QUALIFICATION ENVIRONMENTS

FOR

PROPELLANT TANK ASSEMBLY

ATK P/N 80324-1

Table 1: P/N 80324-1 Propellant Tank Assembly

Assembly Specifications

Parameters	Requirements
Operating Pressure	400 psig
Proof Pressure	600 psig, Actual Proof: psig
Burst Pressure	850 psig, Actual Burst: 850 psig, Rupture @ 950 psig
External Pressure	Not Tested
Internal Vacuum	Not Tested
Material of Construction	Spherical Titanium 6AL-4V Pressure Vessel
Membrane Thickness	″
Tank Mount(s)	Mounting of specimen is provided by a polar boss and two mounting lugs with tapped holes near the girth.
Expulsion Efficiency	%
Design Fill Fraction	-
Tank Capacity	18434.0 in^3
Internal Dimensions	33.34″ Ø spherical
Tank Weight	Maximum tank weight is lbs, Actual tank weight is 45065 lbs
Propellant Capacity	lbs
Shell Leakage	$<1x10^{-6}$ std cc/sec He max, Actual: $1x10^{-7}$ scc/sec He @ 402 psig
Failure Mode	Burst
Natural Frequency	-
Temperature Environment	-
On Orbit Life	-

80324-1 was subjected to the following qualification tests:

Data Sheet	Title
A	INSPECTION
B	PRE-PROOF INTERNAL VOLUME
C	PROOF PRESSURE
D	POST PROOF INTERNAL VOLUME
E	INTERNAL PRESSURE CYCLING (6 SHEETS)
F	DRAIN TEST AND DRYING
G	INTERNAL VACUUM CYCLING
H	LEAK TEST
I	RADIOGRAPHIC AND PENETRANT INSPECTION
J	CLEANLINESS
K	RESONANT FREQUENCY SEARCH (3 SHEETS)
L	ACCELERATION TEST (2 Sheets)
M	DRAIN TEST AND DRYING
N	RADIOGRAPHIC INSPECTION AND FINAL EXAMINATION OF PRODUCT
O	LEAK TEST
P	BURST PRESSURE
Q	PRESSURE CYCLE DATA LOG
R	SPECIMEN VACUUM FILLING
S	SPECIMEN DRYING
T	ACCELERATION TEST STRAIN GAGE DATA
U	BURST TEST STRAIN GAGE DATA

Note: The following tests are only discussed in the report

1) Pressure Cycle Data Log
2) Proof Pressure
3) Internal Pressure Cycling
4) Internal Vacuum Cycling
5) Resonant Frequency Search
6) Acceleration Test
7) Burst Pressure Test

Proof Pressure Test

Internal Pressure Cycling

Tank is pressurized to 600, +20/-0 psig and held for 5 seconds maximum.
Number of cycles is 5.
Tank is pressurized to 400, +20/-0 psig and held for 5 seconds maximum.
Number of cycles is 91.

DATA SHEET "E"
(SHEET 1) B
INTERNAL PRESSURE CYCLING

Date: SEPT 6, 1991

Part No. 80324-11

Test Para. No. 4.5 A) Serial No. 0003

Test Equipment: ST-0315 CAL 6-14-91 DUE 12-14-91 / ST-0625
CAL 8-23-91 DUE 2-23-92 / ST-0700 CAL 8-15-91 DUE 2-15-92

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (600, +20, -0 psig)		Time Period at 600 psig (5 seconds maximum)	
1-16	603	psig	5	Seconds
2-17	600	psig	5	Seconds
3-18	604	psig	5	Seconds
4-19	602	psig	5	Seconds
5-20	600	psig	5	Seconds

Specimen Deformation NONE (None Permitted)

Tested By Mark Fracchia Date 9-6-91 Specimen Passed YES

DATA SHEET "E"
(SHEET 1) A
INTERNAL PRESSURE CYCLING

Date: SEPT 6, 1991

Part No. 80324-11

Test Para. No. 4.5 A) Serial No. 0003

Test Equipment: ST-0700 CAL 8-15-91 DUE 2-15-92
ST-0625 CAL 8-23-91 DUE 2-23-92 / ST-0315 CAL 6-14-91
DUE 12-14-91

