

**GRAVITY PROBE B
PROCEDURE FOR
GSE INSTALLATION**

**MOCK THRUSTER VENT PALLET
INSTALLATION AND LEAK CHECK**

5/3/01

Prepared by: M. Taber

Approvals:

Program Responsibility	Signature	Date
C. Warren Gas/Vac. Engineer		
M. Taber Payload Test Director		
D. Ross GP-B Quality Assurance		
R. Brumley Payload Technical Manager		

NOTES:

Level of QA required during performance of this procedure:

- Stanford QA Representative
- Government QA Representative

All redlines must be approved by QA

Revision Record:

Rev	Rev Date	ECO #	Summary Description
-	5/3/01		Original release

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
GSE	Ground Support Equipment
LD	Leak Detector
NBP	Normal boiling point (1 atmosphere pressure)
SMD	Science Mission Dewar
NR	Not required
MTVP	MockThruster Vent Pallet

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A Scope

This procedure effects the installation and leak check of the Mock Thruster Vent Pallet. It is mounted onto the upper cylinder portion of the SMD and is connected to the SMD thruster vent port. The MTVP is intended to simulate the equivalent flight plumbing in its prelaunch condition but does not provide any functionality except as a location for a pressure transducer to monitor the Main Tank pressure. See 65113-5833500 for a drawing of the flight assembly.

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 oriented with the +Z axis vertical. The thruster vent port is capped by a GSE manifold, and the Main Tank is connected to the Gas Module via bayonet B1 and is operating at approximately 0.3 psig.

D Hardware Required

- D.1 Flight hardware required

Description	No. Req'd
65113-1C34292 Probe-C / Science Mission Dewar Assembly	1

- D.2 Commercial test equipment / instrumentation

Manufacturer	Model	Serial Number	Calibr. Exp. Date
Varian He Leak Detector	960	DRAD6002	N/A
Alternate leak detector: Varian He Leak Detector	636-60	W-161	N/A
Varian Calibrated He leak for LD	F3264302		
Calibrated He leak for alternate LD	F3264302		

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

- D.4 GSE / hardware:

Description	No. Req'd
MTVP Ass'y with Endevco 8510C-50 (50 psig) pressure transducer (see Fig. 1)	1
#2 rubber stopper	1
Helicoflex seal 5833463-107 (existing seal, if installed, may not be reused)	1
Viton o-ring 2-030V747-75 (existing o-ring may be reused, if present)	1
10-32 x0.500" socket head cap screws (A286 CRES); reuse existing hardware	8
#10 stainless washers; reuse existing hardware	8
1" or 1.5" stainless flexible pumping line (length A/R)	1

D.5 Tools

Description	No. Req'd
wrenches	A/R
10-50 in-lb. torque wrench (S/N: _____ Cal. Due date: _____)	1

D.6 Expendables

Description	Quantity
Aluminum foil	A/R
He gas	A/R
ethanol	A/R
Lintless swabs	A/R

E **Software Required**

- E.1 Flight Software: N/A
- E.2 CSTOL Scripts: N/A
- E.3 SPC Scripts: N/A
- E.4 Test Support Software: N/A

F **Procedures Required:** N/A

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

H **Personnel Requirements**

This procedure is to be conducted only by qualified personnel. Chuck Warren, Dave Murray, Tom Welsh, and Mike Taber are qualified to perform this procedure with either Mike Taber or Dave Murray being operations leader. The QA representative shall be either Russ Leese or Dorrene Ross.

I **Safety Requirements**

Care should also be taken to prevent scratching or otherwise damaging vacuum sealing surfaces, particularly those which are on flight equipment and/or must be sealed with metal gaskets. General emergency instructions can be found in "FIST Emergency Procedures", P0141.

J **General Instructions**

- J.1 QA Notification: ***The ONR representative and SU QA program office shall be notified 24 hours prior to the start of this procedure.*** Upon completion of this procedure, the QE Manager will certify her concurrence that the effort was performed and accomplished in accordance with the prescribed instructions by signing and dating in the designated place(s) in this document.
- J.2 Redlines can be initiated by Mike Taber or Dave Murray and must be approved by QA.

- J.3 A Quality Assurance Representative designated by D. Ross shall review any discrepancy noted during this procedure, and approve its disposition. Discrepancies will be recorded in a D-log or a DR per Quality Plan P0108.
- J.4 Only the following persons have the authority to exit/terminate this operation or approve D-Log dispositions: Mike Taber, Dave Murray.

K References and Applicable Documents:

SMD Final Assembly 65113-5833500

Op. Order No. _____
Date Initiated _____
Time Initiated _____

L Operations

L.1 Enter the serial numbers and calibration due dates for the equipment listed in section D.2 and D.5 and verify that the calibrations are current.

L.2 Verify Appropriate QA Notification

- o Verify SU QA program office notified.

Record: Individual notified _____,
Date/time _____ / _____.

