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HRF Flight Rack One Integration Test Procedure IV: Rack Payload Integration

LS-71139-4B

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Approved: _____ _____

Ed Strong — Date
NASA/SF HRF Rack Integration Manager

Approved: _____ _____

NT3/GFE Assurance Branch — Date

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HRF Flight Rack One
Integration Test Procedure IV:
Rack Payload Integration

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REVISION/CHANGE APPROVALS

Date	Revision Letter	Change Number	Prepared By	Approved By:	
				Unit Manager	Projects Manager

DOCUMENT NUMBER LS-71139-4B	**DOCUMENT CHANGE/ REVISION LOG**	PAGE 1 OF 1

CHANGE/ REVISION	DATE	DESCRIPTION OF CHANGE	PAGES AFFECTED
BASIC	9/99	Baseline Issue	ALL
Rev A	5/00	Changes made due to EXPRESS Software upgrade Block II Release III load.	Pgs. i, ii, iii, iv, 1-1 thru1-3, 2-1, 2-2, 3-1, 5-1, 6-1 thru 6-25, A-1 thru A-6
Rev B	8/00	Changes made due to hardware additions, configuration modifications and incorporate deviation sheets into document.	Pgs.i, ii, iii, 2-1, 2-2,4-1, 6-1 thru 6-23, A-10, A-11

Altered pages must be typed and distributed for insertion.

JSC FORM 276 (REV APR 81)

ABSTRACT

This document provides the Rack Payload Integration/Deintegration procedures for the Human Research Facility (HRF) Rack. The process facilitates the functional checks on all payload drawers including installation and removal.

The primary purpose of HRF Rack Payload Integration/Deintegration is the performance of sequences necessary to facilitate the installation and removal of each payload drawer into the HRF Rack. The HRF Rack Integration/Deintegration Procedure will be conducted in Building 241 Payload Rack Check-out Unit (PRCU) test environment at the Johnson Space Center, Houston, Texas. A step-by-step sequence of activities to be conducted is included in Section 6.0 of this procedure.

A Test Readiness Review (TRR) will be held prior to the start of this activity. The TRR Board, Quality Engineering, and the Payload Test Conductor will agree to proceed with the individual tests listed in this document.

KEY WORDS

Human Research Facility
International Space Station Program

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LIST OF ACRONYMS AND ABBREVIATIONS

Assy	Assembly
C&DH	Command and Data Handling
DR	Discrepancy Report
dwr	Drawer
EXPRESS	Expedite the Processing of Experiments to Space Station
EXTNL	External
FOD	Foreign Object Damage
GASMAP	Gas Analyzer System for Metabolic Analysis of Physiology
GSE	Ground Support Equipment
HRF	Human Research Facility
IFR	Integrated Flight Rack
ITCS	Internal Thermal Control System
ISIS	International Subrack Interface Standard
JSC	Johnson Space Center
lbs	pounds
MEIT	Multiple Element Integrated Test
NASA	National Aeronautics and Space Administration
PRCU	Payload Rack Checkout Unit
SIR	Standard Interface Rack
TBD	To Be Determined
TPS	Task Performance Sheet
TRR	Test Readiness Review
VRDS	Verification Requirements Data Sheet
Wrkstn	Workstation

1.0 INTRODUCTION

1.1 PURPOSE

This document outlines the procedures necessary to perform the installation and removal of subrack payloads from the HRF Rack. The expected outcome of this activity is the successful integration and interface testing of the HRF payloads in the HRF Rack.

1.2 SCOPE

This document provides task sequencing to satisfy the test requirements as detailed in the document “Rack One HRF Unique Payload Verification Plan” in SSP-57400, “Human Research Facility Unique Payload Verification Plan for Rack 1, International Space Station Program”. Closure of specific Verification Requirements Data Sheets (VRDS) pertaining to SSP-57400 is addressed in Appendix A of this procedure. The details listed herein describe the necessary hardware, configuration, test equipment set-ups, instrumentation requirements, data requirements, safety concerns, and all other details necessary to perform the appropriate procedure.

This procedure applies to the subsystems and components of the HRF Rack and the PRCU test environment. It encompasses the power up of the integrated HRF Rack, along with the interface testing of the payload drawers to be performed by Lockheed Martin HRF personnel, and other agencies described herein.

1.3 DOCUMENT OVERVIEW

This document details the test setup, test tear down, and the necessary test operation. The procedure is divided into six (6) sections:

Section 6.1 PAYLOAD INTEGRATION
Section 6.2 PAYLOAD DEINTEGRATION
Section 6.3 BONDING
Section 6.4 ISOLATION
Section 6.5 ONLINE PAYLOAD FUNCTIONALS
Section 6.6 MECHANICAL INTERFACE CHECKS

1.3.1 Document Hand-Write Change Control

This document is designed to present baseline procedures for HRF Rack payload integration. It is therefore assumed that this document is subject to hand-write changes while in use in the test area. Hand-write entries will be controlled and documented in this procedure. All hand-writes must be approved by Quality Engineering and the Test Conductor prior to

implementation. Quality Assurance will validate all hand-writes. If safety is affected, then Safety Personnel must also approve changes. The personnel that have Task Performance Sheet (TPS) signature authority are authorized to make hand-write changes to this document. Hand-written changes to this document will be done using deviation sheets (See Appendix A). This document will be revised to include permanent hand-written changes.

1.3.2 Warnings and Cautions

Prior to performing any operation, test personnel must be familiar with all "General Notes, Warnings, Cautions, Special Instructions and Safety Precautions" contained in the reference documents and drawings unless otherwise specified within this procedure.

1.3.3 Task Sequencing

The procedures outlined in this document are written to ensure technical completion of a specified task and are not necessarily sequenced to provide optimum crew/tool equipment utilization or HRF Rack build-up. The work is to be accomplished sequentially, unless it is more efficient to parallel the operations or the secondary document procedures. The responsible Test Conductor must first evaluate any change to assure that there is no degradation of technical requirements, system safety, personnel safety, scheduling, etc. Sequencing changes require concurrence from Quality Assurance.

1.3.4 Repeat Operations

Prior to proceeding, operations that must be repeated require approval of the Test Conductor, and Quality Assurance. All repetitive operations must be documented in the Repetitive Operations Log in Appendix A.

1.3.5 Discrepancies

If any discrepancy occurs in the form of an equipment failure, hazard, or emergency, the personnel concerned will take appropriate action to ensure personnel and equipment safety, and report to a Quality Assurance Specialist. The Test Conductor will notify the National Aeronautics and Space Administration (NASA) facility manager and act as focal point for any further effort required. If required, a Discrepancy Report (DR), Johnson Space Center (JSC) form 2176 will be initiated by Quality Assurance, and will be tracked and worked as described in document NT1-ADM-013 (See Appendix A).

1.3.6 Safety Support

JSC Safety & Health Requirements established in document JPG 1700.1 Version H, will be strictly adhered to throughout all phases of test activities. All hazardous activities will be coordinated with the appropriate facility personnel.

1.3.7 Emergency/Accident Procedure

The following procedures are to be used in the event of an emergency situation, (i.e., smoke or fire) or in the case of an accident involving personal injury. Emergency procedures provide pre-planned and approved guidelines for handling potential hardware/software malfunctions and hazardous situations. If a hazardous situation occurs, the following definitions state the actions necessary to maintain control of the situation and personnel safety. Actions required for the situations not covered by these procedures shall be provided by the Test Conductor real-time, based on his/her best judgment.

Definitions

Abort Test: Take immediate and rapid actions for restoration of safe conditions, removal or rescue of test personnel, notification of the appropriate personnel about the hazardous situation, and shutdown of all systems. This action is taken in catastrophic critical hazard conditions such as fire, smoke, or serious personnel injuries.

Terminate Test: Discontinue test per the standard shutdown procedures provided. This action is required when the situation prevents further compliance with the test objectives.

Hold and Evaluate: Maintain current test conditions or proceed to safe mode to allow time to review system status and impacts of the situation. This action is required in the event of a hardware/software malfunction.

