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**SPECIFICATION
REQUIREMENTS SUMMARY
FOR THE
BRAYTON ISOTOPE POWER SYSTEM (BIPS)
GROUND DEMONSTRATION SYSTEM (GDS)**

76-311737

February 10, 1976

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REQUIREMENTS SUMMARY
FOR THE
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GROUND DEMONSTRATION SYSTEM (GDS)**

76-311737

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SPECIFICATION
REQUIREMENTS SUMMARY
FOR THE
BRAYTON ISOTOPE POWER SYSTEM (BIPS)
GROUND DEMONSTRATION SYSTEM (GDS)

1. INTRODUCTION

This document provides a summary of specification and procedure requirements for the ERDA Phase I Brayton Isotope Power System (BIPS) Program. Phase I covers design, fabrication, and test of the BIPS Ground Demonstration System (GDS) by AiResearch, Phoenix, under Contract No. E(04-3)-1123.

1.1 Purpose

The primary purpose of this document is to provide a summary of required program specifications and procedures. Also included are document definitions, descriptions, and formats, and a listing of commonly used abbreviations. This document is intended to be used as a guide in document preparation and control. The specification and procedure formats included herein reflect the applicable format requirements of MIL-STD-490.

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2. DOCUMENT REQUIREMENT MATRIX/SUMMARY

Overall document requirements for the BIPS GDS program have been assessed and are summarized in Table I. As noted in Table I, each component/subassembly and facility/equipment requirement has been itemized with a preliminary summary of the type of document required. It should be noted that in some instances a general procedure or specification will be prepared as the basic document, with appendices provided to cover unique requirements of specific hardware.

As an adjunct to Table I, an additional table (Table II) has been prepared to present a potential list of required documents by category, with a basic document number pre-assigned. A column is also provided that establishes estimated document preparation completion dates.

3. DOCUMENT DEFINITION AND FORMAT

Documents required for the BIPS GDS program can essentially be divided into three major categories:

A. Specifications

1. Statement of Work (SOW)
2. Design Specifications (SC)
3. Procurement Specifications (PSC)
4. Material Specifications (EMS)
5. Equipment/Facility Specifications
6. Process Specifications
7. Fabrication Specifications

B. Procedures/Plans

1. Test Plans
2. Test Procedures
 - (a) Development Test Instructions (DTI)
 - (b) Formal Test Procedures
 - (c) Acceptance Test Procedures (ATP)
3. Inspection Procedures
4. Cleaning Procedures
5. Storage and Handling Procedures
6. Assembly Procedures (EAI)

C. Reports

1. Test Reports
 - (a) Development (DTR)
 - (b) Formal Test Reports

These major categories are discussed in detail in the following paragraphs.

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Various types of specifications are required to define specific requirements related to a particular program. Specifications always define requirements. These are defined, in general, with basic formats as follows:

- A. Statement of Work - defines the scope of work to be accomplished by a contractor or subcontractor during fulfillment of a particular contract. A SOW is normally prepared when the work scope is of sufficient magnitude to involve all types of personnel, facilities, services, materials, technical support, including design, fabrication, testing, scheduling, and reporting. Actual deliverable hardware may or may not be involved.

FORMAT

1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Scope
 2. APPLICABLE DOCUMENTS
 3. SCOPE OF WORK
 - 3.1 Task Definition
 4. TECHNICAL REQUIREMENTS
 5. GENERAL REQUIREMENTS
 6. DELIVERY REQUIREMENTS
 7. NOTES AND DEFINITIONS
- B. Design Specification - defines detailed technical elements associated with the design of components, equipment, subsystems, and systems.

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FORMAT

1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Scope
2. APPLICABLE DOCUMENTS
3. DESIGN REQUIREMENTS
 - 3.1 General Requirements
 - 3.2 Functional Requirements
 - 3.3 Design and Construction
 - 3.4 Environmental
 - 3.5 Safety/Reliability/Maintainability
4. QUALITY ASSURANCE PROVISIONS
5. PREPARATION FOR DELIVERY
6. NOTES AND DEFINITIONS
ATTACHMENTS/APPENDICIES

- C. Procurement Specification - a PSC is referenced on a Source or Specification Control Drawing and is an extension thereof, and defines technical requirements for subcontractors to design, fabricate, test, and deliver detail equipment, data, documentation, and services.

