GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

GSE CAGING BALLAST SYSTEM INSTALLATION

October 26, 1999

Prepared by: Ken Bower

Approvals

Program Responsibility	Signature	Date
Ken Bower Installation Leader		
Robert Brumley Caging System R.E.		
Mike Taber Payload Test Director		
Dorrene Ross GP-B Quality Assurance		
Sasha Buchman GP-B Hardware Manager		

NOTES:
Level of QA required during performance of this procedure:
__X__Stanford QA Representative
_____Government QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description

Acronyms and Abbreviations:

Acronym / Abbreviation	**Meaning**
GSE	Ground Support Equipment
SMD	Science Mission Dewar
QA	Quality Assurance personnel
HEPA	High Efficiency Particulate Air filter

Table of Contents

A Scope

This procedure effects the installation and leak check of the GSE caging lines ballast system. The system is mounted on the exterior of the dewar midsection and plumbed to the caging line hookups (CG1-6) on the probe.

B Requirements Verification

B.1 Requirements Cross Reference: N/A

B.2 Expected Data for verification per requirement: N/A

C Configuration Requirements

Probe-C is integrated into the SMD per drawing 65113-1C34292 and may be oriented with the +Z axis in any orientation such that ports CG1-6 can be accessed during installation. The valves on parts CG1-6 should be left closed throughout the procedure.

D Hardware Required

D.1 Flight hardware required

Description	No. Req'd
65113-1C34292 Proce-C / SMD Assy.	1

D.2 Commercial test equipment (fill in chart as required):

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Varian Helium Leak Detector	960	DRAD6002	n/a
(alt.) Varian Helium Leak Detector	636-60	W-161	n/a
Varian calibrated Helium Leak	F3264302	LLC9030	3/10/2000
(alt.) Varian calibrated Helium Leak	F3264302	EBAL5056	3/18/2000
Met One particle counter	100L		

D.3 Mechanical/Electrical Special test equipment: N/A

D.4 GSE Hardware:

Description	No. Req'd.
Gamah-plain to VCR-male connector adapters (connector savers)	6
custom twin line coupling manifolds	3
0.5 micron in-line filters	3
custom plumbing lines	3/as required
500 ml ballast tank assemblies	3
30"Hg-0-160psi pressure gauges	3
Nupro SS-4H-V13 shut-off valves	3
custom mounting plate	1
VCR adapter hardware	as required

D.5 Tools

Description	No. Req'd
wrenches	as required

D.6 Expendables

Description	Quantity
Aluminum gaskets for 1/4" Gamah connectors	as required
Stainless Steel gaskets for 1/4" VCR connectors	as required
Felpro C-100 anti-sieze compound	as required
Helium gas (filtered)	as required
Nitrogen gas (filtered)	as required

E **Software Required:** N/A

F **Procedures Required:** N/A

G **Equipment Pretest Requirements:** N/A

H **Personnel Requirements**

This test to be conducted only by certified personnel. Ken Bower, Chuck Warren, Dave Murray, Tom Welsh, Rob Brumley, Chris Gray, and Mike Taber are qualified to perform this procedure with Ken Bower as operations leader. The QA representative shall be either Russ Leese or Dorrene Ross.

I Safety Requirements

I.1 Movement of the gantry used to support the HEPA downflow booth (if required) requires two persons.

I.2 Care should be taken to prevent nicking, overtorqueing, or otherwise damaging flight vacuum sealing surfaces.

I.3 Care should be used when manipulating any electrical cables connected to any part of the flight hardware. This procedure does not imply any authority to disconnect any such electrical connectors.

I.4 General emergency procedures can be found in “FIST Emergency Procedures” (P0141).

J General Instructions

J.1 Redlines can be initiated by Ken Bower or Mike Taber and must be approved by QA.

J.2 Any nonconformance or test anomaly should be per P0108. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

J.3 Only the following persons have the authority to exit/terminate this opertation or perform a restart: Ken Bower, Mike Taber.

J.4 Work done inside the HEPA downflow unit should be performed under conditions consistent with class 1000 cleanroom practices (apparel, tool cleanliness, operational restrictions, etc.).

J.5 During the entire operation, all six flight caging line valves are to remain closed.

K References and Applicable Documents: N/A

Op. Order No._____
Date Initiated_____
Time Initiated_____

L Operations

L.1 Installing flight Gamah connector savers.

L.1.1 prepare six 1/4" Gamah plain fitting (w/nut) to VCR male fitting adapters. Clean and visually inspect these connector savers for any damage or imperfections that could harm or degrade flight hardware.

L.1.2 Install or verify installation of the HEPA downflow unit over the top of the SMD/probe and allow at least one hour of operation before proceeding.

L.1.3 Install one connector saver (with gasket) on to flight ports CG1, CG2, CG3, CG4, CG5, and CG6. Use a back–up wrench on the Caging Port fittings to prevent torque stresses from transferring to the flight hardware. Properly tighten the nut until the gasket is fully deformed to provide a proper seal. If desired, anti-seize compound may be applied to the contact area between the nut and plain fitting of the connector saver (NO ANTI-SEIZE COMPOUNDS MAY BE APPLIED TO THE FLIGHT HARDWARE).

L.1.4 Log, as required, these connections to flight hardware.

L.2 Installing custom twin line coupling manifolds.

L.2.1 Install or verify installation of the HEPA downflow unit over the top of the SMD/probe and allow at least one hour of operation before proceeding.

L.2.2 Remove the manifolds from their clean packaging within the HEPA downflow unit.

L.2.3 Install (without gaskets – this is a fit checking operation) a manifold on to CG1 and CG2. Repeat for CG3 and CG4. Repeat for CG5 and CG6.

