicated discipline, or application modes.
  - good dispersion and viewing freedom for payloads up to 12 meters in length.
- The subsystem approaches recommended are based on a logical and cost-effective distribution of labor among payloads, platform, and the Power System.
- Although most candidate payload definitions/requirements are currently sketchy, the great number and diversity of payloads (50-60) accommodated by the recommended platform concept constitute a sound basis for the concept.

- Develop Concept for a Long Duration Free-Flight Platform In Low Earth Orbit to Provide:
  - Effective Accommodations for a Broad Variety of Payloads
  - Flexibility for Dedicated or Multi-Discipline Payload Groups Which Have Large Differences in Size and Schedule
  - Capabilities That Extend and Complement Those of the Power System
  - Routine, Dedicated Use of Orbiter for Delivery, Revisit and Exchange
- Capitalize on OSS and OSTA Payload Definitions, Updated User Inputs, the Prior MSFC In-House Study and the Concurrent Payload Assessment Study

FIGURE C STUDY OBJECTIVES

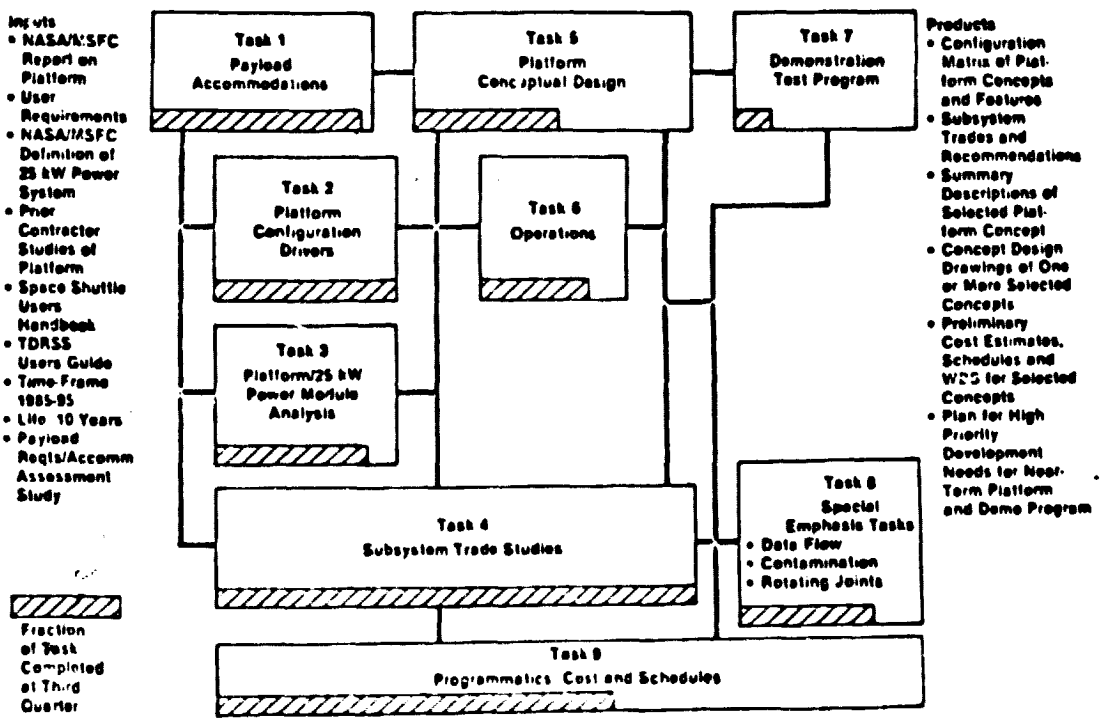


FIGURE D STUDY TASK FLOW

- The T-bar and cruciform configurations inherent in the recommended platform, with rotary joints on each leg, provide very good viewing, separation, and loading features for payloads.
- Deployable structures offer stowage compaction advantages for long arms but structural modelling for analysis and development testing is required.
- Stabilization of 1.5 arc seconds can probably be achieved with an instrument pointing system for payloads with platform structure selected.
- The impacts of transition of Spacelab sortie payloads to platform flight can be kept to a minimum.
- Shuttle RMS support of platform deployment and loading requires a special berthing arm for the extended span reaches involved or RMS relocation.
- The reference Power System used in the study fulfills most platform/payload requirements but numerous minor changes are required.
- A thirty six months program from ATP to first launch is feasible for the first order platform and forty two month duration for the second order.
- The study raised many design, operational and programmatic issues which require more detailed analysis in the future to better address (1) the emerging interface definition needs of the recently-initiated Phase B Power System study and (2) the accommodation needs of representative mission scenarios, recently outlined in the companion TRW study.

From a payload standpoint, therefore, the prospects of flying on first and second order versions of a platform, offer a beneficial progression of orbital accommodations after Spacelab flights, as indicated in Figure E. This escalating capability provides an effective combination of a minimal impact, major improvement in payload accommodations, long-duration unmanned flight, increasing-separation of payloads, provision of man for activation, loading and servicing, centralized, extensive resources, and periodic, single-destination use of Shuttle all shared economically and used at will on a rental basis by many different users through the years.

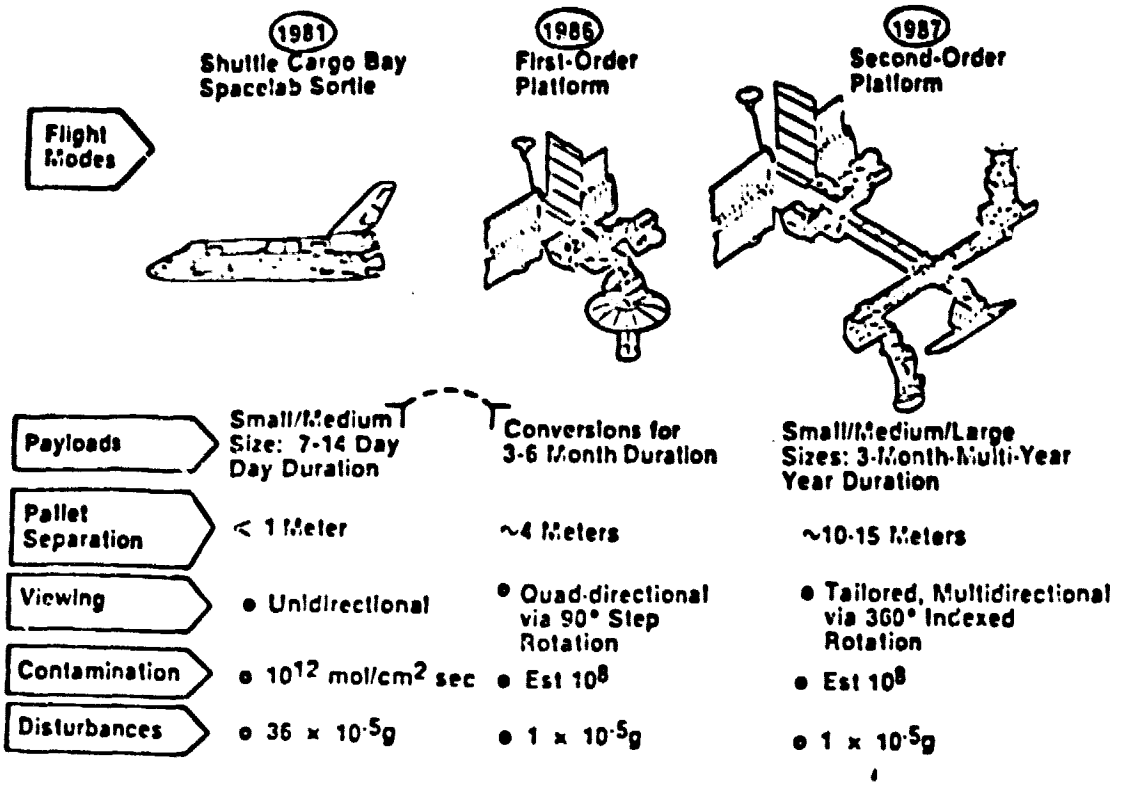


FIGURE E

PROGRESSION OF PAYLOAD ACCOMMODATIONS

Section 1

LOGIC FLOW NETWORK

A detailed logic flow network developed during the SASP phase A study is enclosed in an envelope at the back of this volume.

The critical path in the network is the Structure/Mechanical Subsystem. This subsystem development involves extensive analysis and design effort relative to an intricate structural assembly. A somewhat lengthy and challenging development program will be necessary before a structure can be manufactured that will meet the rigid requirements of a functional space platform. Additionally some of the materials that will be procured are considered to be in the long lead category and the time frame in which it will be procured (1984 and 1985) may present procurement problems more difficult than in today's environment.

The other subsystems of the space platform do not appear to present any problems compared to the Structure/Mechanical subsystem.

Section 2

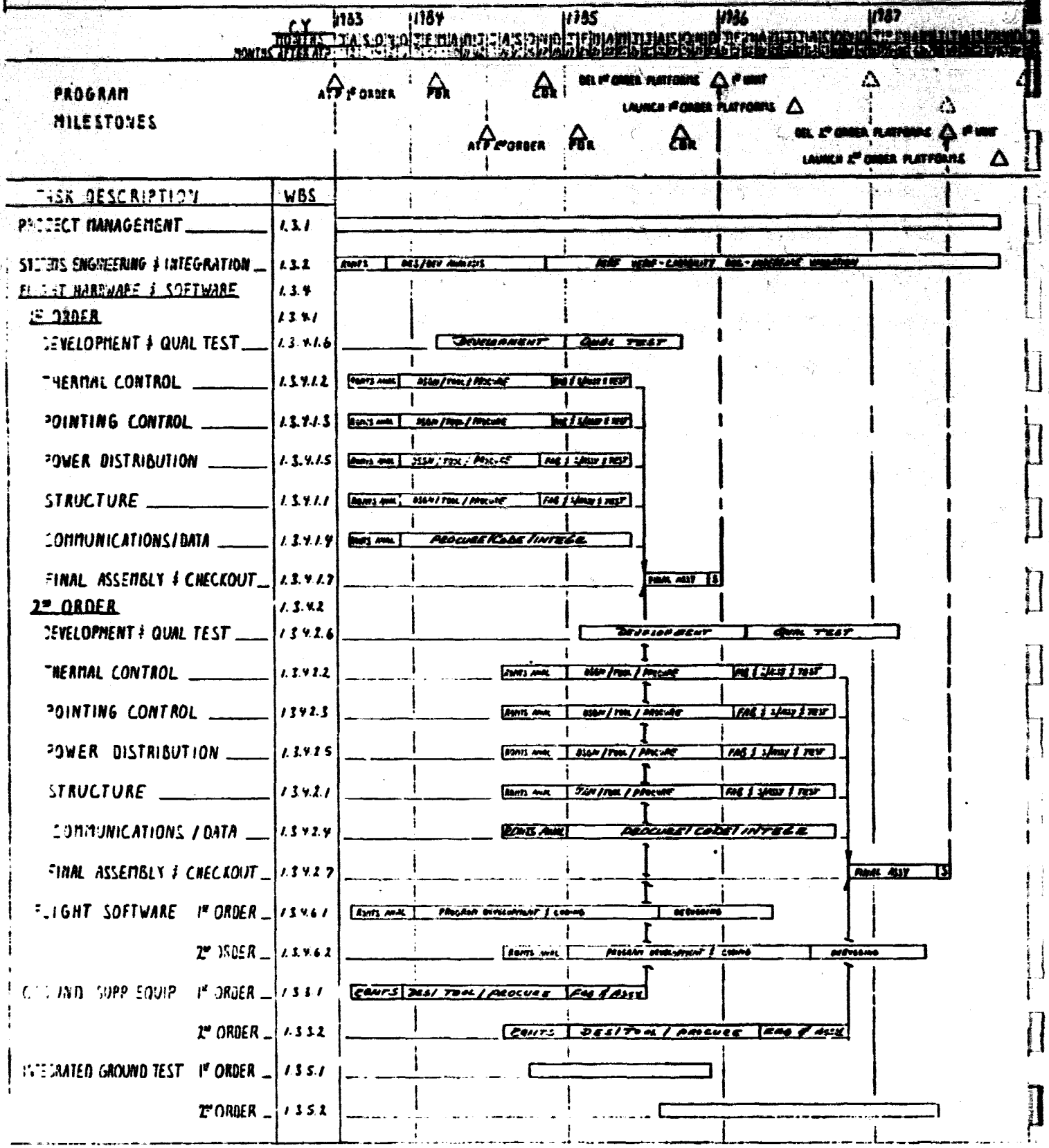
SCHEDULES

The Master Project Phasing Schedule developed for the Sciences and Applications Space Platform (SASP) is in bar chart format as shown in Figure 1. It depicts various aspects of program development including System Engineering and Integration, development and qualification testing, design, procurement, fabrication and assembly of the various subsystems of both the First Order and Second Order phases.