FORMAT

1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Intended Use
2. APPLICABLE DOCUMENTS
3. REQUIREMENTS
4. QUALITY ASSURANCE PROVISIONS
5. PREPARATION FOR DELIVERY
6. NOTES AND DEFINITIONS
ATTACHMENTS/APPENDICIES

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- D. Fabrication Specification - defines criteria for materials, processes, quality, and testing requirements for components, subassemblies, and assemblies designed by AiResearch or a subcontractor and manufactured by another subcontractor.
1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Intended Use
 2. APPLICABLE DOCUMENTS
 3. REQUIREMENTS
 4. QUALITY ASSURANCE PROVISIONS
 5. PREPARATION FOR DELIVERY
 6. NOTES AND DEFINITIONS
- E. Material Specifications - define requirements for materials including chemical composition, mechanical properties, process control, inspection, identification and packaging. Material specifications are prepared as required for AiResearch and subcontractor usage.

FORMAT

1. APPLICATION
2. APPLICABLE DOCUMENTS
3. TECHNICAL REQUIREMENT
 - 3.1 Material
 - 3.2 Chemical Composition
 - 3.3 Mechanical Properties
 - 3.4 Hardness
 - 3.5 Grain Size

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- 3.6 Ductility
- 4. PROCESS CONTROL
- 5. INSPECTION
- 6. IDENTIFICATION AND PACKAGING
- 7. APPROVAL OR PROCUREMENT
- 8. REPORTS
- 9. QUALITY CONTROL

- F. Process Specification - defines requirements for material specifications wherein processes are defined such as process materials, plating, heat treating, manufacturing operations, inspection, and handling criteria. Process specifications are prepared for AiResearch and subcontractor usage.

FORMAT

- 1. INTRODUCTION
 - 2. APPLICABLE DOCUMENTS
 - 3. SPECIAL EQUIPMENT
 - 4. MATERIALS
 - 5. MANUFACTURING OPERATIONS
 - 5.1 Cleaning
 - 5.2 Plating
 - 5.3 Preparation of Materials
 - 5.4 Brazing and Heat Treating
 - 6. INSPECTION
 - 7. QUALITY CONTROL
- G. Equipment/Facility Specification - defines distinct requirements for equipment or facilities, such as technical provisions, general requirements, acceptance, inspection, and checkout.

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FORMAT - varies according to complexity of equipment or facility; however, a typical facility format would include:

1. SCOPE OF WORK
2. DRAWINGS
3. SHOP DRAWINGS
4. SPECIFICATIONS
5. CHANGES
6. PERMITS AND REGULATIONS
7. MATERIAL AND EQUIPMENT
8. PROGRESS CHARTS/REPORTING
9. SUBCONTRACTING
10. WORK RESPONSIBILITIES
11. FACILITY REQUIREMENTS
12. INSPECTION
13. OPERATIONAL ACCEPTANCE TESTS

3.2 Procedures/Plans

Various types of procedures and plans are prepared to define methods of accomplishing a specific task. Procedures and plans always define the method of accomplishing a given task.

Specific types of procedures are defined and generally structured as follows:

- A. Test Plan - defines the overall scope of test requirements, including development and demonstration testing. Included are administrative, quality assurance, inspection, test witnessing, general test setup schematics, and data requirements.

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FORMAT

1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Scope
2. TEST REQUIREMENTS
 - 2.1 General Requirements
 - 2.2 Test Procedures
 - 2.3 Format
 - 2.4 Pre-Test Inspection
 - 2.5 Administrative Requirements
 - 2.5.1 Test Witnessing
 - 2.5.2 Test Log
 - 2.5.3 Test Data
 - 2.5.4 Photographs
 - 2.5.5 Test Reports
3. FACILITIES AND SERVICES
 - 3.1 Test Facilities
 - 3.1.1 Test Setup
 - 3.1.2 Instrumentation
 - 3.1.3 Instrumentation Accuracies
 - 3.2 Services
4. TEST PROCEDURE
 - 4.1 Test Conditions
 - 4.2 Test Installation
 - 4.3 Checkout
 - 4.4 Malfunctions and Failures
 - 4.5 Data Check
 - 4.6 Post-Test Inspection
5. TEST PROGRAM
6. TEST SCHEDULE

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B. Test Procedures

1. Development Test Instruction (DTI) - provides detailed test instructions for use during development tests, and is an informal procedure prepared for AiResearch internal use only.

FORMAT

1. TEST ITEM AND PART NUMBER
2. TEST TITLE
3. FACILITIES AND SPECIAL TEST EQUIPMENT
4. TEST OBJECTIVE
 - 4.1 Test Procedure
 - 4.2 Data Required
2. Formal Test Procedure - provides detailed formal test instructions for conducting tests required by the procuring activity, or design specification. This type of procedure is normally provided to the procuring activity (customer).

