GRAVITY PROBE B
PROCEDURE FOR
GMA OPERATION

(PTP) 15.10.1 / 15.10 GMA FLOW TEST INCLUDING VATTERFLY VALVE & HEATER OPERATIONS (PSVGMAFLOW)

Procedure No. P*0921 Rev. A*

1/24/10

Prepared by: *D. Meriwether*

Approvals:

Program Responsibility	Signature	Date
D. Meriwether Test Author		
C. Gray GMA REE		
B. Muhlfelder Payload Technical Manager		
D. Ross GP-B Quality Assurance		
R. Whelan Systems Engineering		
R. Brumley Deputy Program Manager - Technical		

NOTES:

Level of QA required during performance of this procedure:
_X_ LMMS QA Representative
___ Government QA Representative

1) The Flight GMA has no valve state indicators.
2) There shall be Flight Hardware used during this test.

Revision Record:

Rev	Rev Date	ECO #	Summary Description
A	11/26/02	1400	Added Systems Eng. in sign-off, Add IT -01 3B requirement in scope, add Michael Alpers as an operator

Acronyms and Abbreviations:

Acronym / Abbreviation	Meaning
ECU Monitor Mnemonics	
BE_XXXXX_XXXXXX	Binary Word Monitor
CE_XXXXX_XXXXXX	Current Monitor
DE_XXXXX_XXXXXX	Digital Word Monitor
TE_XXXXX_XXXXXX	Temperature Monitor
TE_XXXXX_X**GT**XXX	GRT TYPE Thermometer
TE_XXXXX_X**PT**XXX	PRT TYPE Thermometer
TE_XXXXX_X**ST**XXX	SDT TYPE Thermometer
TE_XXXXX_XXXXX**D**	Dewer located Thermometer
TE_XXXXX_XXXXX**P**	Probe located Thermometer
TE_XXXXX_XXXXX**Q**	Quartz Block located Thermometer
VE_XXXXX_XXXXXX	Voltage Monitor
AC	Alternate Current
Closed Loop	Hardware Controlled
Command	Software response indicating command sent
Current	Commanded Heater Amperage
DC	Direct Current
Open Loop	Software Controlled
Power	UV Lamp Power Supply readout
Pressure	GMA Pressure Sensor readout
Range	UV Lamp Power Hi Lo Range readout
Signal	UV Lamp Intensity readout
Temperature	Thermometer readout
Voltage	Commanded Heater Voltage

CCCA	Command & Control Computer Assembly
CSTOL	Colorado Spacecraft Test and Operations Language
ECU	Experimental Control Unit
EU	Engineering Unit
EPS	Electrical Power Subsystem
FEU	Flight Equivalent Unit
FSW	Flight Software
FTP	File Transfer Protocol
GMA	Gas Management Assembly
ICD	Interface Control Document
MOC	Mission Operations Center
MSS	Mission Support Software

OASIS-CC	Operations and Science Instrument Support – Command and Control
ONR	Office of Naval Research
PDU	Power Distribution Unit
QA	Quality Assurance
RTC	Real-Time Commands
SPC	Stored Program Commands
SRE	Squid Readout Electronics
TCP/IP	Transmission Control Protocol over Internet Protocol
Tlm	Telemetry
UPS	Uninteruptable Power System
VAC	Volts AC

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A Scope

This procedure verifies gas flows from the Flight GMA to the payload at each probe inlet (S1, S2, S3, S4, P1A and Vent Line). Both the low and high-flow functionality of the GMA is verified. The ECU is initialized and it's internal monitors limit checked. ALL GMA monitors are recorded initially and upon change. The Flight GMA Heaters are then turned on and off, the GMA Temperature sensors are monitored and checked, the GMA Pressure sensors are monitored and checked. All GMA valves are configured into the pre-launch configuration, Each possible Gas flow path is then tested, and finally, all GMA valves are again configured into the pre-launch configuration. *This process involves monitoring and operating each GMA valve for flight GMA testing, IT-01 3B requirement paragraph 15.10 and 15.10.1.*

