

SU/GP-B P0400

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

OPERATIONS MANUAL FOR QA INSPECTION AND FLIGHT STORES

GP-B SCIENCE MISSION PROCEDURE

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1. SCOPE

This document describes operations procedures for QA Inspection and Flight Stores. The QA/Inspection room is located in the FIST OPS auxiliary area in the HEPL building. The operations are divided in this document as follows:

- Raw Materials Issuing
- Flight Parts Receiving
- Flight Parts Inspection
- Acceptance Inspection
- Flight Parts Storage
- Flight Part Traveler
- Flight Part Issuing
- QA/Inspection Hardware and Paper Flow

1.1 Acronyms

The following acronyms are used in this document

RE	Responsible Engineer
QA	Quality Assurance
QE	Quality Engineer
PO	Purchase Order
IIR	Inspection Instructions and Report
SEM	System Effectiveness Manager
HW	Hardware
IRM	Inspection/Receiving Manager
PQA	Government Quality Assurance Acceptance Stamp

2. RAW MATERIALS ISSUING

Purchased Parts using Stanford Supplied Raw Material

- The Responsible Engineer (RE) requests raw Material by submitting a “Raw Materials Request Form” (available in the QA area or in database @ “Relgyro’(O;)\forms”) to the IRM, or his designate. This form (**Attachment A**) calls for the material name, its specification, size, drawing number, quantity parts, quantity material, date required, magnetic zone, flight or non-flight part, vendor, and Purchase Order (PO) number.
 - The request must be submitted prior to material being issued for any flight part.
 - Raw Material for flight parts may be issued only if Vendor, PO#, Traveler and Drawing are provided.
 - The IRM or designate issues the raw material and fills in the appropriate fields in the raw Material Request form which includes The materials Stanford number, magnetic screen report number and quantity issued.
- A Document Package is created by QA with RE assistance, when issuing raw material. The package consists of the following:
 - Material Certificate
 - Magnetic screening report (**Attachment B**) (available in the QA area or in database @ “Relgyro’(O;)\forms”) Screened to the appropriate zone as requested on Raw Material Request Form
 - Drawing
 - Inspection Instructions & Report (IIR) (**Attachment C**) (available in the QA area or in database @ “Relgyro’(O;)\forms”)
 - Storage location
 - Flight Parts Request Forms (**Attachment D**) (available in the QA area or in database @ “Relgyro’(O;)\forms”)
 - Travel sheet
- When issuing raw material, magnetic zone appropriate material will be issued first; e.g., Zone 1 material will not be issued for Zone 3 parts use if there is Zone 3 material available.

3. FLIGHT PARTS RECEIVING AND INSPECTION

- When a flight part arrives at the HEPL receiving office the GP B QA/Inspection will be contacted. The QA IRM or designate will perform the initial inspection pertaining to ID, count and condition. This will be performed at the receiving area. Flight Parts are to be received by authorized QA personnel only. Authorized personnel include the IRM or his designate. The RE is to be immediately notified by QA of flight parts received, and any discrepancies noted.
- All flight parts received will have the acceptance inspection performed in accordance with the approved travel sheet instructions. The QA/Inspection Manager or his designate, in accordance with the Traveler, will perform acceptance inspection. Authority to stamp off the acceptance inspection block of any travel sheet will be limited to these personnel only. Specific inspection instructions are specified in the IIR. The inspection will be performed by the QA and recorded on the IIR form.(Attachment C) Once the IIR is complete the associated travel sheet operation will be bought off.
- A review of the requirements called out on the PO attachment (**Attachment E**) (available in the QA area or in database @ “Relgyro’(O;)\forms)” will be verified. All required items must be available prior to the parts final acceptance.
- An inspection drawing must accompany the IIR. The drawing is to be stamped with “I” stamps, indicating features or measurements to be inspected, and an “Inspection Drawing” stamp, with RE signature, date, and Inspector signature.
- Flight parts can not be released to the floor until final acceptance is completed. A part is considered accepted only after requirements of PO are met and travel sheet completed.
- Upon completion of acceptance inspection, the hardware container will receive a green GP B Flight Hardware label and stored with other flight hardware in the bonded stores area.