FORMAT

- 1.1 Purpose
- 1.2 Scope
- 1.3 Administrative requirements
2. ACCEPT - REJECT CRITERIA
3. TEST
 - 3.1 Special Instructions
 - 3.2 Test Setup
 - 3.3 Test Procedure

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3.4 Data Requirements

3.5 Post-Test Inspection

Attachments

Test Set-up Schematics

Data Sheets

- C. Inspection Procedure - defines detail inspection criteria for a component, subsystem, system, or as required by a detailed formal test procedure.

FORMAT

1. INTRODUCTION
 - 1.1 Purpose
 - 1.2 Scope
 - 1.3 Applicability
2. GENERAL REQUIREMENTS
 - 2.1 Inspection Criteria
 - 2.2 Equipment, Processes, and Supplies
 - 2.3 Critical Cards
 - 2.4 Inspection Records
3. INSPECTION REQUIREMENTS
 - 3.1 Parts, Components, and Assemblies
 - 3.2 Inspection After Test
4. ADDITIONAL REQUIREMENTS
 - 4.1 Witnessing
 - 4.2 Parts Discrepancies
5. DEFINITIONS AND NOTES

- D. Cleaning Procedure - defines detail cleaning requirements for a component, subsystem, system, as required by a specific application.

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FORMAT

1. SCOPE
2. APPLICABLE DOCUMENTS
3. CLEANING REQUIREMENTS
4. MATERIAL CONTROL
5. CLEAN ROOM CONTROLS
 - 5.1 Cleaning Methods
 - 5.2 Cleanliness Control
 - 5.3 Contamination Limits
 - 5.4 Test Media and Materials
 - 5.5 Test Component Handling
 - 5.6 Test Equipment Handling
 - 5.7 Packaging
6. QUALITY ASSURANCE PROVISIONS
7. NOTES AND DEFINITIONS

- E. Storage and Handling Procedure - defines the criteria for handling and storage of components, subsystems, systems, and test equipment wherein specific methods are required due to cleanliness, contamination, radioactivity, fragile materials, etc.

FORMAT

1. SCOPE
2. APPLICABLE DOCUMENTS
3. GENERAL REQUIREMENTS
4. SPECIFIC REQUIREMENTS
 - 4.1 Handling Methods
 - 4.2 Storage Methods
 - 4.3 Recordkeeping
 - 4.4 Periodic Inspection
5. PRESERVATION AND DEPRESERVATION
6. NOTES AND DEFINITIONS

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- F. Engineering Assembly Instruction (EAI) - provides Engineering instruction for assembly and test of modules, components, or subassemblies.

FORMAT

1. INTRODUCTION
 - 1.1 Purpose
2. INSTRUMENTATION AND EQUIPMENT
3. PROCEDURE

3.3 Test Reports

Test reports are prepared to summarize and document test results on development production hardware. Test reports always describe results.

- A. Development Test Report (DTR) - is prepared to summarize test results on development hardware only. Development test reports include data, conclusions, recommendations, recording traces, photographs, and other test data as applicable. DTR's are used for AiResearch internal purposes to establish or verify final design or performance criteria.

FORMAT

1. TEST ITEM AND PART NUMBER
2. TEST TITLE
3. TEST OBJECTIVE
4. TEST RESULTS
 - 4.1 Summary
 - 4.1.1 Test Goals
 - 4.1.2 Test Results
 - 4.1.3 Data Analysis and Validity

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5. CONCLUSIONS AND RECOMMENDATIONS

Attachments

Schematics
Recording Traces
Photographs
Curves
Data Sheets

- B. Formal Test Report - is prepared to summarize and document test results obtained as a result of testing conducted to a formal procedure. Reports are normally prepared to a format consistent with contract or procuring activity requirements. Reports are usually submitted to a customer to verify design and performance of an end item of hardware, i.e., component, subsystem, or system.

FORMAT

1. INTRODUCTION AND SUMMARY
2. DESCRIPTION OF TEST ARTICLE
 - 2.1 Test History
 - 2.2 Test Configuration
3. DESCRIPTION OF TEST
4. INSPECTION RESULTS
5. DISCUSSION OF TEST RESULTS
6. CONCLUSIONS AND RECOMMENDATIONS

Appendices

Photographs
Test Log and Recordings
Component Verification Test

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4. ABBREVIATIONS AND ACRONYMS

Table III provides a general listing of abbreviations and acronyms as related to the BIPS GDS program.