B Success Criteria:

This sequence of operations involves instigating flows at 2, 10, and 725 sccm into first GSE and later (for 2 sccm only) into the probe. For each flow experiment, the success criteria is that the pressure indicated by GSE pressure gauges in the drain vacuum system reads in its nominal range for the given flow (the nominal ranges will be defined in the test procedure). For flows into the gyro spinup lines and P1 line which are bypassed into a pumping system at the fill and drain valves, the relevant pressure indicator is the pressure gauge on the line. For flows into the GMA vent path, the relevant pressure indicator is the pressure gauge on the pumping system connected to the vent path. For flows into the probe, the relevant pressure gauge is the ionization gauge on the pumping system that is connected to the leakage valve. For steps 10 and 11, which test the ability of the valves to respond to the HLD commands, the requirement is that when the dewar HLD is disabled, the flow of gas stops, as indicated by the relevant pressure going to its zero-flow baseline.

C **Requirements Verification**

C.1 Requirements Cross Reference

C.1.1 Moog GMA Functional Test

C.2 Expected Data for Verification per requirement

C.2.1 All Limits passed as specified within CSTOL procedure.

D **Configuration Requirements**

D.1 The GP-B Space Vehicle shall be powered on and in its default (Side A 1553, CCCA, Side A ECU) configuration

D.2 The Flight GMA shall be installed onto the GP-B Space Vehicle and ready for nominal operations.

D.3 Space vehicle orientation should be such that there is access to the manual valves and vacuum lines needed to be operated or connected to for this operation, nominally horizontal with the -X axis up.

D.4 High vacuum system shall be initially connected to bypass (at fill and drain valves mounted on dewar) for GMA flow, leak checked and certified.

D.5 Pressure gauge shall be attached at fill and drain valve to monitor GMA output pressure.

D.6 Vacuum in probe should be better than 5´10-4 torr.

D.7 GMA has been filled with Helium, and gas cleanliness has been certified.

D.8 All GMA operations require the Dewar HLD to be enabled.

D.9 Flight hardware required

Description	Part No.	Finite Lifetime Object	No. Req'd
GP-B Space Vehicle			

D.10 Commercial test equipment

Manufacturer	Model	Serial Number

D.11 Mechanical/Electrical Special test equipment

Description	Part No.

D.12 Tools

Description	No. Req'd
8 mm tape drive	1

D.13 Expendables

Description	Quantity
8 mm tape	1

E Software Required

E.1 Flight Software

Flight Software Name	Version No.
MSS (Mission Support Software)	3.3.1

E.2 CSTOL Scripts

CSTOL Script Name	Version No.
gma_monitor.prc	V 1.2 06/28/02

E.3 SPC Scripts

SPC Script Name	Version No.

E.4 Test Support Software

Test Software Name	Version No.
Oasis (Operating System Software)	V 2.4.5

F Procedures Required

Procedure Name	Procedure No.
(PTP) Flight GMA Flow Path	P0921

G Equipment Pretest Requirements

Equipment	Serial No.	Test Required	Proc. No.	Test Performed Date	By
ECU Forward	8A01313 SN 001	ECU ATP	ECU-064	4/01	JT
ECU Aft	8A0092 SN 002	ECU ATP	ECU-064	4/01	JT
ECU S/V Installation		ECU Installation			
GMA		GMA ATP			
GMA S/V Installation		GMA Installation			

H Personnel Requirements

H.1 As a general requirement, all operations involving flight equipment require at least two persons at all times.

H.2 The test leader for this procedure is Dave Meriwether <Cell *650-725-9332* >, or his appointed representative.

H.3 The GMA REE is Chris Gray <Cell *650-996-5070* >. The GMA REE is responsible for all GMA tests, and will therefore schedule appropriate times for the performance of this procedure.

H.4 The Test Director for all Gyro Spin Up activities is Rob Brumley <Cell *650-245-1746* >, or his appointed representative.

