Bendix

Aerospace Systems Division

F. A. Heinz

Documentation Requirements for
Space Experiment System Programs

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PREFACE

The objective of program documentation is to provide the means for documenting an equipment design by defining performance, configuration, interfaces, operation, maintenance, etc. As such, the program documentation forms the basic media of communication between personnel engaged in research, development, and design, and the personnel responsible for procurement, production, inspection, maintenance, and related logistic functions. It is the purpose of the discussion in this technical memorandum to establish a perspective and to motivate some thought on the documentation requirements for space flight scientific experiment programs from a cost effective viewpoint.

Cost effective program documentation requirements are not easily developed for a complex program as in the example of the Apollo Lunar Surface Experiments Package (ALSEP) for the Apollo program. The documentation requirements for ALSEP are discussed and compared to ASTP program requirements in the report and are presented as the basis for the formulation of recommendations for documentation requirements for future scientific experiment programs.

1. OBJECTIVE

The objective of this technical memorandum is to provide cost effective documentation recommendations for future NASA Space Experiment Programs based on previous ALSEP, Viking, and Rocket Payload requirements.

2. METHODOLOGY

To attain this objective, this technical memorandum presents:

a. A review of documentation requirements and the document data produced for ALSEP Array E.

b. A matrix of all pertinent documentation by individual program area.

c. A functional/value effectiveness evaluation of document types.

d. Recommendations for cost effective baseline documentation and alternate approaches for subsequent NASA Science Payloads and Experiments.

e. A documentation guideline exhibit to satisfy space experiment program requirements for performance, reliability, and safety.

3. DOCUMENTATION CLASSIFICATION

The documentation required by contract for the ALSEP program was divided into categories by type:

Type I - Data requiring NASA written approval prior to implementation.

Type II - Data submitted to NASA for coordination, surveillance, information, review and/or management control.

Type III - Data retained by contractor to be made available to NASA upon request.

Other - Documentation required for internal information and reporting not specified by contract.

4. DOCUMENTATION COST DRIVERS

Various factors tend to increase the cost of program documentation. The factors of primary concern during this study were:

a. Large number and variety of documents for all program areas.

b. Formality of documentation classification, i.e., Type I, Type II, or Type III.

c. Approval requirements for generated documents.

d. Frequency of submittals.

e. Number of copies and resultant reviewing groups inputs and changes.

f. Number of documentation updates.

5. DOCUMENTATION REVIEW

The documentation requirements and submission schedule for the ALSEP Array E program is presented in Appendix A. Each area of the documentation requirements was reviewed to determine the types of documents produced.

A matrix of all pertinent documentation by individual program area was generated as a result of this review and is presented in Appendix B. This matrix includes an assessment of function/cost effectiveness and recommendations for alternate approaches for subsequent NASA Science Payloads and Experiments.

5.1 PROGRAM MANAGEMENT

Management control documents are the top level basis management documents which describe the overall plan for implementing and administering the program. The ALSEP program was managed using an integrated set of Management Control Plans (MCP's) and Functional Plans combined with a Work Breakdown Structure (WBS) and multi-tier hardware schedules.

The overall Management Control Plan (MCP) was generated as a proposal item and negotiated into the contract, originally and for each major revision of the ALSEP contract. For the system and each individual experiment, the primary MCP areas were:

Program Control

Engineering

Crew Engineering

Configuration Control

Reliability

Manufacturing

Testing

Quality Assurance

Logistics

Training

Field Support

Procurement

Costs controls were organized to define and control costs for each of the MCP areas, which were also divided for hardware costing to reflect the primary hardware areas of the WBS at Tier I and Tier II levels.

Configuration Management, Reliability, Quality and Safety Program plans were also prepared to further detail scope and method in accordance with planning requirements set forth in NASA program standards.

The ALSEP program used Program Directives, Engineering Directives, Manufacturing Directives, Test Directives and Quality Directives to coordinate the management of program functions between two or more separate organization groups as needed to accomplish program requirements on a timely and efficient basis. These directives replace or supplement functional program plans and may invoke or define

procedures and processes in the same manner as functional plans. In combination with MCP task statements, directives may fully replace functional plans and be very specific and effective for each individual project or program.

5.2 SYSTEM AND DESIGN ENGINEERING DOCUMENTATION

System and design engineering documentation provide the means for documenting an engineering design by defining performance, configuration, interfaces, operation, etc. These documents form the basic media of communication between personnel engaged in research, development, and design and personnel responsible for procurement, production, inspection, maintenance, and related logistic support functions. Specific documents are listed in the System and Design Engineering section of the Documentation Matrix in Appendix B.

Figure 5.1 illustrates over 90 specifications which were delineated at the start of the Array A Program. The LRRR and Array E experiments added another dozen equipment and interface specifications. Therefore, over 100 equipment and interface specifications were maintained during the program.

Content and format of the subject specifications adhered to the requirements set forth in NASA publication NPC 500-1 (replaced later by the equivalent NASA publication NHB 8040.2). In addition to the flight and GSE hardware specifications for ALSEP, the contractor was responsible for documenting all functional, procedural and hardware interfaces, e.g.,

The interfaces between subsystems,

Test equipment interfaces,

Manned space flight network (MSFN),

The GFE supplied to contractor, and

The crew interfaces.

For specifications, MIL-STD-490 format guidelines for a simple 6 part specification should be used in lieu of NPC 500-1, NHB 8040.2 or contractor procedures (e.g. failure reporting, MRB activity, fault tree analysis, etc.).

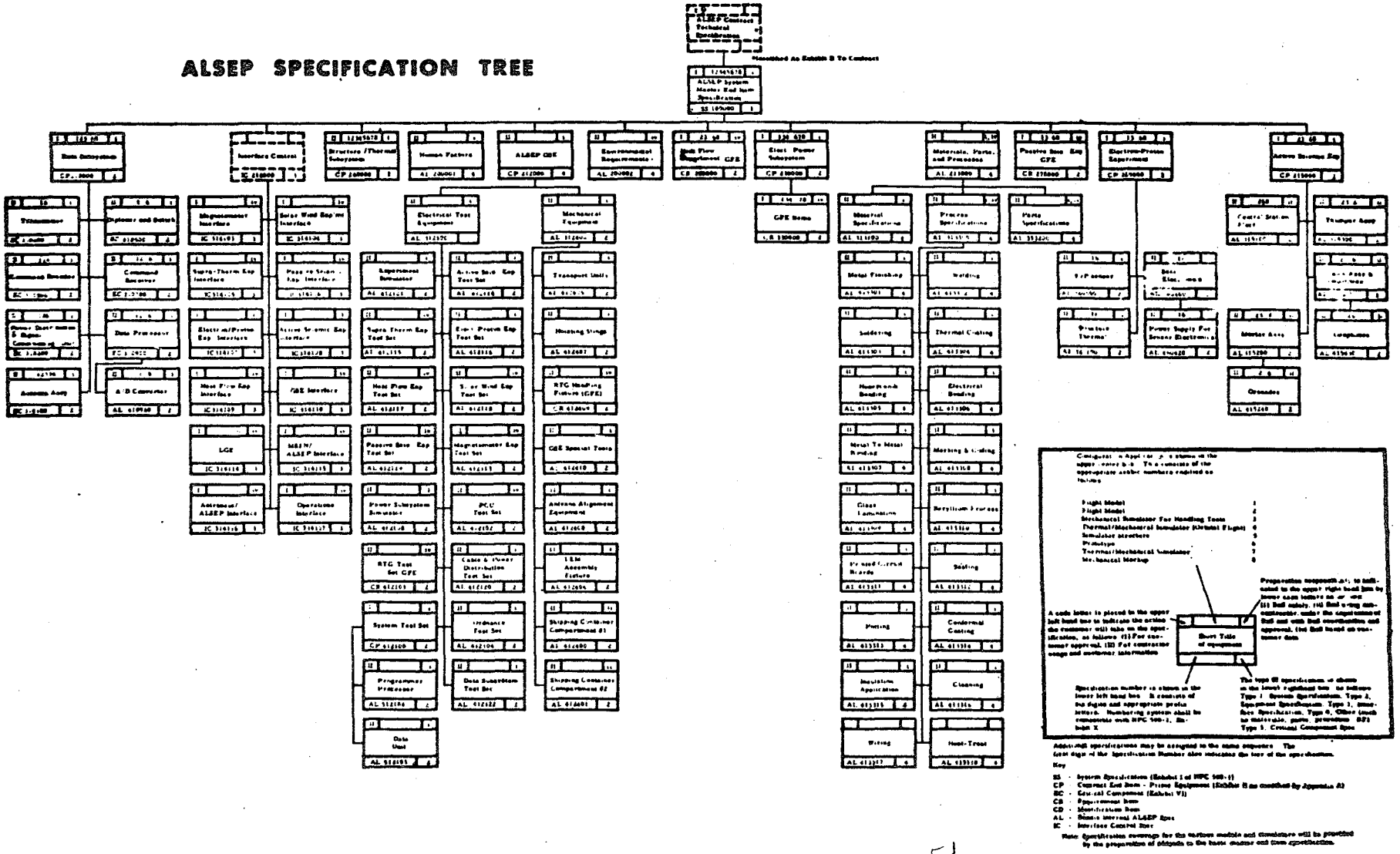

Figure 5.1 Phase II ALSEP Specification Tree

At the piece parts level, the contractor was required to use NASA preferred parts wherever feasible based on a reliability-oriented "Order of Precedence." When new specifications were needed to add part screening, burn-in or other controls to satisfy space program requirements, the contractor was required to write, negotiate and issue piece part specifications equivalent to those in the NASA preferred parts lists. There were more than 200 new user-controlled specs (SCD's) required for ALSEP; 122 of these were used on Array E and they are listed in "Table 5.1." A good number of the new part specifications were required for the LSG and other experiments where the PI could not allow part type substitutions of similar parts from the NASA or other Hi-Rel preferred part lists.

