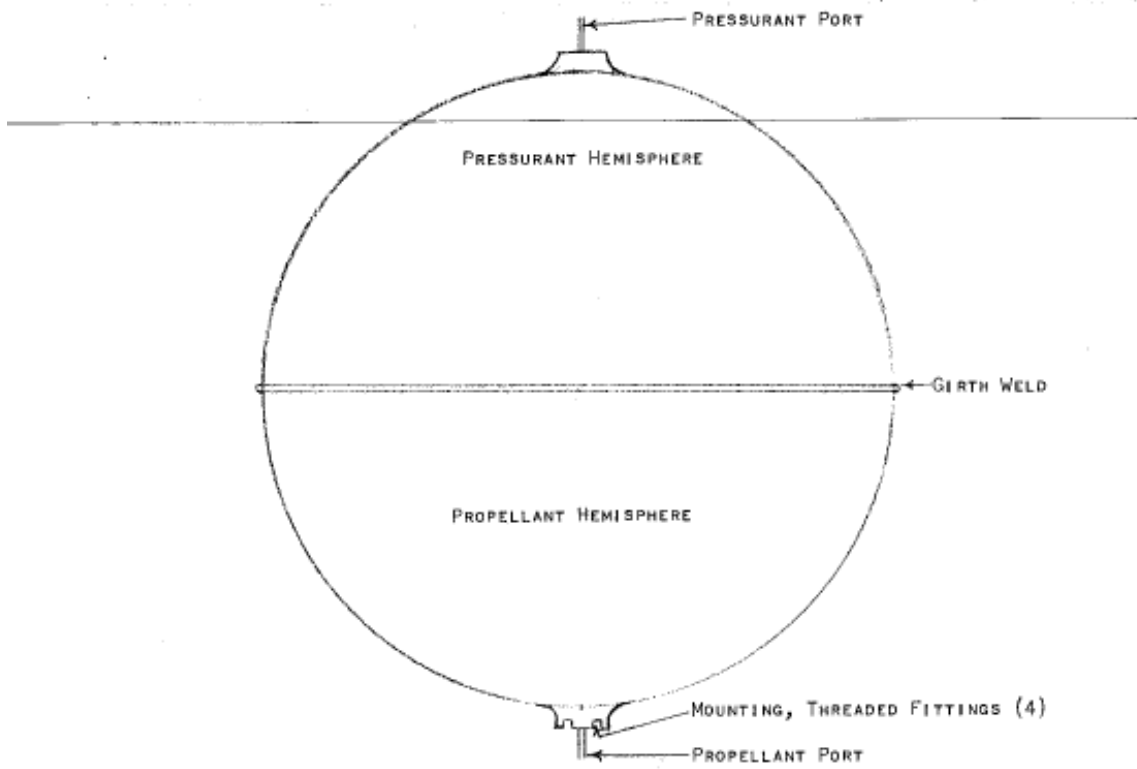


**QUALIFICATION ENVIRONMENTS**  
**FOR**  
**PROPELLANT TANK ASSEMBLY, SPHERICAL**  
**ATK P/N 80213-1**

FIGURE 1  
SPECIMEN CONFIGURATION  
(SPHERICAL)



**Table 1: P/N 80213-1 Propellant Tank Assembly, Spherical  
Specifications**

<b>Parameters</b>	<b>Requirements</b>
Operating Pressure	310 psig
Proof Pressure	550 psig, Actual Proof: 550 psig
Burst Pressure	650 psig, Actual Burst: 650 psig
External Pressure	0.015 Hg
Internal Vacuum	Not tested
Material of Construction	Lightweight spherical titanium hydrazine fuel tank. It contains a titanium vane-type propellant management device mounted at the polar ports. There are two (2) ports with bimetallic (titanium)
Membrane Thickness	0.021"
Tank Mount(s)	Tank is supported by four (4) tapped bosses at the propellant ports.
Expulsion Efficiency	%
Design Fill Fraction	-
Tank Capacity	1236.7 in <sup>3</sup>
Internal Dimensions	13.390" Ø
Tank Weight	Maximum tank weight is 4 lbs, Actual tank weight is 3.359 lbs
Propellant Capacity	
Shell Leakage	<1x10 <sup>-7</sup> std cc/sec He max, Actual: None @ 310 psig
Failure Mode	Burst
Natural Frequency	-
Temperature Environment	-
On Orbit Life	-