TABLE I
SPECIFICATION/PROCEDURE REQUIREMENTS SUMMARY

Hardware/ Equipment/ Facility	Responsibility/ Supplier	Specifications							Procedures/Reports							Notes	Comment/ Requirement	Responsible Engineer
		Statement of Work Required SOW	Procurement Specs. PSC	Equip/ Facility Spec.	Fab. Spec	System/ Subsystem Spec.	Material Spec EMS	Process Spec	Inspection	Cleaning	Storage and Handling	EAI's	Test DT's & QT's	Test Report	Test Plan			
1. BIPS/GDS System (Flight System)	Air Phx	--	--	--	--	X	--	--	X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾	X ⁽¹⁾	(1)	General Procedures/Specifications Acceptance Test Procedure	E. Roll
2. Mini-BRU	GFE	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	(2)	Included in General Procedure (1) , or as Procedure Appendice.	F. Dobler
3. Recuperator	GFE	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾			T. Ashe
4. HSA/EHS	GFE	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾			T. Ashe/P. Post
5. Refractory Plenum	GFE	X	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	(3)	Fansteel Supplier Supplier to provide Test Procedure and Plan	F. Dobler
6. Heat Exchanger	GE	X	--	--	--	(4)	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	(3)	(3)	X ⁽³⁾	(4)	Need spec - but not covered in Supplier SOW (Radiator for Flight Test System)	T. Ashe
7. Multi-Foil Insulation	TECO	X	--	--	--	--	(4)	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	(4)	X ⁽²⁾	X ⁽²⁾	X ⁽³⁾			T. Ashe
8. Bellows	Air LA	X ⁽⁵⁾	--	--	X ⁽⁶⁾	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽⁷⁾	--	--	X ⁽²⁾	(5) (6) (7)	SOW covers Design and Technical Support only Air LA to provide Procurement Spec to Phx Separate EAI for Bellows/Ducting Assy.	T. Ashe
9. Weld Joint	GE & Air Phx	--	--	--	--	--	X ⁽⁸⁾	X ⁽⁸⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽⁷⁾	--	--	X ⁽²⁾	(8)	May be part of Source Control Drawing (SCD)	J. Hadley
10. Ducting	Air Phx	--	X ⁽⁸⁾	--	--	--	X	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽⁷⁾	--	--	X ⁽²⁾			J. Hadley
11. Assembly	Air Phx	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽⁷⁾	--	--	X ⁽²⁾			T. Ashe
12. Support Structure	Air Phx	--	--	--	--	--	X ⁽⁸⁾	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	--	--			T. Ashe
13. Working Fluid	Air Phx	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	--	--	--			J. Hadley
14. Control System	Air Phx	--	X ⁽⁹⁾	--	--	X ⁽¹⁰⁾	X ⁽¹¹⁾	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	X ⁽¹²⁾	X ⁽¹³⁾	X ⁽¹³⁾	--	(9) (10) (11) (12) (13)	Component PSC's as Required Control System Specification As required by PSC's Separate EQI required DT's and DTR's	P. Post
15. Test Materials		--	--	--	--	--	--	--	--	--	--	--	--	--	--			
Joints		--	--	--	--	--	X	X	--	--	--	--	X ⁽¹³⁾	X ⁽¹³⁾	--			
Insulation		--	--	--	--	--	X	X	--	--	--	--	X ⁽¹³⁾	X ⁽¹³⁾	--			T. Ashe
Material Samples		--	--	--	--	--	X	X	--	--	--	--	X ⁽¹³⁾	X ⁽¹³⁾	--			
16. Mockup	Air Phx	--	--	--	--	--	--	--	--	--	--	--	--	--	--			T. Ashe
<u>FACILITIES/EQUIPMENT</u>																		
1. Clean Facility	Air Phx	--	--	X ⁽¹⁴⁾	--	--	--	--	X ⁽¹⁵⁾	X ⁽¹⁵⁾	--	--	X ⁽¹⁶⁾	--	--	(14)	Facility Specification, includes Equip General Reqt's Procedure for Periodic Inspection and Cleaning Facility Shakedown Procedure	E. Roll
A. Clean Assy Area	Air Phx	--	--	X ⁽¹⁴⁾	--	--	--	--	X ⁽¹⁵⁾	X ⁽¹⁵⁾	--	--	X ⁽¹⁶⁾	--	--	(15)		
Filters	Air Phx	--	--	--	--	--	--	--	--	--	--	--	--	--	--	(16)		
Degreaser	Air Phx	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
Bake Oven	Air Phx	--	--	--	--	--	--	--	--	--	--	--	--	--	--			
B. Vac. Tank & Pumps	Air Phx	--	X ⁽¹⁷⁾	--	--	--	--	--	X ⁽¹⁵⁾	X ⁽¹⁵⁾	--	--	X ⁽¹⁶⁾	--	--	(17)	Vacuum Tank Spec to include Pumps	T. Ashe
C. Vac. Dry Box	Air Phx	--	X	--	--	--	--	--	X ⁽¹⁵⁾	X ⁽¹⁵⁾	--	--	X ⁽¹⁶⁾	--	--			T. Ashe
D. Facility Power	Air Phx	--	--	(14)	--	--	--	--	--	--	--	--	--	--	--	(14)	Part of Facility Spec	P. Post
E. Mechanical	Air Phx	--	--	(14)	--	--	--	--	--	--	--	--	--	--	--	(14)	Part of Facility Spec	T. Ashe
Interface Equip.	Air Phx	--	X ⁽⁹⁾	--	--	--	--	--	--	X ⁽¹⁵⁾	--	X ⁽¹⁹⁾	X ⁽¹⁶⁾	--	--	(18)	Assembly (EAI) Instructions (if required)	T. Ashe
F. Ground Test Console	Air Phx	--	X ⁽¹⁹⁾	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽³⁾	X ⁽³⁾	X ⁽³⁾	(19)	Covered by GE SOW 75-311375A	P. Post
G. Power Supply Console	GE	X ⁽¹⁹⁾	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽³⁾	X ⁽³⁾	X ⁽³⁾			
H. Data Acquisition	Air Phx	--	--	X ⁽¹⁴⁾	--	--	--	--	--	--	--	--	X ⁽¹⁶⁾	--	--	(14)	Include in Facility Spec (14)	B. Minshall
I. Gas Management System	GE	X ⁽¹⁹⁾	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽³⁾	X ⁽³⁾	X ⁽³⁾			T. Ashe
J. Test Equipment	Air Phx	--	--	--	--	--	--	--	X ⁽²⁾	X ⁽²⁾	X ⁽²⁾	--	X ⁽¹⁶⁾	--	--		Minimal Procedures Sppendices to General Spec	T. Ashe
2. Controls Test Rig	Air Phx	--	--	X ⁽²⁰⁾	--	--	--	--	X ⁽²⁾	--	--	--	--	--	--	(20)	Equipment Specifications as required	P. Post
3. Facility Checkout	Air Phx	--	--	--	--	--	--	--	--	--	--	--	X ⁽¹⁶⁾	--	--		Part of Facility Shakedown Procedure	G. Buchman