Specification/Source Control Drawings (or documents) need not follow general government standards if "User Specifications" may be jointly negotiated with suppliers to limit key physical, functional, test and traceability requirements of piece parts or components (rather than to document the typical spectrums of requirements applicable to piece part standards).

There were from 12,000 to 14,000 drawings released for each ALSEP array. All ALSEP drawings were prepared to meet the contractor's drawing system requirements for deliverable hardware, i.e., Class B drawings which conform to high but cost effective professional standards. Equivalent standards were imposed on subcontractors and suppliers having design responsibility.

ALSEP Technical Memoranda (ATM's) were defined by ALSEP program directive as the primary means for documenting engineering analyses and reports not explicitly covered by other NASA requirements. Over 1100 such documents were generated during the program (153 of which were prepared for Array E alone). As shown in Table 5.2 the Array E ATM's covered weight and power budgets, stress analysis performed in response to design review action items, scheduled and unscheduled reliability analysis, requirement analysis studies, etc.

There is no doubt that the ATM served as a useful and flexible means for issuing all sorts of technical data using an organized distribution system. The extensive contractor and government distribution list was costly to implement, where essentially all documents on all matters

TABLE 5.1

SPEC CONTROL DRAWING INDEX

ISSUE: B 9/20/71

SCD NUMBER	REV	DESCRIPTION	TYPE	VENDOR	VOL	USAGE B	3	4	5
2330151	C3	Relay	121-3032	Teledyne	1	X			
2331210	E	Connector	Special	Scheldahl	1	X			
2334459	A	Transistor	2N3263	RCA	1	X			
2335190	RC1	Transistor	2N3049	T.I.	1	X			
2335191	RC1	Transistor	2N3045	T.I.	1	X	X		
2335293	A	Switch	6380	Haydon Sw	1	X			
2335661	-	Thermistor	GB42MM62--	Fenwal	1	X	X	X	
2335662	-	Thermistor	FG108N	Tylan	1	X			
2338162	A	Resistor	P2-A	Precision	1	X			
2340305	-	Microckt	DM7800H	National	1		X		
2340307	-	Microckt	LM102F	National	1	X	X		
2340311	A	Microckt	LM111H	National	1	X	X		
2340312	-	Microckt	LM107	National	1	X	X		
2340313	A3	Crystal	Special	Monitor	1	X	X		
2340319	-	Coil	1025	Delevan	1		X		
2340328	A	Microckt	UL02C	AMI	1	X			
2340329	A	Microckt	MX02D	AMI	1	X	X		
2340330	C	Microckt	SPOIC	AMI	1	X			
2340338	C	Diode	1N4568A--	Dickson	1	X	X		X
2340351	A4	Heater	SPCL	Minco	1	2		X	
2340353	A	Resistor	CEA	IRC	1				X
2340354	A3	Connector	SPCL	Omni Spectra	1		X		
2340355	A	Diode	1N4370A	Dickson	1	X	X		
2340356	-	Transformer	SPEC	O. Schott	1				X
2340361	A	Connector	02025-0001	Transitron	1	X			
2340362	RC1	Connector	MDA/MDM	ITT Cannon	1		2		
2340363	-	Diode	SEL-1N4568A	Dickson	1				X
2340365	B	Transformer	SPEC	O. Schott	1				X
2340366	A	Transistor	2N4416A	T.I.	1		X		
2340367	A	Resistor	MH 681 -X	Caddock	1			X	
2340368	A2	Microckt,	NH0019 SPEC	National	1				X
2340369	A2	Connector	MCDB1	Microdot	1				
2340370	-	Diode		TRW	1	X			
2340371	RC1	Microckt	NH0001AF-SEL	National	1				X
2340372	A	Cap. Filt.	1250-700	Erie	1		X		
2340376	B	Diode	1N5483	Unitrode	1	X			
2340379	C	Diode	5082-3006	H. P. Assoc.	1		X		

B - Basic-Central Station
2 - LEAM
3 - LSP
4 - LMS
5 - LSG

SCD NUMBER	REV	DESCRIPTION	TYPE	VENDOR	VOL	USAGE B	3	4	5
2340382	A	Transistor Pr.	2N3811	National	1			X	
2340386	B	Resistor	250SL	Sage	1	X			
2340388	A	SCR	2N1777A	Solid State	1		X		
2340389	A	Transistor	2N3866	RCA	1		X		
2340391	A	Capacitor	100B-471	A. T. C.	1			X	
2340392	-	Diode	1N4716-	Dickson	1			X	X
2340395	-	Transistor	2N2484	Teledyne	1			X	
2340397	B	Resistor	MH51	Welwyn	1			X	
2340398	B2	Resistor	SPEC	Sage	1			X	
2340399	B	Capacitor	SPEC	Aerovox	1			X	
2346200	B2	Fuse	262-XXX	Little Fuse	2	X			
2346201	C	Microckt	54L-XX	T.I.	2	X	X	X	X
2346202	C	Transformer	SPCL	O. Schott	2			X	
2346203	A	Choke	SPCL	O. Schott	2				
2346204	C	Choke	SPCL	O. Schott	2			X	
2346206	A	Choke	SPCL	O. Schott	2			X	
2346207	E2	Microcket	54XX	T.I.	2	X	X	X	X
2346208	-	Capacitor	WQM2DM	Elmenco	2				
2346209	A	Choke	SPCL	O. Schott	2			X	
2346211	A	Choke	SPCL	O. Schott	2			X	
2346217	A	Connector	WST, WSW--	Hughes	2	X	X		
2346220	A	Cutter	1SE166	Atlas	2	LEAM			
2346222	A	Inductor	SPCL	O. Schott	2	X	X		
2346223	A	Inductor	SPCL	O. Schott	2	X	X		
2346224	A	Choke	SPCL	O. Schott	2	X			
2346225	A	Choke	SPCL	O. Schott	2	X			
2346226	B	Transformer	SPCL	O. Schott	2	X			
2346227	B	Transformer	SPCL	O. Schott	2	X			
2346230	-	Capacitor	CKR05	Aerovox	2	X	X	X	X
2346231	-	Capacitor	CKR06	Aerovox	2	X	X	X	X
2346233	-	Capacitor	CKR11	Aerovox	2	X	X	X	X
2346234	-	Capacitor	CKR12	Aerovox	2	X	X	X	X
2346235	-	Capacitor	CKR14	Aerovox	2	X		X	
2346236	-	Capacitor	CKR15	Aerovox	2	X			
2346237	-	Capacitor	CKR16	Aerovox	2				
2346238	A	Thermistor	44032, --	YSI	2	2			X
2346239	-	Relay	431-12	Teledyne	2				X
2346240	A	Capacitor	CSR13	Sprague	2	X	X	X	X
2346241	-	Capacitor	CSR13	Kemet	2			X	X
2346242	A	Switch	IHM-19	Microswitch	2		X		

TABLE 5.1 (CONT'D)

SCD NUMBER	REV	DESCRIPTION	TYPE	VENDOR	VOL	USAGE B 3 4 5
2346244	-	Crystal	2.0352MHZ	Monitor Prod	2	X
2346246	C2	Capacitor	337D	Sprague	2	X X
2346247	B2	Capacitor	HL-5--	Marshall Ind.	2	X
2346249	C	Transformer	SPCL	O. Schott	2	X
2346250	C2	Transistor	2N5071	RCA/Solitron	3	X
2346252	A	Transistor	2N4857	Teledyne	3	
2346255	A	Transformer	SPCL	O. Schott	3	
2346256	A	Crystal, Filt	SPCL	McCoy	3	X
2346257	A2	Mosfet	2N4351	Motorola	3	
2346258	C	Wire			3	X
2346259	A	Wire H. V.		Gore	3	X
2346260	B	Transformer	SPCL	O. Schott	3	X
2346261	B	Relay	SPCL	Electrol	3	X
2346262	RC1	Relay	BR-17	Babcock	3	X
2346263	A	Choke	SPCL	O. Schott	3	
2346264	-	Relay	422-12	Teledyne	3	X X X
2346265	B	Switch		T.I.	3	X
2346266	A	Relay	BR20-AX-	Babcock	3	X
2346268	B	Transformer	SPCL	O. Schott	3	X
2346269	B	Transformer	SPCL	O. Schott	3	X
2346270	C2	Microckt	NH001AF--	National	3	X X
2346271	A2	Microckt	LM108AF&H	National	3	X X
2346272	C2	Microckt	1402-02	Philbrick	3	X
2346273	A2	Microckt	LM103-XX-	National	3	X
2346274	B	Microckt	CDA2-1&2-2	Crystalonics	3	X X
2346275	C	Microckt	8T80, 8T90,	Signetics	3	X
2346278	A	Microckt	NH00?9F	National	3	X X
2346279	A2	Transistor	2N930A	National	3	X
2346280	A	Transformer	D0-T37	UTC	3	X
2346281	B	Transformer	FHA-15	UTC	3	X
2346283	A	Capacitor	JMC52XX	Johanson	3	X
2346285	A2	Transistor	2N3019	National	3	X
2346286	A	Capacitor	MC605	Aerovox	3	X X
2346287	RC2	Resistor	CEC	IRX	3	X
2346288	RC2	Crystal	SPCL	McCoy	3	X
2346289	A2	Resistor	S102--	Vishay	3	X
2346290	RC1	Resi, -Network	310737	Vishay	3	X
2346291	A	Diode	1N5283-SER	Motorola	3	X
2346294	A	Connector	MDC	Microdot	3	X
2346295	A	Diode	UZ1360--	Unitrode	3	X
2346296	C	Microckt	MC1590G	Motorola	3	X
2346297	A3	Microckt	93L11	Fairchild	3	X
2349497	A	Connector	1-202845-X	Amp. Inc.	3	X X
2349498	B	Connector	202844-X	Amp. Inc.	3	X X
2363402	A	Meter	SPCL	Int Inst	3	X