**80213-1 was subjected to the following qualification tests:**

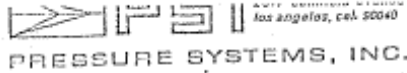
TEST SEQUENCE NUMBER	DESCRIPTION OF TEST
1	EXAMINATION OF PRODUCT, PRELIMINARY
2	EXTERNAL PRESSURE
3	VOLUME - CALIBRATION
4	PROOF PRESSURE
5	LEAKAGE
6	EXAMINATION OF PRODUCT, FINAL (A)
7	CLEANLINESS
8	COMPATIBILITY TEST
9	RANDOM VIBRATION TEST (B)
10	POST RANDOM VIBRATION LEAKAGE TEST
11	SINUSOIDAL VIBRATION TEST (B)
12	POST SINUSOIDAL VIBRATION LEAKAGE TEST
13	BURST PRESSURE TEST
14	CLEANLINESS (C)

The following tests are listed in the report:

- 1) External Pressure Test
- 2) Proof Pressure Test
- 3) Random Vibration Test (B)
- 4) Sinusoidal Vibration Test (B)
- 5) Burst Pressure Test

**External Pressure Test**

Tank is pressurized to .015 psia and held for a test duration of fifteen minutes.



PSI TEST PROCEDURE No. 50-000169  
PAGE 16

REV	A						
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EXTERNAL PRESSURE TEST

DATA SHEET B

DATE 3-11-75

PSI PART NUMBER 80213-1

SERIAL NUMBER 0001

PSI SERIAL NUMBER 0001

TEST PROCEDURE PARA. No. 4.2

DESCRIPTION PROPELLANT TANK, SPHERICAL

TEST EQUIPMENT IF DIFFERENT FROM PARA. 3.4 \_\_\_\_\_

<u>TEST VALUES</u>		<u>REQUIREMENTS</u>
EXTERNAL PRESSURE	<u>14.7</u> PSIA	<u>14.7 PSIA, REF.</u>
INTERNAL PRESSURE	<u>.015 u</u> PSIA	<u>0.1 <del>0.05</del> PSIA MAX.</u>
TEST DURATION	<u>15</u> MINUTES	<u>15, +1, -0 MIN</u>
POST TEST VISUAL EXAMINATION NO DAMAGE OR DISTORTION PERMITTED _____		
TESTED BY <u>Les Rose</u>	PSI <u>26</u>	DATE <u>3-11-75</u> SPECIMEN PASSED <input checked="" type="checkbox"/>

# Proof Pressure Test

Tank is pressurized to 550 psig and held for a test duration of fifteen (15) seconds.



PSI TEST PROCEDURE No. 50-000169  
PAGE 18

REV A 

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PROOF PRESSURE TEST  
AND POST-PROOF VOLUME TEST  
DATA SHEET D

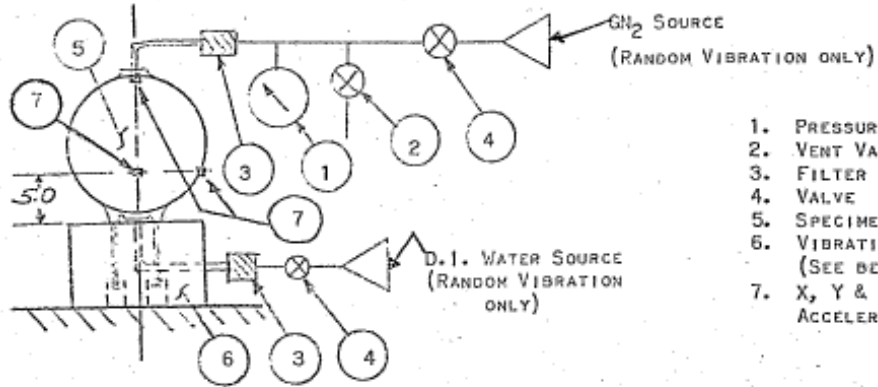
DATE 3-11-75  
PSI PART NUMBER 80213-1  
SERIAL NUMBER 0001 PSI SERIAL NUMBER 0001  
TEST PROCEDURE PARA. No. 4.4 DESCRIPTION PROPELLANT TANK, SPHERICAL  
TEST EQUIPMENT IF DIFFERENT FROM PARA. 3.4 \_\_\_\_\_