- o Verify ONR representative notified.

Record: Individual notified _____,
Date/time _____ / _____.

L.3 Bench leak check the MTVP (see Fig. 1):

L.3.1 With the test port blanked off, start up the leak detector per manufacturer's instructions.

L.3.2 Perform LD autocal (model 960) or manually check LD tuning.

L.3.3 Turn on LD calibrated leak and record: _____ sccs He
Calibrated leak value: _____ sccs He

QA witness: _____

L.3.4 Turn off the calibrated leak and vent LD.

L.3.5 Clean the #2 rubber stopper and insert in the center hole of the MTVP thruster port interface flange.

L.3.6 Connect a pumping line from the LD test port to the MTVP purge valve.

L.3.7 Open both SV12m and the purge valve on the MTVP.

L.3.8 Bag the MTVP.

L.3.9 Start LD and apply He to the bag for three minutes; increase above background should be $<10^{-7}$ sccs He. Record results:

Background leak rate: _____ sccs

Leak rate during test: _____ sccs

QA witness: _____

L.3.10 Remove the bag from the MTVP.

- L.3.11 Vent the leak detector and disconnect the MTVP from the pumping line.
- L.3.12 Remove the rubber stopper from the MTVP.
- L.4 Prepare to install the MTVP:
 - L.4.1 Verify that the items listed in D.4, including a new o-ring and Helicoflex seal, are available.
 - L.4.2 Clean the new Helicoflex seal:
 - L.4.2.1 Remove the seal from the package and clean with ethanol and lintless swab.
 - L.4.2.2 Inspect the seal at 10X magnification, and reclean as necessary. Reject any seal that has a scratch or other defect in the sealing region.
 - L.4.3 Verify that the Main Tank pressure is above atmospheric and record one or both of the following:
 - EG-3 [47]: _____ torr
 - Thr. Vent pres. [49]: _____ torr rel. to atm.
 - L.4.4 Make a comment in the DAS: "Removing thruster vent GSE to install mock thruster pallet."
 - L.4.5 Disconnect the plug to the thruster vent Endevco transducer.
 - L.4.6 Unbolt and remove the currently installed thruster vent GSE, being careful to retain the existing hardware. Immediately install the rubber stopper in the thruster vent port to prevent excessive venting.
 - L.4.7 Wrap the flange on the removed GSE with a double layer of aluminum foil and stow.
 - L.4.8 If a Helicoflex seal was installed, remove and discard.
 - L.4.9 If a viton o-ring was installed, remove, clean, and inspect for damage. If it is in good condition, it may be reused for the mock pallet installation.
 - L.4.10 Clean the sealing surfaces on the SMD with ethanol and lintless swabs.
- L.5 Install the MTVP:
 - L.5.1 Install the viton o-ring and new Helicoflex seal on the SMD thruster port.
 - L.5.2 Remove the rubber stopper and install the MTVP unto the SMD thruster port using the hardware previously removed.
 - L.5.3 Tighten the bolts to a torque of 25-35 in-lbs.
 - QA witness: _____
 - L.5.4 Open / verify open SV12m and the purge valve, and allow the MTVP to purge for 1 minute.

- L.5.5 Close SV12m.
- L.6 Leak check of purge valve closure:
 - L.6.1 Attach the pumping line from the LD to the purge valve.
 - L.6.2 Place the LD in "Hold" mode.
 - L.6.3 Open / verify open the purge valve and start LD to pump out the MTVP.
 - L.6.4 After the LD test port pressure has bottomed out, close the purge valve.
 - L.6.5 Take the LD out of the Hold mode.
 - L.6.6 When the LD reaches the 10^{-7} sccs scale, fully open SV12m to verify that there is no leak through the purge valve in excess of 1×10^{-7} sccs.
 - L.6.7 Vent the LD and disconnect from the purge valve.
 - L.6.8 Cap the purge valve VCR.
- L.7 Leak check the thruster port seal:
 - L.7.1 Blank off the LD test port and rezero the LD.
 - L.7.2 Vent the LD and connect LD to the interseal leak check port.
 - L.7.3 Start the LD and verify the background drops to $\leq 1 \times 10^{-7}$ sccs. (This may take a while.)
 - QA witness: _____
 - L.7.4 Vent the LD and disconnect from the interseal leak check port.
 - L.7.5 Cap the interseal leak check port.
- L.8 Finalize configuration:
 - L.8.1 Reconnect the electrical cable from the Endevco readout to the MTVP Endevco transducer and verify proper operation.
 - L.8.2 Check for signs of TAO activity on the MTVP Endevco, and adjust SV12m to minimize.
 - L.8.3 Enter a comment into the DAS: "Complete installation of MTVP."

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Operation completed.

Completed by: _____

QA witness: _____

Date: _____

Time: _____

QA Program Engineer _____ **Date** _____

Payload Test Director _____ **Date** _____

Figure 1. Schematic of MTVP

