Bendix

Aerospace Systems Division

Qualification Status List
Fuel Cask and Structure Assembly
ALSEP Array E, Flight 6

ATM 780 | B

PAGE 1 OF 10

DATE 29 Oct '71

Prepared by: J. T. Staats
J. T. Staats
ALSEP Reliability

Revised by: L. S. Moskowitz
L. S. Moskowitz
ALSEP Reliability

Approved by: S. J. Ellison
S. J. Ellison, Manager
ALSEP Reliability

In compliance with NASA Contract NASA 9-5829 requirements, this document provides a Qualification Status List (QSL) for use as part of the ALSEP Fuel Cask and Structure Assembly Flight 6 Acceptance Data Package (ADP). As of the date of publication, the information contained herein reflects the status of qualification following the system level thermal/vacuum, shock, and vibration tests conducted at the General Electric Missile and Space Division, Valley Forge, Pennsylvania and at BxA.

The following items represent Qualification and Flight model differences between the qualification model and all previous flight models:

1. Inconel high temp helicoil inserts which were subjected to T/V test were replaced with CRES Helical Coil inserts. These inserts are considered to be qualified for the T/V environment by similarity of design. The CRES inserts were incorporated prior to Design Level Shock and Vibration Testing.

2. The Lanyard Assembly, part no. 2338128, was redesigned to replace the lanyard hook with a bolt and nut through a clevis link. This change provides a positive attachment of the lanyard assembly and does not impact T/V qualification. The change was incorporated prior to Qualification Shock and Vibration Tests.

3. The Baroswitch #2203114 and thermal systems sensor #5001-32 assembly was not a part of the T/V qualification model but did undergo T/V qualification at BxA as a subsystem. The switch 2338650 and sensor assembly were incorporated into the Fuel Cask and Structure Assembly prior to Qual Level Shock and Vibration Tests.

4. The Spline Retainer Bracket was incorporated subsequent to the T/V qualification test; however, a T/V environment would have little or no effect on its function and does not impact the T/V qualification. The spline retainer was incorporated prior to Qual Level Shock and Vibration Testing.

ATM 780 has been updated to Revision B to reflect those modifications made to the ALSEP Cask Assembly (ACA) for Array E, Flight 6 from the ACA qualification configuration. The nature of these changes, as explained by the associated CRD as listed in Table I are such that the original qualification status of the ACA as documented by ATR 200 has not been invalidated based on similarity/design-improvement rationale. These mechanical and process changes provide adequate design safety margins to insure meeting parameter stress levels in excess of those specified in TP SI 249205 and TP SI 249203. Design changes were made as a requirement of the Array E contract and were recognized at the time of the Array E negotiation. These changes were a result of Supplemental Agreement of 108S and authorized by CCP 273. There were no additional changes made to the ACA as a result of the acceptance test program on the Array E ACA. The final results of the acceptance tests performed at GE are documented in the ALSEP Fuel Assembly Acceptance Test Report for ALSEP Array E, Flight 6. This document was prepared by GE and submitted to the AEC. The Array "E" ACA acceptance test program was performed as follows:

1. Final Build Inspection - 2338660 WO/OS
2. Receiving Inspection - SI-249, 197-GE
3. Weight and C.G. - SI-249, 198-GE
4. Dry Run Vibration - SI-249, 203-GE
5. Vibration ± (Dynamic Test) SI-249, 203-GE
6. Tilt Test - SI-249, 206-GE
7. Post Test Inspection - SI-249, 201-GE
8. Final Inspection (BxA) - QAIR-70082

