GRAVITY PROBE B

PROCEDURE FOR

PAYLOAD VERIFICATION

P0928 Rev -

0 HZ SPIN TEST / ADD EXCHANGE GAS IN THE GAF USING THE GMA

September 18, 2002

Prepared by: *C. Gray*

Approvals:

Program Responsibility	Signature	Date
C. Gray *GMA RE*		
R. Stephenson *Engineering*		
S. Sigurjonsson *Software*		
D. Ross *GP-B Quality Assurance*		
R. Brumley *Payload Technical Manager*		

NOTES:
Level of QA required during performance of this procedure:

Stanford QA Representative

All redlines must be approved by QA

Revision Record:

Revision	Date	ECO #	Summary description
-	9/18/2002	N/A	Original revision.

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
ECU	Experiment control unit
FEU	Flight equivalent unit
GAF	Gyro Acceptance Facility
GMA	Flight Gas management assembly
GMOCK	Functionally equivalent GMA

Table of Contents

A Scope

This procedure has two test sections.

The first section runs the 0 Hz Spin software CSTOL script using the Gyro Acceptance Facility (GAF) and either the flight Gas Management Assembly (GMA) or the non-flight functionally equivalent GMA mock-up (G-MOCK). The software script reflects the Flight procedure. It does not flow gas through the Gyro Acceptance Probe, only through the Exhaust Gas Pumping system.

The second section flows ~ 2 sccm He gas from the GMA (or G-MOCK) into the Gyro Acceptance Probe though the P1A port on the GMA to the Probe Exchange Gas Inlet. This section also uses a software CSTOL script.

B Requirements Verification

B.1 Requirements Cross Reference: none

B.2 Expected Data for verification per requirement: none

C Configuration Requirements

The gyro commissioning probe is in the low field dewar and being pumped on by the GAF leakage gas pumping system.
The GMA or G-MOCK has been connected to the GAF per P0923 and is configured such that it may be operated using the ECU FEU and associated test set.

D Hardware Required

D.1 Flight hardware required

Description	No. Req'd
GMA (or functionally equivalent non- flight G-MOCK)	1

D.2 Commercial test equipment

Manufacturer	Model	Serial Number	Calibr. Exp. Date
N/A			

D.3 Mechanical/Electrical Special test equipment

Description	Part No.	Rev. no.	Serial No.	Certification Date
Leakage gas management system				
Gyro spinup gas management system				
ECU FEU				

D.4 Tools

Description	No. Req'd
N/A	

D.5 Expendables

Description	Quantity
N/A	

E Software Required

CSTOL scripts: gma_0hz_spinup.prc; gma_add_exc_gas.prc

F Procedures Required

N/A

G Equipment Pretest Requirements

N/A

H Personnel Requirements

The following personnel have received extensive training in operation of the Gyro Acceptance Facility and are qualified to perform this procedure.

- David Hipkins
- Bruce Clarke
- Chris Gray
- Robert Brumley

I Safety Requirements

I.1 General

It is important to be aware at all times of the position of the probe. Be extremely careful not to accidentally bump into the probe or any system connected to the probe. If any connector does not connect smoothly and securely, do not try to force it. Instead, remove the connector and inspect it to find the reason for the difficulty. Great care must be taken at all times during the performance of this procedure.

I.2 Electrostatic Discharge

Grounded wrist straps are to be worn at all times when mating or demating to an electrical connector on flight hardware.

I.3 Personnel Safety

All operations shall take place according to Stanford University safety guidelines. Any person observing a situation that they deem unsafe shall report the fact immediately to the test director. The Quality Assurance representative shall be responsible for monitoring that all activities are performed in a safe manner.

I.4 Electrical mating and demating of flight hardware connectors

I.4.1 Connection and disconnection shall be performed only when the equipment involved is in a powered-down state unless the procedure specifically states otherwise.

I.4.2 Connector savers are to be used unless otherwise specified.

