

QUALIFICATION ENVIRONMENTS
FOR
POSITIVE EXPULSION PROPELLANT TANK
ATK P/N 80274-1

Table 1: P/N 80274-1 Positive Expulsion Propellant Specifications

Parameters	Requirements
Operating Pressure	377 psig
Proof Pressure	565 psig, Actual Proof: 570 psig
Burst Pressure	792 psig, Actual Burst: 800 psig
External Pressure	Not tested
Internal Vacuum	Not tested
Material of Construction	Spherical 6AL-4V titanium tank fabricated from die forgings and machine welded at the girth. Fluid connections are made thru .250 inch outside diameter titanium tubes.
Membrane Thickness	0.026"
Tank Mount(s)	Mounting is accomplished on two equally spaced lugs located near the equator.
Expulsion Efficiency	99.8%
Design Fill Fraction	-
Tank Capacity	3679.7 in ³
Internal Dimensions	19" Ø spherical
Tank Weight	Maximum tank weight is 14.77 lbs, Actual tank weight is lbs
Propellant Capacity	99 lbs
Shell Leakage	<1x10 ⁻⁶ std cc/sec He max, Actual: none @ 380 psig
Failure Mode	Burst
Natural Frequency	-
Temperature Environment	-
On Orbit Life	-

80274-1 was subjected to the following qualification tests:

<u>TEST SEQUENCE</u>	<u>TEST DESCRIPTION</u>
1	PRELIMINARY EXAMINATION OF PRODUCT
2	PRE-PROOF VOLUME
3	PROOF PRESSURE TEST
4	VOLUME DETERMINATION
5	INTERNAL (DIAPHRAGM) LEAKAGE
6	EXTERNAL LEAKAGE
7	EXPULSION EFFICIENCY
8	VIBRATION
9	INTERNAL (DIAPHRAGM) LEAKAGE
10	EXTERNAL LEAKAGE
11	ACCELERATION TEST
12	WELD INSPECTION
15	INTERNAL (DIAPHRAGM) LEAKAGE
16	EXTERNAL LEAKAGE
17	OPERATING CYCLE LIFE
18	INTERNAL (DIAPHRAGM) LEAKAGE
19	EXTERNAL LEAKAGE
20	EXPULSION EFFICIENCY, PRESSURE DIFFERENTIAL AND FLOW RATE
21	BURST TEST

The following tests are listed in this report:

- 1) Proof Pressure Test
- 2) Acceleration Test
- 3) Operating Cycle Test
- 4) Burst Pressure Test

Proof Pressure Test

Tank is pressurized to 570 psig and held for ten (10) minutes.