"A"

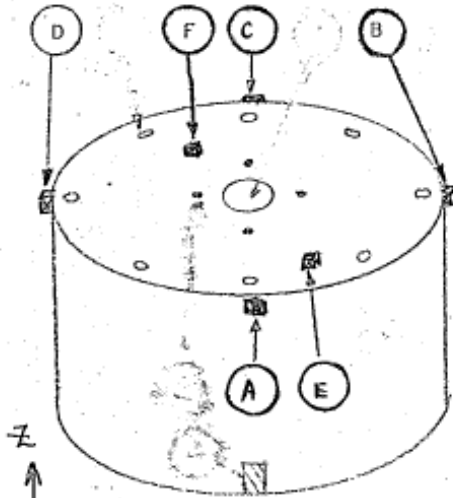
TEST VALUES	REQUIREMENTS
SPECIMEN PRESSURE, MAXIMUM <u>550</u> PSIG	<u>550, +10, -0 PSIG</u>
PRESSURE HOLD TIME <u>15</u> SEC	<u>15, +5, -0 SEC</u>
VISUAL INDICATION OF DAMAGE AFTER PRESSURE RELEASE <u>NO VISUAL DAMAGE</u>	<u>NONE</u>
SPECIMEN FILTERS AND FIXTURE DRY WEIGHT <u>21.3</u> LBS	<u>FROM DATA SHEET C</u>
WEIGHT FILLED WITH WATER <u>65.9</u> LBS	<u>RECORD</u>
WEIGHT OF WATER (WV) <u>44.6</u> LBS	<u>RECORD</u>
TEMPERATURE OF WATER <u>68</u> °F	<u>60 TO 100° F</u>
*CUBIC INCHES OF WATER PER POUND AT TEST TEMP. (SV) <u>27.7276</u> IN <sup>3</sup> /LBS	<u>RECORD</u>
SPECIMEN VOLUME (WV X SV) <u>1236.7</u> IN <sup>3</sup>	<u>1232 IN<sup>3</sup> MIN</u>
SPECIMEN VOLUME PRIOR TO PROOF TEST <u>1236.7</u> IN <sup>3</sup>	<u>FROM DATA SHEET C</u>
CHANGE IN VOLUME DUE TO PROOF TEST <u>NONE</u> IN <sup>3</sup>	<u>3.6 IN<sup>3</sup> MAX</u>
*OBTAIN FROM INTERNATIONAL CRITICAL TABLE	
TESTED BY <u>L. P. D.</u> DATE <u>3-11-75</u> SPECIMEN PASSED	

"A"

# Vibration Test Set-Up



1. PRESSURE GAUGE
2. VENT VALVE
3. FILTER
4. VALVE
5. SPECIMEN
6. VIBRATION FIXTURE  
(SEE BELOW FOR DETAILS)
7. X, Y & Z AXES C.G.  
ACCELEROMETERS



- A. CONTROL ACCELEROMETER, X AXIS  
CROSSTALK RESPONSE ACCELEROMETER,  
Y & Z AXES
- B. CONTROL ACCELEROMETER, Y AXIS  
CROSSTALK RESPONSE ACCELEROMETER,  
X & Z AXES
- C. DIRECTION OF VIBRATION RESPONSE  
ACCELEROMETER, X AXIS
- D. DIRECTION OF VIBRATION RESPONSE  
ACCELEROMETER, Y AXIS
- E. CONTROL ACCELEROMETER, Z AXIS  
CROSSTALK RESPONSE ACCELEROMETER,  
X & Y AXES
- F. DIRECTION OF VIBRATION RESPONSE  
ACCELEROMETER, Z AXIS

VIBRATION FIXTURE  
MAGNESIUM ALLOY BLOCK  
10" DIA X 6-1/2" HIGH

Z AXIS  
LOCATION A X X-TALK  
LOCATION B Y X-TALK  
LOCATION F Z D.O.V.