Emergency Exits and Equipment

Figure 1-1 shows the emergency exits for personnel in the test area, and shows the location of fire pull-stations and fire extinguishers. Figure 1-2 shows the emergency meeting place outside of Building 241.

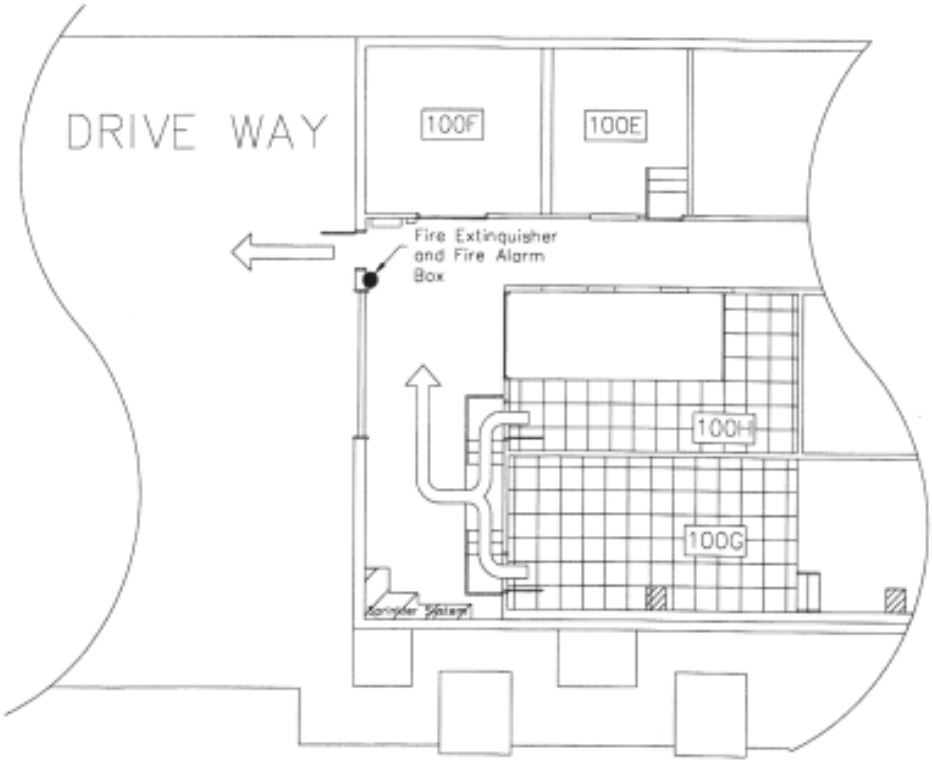

Figure 1-1 241 Facility Clean Room Emergency Exits

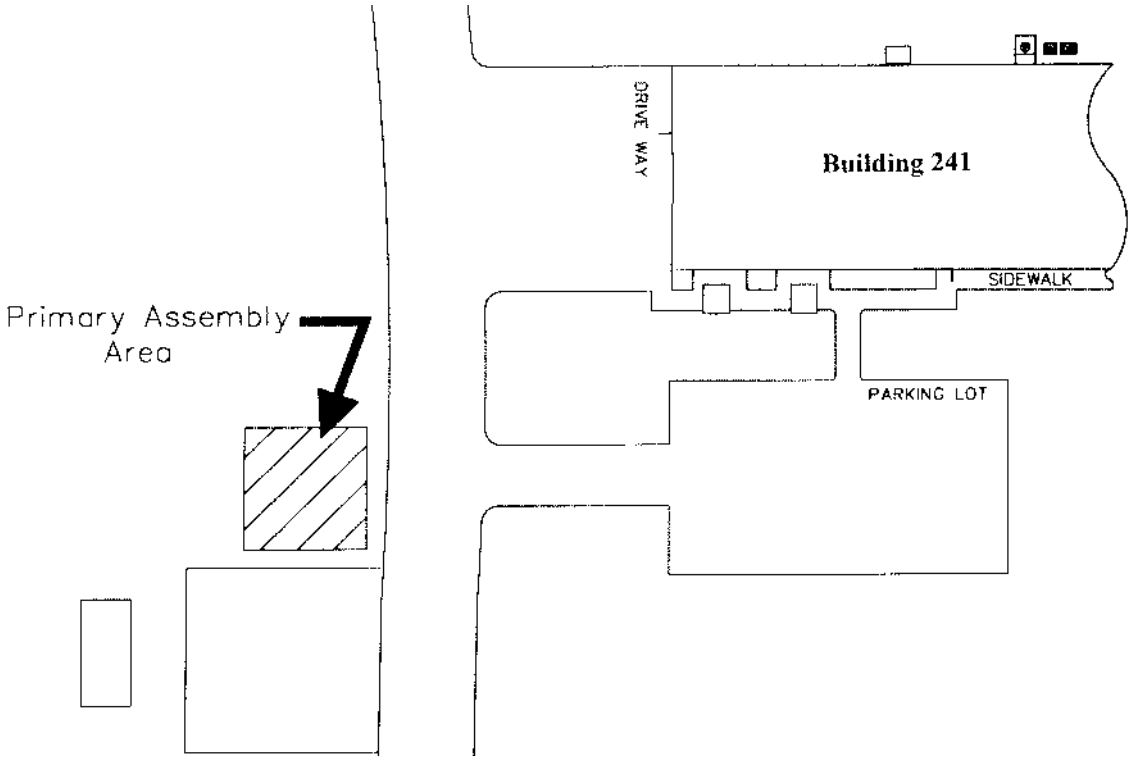

Figure 1-2 241 Facility Emergency Meeting Place

Emergency/Accident Reporting

The Facility Engineer has the primary responsibility of initiating the notification process. General Emergency Instructions:

(1) Sound the alarm and evacuate the area.
(2) If safe, render/de-energize energy systems.
(3) Initiate Flash reporting sequence. (See Appendix A)
(4) Establish emergency response team to support follow on action.

Figure 1-3 shows the JSC Emergency Number and Reporting Sequence. This number is a coordinated number for the emergency related medical, fire and security groups at JSC.