In the event a part is needed prior to acceptance a DR must be generated and the RE’s explanation of the need for early release. QA will document the specific items left prior to final acceptance. This DR will be closed when all required items are completed.

If Government source inspection (GSI) is imposed at the supplier’s facility, receiving inspection shall verify that the government PQA stamp is present on the shipping document.

2. FLIGHT PARTS STORAGE

- After each process is completed in the Inspection travel sheet the flight part shall be returned to QA/Inspection for storage. Parts are physically segregated according to processing status.
- After acceptance inspection is completed the flight parts are stored in a segregated area marked as “Inspection Completed.”
- Once stored any other processes will be followed according to the operations called out in subsequent approved travel sheet.
- Parts are segregated in 3 ways:
 - Storage cabinet
 - Individual location within cabinet
 - Bagging and Tagging
- Storage cabinets are segregated by:
 - Parts in process
 - Parts accepted as Flight Parts
 - Backup Flight Parts
 - Engineering Units (Non-flight parts)
 - Failed Parts
 - Vendor Supplied Parts

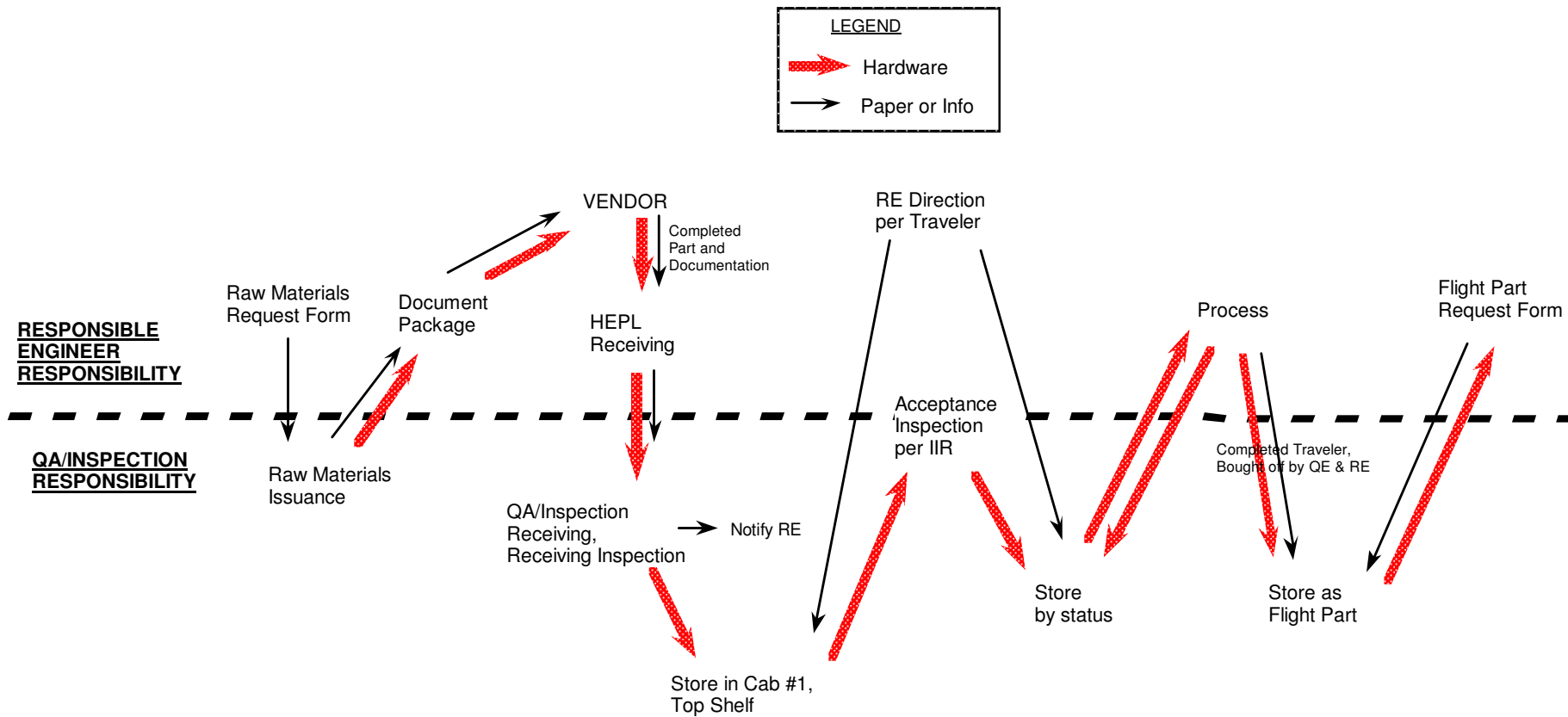
5. TRAVEL SHEET

A detailed guide is available for the preparation and use of travel sheet. (Refer to P0406)

- A travel sheet is generated by the RE and may be modified only by the RE listed on the bottom of that traveler. The RE and Program Quality Engineer must approve the generated traveler prior to being put in use. (**Attachment F**)
- Travel sheets are kept with the flight part from Raw Material Issue forward. At the completion of each operation, the appropriate personnel must buy off each individual step.
- Any process performed on a part must be documented on the travel sheet.
- Completed travel sheet must include
 - Part Name
 - Lot Date Code or Serial Number
 - Vendor
 - PO#
 - Part Number, including dash number
 - Revision Number
 - All processes, operations and required tests, must be documented on the travel sheet in chronological sequence. For each operation, the following information is required:
 - ◇ Operation
 - ◇ Specification
 - ◇ By Whom Performed
 - ◇ Date Completed
 - ◇ Space for Inspection and Approval Stamp
 - ◇ Space for Buy Off Initials
 - ◇ Space for Discrepancies and Remarks
 - Space for Completion Signature by travel sheet RE and QE
- After the travel sheet is completed and bought off by both RE and QE, the part is accepted for flight, and stored as a Flight Part.

6. FLIGHT PARTS ISSUING

