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

SHIPPING THE FLIGHT GMA FROM STANFORD TO LOCKHEED MARTIN SUNNYVALE

GP-B ENGINEERING PROCEDURE

P0944 Rev –

25 September, 2002

PREPARED	R. Pressburg, Quality Assurance	Date
APPROVED	K. Bower, RE	Date
APPROVED	C. Gray, GMA REE	Date
APPROVED	H. Moskowitz, Safety	Date
APPROVED	R. Brumley, Hardware Manager	Date

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A SCOPE

This procedure provides the instructions for shipping the flight Gas Management Assembly (GMA) from Stanford to Lockheed Martin, Sunnyvale (facility 159). GMA will be shipped to Lockheed Martin using an "air ride" vehicle is mandatory.

B SAFETY

The GMA is a gas pressure vessel. Under normal operations, the GMA requires no safety measures or equipment beyond those required for the use of a supply gas cylinder. The GMA is high value flight hardware and should always be handled with the appropriate care under adequate supervision. The GMA tanks are fracture critical items.

C QUALITY ASSURANCE

C.1 QA Notification

The QA program office and ONR representative shall be notified 24 hours prior to the start of this procedure. A Quality Assurance Representative, shall be present during the procedure and shall review any discrepancies noted and approve their disposition. Upon completion of this procedure, the QA Program representative, will certify 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.

C.2 Red-line Authority

Authority to redline (make minor changes during execution) this procedure is given solely to the Test Director or his designate and shall be approved by the QA Representative.

C.3 Discrepancies

Discrepancies will be recorded in a D-log or as a DR per Quality Plan P0108.

D TEST PERSONNEL

The Test Direct shall be Chris Gray or an alternate that he shall designate. The Test Director has overall responsibility for the implementation of this procedure and shall sign off the completed procedure and relevant sections within it. Prior to performing this procedure the Test Director shall perform the Pre-test checklist attached to this document (G.4). At the completion of this procedure the Test Director shall perform the Post-test checklist (G.5).

E REQUIREMENTS

E.1. Electrostatic Discharge Requirements

N/A

E.2. Lifting Operation Requirements

GMA requires at least two persons and a spotter for lifting and placement in the shipping container.

E.3. Hardware Equipment Requirements

	Approximate Weight
Flight GMA (Including GMA Frame)	81 lbs
Gas Delivery System (GDS)	1500 lbs
Pumping System (Alcaltel or similar)	150 lbs
Shock Recorder	5 lbs
Shock Detectors (3 each 15g "shock & tell")	N/A
Leak Detecter (Alcaltel or similar)	150 lbs
Misc. Plumbing Lines and fittings	50 lbs
MLI Frame (including box)	10 lbs
Flow Hood	25 lbs
Misc tools and equipment	20 lbs

Note: MLI frame will be packed in original packaging.)

Total approximate shipping weight: 1991 lbs.

E.4. Instrument Pretest Requirements

None

E.5. Configuration Requirements

GMA shall be in shipping configuration.

- Tank at 300 psia (Verified in GDS Bleeddown Procedure P0942)
- Regulators "locked up" (Verified P0886 Section G.5)_
- All fill and drain valves closed and capped
- All outputs capped (connector savers ok)
- All GSE disconnected
- GMA will be in shipping configuration using the same shipping container in which the GMA was shipped from MOOG.
- Maybe under down flow hood
- GMA is mounted in shipping support frame

E.6. Constraints and Restrictions

Normal handling requirements apply:

- All steps observed by Quality Assurance
- All physical handling of GMA to be performed under supervision of the Test Director.
- Class 100K clean room requirements will be observed
- Identify on the shipper that system is pressurized to 300 psia.
- Quality will witness the securing of all components in the air ride van.

Prior to shipment, a shipping document must be completed by the receiving and shipping department. The shipper must indicate that this is flight hardware and must be signed and approved by Quality Assurance.

F REFERENCE DOCUMENTS

- P0942 " Gas Delivery System Bleed-Down Procedure"
- P0886 "Gas Delivery System Operating Procedure"

G OPERATIONS

G.1. Verify Appropriate QA Notification

QA Notified_____ ONR Notified_____

MSFC Resident Manager_____

G.2. Verify Availability of required personnel.

Verify that personnel representing Stanford Quality Assurance, Stanford Bonded Stores, Stanford Receiving, and appropriate technical personnel are available to ship the GMA.

Verify that Lockheed Martin has been notified that the GMA is being shipped and provide an approximate arrival time.

G.3 Shipment of GMA

Started on: _____

3.1. Verify the GMA is in the shipping configuration as outlined in Step E.5 Position the GMA shipping container in an area close to the GMA.

Quality_____

3.2 Verify that room environment meets 100K Cleanliness Standards

3.3 Open the GMA shipping container and verify internal cleanliness. If necessary vacuum container. Ensure all packing is available. Remove loose packing from the GMA container.

3.4 Place a large piece of clean polyethylene or mylar clean room bagging material wrap in the container. Position the wrap in such a manner that when the GMA is placed in the container the wrap will go around the GMA.

3.5 Place one 15g shock detector at each axis on the handling frame.

3.6 Carefully mount the shock recorder on top on the GMA shipping plate and activate.

3.7 Using a particle counter verify that room environment meets 100k cleanliness standards.

3.8 Remove the flow hood from around the GMA.

3.9 Position one test team member on each side of the GMA to balance the GMA during removal of the hold-down bolts.

3.10 With the GMA held in place remove the hold-down bolts from the frame.

3.11 When the hold-down bolts have been removed carefully lift the GMA and its frame into the shipping container.

3.12 Install the packaging around the GMA ensuring the GMA is fully wrapped and as air tight as possible. (Tape the wrap in place using clean room tape, ensure that the tape does not come in contact any GMA component).