H.5 The Stanford Quality Assurance representative is Dorrene Ross <Beeper *650-317-7922, 1283969* > or her appointed representative.

H.6 The Office of Naval Research representative is Richard Gurr or his appointed representative.

H.7 The following personnel are qualified to perform this procedure using the FIST Ops test set:

H.7.1 Dave Meriwether <Cell 650-725-9332>

H.7.2 Michael Alpers <Pgr 650-845-1739>

H.7.3

I Safety Requirements

I.1 Standard safety practices to ensure safety of personnel and prevent damage to equipment shall be observed during performance of this test.

I.2 Read the CARD's[1] appropriate to ECU GMA Operations before running this test.

I.3 All connectors used will have connector savers attached. Protect all electrical connections and/or Connector Savers with ESD dust caps when the connectors are not mated.

I.4 Ensure that power is removed from cable assemblies before connecting and disconnecting cable connections.

I.5 Grounded wrist straps are to be worn prior to removal of connector caps or covers and during cable mating/demating operations.

I.6 Examine all mating connections before attempting to mate them. Remove any foreign particles. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key ways are aligned.

[1] Constraints and Restrictions Document

J General Instructions

J.1 Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test.

J.2 This procedure operates the Flight ECU, GMA, Vatterfly Valves and the Vacuum Gauge systems of the GP-B satellite. Knowledge of these systems, caution in their operation and attention to displayed information must be exercised at all times during these operations or Hardware damage may result.

J.3 This procedure shall be conducted on a formal basis to its latest approved and released Version.

J.4 In order to expedite test operations, unless specifically noted, the sequence in which major sections or subsections are performed may be altered at the discretion of the GMA REE or his representative.

J.5 All GMA Commands will be separated by at least a 1 second wait statement.

J.6 All GMA Commands will be sent twice.

K References and Applicable Documents

K.1 SCIT-01 System Design, Verification, Integration & Test Plans

K.2 SCSE 06 Command and Telemetry Handbook, App B sw_cmd 3.2.5

K.3 SCSE 16 SECTION 9, Flight Software Design Specification, External Interface Detailed Design, Version Gh

K.4 PLSE-12, Science Payload Specification, Version 4.3

K.5 MSS3.3.3_Report_Excel.xls; GMA Telemetry Monitor List

K.6 Moog GMA Schematic - Drawings #SUGPB-26273

M **Operations:**

M.1 Verify that manual valves which lead to S1, S2, S3, S4, and P1A are closed.

M.2 Connect a high-vacuum pumping system to Vatterfly Valves LV1 and the GMA Vent Outlet. Conduct a leak check of the connection. Plumbing GSE is connected to the off-pallet Fill and Drain valves and connected to the Outlet Valve Manifold which is connected to a High Vacuum pump cart.

M.3 Ensure that Pod C is in it's default configuration, as specified in Configuration Requirements; section E.1

M.4 Bring up the Flight SRE

M.5 Bring up the Flight ECU using scfpwrecua

M.6 Bring up the Flight Vacuum Gauge using p9abvacg_on

M.7 Command On and then Off Side B GMA Heaters.

M.8 Command On Side A GMA Heaters.

M.9 Setup and Verify GMA nominal Initialization State

M.9.1 Limit check Internal ECU Monitors

M.9.2 Start gma_monitor.prc

M.9.3 GMA SDT Limit Check

M.9.3.1 Display and limit check each Flight GMA SDT

M.9.3.1.1 GMA_SDT1A, 1B, 2A, 2B, 3A, 3B

M.9.4 GMA Pressure Sensor Limit Check

M.9.4.1 Display and limit check each GMA Pressure Sensor

M.9.4.1.1 GP1,2,3,4,5,6,7,8,9,10,11,12,13,14

M.9.5 GMA Valve Initialization

M.9.5.1 Start gma_setup.prc and initiate the launch configuration

M.10 ECU / GMA Safe Mode Test

M.10.1 Initiate a flow through the A-side GMA and confirm that the HLD for V1 disables gas flow as designed.