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ALSEP
ARRAY "E"

SPECIFICATION CONTROL DRAWINGS

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(THIS ISSUE "B" SUPERSEDES SCD VOL I, II, III AND SUPPLEMENT 1 DATED JUNE 14, 1971)

PREPARED BY:

ALSEP RELIABILITY DEPARTMENT

Table 5.2

SYSTEM ATMS - ALSEP ARRAY E

ATM No.	Date	Author	Title
241 E (1)	Sept. '71	P. Sondeen	ALSEP Acceptable Parts List for Array E, Amendment 1.
242 E (1)	Sept. '71	P. Sondeen	Approved Materials List for ALSEP Equipment.
268AF	2/25/71	T. Swann	ALSEP Weight Report.
268 AG 268 AH	Sept. '71 4/3/72	R. Foster	ALSEP Weight Report.
605A	10/26/70	R. Dallaire	Failure Rate Data for ALSEP.
780B	10/29/71	L. Moskowitz	Qualification Status List Fuel Cask and Structure Assembly ALSEP Array E, Flight 6.
930 930A 930B 930 C 930 D	12/9/70 2/11/71 6/2/71 11/2/71 3/8/72	O. Neau D. Thomas	Command List (Array E).
935	1/11/71	J. Jones	System Safety Program Plan for ALSEP Array E.
953 953 A 953B	1/22/71 Sept. 1971 10/4/72	R. Dallaire L. Moskowitz	ALSEP Flight System 6 (Array E) System Level Failure Mode Effects and Criticality Analysis.
962	2/2/71	R. Wallace	Array E System Grounding Philosophy.
988	3/8/71	A. Romans	ALSEP Array E Multi-layer Printed Circuit Source Qual Test Plan.
989	3/10/71	A. Wadleigh Dr. Min	Array Subpackage 1 Dynamic Analysis.
990	3/12/71	R. Wallace	Array E LEAM Digital Interface - 54L Versus Amelco Logic.

ATM No.	Date	Author	Title
1004	5/7/71	C. Jensen	EMI Investigation for Array E
1015	6/10/71	R. Dallaire D.J. Thomas	Array E Uplink Redundancy Method Justification
1023	6/17/71	R. Dallaire	Array E Time/Cycle Sensitive List.
1023B 1023C 1023D	10/4/72 10/30/72 11/2/72		
1033 1033A	7/20/71 9/27/72	R. West	ALSEP "EEE" Composite Parts List.
1034	7/26/71	B. Lavin	System Safety Progress Report ALSEP Array E.
1037	8/3/71	G. Crippe	Schjeldahl Dale Connectors.
1045 1045A	8/11/71 9/21/72	P. Sondeen	ALSEP Composite Non-Metalic Materials List.
1048	8/11/71	R. Lavin	July System Safety Progress Report - ALSEP Array E.
1054 1054 A 1054B 1054C 1054D 1054 E 1054 F	9/1/71 Oct. 1971 11/1/71 12/9/71 1/3/72 2/1/72 3/1/72	J. Hendrickson	Monthly Array E Qualification versus Flight System Differences Report. 1054G 4/1/72 1054H 5/10/72 1054I 7/10/72 1054J 10/4/72
1067	11/4/71	J. Jones	October System Safety Progress Report ALSEP Array E.
1069	11/9/71	R. Sporzynski	Array E Software Description
1072	11/17/71	J. Kasser	Array E System Description
1073	11/18/71	R. Redick	Apollo 17 Array E Lunar Surface Deployment Procedures

ATM No.	Date	Author	Title
1076	11/29/71		ALSEP Array E Power Budget
1081	1/3/72	R. Dalaire/T. Fox	TTL-54L
1081A	3/30/72		
1082	2/11/72	J. Matthis/D. Breseke	Recommendations for Minimizing Green Crud.
1083	2/17/72	R. Thomas	ALSEP Array E Engineering Model SP-1 with PSE - Design Limit Vibration Test Results.
1084	2/21/72	B. Lavin	Dec.-Jan. System Safety Progress Report, Array E.
1085	2/23/72	W. Gilham/D. Fithian	ALSEP Array E Design Verification Model Test Report.
1087	3/3/72	B. J. Thomas	Investigation into the Scrambling of Array E Qual Model PDU Relays at Turn-On.
1089	3/14/72	B. Lavin	Feb. System Safety Progress Report Array E.
1090	3/22/72	R. Thomas	ALSEP Array E Engineering Model SP-2 Design Limit Vibration Test Results.
1091	3/23/72	R. Thomas	ALSEP Array E Engineering Model SP-1 with LSG - Design Limit Vibration Test Results.
1092	3/25/72	C. Jensen	SEP/ALSEP EMI Interface.
1093	4/7/72	C. Jensen	Array E S-Band Compatibility Test Results Analysis.
1095	4/11/72	A. Bedford	Array E Calibration Curves.
1096	4/18/72	D. J. Thomas	Spurious Status Changes in Array E
1098	5/1/72	D. J. Thomas	Array E Action Item 604 Ripple on +5Volt Line.

ATM No.	Date	Author	Title
1100	5/12/72	C. Jensen	Invertigation of Array E Experiment EMI Test Data Volidity
1101	5/12/72	B. Lavin	April System Safety Progress Report Array E
1102	5/24/72	H. Geiss / R. Redick	ALSEP Contingency Procedures for Apollo 17 (ALSEP-MP-08).
1102	8/10/72		
1102A	9/27/72		
1103	6/30/72	B. Lavin	Handling, Packaging, Transportation & Storage of ALSEP Array E Flight Hardware & Support Equipment
1105	6/19/72	D. J. Thomas/ C. Jensen	EMI Test Results & Margin of Compatability for ALSEP Array E
1106	8/9/72	T. Fox	System Level Qualification Status Level Array E
1106A	10/4/72		
1107	8/9/72	T. Fox	System Analysis of Two Year Life Capability
1108	8/10/72	D. Steinmeyer	Thermistors used as linearized temperature sensors.
1112	9/27/72	H. Van Hoorde	Array E ALSEP Qual/Flight Differences & Rationale.
1114	10/16/72	J. Jones	Crew/Mission Operational Hazard Analysis.
1119	10/31/72	J. Massatico	Qual SE (SP-1 & 2) Design Limit Vibration Test Results.

CENTRAL STATION ATMS (ARRAY E)

ATM No.	Date	Author	Title
New Numbers			
947	1/21/71	J.E. Staley	Array E Power Conditioning Unit Automatic Power Management Circuit.
949	1/22/71	M. Papaioan	Array E Command Decoder Failure Mode Effects & Criticality Analysis.
950	1/22/71	J.G. Smith	Array E Data Processor Failure Mode Effects & Criticality Analysis.
951	1/22/71	A. Romans	Array E PDU Failure Mode Effects and Criticality Analysis.
951 A	Sept. 1971		
952	1/22/71	A. Moskowitz	Array E PCU Failure Mode Effects and Criticality Analysis.
952A	6/1/71		
954	1/22/71	M. Papaioan	Array E Command Decoder Parts Application Analysis.
955	1/22/71	J.G. Smith	Array E Data Processor Parts Application Analysis.
956	1/22/71	A. Romans	Array E PDU Parts Application Analysis.
956 A	Sept. 1971		
957	1/22/71	A. Moskowitz	Array E PCU Parts Application Analysis.
958	1/26/71	B. Mc Leod	Command Decoder for ALSEP Array E.
963	2/3/71	D. Thomas	Central Station Subsystem Description for ALSEP Array E.
964	2/3/71	J. Maszatics	ALSEP Array E Component Non-Operating Vibration Specifications.
971	2/5/71	R. Ziesmer	Crosstalk & Ground Differentials in the Central Station.
974	2/12/71	B. McLeod	ALSEP Command Decoder Preliminary Functions Description.
981	2/23/71	T. Fox	Reliability Prediction - Array E Redundant Command Receiver.
982	2/23/71	T. Fox	Single Point Failure Summary - Array E Redundant Command Receiver.
983	2/23/71	T. Fox	Parts Application Analysis - Array E Redundant Command Receiver.
984	2/23/71	T. Fox	Failure Mode Effects & Criticality Analysis - Array E Redundant Command Receiver.
985	2/24/71	V. C. Kemp	ALSEP Array E Command Decoder Breadboard Test Report.
998	4/1/71	John G. Smith	ALSEP Array E Parts Application Analysis of Signal Conditioning Circuits.
999	4/1/71	John G. Smith	ALSEP Array E Signal Conditioning Circuits Reliability & Failure Mode Effects Critical Analysis.
1005	5/11/71	A. Romans	ALSEP Array E PSK Transmitter - Failure Modes Effects & Criticality Analysis
1005 A	12/15/71		
1006	5/11/71	A. Romans	ALSEP Array E PSK Transmitter - Parts Application Analysis
1006 A	12/1/71		
1028	7/2/71	H. Geiss	Crew Engineering Test Plan for Evaluation of Array E Antenna Aiming Mechanism.
1031	7/9/71	R. Sigler	ALSEP Array E Antenna Aiming Mechanism Design Verification Test Results.
1032	7/15/71	N. Hadwick	Theoretical Modeling & Analysis of PCU/PDU Output Voltages.
1051	8/17/71	T. Kuchenmeister	Crew Engineering Evaluation of Array E Antenna Aiming Mech.
1113	10/6/72	D. Butts	ALSEP Array E C/S Thermal Design/ Analysis/Test Final Report.