It is a four year program and depicts the sequence of events that lead to the objective of a functional space platform.

A logic network has been provided which displays the inter-relationship of the elements of the schedule and the critical paths. This network also shows other related elements of the system which are needed to support the functions of an operating space platform.

FIGURE 1 SASP MASTER PROJECT PHASING SCHEDULE



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Section 3

FACILITIES

During the course of the study, no special facility requirements were identified. Existing contractor facilities are assumed to require rearrangement of some equipment items to provide floor space and efficient production of graphite epoxy components. No peculiar or major changes are anticipated.

Section 4

COSTING APPROACH, METHODOLOGY AND RATIONALE

This section covers those areas that describe how the cost estimate was derived, what it contains and how it is documented.

4.1 GROUND RULES AND ASSUMPTIONS

The groundrules used in constructing the schedules, estimating the costs and distributing the funding were:

1. All costs are in constant mid Fiscal 1980 dollars.
2. Costs exclude prime contractor fee.
3. ATP for first order platform (Mini Arms) is to be 1 July 1983 with delivery of first flight set on January 1986 and launch on 1 July 1986. ATP for the second order platform is to be 1 July 1984 with delivery of first flight unit 1 July 1987 and launch 1 November 1987. The trail arm unit development and production is to be concurrent with the second order platform.
4. The costs of the second order platform assume the prior design, test and fabrication of the first order platforms.
5. The design, test and fabrication of the first and second order platforms overlap as shown on the schedule and assume a simple prime contractor for both sets of hardware.
6. The costs assume multiple use of test hardware including refurbishment of test hardware for use as spares when cost effective.
7. The test program assumes that qualification tests will be conducted at the component level and that qualification by analysis will be used whenever minor modifications make it possible.
8. Final system functional tests will be performed on the simulator.
9. The costs include providing a partial mockup/simulator to permit functionally reproducing the operation of the platform.

10. The costs include the design, test, fabrication, assembly, checkout and delivery of one set of flight hardware and the functional simulator.
11. The costs include initial spares (through first launch).
12. One set of deliverable GSE is included.

4.2 COST METHODOLOGY

The costs for the SASP platform were estimated using CER's, vendor data, NASA data, direct estimates and factors.

The parametric estimates used CER's and factors based on historical information in the MDAC data bank and data published by Samso. The CER's based on information taken from the MDAC data bank reflect past experience principally from the Saturn S-IVB, Spacelab Tunnel and Delta program. The older data were adjusted by using technology improvement factors from SAMSO. (Reference: "Technology Carryover Factors" Table V-3, page V-II of Unmanned Spacecraft Cost Model, SAMSO TR-78-61, 4th Edition, February 1978). These factors recognize the manhours required to design and fabricate an item using current technology is different from the manhours required to provide the same item with an earlier technology.

In addition to using these technology adjustment factors, the costs were further updated to 1980 dollars using one of two methods. When the subject CER provided manhour requirements, current labor rate data was used to provide the cost associated with each calculation. The rates reflected appropriate industry wide costs. When the CER provided dollar value rather than manhours estimates, the dollar values were escalated to equivalent 1980 dollars using the standard rates MDAC uses for making cost estimates for DOD, NASA and other government agencies.

To illustrate this methodology and typical values used, the initial CER developed in 1977 from raw data for the T1 cost of miscellaneous structure made from aluminum was:

$$T1 = 3973 \text{ (Weight)}^{.757}$$

To update this CER to mid fiscal 1980 dollars and technology, the coefficient was multiplied by the structural technology factor of 0.62 obtained from the Samso reference cited above and an inflation factor of 1.27 as follows:

$$T1_{1980\$} = 3973 \text{ (0.62) (1.27) (Weight)}^{.757}$$
$$= 3132 \text{ W}^{.757}$$

This CER was used to calculate the cost of the Radiator Support Structural/Mechanical portion of the Second Order Platform.

Similar methodology was used to obtain the CER for the non-recurring portion of the cost associated with this type of hardware item. The resulting equation was:

$$\text{Cost} = 118{,}590 \text{ (Weight)}^{.517}$$

This cost does not include the cost of ground test hardware and only minor amount of test labor. These were estimated separately. Also the cost of the system test and system test hardware is estimated separately. These values are added to the CER's value to obtain total non-recurring engineering and testing cost.

The basic non-recurring costs for the items were adjusted to reflect whether the item was a new development, off-the-shelf item, an existing item that required modification to meet the requirement of this program, or had multiple usage within this program. If an item was considered an off-the-shelf existing, qualified design, a minimum of 10% of the new engineering development cost was estimated as necessary to cover such effort as locating the item,

verifying it met the requirements, and including the item on appropriate drawings, specifications and parts lists. If an existed but required modification, a larger factor was used. When an item was used in different places in the configuration or was used in both the first order and the second order, the development integration cost for the subsequent usages was decreased 50% or more from the integration charged for the first usage. This methodology was applied to such items as the berthing part. The Berthing Part on the First Order Mini Arm, which was the first usage of this item, carried the full development and integration cost. Subsequent usages such as the First Order Orbiter Boom, and the Second Order Cross Arms, carried decreasing percentages of development integration costs.

Vendor estimates were used for many of the off-the-shelf items. Cost estimates for most of the avionics components were based on figures obtained from NASA.

The radiator and cold plate costs were derived from a MDAC direct estimate originally made for the 25KW power module. That estimate was modified to reflect the different length of the extrusions and the change in the number of tubing welds required for the two configurations.

4.3 TEST PHILOSOPHY

The test philosophy assumed maximum reuse of test articles. Where possible the qualification test articles were refurbished to be used in the simulator, and articles test in the first order were not retested in the second order of trail arm. Component testing was emphasized and testing of assemblies avoided where possible.

Table 2 lists the hardware quantities of the various items. The quantities are equivalent number of units and include the cost of refurbishment and other test labor in addition to the cost of the hardware itself.

The spares quantity are estimated for initial spares only and additional spares would be required for extended operational activity.

All the quantities shown in Table 2 are consistant with the depth of a phase A study. They were derived by applying general principles and standard historical experience to the class of items. It is anticipated that an indepth analysis of each item would change the value for some specific items. However, the total magnitude of the costs is not expected to change significantly.

HARDWARE QUANTITIES

WBS	NAME	Ground Test	System Test	Production	Initial Spares
FIRST ORDER					
10304010102	Truss	1.0	.93	3	.2
10304010103	Berthing	1.0	.93	3	.2
10303010104	Umbilical	1.25	.93	3	.5
10304010105	I/F Deploy umbilical	1.25	.43	3	.5
10304010109	Docking Adapter "A" structure	1.0	.93	1	.1
10304010202	Pump packages		.43	3	1.0
10304010203	Quick DIS	1.0	2.43	6	1.0
10304010204	Lines	0	1.43	1 set	
10304010205	Flex lines		2.43	1 set	1.0
10304010206	Several Joints	1.25	.43	6	3.0
10304010402	Remote I/N Units	0	1.43	3	1.2
10304010403	Central Unit	1	1.43	3	1.2
10304010404	Sensor	1	1.43	15	3.2
10304010405	Wiring Harness	0	1.43	1 set	
10304010406	Bus Couples	0	1.43	3	1.2
10304010412	TV Cameras	0	1.43	3	1.2
10304010502	30 Disk Box	1	.43	3	
10304010505	Power Cable		1.43	3 sets	
10304010509	Floodlight		1.43	3	1.1
SECOND ORDER					
10304020102	CA Truss	1.0	.93	6	
10304020103	Berth/Umb Active		.43	7	
	Housing	1.0		2	
10304020105	Joints	1.25	.43	2	.5
10304030106	Radiator Support	1	.2	1 set	
10304020107	Equip Housing Top/Box	1	.43	2	
10304020108	Standoff Truss	1	.43	4	.2
10304020109	Docking Adapter "B"	1	.93	1	
10304020109	Joint	1.25	.43	1	.5

Table 2 - Equivalent Hardware Quantities

HARDWARE QUANTITIES

WBS	NAME	Ground Test	System Test	Production	Initial Spares
SECOND ORDER (CONT'D)					
10304020202	Pump Package		1.43	2	.5
10304020203	Quick Design		1.43	6	1
10304020204	Lines		1.43	1 set	
10304020205	Flex lines		1.43	1 set	1
10304020206	Control Valve		1.43	2	1.0
10304020207	Cold Plate	1.0	1.93	1	.1
10304020208	Radiator	1.0	.93	4	.1
10304020302	Magnetic Torques	1.0	.43	4	1
10304020303	Torques Election	1.0	.43	1	.5
10304020402	RIV		1.43	13	1.0
10304020403	Control Unit		1.43	4	1.0
10304020404	Sensor		1.43	40	3.0
10304020405	Wiring Harness		1.43	1	
10304020406	Bus Coupler		.43	10	2.0
10304020407	Hi Rate Recorder		1.43	2	
10304020410	Data Switch		1.43	1	
10304020411	Video Switch		1.43	1	
10304020412	TV Cameras		1.43	7	1.0
10304020502	30 Dis Box		1.43	3	
10304020503	120 Dis Box	1.0	1.43	1	
10304020504	400 Hz Dis Box	1.0	.43	1	
10304020505	Power Cables		1.43	1 set	
10304020506	411 Hz Inverter	1.0	.43	2	
10304020507	Power Cables		1.43	2 sets	
10304020508	Orb I/F Cables		1.43	1 set	
10304020509	Floodlights		.43	7	1.0
TRAIL ARM					
10304030102	Truss		1.43	2	
10304030103	Berth-Act		1.43	3	
10304030104	Umbil-Act		1.43	3	
10304030105	Joint	1.	.93	1	.5

Table 2 - Equivalent Hardware Quantities

HARDWARE QUANTITIES

WBS	NAME	Ground Test	System Test	Production	Initial Spares
TRAIL ARM (CONT'D)					
10304030202	Pump Package		.25	1	
10304030203	Quick Discon		1	3	
10304030204	Lines		.25	1 set	
10304030205	Flex Lines		.25	1 set	
10304030206	Control Valve		.25	1	
10304030207	Cold Plate	.5	.25	1	
10304030208	Radiator	1	.25	4	
10304030402	RIV		1.43	5	
10304030403	Central Units		1.43	1	
10304030404	Sensor		2.43	8	
10304030405	Wiring Harness		1.43	1 set	
10304030406	Bus Couples		1.43	2	
10304030412	TV Camera		1.43	3	
10304030502	3C Distr Box		1.43	1	
10304030503	120 Dist Box		1.43	1	
10304030504	400 Hz Dist Box		1.43	1	
10304030505	Power Cables		1.43	1 set	
10304030506	400 Hz Inverter		.93	2	
10304030509	Floodlight		1.43	3	

Table 2 - Equivalent Hardware Quantities

4.4 REPRESENTATIVE TRADES

Several different configurations of the First Order Mini Arms were considered during the course of the study. Figure 2 describes four of the alternate designs. Configuration 1 had two fixed position parts, one located on the longitudinal axis of the truss, one perpendicular to the axis. Configuration 2 had one part that was hinged to be manually moved from the longitudinal to perpendicular position. Configuration 3 had one part that was hinged as in configuration 2 and in addition had a rotational joint that could be moved manually $\pm 90^{o}$ around the truss axis. This configuration was the same as the configuration except that its movement was manual rather than automatic. Configuration 4 was the fully automated arm where both the 90^{o} hinge and the $\pm 90^{o}$ rotation could be actuated and controlled remotely.

