QUALIFICATION ENVIRONMENTS

FOR

HELIUM REPRESSURIZATION VESSEL ATK P/N 80314-1

Table 1: P/N 80314-1 Helium Repressurization Tank Assembly Specifications

Parameters	Requirements
Operating Pressure	3600 psig
Proof Pressure	5400 psig, Actual Proof: 5950 psig
Burst Pressure	7200 psig
External Pressure	Not tested
Internal Vacuum	Not tested
Material of Construction	Spherical Pressure Vessel constructed of 6AL-4V Titanium. Port is a .250 diameter titanium tube.
Membrane Thickness	0.197"
Tank Mount(s)	Mounting is provided by polar bosses located on the tank center axis.
Expulsion Efficiency	-
Design Fill Fraction	-
Tank Capacity	2301 in ³
Internal Dimensions	16.4" spherical
Tank Weight	Maximum tank weight is 35 lbs, Actual tank weight is 30.89 lbs
Propellant Capacity	-
Shell Leakage	<1x10 ⁻⁶ std cc/sec He max, Actual:1x10 ⁻⁷ scc/sec He @ 3600 psig
Failure Mode	Burst
Natural Frequency	-
Temperature Environment	-
On Orbit Life	-

80314-1 was subjected to the following qualification tests:

Test Sequence	Test Description
1	Acceptance Test
2	Operating Life
3	Random Vibration
4	Burst

5 Post-Test Analysis

Note: The following tests are only listed in this report.

- 1) Proof Pressure Test
- 2) Cryogenic Proof Pressure
 3) Operating Life Cycle
 4) Random Vibration Test

- 5) Burst Pressure Test
- 6) Post-Test Analysis

Pressure Log

Proof Pressure Test

Tank is pressurized to 5950 psig and held for a test period of 6 seconds.

2017 camileld evenue post office box 6999 los angeles cal. 90022	TRW PSI Te Appendix '	est Report No. 50-000113 'A", Page 26
DATA SHEE PROOF PRE		
	Date: 2-21-	85
	PSI Part No	80314-1
	PSI Serial No.	Sooo Helium
Test Equipment PRESSURE GAUGE (ST-0153)	PSI Part Name:	Pressurization Vessel
D- 10000 PSIG DATE CAUR 10-24-84 CAU	B DUE 4-27-85	
Test Media: Distilled/Deionized Water		
	_ Actual	Requirements
Test Pressure	5950_	5930, +25, -0 psig
Pressure Hold Period	<u>6 550</u>	5, +5, -0 seconds
Visual Examination	ND VISUAL	No visual deformation
	DEFORMATION	
	DEFORMATION	

Tested By: MA Op PSI Date 2-71-85 Specimen Passed YES

Cryogenic	Proof	Pressure
-----------	--------------	-----------------

Cooled to -320°F, pressurized to 8750 psig and held for a test period of five seconds. One cyle is performed.

	HEET "D" Appendix "A", Page 27 ROOF PRESSURE	
	Date: <u>2-22-85</u> PSI Part No. 80314-1	•
40.4.	PSI Serial No. OOO Z	
P135C 3-1-85, P457C 3-1	PSI Part Name: Pressurization Ve	
Test Media: GN ₂ and LN ₂	1	
	Record Requirement	_
A) Specimen Temperature	-320°, +20°, -	<u>1</u> 0°F
B) Test Pressure	8750/SEC. 8740, +25, -0	<u>p</u> sig
C) Time at 8740, +25, -0 psig	5 SEC. 10 seconds max	imm
D) Cycles		_
Tested By: 1. Elam	Date 2-22-85 Specimen Passed	1 1

Operating Life

Tank is filled with water and pressurized to 3995, +10/-0 psig. Number of cycles is 100.

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PRESSURE SYS	TEMS, INC.

