QUALIFICATION ENVIRONMENTS

FOR

POSITIVE EXPULSION PROPELLANT

ATK P/N 80271-1

Table 1: P/N 80271- 1 POSITIVE EXPULSION PROPELLANT

Specifications

Parameters	Requirements
Operating Pressure	300 psig
Proof Pressure	900 psig, Actual Proof: 900 psig
Burst Pressure	1200 psig, Actual Burst: 1480 psig
External Pressure	Not tested
Internal Vacuum	Not tested
Material of Construction	Spherical 6Al-4V titanium tank fabricated from closed die forgings and machine welded at the girth. Fluid connections are made thru .250 inch outside diameter titanium tubes.
Membrane Thickness	0.034″
Tank Mount(s)	Mounting is accomplished on three equally spaced lugs located on the pressurant compartment adjacent to the girth weld.
Expulsion Efficiency	99.63%
Design Fill Fraction	-
Tank Capacity	2328.9 in^3
Internal Dimensions	16.50″ Ø spherical
Tank Weight	Maximum tank weight is 11.4 lbs, Actual tank weight is lbs
Propellant Capacity	55 lbs
Shell Leakage	$<1x10^{-6}$ std cc/sec He max, Actual: None @ 302 psig
Failure Mode	Burst
Natural Frequency	-
Temperature Environment	-
On Orbit Life	-

80271-1 was subjected to the following qualification tests:

Test Sequence	Test Description
1	Preliminary Examination of Product
2	Pre-Proof Volume
3	Proof Pressure
4	Post-Proof Volume
5	Internal (Diaphragm) Leakage High and Low Pressure
6	External Leakage
7	Vibration
8	Internal (Diaphragh) Leakage High and Low Pressure
9	External Leakage
10	Expulsion Efficiency
11	Internal (Diaphragh) Leakage High and Low Pressure
12	External Leakage
13	Bulk Yield
14	Burst Test

The following tests are listed in the report:

1) Proof Pressure Test
2) Sine Vibration Test
3) Random Vibration Test
4) Burst Test

Proof Pressure Test

Pressurized to 900 psig and held for 31 seconds.

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PRESSURE SYSTEMS, INC.

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DATA SHEET C
PROOF PRESSURE

DATE: 3-8-79

PSI PART No. 80271-1

PSI SERIAL No. 0001

TEST PARA. No. 4.3

PSI PART NAME: HYDRAZINE SUPPLY TANK

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

TEST MEDIA: DEIONIZED WATER

	ACTUAL	REQUIRED
SPECIMEN PRESSURE	900	900 +10 -0 PSIG
TIME AT PRESSURE	31	30 ± 15 SECONDS
DEPRESSURIZATION TIME TO BELOW 300 PSIG	4	15 SECONDS MAX
VISIBLE EVIDENCE OF DEFORMATION OR FAILURE	NONE	NONE ALLOWED

TESTED BY: Mel Oesterlich DATE 3-8-79 SPECIMEN PASSED YES

Vibration Test Set-Up

Sine Vibration (Wet)

SINUSOIDAL

Frequency (Hz)	Level (G's)	Sweep Rate Octaves/Minute
5 - 15.5	.75 IN DA	2
15.5 - 100	9.0	2
100 - 200	5.0	2

Tank is subjected to the sine vibration levels in each of the three orthogonal axes.

Tank is loaded with 55, +1/-0 lbs of water and pressurized to 300, +10/-0 psig with nitrogen.

SINUSOIDAL VIBRATION

DATE 3/16/79

PSI P/N 80271-1

PSI S/N 0001

HAC S/N _____

PART NAME: HYDRAZINE SUPPLY TANK

TEST PARA. NO. 4.7.6

TANK LOAD: 55 + 1, -0 LBS.

TANK PRESSURE: 300 + 10, -0 PSIG

AXIS	FREQUENCY FROM	FREQUENCY TO	D.A. INCHES	G PEAK	SWEEP RATE MINUTES/OCTAVE	DURATION TOTAL MINUTES	DATE	MAXIMUM AMPLIFICATION
Z	5	15.5	0.75		2 oct/min	5.3	3/16/79	
	15.5	100		9.0				
	100	200		5.0				

TESTED BY: C. W. Whittaker DATE 3/16/79

Random Vibration (Wet)

	RANDOM		
FREQUENCY (Hz)	LEVEL (g^2/Hz	OVERALL LEVEL GRMS	TIME MINUTES/AXIS
20 - 130	+6 DB/OCT		2
130 - 1000	0.4	25.1	2
1000 - 2000	-3 DB/OCT		2

Tank is subjected to the sine vibration levels in each of the three orthogonal axes.

Tank is loaded with 55, +1/-0 lbs of water and pressurized to 300, +10/-0 psig with nitrogen.

RANDOM VIBRATION

DATE 3/16/79

PSI P/N 80271-1

PSI S/N 0001

HAC S/N _____

PART NAME: HYDRAZINE SUPPLY TANK

TEST PARA. No. 4.7.6

TANK LOAD: 55 +1, -0 LBS.

TANK PRESSURE: 300 +10, -0 PSIG

AXIS	FREQUENCY FROM	FREQUENCY TO	G RMS	G^2/Hz	DB/OCT	RUN TIME	DATE
Z	20	130	25.1		+6	2min	3/16/79
	130	1000		0.4			
	1000	2000			-3		

TESTED BY: [signature] DATE 3/16/79

Burst Pressure

The minimum requirement for the tank design burst pressure is 1200 psig.

The actual burst pressure was 1480 psig. The normalized burst pressure was 1417 psig.

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DATA SHEET J
BURST TEST

DATE: 3-23-79
PSI PART No. 80271-1
PSI SERIAL No. 0001
TEST PARA. No. 4.14
PSI PART NAME: HYDRAZINE SUPPLY TANK
TEST EQUIPMENT: HELICOID GAGE (L-009) 0-2000 PSIG
CALIBRATION DUE 9-23-79

TEST MEDIA: DEIONIZED WATER

	ACTUAL	REQUIRED
PRESSURIZATION RATE	175	175 PSIG/MINUTE MAX
BURST PRESSURE	1480	RECORD
WATER TEMPERATURE	71°	
MIN MATERIAL PROPERTIES	177600	170,000 PSI MIN UTS
HEMISPHERE WALL THICKNESS	.031	.034 ± .003
* NORMALIZED BURST PRESSURE	1417	1200 PSIG MIN

*NORMALIZED BURST PRESSURE =

$$(\text{ACTUAL BURST PRESSURE})\left(\frac{\text{UTS } 75^\circ F}{\text{UTS TEST TEMP}}\right)\left(\frac{170{,}000}{\text{ACTUAL MINIMUM MATERIAL PROPERTIES}}\right)\left(\frac{.031}{\text{ACTUAL WALL THICKNESS}}\right)$$

$$1480\left(\frac{177600}{177600}\right)\left(\frac{170000}{177600}\right)\left(\frac{.031}{.031}\right) = 1417$$

TESTED BY: [signature] DATE 3-23-79 SPECIMEN PASSED YES