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (600, +20, -0 psig)		Time Period at 600 psig (5 seconds maximum)	
1	608	psig	5	Seconds
2	610	psig	5	Seconds
3	602	psig	5	Seconds
4	601	psig	5	Seconds
5	602	psig	5	Seconds
6	605	psig	5	Seconds
7	600	psig	5	Seconds
8	610	psig	5	Seconds
9	601	psig	5	Seconds
10	602	psig	5	Seconds
11	603	psig	5	Seconds
12	601	psig	5	Seconds
13	605	psig	5	Seconds
14	600	psig	5	Seconds
15	600	psig	5	Seconds

DATA SHEET "E"
(SHEET 2)
INTERNAL PRESSURE CYCLING

Date: SEPT 6, 1991

Part No. 80324-11

Test Para. No. 4.5 B) Serial No. 0003

Test Equipment: ST-0625 Cal 8-23-91 Due 2-23-92
ST-0315 Cal 6-14-91 Due 12-14-91

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (400, +20, -0 psig)		Time period at 400 psig (5 seconds, maximum)	
1	401	psig	5	Seconds
2	400	psig	5	Seconds
3	402	psig	5	Seconds
4	400	psig	5	Seconds
5	404	psig	5	Seconds
6	402	psig	5	Seconds
7	402	psig	5	Seconds
8	400	psig	5	Seconds
9	400	psig	5	Seconds
10	406	psig	5	Seconds
11	402	psig	5	Seconds
12	401	psig	5	Seconds
13	400	psig	5	Seconds
14	400	psig	5	Seconds
15	402	psig	5	Seconds
16	405	psig	5	Seconds
17	402	psig	5	Seconds
18	402	psig	5	Seconds

COMPLETE Addl. Tubing Loose/Pull Str. 09/06/91

DATA SHEET "E"
(SHEET 3)
INTERNAL PRESSURE CYCLING

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (400, +20, -0 psig)		Time period at 400 psig (5 seconds, maximum)	
19	403	psig	5	Seconds
20	400	psig	5	Seconds
21	400	psig	5	Seconds
22	400	psig	5	Seconds
23	401	psig	5	Seconds
24	400	psig	5	Seconds
25	410	psig	5	Seconds
26	400	psig	5	Seconds
27	400	psig	5	Seconds
28	405	psig	5	Seconds
29	402	psig	5	Seconds
30	402	psig	5	Seconds
31	400	psig	5	Seconds
32	407	psig	5	Seconds
33	402	psig	5	Seconds
34	401	psig	5	Seconds
35	405	psig	5	Seconds
36	402	psig	5	Seconds
37	400	psig	5	Seconds
38	402	psig	5	Seconds
39	400	psig	5	Seconds
40	400	psig	5	Seconds

[illegible] 09/06/91

DATA SHEET "E"
(SHEET 4)
INTERNAL PRESSURE CYCLING

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (400, +20, -0 psig)		Time period at 400 psig (5 seconds, maximum)	
41	402	psig	5	Seconds
42	403	psig	5	Seconds
43	402	psig	5	Seconds
44	402	psig	5	Seconds
45	400	psig	5	Seconds
46	402	psig	5	Seconds
47	402	psig	5	Seconds
48	401	psig	5	Seconds
49	400	psig	5	Seconds
50	405	psig	5	Seconds
51	404	psig	5	Seconds
52	402	psig	5	Seconds
53	400	psig	5	Seconds
54	402	psig	5	Seconds
55	400	psig	5	Seconds
56	400	psig	5	Seconds
57	400	psig	5	Seconds
58	401	psig	5	Seconds
59	400	psig	5	Seconds
60	400	psig	5	Seconds
61	404	psig	5	Seconds
62	402	psig	5	Seconds