PSI REPORT No. 56-000078
APPENDIX C
PAGE C-4

DATA SHEET C PROOF PRESSURE TEST

DATE 4-23-79

PSI P/N 80274-1

PSI SERIAL No. 0001

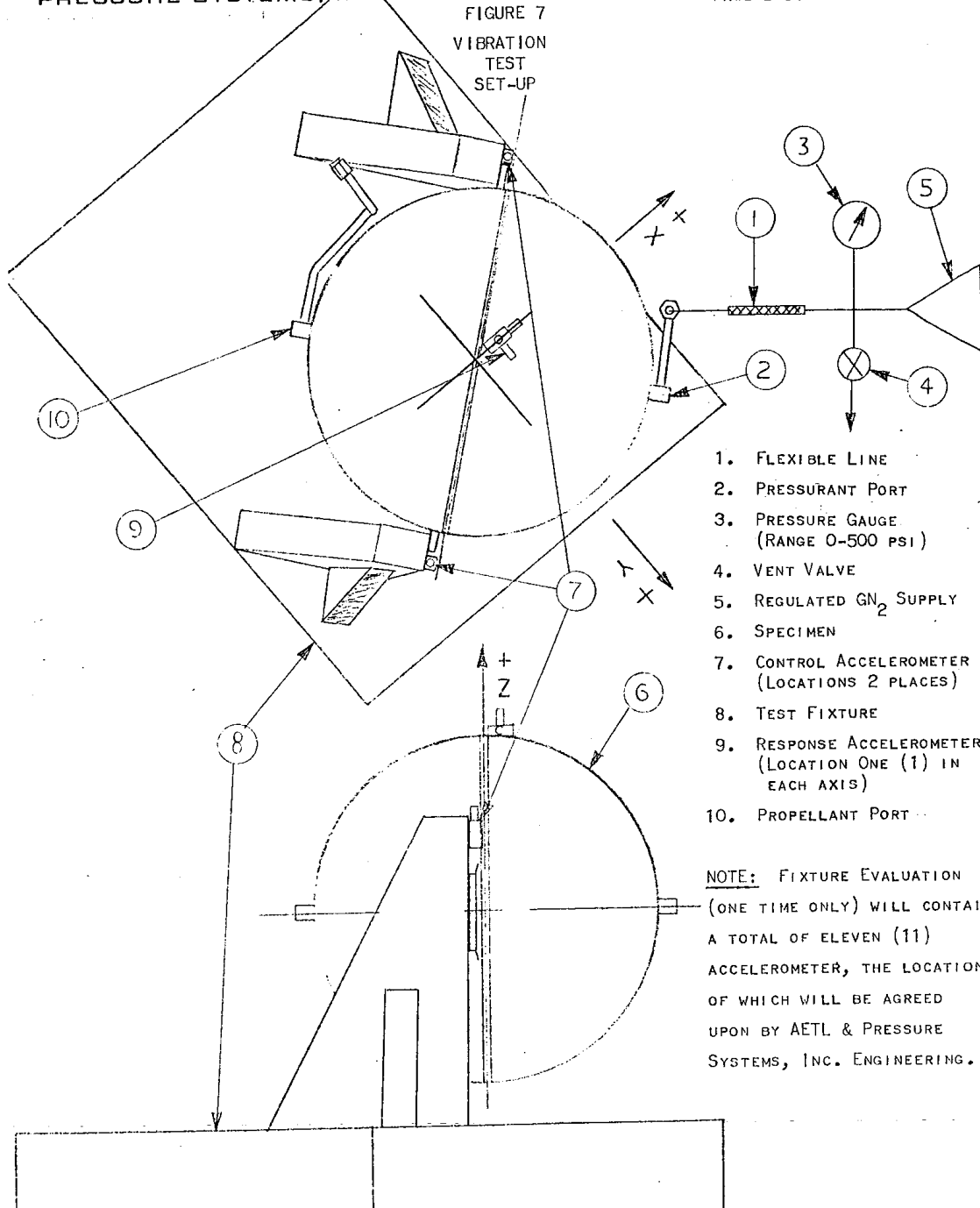
TEST EQUIPMENT GAUGE, PRESSURE, HEISS, 0-1000 PSIG
CALIBRATION DUE 9-8-79

TEST MEDIA:	<u>DEIONIZED WATER</u>	
	<u>ACTUAL</u>	<u>REQUIRED</u>
SPECIMEN PRESSURE	<u>570 PSIG</u>	565 +10 -0
PRESSURE HOLD PERIOD	<u>10 MINUTES</u>	10 +1 -0 MINUTES
PRESSURE CYCLES	<u>1</u>	<u>1</u>
DEFORMATION OBSERVED	<u>NONE</u>	

TESTED BY: [Signature] DATE 4-23-79 SPECIMEN PASSED YES
4-23-79 SPECIMEN FAILED NO

Vibration Test Set-Up

FIGURE 7
VIBRATION
TEST
SET-UP



1. FLEXIBLE LINE
2. PRESSURANT PORT
3. PRESSURE GAUGE
(RANGE 0-500 PSI)
4. VENT VALVE
5. REGULATED GN₂ SUPPLY
6. SPECIMEN
7. CONTROL ACCELEROMETER
(LOCATIONS 2 PLACES)
8. TEST FIXTURE
9. RESPONSE ACCELEROMETER
(LOCATION ONE (1) IN
EACH AXIS)
10. PROPELLANT PORT

NOTE: FIXTURE EVALUATION
(ONE TIME ONLY) WILL CONTAIN
A TOTAL OF ELEVEN (11)
ACCELEROMETER, THE LOCATION
OF WHICH WILL BE AGREED
UPON BY AETL & PRESSURE
SYSTEMS, INC. ENGINEERING.