LSP ATMS (ARRAY E)

ATM No.	Date	Author	Title
927 A	3/17/71	P. Ireton	Lunar Seismic Profiling Experiment Dynamic Analysis.
928	12/3/70	J. Zimmer	LSPE Integrated Test Plan, ALSEP-TM-659
948	1/22/71	E. Weidner	Deletion of Geophone Temperature Sensor.
959	2/1/71	R. Deppe	First Crew Engineering Evaluation of Array E - LSPE Geophone Cable Reel.
975	2/12/71	J. Staats	LSPE Parts Application Analysis.
976	2/12/71	J. Staats	LSPE Failure Modes, Effect Analysis.
1002	4/22/71	D. Toelle	LSPE Explosive Package Stowage Thermal Constraints.
1035	7/26/71	J. Staats	LSPE Timer Control Module Seal Analysis.
1036 1036A	7/29/71 11/10/71	J. Owens	LSPE Transmitting Antenna Stability Investigation.
1038	8/3/71	J. Jones	LSP Timer Overbanking on the Lunar Surface.
1039	8/6/71	J. Staats	"EEE" Parts List for LSP.
1040	8/6/71	J. Staats	Non-Metalic Materials List for LSP.
1041	8/6/71	J. Staats	Time/Cycle Sensitive Components List for LSP.
1046	8/11/71	Dr. G. Min	LSP Explosive Package Fragmentation Study.
1049	8/11/71	R. Brown	LSP Detailed System Hazard Analysis.
1053 1053A 1053B	8/30/71 12/9/71 1/12/72	R. Brown J. Jones J. Jones	LSP Operational Hazard Analysis.
1056 1056A 1056B	9/14/71 12/20/71 1/12/72	J. Jones	LSP Ground Operations and Safety Plan.
1079	12/15/71	Dr. Min/ Dr. Dewhirst	LSPE Explosive Package Fragmentation and Cratering Related to Striking Probability Investigation
1080	12/15/71	D. Toelle	LSPE Interim Stowage Thermal Constraints
1086	2/25/72	T. W. Weir	LSPE Thermal Battery Test.
1088	3/7/72	L. Lewis	LSPE Safe Arm Slide Failure Evaluation Report.
1094	4/7/72	R. Worchester	LSPE Housing & Charge Assy Foam Test Report.
1099	5/8/72	Dr. Min	Preliminary Test Evaluation on LSPE Harard Analysis
1104	6/12/72	B. Lavin	Comparative Safety Analysis - LSP Timers
1109	9/15/72	D. Toelle	Lunar Seismic Profiling Experiment Design Verification Thermal Vacuum Test
1110	9/15/72	D. Toelle	LSPE Qualification & Flight Acceptance Thermal Vacuum Test Summary & Thermal Design Final Report.
1115	10/16/72	J. Jones	LSP Final Safety Report.

LEAM ATMS (ARRAY E)

ATM No.	Date	Author	Title
977	2/15/71	J. Cooper	LEAM Failure Mode Effect & Criticality Analysis.
978	2/15/71	J. Cooper	LEAM Reliability Prediction.
980	2/23/71	J. Cooper	A Trade-Off Study of Various Methods of Releasing the LEAM Dust Covers.
995	3/24/71	R. Sims L. Mills	LEAM Film Development Test Report.
996	3/29/71	T. Kuechen-meister	Crew Engineering Evaluation of the Array E LEAM Experiment - Crew Engineering Model.
1010	6/7/71	D. Perkins	LEAM Film Development Report
1011	6/7/71	P. Pilon	LEAM Film Vibration Report
1012	6/7/71	P. Pilon	LEAM Mechanical Tests
1013	6/7/71	G. VanHoorde	LEAM Reliability Numerical Analysis, Reliability Mathematical Model FMECA & Single Point Failures.
1014	6/8/71	G. VanHoorde	LEAM CDR Parts Application Analysis
1016	6/10/71	M. Calarese	Gross Hazard Analysis Report - LEAM Experiment
1019	6/11/71	L. Mills	LEAM DVT Thermal Test Report.
1022	6/14/71	L. Kalinlec	LEAM Dynamics Analysis (DVT).
1025	6/17/71	G. VanHoorde	Time Sensitive Cycle Items - LEAM.
1027	6/21/71	G. VanHoorde	Parts & Materials List for LEAM Experiment.
1030	7/9/71	G. VanHoorde	LEAM Reliability Numerical Analysis.
1065	10/19/71	J. H. Owens	Structural Analysis Report LEAM
1066	10/22/71	K. Wadlegh	LEAM Dynamic Analysis Flight Model.

ATM No.	Date	Author	Title
1075	11/23/71	L. Mills	LEAM Thermal Design Report
1118	10/26/72	G. Pearce	LEAM Thermal Design Analysis/ Test Final Report.

LMS ATMS (ARRAY E)

ATM No.	Date	Author	Title
960	2/2/71	K. Deppe	Crew Engineering Evaluation of Array E - LMS Experiment Crew Engineering Model.
965	2/4/71	F. Howell	LMS Reliability - Reliability Prediction
965A	6/9/71		
966	2/4/71	F. Howell	LMS Reliability - Parts Application Analysis.
966A	6/3/71		
966 B	3/9/72	J. Hendrickson	
967	2/4/71	F. Howell	LMS Reliability - EEE Part List for UTD and Bendix.
967 Addendum 1	10/29/71		
967A	4/14/72		
968	2/4/71	F. Howell	LMS Reliability - Non Metalic Material List.
969	2/4/71	F. Howell	LMS Reliability - Time/Cycle Sensitive Part List.
969A	7/27/72		
970	2/4/71	F. Howell	LMS Reliability - FMECA & Single Point Failure Summary.
970A	5/15/71		
970 B	3/21/72	R. Hiebert	
1018	5/10/71	C. Taylor	Gross Hazard Analysis Report - LMS Experiment
1020	6/11/71	A. Tente	LMS Mechanical Test Reports.
1029	7/8/71	A. Tente	LMS Thermal Vacuum Tests Reports.
1042	8/9/71	J. Owens	LMS Structural Analysis Report.
1071	11/15/71	L. Duesterberg	Array E ALSEP LMS High Voltage Power Supply Capacit Problem Analysis & Corrective Action
1097	4/19/72	D. Toelle	Lunar Mass Spectrometer Design Verification Thermal Vacuum Test
1097A	5/17/72		
1111	9/15/72	D. Toelle	LMS Qualification & Flight Acceptance Thermal Vacuum Test Summary & Thermal Design Final Report.

ATM No.	Date	Author	Title
929	12/4/70	G. VanHoorde	Single Point Failure Analysis Summary. 454.
929B	5/18/71		
937	1/12/71	G. VanHoorde	Preliminary LSG Numerical Reliability Analysis.
979	2/18/71	G. VanHoorde	Preliminary Parts Application Analysis LSGE.
1008	6/2/71	G. VanHoorde	LSG Reliability Mathematical Model Reliability Numerical Analysis & FMECA
1009	6/2/71	G. VanHoorde	LSG CDR Parts Application Analysis
1009 A	Aug. 1971		
1017	6/10/71	T. Breezy	Gross Hazard Analysis Report - LSG Experiment
1026	6/21/71	G. VanHoorde	Parts & Materials List for LSG Experiment.
1043	8/9/71	G.R. VanHoorde	"EEE" Parts List for LSG.
1044	8/10/71	G.R. VanHoorde	Non-Metalic Materials List for LSG.
1057	9/15/71	B. Lavin	LSG Boydbolt Release Tests Report.
1058	9/16/71	M. Dela Crux	LSG Flight Sensor Closed Loop Performance Computer Analysis.
1024	6/17/71	G. VanHoorde	Time Sensitive Cycle Items - LSG.
1116	10/16/72	G. Pearce	ALSEP Array E LSG Thermal Control Design Analysis & Tests Final Report.

were issued to a complete distribution list, e.g., each PI desired all system ATMS and those on all experiments other than his own. Full distribution of ATM logs should allow recipients to review each ATM topic and request only those items he knows will be of interest to him.

5.3 CONFIGURATION MANAGEMENT

Configuration control, the processing of drawing changes, specification changes, etc., was based on the use of the existing contractor's configuration management procedures which met the intent of NASA regarding design baseline configuration accounting and change control.

Change Board Membership, approval signatures required for various types of drawings, etc., was established and maintained via contractor program directives coordinated with contractor in-house policies and procedures.

PDR and CDR scheduling for ALSEP was determined by program management and supported by configuration control as appropriate.

5.4 SYSTEM TEST

Test Procedures, Types I and II for ALSEP consisted of dozens of documents generated for each type of functional or environmental test performed at component, integration system and end-item levels of assembly, during separate stowage mission modes, with variation procedure documents for MSFN test, KSC operational check, etc. The rather large variety of customer controlled tests and individual test-unique test procedures results in a costly test document program, justified only by man-rated safety programs, but not by Experimenters. Therefore it is suggested that emphasis be placed on meeting the experiment end item requirements in customer approved procedures and reduction in the number of formally controlled procedures and reports to those which deal with end item testing.

5.5 RELIABILITY AND QUALITY ASSURANCE

Quality Assurance activities which include Quality Engineering, Inspection, Testing, etc. was based on existing contractor's quality

assurance procedures which met the intent of NASA requirements. The reliability program was conducted in accordance with the Reliability Program Plan developed to respond to NASA requirements as specified in the contract. Specific Reliability and Quality Assurance documentation and recommendations for future programs are included in the Reliability and Quality Assurance section of Appendix B.

5.6 SYSTEM SUPPORT/LOGISTICS

The System Support and Logistics activities were tailored to meet NASA requirements as specified in the contract in the areas of Launch Complex Operations, Safety, Training, Human Factors, Maintenance, Spares, Launch Complex Quality Programs, etc.

In areas such as familiarization manuals and maintenance manuals documentation costs can vary widely depending on their depth. Scope limited to external features, input/output functions and external test interfaces minimizes user cost and complexity. Recoverable or non-recoverable hardware may be maintained at the end-item level which is generally more efficient for both the user and the supply contractor (who will perform lower-level maintenance.)