- Flight Parts may be issued by QA/Inspection once the part is inspected and accepted by receiving inspection. This will occur only if all provisions required by the PO and IIR are met. The travel sheet must be signed off and stamped by the RE and program QE.
- A “GPB Flight Hardware” decal must be attached to the bag containing the hardware.
- Flight parts may be removed from Stores by the RE filling out a “Flight Parts Request” form. (Attachment D) (form available in the QA area or in database @ “Relgyro’(O;)forms)” and submitting it to QA Inspection. Forms are located outside the bonded stores area. The completed forms can be left in the Flight parts request box, clearly marked outside the flight stores area. This box will be checked several times each day to ensure a timely turn around. Forms can also be given directly to a program QE.
 - After the request form is reviewed by QA the RE will be contacted on the part availability. A flight part that has not completed the QA Inspection can only be issued if a DR is generated, detailing the reason and listing the remaining items required to completion of acceptance (See section 3)
 - If an assembly requires kitting, the kit list must be completed documenting all articles and materials needed for assembly. Individual parts must include serial numbers or lot date codes. These parts shall be organized together and placed in the appropriate bin. This bin will be labeled with the assembly part number, serial number and GPB Flight sticker.
 - Approved Traveler for next assembly must be presented to QA Inspection.
 - All nonflight parts will be issue with a nonflight sticker.



QA/ INSPECTION HARDWARE AND PAPER FLOW

ATTACHMENTS

SAMPLE FORMS

- **Attachment A, Raw Materials Request Form**
- **Attachment B, Magnetic Screening Test report**
- **Attachment C, Inspection Instructions and Report (IIR)**
- **Attachment D, Flight Parts Request Form**
- **Attachment E, Special notes for PO**
- **Attachment F, Travel Sheet Form**

ATTACHMENT A

Raw Materials Request

****All information in Italics must be answered to process request****

Material _____ *Spec.* _____ *Size* _____

Drawing. # _____ *Qty. parts* _____ *Material Qty.* _____

MAGNETICS TESTING REQUIRED: YES / NO Zone: 1 2 3 4

FLIGHT PARTS: YES / NO

GTU / Science mission / other _____

Requester _____ *Phone* _____ *Date* _____

Deliver to _____ *Phone* _____

VENDOR _____ **PO** _____

----- **For QA use only** -----

Date request received: _____

Material Serial # _____

Magnetic Screen # _____

Magnetic Zone Approved for _____

Quantity material issued _____

Date filled: _____

Initial / stamp _____

ATTACHMENT B
Magnetic Screening Test Report

To be completed by engineer (SU) or Magnetics Lead (LMSC) **Date:** January 24, 2010