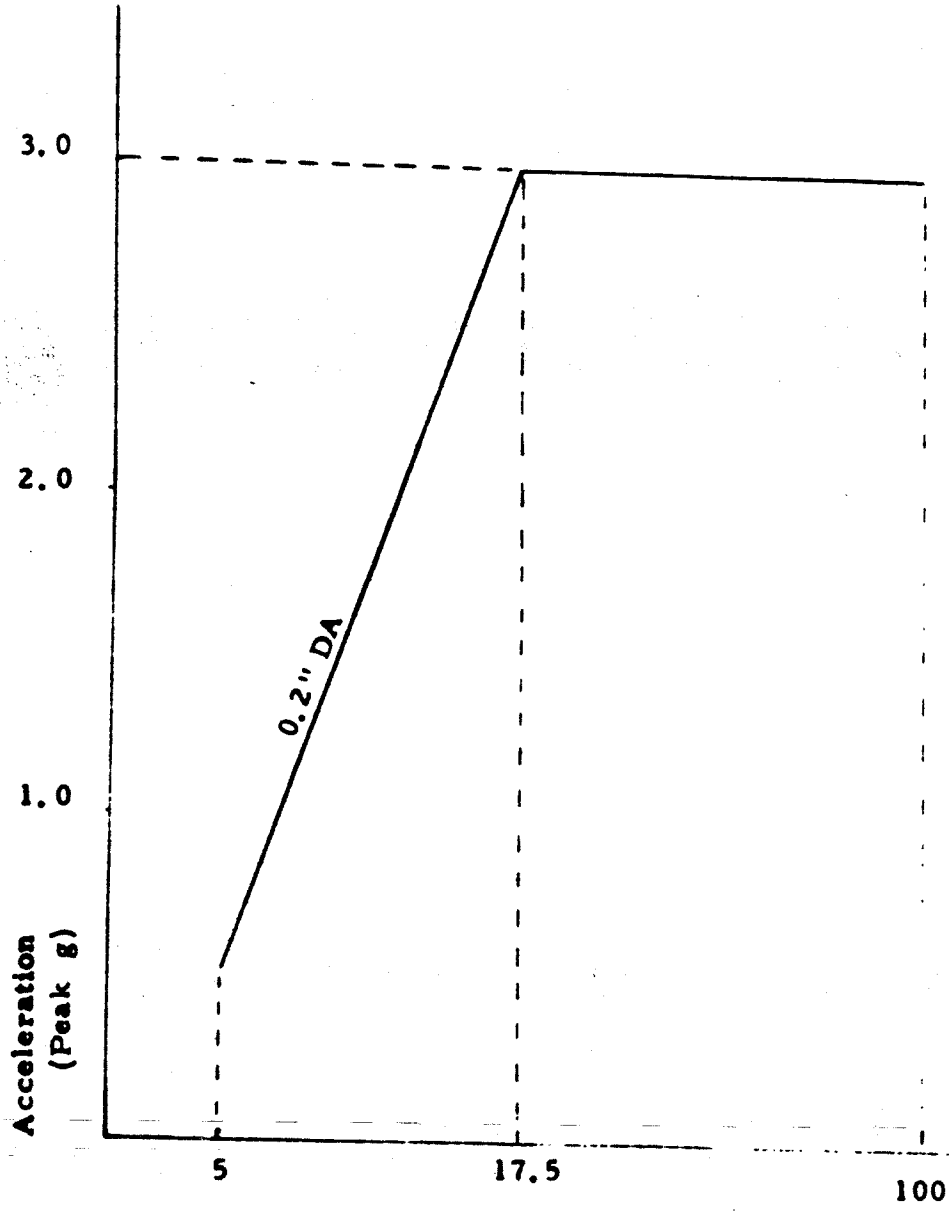
TABLE I

ARRAY E FUEL CASK CONFIGURATION DIFFERENCES

NOMENCLATURE	ARRAY D P/N & REV.	ARRAY E P/N & REV.	CRD NO.	REASON/AUTHORITY
Cradle Upper	2335001 H	2335001 J	65225	Correct Previous ECN Error - Documentation Change Only. Hardware Conformed
Band Assembly - Upper	2337977 B	2337977 C	65030	Ref. Supplemental Agreement 108S to Provide More Adjustment in Band Assembly
Fuel Cask and Structure Assembly	2338660 R	2338660 S	65064	Improve Compatibility of Material for Welding. Ref. DRF3-CSK-0009 and CCP273
Band Assembly Cask	2338661 S	2338661 T 2338661 U	65065 A 65351	Same As Above Delete Note 14 and Correct Previous ECN Error
Strap	2338038 A	2348611 -		Revised by CRD 65065A
Strap Sensor	2338039 A	2348612 -		Revised by CRD 65065A

At the Array E Cask Assembly CARR held at BxA on Sept. 1, 1971, Minutes 71-9703-36, it was stated that all changes had been reviewed and that all items and the assembly are ~~qualified~~.