TABLE II
BIPS/GDS
SPECIFICATION/PROCEDURE REQUIREMENTS
BY DOCUMENT CATEGORY

Document Type	Item	Specific Requirement	Supplier/Responsibility	Document Designation	Status/Due Date
A. <u>STATEMENT OF WORK</u> (SOW)	1	HRHX	GE	75-311375A	Complete
		Gas Management Syst	GE	75-311375A	Complete
		Power Supply Console	GE	75-311375A	Complete
	2	Multi-Foil Insulation	TECO	75-311499A	Complete
	3	Bellows*	AIRLA	75-311472	Complete *Covers design only
	4	Refractory Plenum	Fansteel	75-311217C	Complete
B. <u>PROCUREMENT SPECIFICATIONS</u> (PSC's)	1	Bellows	AIRLA	-	AIR/LA to provide PSC
	2	Ducting*	AIRPHX	-	*May be SCD (source cont. drawing)
	3	Control System a. Components	AIRPHX	PSC76-311756	12-1-76
	4	Vac. Tank and Pumps	AIRPHX	PSC76-311738	3-1-76
	5	Vac. Dry Box	AIRPHX	PSC76-311739	9-1-76
C. <u>EQUIP/FACILITY SPECS</u>	1	Clean Facility a. Clean Assy Area b. Facility Power c. Mech. Interface Equipment d. Data Acquisition e. Facility Checkout	AIRPHX	76-311740	6-1-76
	2	Controls Test Rig	AIRPHX	76-311741	6-1-76
	3	Ground Test Console		Tool Order (Lab)	10-15-76
D. <u>SYSTEM/SUBSYSTEM SPECIFICATION</u> (SC)	1	BIPS/GDS System Design Specification	AIRPHX	SC 76-311742	3-1-76
	2	HRHX	GE	-	12-1-76
	3	Control System	AIRPHX	SC 76-311743	6-1-76
E. <u>MATERIAL SPECIFICATIONS</u> (EMS)	1	Multi-Foil Insul	TECO	-	Need material spec
	2	Weld Joint/ Ducting Assy.	AIRPHX	Source Cont Dwg.	6-1-76
			AIRPHX	Source Cont Dwg.	7-1-76
	3	Support Structure	AIRPHX*	Source Cont Dwg	12-1-76
	4	Test Materials		Source Cont Dwg	3-1-76
		a. Joints			3-1-76
		b. Insulation			5-1-77
		c. Samples			
		Ch-103	AIRPHX	EMS 57800	3-15-76 (Revision)
		HST X	AMS	AMS 5536	Existing
		HST X	AMS	AMS 5754	Existing
		304 SS	AMS	AMS 5511	Existing
		304 SS	AMS	AMS 5647	Existing
		1100 Al	FED	QQA 250/1	Existing
		6061 Al	FED	QQA 250/11	Existing
		INC 713LC	AIRPHX	EMS 55079	Existing
		INC 713LC	Quality	EMS 52300	Existing
F. <u>INSPECTION PROCEDURES</u>	1	BIPS/GDS General Inspection Proc.	AIRPHX	76-311744	4-1-76 (Partial)
		a. Mini-BRU		Appendix I	
		b. Recuperator		Appendix II	
		c. HSA/EHS		Appendix III	
		d. Refractory Plenum		Appendix IV	
		e. Heat Exchanger (Radiator)		Appendix V	
		f. Multi-Foil Insul.		Appendix VI	
		g. Ducting/Bellows Assembly		Appendix VII	
		h. Support Structure		Appendix VIII	
		i. Working Fluid		Appendix IX	
		j. Control System		Appendix X	
		k. Power Supply Console		Appendix XI	
		l. Gas Mgmt. System		Appendix XII	
		m. Test Equipment		Appendix XIII	
		n. Controls Test Rig		Appendix XIV	