M.10.1.1 Record Pressure Sensors GP2, GP4, GP6, and GP14.

M.10.1.2 Command Open GMA Valves V29, V1, V5.

M.10.1.3 Wait for a pressure rise in Pressure Sensors GP2, GP4, GP6, and GP14 and then record value.

M.10.1.4 Send HLD 431 (Disable ECU_DEWAR_Htrs AsideHt).

M.10.1.5 Wait until pressure returns to the values as recorded in M.9.1.1 for Pressure Sensors GP2, GP4, GP6, and GP14 and then record value.

M.10.1.6 Command Closed GMA Valves V5, V1, (wait 60 sec.)V29

M.10.2 Initiate a low-flow through the B-side GMA and confirm that the HLD for V2 disables gas flow as designed. Reset HLD, evacuate the GMA and re-initialize all GMA valves.

M.10.2.1 Record Pressure Sensors GP3, GP5, GP6, and GP14.

M.10.2.2 Command Open GMA Valves V30, V2, V4.

M.10.2.3 Wait for a pressure rise in Pressure Sensors GP3, GP5, GP6, and GP14 and then record value.

M.10.2.4 Send HLD 472 (Disable ECU_DEWAR_Htrs BSideHt).

M.10.2.5 Wait until pressure returns to the values as recorded in M.9.2.1 for Pressure Sensors GP3, GP5, GP6, and GP14 and then record value.

M.10.2.6 Command Closed GMA Valves V4, V2, (wait 60 sec.) V30

M.10.3 Place GMA into Launch Mode

M.10.3.1 Start gma_launch.prc

Gas Flow Path Test

M.11 Verify "Open" Fill and Drain Valves (Ensure pumping system is operating and manifold is under vacuum)

M.12 Gyro 1, Side B, Primary 725 sccm Flow Path

M.12.1 Pressure Sensors GP1,3,5,6,7,8

M.12.2 Manually Open GSE valve OMG1

M.12.3 Command Open GMA Valves V2, V6, V9

M.12.4 Wait for a rise in pressure as monitored by the Pressure Sensors GP7,8

M.12.5 Command Closed GMA Valves V6, V2,

M.12.6 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, GP8

M.13 Gyro 1, Side A, Primary 725 sccm Flow Path

M.13.1 Command Open V1, V5

M.13.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP7,8

M.13.3 Command Closed GMA Valves V9

M.13.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, GP8

M.13.5 Pressure Sensors GP1,2,4,6,7,8

M.14 Gyro 1, Side A, Redundant 725 sccm Flow Path

M.14.1 Command Open GMA Valves V10

M.14.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP7,8

M.14.3 Command Closed GMA Valves V10

M.14.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, GP8

M.14.5 Pressure Sensors GP1,2,4,6,7,8

M.14.6 Manually Close GSE valve OMG1

M.15 Gyro 2, Side A, Primary 725 sccm Flow Path

M.15.1 Manually "Open" GSE valve OMG2

M.15.2 Command Open GMA Valves V13

M.15.3 Wait for a rise in pressure as monitored by the Pressure Sensors GP9, 10

M.15.4 Command Closed GMA Valves V13

M.15.5 Wait for a fall in pressure as monitored by the Pressure Sensors GP9, GP10