ACA Qual Level Sine Wave Vibration
Launch and Boost Phase
Figure 1



5 - 100 - 5 Hz

Scan Rate - 3 oct/minute

Tolerance - ± 10%

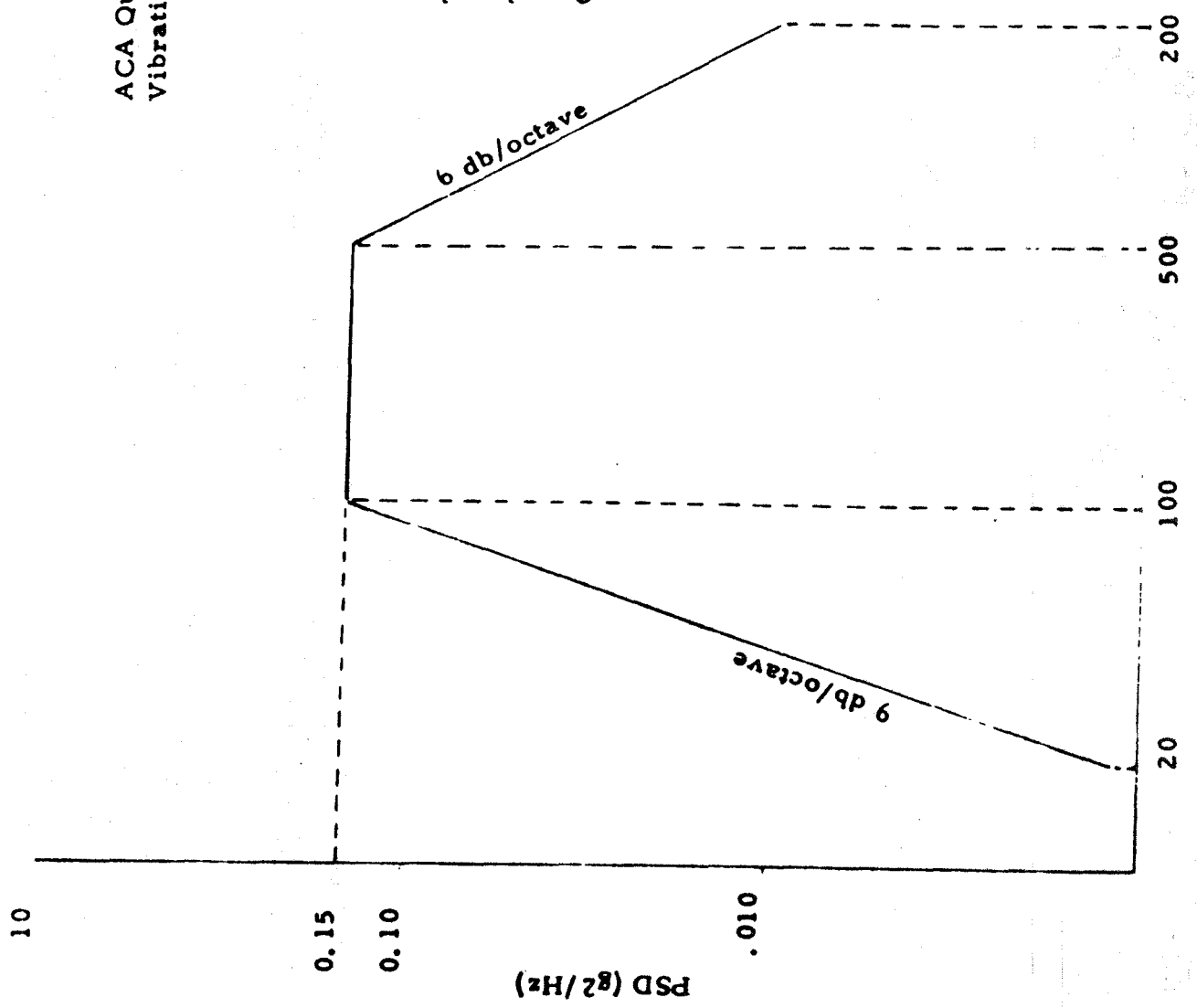
NOTE: A slight overtest may be experienced at the ACA resonance frequency (40Hz) during sinusoidal "Y" axis vibration, due to the characteristic of the vibration system servo loop's inability to maintain the input at the ACA resonance.