TABLE II
BIPS/GDS
SPECIFICATION/PROCEDURE REQUIREMENTS
BY DOCUMENT CATEGORY

Document Type	Item	Specific Requirement	Supplier/Responsibility	Document Designation	Status/Due Date
F. <u>INSPECTION/CLEANING PROCEDURE</u> (Periodic Requirement)	1	Clean Facility	AIRPHX	76-311745	11-1-76
		a. Clean Assy Area		Appendix I	
		b. Vac Tank & Pumps		Appendix II	
		c. Vac Dry Box		Appendix III	
		d. Grd Test Console			
G. <u>CLEANING PROCEDURES</u>	1	BIPS/GDS General Cleaning Procedure	AIRPHX	76-311746	11-1-76
		a. Mini-BRU		Appendix I	
		b. Recuperator		Appendix II	
		c. HSA/EHS		Appendix III	
		d. Refractory Plenum		Appendix IV	
		e. Heat Exchanger		Appendix V	
		f. Multi-Foil-Insul.		Appendix VI	
		g. Ducting/Bellows Assembly		Appendix VII	
		h. Support Structure		Appendix VIII	
		i. Working Fluid		Appendix IX	
		j. Control System		Appendix X	
		k. Power Supply Console		Appendix XI	
		l. Gas Mgmt System		Appendix XII	
		m. Test Equipment		Appendix XIII	
H. <u>STORAGE & HANDLING PROCEDURES</u>	1	BIPS.GDS General Procedure	AIRPHX	76-311747	11-1-76
		a. Mini-BRU		Appendix I	
		b. Recuperator		Appendix II	
		c. HSA/EHS		Appendix III	
		d. Refractory Plenum		Appendix IV	
		e. Heat Exchanger		Appendix V	
		f. Multi-Foul Insul		Appendix VI	
		g. Ducting/Bellows Assembly		Appendix VII	
		h. Support Structure		Appendix VIII	
		i. Working Fluid		Appendix IX	
		j. Control System		Appendix X	
		k. Power Supply Console		Appendix XI	
		l. Gas Mgmt System		Appendix XII	
		m. Test Equipment		Appendix XIII	
I. <u>ASSEMBLY INSTRUCTIONS</u> (EAI's)	1	BIPS/GDS System EAI	AIRPHX	76-311748	12-1-76
		a. HSA/EHS			
		b. Refractory Plenum			
		c. Multi-Foil Insul			
		d. Support Structure			
	2	Bellows/Ducting Assembly	AIRPHX	76-311749	9-1-76
	3	Control System	AIRPHX	76-311750	2-1-77
	4	Ground Test Console	AIRPHX	Tool order (Lab)	-
J. <u>TEST PLANS</u>	1	BIPS/GDS Overall Test Plan	AIRPHX	76-311752	6-1-76
		a. Heat Exchanger	GE	TBD	4-1-76
		b. Multi-Foil Insul.	TECO	TBD	
		c. Power Supply Console	GE	TBD	4-1-76
		d. Gas Mgmt System	GE	TBD	4-1-76
K. <u>TEST PROCEDURES</u>	1	BIPS/GDS System Test Procedures	AIRPHX	-	
		a. Endurance		76-311753	5-1-77
		b. Performance		76-311754	5-1-77
		c. Acceptance Test		ATP 76-311755	5-1-77
	2	Facility Checkout Procedure		(Included in facility specification)	
	3	Heat Exchanger	GE	TBD	
	4	Power Supply Console	GE	TBD	
	5	Gas Mgmt System	GE	TBD	
	DTs	1. Control System	AIRPHX	DT's as req'd	12-1-76
		2. Test Materials a. Joints b. Insulation c. Materials			As req'd
		3. Component Dev (As req'd)			
L. <u>TEST REPORTS</u>		As required by tests			As req'd on test completion