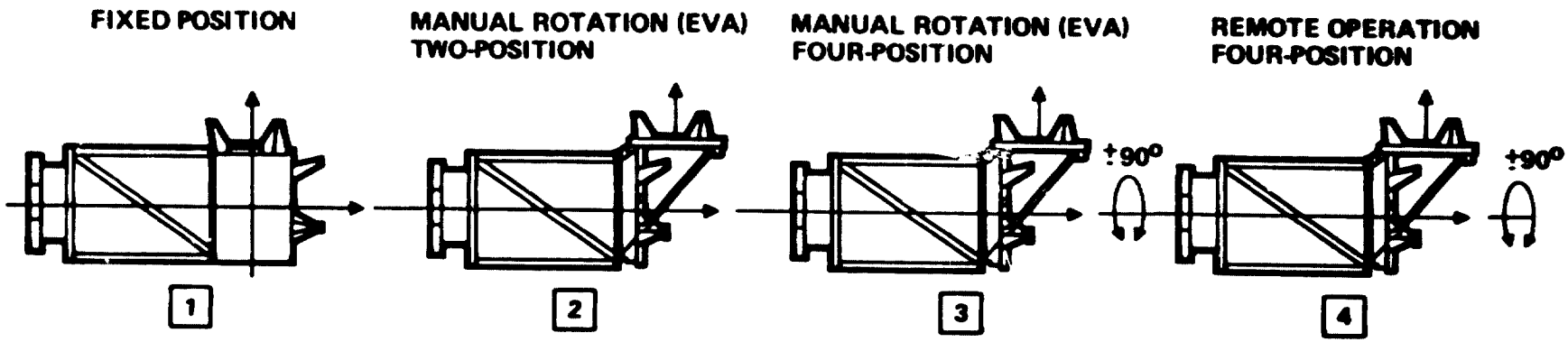
This remotely operatable unit was the configuration included in the cost estimates.

The comparative costs of the structural/mechanical portion of these arms are given below. Also the approximate change in magnitude of the cost of the first order system is indicated:

CONFIGURATION	PERCENT OF			
	Development	Recurring	Total Struct/Mech	Total First Order
1 (Fixed)	84	110	92	96
2 (Hinged Only)	88	93	89	95
3 (All Manual)	94	96	94	97
4 (All Auto)	100	100	100	100

Table 3 - First Order Mini Arm Trade

FIRST-ORDER PLATFORM PAYLOAD BERTH



- LOW COST
- VIEWING LIMITATION
- HIGH RELIABILITY
- RMS REQUIRED FOR POSITION CHANGE
- NO EVA REQUIRED
- SIMPLE SERVICE ROUTING
- CHANGEOUT POSSIBLE ONLY WHEN ORBITER BERTHED
- INCREASED LAUNCH ENVELOPE

- LOW MEDIUM COST
- EVA REQUIRED FOR VIEWING CHANGE
- SERVICES FLEXED ACROSS HINGE
- VIEWING LIMITATION

- MEDIUM COST
- EVA REQUIRED FOR ALL POSITION CHANGE
- SERVICES FLEXED ACROSS HINGE
- COOLANT LINE UTILITIES SWIVEL JOINT ACROSS ROTARY JOINT

- HIGH COST
- MAXIMUM VIEWING CAPABILITY
- ELECTRICAL MECHANICAL ACTUATOR TO DRIVE ROTARY JOINT AND FOLDING JOINT
- NO EVA REQUIRED
- COOLANT LINE SWIVEL REQUIRED ACROSS ROTATING JOINT
- GREATER COMPLEXITY

- **Concept 4 Selected Based on Following:**
  - **No EVA Required**
  - **Viewing Direction Controlled Remotely**
  - **Folding Mechanism Space Qualified (PAM)**

Figure 2 - Alternate Configurations for First Order Platform Trades

4.5 WBS DIAGRAM AND DICTIONARY

The workbreakdown structure associated with this study is shown in Figure 3. This hierarchy and numeric identification was used to collect the cost estimates in an orderly manner. Each detail cost estimate and funding distribution table reflects this numeric system. A detail definition of each of the line items is included in the WBS dictionary presented in Appendix A of this report.

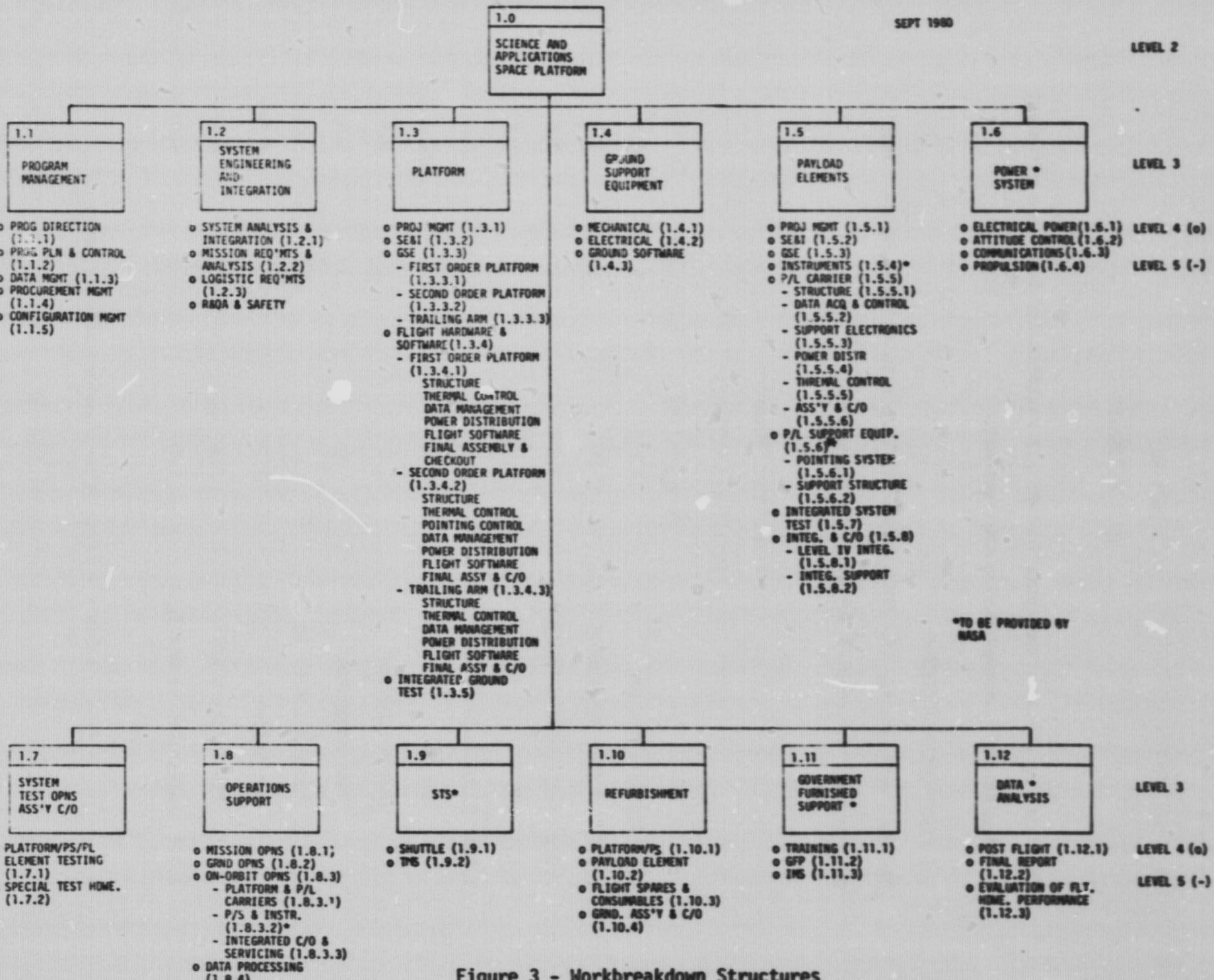


Figure 3 - Workbreakdown Structures

Section 5

COST ESTIMATES

This section presents the costs for WBS 1.3 Platform for the three different configurations estimated during the contract.

5.1 FIRST ORDER PLATFORM

The cost estimate for the first order platform only is shown below. This program does not require any previous production.

First Order Platform

(Millions of 1980$)

	Non Recurring	Recurring	Total
1.3 Platform Project	18.2	8.0	26.2
1.3.1 Project Management	1.1	.5	1.6
1.3.2 Syst Engrg & Integr	2.0	.6	2.6
1.3.3 GSE	1.2		1.2
1.3.4 Hardware/Software	12.5	6.9	19.4
Structure	7.4	3.0	10.4
Thermal Control	1.3	2.1	3.4
Data Management	.6	.8	1.4
Power Distribution	.2	.2	.4
Net Software	1.7		1.7
Final Assy & C/O	1.3	.8	2.1
1.3.5 Integrated Second Test	1.4		1.4

Table 4 - First Order Platform Summary Costs

5.2 SECOND ORDER PLATFORM

The cost estimate for the second order platform is shown below. This program assumes the development/fabrication of the first order was started one year before this program. This estimate includes commonality with the First Order and assumes the Second Order is a follow-on to the First Order. If the Second Order was built without a First Order, the costs for development of the Second Order would be significantly higher and the recurring unit costs slightly higher.

Second Order Platform

Follow-On To First Order

(Millions of 1980$)

		Non-Recurring	Recurring	Total
1.3	Platform Project	52.8	22.2	75.0
1.3.1	Project Management	2.6	1.5	4.1
1.3.2	Syst Engrg & Integr	4.9	1.7	6.6
1.3.3	GSE	2.6		2.6
1.3.4	Hardware/Software	29.9	19.0	48.9
	Structure	13.0	7.2	20.2
	Thermal Control	2.1	1.8	3.9
	Pointing Control	3.1	1.9	5.0
	Data Management	2.4	5.4	7.8
	Power Distribution	.9	.4	1.3
	Net Software	5.8		5.8
	Final Assembly & C/O	2.6	2.3	4.9
1.3.5	Integr Second Test	12.8		12.8

5.3 TRAIL ARM

The summary level cost estimate for the Trail Arm is shown below. This estimate assumes the Trail Arm is produced concurrently with the Second Order Platform and started one year after beginning the Fiscal Order Platform. These schedules could be changed without cost impact provided there was no production gap between the three configurations. These costs would be slightly higher if the First Order Platform were not fabricated prior to the Second Order. They would be substantially higher if the Second Order were not fabricated prior to the Trail Arm.