Sine Vibration (Wet)

<u>SINUSOIDAL</u>			
<u>AXIS</u>	<u>FREQUENCY (Hz)</u>	<u>LEVEL</u>	<u>SWEEP RATE OCTAVES/MINUTE</u>
Z	5 - 22.75	12 MM (0 TO PEAK)	
	22.75 - 100	25 g	2
	100 - 200	4.5g	
X, Y	5 - 9.65	12 MM (0 TO PEAK)	2
	9.65 - 200	4.5 g	

Tank is loaded with 99, +1/-0 lbs of deionized water and pressurized to 377, +10/-0 psig.

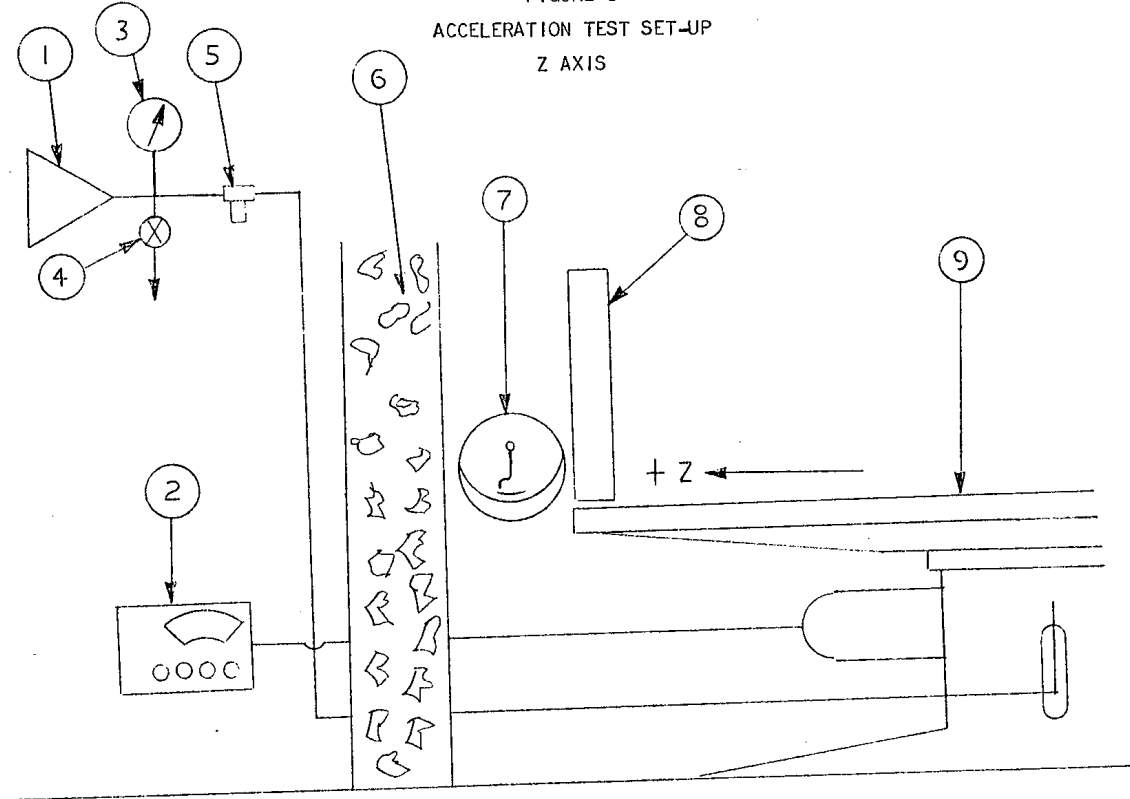
Random Vibration (Wet)

<u>RANDOM</u>				
<u>Axis</u>	<u>FREQUENCY (Hz)</u>	<u>PSD</u>	<u>GRMS</u>	<u>TIME MINUTES/Axis</u>
X, Y & Z	20 - 40	+6DB/OCTAVE	15.1	2
	40 - 108	1.0g ² /Hz		
	108 - 250	-7.8DB/OCTAVE		
	250 - 700	0.11g ² /Hz		
	700 - 2000	-6DB/OCTAVE		

Tank is loaded with 99, +1/-0 lbs of deionized water and pressurized to 377, +10/-0 psig.