3.13 Visually inspect the GMA and packaging to ensure the container lid can be closed.

3.14 Install remaining packing material and close the container. Verify container is properly secured by placing and securing it on a palette. If required a forklift can be used to lift container into the shipping vehicle.

3.15 Verify that Stanford Receiving, Stanford QA and Stanford Bonded Stores have the necessary paperwork prepared for shipment.

3.16 When air ride van arrives, assist them in loading the GMA crate from the FIST Ops area to the air ride van.

- As a minimum, two individuals will move the GMA from the FIST Ops area to the air ride van.
- Stanford Receiving and Quality will witness the loading of the GMA container to the air ride van and will ensure the container is properly secured (tied down).

Quality_____

3.17 Stanford Receiving and Quality must verify the appropriate paperwork is available.

NOTE: Quality Assurance must accompany the GMA in the Air Ride Vehicle.

Stanford Receiving: _____ Date: _____

Quality_____

3.18 Once the air ride van has arrived at Lockheed Martin, Stanford Quality will ensure the shipping document is signed, retain a copy and provide the retained copy to Stanford Receiving. Quality Assurance and the Test Director will witness the downloading and turnover of the GMA to Lockheed Martin.

Quality_____

DCMA_____

G.4 PRE-TEST CHECKLIST (NOTE: THIS IS A GENERIC CHECKLIST DESIGNED TO BE USED PRIOR TO THE START OF ALL PROCEDURES. ALL ITEMS CONTAINED BELOW MAY OR MAY NOT APPLY)

DATE	PROCEDURE #	CHECKLIST ITEM	COMPLETED	REMARKS
		1. VERIFY THE TEST PROCEDURE BEING USED IS THE LATEST REVISION.		Verify with the Procedure release area that this is the latest revision.
		2. VERIFY ALL CRITICAL ITEMS IN THE TEST ARE IDENTIFIED AND DISCUSSED WITH THE TEST TEAM.		The entire test procedure will be reviewed by the test team prior to performance
		3. VERIFY ALL REQUIRED MATERIALS AND TOOLS ARE PRE-STAGED AND AVAILABLE IN THE TEST AREA.		Special materials (tape, wrap etc. are identified in the body of the procedure. No special tools are required.
		4. VERIFY ALL HAZARDOUS MATERIALS INVOLVED IN THE TEST ARE IDENTIFIED TO THE TEST TEAM.		All activities associated with movement of the GMA are considered critical and must be performed carefully. The only hazardous material used is pressurized helium.
		5. IF HELIUM IS TO BE USED VERIFY THAT A BLUE "HELIUM" TAG IS AROUND THE NECK OF THE HELIUM CYLINDER.		
		6. VERIFY ALL HAZARDOUS STEPS TO BE PERFORMED ARE IDENTIFIED TO THE TEST TEAM.		
		7. VERIFY EACH TEAM MEMBER KNOWS THEIR INDIVIDUAL RESPONSIBILITIES.		
		8. CONFIRM THAT EACH TEST TEAM MEMBER CLEARLY UNDERSTANDS THAT HE/SHE HAS THE AUTHORITY TO STOP THE TEST IF AN ITEM IN THE PROCEDURE IS NOT CLEAR. **NOTE: DURING A HAZARDOUS OPERATION THE TEST WILL ONLY BE STOPPED WHEN IT IS SAFE TO DO SO**.		
		9. CONFIRM THAT EACH TEST TEAM MEMBER CLEARLY UNDERSTANDS THAT HE/SHE HAS THE AUTHORITY TO STOP THE TEST IF THERE IS ANY ANOMALY OR SUSPECTED ANOMALY **NOTE: DURING A HAZARDOUS OPERATION THE TEST WILL ONLY BE STOPPED WHEN IT IS SAFE TO DO SO**		
		10. NOTIFY MANAGEMENT OF ALL DISCREPANCY REPORTS OR D-LOG ITEMS IDENTIFIED DURING THE PROCEDURE. IN THE EVENT AN INCIDENT OCCURS DURING PROCEDURE PERFORMANCE, MANAGEMENT WILL BE NOTIFIED IMMEDIATELY.		
		11. CONFIRM THAT EACH TEST TEAM MEMBER UNDERSTANDS THAT THERE WILL BE A POST-TEST TEAM MEETING.		
		TEAM LEAD SIGNATURE:		

G.5 POST-TEST CHECKLIST NOTE: THIS IS A GENERIC CHECKLIST DESIGNED TO BE USED AT THE COMPLETION OF ALL PROCEDURES. ALL ITEMS CONTAINED BELOW MAY OR MAY NOT APPLY)

DATE	PROCEDURE #	CHECKLIST ITEM	COMPLETED	REMARKS
		1- VERIFY ALL STEPS IN THE PROCEDURE WERE SUCCESSFULLY COMPLETED.		
		2- VERIFY ALL MINOR/MAJOR DISCREPANCIES DISCOVERED DURING TESTING ARE PROPERLY DOCUMENTED.		
		3- ENSURE MANAGEMENT HAS BEEN NOTIFIED OF ALL MINOR/MAJOR DISCREPANCIES.		
		4- ENSURE THAT ALL STEPS THAT WERE NOT REQUIRED TO BE PERFORMED ARE PROPERLY IDENTIFIED.		
		5- IF APPLICABLE SIGN-OFF TEST COMPLETION.		
		TEAM LEAD SIGNATURE		

H PROCEDURE SIGN OFF

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

Approved: _____ Date: _____
Test Engineer

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

Approved: _____ Date: _____
QA Representative