I.4.3 Connectors shall be inspected for contamination and for bent, damaged, or recessed pins prior to mating.

I.4.4 Grounded wrist straps are to be worn prior to removal of connector caps or covers and during mating/demating operations on flight hardware.

I.4.5 ESD-protective caps or covers are to be immediately installed after demating of connectors on flight hardware.

J General Instructions

J.1 Quality Assurance

QA Notification

This test will be conducted on a formal basis to approved and released procedures. **The QA program office and ONR representative shall be notified 24 hours prior to the start of this procedure**. A Quality Assurance Representative, designated by D. Ross shall be present during the procedure and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program Engineer, D. Ross or her designate, 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 Redline Authority

Redlines can be initiated by any of the qualified operators listed in section H and must be approved by QA.

J.3 Discrepancies

Any nonconformance or test anomaly should be reported by a Discrepancy Report. Refer to the Quality Plan, P0108, for guidance. Do not alter or break test configuration if a test failure occurs; notify quality assurance.

J.4 Test Exit Authority

Only the following persons have the authority to exit/terminate this test or perform a retest:

Rob Brumley, Chris Gray, David Hipkins, Bruce Clarke, Sasha Buchman, William Bencze, and QA personnel.

K References and Applicable Documents

Op. Order No._____
Date Initiated_____
Time Initiated_____

L OPERATIONS

The following section details how to perform the 0hz. Spin test.

L.1 Pre Test-Checklist

Start Date: _____

Start Time: _____

L.1.1 GMA (or GMOCK) has a Helium pressure > 300 psia _____

L.1.2 Leakage Gas Pumping System is operating, pumping on the probe (**VAT** open) and the probe pressure (P_{PB} measured on ion gauge channel A) is < 5 x 10^{-5} torr _____

L.1.3 Spinup Exhaust Pumping System is operating and the exhaust gas pressure (EGP) is <5 x 10^{-3} torr (this is used to evacuate the spinup manifold) _____

L.1.4 Verify the probe exhaust (gold manual valve – **PEX1**) is closed. _____

L.1.5 Verify the probe exhaust by-pass valve (**PEX2**) is closed. _____

L.1.6 Confirm manifold between the GCP spin-up inlet (SU2) and the Gyro Spinup management manifold up to valves **PV2** and **OMG Valves** (with **SU1** open and **DP1**, **FF1**, **FF2**, **FF3**, **FF4** closed) is connected and under vacuum. _____

L.1.7 OMG1, OMG2, OMG3, OMG4, OMP1A, OMVent, and OMVent2 are closed _____

L.1.8 Pumping cart is connected to the GMA Vent outlet and is pumping up to OMVent. Pressure is < 1 x 10^{-4} torr. _____

L.1.9 Software cstol sript gma_0hz_spinup.prc and gma_add_exc_gas.prc is loaded on Oasis _____

L.2 0 Hz Spin Test

Note: *Refer to figures 2 for pumping and gas management system schematic.*

L.2.1 Verify a pumping cart is connected to the vent port of the GMA outlet manifold valve OMVent. Pressure should be < 1 x 10^{-4} torr. Open BV-2 on the pumping cart manifold to evacuate the manifold up to OMVent. After the pressure is 1 x 10^{-3} torr, open OMVent to the GMA.

L.2.2 Start CSTOL script "gma_0hz_spinup.prc" and run entire script with a 10 minute Hold at the wait command on Oasis.

L.2.3 After CSTOL is complete and the pumping cart pressure indicates a pressure 1 x 10^{-4} torr, close OMVent.

L.2.4 0 Hz procedure is complete. Completed by: _____
Witnessed by: _____
Date:

_____

L3 Exchange Gas Test Set-Up

Note: *Refer to figures 1 and 2 for pumping and gas management system schematics.*

L.3.1 Check that **SEP-1**/**SEP-2** pumps are operating and the exhaust gas pressure (EGP on the GAF pumping system) is < 5 x 10^{-3} torr. The control panel for these pumps is located at the east wall of FIST OPS. If the pumps are not running pressing the momentary switches on the right side of the schematic on the panel can start them. Place the system in Interlock Defeat mode and verify yellow LED is blinking.