Acceleration Test Set-Up

FIGURE 8
 ACCELERATION TEST SET-UP
 Z AXIS



- | | |
|-------------------------------------|---------------|
| 1. REGULATED NITROGEN SUPPLY | 5. FILTER |
| 2. COUNTER | 6. WALL |
| 3. PRESSURE GAUGE (RANGE 0-500 PSI) | 7. SPECIMEN |
| 4. VENT VALVE | 8. FIXTURE |
| | 9. CENTRIFUGE |

Acceleration Test

Tank is accelerated to 25, +2 G's for a 1 minute duration in each direction along the Z axis.

Tank is loaded with 99, +1/-0 lbs of deionized water and pressurized to 377, +10/-0 psig.



PSI REPORT No. 56-000078
APPENDIX C
PAGE C-67

DATA SHEET H
ACCELERATION TEST

DATE 5-25-1979

PSI P/N 80274-1

PSI SERIAL No. 0001

TEST EQUIPMENT _____

TEST MEDIA:	NITROGEN AND	DEIONIZED WATER		REQUIREMENTS
		ACTUAL		
AXES:		+Z	-Z	
1) Wt. OF WATER IN SPECIMEN		<u>100LBS</u>	<u>100LBS</u>	99 ^{+1.0} LBS _{-0.0}
2) PRE-TEST INTERNAL PRESSURE		<u>380</u>	<u>380</u>	377 ⁺¹⁰ ₋₀
3) G LEVELS		<u>25</u>	<u>25</u>	25g
4) DURATION		<u>1 minute</u>	<u>1 minute</u>	1 MIN/DIRECTION DURATION

TESTED BY: Ann Orulich DATE 5-25-79 SPECIMEN PASSED YES

Operating Cycle Life

Tank is loaded with 99, +1/-0 lbs of deionized water and pressurized to 377, +10/-0 psig. The tank is then discharged. Number of cycles is 48. Propellant compartment is now completely filled with water. It is then discharged. Number of cycles is 2.



PSI REPORT No. 56-000078
APPENDIX C
PAGE C-70

DATA SHEET I OPERATING CYCLE TEST

DATE 5-23-79
PSI P/N 80274-1
PSI SERIAL No. 0001

TEST EQUIPMENT GAUGE, PRESSURE HEISE, 0-1000 PSIG, NO STABILIZ
CALIBRATION DUE 9-8-79

TEST MEDIA:	DEIONIZED WATER AND NITROGEN	
	ACTUAL	REQUIRED
SIMULATED PROPELLANT LOAD	<u>99 LBS</u>	99 ⁺¹ -0 LBS
EXPULSION CHARGE	<u>380 PSIG</u>	377 ⁺¹⁰ -0 PSIG
75% EXPULSION (48 CYCLES)	<u>99 LBS</u>	99 ⁺¹ -0 LBS
100% EXPULSION (2 CYCLES)	<u>133 LBS</u>	PROPELLANT COMPARTMENT FULL CAPACITY

TESTED BY: Ann Ornelich DATE 5-23-79 SPECIMEN PASSED Yes

Burst Test

Tank is pressurized to minimum burst pressure of 792 psig and held for 5 seconds.

Tank was not ruptured.



PSI REPORT No. 56-000078
APPENDIX C
PAGE C-72

DATA SHEET K BURST PRESSURE TEST

DATE 6-8-79

PSI P/N 80274-1

PSI SERIAL No. 0001

TEST EQUIPMENT HEISE GAUGE (ST 0153) 0-1000 PSIG, CALIBRATION DUE 9-8-79

TEST MEDIA:	DEIONIZED WATER	
	<u>ACTUAL</u>	<u>REQUIREMENTS</u>
BURST TEST PRESSURE	<u>800 PSIG</u>	<u>792 +10, -0 PSIG</u>
TIME TO REACH BURST PRESSURE	<u>50 SECS</u>	<u>15 SECS MIN/ 300 SECS MAX</u>
TIME AT TEST PRESSURE	<u>5 SECS</u>	<u>5 SECS MAXIMUM</u>

TESTED BY: Ann Orulich DATE 6-8-79 SPECIMEN PASSED YES