

**GRAVITY PROBE B  
PROCEDURE FOR  
PAYLOAD VERIFICATION**

**(PTP) VATTERFLY VALVE \_\_\_\_\_  
OPERATION**

6/27/00  
ECO 1172

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		
B. Muhlfelder 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
A	6/27/00	1172	1) Changed title and revised to apply to all flight Vatterfly valves (LV-1,2, V1 – V4); 2) Added QA/ONR notification 3) Incorporated redline 4) Modified Table 1

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
IG	Ionization Gauge
LGS	Leakage Gas (Turbopump) System
LV#	6" Vatterfly # (LV1 is in -X,-Y quadrant, LV2 is in -X, +Y quadrant)
SMD	Science Mission Dewar
UTS	Utility Turbopump System
V#	Exhaust valve # (2.5" Vatterfly valves)
VV	Vatterfly Valve

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**A Scope**

This procedure opens or closes a specified Vatterfly valve on Probe-C. It provides for multiple operations of this valve.

**B Requirements Verification**

- B.1 Requirements Cross Reference: N/A
- B.2 Expected Data for verification per requirement: N/A

**C Configuration Requirements**

The Vatterfly Valve Controller may be connected to the valve connector via a connector saver. (Note: In this procedure LV1 refers to the 6" Vatterfly valve located in the -X, -Y quadrant of the Cross Flange and LV2 refers to the 6" Vatterfly valve located in the -X, +Y quadrant.) The external interface of the appropriate valve is being maintained under vacuum by an appropriate turbopump system such as the LGS or UTS. The pressure in the Probe is not more than 0.1 torr.

**D Hardware Required**

- D.1 Flight hardware required

Description	No. Req'd
65113-1C34115-102 Probe-C	1

- D.2 Commercial test equipment/instrumentation: N/A

- D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification No.
Vatterfly Valve Controller		-	8A01145GSE	ETP-029A
VV/VV-controller cable				

- D.4 Tools: N/A
- D.5 Expendables: N/A

- 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 qualified personnel. Chuck Warren, Dave Murray , Mike Taber, Gideon Asher, and Chris Gray are qualified to perform this procedure. The QA representative shall be either Russ Leese or Dorrene Ross.

I      **Safety Requirements**

One of the options in this procedure opens the Probe. Exposure of the Probe to a sudden inrush of gas could cause significant damage to the Probe and/or the lead shield (when the Probe is installed in the Dewar). A high degree of care should be taken to make sure that the 6" Vatterfly valve is not opened unless the the internal and external pressures are known to be approximately equal.

J      **General Instructions**

- J.1      QA Notification: ***The 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, Dave Murray, or Gideon Asher and must be approved by QA.
- J.3      Any nonconformance or test anomaly should be reported by a per the Quality Plan, P0108. Do not alter or break test configuration if a test failure occurs; notify quality assurance.
- J.4      Electrical mating and demating of flight hardware connectors
  - J.4.1      Connection and disconnection shall be performed only when the equipment involved is in a powered-down state.
  - J.4.2      Connector savers are to be used unless otherwise specified.
  - J.4.3      Connectors shall be inspected for contamination and for bent, damaged, or recessed pins prior to mating.
  - J.4.4      Grounded wrist straps are to be worn prior to removal of connector caps or covers and during mating/demating operations.
  - J.4.5      ESD-protective caps or covers are to be immediately installed after demating of connectors.

K      **References and Applicable Documents: N/A**

Op. Order No. \_\_\_\_\_  
Date Initiated \_\_\_\_\_  
Time Initiated \_\_\_\_\_

**L Operations**

- L.1 Specify here and on the cover page which Vatterfly Valve these operations apply to: \_\_\_\_\_
- 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 If the controller is not connected to the appropriate valve, perform the following:
  - L.3.1 Verify that a connector saver is installed on the valve connector. If not, a connector saver should be installed using the General Instructions in J.4. Log the operation in the GP-B Usage Log Book: Probe-C.
  - L.3.2 Following the General Instructions in J.4, connect the controller to the valve using the specified cable.