TRW PSI Report No. 56-000113 Appendix "C", Page C-2

DATA SHEET "B-1" OPERATING LIFE TEST

					Date: 3/	25/85		
					TRW PSI Par	t No	80314-	-1
					TRW PSI Ser	ial No		<u>د `</u>
Tes	st Equipmen	t PRESSURE GAU	6E (L-	012)0-100	ooTRW PSI Par	t Name:	Helium ressurizat	ion Vessel
<u> 25</u>	16 DATE CE	14 5 4-9-94 CAC						
Tes	- 5 -85 v∪€ st Media:	Distilled/Deic	nized V	Nater R	equirements		Actual	
A) B)	Water Res Water pH	istivity		50	00,000 ohms m	in	17 MED OH	<u>w</u> s
C) D)	Specimen 1	Pressure ation Rate		39	.5 - 8.0 955 ± 10 psig	1	7.0 See below	_
,		_			00 psig/sec.		See below	_
Cvcle	Pressure	Press. Rate	Cycle	Pressure	Press. Rate	Cycle	Pressure	Press. Rate
1	<u>3950 </u> v	*** 75 Au XX	່ສູ້ 18 ສະ	_3950	87	35	3950_	86
2	3950 X		1 9	3950_	_ 87	36	3950	_86
3	3950	72	20	3950	_87	37	3950	_86
4	3950	86	21	<u> 3950</u>	_87	38	3950	58
5	_3950_	86	22	3950	87	39	3950	_58
6	3950	89	23	3950	87	40	3150	58
7	3950	89	24	3950	87	41	3950	_51
8	3950	87	25	3950	89	42	3950	_51
9	3950	87	26	3950	89	43	3650	_51
10	3950	89	27	_3950	_ 89	44	3950	_56
11	<u> 3950·</u>	BL	28	3950	88	45	3950	56
-12	3950	86	- 29	3950	88	46	3950	56
13	3950	89	30	<u>"3950</u>	_87	47	3950	56
¹⁴ .	3950	. 87 :	31	3950	87	48	3950	55
15	3950	89	32	3950	86	49	3950	55
16	3950	89	33	3950	86	50	3150	56
17	3950	89	34	3950	86			

TRW PSI Report No. 56-000113 Appendix "C", Page C-3

DATA SHEET "B-2" OPERATING LIFE TEST

					Date: 3	25 85		
					TRW PSI Par	t No	80314-	-1
				. *	TRW PSI Ser	ial No.	0002	
Tes	t Equipment	PRESSURE GAU	16E (L	012)	TRW PSI Par	t Name:P	Helium ressurizat	ion Vessel
0-1	10000 PSI6	DATE CALLE 4-	9-34 6	AUB DUC	1-5-85 Pers	MKE GAS	±€ (5]-0	153)
	DOO FSIE	DATE CALLS 3	5-35 2	(Contin				
Cycle	Pressure	Press. Rate	Cycle	Pressure	Press. Rate	Cycle	Pressure	Press. Rate
51	3150	56	68	3950	5 5	85	3950	_55
52	3150	56	69	3650	<u> </u>	86	3150	56
53	_3950_	56	70	<u>3950</u>	56	87	3950	_56
54	3950	55	71	3950	55	88	3950	
55	3950	55	72	3950	56	89	_3950_	56
56	3950	56	73	3950	56	90	3950	56
57	3150	_56	74	3950	56	91	3956	56
58	3950		75	3950	55	92	3950	_ 55
59	3950	56	76	3950	\$5	93	3950_	5 5
60	3950	_ 56	77	3950	56	94	3950	\$5
61	<u> 3950</u>	55	78	3950	56	95	3950	55
62	<u> 3950</u>		79	3950	56	96	3950	_56
63	3950_		80	3950	56	97	_3950	_56
64	3950	_56_	81	3950	56	98	3950	56
65	3950	56	82	3950	55	99	3150	55
66	3950	55	83	3150	56	100	3150	55
67 .	3950	56	84	39 5 0	56			