M.15.6 Pressure Sensors GP1,2,4,6, 9,10

M.16 Gyro 2, Side A, Redundant 725 sccm Flow Path

M.16.1 Command Open GMA Valves V14

M.16.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP9, 10

M.16.3 Command Closed GMA Valves V14

M.16.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP9, GP10

M.16.5 Pressure Sensors GP1,2,4,6, 9,10

M.16.6 Manually Close GSE valve OMG2

M.17 Gyro 3, Side A, Primary, 725 sccm Flow Path

M.17.1 Manually "Open" GSE valve OMG3

M.17.2 Command Open GMA Valves V17

M.17.3 Wait for a rise in pressure as monitored by the Pressure Sensors GP11

M.17.4 Command Closed GMA Valves V17

M.17.5 Wait for a fall in pressure as monitored by the Pressure Sensors GP11

M.17.6 Pressure Sensors GP1,2,4,6,11

M.18 Gyro 3, Side A, Redundant 725 sccm Flow Path

M.18.1 Command Open GMA Valves V18

M.18.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP11

M.18.3 Command Closed GMA Valves V18

M.18.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP11

M.18.5 Pressure Sensors GP1,2,4,6,11

M.18.6 Manually Close GSE valve OMG3

M.19 Gyro 4, Side A, Primary 725 sccm Flow Path

M.19.1 Manually "Open" GSE valve OMG4

M.19.2 Command Open GMA Valves V19

M.19.3 Wait for a rise in pressure as monitored by the Pressure Sensors GP12, 13

M.19.4 Command Closed GMA Valves V19

M.19.5 Wait for a fall in pressure as monitored by the Pressure Sensors GP12, 13

M.19.6 Pressure Sensors GP1,2,4,6,12,13

M.20 Gyro 4, Side A, Redundant 725 sccm Flow Path

M.20.1 Command Open GMA Valves V20

M.20.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP12, 13

M.20.3 Command Closed GMA Valves V20

M.20.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP12, 13

M.20.5 Pressure Sensors GP1,2,4,6,12,13

M.20.6 Manually Close GSE valve OMG4

M.21 Vent, Side A, Primary 725 sccm Flow Path

M.21.1 Manually Open GSE valve OMVent, then Command Open GMA Valves V29

M.21.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP14

M.21.3 Command Closed GMA Valves V29

M.21.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP14

M.21.5 Pressure Sensors GP1,2,4,6,14

M.22 Vent, Side A, Redundant 725 sccm Flow Path

M.22.1 Command Open GMA Valves V30

M.22.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP14

M.22.3 Command Closed GMA Valves V30

M.22.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP14

M.22.5 Pressure Sensors GP1,2,4,6,14,

M.22.6 Manually Close GSE valve OMVent

M.23 Place GMA into Launch Mode

M.23.1 Start gma_launch.prc

M.24 Flush, Side A, Primary 2 sccm Flow Path

M.24.1 Manually Open GSE valve OMP1A

M.24.2 Command open V1, V3, V25

M.24.3 Wait for 30 seconds

M.24.4 Close V25, V3, V1

M.24.5 Command open V2, V4, V26

M.24.6 Wait for 30 seconds

M.24.7 Close V26, V4, V2

M.24.8 Manually Close GSE valve OMP1A

M.25 Finish 15.10.1 Type “Go to GMA End” to compete this procedure. Go to Section XX to close this procedure

M.26 Place GMA into Launch Mode

M.26.1 Start gma_launch.prc

M.27 Continue with 15.10, gas will flow though probe at 2 sccm.

M.28 Power ON LV1a Heater

M.29 Verify GSE is connected to LV1, pump is operating, and the manifold is under vacuum.

M.30 Record P9 range and signal. If value starts increasing, notify GMA group.

M.31 Verify spin-up manifold GSE pump is connected to the OMG1 – 4 and OMP1A valves and all OM valves are open. The pump shall be operating and under vacuum up to the off-pallet Fill and Drain valves.

M.32 Wait for pressure to base out (< 1 X 10^{-3} torr.), then torque close all the Fill and Drain valves to isolate the GSE from the GMA manifold.

M.33 Command Vatterfly Valve LV1a Open

M.34 Slowly open the science probe manual gyro inlet valves (P1A, S1, S2, S3, and S4) one at a time while the P9 pressure is being monitored. If the P9 pressure starts to rise while a manual valve is being opened, close the valve immediately.

M.35 Verify a pump cart is connected, operating, and the manifold up to the GMA vent is under vacuum. Verify and record GP14 pressure. This pressure should be at 0 psia.