EGP = _____ mtorr

L.3.2 Close (or verify closed) manual valves **FF4, SU2 and SU3**.

L.3.3 Open manual valves **FF1, FF2, FF3, SU1** and **OMP1A**.

L.3.4 Open pneumatic valves **PV2** and **PV4**.

L.3.5 Wait for the exhaust gas pressure (EGP) to stabilize to the pressure recorded in step L.1.3 +/- 0.1 mtorr.

L.4 Purge and Pump Out the Spin-up Manifold Using GAF Bypass Flow

L.4.1 Check to ensure the GAF spin-up gas supply bottle contains > 250psi helium. Open the valve on the gas bottle and on the regulator.

L.4.2 The regulator should be set to 20 –25 psig.

L.4.3 Open **PV1** (down position- 2000 sccm flow controller).

L.4.4 On the 2000 sccm flow controller, rotate the 10-turn pot counter-clockwise on until a flow of 725 sccm is displayed. Continue this purge for 10 minutes.

L.4.5 Dial the flow down to zero on the 2000 sccm flow controller and close PV1.

L.4.6 Wait for the exhaust gas pressure (EGP) to stabilize to the pressure recorded in step L.2.1 +/- 0.1 mtorr.

L.4.7 Open the manual valve **FF4** on the probe and note any exhaust pressure rise (EGP).

L.4.8 Close the pneumatic valves **PV2** and **PV4**.

L.4.9 Verify a pumping cart is connected to the vent port of the GMA outlet manifold valve OMVent. Pressure should be < 1 x 10^{-4} torr. Open BV-2 on the pumping cart manifold to evacuate the manifold up to OMVent. After the pressure is 1 x 10^{-3} torr, open OMVent to the GMA.

L.5 Exchange Gas Test

L.5.1 Record Gyro Acceptance Probe Pressure:_____

L.5.2 Record Spin-Up and Exhaust Barratron Gauge Pressures

Spin-Up Pressure:_____

Exhaust Pressure:_____

L.5.3 Execute the CSTOL sript “gma_add_exc_gas.prc” which opens V25, V1, and then V3 and hold at the wait for 10 minutes.

L.5.4 After 10 minutes, Record the following pressures:

Gyro Acceptance Probe Pressure:_____

Spin-Up Pressure:_____

Exhaust Pressure:_____

L.5.5 Continue with the CSTOL script which then closes **V25**, **V1**, and then **V3**.

L.5.6 Open pneumatic valves **PV2** and **PV4**.

L.5.7 Wait for the exhaust gas pressure (EGP) to stabilize to the pressure recorded in step L.1.3 +/- 0.1 mtorr.

L.5.8 Close **OMVent, OMP1A, and FF4**.

L5.9 Close (or verify closed) manual valves **FF1, FF2, FF3, SU2 and SU3**.

L.5.10 Close the valve on the gas bottle and on the regulator for the GAF (Gyro Acceptance Facility).

L.5.11 Close **BV-2** and shut off pumping cart unless needed for the next operation.

L.5.11 Exchange gas procedure is complete.