5.7 MANUFACTURING

Manufacturing documentation consisted of a Manufacturing Program Plan, Schedules, Make or Buy Plan, Processes (existing contractor processes where applicable), Work Order Operation Sheets (WOOS), Workmanship Standards, and Tool Drawings. Documentation cost reduction in this area could best be achieved through the reduction of the number of separate documents to be maintained, reducing all document classification to Type III, and using existing contractor procedures to the maximum extent possible.

6. DOCUMENTATION VALUE ASSESSMENT

Appendix B presents a matrix evaluation of ALSEP documentation. Of the 81 line items, 48 or 59% of them are Type I and Type II which require approval/disapproval action.

It would seem advisable to eliminate most Type I documents by negotiating the baseline equivalent during contract negotiation, all subsequent changes would be processed through contract change channels which can fully evaluate and control delta costs.

Objective Accomplishment, Relative Cost, Program Impact and Justified Cost/Result columns in the Table score effectiveness in these areas on a basis of one-to-ten, from low to highly effective.

Items which are scored as low as 7 or 8 in the "Justified Cost/Result" column generally may be replaced by lower-cost alternate concepts or eliminated. Requirements for the lower cost alternates should be reduced to meet program intent for each contract; established government standards should only represent a guideline.

7. SUMMARY AND RECOMMENDATIONS

To realize a documentation cost reduction for a space experiment systems program it is necessary to minimize cost drivers while maintaining sufficient requirements to assure hardware performance, reliability, and safety. This can be achieved by the systematic application of the following actions:

a. Reduce, to the maximum extent possible, the number and variety of documents for all program areas.

b. Limit the number of Type I and Type II, requiring approval/disapproval action.

c. Reduce frequency of document submittals.

d. Limit distribution lists to those areas where the document is needed.

e. Reduce the number of document updates.

f. Utilize a lower cost alternate document for the high cost item where possible.

Appendix B summarizes the documentation reviewed and presents recommendations for future space experiment applicability and lower cost alternate documentation items. The rationale for the recommendation is included in the remarks column.

Appendix C was prepared for use as a guideline to a cost effective payload experiment documentation which can still satisfy the intent of NASA requirements for performance, reliability, and safety.

APPENDIX A

SCHEDULE III

EXHIBIT D

ALSEP FLIGHT SYSTEM NO. 6 (ARRAY E)

DOCUMENTATION SCHEDULE

Item No.	Item Description	Delivery Dates Initial	Revisions	Type	Copies
Part A	Program Control Data				
A1	Management Control Plan	w/Proposal	2 weeks after contract award; thereafter 5 days after revision	II	4
A2	Cost Proposal	w/Proposal	--	II	4
A3	Make or Buy Plan	w/Proposal	--	I	4
A4	Financial Mgt. Reports a. Monthly (533A)	Should be: Monthly (on or before 25th day of month being reported)	Monthly (15th day of month reported)	II	10
	b. Quarterly (533Q)	Quarterly (on or before 10th day of month following last day of quarter being reported)	Quarterly		10
A5	Monthly Letter		Monthly (15th working day following period being reported)	II	15
A6	Photographic Requirements				
	c. Pictures	20 days after significant event	--	II	original and one work print
A7	Minutes, Reviews*	5 days after review	As Required	II	4

Item No.	Item Description	Delivery Dates Initial	Revisions	Type	Copies
A8	Final Report	Not Required			
A9	New Technology Report	As Required		I	5
Part B	Design/Systems Engineering Data				
B1	Interface Control Specifications	7/1/71	5 days after revision	I	7
B2	Contract End Item (CEI) Specification	TBD	5 days after revision	I	7
B3	Crew Training Model Specification	TBD	5 days after revision	I	7
B4	Drawings (Per Para. 3.1.9 Exhibit A)	As Requested	--	III	1
B5	Design Analysis Reports	As Available	5 days after revision	II	4
B6	Interface Control Documentation	Submit 14 days prior to CDR	5 days after revision	I	3
B7	Subcontractor Drawings and Engineering Orders	As Requested	--	III	1 plus 1 repro (sepia)
B8	Specification and Source Control Drawings	As Requested	--	III	1 plus 1 repro (sepia)

Item No.	Item Description	Delivery Dates: Initial	Revisions	Type	Copies
B9	Operations Plan Input	TBD	5 days after revision	I	25
B10	Design Certification Review Report	TBD		II	5
B11	Measurements Requirements Document	Preliminary: Final: 6 mos. before flt. hdw. delivery	5 days after revision	I	5
B12	Subcontractor/Vendor Reports and Data	As Requested	--	III	1
B13	Spacecraft Operations Data Book Inputs	30 days prior to delivery of flt. sys. delivery	Revisions as Required	I	10, inc. 1 repro
B14	Design Review Minutes (PDR's and CDR's)	14 days after design review	Chit close out forms, after signed, by MSC representative	II	10
B15	Contingency Deployment Procedure	3 mos. prior to flt. hardware delivery	As required	I	10, inc 1 repro.
B 16	ALERTS	As Requested	As required	I	4
Part C	Testing Data				
C1	Integrated System Test Plan (System Level)	60 days prior to test	As Required	I	4
C2	Qualification Test Plan	60 days prior to test	5 days after revision	I	4
C3	Flight Acceptance Test Plan	60 days prior to test	5 days after revision	I	4

Item No.	Item Description	Delivery Dates: Initial	Revisions	Type	Copies
C4	Level A Spares Test Plan	60 days prior to test	5 days after revision	I	4
C5	Test Procedures and Specifications-Revised	20 days prior to each test	5 days after revision	I or II per Table I	Type I-3 to MSC rep., Type II-1 to MSC rep.
C6	Acceptance Test Reports and Data Tapes	4 weeks after test completion; data tapes as requested	Test report addenda published as required	II	3 to MSC rep.,Original Mag. Tape to MSC
Part D	Reliability and Quality Control Data				
D1	Process Control Procedures Continuing Revision (Manufacturing Process Manual)	As Issued	As Issued	II	1 to MSC rep., copy 51 of BxA MP Manual
D2	Quality Handling and Inspection Procedures	20 days prior to each test	5days after revision	II	1 to MSC rep.
D3	Contractor Parts List	Preliminary As Available	Final: Concurrent with delivery of flight hardware	II	4
D4	Subcontractor Parts List	Concurrent with subcontractor delivery of flt. hardware	--	III	1

Item No.	Item Description	Delivery Dates Initial	Revisions	Type	Copies
Part E	System Support/Logistics Data				
E1	Storage Procedures for End Items (EMSDI) Revised TM's wherever feasible	20 days prior to delivery of flt. hardware	5 days after revision	II	4 (MSC) Each Site Office 1 KALPO
E2	Manual Updating				
	Familiarization Course Handout	Concurrent with course		II	Course requirements plus 4 copies and 1 repro.
E3	Ground Safety Plan A. Draft]	90 days prior to flight hdw. delivery	--	II	5
	B. Final	Concurrent with flight hardware	--	II	20
E4	Crew/Missions Operation Hazard Analysis	14 days prior to FHR	As Required	I	10 plus repro.
E5	Support Material List (SML)	As Required		II	4
E6	System Safety Plan	Per Proposal	As Required	I	5 plus repro.
E7	Quality Program Plan	Per Proposal MCP's	As Required	I	5 plus repro.

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Item No.	Item Description	Delivery Dates Initial	Revisions	Type	Copies
D5	A. Preliminary ADP	2 weeks prior to hardware delivery	--	II	2
	B. Acceptance Data Package (ADP), including in part: Qualification Status and Equipment Log	Concurrent with delivery of flt. hardware	5 days after revision	I	1 (with hdw. 1 MSC
D6	Failure Reports A. TWX	Within 24 hrs. of failure isolation	--	II	4
	C. Failure Analysis and corrective action reports	As Required	5 days after revision	II	4
D7	Failure Mode, Effects and Criticality Analysis	Submit 14 days prior to CDR	--	II	4
D8	Final Single Point Failure Summary	Concurrent with FMECA	--	II	4
D9	Parts Application Analysis	At CDR		II	4
D10	Acceptable Parts List	At CDR		II	4
D11	Approved Materials	14 days prior to CDR		II	4