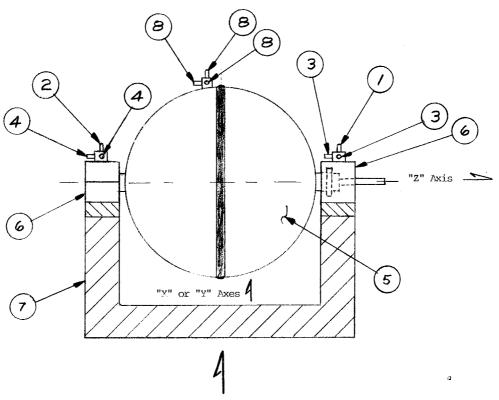
Random Vibration Test Set-Up



TRW PSI Test Report No. 56-000113 Page 11

FIGURE NO. 4

RANDOM VIBRATION TEST ACCELEROMETER LOCATIONS



DIRECTION OF EXCITATION X & Y AXES

- 1. Control Accelerometer Inlet Side Mount 2. Control Accelerometer Blind End Mount

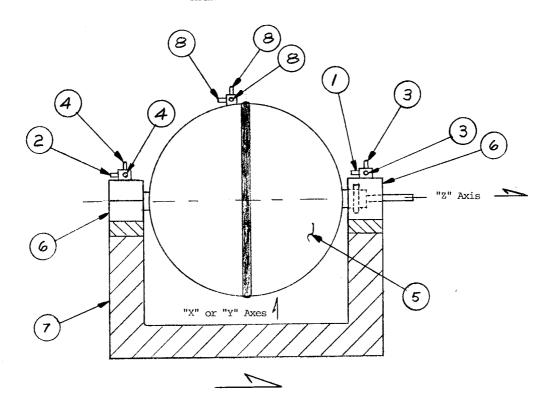
- Control Accelerometer Blind End Mount
 Response Accelerometer Inlet Side Mount
 Response Accelerometer Blind Side Mount

- Response Accelerometer Brind Black Park
 Test Specimen
 Split Saddle Blocks
 Vibration Tub
 Response Accelerometer Specimen Mounted



FIGURE NO. 5

RANDOM VIBRATION TEST ACCELEROMETER LOCATIONS

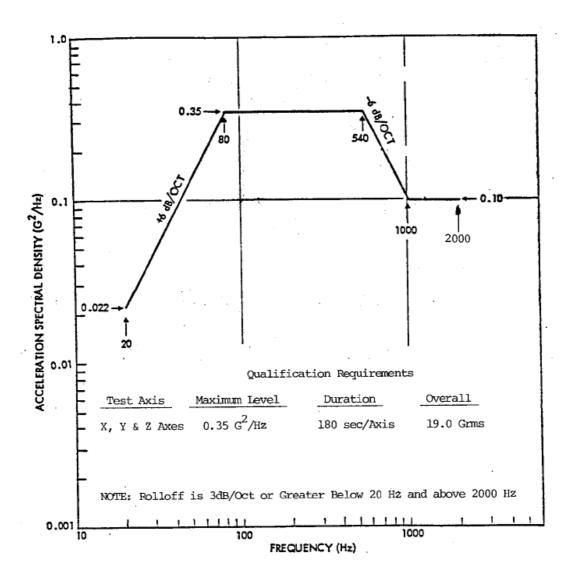


DIRECTION OF EXCITATION "Z" AXIS

- Control Accelerometer Inlet Side Mount
 Control Accelerometer Blind End Mount
 Response Accelerometer Inlet Side Mount
 Response Accelerometer Blind Side Mount
 Test Specimen
 Split Saddle Blocks
 Vibration Tub
 Response Accelerometer Specimen Mounted

- 8. Response Accelerometer Specimen Mounted

Random Vibration (Dry)



Tank is pressurized to 3600 ± 50 psig.



TRW PSI Report No. 56-000113 Appendix "C", Page C-50

DATA SHEET "C-2" RANDOM VIBRATION

	_ Date: <u>3</u> -	28-85 art No. 80314-1
Test Equipment	- .	erial No. OOO2 Helium art Name: Pressurization Vessel
Test Media: GN ₂	Actual	Requirement
Specimen Pressure	3600	3600 ± 50 psig

*	Freque			2	dB/Oct	dB/Oct		
Axis	From	To	G(ms)	G ² /Hz	Roll Up	Roll Off	Run Time	Date
Χ	20	80	19.0		+6		1805EC.@	3-28-85
	80	540		0.35			Frenc Correr	1
	540	1000				-6		
	1000	2000	₩	0.10				*
					,			

* Use a separate Data Sheet for each axis.