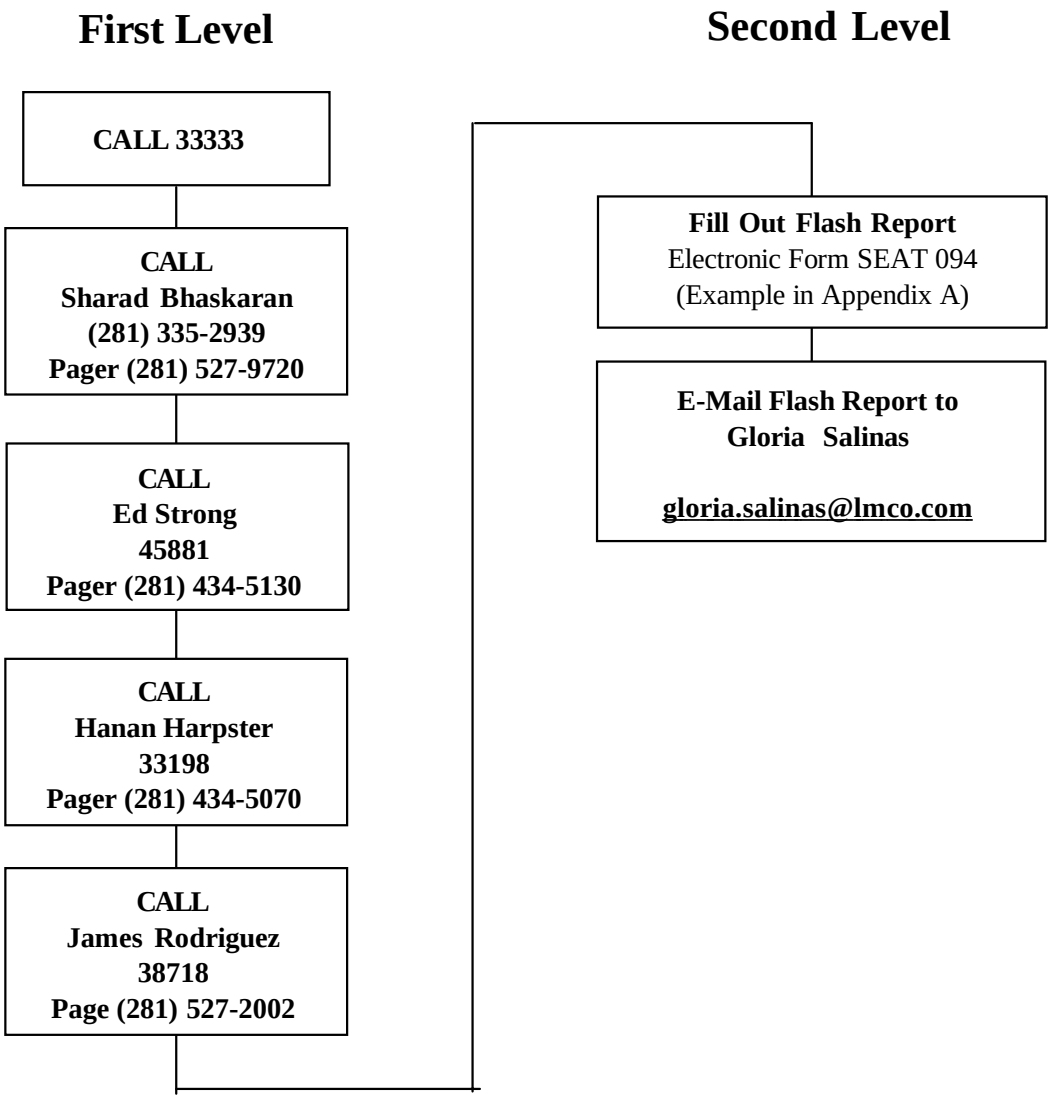

Figure 1-3 JSC Emergency Number and Reporting Sequence

Systems Emergency Procedures

The following procedures are to be carried out by the Test Conductor and Test Personnel in accordance with the condition as defined below:

CONDITION	RESPONSIBILITY	ACTION
Fire/Visible Smoke in Test Area	Test Conductor/ Technician	Abort Test

(1) Sound the alarm: Activate alarm at pull box and/or phone in emergency.
(2) Do not move injured personnel unless necessary to prevent further injury.
(3) If safe, attempt to de-energize system, i.e., thermal, electric, etc.
(4) Initiate notification process. This may be conducted away from the situation via telephone.

CONDITION	RESPONSIBILITY	ACTION
Electrical burn/smoke odor	Test Conductor/ Technician	Terminate Test

(1) Shutdown all electrical test equipment systems.
(2) Locate nearest fire extinguisher.
(3) Investigate/Isolate the source of odor.
(4) If required, perform steps associated with a Fire/Smoke situation.

CONDITION	RESPONSIBILITY	ACTION
Loss of Facility Power	Test Conductor/ Technician	Hold & Evaluate

(1) Evaluate the situation and impact to the test. Investigate the cause and potential frequency of occurrence. Take appropriate steps to restore the failed systems to their nominal/safe operating conditions.

Personnel Emergency/Accident Procedures

CONDITION	RESPONSIBILITY	ACTION
Serious Personal Injury	Test Conductor/ Technician	Terminate Test

(1) To prevent further injury, do not move the injured personnel unless necessary.
(2) Render the area safe, then administer first aid as required.
(3) Initiate notification process.
(4) Do not leave injured personnel alone until emergency personnel arrive.

CONDITION	RESPONSIBILITY	ACTION
Minor Personal Injury	Test Conductor/ Technician	Hold & Evaluate

(1) Render the area safe, then administer First Aid as required.
(2) Initiate notification process.
(3) Take injured individual to medical treatment facility.

1.3.8 Hazardous Waste Handling

Hazardous material identification, labeling and storage at Building 241 shall be done according to JSC Form 1161, “Disposal Inventory for Miscellaneous Hazardous Wastes.” Disposal containers, transportation and disposal will be provided by the designated JSC waste management service. All Internal Thermal Control System (ITCS) waste disposal in Building 241 should be coordinated through the Facility Manager.

2.0 APPLICABLE DOCUMENTATION

The following documents form a part of this Verification Plan to the extent specified. Tasks and activities referenced in pre-test, post-test, and procedural sequences may be performed using the most recent revision of the document stated.

NASA Documents:

Number	Rev.	Title
JHB 5322	C	Contamination Control Requirements Manual
KHB 1700.7	LI	Space Shuttle Payload Group Safety Handbook
LS-71139-2	B	HRF Flight Rack One Integration Test Procedure II: Payload Rack Checkout Unit Mechanical Operations and Fluid Sampling
LS-71139-3	B	HRF Rack One Integration Test Procedure III: Payload Rack Operation Support Procedures
LS-71139-5	B	HRF Flight Rack One Integration Test Procedure V: Rack Activation/Deactivation
NT1-ADM-012	Base-line	Task Performance Sheet (TPS) NT/Occupational Safety and Institutional Assurance Division
NT1-ADM-013	A	Quality Assurance Record Center Discrepancy Reporting and Tracking Systems
SSP57400		Human Research Facility Unique Payload Verification Plan for Rack 1, International Space Program

Boeing Documents:

Number	Rev.	Title
D683-44094-2	A	Human Research Facility Flight Rack Command & Data Handling (C&DH) Acceptance Test Procedure
D683-27519-1	G	User Guide for the Payload Rack Checkout Unit (PRCU)

2.1 APPLICABLE SOFTWARE

The following software provides the configuration data used in this test setup:

HRF Rack Configurations are based upon:

Software Item	Version
Rack Interface Controller (RIC)	Expedite the Processing of Experiments to Space Station (EXPRESS) -9
EXPRESS Laptop	EXPRESS HH

PRCU Software Configurations are based upon:

Software Item	Version
Payload Rack Check-out Unit (PRCU)	PRCU Block 2.0
Payload Executive Processor (PEP)	PEP Version 18

HRF Software Configurations are based upon:

Software Item	Version
Common Software	Block 2.3
Commercial Off the Shelf (COTS) Applications	Windows NT/95
Instrument Applications	N/A
Experiment Applications	N/A
HRF Workstation Software	Load 5.0
Integrated Build	Load 5.0

3.0 TESTING PROCESS OVERVIEW

3.1 TESTING OBJECTIVE

The test objectives are as follows:

- Facilitate the successful integration of the payloads into the HRF Rack.
- Perform basic bonding test on each integrated payload.
- Perform online functionals for all payloads after installation has been completed.
- Facilitate the removal and deintegration of each payload drawer.
- Perform isolation check on the HRF Rack.

3.2 TEST REQUIREMENTS

The following paragraphs describe the requirements of the specific tests to be conducted and may include references to the specific VRDS to be completed.

3.3 TEST CONDITIONS

3.3.1 Test Conduct Ground Rules

The rules as defined in the following subparagraphs will be followed during all test activities.

3.3.2 Roles and Responsibilities

The Test Conductor is responsible for the overall management and integration of all verification testing at the systems level. The Test Conductor is responsible for the safe, successful control and conduct of all testing. The Test Conductor will ensure all test team members are knowledgeable of the subsystems required for the verification test to be performed. The conductor acquires and assigns test resources and is responsible for the adequacy of test documentation. Additional responsibilities are:

- Test schedule coordination
- Test resource management
- Assurance of efficient test conduct
- Data and reports coordination

The Test Engineer is responsible for conducting the specific verification testing, including the coordination of test materials and personnel. The Test Engineer provides the test configuration, test plan and required

paperwork/procedures. The Test Engineer is the principal technical focal point for a given test. The Test Engineer coordinates all test data processing and supports the Test Conductor in the preparation of the post-test report.