APPENDIX B

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Program Management								
Management Control Plan (MCP)	II	9	9	9	10	Yes	Yes	Submit with Proposal, no Update
MCP Task Statement	II	9	9	9	10	Yes	Yes	Use as Major Contract Control. Submit with Proposal.
Cost Proposal	II	9	9	9	10	Yes	Yes	Submit with Proposal. Updated at Final Negotiations and by CCP's.
Monthly Letter Report	II	8	8	8	8	No	Yes	Reduce Frequency to Bi-Monthly or Quarterly informal Report.
Financial Management Reports	II	9	9	9	9	Yes	Yes	Reduce Frequency of Reporting.
Manpower/Overtime Reports	II	7	8	7	7	Yes	No	
Technical and Management Review Minutes	II	9	9	9	9	Yes	Yes	Reduce No. of Meetings and Participants.
Review Meeting Reports	II	7	7	7	7	No	No	Use Minutes as Only Document.
New Technology Reports	I	9	9	9	9	No	Yes	Define Areas. Submit Only Areas Verified.
Photographic Documentation	II	9	5	9	7	No	No	Define Minimum Level.
Functional Flow Diagrams	II	8	7	8	7	No	No	
Final Program Reports	I	7	8	7	7	No	No	
Program Directives	III	10	10	10	10	No	Yes	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
System and Design Engineering								
Specifications:								
Contractor End Item Spec. (CEI)	I	8	8	9	8	Yes	Yes	Use CEI Spec. for all Design, Performance, Interface, Construction, Verification, and Environmental Reqm'ts.
Interface Control Specs. (ICS)	I	8	8	8	8	No	No	Interface Reqm'ts per CEI Spec.
System Specs.	II	8	8	8	8	No	No	All System, Subsystem, and Component Specs, will be Defined by Experimenter and/or Contractor and not be Deliverable Documents.
Subsystem Specs.	II	8	8	8	8	No	No	
Component Specs.	II	8	8	8	8	No	No	
Part/Device Specs.	III	9	8	9	9	No	Yes	As Applicable to Experimenter and/or Contractor Procurement Reqm'ts.
Training Model Specs.	I	8	8	8	7	No	No	
Demonstration Model Spec.	II	8	8	8	7	No	No	
System Test Equipment Spec.	II	7	5	7	7	No	No	Interface Reqm'ts per CEI Spec.
Component Test Equip. Spec.	II	7	5	7	7	No	No	
GSE Spec.	II	7	5	7	7	No	No	
Special Fixture Specs.	II	7	5	7	7	No	No	
Shipping Container Specs.	II	7	5	7	7	No	No	
Human Factors Specs.	II	7	5	7	7	No	No	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Spec. Lists & Trees	III	8	7	8	8	No	No	
Structural/Thermal Specs.	II	8	7	8	8	No	No	
Material & Process Specs.	II	8	7	9	9	No	No	Defined by Program Reqm'ts and Contractor Approved Material.
Drawings:								
Layouts	III	9	9	10	9	Yes	Yes	Contractor to Maintain As Built Configuration for each Model per Internal C/M System. Top Assembly, Interface, and Schematic Drawings Class I for Flight Configuration Only. No Deliverable Dwg. Pkg. Other Than Top Assy, ICD, and Schematics. Red-lining of Dwgs During Development Acceptable as Long as Configuration is Maintained. Parts & Materials Used in Design Presented and Approved at CDR. All Non-preferred Parts & Materials Qual. Data Presented at CDR.
Interface	I	9	9	10	9	Yes	Yes	
Assembly	III	9	9	10	9	Yes	Yes	
Details	III	9	9	10	9	Yes	Yes	
Subassemblies	III	9	9	10	9	Yes	Yes	
Specification Control	III	9	9	10	9	Yes	Yes	
Source Control	III	9	9	10	9	Yes	Yes	
Schematic	III	9	9	10	9	Yes	Yes	
Wiring List	III	9	9	10	9	Yes	Yes	
MFR Fixtures/Tools	III	9	9	10	9	Yes	Yes	
Trees	III	9	9	10	9	Yes	Yes	
Hardware Trees	III	9	9	10	9	Yes	Yes	
Design Analysis Reports	II	9	9	9	8	No	No	No Formal Analysis Reporting Other Than Provided in System Safety Assessment Report.
Technical Memorandum	II	8	8	8	8	Yes	Yes	Per Internal Requirements.
Interface Control Documents	I	8	7	8	9	Yes	Yes	Type I Controlled Document Approved at CDR.

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Subcontractor Documents and Engineering Orders	III	8	9	8	8	Yes	Yes	Per Contractor C/M Reqm'ts. No Deliverable Documentation other than Class I Interface or Safety Documents.
Measurement Reqm'ts Document	I	8	9	8	8	No	No	
Design Certificate Review Report	II	8	9	8	8	No	No	
Subcontractor/Vendor Reports & Data	III	8	9	8	8	No	No	
Design Review Documentation	II	9	9	9	9	Yes	Yes	
Contingency Procedures	I	8	8	9	8	No	No	Include in Flight Operations Plan, Ref. Engineering Support Documentation.
Measurement/Command List	I	8	8	9	8	No	No	
Calibration Data - Listings, Curves, Mag. Tapes and Definition Documents	II	9	9	9	9	No	Yes	Only as Required to Document Information Reqd for Mission Operations. Where PI Provides Self Contained Recording Capability, no Calibration or Software Provided
Software Program Listings, Flow	III	8	9	8	8	No	No	
Software Utilization Documents	III	7	5	7	7	No	No	
Design Description Documents	III	7	5	7	7	No	No	
System Weight Reports	II	7	5	8	7	No	No	
System Power Reports	II	7	5	8	7	No	No	
Engineering Test Reports	III	7	5	7	7	No	No	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Design Data Books	III	8	9	8	8	No	No	
Test Set Maint. Documents	II	7	8	7	7	No	No	No Formal Ste Manual Recommended Interface Schematics and the Assembly Drawings Provided to Document Design and Configuration. Any Interfaces which Effect Safety will be Class I and Engineering Changes Maintained. Calibration and Acceptance of Test Equipment is Experimenter's Responsibility. No Formal R&QA Records of STE Design or Operation Recommended.
Contact/Trip Reports	III	7	8	7	7	No	No	Only as Dictated by the PI or Contractor Internal Requirements per Financial Report Requirements as Negotiated for Financial and Program Requirements.
Manpower Plans	II							
Task and Hardware Schedules	II							
Engineering Directives	III	10	10	10	10	No	Yes	
Configuration Management								
Configuration Management Plan	I	9	7	9	9	No	Yes	Submit with Proposal. Use Contractor Inhouse System Modified per RFP.
Configuration Documentation Index	II	8	8	9	8	No	No	Use Contractor Inhouse System.
Specification Identification Log	II	8	8	9	8	No	No	Use Contractor Inhouse System.
Configuration Identification Procedure	II	8	8	9	8	No	No	Use Contractor Inhouse Procedure.

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Configuration Control Procedure	II	8	8	10	8	No	No	Use Contractor Inhouse Procedure.
Engineering Change Proposal (ECP)	I	9	9	10	9	Yes	Yes	Submit for Class I Interface and Safety Changes only Using Contractor System and Forms.
Specification Change Log	II	8	7	8	9	No	No	Use Contractor Inhouse System.
Specification Change Notice	II	8	9	9	8	Yes	Yes	For Type I Changes only.
Configuration Identification Index	II	8	9	8	8	No	No	Use Contractor Inhouse System.
Request for ECP (RECP)	I	8	9	8	8	Yes	Yes	Customer Form. Improve Response Time & Deligate Lower Level of Approval.
Deviations and Waivers	I	8	7	8	8	Yes	Yes	For Safety, Materials Interface only.
Equipment Serialization & Tracking	II	8	7	8	8	No	Yes	S/N & Dash No. of Major Assemblies only.
Baseline Data Package	II	8	7	8	8	Yes	Yes	Informal Data Packages Parts and Materials Formal Type I Presented at CDR.
Interface Controls	I	8	8	8	8	Yes	Yes	Class I-ICD's only. All others Class II Drawings.
Drawing Controls	II	8	8	8	8	Yes	Yes	
Subcontractor/Vendor Controls	III	8	7	8	8	Yes	Yes	At Contractor Discretion.
Change Control Board (CCB)	II	8	9	8	8	Yes	Yes	Convene for Class I Changes Only.

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
System Test								
Integrated System Test Plan	I	9	9	8	8	No	No	Submit Proposed Test Sequence and Levels with Proposal.
Qualification Test Plan	I	9	9	8	8	No	No	
Flight Acceptance Test Plan	I	8	9	8	8	No	No	
Spares Test Plan	I	8	9	8	8	No	No	
End Item Test Plan	I	8	9	8	8	No	No	
Pre-Installation Test Procedures	II	7	8	7	7	Yes	No	
Qualification Test Procedure	I	9	8	9	9	Yes	Yes	Type II Procedures. Environmental and Test Requirements Provided to PI and Concurred upon for Qual. and Flight Tests.
Qualification Test Reports	II	8	8	8	9	Yes	Yes	As Run Copies of Test Procedures Records and Data.
Acceptance Test Procedures	I	9	8	9	9	Yes	Yes	Type II Procedures.
Acceptance Test Reports	II	8	8	8	9	Yes	Yes	As Run Copies of Test Procedures and Data. ADP Includes Interface and Safety Test Results.
Test Equipment Documentation	II	8	8	8	8	No	No	
Pre- and Post-Test Meetings and Minutes	II	8	7	8	7	No	No	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Data Reduction Analysis	II	8	9	8	8	No	No	None other than Reqd by Contractor.
Qual Test Readiness Review (QTRR)	II	8	9	8	8	No	No	
Flight Test Readiness Review (FTRR)	II	8	9	8	8	No	No	
Qual Assessment Review (QAR)	II	8	9	8	8	No	No	
First Article Configuration Review (FACR)	II	8	9	8	8	No	No	
Customer Acceptance Readiness Review (CARR)	II	8	9	8	9	No	Yes	
Reliability & Quality Assurance								
Reliability Program Plan	I	9	9	9	9	Yes	Yes	
Quality Assurance Program Plan	I	9	9	9	9	Yes	Yes	Use Contractor Inhouse System Modified per RFP.
Process Control Procedures	II	9	8	9	8	No	No	Specify on Drawings.
Handling and Inspection Procedures	II	9	8	9	8	No	No	Specify on Drawings.
Certification Test Procedures	II	8	9	8	8	No	No	
Certification Test Plan	II	8	9	8	8	No	No	
Certification Test Report	II	8	9	8	8	No	No	
Certification of Flight Worthiness (COFW)	II	8	8	8	8	Yes	No	