Trail Arm

Concurrent with Second Order, One Year After First Order

(Millions of 1980$)

	Non-Recurring	Recurring	Total
1.3 Platform Project	12.8	5.3	18.1
1.3.1 Project Management	.7	.3	1.0
1.3.2 System Engrg & Integr	1.3	.5	1.8
1.3.3 GSE	.8	4.5	.8
1.3.4 Hardware/Software	7.9	4.5	12.4
Structure	3.3	1.6	4.9
Thermal Control	1.7	.9	2.6
Data Management	.8	1.2	2.0
Power Distribution	.3	.2	.5
Flx Software	1.0		1.0
Final Assy & C/O	.8	.6	1.4
1.3.5 Integr Second Test	2.1		2.1

Section 6

TOTAL PROGRAM FUNDING SCHEDULES

The estimated funding distribution by fiscal year for the three programs are shown as follows: Table 7, Funding for First Order Platform; Table 8, Funding for First and Second Order Platform; Table 9, Funding for First and Second Order Platform and Trail Arm. All funding distributions are in millions of mid-fiscal 1980 dollars and compatible with the schedule shown in Section 2 and the groundrules in Section 4.

TITLE: SASP FINAL: 1ST ORDER S1H5F SERIES.

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COST DATA FORM = D(1)
NON-RECURRING (DEVELOPMENT)

WBS NUMBER	WBS TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
0	TOTAL PROGRAM	26.19	.86	11.78	11.76	1.80	.00	.00	0.00	0.00	0.00	0.00	0.00	0.00
103	PLATFORM DEVELOPMENT	18.21	.86	11.78	5.06	.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	1.10	.05	.75	.30	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	1.10	.05	.75	.30	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	2.05	.05	.98	.94	.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	2.05	.05	.98	.94	.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10303	GSE	1.15	.01	.69	.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030301	FIRST ORDER	1.15	.01	.69	.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	12.50	.75	9.35	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	12.50	.75	9.35	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	7.42	.57	6.60	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	1.31	.11	1.17	.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.60	.05	.53	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.18	.01	.16	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040106	FLIGHT SOFTWARE	1.70	.01	.65	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	1.28	0.00	.24	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10305	INTEGR.GRND.TEST	1.41	0.00	0.00	.97	.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030501	INTEGR.GRND.TEST	1.41	0.00	0.00	.97	.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050101	MA STRU SYS TST	.84	0.00	0.00	.57	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050102	MA TC SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050104	MA DM SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050105	MA PD SYS TST	.04	0.00	0.00	.03	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 7 - Funding for First Order Platform

TITLE: SASP FINAL: 1ST ORDER S1H5F SERIES.

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COST DATA FORM - D(2)
RECURRING (PRODUCTION)

WBS NUMBER	TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
103	PLATFORM RECURRING	7.98	0.00	0.00	6.70	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	.52	0.00	0.00	.27	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	.52	0.00	0.00	.27	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	.60	0.00	0.00	.30	.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	.60	0.00	0.00	.30	.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	6.87	0.00	0.00	6.14	.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	6.87	0.00	0.00	6.14	.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	3.00	0.00	0.00	2.86	.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	2.05	0.00	0.00	1.77	.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.84	0.00	0.00	.74	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.20	0.00	0.00	.17	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	.78	0.00	0.00	.59	.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 7 - Funding for First Order Platform

TITLE: 1ST. 2ND ORDER SASP FINAL; S2H5F SERIES.

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COST DATA FORM - D(1)
NON-RECURRING (DEVELOPMENT)

WBS NUMBER	TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
0	TOTAL PROGRAM	101.22	.86	12.82	31.94	40.80	14.76	.04	0.00	0.00	0.00	0.00	0.00	0.00
103	PLATFORM DEVELOPMENT	71.02	.86	12.82	25.24	25.77	6.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	3.71	.05	.80	1.37	1.29	.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	1.10	.05	.75	.30	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030102	PROJ MGMT-2ND ORD	2.61	0.00	.05	1.07	1.29	.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	6.92	.05	1.09	3.06	2.35	.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	2.05	.05	.98	.91	.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030202	S E AND I-2ND ORD.	4.87	0.00	.11	2.12	2.28	.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10303	GSE	3.71	.01	.71	1.60	1.37	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030301	FIRST ORDER	1.15	.01	.69	.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030302	2ND ORDER	2.56	0.00	.02	1.16	1.37	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	42.42	.75	10.22	18.18	12.23	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	12.50	.75	9.35	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	7.42	.57	6.60	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	1.31	.11	1.17	.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.60	.05	.53	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.18	.01	.16	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040106	FLIGHT SOFTWARE	1.70	.01	.65	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	1.28	0.00	.24	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030402	SECOND ORDER	29.92	0.00	.87	15.78	12.23	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040201	STRU STAN ARM	13.03	0.00	.52	8.75	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040202	ST/SM THERMAL CONT	2.12	0.00	.10	1.54	.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040203	POINTING CONTROL	3.15	0.00	.08	1.76	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040204	DM STAND/SS MOD	2.36	0.00	.12	1.75	.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040205	SM POWER DISTRIB	.88	0.00	.04	.62	.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040206	FLIGHT SOFTWARE	5.80	0.00	.01	1.36	3.50	.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040207	FINAL ASSY & C/O	2.58	0.00	0.00	0.00	2.48	.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10305	INTEGR.GRND.TEST	14.26	0.00	0.00	1.03	8.53	4.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030501	INTEGR.GRND.TEST	1.41	0.00	0.00	.97	.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050101	MA STRU SYS TST	.84	0.00	0.00	.57	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050102	MA TC SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050104	MA DM SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050105	MA PD SYS TST	.04	0.00	0.00	.03	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030502	INTEGR.GRND.TEST	12.84	0.00	0.00	.06	8.09	4.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050201	CA STRU SYS TST	5.83	0.00	0.00	.03	3.67	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050202	TC SM QUICK DIS	1.70	0.00	0.00	.01	1.07	.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050203	MAGNETIC TORQUE BA	.79	0.00	0.00	.00	.50	.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050204	CONTROL UNIT	4.18	0.00	0.00	.02	2.63	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050205	CA PD SYS TST	.34	0.00	0.00	.00	.22	.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 8 - Funding for First and Second Order Platform

TITLE: 1ST. 2ND ORDER SASP FINAL: S2M3F SERIES.

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COST DATA FORM = D(2)
RECURRING (PRODUCTION)

WBS NUMBER	WBS TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
103	PLATFORM RECURRING	30.20	0.00	0.00	6.70	15.03	8.43	.04	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	1.98	0.00	0.00	.27	.84	.85	.02	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	.52	0.00	0.00	.27	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030102	PROJ MGMT-2ND ORD	1.45	0.00	0.00	0.00	.58	.85	.02	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	2.36	0.00	0.00	.30	1.00	1.05	.02	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	.60	0.00	0.00	.30	.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030202	S E AND I-2ND ORD.	1.77	0.00	0.00	0.00	.70	1.05	.02	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	25.86	0.00	0.00	6.14	13.19	6.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	6.87	0.00	0.00	6.14	.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	3.00	0.00	0.00	2.86	.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	2.05	0.00	0.00	1.77	.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.84	0.00	0.00	.74	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.20	0.00	0.00	.17	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	.78	0.00	0.00	.59	.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030402	SECOND ORDER	18.99	0.00	0.00	0.00	12.46	6.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040201	STRU STAN ARM	7.16	0.00	0.00	0.00	5.36	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040202	ST/SM THERMAL CONT	1.76	0.00	0.00	0.00	1.16	.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040203	POINTING CONTROL	1.87	0.00	0.00	0.00	1.09	.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040204	DM STAND/SS MOD	5.44	0.00	0.00	0.00	4.17	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040205	SM POWER DISTRIB	.46	0.00	0.00	0.00	.36	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040207	FINAL ASSY & C/O	2.30	0.00	0.00	0.00	.32	1.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 8 - Funding for First and Second Order Platform

TITLE: 1ST + 2ND +TRAIL ARM FINAL: STH5F SERIES.

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COST DATA FORM = D(1)
NON-RECURRING (DEVELOPMENT)

WBS NUMBER	WBS TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
0	TOTAL PROGRAM	119.27	.86	13.16	37.76	49.70	17.75	.05	0.00	0.00	0.00	0.00	0.00	0.00
103	PLATFORM DEVELOPMENT	83.83	.86	13.16	31.06	31.30	7.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	4.41	.05	.82	1.68	1.61	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	1.10	.05	.75	.30	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030102	PROJ MGMT-2ND ORD	2.61	0.00	.05	1.07	1.29	.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030103	PROJ MGMT-TR ARM	.70	0.00	.01	.32	.32	.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	8.22	.05	1.12	3.63	2.96	.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	2.05	.05	.98	.94	.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030202	S E AND I-2ND ORD.	4.87	0.00	.11	2.12	2.28	.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030203	S E AND I-TR ARM	1.30	0.00	.03	.57	.61	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10303	GSE	4.47	.01	.72	1.95	1.78	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030301	FIRST ORDER	1.15	.01	.69	.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030302	2ND ORDER	2.56	0.00	.02	1.16	1.37	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030303	TRAILING ARM	.76	0.00	.01	.34	.41	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	50.35	.75	10.50	22.76	15.09	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	12.50	.75	9.35	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	7.42	.57	6.60	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	1.31	11	1.17	.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.60	.05	.53	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.18	.01	.16	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040106	FLIGHT SOFTWARE	1.70	.01	.65	1.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	1.28	0.00	.24	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030402	SECOND ORDER	29.92	0.00	.87	15.78	12.23	1.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040201	STRU STAN ARM	13.03	0.00	.52	8.75	3.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040202	ST/SM THERMAL CONT	2.12	0.00	.10	1.54	.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040203	POINTING CONTROL	3.15	0.00	.08	1.76	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040204	DM STAND/SS MOD	2.36	0.00	.12	1.75	.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040205	SM POWER DISTRIB	.88	0.00	.04	.62	.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040206	FLIGHT SOFTWARE	5.80	0.00	.01	1.36	3.50	.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040207	FINAL ASSY & C/O	2.58	0.00	0.00	0.00	2.48	.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030403	TRAILING ARM	7.93	0.00	.28	4.58	2.86	.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040301	STRU TRAIL ARM	3.31	0.00	.15	2.34	.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040302	ST/TA THERMAL CONT	1.72	0.00	.08	1.26	.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040304	DM TRAIL ARMS	.69	0.00	.03	.51	.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040305	TA POWER DISTRIB	.28	0.00	.01	.21	.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040306	FLIGHT SOFTWARE	1.07	0.00	.00	.25	.65	.17	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040307	FINAL ASSY & C/O	.85	0.00	0.00	0.00	.81	.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10305	INTEGR.GRND.TEST	16.38	0.00	0.00	1.04	9.87	5.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030501	INTEGR.GRND.TEST	1.41	0.00	0.00	.97	.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050101	MA STRU SYS TST	.84	0.00	0.00	.57	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050102	MA TC SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9 - Funding for First and Second Order Platform and Trail Arms

TITLE: 1ST + 2ND +TRAIL ARM FINAL: STHSF SERIES.