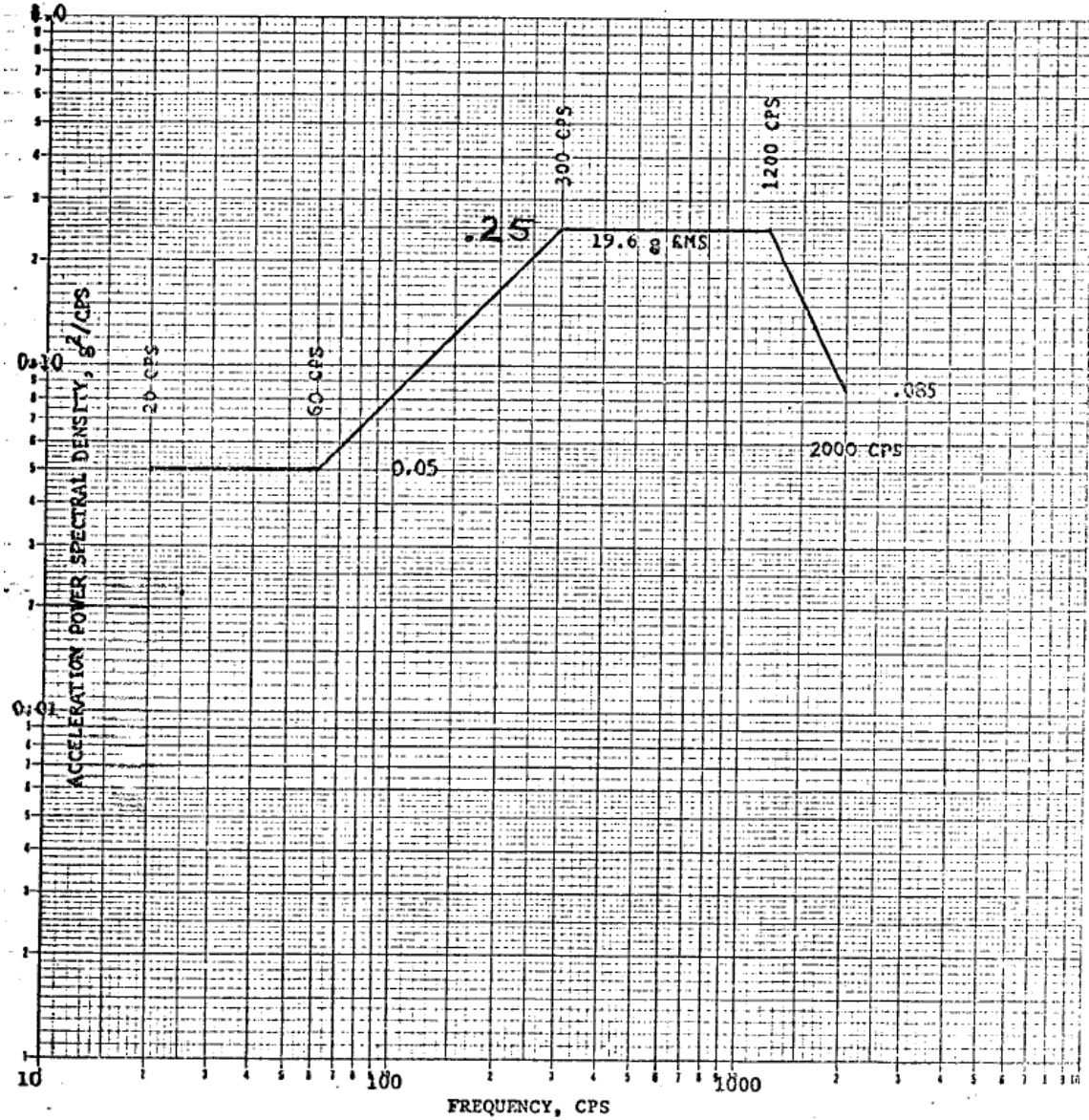
X AXIS  
LOCATION B Y X-TALK  
LOCATION C X D.O.V.  
LOCATION E Z X-TALK

Y AXIS  
LOCATION A X X-TALK  
LOCATION D Y D.O.V.  
LOCATION E Z X-TALK

VIBRATION TEST

# Random Vibration (Wet)

RANDOM VIBRATION ENVIRONMENT



The tank is loaded with  $27 \pm 3$  lbs of distilled, deionized water and pressurized to 310, +20/-0 psig.

