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AIRESEARCH MANUFACTURING COMPANY OF ARIZONA
A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONA

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BRAYTON ISOTOPE POWER SYSTEM
(BIPS)
DESIGN LAYOUT SUMMARY

RESTRICTED

76-311972

June 15, 1976

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AIRESEARCH MANUFACTURING COMPANY OF ARIZONA
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TOTAL PAGES 2

ATTACHMENTS:

Assembly and Installation Tab (after Page 1)
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3605400 Sheets 1 & 2 (Including Parts List, 2 pages)
241001 Sheets 1 & 2
Heat Rejection Heat Exchanger Tab
3605439
Basic System Tab
L3621583 Sheets 1, 2, & 3
Dimensional and Thermal Analysis Tab
L3621583 Sheets 4, 5, & 6
Support Structure Tab
L3621585 Sheets 1 & 2
L3621586 Sheets 1, 2, & 3
L3621661
L3621662

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BRAYTON ISOTOPE POWER SYSTEM
(BIPS)
DESIGN LAYOUT SUMMARY

1. INTRODUCTION

This report, prepared by the AiResearch Manufacturing Company of Arizona, a Division of the Garrett Corporation, presents a summary of the Brayton Isotope Power Systems (BIPS) design layout drawings. These drawings were generated in compliance with Task 3 (Preliminary Design of the BIPS Ground Demonstration System) of Phase I of the ERDA sponsored BIPS contract E(04-3)-1123.

The design summary presented herein was compiled for presentation at the BIPS Preliminary Design Review Meeting to be held at the AiResearch Manufacturing Company of Arizona July 20 - 22, 1976.

2. DESIGN LAYOUT SUMMARY

The BIPS design layout summary has been divided into the following five major categories: Assembly and Installation; Heat Rejection Heat Exchanger; Basic System; Dimensional and Thermal Analysis; and Support Structure. A complete list of included drawings is presented in the Table of Contents.

Drawings related to the major components, which are Government furnished, are included in the Configuration Control Document (AIRPHX Report 75-311274B). Facility drawings are included in the BIPS Facility Specification, Report No. 76-311740.

AIRESEARCH MANUFACTURING COMPANY OF ARIZONA
A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONA

BIPS - GDS 241000
MATERIAL PARTS LIST

<u>Description</u>	<u>Part Number</u>	<u>Item No.</u>	<u>Material</u>	<u>No. Required</u>	<u>Remarks</u>
System Assy	241000-1	1	-		
Installation	241001-1	-	-		
Engine Assy	240610-1	2	-	1	
Welded Assy	3605400-1	3	-	1	
Strut	3605405-1	4	Al-Alloy 6061-T6	4	
Strut	3605405-2	5	Al-Alloy 6061-T6	4	
Support	3605411-1	6	Titanium	1	Low Thermal Conductivity
Support	3605412-1	7	INCO 718	1	Low Thermal Conductivity High Temp High Strength
Link	3605413-1	8	Waspaloy	1	High Strength
Clevis	3605414-1	9	Hast-X	2	High Strength
Clevis	3605414-2	10	Hast-X	1	High Strength
Bracket	3605416-1	11	CRES 17-4PH	2	Heat Treated
Bellows	3605418-1	12	Hast-X	2	
Bellows	3605418-2	13	Hast-X	4	
Bellows	3605420-1	14	CRES 300 Series	5	
Bellows	3605420-2	15	CRES 300 Series	1	
GMS Valve	3605425-1	16	CRES 300 Series	1	Welded to System
Nozzle	3605426-1	17	CRES 300 Series	1	
Valve Overspeed & Shutdown	3605427-1	18	CRES 300 Series	2	Welded to System
Tee, Duct	3605428-1	19	CRES 300 Series	1	
Elbow, Duct	3605429-1	20	CRES 300 Series	1	
Elbow, Reducing	3605430-1	21	CRES 300 Series	1

AIRESEARCH MANUFACTURING COMPANY OF ARIZONA

A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONABIPS - GDS 241000
MATERIAL PARTS LIST
(Contd)