The Facility Engineer is responsible for ensuring that the required instrumentation is calibrated, installed and conditioned to provide the data necessary to meet the test objectives. The Facility Engineer is responsible for the coordination of certified Test Technician/Test Operator support.

The Test Technician/Test Operator is responsible for selection, setup, operation, maintenance and configuration of the test equipment in accordance with the approved test plan and procedure.

3.3.2.1 Test Area Requirements

Special emphasis is to be given to testing flight articles. The following rules will be incorporated into test documentation and compliance is the responsibility of all test team members. Repeated non-compliance may be grounds for denial of access to the test facility.

3.3.2.2 Test Area Cleanliness

Room 100H in Building 241 is certified as a level 100K clean room. Requirements for working in such an environment are detailed in Contamination Control document, JHB 5322C. All test team members with access to room 100H shall be familiar with these requirements and may undergo pre-access training or certification at the discretion of the Facility Engineer. The following rules shall be maintained at all times while in the test facility:

- Smocks, head and beard covers shall be worn at all times.
- Test Area will be kept clean and orderly at all times.
- All debris created during test preparation, conduct, or tear down will be continuously removed to prevent Foreign Object Damage (FOD) contamination.

3.3.2.3 Test Area Access

Access to all test areas shall be limited during test operations. Only essential personnel shall be admitted. The test area, surrounding test consoles, and test instrumentation shall be controlled to restrain visitors and prevent tampering with the test article or test equipment. Determination of essential personnel will be made by the Test Conductor or Test Engineer, and enforced by the Facility Engineer.

3.3.2.4 Work Area Rules

The following work rules shall be observed for the duration of testing:

- All work stands shall have toe boards sufficient to prevent any item from being accidentally dropped into a test article.
- All work stands shall have the side accessing the test article padded to prevent test article damage in the event the stand comes in contact with the test article.
- Rings and watches must be taped or removed.

3.3.2.5 Temporary Configuration Changes

Temporary changes to the Test Article configuration will be accomplished and documented as described in document NT1-ADM-012 TPS NT/Occupational Safety and Institutional Assurance Division.

4.0 TPS AUTHORIZED PERSONNEL

The TPS Authorization is comprised of two (2) types:

- Type A – A Task Performance Sheet that changes the temporary or permanent configuration of the "Flight" (Class I) or Ground Support Equipment (GSE) test hardware. These documents must be reviewed and agreed upon by the customer before obtaining a NASA Signature. Absolutely no work is to be performed without having the proper paperwork in hand with the appropriate signatures.

- Type B – A Task Performance Sheet that does not change the configuration of the hardware which is being tested. These documents do not require a NASA Signature, and are to be coordinated with the customer and submitted for signature.

All documents must have verification authorization by the appropriate Lockheed Martin engineer.

If documents require hardware to be pulled out of bond; the appropriate signature authority for the bond room must be included. This list is for reference purposes only, verify before use. The official list is provided in NASA EA5 memo.

LIST OF AUTHORIZED SIGNATURES

Project ID	Project Name	New Project ID	New Project Name	NASA Technical Monitor	Mission Assigned	Other Authorized Signatures
HPMHPMS1	Integration Hardware Definition & Development/Ground Rack Design and Build	HPMS	High Fidelity Mockup/Ground Development Facility/Launch Integration Facility/Payload Rack Checkout Unit	Ed Strong	HRF	Sharad Bhaskaran Robert Henneke Bob Trittipo Tom Wiggins Elton Witt
HPM1	Ground Facilities Development	Deleted – Content moved to HPMS				
HPM3	Water Cooled Rack Development	HPM3	Flight Prototype Rack Integration/Flight Rack Integration	Ed Strong	HRF	Carlos Aquilar Sharad Bhaskaran Todd Leger Kevin Upham
HPCP	HRF Launch Package 1 Hardware Design	Deleted – Content moved to HPM3				
MEIT	Multiple Element Integration Test (MEIT)	Deleted – Content moved to HPM3				

5.0 TEST SET UP

The test set up and tear down will be governed by TPS JSC Form 1225.

5.1 PRE-TEST ACTIVITY

Verify HRF Rack is properly mated to the appropriate test environment per SIG38116325 REV A. Configure test environment for HRF rack testing and apply power per LS-71139-2 Section 6.0.

5.2 POST-TEST ACTIVITY

Remove power from HRF Rack and power down test environment per LS-71139-2 Section 6.0.

6.0 TEST PROCEDURE

6.1 PAYLOAD INTEGRATION

Each experiment drawer is equipped with fixed payload handles. When integrating the payloads into the HRF Rack a 5/16" Allen Wrench is needed to secure the handles in place. The two handles, right and left, are position specific. The right side handle contains a short captive screw, while the left side handle assembly has a free standing screw which is longer than that of the right side. Once integrated the right handle of the drawer is the first to be fastened followed by the left handle. When integrating a payload which utilizes more then four (4) Payload Units (PU) the handles are to be fasten in a diagonal pattern.

Each stowage drawer is equipped with the International Subrack Interface Standard (ISIS) handles. The handles are operated by pulling upward until the clasp is fastened. The handle is then secured in place by pushing the locking bolt upward, so that it is visibly protruding from the top.

6.1.1 Gas Analyzer System for Metabolic Analysis of Physiology (GASMAP) Analyzer Module

TABLE 6.1 GASMAP ANALYZER MODULE

Step	Payload	HRF Rack
1.	GASMAP Analyzer Module, Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **CAUTION**: It requires three (3) persons to lift and guide the GASMAP Analyzer Module.	
2.		HRF Rack, Front Panel, Subrack Location C2 and D2 Install: GASMAP Analyzer Module drawer **NOTE**: Line up slide guides with HRF Rack drawer (dwr) guides for Subrack drawer location C2 and D2. Forcefully slide payload into location until a connection is made with the striker bar and handles can be secured.
3.	GASMAP Analyzer Module, Front panel • Right handle bolt - Fasten • Left handle bolt - Install **NOTE:** Bolts are to be torqued until snug.	

T: ____ QA: ____

6.1.2 GASMAP Calibration Module

TABLE 6.2 GASMAP CALIBRATION MODULE

Step	Payload	HRF Rack
1.	GASMAP Calibration Module, Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **CAUTION**: It requires two (2) persons to lift and guide the GASMAP Calibration Module.	
2.		HRF Rack, Front Panel, Subrack Location B1 Install: GASMAP Calibration Module drawer **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer location B1. Forcefully slide payload into location until a connection is made with the striker bar and handles can be secured.
3.	GASMAP Calibration Module, Front panel • Right handle bolt - Fasten • Left handle bolt - Install **NOTE**: Bolts are to be torqued until snug.	

T: ____ QA: ____

6.1.3 Cooling Stowage Drawer

TABLE 6.3 COOLING STOWAGE DRAWER

Step	Payload	HRF Rack
1.	Cooling Stowage Drawer 1, Front panel • Locks - Locked • Handles - Closed **CAUTION:** It requires two (2) persons to lift and guide the Cooling Stowage Drawer.	
2.		HRF Rack, Front Panel, Subrack Location G1 Install: Cooling Stowage Drawer **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer location G1. Continue to slide payload back until only six (6) inches remain exposed.
3.	Cooling Stowage Drawer 1, Front panel • Locks - Unlocked • Handles - Open **NOTE**: Forcefully slide payload into location until connection is made with the connector bar and handles can be latched.	
4.	Cooling Stowage Drawer 1, Front panel • Handles - Closed • Locks - Locked	
5.	Cooling Stowage Drawer 2, Front panel • Locks - Locked • Handles - Closed **CAUTION:** It requires two (2) persons to lift and guide the Cooling Stowage Drawer.	