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DATA SHEET "E"
(SHEET 5)
INTERNAL PRESSURE CYCLING

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (400, +20, -0 psig)		Time period at 400 psig (5 seconds, maximum)	
63	400	psig	5	Seconds
64	401	psig	5	Seconds
65	400	psig	5	Seconds
66	400	psig	5	Seconds
67	402	psig	5	Seconds
68	405	psig	5	Seconds
69	408	psig	5	Seconds
70	400	psig	5	Seconds
71	402	psig	5	Seconds
72	402	psig	5	Seconds
73	400	psig	5	Seconds
74	400	psig	5	Seconds
75	400	psig	5	Seconds
76	402	psig	5	Seconds
77	405	psig	5	Seconds
78	400	psig	5	Seconds
79	402	psig	5	Seconds
80	402	psig	5	Seconds
81	400	psig	5	Seconds
82	404	psig	5	Seconds
83	410	psig	5	Seconds
84	403	psig	5	Seconds

DATA SHEET "E"
(SHEET 6)
INTERNAL PRESSURE CYCLING

Test Media: Deionized Water

"D" Cycle	Specimen Pressure (400, +20, -0 psig)		Time period at 400 psig (5 seconds, maximum)	
85	400	psig	5	Seconds
86	402	psig	5	Seconds
87	407	psig	5	Seconds
88	401	psig	5	Seconds
89	404	psig	5	Seconds
90	402	psig	5	Seconds
91	401	psig	5	Seconds

Specimen Deformation NONE (none permitted)

Tested By Matt Fiscus Date 9-6-91 Specimen Passed YES

Witnessed By N/A Date N/A Specimen Failed NO

Internal Vacuum Cycling

Tank is evacuated to a pressure of 4500 microns or less and held for 5, +0.5/-0 minutes. Number of cycles is 10.

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DATA SHEET "G"
INTERNAL VACUUM CYCLING

Date: SEPT 9, 1991

Part No. 80324-11

"D" Test Para. No. 4.7 Serial No. 0003

Test Equipment: S/N 100417 CAL 2-25-91 DUE 2-25-92
(S/N 1753) VACUUM GAUGE

Cycle	Specimen Pressure (4500 Microns or Less)		Test Period (5, +0.5, -0 Minutes)	
1	3200	microns	5	min
2	3000	microns	5	min
3	3200	microns	5	min
4	4500	microns	5	min
5	4200	microns	5	min
6	3200	microns	5	min
7	4000	microns	5	min
8	3000	microns	5	min
9	4000	microns	5	min
10	3200	microns	5	min

Final Cycle - Back Fill With He/Dry N_2 [illegible] QC

Specimen Deformation NONE (None Permitted)

Tested By Matteo Friscia Date 9-9-91 Specimen Passed YES

Witnessed By [illegible] N/A Date N/A Specimen Failed NO

Resonant Frequency

Test Condition	Specimen Loading
1	Empty
2	267, +10, -0 lb water
3	587, +10, -0 lb water
4	418, +10, -0 lb freon
5	920, +10, -0 lb freon

Tank is also pressurized to 400, +15/-0 psig.