<u>Description</u>	<u>Part Number</u>	<u>Item No.</u>	<u>Material</u>	<u>No. Required</u>	<u>Remarks</u>
Elbow, Duct	3605431-1	22	Hast-X	2	
Elbow, Duct	3605432-1	23	Hast-X	1	
Lower Support Structure	3605433-1	24	Al-Alloy 6061-T6	1	
Duct Assy	3605434-1	25	CRES 300 Series	1	
Duct	3605435-1	26	Hast-X	1	
Duct	3605435-2	27	CRES 300 Series	1	
Duct	3605435-3	28	Hast-X	1	
Duct	3605435-4	29	CRES 300 Series	1	
Duct	3605436-1	30	CRES 300 Series	1	Sized to Fit
Duct 180°	3605437-1	31	CRES 300 Series	1	Sized to Fit
Duct 180°	3605437-2	32	CRES 300 Series	1	Sized to Fit
Duct 180°	3605438-1	33	CRES 300 Series	1	Sized to Fit
HRHX	3605439-1	34	CRES 300 Series	1	Source Control Part
Elbow, Duct	3605440-1	35	CRES 300 Series	1	
Bracket	3605441-1	36	Al-Alloy 6061-T6	2	
Shim	3605442-1	37	CRES 300 Series	A/R	
Shim	3605442-2	38	CRES 300 Series	A/R	
Shim	3605442-3	39	CRES 300 Series	A/R	
Shim	3605442-4	40	CRES 300 Series	A/R	
Shim	3605443-1	41	CRES 300 Series	A/R	
Shim	3605443-2	42	CRES 300 Series	A/R	
Shim	3605443-3	43	CRES 300 Series	A/R	
Shim	3605443-4	44	CRES 300 Series	A/R	
Shim	3605444-1	45	CRES 300 Series	A/R	
Shim	3605444-2	46	CRES 300 Series	A/R

AIRESEARCH MANUFACTURING COMPANY OF ARIZONA
A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONA

BIPS - GDS 241000
MATERIAL PARTS LIST
(Contd)

<u>Description</u>	<u>Part Number</u>	<u>Item No.</u>	<u>Material</u>	<u>No. Required</u>	<u>Remarks</u>
Shim	3605444-3	47	CRES 300 Series	A/R	
Shim	3605444-4	48	CRES 300 Series	A/R	
Pin, Clevis	3605449-1	49	A-286	2	
Pin, Clevis	3605449-2	50	A-286	1	
Pin, Clevis	3605449-3	51	A-286	17	
Duct, Assy	3605446-1	52	CRES 300 Series	1	
Check Valve	123858-2	53	CRES 17-4 PH	1	
Recuperator	190930-1	54	Hast-X	1	GFE AIRLA
Adaptor	3605447-1	55	CRES 300 Series	1	
Adaptor	3605447-2	56	CRES 300 Series	1	
Adaptor	3605447-3	57	CRES 300 Series	1	
Bellows	3605421-1	58	CRES 300 Series	2

AIRESEARCH MANUFACTURING COMPANY OF ARIZONA

A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONABIPS - GDS 3605400
MATERIAL PARTS LIST

<u>Description</u>	<u>Part Number</u>	<u>Item No.</u>	<u>Material</u>	<u>No. Required</u>	<u>Remarks</u>
Welded Assy	3605400-1	1			
Upper Support	3605402-1	2	Al-Alloy 6061-T6	1	
Ring	3605408-1	3	Hast-X	1	
Ring, Sizing	3605406-1	4	Hast-X	2	Sized to fit
Bracket, Mount	3605417-1	5	Al-Alloy 6061-T6	6	Heat Treated 17-4PH Pin
Support, Duct	3605407-1	6	Hast-X	1	
Turbine Plenum	3604356-1	7	Columbium Cb-C103	1	
Bellows	3605419-1	8	Hast-X & Cb-C103	1	Hast-X to Cb-C103 Bi-met Joint
Heat Source Assy	47J313000	9	Cb-C103 Interface	2	GFE General Electric
Support Structure, Tank	3605404-1	10	Al-Alloy 6061-T6	1	
Pin, Clevis	3605448-1	11	A-286	3	
Ring, Sizing	3605445-1	12	Columbium Cb-C103	2	Sized to fit
Shim	3605409-1	13	CRES 300 Series	A/R	
Shim	3605409-2	14	CRES 300 Series	A/R	
Shim	3605409-3	15	CRES 300 Series	A/R	
Shim	3605409-4	16	CRES 300 Series	A/R	
Shim	3605450-1	17	CRES 300 Series	A/R