09/04/80
PAGE 2A

COST DATA FORM = D(1)
NON-RECURRING (DEVELOPMENT)

WBS NUMBER	WBS TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
103050104	MA DM SYS TST	.27	0.00	0.00	.19	.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050105	MA PD SYS TST	.04	0.00	0.00	.03	.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030502	INTEGR.GRND.TEST	12.84	0.00	0.00	.06	8.09	4.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050201	CA STRU SYS TST	5.83	0.00	0.00	.03	3.67	2.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050202	TC SM QUICK DIS	1.70	0.00	0.00	.01	1.07	.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050203	MAGNETIC TORQUE BA	.79	0.00	0.00	.00	.50	.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050204	CONTROL UNIT	4.18	0.00	0.00	.02	2.63	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050205	CA PD SYS TST	.34	0.00	0.00	.00	.22	.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030503	INTEGR.GRNDS.TEST	2.12	0.00	0.00	.01	1.33	.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050301	TA STRU SYS TST	1.36	0.00	0.00	.01	.85	.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050302	TA TC SYS TEST	.17	0.00	0.00	.00	.11	.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050304	TA DM SYS TST	.38	0.00	0.00	.00	.24	.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103050305	TA PD S''S TST	.21	0.00	0.00	.00	.14	.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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Table 9 - Funding for First and Second Order Platform and Trail Arms

TITLE: 1ST + 2ND +TRAIL ARM FINAL: STH5F SERIES.

09/04/80
PAGE 3A

COST DATA FORM = D(2)
RECURRING (PRODUCTION)

WBS NUMBER	TITLE	CUM TOTAL	FISCAL YEARS (1980 DOLLARS IN MILLIONS) 1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994
103	PLATFORM RECURRING	35.44	0.00	0.00	6.70	18.40	10.29	.04	0.00	0.00	0.00	0.00	0.00	0.00
10301	PROJ MGMT	2.32	0.00	0.00	.27	.98	1.06	.02	0.00	0.00	0.00	0.00	0.00	0.00
1030101	PROJ MGMT-1ST ORDE	.52	0.00	0.00	.27	.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030102	PROJ MGMT-2ND ORD	1.45	0.00	0.00	0.00	.58	.85	.02	0.00	0.00	0.00	0.00	0.00	0.00
1030103	PROJ MGMT-TR ARM	.34	0.00	0.00	0.00	.14	.20	.00	0.00	0.00	0.00	0.00	0.00	0.00
10302	S E AND I	2.80	0.00	0.00	.30	1.17	1.30	.03	0.00	0.00	0.00	0.00	0.00	0.00
1030201	S E AND I-1ST ORD.	.60	0.00	0.00	.30	.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030202	S E AND I-2ND ORD.	1.77	0.00	0.00	0.00	.70	1.05	.02	0.00	0.00	0.00	0.00	0.00	0.00
1030203	S E AND I-TR ARM	.43	0.00	0.00	0.00	.17	.26	.01	0.00	0.00	0.00	0.00	0.00	0.00
10304	HARDWARE	30.33	0.00	0.00	6.14	16.25	7.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030401	FIRST ORDER	6.87	0.00	0.00	6.14	.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040101	STRU MINI ARM	3.00	0.00	0.00	2.86	.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040102	MINI THERMAL CONT	2.05	0.00	0.00	1.77	.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040104	DM MINI ARM	.84	0.00	0.00	.74	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040105	MA POWER DISTRIB	.20	0.00	0.00	.17	.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040107	FINAL ASSY & C/O	.78	0.00	0.00	.59	.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030402	SECOND ORDER	18.99	0.00	0.00	0.00	12.46	6.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040201	STRU STAN ARM	7.16	0.00	0.00	0.00	5.36	1.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040202	ST/SM THERMAL CONT	1.76	0.00	0.00	0.00	1.16	.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040203	POINTING CONTROL	1.87	0.00	0.00	0.00	1.09	.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040204	DM STAND/SS MOD	5.44	0.00	0.00	0.00	4.17	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040205	SM POWER DISTRIB	.46	0.00	0.00	0.00	.36	.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040207	FINAL ASSY & C/O	2.30	0.00	0.00	0.00	.32	1.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1030403	TRAILING ARM	4.47	0.00	0.00	0.00	3.07	1.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040301	STRU TRAIL ARM	1.59	0.00	0.00	0.00	1.16	.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040302	ST/TA THERMAL CONT	.90	0.00	0.00	0.00	.71	.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040304	DM TRAIL ARMS	1.26	0.00	0.00	0.00	1.00	.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040305	TA POWER DISTRIB	.15	0.00	0.00	0.00	.12	.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
103040307	FINAL ASSY & C/O	.57	0.00	0.00	0.00	.08	.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table 9 - Funding for First and Second Order Platform and Trail Arms

-VOLUME III APPENDIX-

APPENDIX A

WORK BREAKDOWN STRUCTURE
AND DICTIONARY
FOR THE
SCIENCE AND APPLICATIONS SPACE PLATFORM

Date: 12 September 1980

WBS 1.0 Level 2

WBS Title: Science & Applications Space Platform

This WBS element summarizes all labor and material required for the design. development, fabrication, assembly, test, checkout, and operation of the SASP.

The following subelements are included:

WBS No.	WBS Title
1.1	Program Management
1.2	System Engineering & Integration
1.3	Platform
1.4	Ground Support Equipment
1.5	Payload Elements
1.6	Power System
1.7	System Test Operations, Assembly & Checkout
1.8	Operations Support
1.9	Space Transportation System
1.10	Refurbishment
1.11	Government Furnished Support
1.12	Data Analysis

WBS 1.1 Level 3

WBS Title: Program Management

This WBS element summarizes all effort required to manage, direct, and control the SASP program from the design and development phase through the operational phase. This effort includes planning, organizing, budgeting, scheduling, directing, and controlling the program to ensure that the overall objectives are accomplished.

The following subelements are included:

WBS	Title
1.1.1	Program Direction
1.1.2	Program Planning & Control
1.1.3	Data Management
1.1.4	Procurement Management
1.1.5	Configuration Management

WBS 1.1.1 Level 4

WBS Title: Program Direction

This WBS element summarizes all efforts of the Program Manager and his staff. It includes management review and control as well as direction in executive, engineering and scientific areas necessary to assure proper progress and attainment of program goals. It also includes continuous monitoring of all functional management disciplines for central direction and control of the overall program by insuring timely resolutions of scientific, technical, or programmatic problem areas.

WBS 1.1.2 Level 4

WBS Title: Program Planning & Control

This WBS element includes those management efforts associated with integrated planning, scheduling, budgeting, cost control and reporting necessary to provide management visibility and control of overall program activities. This effort includes the preparation and maintenance of a master program schedule and those planning documents associated with definition of the SASP program. Also included is a performance management system for monitoring and controlling technical performance of all tasks.

WBS 1.1.3 Level 4

WBS Title: Data Management

This WBS element includes those overall management activities required to ensure proper information control, compatibility, availability, and currency. Included are services to identify, prepare, control, reproduce, distribute and maintain status of the internal and deliverable documentation for the SASP. Establishment, implementation, and maintenance of the data management requirements and procedures are also part of the element.

WBS 1.1.4 Level 4

WBS Title: Procurement Management

This WBS element includes management and technical control of the efforts provided by subcontractors and vendors. Tasks included are the providing of work direction to subcontractors and vendors; authorizing subcontractor tooling and equipment; analyzing subcontractor reports; conducting subcontractor and vendor reviews; and on-site coordination and evaluation of procurement. Also, included is the maintenance of records and submission of required reports relating to the geographic dispersion of minority and small business participation in project procurements and subcontracts.

WBS 1.1.5 Level 4

WBS Title: Configuration Management

This WBS element includes those management activities associated with defining, controlling, and accounting for the hardware and software configurations at any point in time throughout the program cycle. The configuration management system developed will provide identification of configuration and programmatic baselines, control changes to and maintain current status accountability of these baselines, and progressively verify that the as-built configuration agrees with the contract requirements (or that differences are identified). Included in this element are the establishment, implementation, and maintenance of specification formats; end item selection criteria; procedures for control and accounting of configurations and changes; provisions for design support; conducting design reviews, audits and analyses; and class II change control. Also included in this element is participation in configuration verification audits to support CEI acceptance.

WBS 1.2 Level 3

WBS Title: System Engineering & Integration

This WBS element summarizes all system level analyses, trade studies, and logistics activities, including performance studies and analyses and the development of requirements and definitions necessary to direct and control design. This element also includes all program safety, reliability and quality assurance planning and control activities.

The following subelements are included:

WBS	Title
1.2.1	System Analysis & Integration
1.2.2	Mission Requirements & Analysis
1.2.3	Logistic Requirements
1.2.4	Safety, Reliability & Quality Assurance

WBS 1.2.1 Level 4

WBS Title: System Analysis & Integration

This WBS element incorporates analyses, studies, and evaluations necessary to establish design and test requirements, and to support the development and verification of design solutions. This effort includes trade studies, interface design (ICD's), mathematical modeling and providing specific data relative to the configuration and capability of the SASP.

WBS 1.2.2 Level 4

WBS Title: Mission Requirements & Analysis

This WBS element includes analyses, studies, and evaluations associated with the determination and establishment of mission operation requirements, the establishment of flight and mission operation plans, and evaluation of associated procedures.

WBS 1.2.3 Level 4

WBS Title: Logistic Requirements

This WBS element includes that effort required to establish, implement, operate and maintain a logistic program in support of the SASP and its related support equipment. This includes the identification of spares requirements, analysis of support requirements, inventory control, identification of repair requirements, establishment of warehousing and storage requirements, and transportation analyses and planning.

WBS 1.2.4 Level 4

WBS Title: Safety, Reliability & Quality Assurance

This WBS element incorporates all safety, reliability, and quality assurance planning and control activities for the SASP project to assure that these considerations are included in the design, development, and test operation phases in a cost effective manner. This element also includes those efforts associated with the establishment, implementation, and maintenance of safety, reliability, and quality assurance activities to ensure satisfactory hardware/software delivery and operations through procedures, training, analysis, review, and assessment. (The quality assurance effort associated with the inspection of products to verify their quality or acceptability is performed in those WBS elements in which the products are produced.)

WBS 1.2 Level 3

WBS Title: Platform

This WBS element summarizes all labor and material required for the design, development, fabrication, assembly, test, and checkout of the platform. The platform includes structure and all supporting subsystems required to accomplish the scientific requirements. (Note that the Power System and Payload elements are excluded here.)

The following subelements are included:

WBS	Title
1.3.1	Project Management
1.3.2	System Engineering
1.3.3	Ground Support Equipment
1.3.4	Flight Hardware/Software
1.3.5	Integrated Ground Test

WBS 1.3.1 Level 4

WBS Title: Project Management

This WBS element summarizes all effort required to manage, direct and control the platform project. This effort includes planning, organizing, budgeting, scheduling, directing, and controlling the project to ensure that the overall objectives are accomplished.

The following subelements are included:

WBS	Title
1.3.1.1	Project Direction
1.3.1.2	Project Planning & Control
1.3.1.3	Data Management
1.3.1.4	Procurement Management
1.3.1.5	Configuration Management

WBS 1.3.2 Level 4

WBS Title: System Engineering & Integration

This WBS element summarizes all system level analyses, trade studies, and logistics activities, including performance studies and analyses and development of requirements and definitions necessary to direct and control design of the platform. This element also includes all project safety, reliability and quality assurance planning and control activities.