DOCUMENTATION MATRIX

Value Assessment / Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Installation Test Procedures	II	8	9	8	8	No	No	Submit Information Required Through KSC Ground Operation Plan.
Acceptance Data Package	I	9	9	9	9	Yes	Yes	Provide Major I/F Dimensional, Weight, Cleanliness Data. Also all Interface, Materials and Safety Deviations and/or Waivers.
Failure Mode and Effects Analysis (FMEA)	II	9	9	9	8	No	No	Provide Engineering Matrices as Required. Maintain and Track Failures/Problems which Relate to Safety or Interface Considerations. Analysis Presented at CDR.
Time/Cycle Control Procedure	II	8	9	8	8	No	No	
Time/Cycle Equipment Logs	II	8	9	8	8	No	No	
Time/Cycle Sensitive Component List	II	8	9	8	9	Yes	No	
Alerts and Response Reports	I	8	9	8	8	No	No	Supplied by Program for Material and Safety use.
EEE Parts List	II	9	9	9	8	Yes	Yes	Use Mil Standard Parts. Eliminate Screening. Standardize Parts. Provide Parts and Materials Data to Experimenters/Contractors. Provide Materials List at CDR. All Non-Conformance need Qual Data.
Failure Notices and Reports	II	9	8	9	9	No	Yes	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Subcontractor Parts List	III	8	8	8	9	Yes	Yes	
Non Metalic Material List	II	9	9	9	9	Yes	Yes	
Parts Application Report	II	8	9	8	8	No	No	
EEE Parts Derating Report	II	8	9	8	8	No	No	
EEE Parts Changes Substitutions Deviation	II	8	9	8	8	No	No	Submit with QA Plan and Acceptance Test Results.
Contamination Control Plan	II	8	9	8	8	No	No	
Failure Report Closure Plan	II	8	9	7	7	No	No	
Subcontractors Q/C Plan	III	8	8	8	8	No	No	
Worst Case Analysis	II	8	10	8	8	No	No	
Mean Time Between Failure (MTBF) Analysis	II	8	9	8	8	No	No	
Material Review Board	II	8	10	8	8	No	No	No Formal MRB. Informal Tracking and Engineering Close Out of all Safety and Interface Problems/Failures.
Quality Assurance Instruction Report (QAIR)	II	8	9	8	8	No	No	
Workmanship Traceability	II	8	9	8	8	No	Yes	For Critical Safety Related Hardware Only. Contractor to Define.
Parts Traceability	II	8	9	8	8	No	No	

DOCUMENTATION MATRIX

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Qualification Status List	II	7	8	7	7	No	No	
System Support/Logistics								
Operations Support Handbook	I	8	9	8	8	No	No	
KSC Failure Reports	II	8	9	8	8	No	No	
Overall Flight Hardware Checkout Flow Plan	II	8	9	8	8	No	No	
Site Activation/Revalidation Schedule	II	8	9	8	8	No	No	
Flight Hardware Schedule	III	8	9	9	8	No	Yes	Informal Schedule Maintained by Exp Supplier for Inputs to Overall KSC Test Integration Schedule.
Preflight Operations Procedure	II	8	9	8	8	No	No	
KSC Management Report	II	9	9	8	8	No	No	
KSC Manpower Report	II	9	9	8	8	No	No	
GSE Open Items Status Report	II	9	9	8	8	No	No	
Test and Checkout Plan	II	9	9	8	8	No	No	
Test and Checkout Procedure	II	8	9	9	8	Yes	Yes	System Safety Tests During KSC Spacecraft Integration Supported by Exp Field Team Combine with Ground Safety Plan.
Hazard Analysis Report	II	8	9	9	8	Yes	No	

DOCUMENTATION MATRIX

Value Assessment / Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
System Safety Plan	I	8	9	9	8	Yes	Yes	An extensive Safety Plan should be Provided for each Experiment and be Reviewed and Approved by NASA for Hazards as Pressure, Pyrotechnics, Electrical Hazards, Static Change, High-Tension, Radiation, Chemical Caustic Toxic Substances, Combustibles Grounding, etc.
KSC Operations Plan	I	8	9	9	8	No	Yes	Conducted by Training Office.
Crew/Missions Operations Analysis	II	8	9	8	8	No	No	
Support Material List	II	8	9	8	8	No	No	
Storage Procedures	II	8	9	8	8	No	No	
Familiarization Manual	II	8	9	8	8	No	No	
Training Course Documents	II	8	9	8	8	No	No	
KSC Quality Program Plan	I	8	9	8	8	No	No	
Support Equipment Analysis	II	8	9	8	8	No	No	
Logistics/Spares Plan	I	8	9	9	8	Yes	Yes	Spares and Logistics Requirements need Identification for Quantity and Delivery if Experiment is Flown Several Times or Where Inflight Repair is Required.
Mission Support Data Book	I	8	9	8	8	No	No	

Value Assessment Documentation Item	Type Classification Classification	Objective Accomplishment	Relative Cost	Program Impact	Justified Cost/Result	ASTP Documentation Requirements	Space Expmt Applicability	Remarks
Operation and Maintenance Manual	II	8	9	9	8	Yes	Yes	Operation and Maintenance of Experiments should be Combined with Logistics/ Spare Plan if Experiment Operation or Repair is Conducted by Shuttle Crew. Degree of Detail will Depend on Extent of PI or Crew Involvement.
Manufacturing								
Make or Buy Plan	I	8	9	8	8	No	No	
Manufacturing Processes	II	8	9	9	8	Yes	Yes	Class III as Defined by Contractor.
Manufacturing Program Plan	I	8	9	8	8	No	No	
Manufacturing Work Order Operation Sheets	III	8	9	9	8	No	Yes	Per Contractor System.
Workmanship Standards	II	8	9	8	8	No	No	No Traceability Required other than Defined by Contractor for Critical Parts only.
Tooling, Jigs, and Fixture Documentation	II	8	9	8	8	No	No	Informal.
Program Schedules (Tier I, II, III, and IV)	II	8	9	8	8	No	No	Other than Required for Program Control.
Manufacturing Directives	III	8	9	9	8	No	Yes	

APPENDIX C

DOCUMENTATION REQUIREMENTS EXAMPLE

TABLE OF CONTENTS

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EXHIBIT C

DOCUMENTATION REQUIREMENTS

1.0 GENERAL

The documentation requirements defined in this Exhibit indicate the scope of documentation effort of this contract. Specific documentation delivery requirements are presented in Schedule III attached.

The documentation requirements specified shall not be altered as a result of a make-or-buy decision, e.g., the contractor shall be responsible for the items he makes as well as those he buys. A conflict exists between the requirements of this document and the referenced specifications or documents, the requirements of this Exhibit apply.

1.1 CLASSIFICATION

Data required shall be of three categories. Type I shall be submitted to NASA for approval. Implementation of Type I documentation shall not proceed until after: (1) approval by NASA, or (2) until 7 days after receipt by NASA for procedures and 20 days for reports and plans. NASA approval is considered to be granted if the contractor has not received written notice of disapproval and identification of specific deficiencies within 7 days for procedures and 20 days for reports and plans. Type II data shall be submitted for coordination, surveillance, information, review and/or management control. Type III data shall be retained by the contractor and submitted to NASA only upon request. Insofar as practicable, the contractor's own internal documents shall not be retyped and duplicated on more expensive paper prior to submission.

1.2 DATA IDENTIFICATION

All contractor documentation shall be organized into a series of numbered documents. All documents delivered, except drawings, shall be clearly marked with the paragraph number which requires such delivery. Type I documents shall be clearly marked "Preliminary - NASA Approval Pending" or "Approved by NASA" as

appropriate. The number of copies required will be one reproducible copy for all Type I and II documents except punch cards, tapes, and drawings, plus two additional copies unless otherwise noted in Schedule III.

1.3 REVISIONS, AMENDMENTS, AND ADDITIONS

In preparing Type I and Type II documentation which will require periodic revision, the contractor shall prepare initial documentation using a refastening method so that pages may be deleted and/or inserted. When the original document is so prepared, the contractor need not submit the entire document but shall submit revised, amended or additional pages as appropriate. Accompanying these pages will be an instruction page detailing the exact means for effecting the revision or amendment. The provision of this paragraph does not apply to specifications, drawings, etc., which have an established procedure for the processing of amendments and revisions.

2.0 APPLICABLE DOCUMENTS

Documents referenced in this exhibit are of the issue in effect on the data of contract effectivity and form a part of this exhibit to the extent specified herein.

3.0 MANAGEMENT DOCUMENTS

Management documents are to be top level documents which consist of the Management Control Plans and Function Plans. The plan shall detail the tasks by which the contractor intends to comply with the statement of work. The plan shall include master phasing charts and milestone charts for the overall program.

3.1 MANAGEMENT CONTROL PLANS

The documents shall consist of a series of plans, the total of which amounts for the activities of the contractor, subcontractor, and personnel on the program.

3.1.1 Financial Management Reports

A contractor Financial Management Report (NASA Form 533) shall be prepared each month.

3.1.2 Monthly Letter Progress Report

A monthly summary of schedule significant program progress and tasks shall be prepared.

3.2 COST PROPOSAL

The contractor shall prepare an integrated cost proposal for the implementation of this program and any modification thereto. The cost proposal shall be divided into the same organization units as the Management Control Plans and shall comply with standard Government policy.

4.0 FUNCTIONAL PLANS

4.1 INTEGRATED TEST PLAN

This document shall describe the hardware Qualification Test Program and the Flight Acceptance Test Program and shall be submitted in accordance with Schedule III.

4.2 RELIABILITY PLAN

Task statements included in the Management Control Plan:

4.2.1 Failure Reports on Qualification and Flight Models Shall Consist of:

(a) TWX notification to NASA
(b) Analysis and corrective action on non-GFE items.

4.2.2 Approved Materials List

The contractor and suppliers shall select parts, devices and materials for the contract hardware on the basis of suitability for their application(s). Initial selections may be based on good performance in

prior comparable uses or its presence on an existing list, whether NASA-furnished or from another source. Whenever practicable, items selected shall be already qualified to pertinent specifications, and selection shall minimize the number of stypes of each generic type. When selecting items previously qualified, the contractor shall devote particular attention to currentness of data, applicability of basis of qualification and adequacy of specifications. The contractor and suppliers shall prepare and maintain project parts, devices, and materials lists for use in design of the contract hardware. Because these items are a limiting factor on the reliability of the design and hardware, every effort shall be made to select all necessary parts, devices, and materials as early in the project life as possible. The project lists should be complete (with the exception of a few items) and be submitted to the procuring NASA installation prior to detailed design of the hardware. After initial submittal, Contractor parts/devices/materials lists shall be updated and submitted as specified in the contract.