AIRESEARCH MANUFACTURING COMPANY OF ARIZONA
A DIVISION OF THE GARRETT CORPORATION
PHOENIX, ARIZONA

BIPS - GDS 3605400
MATERIAL PARTS LIST
(Contd)

<u>Description</u>	<u>Part Number</u>	<u>Item No.</u>	<u>Material</u>	<u>No. Required</u>	<u>Remarks</u>
Shim	3605450-2	18	CRES 300 Series	A/R	
Shim	3605450-3	19	CRES 300 Series	A/R	
Shim	3605450-4	20	CRES 300 Series	A/R	
Bellows	3605422-1	-	Columbium Cb-C103	2	Part of HSA Assy
Bellows	3605424-1	-	Hast-X to Cb-C103	2	Part of HSA Assy

PART NO.	CUSTOMER CODE AND APPLICATION	REMARKS
241000-1	ERDA - BRAYTON ISOTOPE POWER SYSTEM GROUND DEMONSTRATION SYSTEM	AS SHOWN

REVISIONS	DATE	APPROVED
1		
2		
3		
4		
5		
6		
7		
8		
9		
10

ITEM	NAME	DESCRIPTION	ZONE
6	GAS MANAGEMENT VALVE PORT	BOSS PER MS33649-12	C5
5	SYSTEM MOUNT PADS	AS SHOWN	C8
4	HRHX COOLANT OUTLET	FITTING PER MS33656-10	H5
3	HRHX COOLANT INLET	FITTING PER MS33656-10	C5
2	VACUUM TANK OUTLET	CONFORMS TO 150# 5 INCH BLIND PIPE FLANGE MODIFIED	G4
1	VACUUM TANK INLET	CONFORMS TO 150# 5 INCH BLIND PIPE FLANGE MODIFIED	C4

4. UNTOLERANCED DIMENSIONS
3. SEE PL241000-1 FOR SYSTEM
2. ALL DIMENSIONS ARE COLD.
1. FORM/POSITION TOLERANCING
- BE ± .06.
MBLY PART NUMBER.
AIRESEARCH SC6000.

QUANTITY	REQD	PART NO	OR IDENTIFYING NO	SYM	DESCRIPTION	CODE	MATERIAL AND SPECIFICATION	ZONE
1		CCPS2-1 GDS						
1		FINAL	241000					
1		RECD	NEXT ASSY					
1		RECD	TREATMENT					
1		RECD	PROCESS					
1		RECD	MAINT AND SPEC					
1		RECD	MAINT AND SPEC					
1		RECD	MAINT AND SPEC					
1		RECD	MAINT AND SPEC					
1		RECD	MAINT AND SPEC					
1		RECD	MAINT AND SPEC					

SIGNATURES	DATES	REVISIONS

SYSTEM INSTALLATION, BIPS - GDS
241001
SCALE 1/4
WT
SHEET 1 OF 2

REVISIONS		DATE	BY	APPROVED
1	INITIAL			
2				
3				
4				
5				
6				
7				
8				
9				
10

REVISIONS		DATE	BY	APPROVED
1	INITIAL			
2				
3				
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10				

REVISIONS		DATE	BY	APPROVED
1	INITIAL			
2				
3				
4				
5				
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8				
9				
10

SECTION	MSA				MAX ALLOWABLE Δ								MAX. Δ
	THERMAL EXPANSION			TOLERANCE $\pm$ IN DIA	LOAD LBS			MOMENT IN LBS			MAX. Δ		
	X_1	Y_1	Z_1		X_2	Y_2	Z_2	X_3	Y_3	Z_3			
PER FEET OF PIPE	0.004 DOWN	0	0	A ₁	2750	1750	1500	—	—	—	—	—	X_4
PER FEET OF PIPE	0	0	-0.003	—	2250	2250	0	2275	2275	—	—	—	X_5
LET	0.009	0	0.004	—	1750	240	1850	—	1750	160	—	—	—
1/4LET	0.075	0	-0.056	—	1820	240	1950	—	1750	160	—	—	—