The following subelements are included:

WBS	Title
1.3.2.1	System Analysis & Integration
1.3.2.2	Mission Requirements & Analysis
1.3.2.3	Logistic Requirements
1.3.2.4	Safety, Reliability and Quality Assurance

WBS 1.3.3 Level 4

WBS Title: Ground Support Equipment (GSE)

This WBS element summarizes all labor and material required to design, develop, test, qualify, procure, fabricate, assemble, and checkout the electrical and mechanical GSE required to support the platform. It includes all equipment involved in handling, transportation, servicing, and checking out the platform systems. The following subelements are included:

WBS	Title
1.3.3.1	First Order Platform
1.3.3.2	Second Order Platform
1.3.3.3	Trailing Arm

WBS 1.3.4 Level 4

WBS Title: Flight Hardware and Software

This WBS element summarizes all effort required to design, develop, test, qualify, procure, fabricate, assemble and checkout the platform flight hardware and software.

The following subelements are included:

WBS	Title
1.3.4.1	First Order Platform
1.3.4.2	Second Order Platform
1.3.4.3	Trailing Arm

WBS 1.3.4.1 Level 5

WBS Title: First Order Planform

This element summarizes the effort required to design, develop, test, procure, fabricate, assemble and checkout the first order platform flight hardware and software. Included is such effort as tne preparation of detail design drawings and procurement specifications; the design and manufacture of production tools and special test equipment; the selection of suppliers; the conduct of component, module and subsystem development and qualification tests; final assembly and acceptance test; packaging and [illegible]ment of the completed platforms.

WBS 1.3.4.1 Continued

The following subelements are included:

WBS	Title
1.3.4.1.1	Structure
1.3.4.1.2	Thermal Control
1.3.4.1.3	Data Management
1.3.4.1.4	Power Distribution
1.3.4.1.5	Flight Software
1.3.4.1.6	Final Assembly and Checkout

WBS 1.3.4.2 Level 5

WBS Title: Second Order Platform

This element summarizes the effort required to design, develop, test, procure, fabricate, assemble and checkout the second order platform flight hardware and software. Included is such effort as the preparation of detail design drawings and procurement specifications; the design and manufacture of production tools and special test equipment; the selection of suppliers; the conduct of component, module and subsystem development and qualification tests; final assembly and acceptance test; packaging and shipment of the completed platforms.

The following subelements are included:

WBS	Title
1.3.4.2.1	Structure
1.3.4.2.2	Thermal Control
1.3.4.2.3	Pointing Control
1.3.4.2.4	Data Management
1.3.4.2.5	Power Distribution
1.3.4.2.6	Flight Software
1.3.4.2.7	Final Assembly and Checkout

WBS 1.3.4.3 Level 5

WBS Title: Trailing Arm

This element summarizes the effort required to design, develop, test, procure, fabricate, assemble and checkout the trailing arm flight hardware and software. Included is such effort as the preparation of detail design drawings and procurement specifications; the design and manufacture of production tools and special test equipment; the selection of suppliers; the conduct of component, module and subsystem development and qualification tests; final assembly and acceptance test; packaging and shipment of the completed arm.

The following subelements are included:

WBS	Title
1.3.4.3.1	Structure
1.3.4.3.2	Thermal Control
1.3.4.3.3	Data Management
1.3.4.3.4	Power Distribution
1.3.4.3.5	Flight Software
1.3.4.3.6	Final Assembly and Checkout

WBS 1.3.5 Level 4

WBS Title: Integrated Ground Test

This WBS element includes all labor and material required to plan, perform and evaluate ground tests which involve hardware from two or more platform WBS elements. Also included is all test hardware (test fixtures, instrumentation, consumables, etc.) required to conduct the integrated ground testing. In addition, all required STE, along with the test procedures, test setup, data reduction and test reports are included in this WBS element. The test specimens (if flight configuration and built with production tooling) are excluded.

WBS 1.4 Level 3

WBS Title: Ground Support Equipment (GSE)

This WBS element includes all labor and material required to design, develop, test, qualify, procure, fabricate, assemble, and checkout the GSE and ground software required to support the SASP project. It includes only that equipment which is needed to handle, transport, service, or checkout the integrated platform/power system/payloads. GSE which is unique to any one orbital element (i.e., platform, power system, etc.) is provided elsewhere.

The following subelements are included:

WBS	Title
1.4.1	Electrical
1.4.2	Mechanical
1.4.3	Ground Software

WBS 1.5 Level 3

WBS Title: Payload Elements

This WBS element summarizes all the labor and material required to design, develop, test, qualify, procure, fabricate, assemble and checkout the payload elements for the SASP. Payload elements include the instruments, the instrument carriers, the payload support equipment, and the integration and checkout required to qualify each payload element. Also included are the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

The following subelements are included:

WBS	Title
1.5.1	Project Management
1.5.2	System Engineering & Integration
1.5.3	Ground Support Equipment
1.5.4	Instruments
1.5.5	Payload Carrier
1.5.6	Payload Support Equipment
1.5.7	Integrated System Test
1.5.8	Integration and Checkout

WBS 1.5.1 Level 4

WBS Title: Project Management

This WBS element summarizes all effort required to manage, direct and control the payload element project. This effort includes planning, organizing, budgeting, scheduling, directing, and controlling the project to ensure that the overall objectives are accomplished.

The following subelements are included:

WBS	Title
1.5.1.1	Project Direction
1.5.1.2	Project Planning & Control
1.5.1.3	Data Management
1.5.1.4	Procurement Management
1.5.1.5	Configuration Management

WBS 1.5.2 Level 4

WBS Title: System Engineering & Integration

This WBS element summarizes all system analyses, trade studies, and logistic activities, including performance studies and analyses and the development of requirements and definitions necessary to direct and control design of the payload elements. This element also includes all project safety, reliability and quality assurance planning and control activities.

The following subselements are included:

WBS	Title
1.5.2.1	System Analysis & Integration
1.5.2.2	Mission Requirements & Analysis
1.5.2.3	Logistic Requirements
1.5.2.4	Safety, Reliability & Quality Assurance

WBS 1.5.3 Level 4

WBS Title: Ground Support Equipment (GSE)

This WBS element includes all labor and material required to design, develop, test, qualify, procure, fabricate, assemble, and checkout the electrical and mechanical GSE required to support the various payload elements. It includes all equipment involved in handling, transporting, servicing, and checking out the payload systems required to accomplish the project requirements.

WBS 1.5.4 Level 4

WBS Title: Instruments (NASA provided)

This WBS element includes all the labor and material required to design, develop, test, qualify, procure, fabricate, assemble and checkout the SASP instruments. Included are OSS, OSTA, and OAST instruments that are compatible with the platform. Also included are the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

WBS 1.5.5 Level 4

WBS Title: Payload Carrier (DDT&E & Flight Hardware)

This WBS element summarizes all labor and material required to design, develop, test, qualify, procure, fabricate, assemble, and checkout, the payload carrier. (This may be a Spacelab type pallet or other structure). Included are all supporting subsystems of the payload carrier. Also included are the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

The following subelements are included:

WBS	Title
1.5.5.1	Structure
1.5.5.2	Data Acquisition & Control
1.5.5.3	Support Electronics
1.5.5.4	Power Distribution
1.5.5.5	Thermal Control
1.5.5.6	Assembly & Checkout

WBS 1.5.6 Level 4

WBS Title: Payload Support Equipment (NASA provided)

This WBS element includes all labor and material required to design, develop, test, qualify, procure, fabricate, assemble, and checkout the payload support equipment. These items are dependent upon the payload complement being flown on each mission, and include those items which are required by several SASP users. Examples include a pointing system, payload support structure(s), etc. Also included are the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

WBS 1.5.6 Continued

The following subelements are included:

WBS	Title
1.5.6.1	Pointing System
1.5.6.2	Support Structure
	Other (Avionics)

WBS 1.5.7 Level 4

WBS Title: Integrated System Test

This WBS element includes all labaor and material required to plan, perform and evaluate integrated (multiple payload elements) development/ qualification/validation tests for each mission at the contractor's facility. Also included is any test hardware (Instr. carrier, pallet, support equipment, simulator), required to accomplish this activity. In addition, all required STE along with the test procedures, test setup, and test reports are included in this WBS element.

WBS 1.5.8 Level 4

WBS Title: Integration & Checkout

This WBS element includes all labor and material required to perform the final assembly and checkout (i.e. Level IV integration) of the instruments, payload carrier, and payload support equipment prior to launch. This activity will take place at KSC or at a specially designated integration site. Any special tooling, assembly hardware, and software required to accomplish this activity is also included. In addition, all labor and material required to accomplish the integration support (i.e., support to integration levels III, II & I) activities is included. Also included are the preparation of drawings, procedures, and specificiations necessary to accomplish these activities.

The following subelements are included:

WBS	Title
1.5.8.1	Level IV Integration
1.5.8.2	Integration Support

NOTE: MDAC-HB will not be required to develop a cost estimate for the integration of the P/S instruments with their P/S support equipment.

WBS 1.6 Level 3

WBS Title: Power System (NASA provided)

This WBS element summarizes the labor and material required to manufacture, assemble and checkout a power system. (Design, development, test and qualification costs are excluded.) The baseline will be the 25 kW P/S. In addition, costs for other size power systems, depending on platform sizing and payload requirements, will be provided, if required. The primary functions of the power system is to provide electrical power, attitude control, and communications and propulsion for the SASP.

The following subelements are included:

WBS	Title
1.6.1	Electrical Power
1.6.2	Attitude Control
1.6.3	Communications
1.6.4	Propulsion

WBS 1.7 Level 3

WBS Title: System Test Operations, Assembly & Checkout

This WBS element summarizes all labor and material required to perform the integrated ground testing, assembly, and checkout of the platform/power system/payload elements. Also included are the consumables and software required to accomplish this activity. In addition, all required STE along with the test procedures, test setup, and test reports are included in this WBS element.

The following subelements are included:

WBS	Title
1.7.1	Platform/Power System/Payload Element Testing
1.7.2	Special Test Hardware

WBS 1.8 Level 3

WBS Title: Operations Support

This WBS element summarizes all contractor-provided services required to support the SASP during the operational phase. This includes ground and mission operations as well as on-orbit operations, post-flight operations, data processing, and any other effort required to support the SASP project during the operational phase.

The following subelements are included:

WBS	Title
1.8.1	Mission Operations
1.8.2	Ground Operations
1.8.3	On-Orbit Operations
1.8.4	Data Processing

WBS 1.8.1 Level 4

WBS Title: Mission Operations

This WBS element includes all equipment and services required to support the on-orbit operations of the SASP by both the hardware/integration contractors and scientific personnel. Included are all ground station (POCC) activities including tracking, command, communications, and data handling. Effort includes mission planning, scheduling, payload assignments, mission configuration definition, preparation of time-lines, real-time resolution of problems, and the conduct of the post-mission critique.

WBS 1.8.2 Level 4

WBS Title: Ground Operations

This WBS element includes all equipment and services required to accomplish the pre-flight and post-flight ground operations for the SASP. Included are all integration and launch operations support activities such as mating with orbiter, pre-flight checkout, launch countdown, post-flight deactivation, removal from orbiter and transfer to refurbishment facility.

WBS 1.8.3 Level 4

WBS Title: On-Orbit Operations

This WBS element summarizes all labor and material required to assemble, checkout, and service the platform, the power system, and the payload elements while in orbit. Any unique assembly hardware not provided in the hardware WBS elements is also included along with the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

The use of a TMS for purposes of payload placement/retrieval as well as platform servicing should be considered here.

The following subelements are included:

WBS	Title
1.8.3.1	Platform and Payload Carriers
1.8.3.2	Power System and Instruments
1.8.3.3	Integrated Checkout and Servicing

WBS 1.8.3.1 Level 5

WBS Title: Platform and Payload Carriers

This WBS element contains all labor and material required to checkout and service the platform and payload carriers while in orbit. Included is the unique effort associated with preparing drawings, procedures and specifications necessary to accomplish these activities.