Test is conducted in each of the three mutually perpendicular axes.



REV							
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RANDOM VIBRATION TEST

DATA SHEET B

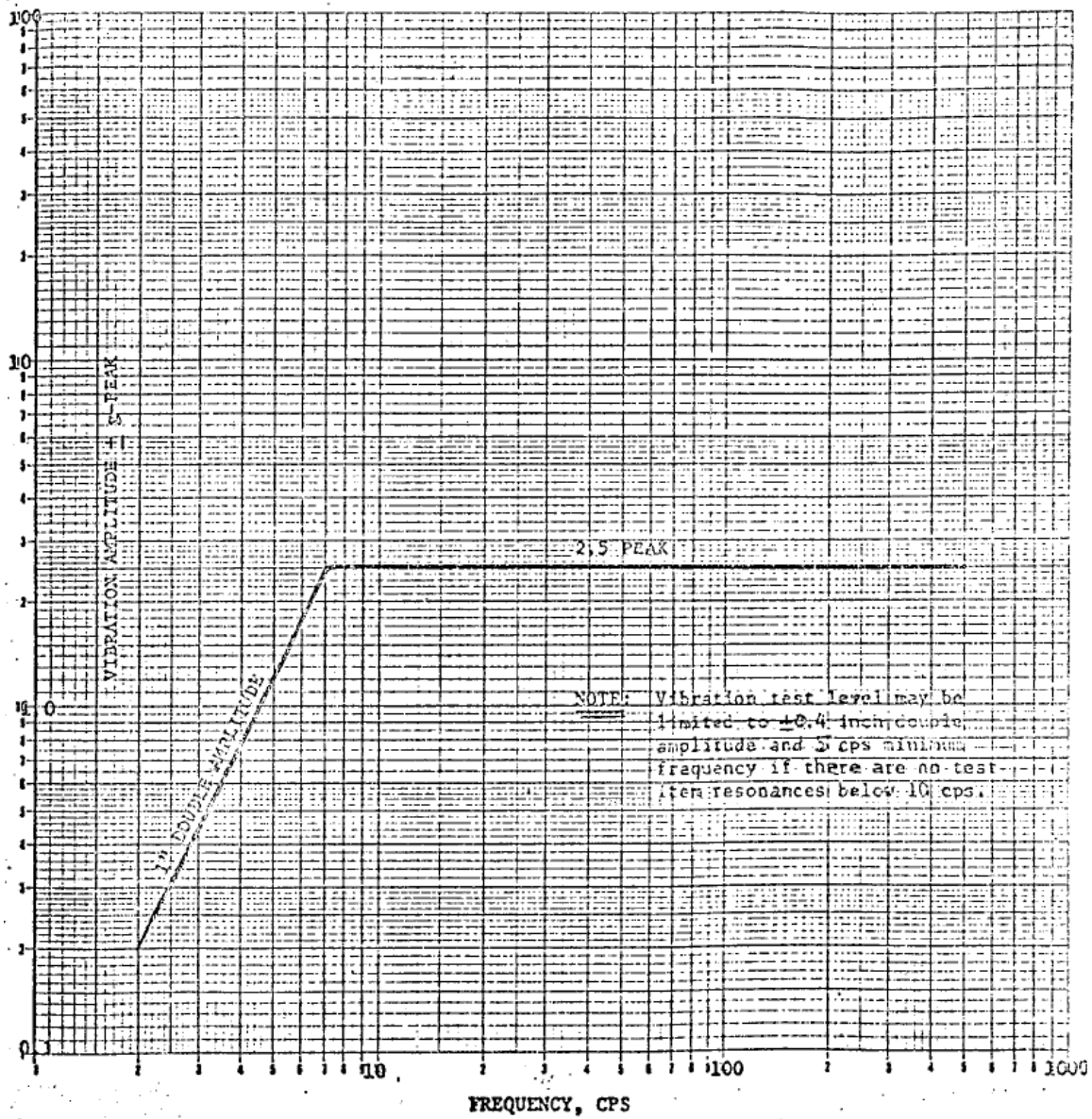
DATE 4-2-75, 4-3-75  
 PSI PART NUMBER 80213-1  
 SERIAL NUMBER 0001 PSI SERIAL NUMBER 0001  
 TEST PROCEDURE PARA. No. 4.2 DESCRIPTION PROPELLANT TANK, SPHERICAL  
 TEST EQUIPMENT IF DIFFERENT FROM PARA. 3.4