TABLE IV											
OUT SUPPORT CONE						MAX ALLOWABLE Δ					
SECTION	THERMAL EXPANSION			TOLERANCE IN A_c O.A.	LOAD LBS			MOMENT IN LBS			MAX. LO.
	X_c	Y_c	Z_c		X_c	Y_c	Z_c	X_c	Y_c	Z_c	
UNIT				A_c							X_c
1	0.03	0.04	0.024	0.0055	2200	4500	2200	2450		2450	-
2	0.040	0	0.024	0.0175	3350	2200	2200		2300	1450	-
3	0.010	0	0.020	0.0175	5350	2200	2200		2300	150	-
4	0	0	0.059	0.0075	5700	2200	2700	2200		2200	-

		TABLE 1								
		VAC TANK		MAX ALLOWABLE Δ						
		TELEPHONE		LOAD LBS			MOMENT IN-LB			
LOCATION		AT DIA	X _r	Y _r	Z _r	X _r	Y _r	Z _r		
MOUNT	AP	—	—	—	—	—	—	—		
LOADS										
1/2 Z _r										
1/2 Z _r										
Z _r										
INLET	.093	5300	580	±180						
OUTLET	.093	500	280	±160						

[illegible]

170417
LOADS
8 1/2 20

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DISPATCH SERVICE This form is to be filled out by the person who is responsible for the dispatch of the document. It is to be filled out in duplicate and the original and copy are to be submitted to the appropriate authority.		LAYOUT OVERSIGHT & STRATEGIC ANALYSIS		() () ()
NAME S. J. 23	DATE 1/23/74	TIME 11:00 AM	BY VI	NO. OF COPIES 1
TO DIRECTOR	FROM VI	SUBJECT BIPS GDS	FILE NO. 1583	DATE 1/23/74

REVISIONS			
NO.	DESCRIPTION	DATE	APPROVED
1	REVISED	1-25-76	
2	REVISED MOUNTS	3-9-76	
3	REVISED MOUNT #2	4-1-76	
REVISION STATUS OF SHEET			
BY	CHKD	APPD

LAYOUT			
SUPPORT STRUCTURE FOR BRU, MBR & MSA			
LOWER SUPPORT STRUCTURE			
1/2			
2-1005			
C3621585			

REVISIONS		DATE	APPROVED
1	INITIALS	11-21-70	
2	DESIGN	11-21-70	
3	REVISION	11-21-70	
REVISION STATUS OF SHEET			
REV	BY	DATE	APPROVED

ASSEMBLY FITS	
LOCATION	FIT
△	.0023 LOOSE
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△	.0000 LOOSE

ROD END BEARING
SOUTHWEST PROD CO
PN BRE-6685
2 REQD

WASPALOY ROD
250 DIA

MOUNT LOAD PLANES	
1	XYZ
2	XZ
3	X

SCALE 1/4

TITANIUM TUBE
L25 OD X .125 WALL

SELF ALIGNING BEARING
SOUTHWEST PRODUCTS CO
PN. BHDR-6897

SECTION B-B
SCALE 1/1

SECTION A-A
SCALE 1/1

△ DRY FILM LUBE BORE AND RACE WITH TUNGSTEN DISULFIDE PER EMS 52437

REVISIONS		DATE	APPROVED
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2	DESIGN	11-21-70	
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PREPARED BY Name: <u>James L. ...</u> Title: <u>...</u> Date: <u>12-2</u>		LAYOUT
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SCALE 4/1

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DISSEMINATION SUMMARY This report contains information that is being disseminated to other personnel. It is to be controlled and handled in accordance with the instructions in the following sections.	1.1876 1.1876	1.1876 1.1876	1.1876 1.1876	LAYOUT SYSTEM SUPPORTS TANK IN WACULUM TANK 22	1.1876 1.1876
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