(A)		(G)	
ABS	Auxiliary Battery System	g	Acceleration Due to Gravity
ACS	Auxiliary Cooling System (for HSA)	GDEHS	Graphite Dynamic Electric Heat Source (GE Term for EHS-D) (Obsolete Term)
ACS	Attitude Control System	GDS	Ground Demonstration System - PCS + EHS-S
AEC	Atomic Energy Commission (now ERDA)	GE	General Electric, Valley Forge
AEC PR	Atomic Energy Commission Procurement Regulation		General Electric Heat Source (GE term for EHS-S) (Obsolete Term)
AIRPHX	AIRResearch, Phoenix	GET	Ground Elapsed Time
AIRLA	AIRResearch, Los Angeles Heat Transfer Systems	GFE	Government Furnished Equipment
AFSCF	Air Force Satellite Control Facility	GMS	Gas Management System
AM	Amplitude Modulation	GMT	Greenwich Mean Time
AOA	Abort-Once-Around	GN2	Gaseous Nitrogen
ASE	Airborne Support Equipment	GN&C	Guidance, Navigation and Control
ARS	Atmospheric Revitalization Subsystem	GSE	Ground Support Equipment
ATO	Abort-To-Orbit	GTC	Ground Test Console (a STE/GSE item)
ATCS	Active Thermal Control Subsystem	(H)	
(B)		HS	Heat Source (Same as and replaced by IHS)
BCL	Battelle Columbus Laboratory	HSA	Heat Source Assembly (Does not include IHS or HSS Does include HSHX, structure, insulation, ACS and ECS.)
BOM	Beginning of Mission	HSHX	Heat Source Heat Exchanger
BIPS	Brayton Isotope Power System	HSIS	Heat Source Insulation System
BRU	Brayton Rotating Unit	HSS	Heat Source Simulator (Same as and replaced by EHS)
Btu	British Thermal Unit	Hz	Hertz (Cycles)
(C)		(I)	
C	Centigrade Degrees	IBFS	Isotope Brayton Flight System
CCAFS	Cape Canaveral Air Force Station	IBGDS	Isotope Brayton Ground Demonstration System (GDS + IHS)
CCTV	Closed Circuit Television	IHE	Isotope Handling Equipment
CFM	Cubic Feet per Minute	IHS	Isotope Heat Source (Isotope and Reentry Protection)
c.g. or CG	Center of Gravity	IMU	Inertial Measurement Unit
CO2	Carbon Dioxide	IUS	Interim Upper Stage
CRT	Cathode Ray Tube	IVA	Intra Vehicular Activity
Cu. Ft.	Cubic Feet	(J)	
CSI	Control Servo Input	JPL	Jet Propulsion Laboratory (Pasadena, Cal.)
(D)		JSC	Johnson Space Center (Houston)
DAS	Data Acquisition System	(K)	
db	Decibel	K	1,000
DC	Direct Current	KB	Keyboard
DCS	Demonstrator Cooling System	Kbaud	Code elements per second in 1,000's
Delta-V or ΔV	Velocity Change in Feet per Second	Kbps	Bits per Second in 1,000's
DOD	Department of Defense	Kg	Kilogram
DOD STS	Department of Defense Space Transportation System	Km	Kilometers
(E)		KSC	Kennedy Space Center
EAI	Engineering Assembly Instructions	kwh	Kilowatt Hours
EAFB	Edwards Air Force Base	(L)	
EPFS	Electrically Powered Flight System (PCS + EHS-D)	LASL	Los Alamos Scientific Laboratory
ECLS	Environmental Control and Life Support	LCC	Launch Control Center
ECS	Emergency Cooling System	LES 8/9	Lincoln Experimental Satellite (No. 8 & 9)
EHS-D	Electrical Heat Source - Dynamic	lbs	Pounds
EHS-S	Electrical Heat Source - Static	LF	Load Factor
ELS	Eastern Launch Site	LH2	Liquid Hydrogen
EMS	Material Specification (AIRResearch Term)	LiOH	Lithium Hydroxide
EOM	End of Mission	LO2	Liquid Oxygen
ESD	Electronic System Division (of Air Force System Command)	LPS	Launch Processing System
ET	External Expendable Tank	(M)	
EPS	Electrical Power System	M	Meters
ERDA	Energy Research and Development Administration (Formerly AEC)	MBR	Mini-Brayton Recuperator
EVA	Extravehicular Activity	MB-ERTG	400 Watt Mini-Brayton-Economic Radioisotope Thermodynamic Generator Design (Refer also to IBFS)
(F)		MCC	Mission Control Center
F	Fahrenheit Degrees	MDM	Multiplexer-Demultiplexer
FBS	Flight Battery System Required for Start in Orbit	MECO	Main Engine Cut-Off
PIB	Fuel Impact Body	MHW	Multi-Hundred Watt (AEC/GE IHS Technology)
FM	Frequency Modulation	MHz	Megahertz
FMA	Failure Mode Analysis	MM	Millimeters
FMEA	Failure Modes and Effects Analysis	MMD	Mean Mission Duration
FMECA	Failure Modes, Effects and Criticality Analysis	MOS	Mission Operation System
FPR	Federal Procurement Regulation	MR	Milliradians
fps	Feet per Second	MSS	Mission Specialist Station
FS	Flight System		
FSA	Fuel Sphere Assembly		
FSAR	Final Safety Analysis Report		
FSE	Flight Support Equipment		
FUO	Follow-up Output		
FT	Feet, Foot		
FWW	Food, Water and Waste Management		