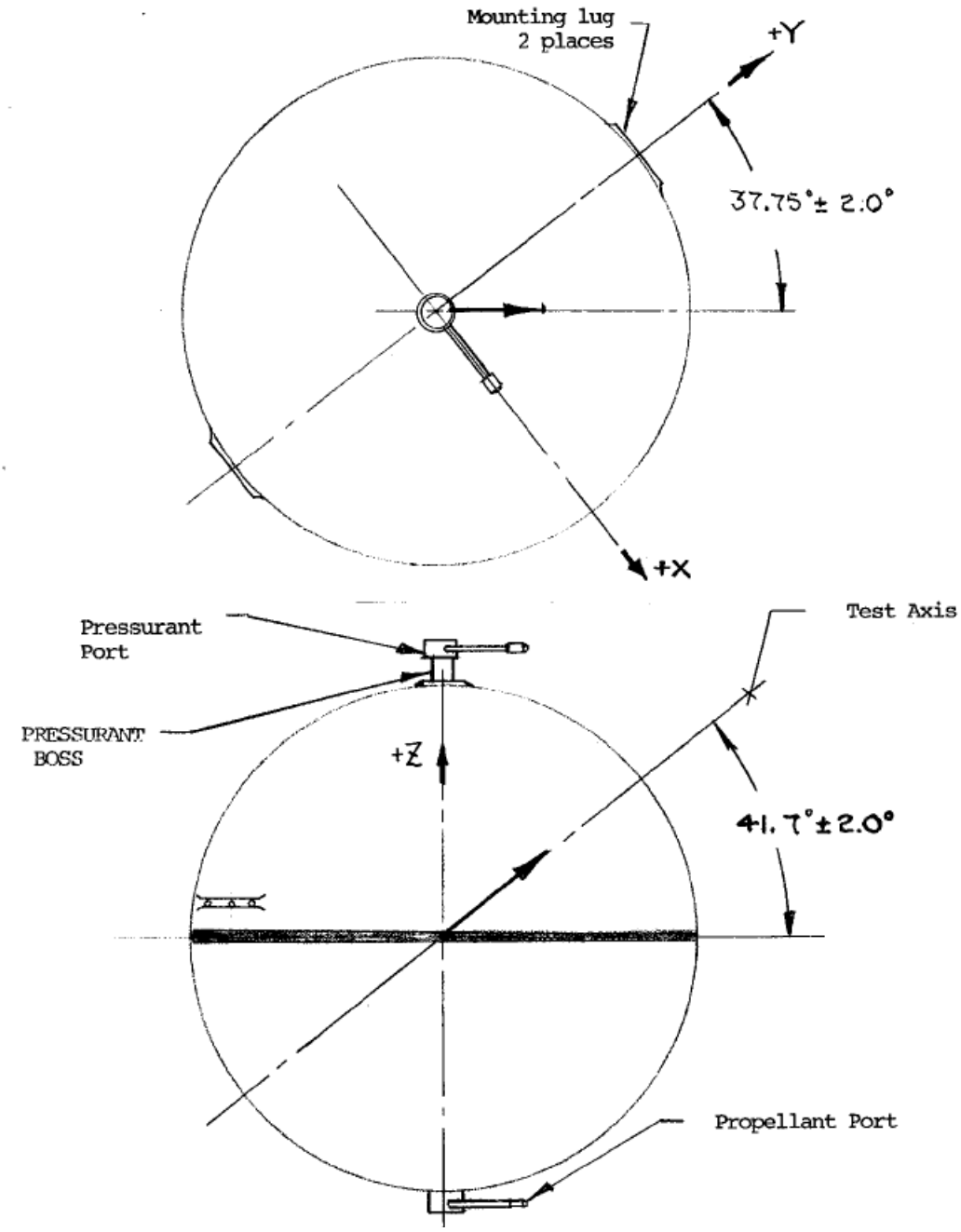
Resonant frequency is found by using an impulse hammer to generate the required frequency (5 – 2000 Hz). Tank is excited with impulse hammer in the +X, +Y, and +Z axis direction.

Acceleration Test

Acceleration test conducted at 17.93 ± 1.5 G in the two directions along the axis defined below.

Tank is loaded with 920, +5/-0 lbs of Freon and pressurized to 400, +15/-0 psig.

A total of 4 cycles in each orientation is performed.



Burst Pressure Test

The tank design burst pressure is 850 psig.

The actual burst pressure was 950 psig.

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DATA SHEET "P"
BURST PRESSURE

Date: 9-17-91

Part No. 80324-11

Test Para. No. 4.18 Serial No. 0003

Test Equipment: ST-00621 Cal 5-20-91 Due 11-20-91 / ST-0625 Cal 8-23-91 Due 2-23-92 / ST-0716 Cal 7-17-91 Due 1-17-92

Test Media: Deionized Water

		Record	Required
A)	Specimen Temperature	71 °F	Record
B)	Design Burst Pressure (=P_B) (from Paragraph 4.18 C)	850 psig	Record
C)	Specimen Test Pressure	850 psig	P_B, +10, -0 psig
D)	Time at Burst Pressure	8 sec	10 seconds maximum
E)	Specimen Failure Pressure	950 psig	P_B psig minimum

Tested By Matt Grossin Date 9-17-91 Specimen Passed YES

Witnessed By SPA Date 9-17-91 Specimen Failed NO