TABLE 6.3 COOLING STOWAGE DRAWER (CONT'D)

Step	Payload	HRF Rack
6.		HRF Rack, Front Panel, Subrack Location H2 Install: Cooling Stowage Drawer **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer location H2. Continue to slide payload back until only six (6) inches remain exposed.
7.	Cooling Stowage Drawer 2, Front panel • Locks - Unlocked • Handles - Open **NOTE**: Forcefully slide payload into location until connection is made with the connector bar and handles can be latched.	
8.	Cooling Stowage Drawer 2, Front panel • Handles - Closed • Locks - Locked	

T: ____ QA: ____

6.1.4 Ultrasound

TABLE 6.4 ULTRASOUND

Step	Payload	HRF Rack
1.	Ultrasound Unit Assembly (Assy), Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **CAUTION:** It requires four (4) persons to lift and guide the Ultrasound Unit Assy.	
2.		HRF Rack, Front Panel, Subrack Location C1, D1, E1, and F1 Install: Ultrasound Unit Assy **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer location C1, D1, E1, and F1. Forcefully slide payload into location until a connection is made with the connector bar and handles can be latched.
4.	Ultrasound Unit Assy, Front panel • Right handle bolt - Fasten • Left handle bolt - Install **NOTE:** Bolts are to be torqued until snug.	
5.		Ultrasound Unit Assy, Front Panel Install mounting hardware in each Subrack location Torque to 28 ± 5 in/lbs above running torque Upper Right: _____ in/lbs Upper Left: _____ in/lbs Middle Right_____ in/lbs Middle Left: _____ in/lbs Lower Right: _____ in/lbs Lower Left: _____ in/lbs Torque Wrench Calibration #: _____ Calibration Date: _____

T: ____ QA: ____

6.1.5 Workstation

TABLE 6.5 WORKSTATION

Step	Payload	HRF Rack
1.	HRF Workstation (Wrkstn), Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **CAUTION:** It requires two (2) persons to lift and guide the HRF Wrkstn payload.	
2.		HRF Rack, Front Panel, Subrack Location G2 Install: HRF Wrkstn **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer location G2. Forcefully slide payload into location until connection is made with the connector bar and handles can be latched.
3.	HRF Wrkstn, Front panel • Right handle bolt - Fasten • Left handle bolt - Install **NOTE:** Bolts are to be torqued until snug.	

T: ____ QA: ____

6.1.6 ISIS Drawers

TABLE 6.6 ISIS DRAWERS

Step	Payload	HRF Rack
1.	ISIS Drawers, Front panel • Locks - Locked • Handles - Closed **CAUTION:** It requires two (2) persons to lift and guide the ISIS Drawers payload.	
2.		HRF Rack, Front Panel, Subrack Location H1, J1, J2, F2, and E2 Install: ISIS Drawers **NOTE**: Line up slide guides with HRF Rack dwr guides for Subrack drawer locations H1, J1, J2, F2, and E2. Continue to slide payload back until only six (6) inches remain exposed.
3.	ISIS Drawers, Front panel • Locks - Unlocked • Handles - Open **NOTE**: Forcefully slide payload into location until connection is made with the connector bar and handles can be latched.	
4.	ISIS Drawers, Front panel • Handles - Closed • Locks - Locked	

T: ____ QA: ____

6.2 PAYLOAD DEINTEGRATION

To unlock the ISIS handle disengage the lock by pushing the locking bolt downward, so that it is not visibly protruding from the top.
Simultaneously depress the inside button and pull the handle downward.

Experiment drawers are unsecured by removing the left handle bolt and disengaging the right handle bolt.

6.2.1 GASMAP Analyzer Module

TABLE 6.7 GASMAP ANALYZER MODULE

Step	Payload	HRF Rack
1.		GASMAP Analyzer Module, Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **NOTE**: Pull drawer out until payload disengages from rear connectors.
2.	GASMAP Analyzer Module, Front panel **CAUTION:** It requires at least three (3) persons to remove and lift GASMAP from the HRF Rack. Slide GASMAP Analyzer Module - Forward Slide Stop - Lift Remove GASMAP from HRF Rack	

T: ____ QA: ____

6.2.2 GASMAP Calibration Module

TABLE 6.8 GASMAP CALIBRATION MODULE

Step	Payload	HRF Rack
1.		GASMAP Calibration Module, Front panel • Right handle bolt - Unfasten • Left handle bolt - Remove **NOTE**: Pull drawer out until payload disengages from rear connectors.
2.	GASMAP Calibration Module, Front panel **CAUTION:** It requires at least two (2) persons to remove and lift GASMAP from the HRF Rack. Slide GASMAP Calibration Module - Forward Slide Stop - Lift Remove GASMAP from HRF Rack	

T: ____ QA: ____

6.2.3 Cooling Stowage Drawer

TABLE 6.9 COOLING STOWAGE DRAWER

Step	Payload	HRF Rack
1.		Cooling Stowage Drawer, Front panel • Locks - Locked • Depress - Button • Handles - Open **NOTE**: Push both handles down simultaneously until payload disengages from rear connectors. • Handles - Closed • Locks - Locked
2.	Cooling Stowage Drawer, Front panel **NOTE**: It requires at least two (2) persons to remove and lift Cooling Stowage Drawer from the HRF Rack. Slide Cooling Stowage Drawer - Forward Slide Stop - Lift Remove Cooling Stowage Drawer from HRF Rack	

T: ____ QA: ____

6.2.4 Ultrasound

TABLE 6.10 ULTRASOUND

Step	Payload	HRF Rack
1.		Ultrasound Unit Assy, Front panel Remove and stow mounting hardware
2.		Ultrasound Unit Assy, Front panel • Left handle bolt - Remove • Right handle bolts - Unfasten **NOTE**: Pull drawer out until payload disengages from rear connectors.
3.	Ultrasound Unit Assy, Front panel **CAUTION:** It requires at least four (4) persons to remove and lift Ultrasound Unit from the HRF Rack. Slide Ultrasound Unit Assy - Forward Slide Stop - Lift Remove Ultrasound Unit Assy. from HRF Rack	

T: ____ QA: ____

6.2.5 Workstation

TABLE 6.11 WORKSTATION

Step	Payload	HRF Rack
1		HRF Wrkstn, Front panel • Left handle bolt - Remove • Right handle bolt - Unfasten **NOTE**: Pull drawer out until payload disengages from rear connectors.
2	HRF Wrkstn, Front panel **CAUTION**: It requires at least two (2) persons to remove and lift HRF Wrkstn from the HRF Rack. Slide HRF Wrkstn - Forward Slide Stop - Lift Remove HRF Wrkstn from HRF Rack	

T: ____ QA: ____

6.2.6 ISIS Drawers

TABLE 6.12 ISIS DRAWERS

Step	Payload	HRF Rack
1		ISIS Drawers, Front panel • Locks - Locked • Depress - Button • Handles - Open **NOTE**: Push both handles down simultaneously until payload disengages from rear connectors. • Handles - Closed • Locks - Locked
2	ISIS Drawers, Front panel **NOTE**: It requires at least two (2) persons to remove and lift ISIS Drawers from the HRF Rack. Slide ISIS Drawers - Forward Slide Stop - Lift Remove ISIS Drawers from HRF Rack	

T: ____ QA: ____

6.3 BONDING

Each payload drawer must meet the bonding specification referenced in document SSP 30245 Rev D. The HRF Rack cannot be activated until bonding of the drawers has been verified. Resistance of 100 milliohms or less is necessary for shock hazard safety reasons. A resistance of 2.5 milliohms or less is needed for tests such as EMI.