[Date	Time	LOG ENTRIES
ļ	3-28-85	0032	PERFORM -6 de CHECKOUT PRIN
	3:78-85	0042	PREMIEM FULL LOVEZ RAMON
	3-28-6s	0046	LAMBOM YES. ROMECTE

		٠.
Tested By: S. Harrison	Date 3-28-85 Specimen Passed	. Its
Tested by: 2/. Nonwow	Date 3 480 40 5 Decement 17.55cg	<u>-7</u> K



TRW PSI Report No. 56-000113 Appendix "C", Page C-61

DATA SHEET "C-2" RANDOM VIBRATION

		e eta e conju		ANDOM VIE				
					Date: 3	-28-85		
				_	TRW PSI P	art No	80314-1	
				-	TRW PSI S	erial No	0002 Melium	·
Test E	Equipment				TRW PSI P	art Name: <u>Pre</u>	ssurization	Vessel
Test M	Media: GN ₂	•		` <u>A</u> c	ctual	Requ	irement	
	Specime	n Pressure	, e	<u>36</u>	00_	<u>3600 ±</u>	: 50 psig	
* Axis	Frequen From	cv To	G(rms)	G ² /Hz	dB/Oct Roll Up	dB/Oct Roll Off	Run Time	Date
У	20	80	190		+6		180500	3-28-85

*	Freque	ncv	-	2	dB/Oct	dB/Oct	1	
Axis	From	To	G(rms)	G ² /Hz	Roll Up	Roll Off	Run Time	Date
У	20	80	19.0		+6		180 Sec@	3-28-85
	80	540		0.35			FILL LOVEZ	
	540	1000		<u></u>		-6		
	1000	2000	•	0.10			·	#
				1				//

^{*} Use a separate Data Sheet for each axis.

Date	Time	LOG ENTRIES
3-28-85	0129	PERFORM-64B CHECKOUT RUN
<i>3-28-8</i> 5	0136	PERFORM FULL LOVEL RANDOM
3-28-85	0140	PANNON V38. COMPLETE

	,		
Tested By: Narryon	Date <u>3-28-85</u>	_Specimen Passed	1

Burst Pressure

The minimum requirement for the tank burst pressure is 7900 psig (equivalent to 7200 psig at 165°F).

The actual burst pressure was 9090 psig.

PRESSURE SYSTEMS, INC.	TR App	V PSI Report No. 56-000113 pendix "C", Page C-72
	DATA SHEET "D" BURST TEST	
	_ Date: 4-zz-8	5
	_ TRW PSI Part No	80314-1
	TRW PSI Serial	No. ooz
Test Equipment Pressure GAUGE	SN 0621) TRW PSI Part No	me:Pressurization Vessel
0/1500 PSIG PATE CAUS 4-19	8-95 CALIB PUE 10	44/85
	•	
	•	
Test Media: Deionized Wat	er	
*	Actual	Requirement
A) Specimen Pressure at Burst	9090 psig	7900 psig minimum
B) Water Resistivity	17.0 web outm	500,000 ohms min.
C) Water pH	7.0	5.5 - 8.0
		·
· 0 1 4	·	
Tested By: Jewhy A	Date 4/22/85	Specimen Passed 425

Post=Test Analysis



TRW PSI Report No. 56-000113 Appendix "C", Page C-73

DATA SHEET "E" POST TEST ANALYSIS

		W PSI Part No. 80314-1 W PSI Serial No. 000
est		Helium W PSI Part Name: Pressurization Vesse
		The section vesse
		,
		Compliance
A)	Post Test Analysis (Para. 4.5)	44 (PST)
B)	Record Point-Of-Failure (Origin)	V
	THE ORIGIN OF RUPTURE OCCURRED) IN THE MEMBRADE
	OF THE PORTED HEMISPHERE (P/N 80-31	14040-3, S/N 137). THE
	POINT OF ORIGIN WAS LOCATED APP	PROXIMATRLY 4.5" FROM
	THE "Z" AXIS CENTER LINE	
		· · · · · · · · · · · · · · · · · · ·

Burst Tank Pictures