	TEST VALUE	REQUIREMENT
D. I. WATER WEIGHT	<u>27.56 LBS.</u>	<u>27 ±3 LBS.</u>
GN <sub>2</sub> PRESSURE	<u>320 PSIG.</u>	<u>310,+20,-0PSIG</u>
X-AXIS VIBRATION SWEEP	<u>3 MIN.</u>	<u>3 MIN. MINIMUM</u>
GN <sub>2</sub> PRESSURE	<u>90 PSIG.</u>	<u>100 PSIG. MAX</u>
VISUAL EXAMINATION	<u>NO DAMAGE</u>	<u>NO DAMAGE</u>
GN <sub>2</sub> PRESSURE	<u>320 PSIG.</u>	<u>310,+20,-0PSIG</u>
Y-AXIS VIBRATION SWEEP	<u>3 MIN.</u>	<u>3 MIN. MINIMUM</u>
GN <sub>2</sub> PRESSURE	<u>90 PSIG.</u>	<u>100 PSIG MAX.</u>
VISUAL EXAMINATION	<u>NO DAMAGE</u>	<u>NO DAMAGE</u>
GN <sub>2</sub> PRESSURE	<u>320 PSIG.</u>	<u>310,+20,-0PSIG</u>
Z-AXIS VIBRATION SWEEP	<u>3 MIN.</u>	<u>3 MIN. MINIMUM</u>
GN <sub>2</sub> PRESSURE	<u>0 PSIG.</u>	<u>0 PSIG.</u>
VISUAL EXAMINATION	<u>NO DAMAGE</u>	<u>NO DAMAGE</u>
FLUID PARTICLE COUNT.		
TOTAL MILLILITERS	<u>12,500 ML</u>	
	PARTICLES	PARTICLE PER 100 ML
NUMBER OF PARTICLES 5 TO 10 μ	<u>90,800</u>	<u>725</u>
11 TO 25 μ	<u>11,200</u>	<u>90</u>
26 TO 50 μ	<u>1,511</u>	<u>12</u>
51 TO 100 μ	<u>854</u>	<u>7</u>
101 TO 750 μ	<u>114</u>	<u>1</u>
>750 μ	<u>0</u>	<u>0</u>
VIBRATION BY <u>Dennis Miller 4/3/75</u>	VIBRATION	<u>PASSED</u>
TESTED BY <u>F.D. Joffe</u>	DATE <u>4-3-75</u>	SPECIMEN PASSED <u>NOT</u>

APPLICABLE

# Sine Vibration (Dry)

## SINUSOIDAL VIBRATION ENVIRONMENT



Tank is subjected to 2 double sinusoidal vibration sweeps in each of the three mutually perpendicular axes.


Tank is empty and unpressurized.