6.3.1 GASMAP Analyzer Module

TABLE 6.13 GASMAP ANALYZER MODULE

Step	Payload	GSE
1.	GASMAP Analyzer Module, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	GASMAP Analyzer Module, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.3.2 GASMAP Calibration Module

TABLE 6.14 GASMAP CALIBRATION MODULE

Step	Payload	GSE
1.	GASMAP Calibration Module, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	GASMAP Calibration Module, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.3.3 Cooling Stowage Drawer

TABLE 6.15 COOLING STOWAGE DRAWER

Step	Payload	GSE
1.	Cooling Stowage Drawer, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	Cooling Stowage Drawer, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.3.4 Ultrasound

TABLE 6.16 ULTRASOUND

Step	Payload	GSE
1.	Ultrasound Unit Assy, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	Ultrasound Unit Assy, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.3.5 Workstation

TABLE 6.17 WORKSTATION

Step	Payload	GSE
1.	HRF Wrkstn, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	HRF Wrkstn, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.3.6 ISIS Drawers

TABLE 6.18 ISIS DRAWERS

Step	Payload	GSE
1.	ISIS Drawers, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.1 Verify the following: • Drawer to HRF Rack resistance <100 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	ISIS Drawers, Front Panel Perform bonding test per SSP 30245 Rev. D, Section 3.2.1.2 Verify the following: • Drawer to HRF Rack resistance <2.5 milliohms	Milliohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____ N/A: ____ T: ____ QA: ____

T: ____ QA: ____

6.4 ISOLATION

Isolation tests of the HRF Rack must meet the specification referenced in document SSP30240. Once the isolation has been proven to be greater than or equal to one (1) megaohm the HRF Rack can be powered.

TABLE 6.19 RACK ISOLATION

Step	HRF Rack	GSE
1.	HRF Rack, P1 Connector, Pin A Perform isolation test per SSP 30240 Rev. B Verify the following: • Meter reads ≥ 1 Megohm	Megohm Meter Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
2.	HRF Rack, P1 Connector, Pin C Perform isolation test per SSP 30240 Rev. B Verify the following: • Meter reads ≥ 1 Megohm	
3.	HRF Rack, P2 Connector, Pin A Perform isolation test per SSP 30240 Rev. B Verify the following: • Meter reads ≥ 1 Megohm	
4.	HRF Rack, P2 Connector, Pin C Perform isolation test per SSP 30240 Rev. B Verify the following: • Meter reads ≥ 1 Megohm	

T: ____ QA: ____

6.5 ONLINE PAYLOAD FUNCTIONALS

In order to perform online payload functionals, the HRF Rack must be activated using the LS-71139-5 document Section 6.0.

6.5.1 GASMAP Analyzer Module

This sequence describes the functional procedure performed on the HRF GASMAP units. This procedure is conducted with the following assumptions:

- The analyzer has been calibrated.
- The functionality of the GASMAP payload including the following subsystems:
  - Analyzer Roughing
  - System Power
  - Front Panel Controls
  - Identification
  - Environmental Sensor
  - Flow Meter
  - Room Air Measurement
  - Gas Delivery System

The following list provides the flight units that are needed to perform on-line functional tests.

TABLE 6.20 GASMAP ANALYZER MODULE HARDWARE

Qty	Item	Class
1	Analyzer Module	Class I
1	Catheter	Class I
1	Flowmeter Cable	Class I
1	Flow Cartridge	Class I

Once the GASMAP payload has successfully completed online functional testing, it is considered completely operational and can be used during testing of the HRF Rack.

TABLE 6.21 GASMAP ANALYZER FUNCTIONAL

Step	PRCU	HRF Rack	Payload
1.		HRF Rack, Upper Front Panel Verify the following: Subrack D2 pwr sw - off	
2.	Activate GASMAP Analyzer Module per LS-71139-5 Section 6.0 N/A: ____ T: ____ QA: ____	Activate GASMAP Analyzer Module per LS-71139-5 Section 6.0 N/A: ____ T: ____ QA: ____	
3.			GASMAP Analyzer Module, “Main Menu” screen Select: “Diag” <3> Select: “Display” <1> Select: “Devices” <3> Select: “Ion Pump” <1> Verify the following appears: • “Ion Pump” screen
4.			GASMAP Analyzer Module, “Ion Pump” screen Record the following measurements: IPC = _____ µA (< 20 µA) IPV = _____ V (4500 – 6300 V)
5.			GASMAP Analyzer Module, Front Panel Select: <MAIN MENU> Verify the following appears: • “Main Menu” screen
6.			GASMAP Analyzer Module, “Main Menu” screen Select: “Diag” <3> Select: “Test” <3> Select: “LCD” <2> Verify the following: • All LCD segments are functional
7.			GASMAP Analyzer Module, “LCD Test” screen Select: <MAIN MENU> Verify the following appears: • “Main Menu” screen
8.			GASMAP Analyzer Module, “Main Menu” screen Select: “Diag” <3> Select: “Test” <3> Select: “Lamp” <4> Verify the following appears: • “Lamp Test” screen

TABLE 6.21 GASMAP ANALYZER FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
9.			GASMAP Analyzer Module, "Lamp Test" screen Select: <1> Select: <2> Verify the following: • "ERROR" LED is on • "CHECK LCD" LED is on
10.			GASMAP Analyzer Module, "Lamp Test" screen Select: <1> Select: <2> Verify the following: • "ERROR" LED is off • "CHECK LCD" LED is off
11.			GASMAP Analyzer Module, "Lamp Test" screen Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
12.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Test" <3> Select: "Keypad" <1> Verify the following appears: • "Key Pad Test" screen
13.			GASMAP Analyzer Module, "Keypad Test" screen Select each key three (3) times, except <ESC> Verify the following: • All keys are functional
14.			GASMAP Analyzer Module, "Keypad Test" screen Select: <ESC> Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
15.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Display" <1> Select: "System" <1> Select: "About" <1> Verify the following appears: • "About HRF GASMAP" screen
16.			GASMAP Analyzer Module, "About HRF" screen Record the following information: HRF GASMAP S/N: _____ HRF GASMAP IS S/W Version: _____ HRF GASMAP RAMS S/W Version: _____ HRF GASMAP Ethernet Address: _____ HRF GASMAP IP Address: _____ Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen

TABLE 6.21 GASMAP ANALYZER FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
17.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Display" <1> Select: "Devices" <3> Select: <↓ > Select: "Environment" <2> Verify the following appears: • "Environment" screen
18.			GASMAP Analyzer Module, "Environment" screen Record the following information: • Cabin Temperature: _____ º C • Barometric Pressure:_____ mmHg
19.		Record the following information: • Ambient Temperature:_____ºC • Barometric Pressure: _____ mmHg	
20.			GASMAP Analyzer Module, Cabin Temperature Sensor Place finger on sensor for 10-20 seconds Verify the following: • Sensor temperature increases
21.			GASMAP Analyzer Module, Cabin Temperature Sensor Remove finger from sensor Verify the following: • Sensor temperature decreases Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
22.			Connect the following hardware: • Turbine flow meter Ground Support Equipment (GSE) to GASMAP Analyzer Module, J6
23.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Test" <3> Select: "VMM" <3> Verify the following appears: • "VMM Test" screen
24.			Breathe into the flow meter: • Perform two slow inhales Verify the following: • Front panel inhale value increases during inhales • Perform two slow exhales Verify the following: • Front panel exhale value increases during exhales
25.			GASMAP Analyzer Module, "VMM Test" screen Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
26.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Setup" <2> Select: "Sample Draw" <5> Verify the following appears: • "Sample Draw" screen

TABLE 6.21 GASMAP ANALYZER FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
27.			GASMAP Analyzer Module, "Sample Draw" screen Select: "Cath Pump" <1> Select: <ENTER> Verify the following appears: • "Diag Setup" screen
28.			GASMAP Analyzer Module, "Diag Setup" screen Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
29.			GASMAP Analyzer Module, "Main Menu" screen Select: "Operate" <4> Select: "Default1" <1> Verify the following appears: • "Atmospheric Information" screen **NOTE**: Wait thirty (30) seconds before proceeding.
30.			GASMAP Analyzer Module, "Atmospheric Information" screen Record the following information: Gas Rm Air Measured Limits N_2 78.08%_____ 77.08<X<79.08% O_2 20.93%_____ 19.93<X<21.93% CO_2 0.05% _____ 0<X<0.25% Ar 0.94% _____ 0.64<X<1.24%
31.			GASMAP Analyzer Module, "Atmospheric Information" screen Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen
32.			GASMAP Analyzer Module, "Main Menu" screen Select: "Diag" <3> Select: "Display" <1> Select: "Devices" <3> Select: "CathPmp" <2> Verify the following appears: • "Catheter Pump" screen
33.			GASMAP Analyzer Module, "Catheter Pump" screen Record the following information: • Catheter Flow: _____ ml/min (60 ± 5 ml/min) • Place finger over end of catheter to block flow Record the following information: • Catheter Flow: _____ ml/min (≤ 10 ml/min) Verify the following: • "ERROR" LED is on
34.			GASMAP Analyzer Module, "Catheter Pump" screen Select: <MAIN MENU> Verify the following appears: • "Main Menu" screen