Completed by: _____
Witnessed by: _____
Date:_____

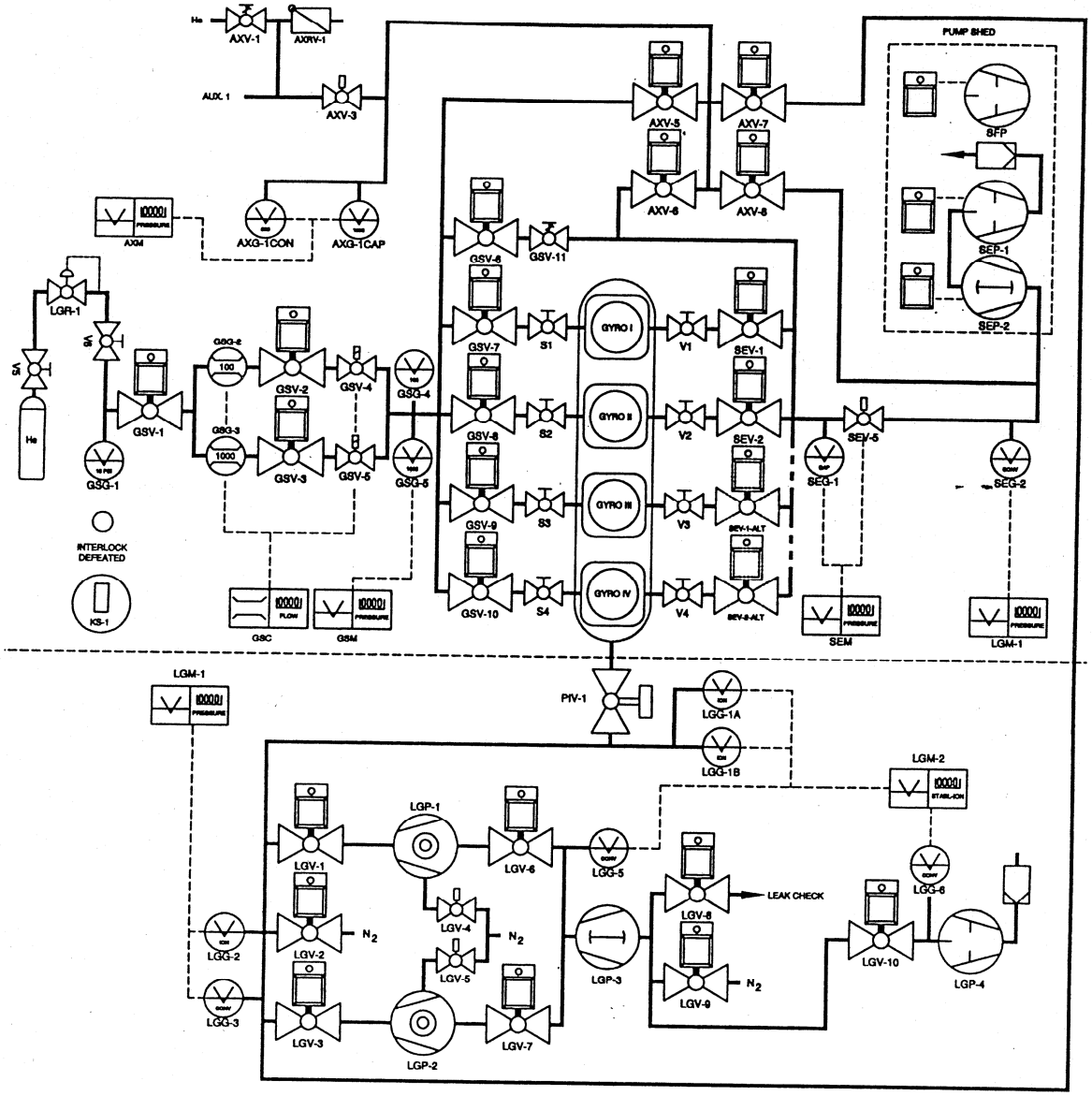
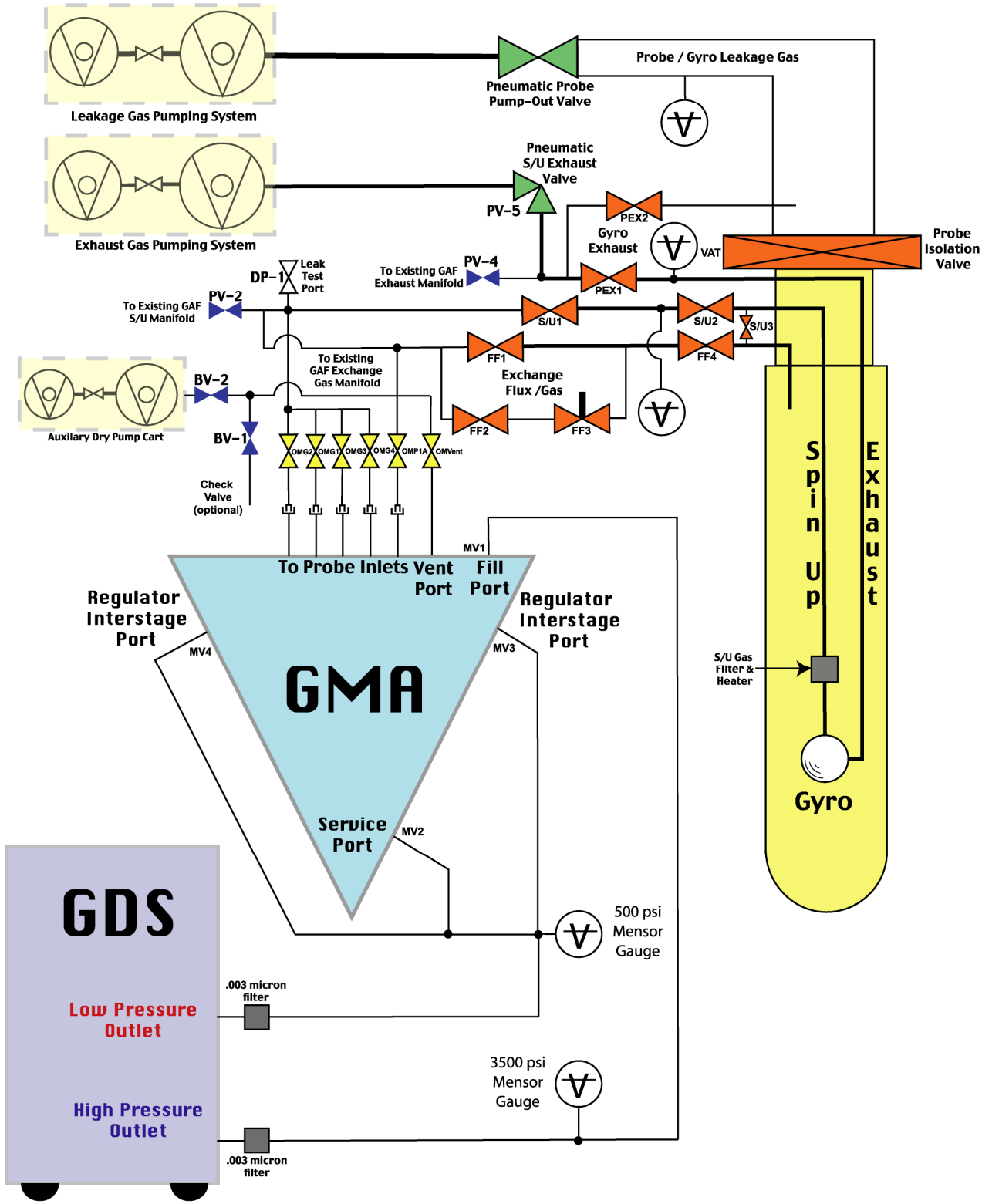


Figure 1: Gyro Gas Management System

This figure shows the location of the switches for the exhaust pumps SEP-1 and SEP-2. No other valve designations or labels in this figure are used in this procedure. Figure 2 – GMA Interface with the GAF is shown on the next page.

GMA Interfaced with Gyro Acceptance Facility



Procedure Sign Off

The results obtained in the performance of this procedure are acceptable:

_____ date: _____
Test Director/GMA Engineer

Discrepancies if any:

Approved: _____ date: _____
C. Gray, GMA REE

Approved: _____ date: _____
QA Representative

Approved: _____ date: _____
D. Ross, QA