REV	A								
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SINUSOIDAL VIBRATION TEST

DATA SHEET D

DATE 4-4-75 - 4-7-75  
 PSI PART NUMBER 80213-1  
 SERIAL NUMBER 0001 PSI SERIAL NUMBER 0001  
 TEST PROCEDURE PARA. No. 4.4 DESCRIPTION PROPELLANT TANK, SPHERICAL  
 TEST EQUIPMENT, IF DIFFERENT FROM PARA. 3.4

	TEST VALUE	REQUIREMENT
TANK EMPTY AND UNPRESSURIZED	<i>[Signature]</i>	OPER. STAMP
X-AXIS VIBRATION SWEEP	<i>[Signature]</i>	OPER. STAMP
VISUAL EXAMINATION	<i>[Signature]</i>	NO DAMAGE
Y-AXIS VIBRATION SWEEP	<i>[Signature]</i>	OPER. STAMP
VISUAL EXAMINATION	<i>[Signature]</i>	NO DAMAGE
Z-AXIS VIBRATION SWEEP	<i>[Signature]</i>	OPER. STAMP
VISUAL EXAMINATION	<i>[Signature]</i>	NO DAMAGE
FILL WITH DISTILLED, DEIONIZED WATER	<u>26.55</u> LBS.	27 ± 3 LBS.
<u>FLUID PARTICLE COUNT</u>		
TOTAL MILLILITERS <u>13,440</u> ML	PARTICLES	PARTICLES PER 100 ML
NUMBER OF PARTICLES		
5 to 10 <u>U</u>	<u>28,000</u>	<u>207</u>
11 to 25 <u>U</u>	<u>7,100</u>	<u>53</u>
26 to 50 <u>U</u>	<u>317</u>	<u>2</u>
51 to 100 <u>U</u>	<u>94</u>	<u>1</u>
101 to 750 <u>U</u>	<u>3</u>	<u>0</u>
>750 <u>U</u>	<u>0</u>	<u>0</u>
RADIOGRAPHIC EXAMINATION FOR PMD CONDITION/ORIENTATION		OPER. STAMP
TESTED BY <u>F ZOGG</u>	DATE <u>4-7-75</u> SPECIMEN PASSED	<input checked="" type="checkbox"/> <i>[Signature]</i>

**Burst Pressure Test**

Tank is held at design burst pressure, 650 psig, for 120 seconds.

Tank was not ruptured.



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REV									
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BURST PRESSURE TEST  
DATA SHEET F

Date 4-9-75  
 PSI PART NUMBER 80213-1  
 SERIAL NUMBER 0001 PSI SERIAL NUMBER 0001  
 TEST PROCEDURE PARA. No. 4.6 DESCRIPTION PROPELLANT TANK, SPHERICAL  
 TEST EQUIPMENT, IF DIFFERENT FROM PARA. 3.4 \_\_\_\_\_

TEST MEDIA: DESTILLED, DEIONIZED WATER

	TEST VALUE	REQUIREMENT
WATER, PH	<u>7.2</u>	6.0 TO 7.5
WATER RESISTIVITY	<u>16 MEGOHM</u>	1.0 MEGOHM MIN
WATER TEMPERATURE	<u>64 °F</u>	70° ± 10°F

TEST PRESSURE ±5 PSIG	TIME AT PRESSURE	REQUIREMENT
70 PSIG	<u>30</u> SEC	30 SEC MIN
130 PSIG	<u>30</u> SEC	30 SEC MIN
200 PSIG	<u>30</u> SEC	30 SEC MIN
250 PSIG	<u>30</u> SEC	30 SEC MIN
330 PSIG	<u>30</u> SEC	30 SEC MIN
390 PSIG	<u>30</u> SEC	30 SEC MIN
480 PSIG	<u>30</u> SEC	30 SEC MIN
490 PSIG	<u>30</u> SEC	30 SEC MIN
520 PSIG	<u>30</u> SEC	30 SEC MIN
550 PSIG	<u>30</u> SEC	30 SEC MIN
580 PSIG	<u>30</u> SEC	30 SEC MIN
620 PSIG	<u>30</u> SEC	30 SEC MIN
650 PSIG	<u>120</u> SEC	120 SEC MIN

COMMENTS: \_\_\_\_\_

TESTED BY Les. Perl [PSI 125] DATE 4-9-75 SPECIMEN PASSED