**NOTE:**

The following assumes that it is desired to open the valve; if it is desired to close the valve, the option in parentheses should be used.

- L.4 To open (close) a Vatterfly valve, perform the following steps and document in Table 1:
  - L.4.1 Enter date, time in Table 1. Also if this valve operation is being called for in another procedure, enter the Op Order Number in Table 1.
  - L.4.2 Specify operation: open (close)
  - L.4.3 Record pressure inside probe and the pressure gauge designation.
  - L.4.4 Record pressure on the outside of the specified valve and the pressure gauge designation.
  - L.4.5 If opening the valve, verify that the pressure differential across the valve is not more than 5 torr (0.1 psid).
  - L.4.6 Perform the following to prepare for Vatterfly valve operation and check off each step in Table 1:

- L.4.6.1 Verify that the Vatterfly Controller is off (power switch is on back of box).
- L.4.6.2 Verify that all toggle switches are off (in the down position).
- L.4.6.3 If necessary, plug in the Vatterfly Valve Controller to ac power.
- L.4.6.4 Power up the Controller; "AC" and "Motor" lights should come on.
- L.4.6.5 Place "Valve Motor Select" right-hand switch to on; "Motor Enabled: LV1, EV1, EV3" light should come on.
- L.4.6.6 Place "Enable A" switch to on; both "Open" and "Closed" LEDs should illuminate.

**CAUTION:**

In performing the next step to verify valve state, be sure that the Valve State Select switches are set to the current valve state. If the Valve State Select switches are set to the opposite state, pressing the "Execute" button will cause the valve to operate.

- L.4.6.7 To verify that the valve is closed (open), place both of the "Valve State Select: Close (Open)" switches to on and press the "Execute" button; the "Open" ("Closed") light should go off with the other light remaining on.

**NOTE:**

When the Controller is on but not to be used soon, it is prudent to disable all valve operations by placing the "Enable: A" and "Enable: B" switches in the off position. Both "Valve State" lights should be off.

- L.4.7 Operate the Vatterfly valve by performing the following and check off each step in Table 1:
  - L.4.7.1 Verify / place "Enable: A" switch on.
  - L.4.7.2 Place both "Valve State Select: Close (Open)" switches to off and both "Valve State Select: Open (Close)" switches to on.
  - L.4.7.3 Reset th "Motor Run Time" counter to zero.
  - L.4.7.4 Push the "Execute" button; the "Closed (Open)" light should go off immediately and after a delay the "Open (Closed)" light should come on. Record the drive time in the table.

- L.5 Secure the Valve Controller

- L.5.1.1 Place all the Enable switches in the off position.
- L.5.1.2 Power down the Vatterfly Valve Controller.
- L.5.1.3 (Optional) Disconnect the VV/VV controller cable from the VV per General Instruction J.4

Operations completed.

Completed by: \_\_\_\_\_

QA witness: \_\_\_\_\_

Date: \_\_\_\_\_

Time: \_\_\_\_\_

PTD: \_\_\_\_\_

RQE: \_\_\_\_\_

**Gravity Probe B**

6/15/00

**Vatterfly Valve \_\_\_\_ Operation**

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Table 1

Valve op. No.	1	2	3	4	5	6	7	8	9
Date:									
Time:									
Calling Op. Order No.									
Open / Close:									
Probe pressure (torr):									
Probe pres. gauge									
Ext. pressure (torr):									
Ext. press. gauge									
L.4.5 (√)									
L.4.6.1 (√)									
L.4.6.2 (√)									
L.4.6.3 & 4(√)									
L.4.6.5 (√)									
L.4.6.6 (√)									
L.4.6.7 (√)									
L.4.7.1 (√)									
L.4.7.2 (√)									
L.4.7.3 (√)									
L.4.7.4 (√)									
Execute time (sec.):									
L.5.1.1 (√)									
L.5.1.2 (√)									
L.5.1.3(√)									

**Gravity Probe B**

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**Vatterfly Valve \_\_\_\_ Operation**

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Valve op. No.	1	2	3	4	5	6	7	8	9
QA witness									