TABLE III
BIPS/GDS PROGRAM
ABBREVIATIONS AND ACRONYMS

(N)		(T)	
NA	Not Applicable	TBD	To Be Defined
NASA LeRC	National Aeronautical and Space Administration Lewis Research Center	TACB	Temperature of Cabin
NRA	Nuclear Research and Application	TDRS	Tracking and Data Relay Satellite
N.MI or n.mi	Nautical Mile	TES	Teledyne Energy Systems (formerly Teledyne Isotopes)
		TIT	Turbine Inlet Temperature
		TV	Television
(O)		(U)	
OBF	Orbiter Processing System	ULT	Ultimate Loads
OHA	Operational Hazard Analysis	USAR	Updated Safety Analysis Report
ORNL	Oak Ridge National Laboratory		
OMS	Orbital Maneuvering Subsystem	(V)	
(P)		VAB	Vehicle Assembly Building
PCL	Power Conversion Loop (Use of PCS preferred)	VAFB	Vandenberg Air Force Base
PCM	Pulse Code Modulation	VDC	Volts Direct Current
PCR	Payload Changeout Room	VHF	Very High Frequency
PCS I	Power Conversion System (HSA + BRU + MBR + Heat Sink + Controls + Piping & Structure	VRE	Voltage Regulator Exciter
PCS II	Power Conversion System (HSA + BRU + MBR + Radiator + Controls + Piping and Structure		
PGHM	Payload Ground Handling Mechanism		
PHA	Preliminary Hazard Analysis		
PLC	Parasitic Load Control System		
P/L	Payload		
PLCC	Payload Control Center		
PLH	Payload Handling		
PLM	Payload Management		
POP	Perpendicular to Orbit Plane		
PSAR	Preliminary Safety Analysis Report		
PGC	Power Supply Console (for RHS)		
PSC	Procurement Specification (AirResearch Term)		
PSE	Peculiar Support Equipment		
psi	Pounds per Square Inch		
psia	Pounds per square Inch Absolute		
PSS	Payload Specialist Station		
PSSR	Preliminary System Safety Review		
(Q)			
q or Q	Aerodynamic Pressure		
QA	Quality Assurance		
(R)			
RCS	Reaction Control System		
RCS	Radiator Cooling System		
RF	Radio Frequency		
RM	Remote Manipulator		
RMS	Remote Manipulator System		
RSS	Root Sum Square		
RTLS	Return to Launch Site		
RTG	Radioisotope Thermoelectric Generator		
RTS	Remote Tracking Station		
(S)			
SAMSO	Space and Missile System Organization		
SNS	Space Nuclear Systems		
SMAB	Solid Motor Assembly Buildup		
SRB	Solid Rocket Booster		
SRM	Solid Rocket Motor		
SSP	Space Shuttle Program		
SSME	Space Shuttle Main Engine		
SSS	Space Shuttle System		
SSPP	System Safety Program Plan		
SSV	Space Shuttle Vehicle		
STDN/TDRSS	Space Tracking and Data Network/Tracking Data Relay Satellite System		
STE	Special Test Equipment		
STS	Space Transportation System		
SURVASCATCOM	Air Force Survivable Communication Satellite {now AFSAT (COM III)}		