ACA Qual Level Random
Vibration-Launch and Boost
Phase
Figure 2

Test time = 2 1/2 minutes/axis

Tolerance = ± 3 db

Grms = 11.1 ± 10%



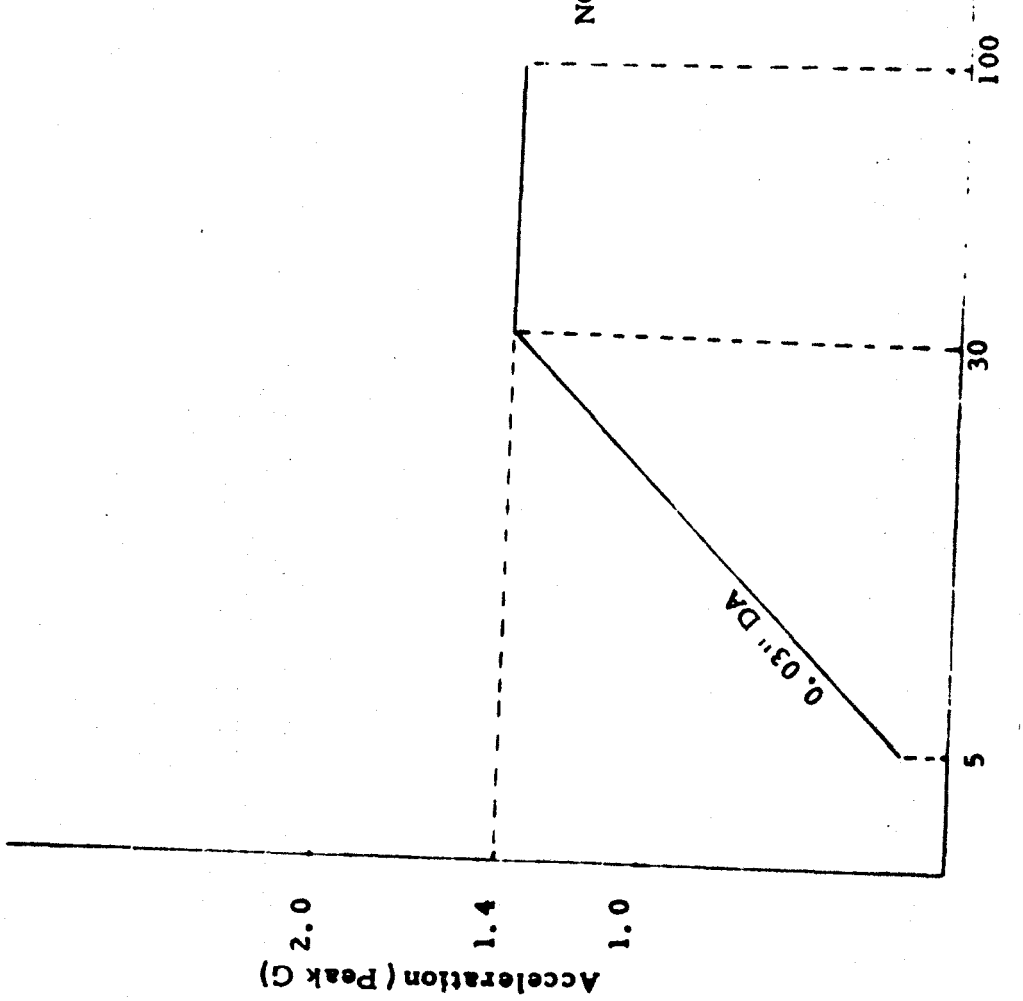
ACA Qual Level Sine Wave Vibration
Lunar Descent Phase
Figure 3