TABLE 6.21 GASMAP ANALYZER FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
35.			GASMAP Analyzer Module, "Main Menu" screen Perform Section 6.3.1.1 of LS-71139-5 to clear "ERROR" LED NOTE: Allow GASMAP to run for at least one (1) hour before powering down unit. Record the following values prior to deactivation: IPC: _____ μA IPV: _____ V
36.	Deactivate GASMAP Analyzer Module per LS71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	Deactivate GASMAP Analyzer Module per LS71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	
37.			Disassemble All GASMAP hardware N/A: _____ T: _____ QA: _____

T: ____ QA: ____

6.5.2 GASMAP Calibration Module

This section describes the procedures for the functional test of the GASMAP Calibration Module. The following table describes the flight units that are needed to perform on-line functional tests.

TABLE 6.22 GASMAP CALIBRATION MODULE HARDWARE

Qty	Item	Class
1	GASMAP Calibration Module	Class I
1	Variable pwr Supply	Class I
1	External Low Pressure Gauge	Class I
1	Calibration Solenoid Test Box	Class I
1	Hose Assy.	Class I

The objective of this test is to assess the functionality of the GASMAP Calibration Module after integration into the HRF Rack.

TABLE 6.23 GASMAP CALIBRATION MODULE FUNCTIONAL

Step	PRCU	HRF Rack	Payload
1.			GASMAP Cal Module, Front Panel Verify the following: • Valve 1 - closed • Valve 2 - closed • Valve 3 - closed
2.			Connect the following hardware: GSE Calibration Solenoid Test Box to Variable Power Supply
3.			GASMAP Cal Module, Front Panel Connect the following: • GSE Calibration Solenoid Test Box, P1 to GASMAP Cal Module, J1 (SOL POWER)

TABLE 6.23 GASMAP CALIBRATION MODULE FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
4.			Variable Power Supply, front panel Main Power sw - on • Set Value: 12 V • Set Value: 2 amps Record the following information: Model: _____ NASA Tag #: _____ Calibration #: _____ Calibration Date: _____
5			GASMAP Cal Module, Front Panel Connect the following: • GASMAP Cal Module (sample output) to Catheter
6			GASMAP Cal Module, Front Panel • Valve 1 - open • Valve 2 - open • Valve 3 - open **NOTE**: Valves can be opened by rotating knobs clockwise one (1) to three (3) times.
7			GASMAP Cal Module, Front Panel Verify/Record the following information: Tank 1:_____ psi (400≤P≤1450) Tank 2: _____ psi (400≤P≤1450) Tank 3: _____ psi (400≤P≤1450)
8			GSE Calibration Solenoid Test Box • SW1 - on • SW2 - off • SW3 - off • SW4 - off Verify the following: SOL1 LED is illuminated green **NOTE**: Allow fifteen (15) seconds for the pressure to stabilize before continuing with the following step.
9			External (Extnl) Low Pressure Gauge, Front Panel Record the following information: • Tank 1 pressure: _____ psi (6≤P≤9)
10			GSE Calibration Solenoid Test Box • SW1 - off • SW2 - off • SW3 - off • SW4 - off
11.			GASMAP Cal Module, Front Panel Disconnect the following: • GASMAP Calibration Module (sample output) from Catheter **NOTE**: The catheter is disconnected to relieve pressure on the unit.
12.			GASMAP Cal Module, Front Panel Connect the following: • GASMAP Calibration Module (sample output) to Catheter
13.			Extnl Low Pressure Gauge, Front Panel Verify the following: • Gauge reading is < 1 psi

TABLE 6.23 GASMAP CALIBRATION MODULE FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
14.			GSE Calibration Solenoid Test Box • SW1 - off • SW2 - on • SW3 - off • SW4 - off Verify the following: • SOL2 LED is illuminated • Audible click can be heard **NOTE**: Allow fifteen (15) seconds for the pressure to stabilize before continuing with the following step.
15.			Extnl Low Pressure Gauge, Front Panel Record the following information: • Tank 2: _____ psi (6≤P≤10)
16.			GSE Calibration Solenoid Test Box • SW1 - off • SW2 - off • SW3 - off • SW4 - off
17.			GASMAP Cal Module, Front Panel Disconnect the following: • GASMAP Calibration Module (sample output) from Catheter **NOTE**: The catheter is disconnected in order to relieve pressure on the unit. When the pressure has been relieved, continue on with the following step.
18.			GASMAP Cal Module, Front Panel Connect the following: • GASMAP Calibration Module (sample output) to Catheter
19.			Extnl Low Pressure Gauge, Front Panel Verify the following: • Gauge reading is < 1 psi
20.			GSE Calibration Solenoid Test Box • SW1 - off • SW2 - off • SW3 - on • SW4 - off Verify the following: • SOL3 LED is illuminated • Audible click can be heard **NOTE**: Allow fifteen (15) seconds for the pressure to stabilize before continuing with the following step.
21.			Extnl Low Pressure Gauge, Front Panel Record the following information: • Tank 3 pressure: _____ psi (6≤P≤9)
22.			GSE Calibration Solenoid Test Box • SW1 - off • SW2 - off • SW3 - off • SW4 - off
23.			GASMAP Cal Module, Front Panel Disconnect the following: • GASMAP Calibration Module (sample output) from Catheter **NOTE**: The catheter is disconnected to relieve pressure on the unit.

TABLE 6.23 GASMAP CALIBRATION MODULE FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
24.			Extnl Low Pressure Gauge, Front Panel Verify the following: • Gauge reading is < 1 psi
25.			Variable Power Supply Main pwr sw - off
26.			Disconnect the following hardware: • GSE Calibration Solenoid Test Box from Variable Power Supply
27.			GASMAP Cal Module, Front Panel Disconnect the following: • GSE Calibration Solenoid Test Box, P1 from GASMAP Cal Module, J1 (SOL POWER)
28.			GASMAP Cal Module, Front Panel • Valve 1 - closed • Valve 2 - closed • Valve 3 - closed
29.			Disassemble all GASMAP hardware

T: ____ QA: ____

6.5.3 Cooling Stowage Drawer

This section describes the procedures for the functional test of the Cooling Stowage Drawer. The following table describes the flight units that are needed to perform on-line functional tests.

TABLE 6.24 COOLING STOWAGE DRAWER HARDWARE

Qty	Item	Class
1	Cooling Stowage Drawer	Class I

The objective of this test is to assess the functionality of the Cooling Stowage Drawer after integration into the HRF Rack.

TABLE 6.25 COOLING STOWAGE DRAWER FUNCTIONAL

Step	PRCU	HRF Rack	Payload
1.	Activate Cooling Stowage Drawers per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	Activate Cooling Stowage Drawers per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	
2.			Cooling Stowage Drawer Verify the following: • Fan audibly engages
3.	Deactivate Cooling Stowage Drawers per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	Deactivate Cooling Stowage Drawers per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	

T: _____ QA: _____

6.5.4 Ultrasound

The Ultrasound functional test confirms the Ultrasound System is working properly and focuses on the modified Commercial-Off-The-Shelf (COTS) ultrasound components. The test accurately assesses eighty-five percent (85%) of the system and will confirm the functionality of those systems and the following subsystems:

- System Software
- Critical Data Pathways
- Video Tape Recorder Power/Power Supply Board
- Fans/Tachometer
- DC Interface Module
- DC/DC Converter (Primary)
- Front Panel LED

The following list provides the flight units that are needed to perform on-line functional tests.