Component **Raw Material** **Coupon** **Magnetic Zone: (1)**

P.O. #: E51823 **Part #:** 25097-101 **Rev.- Qty** 5

Part name: PLATE, BOTTOM, SQUID BRACKET **Requester:** Ben Taler **Phone:** 5-6403

Material name & spec: COPPER, UNS C10100 O60 ASTM B 152
(ex: beryllium copper, ASTM B196, UNS C17200)

Lot or heat number _____ **rod/bar/sheet #** _____
(ex: heat# 14290)

Vendor: Watts *(ex: CHAMP Co.)*

Material producer: _____
(ex: Alcoa Aluminum)

Mass of material _____ **total grams** = _____ **grams/part** x _____ **parts**

Minimum distance of part from any gyro _____ **cm** **Range of distances** _____ - _____ **cm**

No etch **Cleaning Data**
 Soap & water **Chem etch, type:** _____ **time/depth of etch:** 0.5 mil **by:** _____
 other _____ *(ex: H₂SO₄)* *(ex: 1 mil)*

Room Temperature Test Data **Please return sample**
Number of coupons _____ **1st test: Mag** _____ **μG** **Demag** _____ **μG** **2nd test: Mag** _____ **μG** **Demag** _____ **μG**
(informal screening; no LMSC log book entry) **initials of screener** _____ **date** _____
 Mag RT pass ≤ 1 μG **Mag RT reject** (> 1 μG) **scrap, by:** _____ **Send on, by:** _____

Cryogenic Test Data **Date rcv'd** _____

Sample# _____ **Mass** _____ **grams**

Large Cryogenic Tester
Remanent moment _____ **emu** **Temp** _____ **K** **Exp:** _____ **G**

MPMS
Remanent moment _____ **emu** **Temp** _____ **K** **Exp:** _____ **G**
Susceptibility _____ **emu/G** **Temp** _____ **K** **Field:** _____ **G**

Mass susceptibility _____ **emu/G/g**

Gradiometer
Remanent moment _____ **emu** **Temp** _____ **K** **Exp:** _____ **G**

Test conducted by: _____ **date** _____ **Test approved by:** _____

Comments: _____

Pass/Fail Criteria	Zone	Remanent moment	Mass susceptibility
<input checked="" type="radio"/> Passes zone criteria	1	(d ³) x 10 ⁻⁷ = _____ emu	≤ 5 x 10 ⁻⁶ emu/G/g
Approved by: _____	2A	≤ 2 x 10 ⁻⁶ emu	≤ 5 x 10 ⁻⁶ emu/G/g
	2B	≤ 4 x 10 ⁻⁶ emu	≤ 1 x 10 ⁻⁵ emu/G/g
<input checked="" type="radio"/> Fails zone criteria	Mag Committee disposition:		<input checked="" type="radio"/> Approved <input checked="" type="radio"/> Rejected

Attach Waiver form to this report.

Approved : **Rejected:** **Waiver#** _____ **DR#** _____

enter data in Magnetic Screening Log Book, and apply Mag Stamp as required.

Log # _____ **, CS** _____ **Closure Date** _____

ATTACHMENT C

Inspection Instructions & Report

PART NAME: Pin, Contact, R/O Cable				SERIAL NUMBER OR LDC:		
PART NUMBER: 25012-101				REVISION: A		
PRODUCED BY: MTE				PURCHASE ORDER NUMBER: SM3545		
QUANTITY ORDERED: 50			QUANTITY RECEIVED:			QUANTITY ACCEPTED:
#	Item	Inspection Method	Results	Date Completed	Initials or Stamp	Remarks/Discrepancies (Ref. Related Docs.)
1	Inspect for damage					
2	Check part identity against dwg.					
3	Verify vendor's documents [are they all there and signed?]					
4	Fill in shaded portion of IRR					
5	Inspect parts for dimensions and other criteria marked by RE on Inspection Drawing dated _____ <u>Verify no burrs, all parts.</u>					Qty of to be inspected: _____ List actual dimensions on dwg. List all discrepancies below for RE buy-off. Keep qty inspected for mag & GTU-1.