5-100-5 Hz

Scan Rate - 1 oct/minute

Tolerance ± 10%

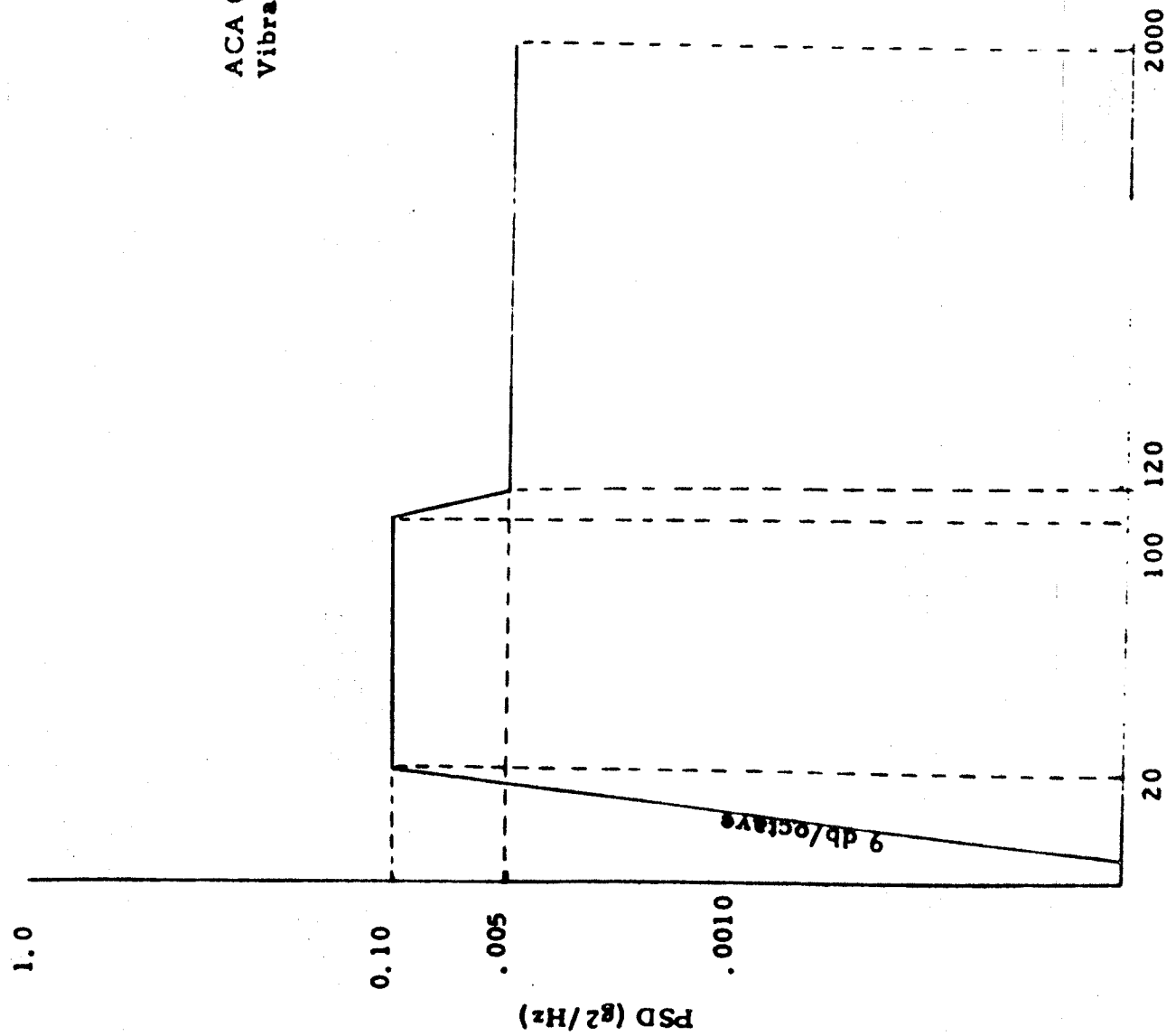
NOTE: A slight overtest may be experienced at the ACA resonance Frequency (40 Hz) during sinusoidal "Y" axis vibration, due to the characteristic of the vibration system servo loop's inability to maintain the input at the ACA resonance.