WBS 1.8.3.2 Level 5

WBS Title: Power System and Instruments (NASA provided)

This WBS element contains all labor and material required to checkout and service the power system and instruments while in orbit. Included is the unique effort associated with preparing drawings, procedures and specifications necessary to accomplish these activities.

WBS 1.8.3.3 Level 5

WBS Title: Integrated Checkout & Servicing

This WBS element contains all labor and material required to checkout and service the combined P/S, platform, payload carrier, and instruments while in orbit. Included is all effort associated with the preparation of drawings, procedures, and specifications necessary to accomplish these activities.

WBS 1.8.4 Level 4

WBS Title: Data Processing

This WBS element includes all services required to obtain and reduce SASP hardware/software performance and scientific data to engineering terms compatible for analysis. Also included are the preparation of all procedures and specifications required to accomplish this activity and the distributon of reduced data to the evaluators.

WBS 1.9 Level 3

WBS Title: Space Transportation System (STS) (NASA provided)

This WBS element summarizes all the effort involved with the initial placement of the SASP (including P/S) into low earth orbit, as well as periodic revisits for platform/payload servicing and refurbishment, and payload changeout and placement. Such items as orbiter stay time, EVA, and the use of the orbiter RMS or a TMS should also be accounted for in this WBS element.

The following subelements are included:

WBS	Title
1.9.1	Shuttle
1.9.2	TMS

WBS 1.10 Level 3

WBS Title: Refurbishment

This WBS element includes all labor and material necessary for the post-flight refurbishment and update of the platform/power system and the payload elements. Also included are the preparation and updating of all drawings, procedures, and specifications.

The following subelements are included:

WBS	Title
1.10.1	Platform/Power System
1.10.2	Payload Elements
1.10.3	Flight Spares & Consumables
1.10.4	Ground Assembly & Checkout

WBS 1.11 Level 3

WBS Title: Government Furnished Support (NASA provided)

This WBS element includes all equipment and services required of the government to support the SASP program. This activity includes government support to the development and operation of the SASP. Also inlcuded is the support required for the overall program coordination including the STS, scientific payloads, facilities, etc.

The following subelements are included:

WBS	Title
1.11.1	Training
1.11.2	Government Furnished Property (GFP)
1.11.3	Institutional Management Services (IMS)

WBS 1.11.1 Level 4

WBS Title: Training

This WBS element summarizes all documentation, services, and training aids required to accomplish both the ground and on-orbit training necessary to attain the SASP mission requirements.

WBS 1.11.2 Level 4

WBS Title: Government Furnished Property (GFP)

This WBS element includes all Government provided effort, services, and materials required to provide the necessary GFP. Included are all ground-based facilities, GSE, hardware, services, and documentation required to accomplish the program requirements. Contractor effort associated with the acquisition and accountability of GFP is provided in WBS element 1.1.

WBS 1.11.3 Level 4

WBS Title: Institutional Management Support (IMS)

This WBS element includes the funding for the direct labor of civil service support chargeable to the SASP program. This tax is in terms of a cost per civil service man-year.

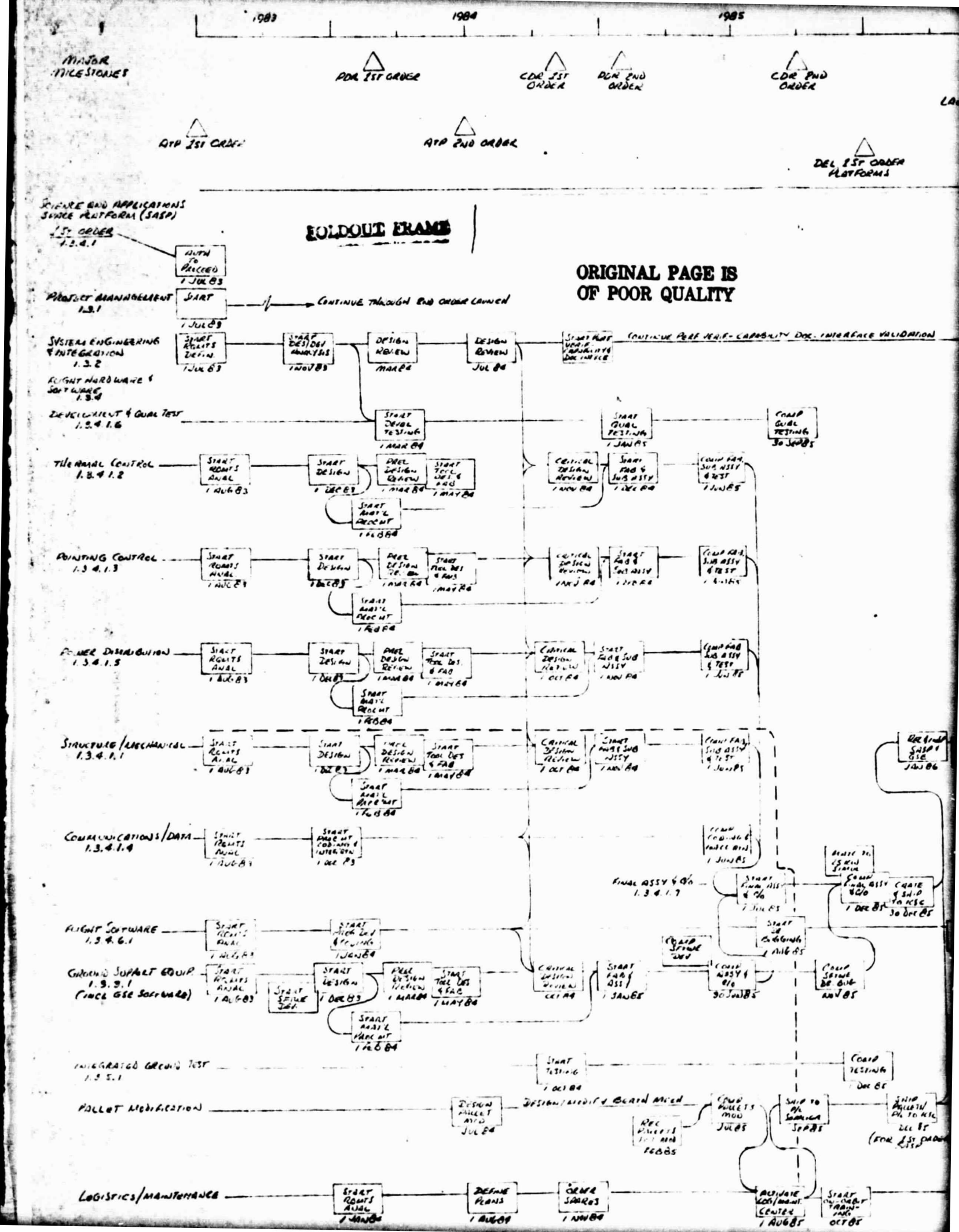
WBS 1.12 Level 3

WBS Title: Data Analysis (NASA provided)

This WBS element summarizes all services and material required of the PI and hardware contractors to analyze and document the data obtained from the experiments/flight hardware. Included is all required documentation, including the PI's preliminary and final reports. Costs incurred for this WBS element should be for up to one (1) year after mission completion.

The following subelements are included:

WBS	Title
1.12.1	Post-Flight Experiment Evaluation
1.12.2	Final Report (Experiments)
1.12.3	Evaluation of Flight Hardware Performance


1983
1984
1985
MAJOR MILESTONES
PDR 1ST ORDER
CDR 1ST ORDER
PDR 2ND ORDER
CDR 2ND ORDER
ATP 1ST ORDER
ATP 2ND ORDER
DEL 1ST ORDER PLATFORMS
SCIENCE AND APPLICATIONS SPACE PLATFORM (SASP)
FOLDOUT FRAME
ORIGINAL PAGE IS OF POOR QUALITY
1ST ORDER 1.3.4.1
AUTH TO PROCEED 1 JUL 83
PROJECT MANAGEMENT 1.3.1
START 1 JUL 83
CONTINUE THROUGH END ORDER CANCEL
SYSTEMS ENGINEERING & INTEGRATION 1.3.2
FLIGHT HARDWARE & SOFTWARE 1.3.4
DEVELOPMENT & QUAL TEST 1.3.4.1.6
THERMAL CONTROL 1.3.4.1.2
POINTING CONTROL 1.3.4.1.3
POWER DISTRIBUTION 1.3.4.1.5
STRUCTURE/MECHANICAL 1.3.4.1.1
COMMUNICATIONS/DATA 1.3.4.1.4
FLIGHT SOFTWARE 1.3.4.6.1
GROUND SUPPORT EQUIP 1.3.3.1 (INCL GSE SOFTWARE)
INTEGRATED GROUND TEST 1.3.5.1
PALLET MODIFICATION
LOGISTICS/MAINTENANCE
FINAL ASSY & C/O 1.3.4.1.7