M.36 Gyro 1, Side A, Primary 2 sccm Flow Path

M.36.1 Command open V29 (wait 60 seconds), Command Open GMA Valves V1, V3, V9, Close V29

M.36.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP7, 8

M.36.3 Command Closed GMA Valves V3, V1

M.36.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, 8

M.37 Gyro 1, Side B, Primary 2 sccm Flow Path

M.37.1 Command Open GMA Valves V2, V4

M.37.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP7, 8

M.37.3 Command Closed GMA Valve V9

M.37.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, 8

M.37.5 Pressure Sensors GP1,3,5,6,7,8

M.38 Gyro 1, Side B, Redundant 2 sccm Flow Path

M.38.1 Command Open GMA Valves V10

M.38.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP7, 8

M.38.3 Command Closed GMA Valves V10

M.38.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP7, 8

M.38.5 Pressure Sensors GP1,3,5,6,7,8

M.39 Gyro 2, Side B, Primary 2 sccm Flow Path

M.39.1 Command Open GMA Valves V13

M.39.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP9, 10

M.39.3 Command Closed GMA Valves V13

M.39.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP9, 10

M.39.5 Pressure Sensors GP1,3,5,6,9,10

M.40 Gyro 2, Side B, Redundant 2 sccm Flow Path

M.40.1 Command Open GMA Valves V14

M.40.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP9, 10

M.40.3 Command Closed GMA Valves V14

M.40.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP9, 10

M.40.5 Pressure Sensors GP1,3,5,6,9,10

M.41 Gyro 3, Side B, Primary, 2 sccm Flow Path

M.41.1 Command Open GMA Valves V17

M.41.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP11

M.41.3 Command Closed GMA Valves V17

M.41.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP11

M.41.5 Pressure Sensors GP1,3,5,6,11

M.42 Gyro 3, Side B, Redundant 2 sccm Flow Path

M.42.1 Command Open GMA Valves V18

M.42.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP11

M.42.3 Command Closed GMA Valves V18

M.42.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP11

M.42.5 Pressure Sensors GP1,3,5,6,11

M.43 Gyro 4, Side B, Primary 2 sccm Flow Path

M.43.1 Command Open GMA Valves V19

M.43.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP12, 13

M.43.3 Command Closed GMA Valves V19

M.43.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP12, 13

M.43.5 Pressure Sensors GP1,3,5,6,12,13

M.44 Gyro 4, Side B, Redundant 2 sccm Flow Path

M.44.1 Command Open GMA Valves V20

M.44.2 Wait for a rise in pressure as monitored by the Pressure Sensors GP12, 13

M.44.3 Command Closed GMA Valves V20

M.44.4 Wait for a fall in pressure as monitored by the Pressure Sensors GP12, 13

M.44.5 Pressure Sensors GP1,3,5,6,12,13

M.44.6 Command Closed V4, V2

M.44.7 Go to GMA Set-Up, Start gma_sleep.prc

M.44.8 **Close All Science Gyro Inlet Manual Valves (P1a, S1, S2, S3, and S4)**

M.45 Wait for a fall in pressure as monitored by the Vacuum Gauge then Command Closed the Vatterfly valve LV1a.

M.46 Disconnect the high-vacuum pumping system from Vatterfly Valves LV1 (if configuration is not necessary for the next operation)

M.47 Backfill the GSE manifold connected to the GMA vent with Helium gas and observe the pressure on the GMA's P6 gauge to ensure that the vent path is closed. Disconnect the pumping manifold connected to the GMA vent.

M.48 Command Off Side A Vatterfly Valve LV1 Heaters and GMA Heaters

M.49 At this point, all GSE should be disconnected from the vehicle and the system should be placed in its nominal configuration for future activities.

M.50 FLIGHT GMA Flow Path test completion

M.50.1 Command Off the Flight Vacuum Gauge using p9abvacg_off

M.50.2 Command Off Flight ECU using scfoffecua

M.50.3 Command Off the Flight SRE

M.50.3.1 Test completed:

Completed by: _____
Witnessed by: _____
Date: _____
Time: _____

Quality Engineer: _____
Date: _____
Time: _____