ACA Qual Level Random
Vibration-Lunar Descent Phase
Figure 4

Test time = 12 1/2 minutes/axis

Tolerance = ± 3 db



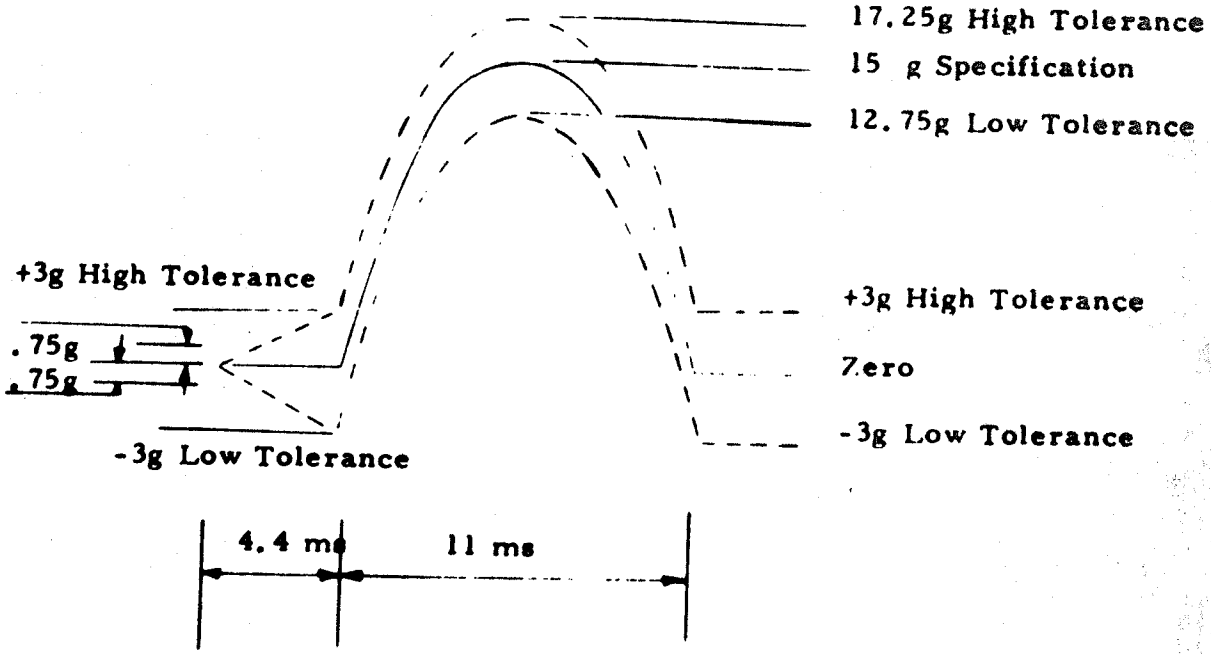


FIGURE 5

HALF SINE SHOCK PULSE CONFIGURATION AND ITS TOLERANCE LIMITS (+X, ±Y, ±Z DIRECTION)

QUALIFICATION STATUS LIST-ALSEP PROGRAM

Date 29 Oct 71	No. ATM 780	Rev. No. B
Analyst J. Staats	Page 10 of 10 Pages	

Item Nomenclature	Environment and/or Parameter	Stress Level		Verification of Stress Level Capability				Remarks
		Requirement	Capability	Agent	Location	Document Reference	Date	
Fuel Cask Band & Structure Assembly 2338660 Astronaut Guard 2338675	ENVIRONMENTAL Temperature: Operating Non-Operating Earth Moon	-400°F to +270°F	-400°F to +270°F	General Electric Missile & Space Div.	Valley Forge, Pa.	As Run T/V TP SI 249205 and ATR 200/BSR 2634	2/4/69	Successfully Tested
	Pressure Operating Non-Operating	Sea Level to 10^{-12} Torr	Tested to 1×10^{-5} Torr	General Electric Missile & Space Div.	Valley Forge, Pa.	ATR 200/BSR2634 As Run T/V TP SI 249205	2/4/69	Successfully tested to 1×10^{-5} Torr
	Humidity Operating Non-Operating	15% to 100%	Designed to meet the requirement	N/A				No testing required
	Vibration Operating Non-Operating Launch & Flight Lunar Landing	Vibration Levels as defined in Figures 1 thru 4.	Meets the vibration levels defined in Figures 1 thru 4.	General Electric Missile & Space Div.	Valley Forge, Pa.	Cask Assy. Dynamic Test Procedure SI 249203 and ATR 200/BSR2634	3/29/69	Successfully Tested
	Acceleration Operating Non-Operating	N/A	N/A	N/A				
	Shock Operating Non-Operating	Shock Level as defined in	15 g half sine 15.4 MS	General Electric Missile & Space Div.	Valley Forge, Pa.	Cask Assy. Dynamic TP SI 249-203-ATR200/BSR2634	3/29/69	Successfully Tested
	Salt Spray	N/A						
	Sand & Dust	N/A						
	Fungus	N/A						
	Acoustical Noise	N/A						
	Rain	N/A						
	Radiation							
	Explosion Proof							
	PARAMETRIC NOTE: The Baroswitch and sensors were successfully qualified at BxA for Thermal Vacuum per TP 2338660 (ALSEP-TM-417).							

870-12

Sheet ____ of ____