STANFORD UNIVERSITY
W.W. HANSEN EXPERIMENTAL PHYSICS LABORATORY
GRAVITY PROBE B, RELATIVITY GYROSCOPE EXPERIMENT
STANFORD, CALIFORNIA 94305-4085

REPLACING BELLOW IN 2.5" VALVES

GPB ENGINEERING PROCEDURE

P0718

July 19, 2000

PREPARED _____ _____
A. Halevy , GMA Engineer Date

APPROVED _____ _____
G. Asher, GMA REE Date

APPROVED _____ _____
D. Ross, Quality Assurance Date

APPROVED _____ _____
B. Muhlfelder, Hardware Manager Date

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1. GENERAL DESCRIPTION

This procedure describes the replacement of sealing plates in flight vatterfly valves V1,V2, V3, V4 and V5 (Howden drawing #3179) in order to have a vulcanized sealing other than the O ring type sealing.

2. TEST INFORMATION

- Proper care should be taken in handling components, and their cleanliness must be preserved.
- Temperature: Room temperature
- Humidity: not critical

2.2 Cleanliness

2.2.1 Normal lab environment when components are double bagged.

2.2.2 Class 1000 Clean Room, on laminar flow working table.

2.3 ESD precautions

2.3.1 None required.

ONR representative, and QA to be notified 24 hours prior to beginning this procedure

2.4 Personnel, QA, and Documentation

2.4.1 Personnel Integration and Test Director

The Integration and Test Director (ITD) shall be Aaron Halevy or an alternate that he shall designate. The ITD has overall responsibility for the implementation of this procedure and shall sign off the completed procedure and relevant sections within it. The GMA REE shall also sign off the completed "As-Built" procedure.

Integration Engineers and other personnel. All engineers and technicians participating in this procedure shall work under the direction of the ITD who shall determine personnel that are qualified to participate in this procedure. Participants in this procedure are to be C. Warren and A. Halevy.

The test shall be conducted on a formal basis to approved and released procedures. The QA program office shall be notified of the start of this procedure. A Quality Assurance Representative, designated by D. Ross shall be present during the procedure (if deemed

necessary) and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Manager, D. Ross or her designate, shall certify their 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. Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108. If a re-test of any or all of the hardware is necessary, the ITD will determine the appropriate changes in the procedure, with the QA Manager's approval.

2.5 Red-line Authority

Authority to red-line (make minor changes during execution) this procedure is given solely to the ITD or his designate, or the GMA Manager, and shall be approved by QA. Additionally, approval by the Hardware Manager shall be required, if in the judgment of the ITD or QA Representative, experiment functionality may be affected.

To conveniently record data directly into the procedure thus generating the "as-built" document, the procedure will be handled, if possible, in a paperless fashion until completed. A Laptop computer containing an electronic version of this procedure will be operated by the ITD or QA Representative and data shall be recorded by typing directly into the electronic file. Alternatively, an "As-Built" may be created after-the-fact from hand written notes in the approved procedure.

Following completion of the procedure and the creation of an edited electronic copy, a hard copy of the "As-Built" procedure shall be printed and ***signed off by all the designated parties*****.** It shall then be filed, including an electronic copy into the data base.

The electronic editing of this document shall be as follows:

Data will be inserted into the document using normal font, i.e. non-bold, non-italic

- "Signatures" shall be designated by **BLACK CAPITAL BOLD LETTERS**.
- "Redlines" shall be in ***RED BOLD ITALICS*** to make them distinguishable in computer and on the hard copy printout.
- If available, digital pictures shall be inserted into the document where appropriate.

3. DOCUMENTS AND EQUIPMENT

3.1 Applicable Documents

Howden drawing #25012

3.2 Test Equipment

Equipment	Model and Serial Number	Calibration
scriber		
Set of fine pliers		
tweezers		
Control box		
Set of metric Allen keys		

4. OPEN THE HOWDEN DRIVE

Started on: _____ Valve #_____

7. Notify QA & ONR 24 hours prior to start of operation.
8. Open the lockwire (28) screws (23) and pull off the two side covers (26,27), the top one (24) only if needed, mark the torque.
9. # 27 A_____ B_____ C_____ D_____
10. # 26 A_____ B_____ C_____ D_____
11. # 24 A_____ B_____ C_____ D_____
12. Mark the position of each limit switch with a razor scribe record torque.
13. # 27 side A_____ B_____ C_____ D_____
    # 26 side A_____ B_____ C_____ D_____
14. Pull back the limit switches (16,17) out of the way of the trunnion.
15. Remove 4 screws from the trunnion marking the torque and orientation.
16. # 27 side A_____ B_____ # 26 side C_____ D_____
17. Open the lockwire (28) and remove the bottom flange screws (9) record torque.

18. A_____ B_____ C_____ D_____.
19. Carefully remove valve bottom from the Howden top. Be sure that the shutters (6) will not damage, watch through the missing covers.
20. Inspect the interior of the mechanical system. Take photos, record comments:

21. Inspect the bellow carefully for any visible damage (Vat dwg). If there is no visible damage, we have to change the bonnet angle and assemble again.
22. Check the opening torque on the two (36) screws, if they are loose, just adjust the angle if possible and tighten the screws. You may need to open the valve.

23. BELLOW REPLACEMENT. (VAT DWGS).

24. Open the valve to fully open position.
25. Document cycling of each valve in valve's cycle log and on the table below.

Valve #: Cycles	

26. Fine scribe the exposed bushing area (13) to mark it's position.
27. Remove one circlip (33) from pin (15), and take away pin (15) with the other circlip.
28. Remove bushings (14).
29. Slide bushing 13 out of the stem.
30. Use clean adhesive tape to protect the fork of the plate holder from scratching the sealing area.
31. Remove bellow sub assembly, and the vacuum aluminum seal (16).
32. Put the bonnet seal (16) on the valve body. Grease Alu seal for Alu body slightly with VAT-UHV grease.
33. Put bellow in place and tighten the screws very light ("finger tight").

34. Bring the sealing plate to its original position, slide bushing 13 to its location use the scribe for the right positioning.
35. Bring the sealing plate to the open position, make sure that the cam is also in the open position.
36. Slide bushings (14), using your finger to stop their falling from the other side.
37. Insert pin (15) with one circlip (33).
38. Secure the assembly by locking the other circlip (33).
39. Check the 0.1 mm gap between bushing (13) and (18). Adjust by items (9) and (46) tighten properly.
40. Final centering the valve sealing plate. The plate shouldn't touch the valve body during opening and closing. It is most important that the plate does not touch the body on the side opposite the bellow. It is less critical if the plate should touch the body on the side of the bellow in the open position. During opening of the valve there should be a clearance of 0.2-0.3 mm between the plate seal and the valve body on the side opposite to the bellow, you can change the position of the valve plate after loosening the 4 nuts (45) and by carefully moving the plate with. Tighten the 4 nuts properly.
41. Stake the nuts (45) and (46), according to P0499.
42. Close the valve by pushing the bellow with your hand, correct the sealing plate angle if is not parallel to flange. To correct angle turn the bonnet carefully, loose screws (36) if needed. Tighten screws (36)

5. ASSEMBLE HOWDEN DRIVE.

5.1 Perform steps 4.7 to 4.2. in opposite direction. Torque per the recorded ones.

6. PROCEDURE COMPLETION

7. DATA BASE ENTRY

The following data shall be entered into the GP-B Data base:

- Name, number and revision of this procedure
- Date of successful completion of procedure.
- Part numbers and serial numbers of Vatterfly valve and their components