L.2.4 Finger tighten the VCR connectors between the custom manifolds and the connector savers.

L.2.5 Install a 0.5 micron filter (Swagelok SS-4FWS-VCR-05) on to the outlet of each custom manifold (flow arrow pointed away from the manifold) using VCR gaskets and adpapters as required. Torque to Swagelok specifications (1/8 turn beyon finger tight).

L.3 Assembling the ballast tank system

L.3.1 Assemble in three sets of the following hardware as shown in attachment 1:

L.3.1.1 one 500 ml ballast tank (Swagelok 304L-HDF4-500) assembly w/VCR male fittings (Swagelok SS-4-VCR-1-4)

L.3.1.2 one 1/4" double female VCR adapter (Swagelok SS-4-WVCR-6-DF)

L.3.1.3 one 1/4" VCR "T" (Swagelok SS-4-VCR-T)

L.3.1.4 one Span 30"Hg-0-160psi pressure gauge (Millipore GA0001506475)

L.3.1.5 one Nupro SS-4H-V13 shut-off valve (Swagelok SS-4H-V13) (Install with flow direction away from ballast tank.)

L.3.1.6 four 1/4" stainless Steel VCR gaskets (Swagelok SS-4-VCR-2-GR)

L.3.2 Properly tighten all connections in accordance with Swagelok specifications.

L.3.3 Assemble the custom ballast tanks and mounting plate as shown in attachment 1. Adjust clamps such that the system mounts easily onto the end flanges of the cylidrical portion of the SMD/probe assembly.

L.4 Mount the ballast tank system onto the SMD/probe assembly midway between the –X and –Y axes (+/- 10°) and tighten the clamps to adequately secure the system. This location may be adjusted or changed if future interferences with other equipment is discovered.

L.5 Prepare custom plumbing lines.

L.5.1 Measuring and test fitting as required, custom bend and cut three 1/4" stainless steel tubes (cleaned by electropolishing) that will connect each manifold to a ballast tank. Route the tubing such that minimal interference with flight or other ground support hardware will occur (no specific path is designated).

L.5.2 Weld a VCR female fitting on to both ends of each tube using a filtered Nitrogen purge gas.

L.5.3 Clean each tube (filtered freon flow is recommended).

L.6 Install plumbing lines.

L.6.1 Install each of the three plumbing lines in place on the SMD/probe assembly. Secure as required. Use care to prevent interference with electrical connections.

L.6.2 Connect each end of the plumbing lines to the appropriate manifold and ballast tank using VCR gaskets as required. Properly tighten all connections in accordance with Swagelok specifications.

L.6.3 Basic installation complete: completed by:_____

QA approval:_____

L.7 Verify cleanliness of system.

L.7.1 Install or verify installation of the HEPA downflow unit over the top of the SMD/probe and allow at least one hour of operation before proceeding.

L.7.2 Measure the background particle count (5x 1 minute)of the area around the Caging Ports and record in the table below.

L.7.3 Disconnect a manifold from the connector savers and cover the connector savers.

L.7.4 Connect a clean gas supply (Nitrogen recommended) to a ballast tank assembly and open the ballast tank assembly valve.

L.7.5 Lightly blow clean gas through the ballast tank system and measure the particulate output near each connector of the manifold and record the measurements in the table below. If the resultant particle count is higher than the background count, purge and/or reevaluate the system. If the particle count is not above the background count, accept the system.

L.7.6 Maintaining a light positive gas flow, reconnect the manifold to the connector savers (with gaskets). Properly tighten all connections in accordance with Swagelok specifications. Close the ballast tank assembly valve and disconnect the gas supply.

L.7.7 Repeat steps L.7.1 through L.7.4 for each ballast system.

L.7.8 Cleanliness acceptable: completed by:_____

QA approval:_____

	background	CG1 &CG2	CG3&CG4	CG5&CG6
1				
2				
3				
4				
5				
ave.				

L.8 Pressure test the system. **WARNING!** Pressurized gases can be hazardous to health and equipment and should only be handled by qualified personnel. Use care when venting presurized gases.

L.8.1 Connect a regulated clean gas supply (Nitrogen recommended) to a ballast tank assembly and open the ballast tank assembly valve.

L.8.2 Slowly raise the pressure within the system to at least 200 psi absolute (300 psi max.) and shut-off the gas supply.

L.8.3 Monitor the pressure for at least ten minutes. Perform repairs (and/or repeat any steps above) until no pressure drops are detected.

L.8.4 Repeat steps L.8.1 through L.8.3 for each ballast tank assembly.

L.9 Leak check the system.

L.9.1 Connect a certified Helium leak detector to a ballast tank assembly utilizing any hardware as required.

L.9.2 Perform a leak check of the entire plumbed assembly.

L.9.3 Perform repairs (and/or repeat any steps above) until no leaks are detected.

L.9.4 Repeat steps L.9.1 through L.9.3 for each ballast tank assembly.

L.9.5 Vacuum performance acceptable:

completed by:_____

QA approval:_____

L.10 Helium purge the system.

L.10.1 Connect a vacuum system and clean Helium gas supply to a ballast tank assembly and open the ballast tank assembly valve.

L.10.2 Evacuate the ballast tank assembly.

L.10.3 Fill the ballast tank assembly with Helium gas (to just over atmospheric pressure).

L.10.4 Repeat step L.10.2 and L.10.3 two additional times.

L.10.5 Close the ballast tank assembly valve.

L.10.6 Repeat steps L.10.1 through L.10.5 for each ballast tank assembly.

Operation completed.

Completed by: _____

Witnessed by: _____

Date: _____

Time: _____

Payload Test Director:_____

Responsible Quality Engineer:_____