4.3 QUALITY PLAN

Shall be defined in the basic contract and MCP tasks.

4.4 CONFIGURATION MANAGEMENT PLAN

Configuration Management as provided in the MCP tasks shall be implemented under this program.

5.0 SPECIFICATIONS

5.1 CFE SPECIFICATIONS

Using 6-section MIL-STD format as a guide, the contractor shall prepare CFE specifications for his hardware at the deliverable end item level. Equipment Specifications shall specify the detailed requirements of the particular equipment, identify the subsystem of which it is a part, and specify the quality and acceptance provisions designed to show that the requirements have been fulfilled.

5.1.1 Interface Documentation

The preparation of interface documentation shall be the responsibility of the contractor. The contractor or other representative who is to provide the equipment on behalf of the Government shall co-sign the interface documentation prior to its submittal to NASA/MSC for approval. Interface differences between participants shall be resolved by NASA/MSC.

5.2 END ITEM SPECIFICATION

The contractor shall prepare specifications defining the technical requirements. In general, these specifications shall define such areas as functions, performance, design, configuration, interface, qualification, reliability and acceptance requirements for the module to be delivered.

5.3 TEST PROCEDURES AND SPECIFICATIONS

Test procedures shall be prepared for qualification and flight acceptance tests and will be utilized by test personnel to conduct such tests. As such, they will describe the step-by-step activities to be performed during the test operations. The activities will be listed in the sequence in which they are to be performed and keyed to a specific time reference. All safety or emergency procedures will be detailed for each hazardous condition.

5.3.1 Quality Test and Inspection Procedures

The contractor shall prepare test and inspection procedures in accordance with contractor standards for good practices.

5.3.2 Process Control Procedures

The contractor shall provide process control procedures in accordance with contractor standards for good practice.

5.3.3 Recommended Storage Procedures for End Items

The contractor shall provide adequate storage procedures. These procedures shall assure suitable protection against deterioration and damage for both short term and long term (in excess of two years) storage periods. Special handling and preventive maintenance considerations shall be included as necessary.

5.4 SYSTEM QUALIFICATION TEST REPORT

The contractor shall prepare a Qualification Test Report covering all such tests defined by the program.

5.5 FLIGHT ACCEPTANCE TEST REPORT

The contractor shall prepare a Flight Acceptance Test Report consisting of the following:

1) Pre-test meeting minutes (if applicable)
2) As-run procedure including DR's
3) Post test meeting minutes (if applicable)
4) Documentation of closing action items status.

6.0 ENGINEERING REPORTS AND DATA

6.1 TECHNICAL DATA, REPORTS AND ANALYSES

The contractor shall prepare technical reports which describe the studies, analyses, and results of the contractual effort. The reports shall be prepared at times when complete blocks of work have been accomplished, and if appropriate, as logical subdivisions thereof. Major technical areas shall not be combined in a single document, but shall be published individually. Format is contractors option.

6.2 DESIGN INFORMATION

The contractor shall submit preliminary design information to assist in expediting the interchange of design data and to keep NASA continually and currently appraised of the contractor's activities, philosophy, approaches, solutions, and design evaluations. See 6.1 for data media.

6.2.1 Design Review Minutes

Minutes shall be prepared of the results of the Design Review. Action items incorporated shall include schedule dates.

6.3 SUBCONTRACTOR DRAWINGS AND ENGINEERING ORDERS

The contractor shall maintain a complete, up-to-date set of all drawings sufficient to describe each of the equipments, including those of his vendors, for which he is responsible. The contractor drawings shall be Type III. Drawings of non-deliverable modules or in-house equipment such as mockups, etc., shall be type III. These drawings shall be prepared using the contractor's internal drawing system, and shall conform to high professional standards.

6.4 SPECIFICATIONS/SOURCE CONTROL DRAWINGS

Contractor procured hardware shall not require submission of engineering drawings for suppliers. The contractor, in order to exercise control of suppliers, will prepare specification/source control drawings, as applicable, and will make these documents available to NASA upon request.

7.0 OTHER DOCUMENTATION

7.1 OPERATIONAL DATA BOOK INPUT

A Spacecraft Operational Data Book addendum shall be written and prepared to define configuration, operational data, system constraints and limitations and system command descriptions. This Type I data will be published and distributed by NASA for use in lunar operations. Inputs supplied by the Contractor will be published and distributed by NASA.

7.2 CONTRACTOR'S PARTS LIST

The contractor shall prepare a list of parts and materials selected and submit these data to scheduled design reviews.

7.3 MINUTES OF MEETINGS

Meetings - NASA shall be notified 3 days in advance of meetings with other contractors, government agencies, and participants in the Program. Minutes (including all agreements and action items) of meetings shall be written by the contractor and the draft signed by representatives of the organizations involved prior to departure of the meeting parties. The minutes shall be typed and forwarded to all attendees and various designated NASA addresses.

7.4 MEASUREMENTS REQUIREMENTS DOCUMENT

Provide NASA data survey parameters applicable to each measurement point in tabular form to permit evaluation of the validity of each measurement.

7.5 GROUND SAFETY PLAN

The Ground Safety Plan shall include the purpose and description of the hardware. It shall include details of equipment design with special emphasis on the safety features. It shall also describe ordnance items, technical data sheets, and the KSC flight systems operations and safety management program precautions which apply.

7.6 OPERATIONS PLAN INPUT DATA

The Operations data shall define the operating sequences for the operational hardware. It shall contain the time lines for each experiment turn-on, and operations procedures. The operations data provides the guidelines for the development of the Science Operation Support Plan.

7.7 OPERATIONS HAZARD ANALYSIS

The details of the report shall be consistent with the complexity and inherent hazard potential of the hardware during test, checkout, and support for maintenance, training, simulation, and operations.

8.0 ACCEPTANCE DATA PACKAGE (ADEP)

ADP contents to be as specified in the basic contract Exhibits. Two (2) copies of the ADP for each end item will be delivered with each Flight Model. NASA review and approval of each ADP is required prior to NASA final acceptance of the end item.

SCHEDULE III

DOCUMENTATION SCHEDULE

Item No.	Item Description	Delivery Dates: Initial	Delivery Dates: Revisions	Type	Copies
Part A	Program Control Data				
A1	Management Control Plan	w/Proposal	2 weeks after contract award; thereafter 5 days after revision	II	4
A2	Cost Proposal	w/Proposal	--	II	4
A3	Financial Mgt. Reports				
	b. Quarterly (533)			II	10
A4	Monthly Letter		Bi-Monthly	II	15
A5	Minutes, Reviews*	5 days after review	As Required	II	4
A6	New Technology Report	As Required		I	5
Part B	Design/Systems Engineering Data				
B1	Contract End Item (CEI) Specification	TBD	5 days after revision	I	7
B2	Drawings	As Requested	--	III	1
B3	Interface Control Documentation	Submit 14 days prior to CDR	5 days after revision	I	3
B4	Subcontractor Drawings and Engineering Orders	As Requested	--	III	1 plus 1 repro (sepia)
B5	Specification and Source Control Drawings	As Requested	--	III	1 plus 1 repro (sepia)
B6	Operations Plan Input	TBD	5 days after revision	1	25
B7	Spacecraft Operations Data Book Inputs	30 days prior to delivery of flt. sys. delivery	Revisions as Required	I	10, inc. 1 repro
B8	Design Review Minutes (PDR's and CDR's)	14 days after design review	Chit close out forms, after signed, by MSC representative	II	10
Part C	Testing Data				
C1	Integrated System Test Plan (System Level)	60 days prior to test	As Required	I	4
C2	Qualification Test Procedure	60 days prior to test	5 days after revision	I	4
C3	Flight Acceptance Test Procedure	60 days prior to test	5 days after revision	I	4

Item No.	Item Description	Delivery Dates: Initial	Delivery Dates: Revisions	Type	Copies
C4	Level A Spares Test Plan	60 days prior to test	5 days after revision	I	4
C5	Test Procedures and Specifications-Revised	20 days prior to each test	5 days after revision	I or II per Table I	Type I-3 to MSC rep., Type II-1 to M3C rep.
C6	Acceptance and Qualification Test Reports and Data Tapes	4 weeks after test completion; data tapes as requested	Test report addenda published as required	II	3 to MSC rep., Original Mag. Tape to MSC
Part D	Reliability and Quality Control Data				
D1	Contactor Parts List	Preliminary As Available	Final: Concurrent with delivery of flight hardware	II	4
D2	Subcontractor Parts List	Concurrent with subcontractor delivery of flt. hardware	--	III	1
D3	A. Preliminary ADP	2 weeks prior to hardware delivery	--	II	2
	B. Acceptance Data Package (ADP), including in part; Qualification Status and Equipment Log	Concurrent with delivery of flt. hardware	5 days after revision	I	1 (with hdw. 1 MSC
D4	Failure Reports				
	A. TWX	Within 24 hrs. of failure isolation	--	II	4
	B. Failure Analysis and corrective action reports	As Required	5 days after revision	II	4
D5	Acceptable Parts List	At CDR		II	4
D6	Approved Materials	14 days prior to CDR		II	4
Part E	System Support/Logistics Data				
E1	Storage Procedures for End Items (FPHGGI) Revised TM's wherever feasible	20 days prior to delivery of flt. hardware	5 days after revision	II	4 (KSC) BxA Site Office 1 RALPO
E2	Manual Updating				
E3	Ground Safety Plan				
	A. Draft	90 days prior to flight hdw. delivery	--	II	5
	B. Final	Concurrent with flight hardware	--	II	20
E4	System Safety Plan	Per Proposal	As Required	I	5 plus repro.
E5	Quality Program Plan	Per Proposal MCP's	As Required	I	5 plus repro.