LIST DISCREPANCIES BELOW FOR REVIEW AND DISPOSITION BY RESPONSIBLE ENGINEER

{Continue on another sheet if necessary and attach to this one}

#	DISCREPANCY DESCRIPTION	Should be	IS	RESPONSIBLE ENGINEER'S COMMENTS	RE Buyoff
A					

ATTACHMENT D

FLIGHT PARTS REQUEST FORM UPDATED 21 JULY 1998 (required before parts can be issued)

Part Name _____
Part No. _____
Next Assembly Number _____ - _____ REV ____
Mag Certs Required? { } Zone _____
USE: { } Proto Eng. { } SM*
*only fully signed off parts may be issued for SM.

Are these parts being removed prior to acceptance?
YES / NO

If Yes, RE must initiate a DR & record nos. here _____

Are parts to be returned to stores as flight parts after use?
YES / NO

If Yes, separate traveler required documenting use or next
assembly traveler returned with new assembly.

Requester _____ Phone _____

Quantity required _____ Need Date _____

Quantity issued _____ By _____ Date _____
(Name & Stamp)

Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____
Serial Nos. _____	LDC _____	Mag# _____

Please contact Phil Unterreiner @ 3-3264 or Grace Brauer @ 51484 or 34790
with any questions regarding this form.

ATTACHMENT E

STANFORD UNIVERSITY
GRAVITY PROBE B, RELATIVITY MISSION

SPECIAL NOTES FOR FLIGHT PART ORDER

P.O.# _____ **Vendor:** _____

- ___ 1. Prior to using any other supplier source, vendor is to notify Stanford Buyer of this supplier including name, address and telephone number. This must be done before completing this flight part order.
- ___ 2. In conjunction with Travel Sheets provided by Stanford, vendor is to follow instructions that are specific to machine shop. Sign and return the travelers with delivery of parts.
- ___ 3. Materials provided by Stanford will include material COC and/or COT.
 - a) Excess materials must be returned with delivery of parts and clearly identified.
 - b) Show P.O.# for work and enclose copy of material COT or COC with material.
- ___ 4. Standard/Off-Shelf Parts, vendor is to include COC on parts and Lot No.
- ___ 5. Analysis, Inspection and Test Reports shall remain on file for no less than 5 years after completion of order.
- ___ 6. Mark packaging/shipping container "FLIGHT PARTS" (for fabrications identified as such), e.g. use dark ink marker to write bold lettering on packing list or outside of package.
- ___ 7. Unless specifically addressed in travel sheet or drawing packaging, shipping shall be per normal supplier system.
- ___ 8. The Contractor shall be notified of any articles having limited life or drift with age. Vendor shall provide records indicating life used prior to delivery and remaining life characteristics.
- ___ 9. Contractor QE shall be immediately notified of any discrepancy that will effect form fit or function or seriously impact schedule.
- ___ 10. Government Source Inspection (GSI):
The Government has the right to inspect any or all of the work included in this order at the supplier's plant.
- ___ 11. Vendor will provide written sign off evidence that Quality Assurance has reviewed, completed and approved all requirements needed to satisfy this order.

ATTACHMENT F

Travel Sheet

PART NAME:				SERIAL NUMBER OR LDC:			
DRAWING NUMBER:				REVISION: -			
#	OPERATION	SPECIFICATION NO. & REV.	PERFORMED BY:	DATE COMPLETED	INSPECTION & APPROVAL	BUY OFF	REMARKS/DISCREPANCIES (REF. RELATED DOCS.)
1			Stanford				
2			Stanford				
3					I		
4			Stanford				
5	(Apply GPB Flight Decal)		Stanford		Q		
6	Final Buy Off RE		Stanford				
7	QA Buy Off		Stanford				
RESPONSIBLE ENGINEER:			SIGNATURE:			DATE:	
QUALITY ASSURANCE:			SIGNATURE:			DATE:	