1986 1987 1988 1989

LAUNCH 1ST ORDER PLATFORMS

LAUNCH END ORDER PLATFORMS

DEL END ORDER PLATFORMS

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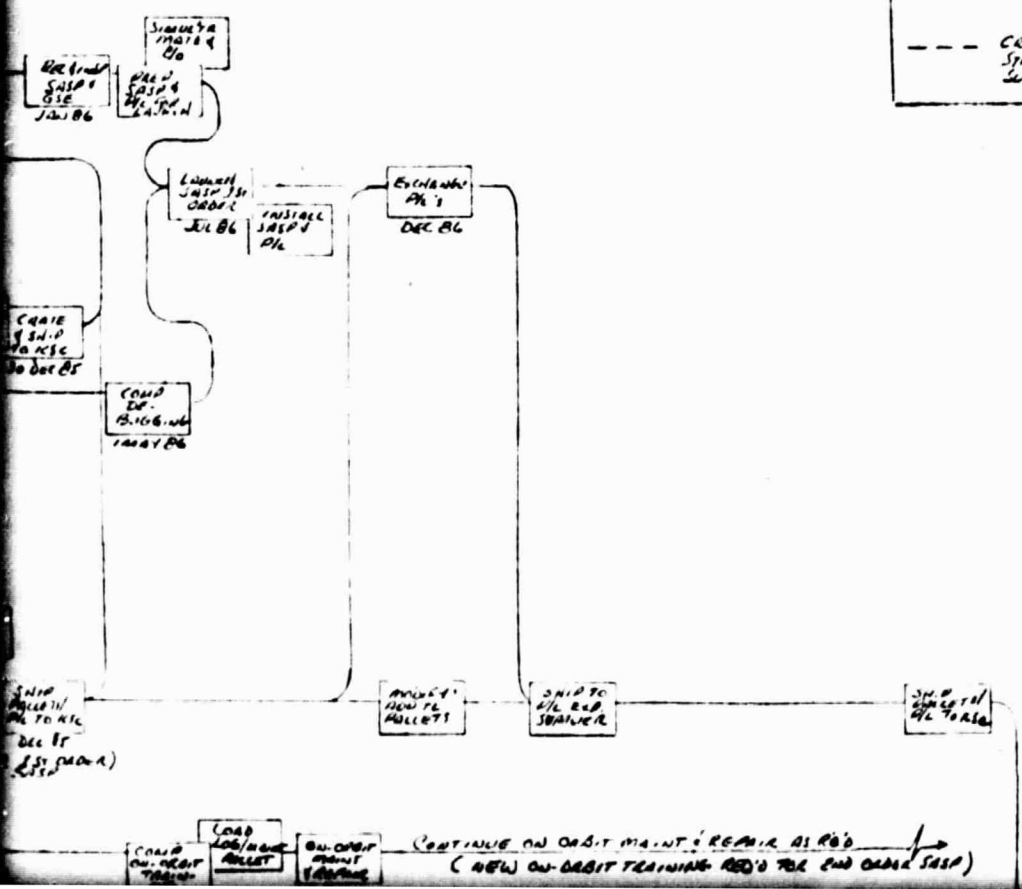
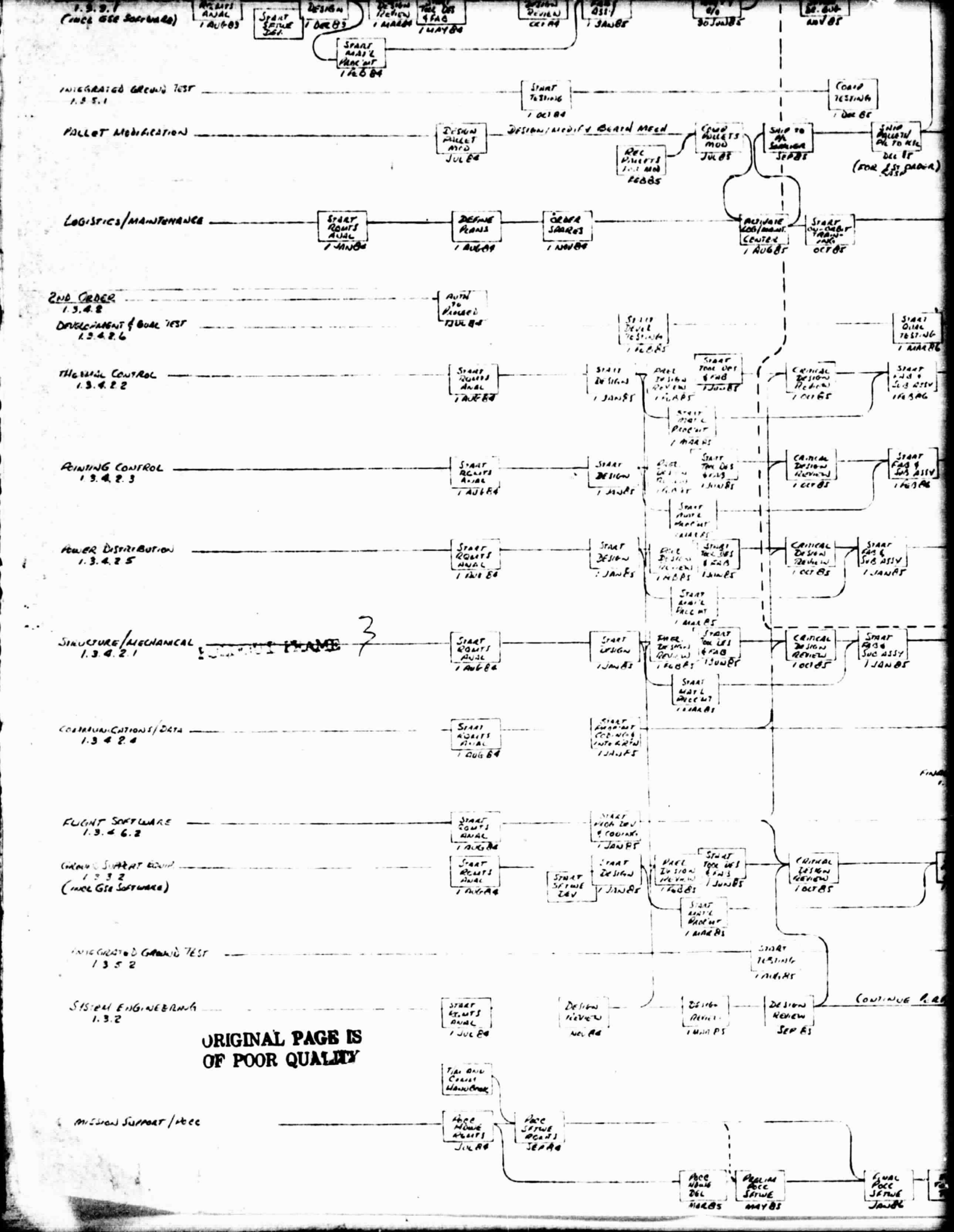
ROLLOUT FRAME 2

SCIENCE AND APPLICATIONS SPACE PLATFORM LOGIC NETWORK

--- CRITICAL PATH STRUCTURE/MECHANICAL SUBSYSTEM

AUG 1980

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START TESTING 1 OCT84
COMP TESTING 1 DEC85
PALLET MODIFICATION
DESIGN PALLET MOD JUL84
DESIGN/MODIFY BOARD MOD
REC PALLETS MOD FEB85
COMP PALLETS MOD JUL85
SHIP TO PR SHARING SEP85
SHIP PALLETS/DEL TO KSC DEC 85 (FOR LST PHASE)
LOGISTICS/MAINTENANCE
START REQTS ANAL 1 JAN84
DEFINE PLANS 1 AUG84
ORDER SPARES 1 NOV84
ACTIVATE LOG/MAINT CENTER 1 AUG85
START ON-ORBIT TRAINING OCT85
2ND ORDER 1.3.4.8
AUTH TO PROCEED JUL84
DEVELOPMENT & QUAL TEST 1.3.4.2.6
START DEVEL TESTING 1 FEB85
START QUAL TESTING 1 MAR86
THERMAL CONTROL 1.3.4.2.2
START REQTS ANAL 1 APR84
START DESIGN 1 JAN85
PRELIM DESIGN REVIEW 1 MAR85
START TOOL DES & FAB 1 JUN85
CRITICAL DESIGN REVIEW 1 OCT85
START FAB & SUB ASSY 1 FEB86
START MATL PROCMT 1 MAR85
POINTING CONTROL 1.3.4.2.3
START REQTS ANAL 1 AUG84
START DESIGN 1 JAN85
PRELIM DESIGN REVIEW 1 MAR85
START TOOL DES & FAB 1 JUN85
CRITICAL DESIGN REVIEW 1 OCT85
START FAB & SUB ASSY 1 FEB86
START MATL PROCMT 1 MAR85
POWER DISTRIBUTION 1.3.4.2.5
START REQTS ANAL 1 AUG84
START DESIGN 1 JAN85
PRELIM DESIGN REVIEW 1 MAR85
START TOOL DES & FAB 1 JUN85
CRITICAL DESIGN REVIEW 1 OCT85
START FAB & SUB ASSY 1 JAN87
START MATL PROCMT 1 MAR85
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START REQTS ANAL 1 AUG84
START DESIGN 1 JAN85
PRELIM DESIGN REVIEW 1 FEB85
START TOOL DES & FAB 1 JUN85
CRITICAL DESIGN REVIEW 1 OCT85
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COMMUNICATIONS/DATA 1.3.4.2.4
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FLIGHT SOFTWARE 1.3.4.6.2
START REQTS ANAL 1 AUG84
START PROG DEV & VERIFY 1 JAN85
GROUND SUPPORT EQUIP 1.3.3.2 (MACE GSE SOFTWARE)
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START SOFTWARE DEV
START DESIGN 1 JAN85
PRELIM DESIGN REVIEW 1 FEB85
START TOOL DES & FAB 1 JUN85
CRITICAL DESIGN REVIEW 1 OCT85
START MATL PROCMT 1 MAR85
INTEGRATED GROUND TEST 1.3.5.2
START TESTING 1 MAR85
SYSTEM ENGINEERING 1.3.2
START REQTS ANAL 1 JUL84
DESIGN REVIEW NOV84
DESIGN REVIEW 1 MAR85
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CONTINUE FOR
ORIGINAL PAGE IS OF POOR QUALITY
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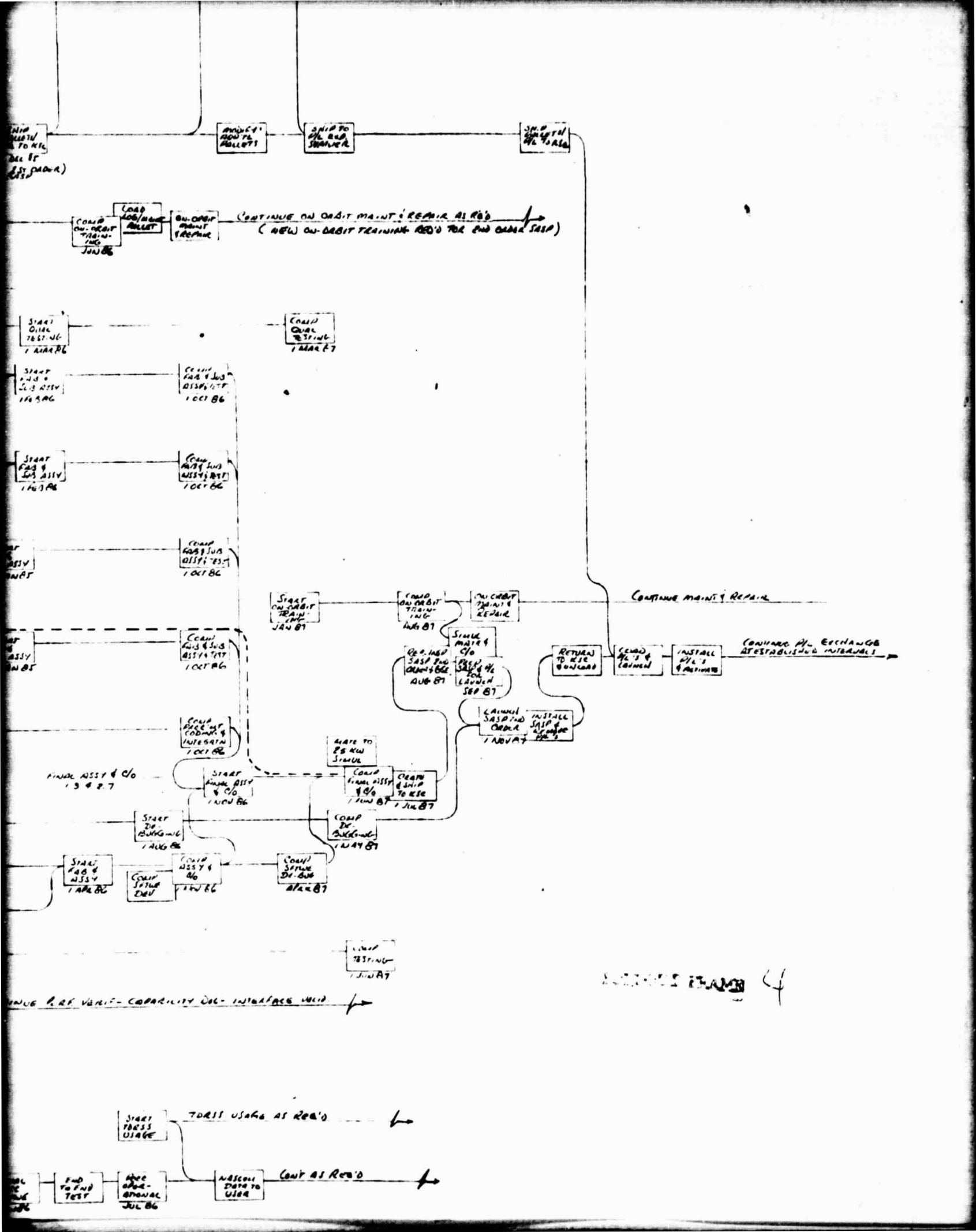
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(NEW ON-ORBIT TRAINING REQ'D FOR END CARGO SASP)
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TDRSS USAGE AS REQ'D
CONT AS REQ'D