TABLE 6.26 ULTRASOUND HARDWARE

Qty	Item	Class
1	Unit Assy	Class I
1	Keyboard Module Assy	Class I
1	Keyboard Cable Assy	Class I
1	External Monitor Cable Assy	Class I
1	Monitor Cable Assy	Class I
1	HRF Monitor	Class I
1	Ultrasound Scanhead	Class I

Upon successful completion of the functional testing, the Ultrasound payload can be used for HRF Rack testing purposes.

TABLE 6.27 ULTRASOUND FUNCTIONAL

Step	PRCU	HRF Rack	Payload
1.		Activate Ultrasound Unit Assy per LS-71139-5 Section 6.0	
2.			HRF Monitor, front panel Verify the following appears: • Sonogram Screen • Operational Clock **NOTE**: If warning or error banners appear, record them in the error log by pressing the <Superkey><THI<0> two (2) times before proceeding with the following step. Remove scanhead from the Ultrasound
3.			Keyboard Module Assy, Top Panel Select: <Superkey> <0> Verify the following appears: • Ultrasound Login display

TABLE 6.27 ULTRASOUND FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
4.			Keyboard Module Assy, Top Panel At the "User" prompt: Type: csr <Enter> At the "Password" prompt: Type: user <Enter> Select: "OK" button
5.			Keyboard Module Assy "Tests and Utilities" Screen Select: FREEZE Select: "Test, Utils" button Verify the following appears: • "Machine Components" Screen
6.			Keyboard Module Assy "Machine Components" Screen Select: "Machine…" Verify the following: • "2D Ultrasound" is highlighted
7.			Keyboard Module Assy "Machine Components" Screen Select: "Tests & Utils." Verify the following: • "Test and Utilities" Screen appears
8.			Keyboard Module Assy "Test and Utilities" Screen Select: End-to-End Test Select: "Execute" button Verify the following: • Test indicates PASS
9.			Keyboard Module Assy "Test and Utilities" Screen Select: Back-End Test Select: "Execute" button • Wait approximately two (2) minutes Verify the following: • Test indicates PASS
10.			Keyboard Module Assy "Test and Utilities" Screen Select: "Components" button Verify the following: • "Machine Components" screen appears
11.			Keyboard Module Assy "Machine Components" Screen Select: "Color Ultrasound" Select: "Test & Utils." button Verify the following: • "Test and Utilities" screen appears
12.			Keyboard Module Assy "Test and Utilities" Screen Select: End-to-End Test Select: "Execute" button • Wait approximately two (2) minutes Verify the following: • Test indicates PASS
13.			Keyboard Module Assy "Tests and Utilities" Screen Select: Back-End Test Select: "Execute" button Verify the following: • Test indicates PASS

TABLE 6.27 ULTRASOUND FUNCTIONAL (CONT'D)

Step	PRCU	HRF Rack	Payload
14.			Keyboard Module Assy "Tests and Utilities" Screen Select: "Components" Select: "Go to Top Level…" button Select: "Machine…" Select: "Test & Utils." button Verify the following: • "Test and Utilities" screen appears
15.			Keyboard Module Assy "Test and Utilities" Screen Select: "Comprehensive Test" Select: "Execute" button **NOTE**: Execution of this test takes approximately twenty (20) minutes. Verify the following: • Test indicates PASS
16.			Keyboard Module Assy "Test and Utilities" Screen Select: "Close" Verify the following: • "ATL" window appears
17.			Reattach Scanhead to Ultrasound Unit **NOTE**: Reattach Scanhead by keeping the handle in an upright position and slide Scanhead back to connect to the Ultrasound unit. Lock in place by rotating the handle to the right.
18.			Keyboard Module Assy " ATL" Window Select: "REBOOT"
19.			HRF Monitor, front panel Verify the following appears: • Sonogram Screen • Operational Clock **NOTE**: If warning or error banners appear, record them in the error log by pressing the <Superkey><THI<0> two (2) times.
20.	Deactivate Ultrasound Unit Assy per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	Deactivate Ultrasound Unit Assy per LS-71139-5 Section 6.0 N/A: _____ T: _____ QA: _____	

T:_____ QA:_____

6.5.5 Workstation

This section describes the procedures for the functional test of the Workstation payload drawer.

The following table describes the flight units that are needed to perform on-line functional tests.

TABLE 6.28 WORKSTATION HARDWARE

Qty	Item	Class
1	HRF Workstation	Class I
1	HRF Workstation Keyboard	Class I
1	HRF Monitor	Class I
1	Workstation RGB Cable	Class I
1	Workstation (WS) Keyboard Cable	Class I
1	Serial cable	Class I
1	SCSI Terminator	Class I
1	Common Power Cable	Class I

Once the Workstation payload has successfully completed functional testing, it can be used for the HRF Rack testing purposes.

TABLE 6.29 WORKSTATION FUNCTIONAL

Step	PRCU	HRF Rack 1	Payload
1.	Activate Workstation per LS-71139-5 Section 6.0.	Activate Workstation per LS-71139-5 Section 6.0.	
2.			AT "user" prompt: Type: "administrator" At "password" prompt: Select: "hrf" Verify the following: "Windows NT" desktop appears
3.			HRF Wrkstn, "Windows NT" desktop Select: "Start" menu Navigate to: "CSW User Interface" Verify the following: "HRF" screen appears
4.			HRF Wrkstn, "HRF" screen Select: "HRF Exit" button Verify the following: Dialog box appears
5.			HRF Wrkstn, dialog box Select: "Yes" button Verify the following: "Windows NT" desktop appears
6.			HRF Wrkstn, "Windows NT" desktop Select: "Start" menu Select: "Programs" Select: "Workstation" Verify the following: "Workstation" window appears
7.			HRF Wrkstn, "Workstation" window Select: "Individual tests" button Select: "Graphics test" button Verify the following: Dialog box appears **NOTE:** Execution of this test takes approximately twenty (20) minutes.

TABLE 6.29 WORKSTATION FUNCTIONAL (CONT"D)

Step	PRCU	HRF Rack 1	Payload
8.			HRF Wrkstn, Dialog box Select: "Yes" button
9.			HRF Wrkstn, "Workstation" window Verify the following: "Graphics Test: "OK" message appears
10.			HRF Wrkstn, "Workstation" window Select: "Exit" button Verify the following: Dialog box appears
11.			HRF Wrkstn, Dialog box Select: "Yes" button Verify the following: "Windows NT" desktop appears
12.	Deactivate Workstation per LS-71139-5 Section 6.0.	Deactivate Workstation per LS-71139-5 Section 6.0.	

T:_____ QA:_____

6.6 MECHANICAL INTERFACE CHECKS

TBD

APPENDIX A

Forms
For reference purposes only.

1. PROJECT CODE	2. JPIC CODE	**TASK PERFORMANCE SHEET** NASA - LYNDON B. JOHNSON SPACE CENTER				
3. TYPE A	CONFIGURATION CHANGE		4. TPS NO.		5. PAGE	OF
	PERMANENT	TEMPORARY	6. MOD SHEET(S) NUMBER(S)	7. ORG.	8. SYSTEM	9. NEED DATE
B	NONCONFIGURATION CHANGE					
10. PART NAME		11. PART NO./DRAWING NO.		12. SERIAL/LOT	13. TIME/CYCLE/SHELF LIFE ☐ YES ☐ NO	
14. APPLICABLE DOCUMENTS		15. CONTRACT NO./JOB NO.		16. HAZ. TASK ☐ YES ☐ NO	17. ENG. EVAL. ☐ YES ☐ NO	
18. SHORT TITLE OF TPS					19. ADP UPDATE ☐ YES ☐ NO	

20. OPER SEQ. NO.	21. OPERATIONS *(Print, Type, or Write Legibly)*	VERIFICATION 22. TECH.	23. QA/DV

24. ORIGINATOR	DATE	25. FINAL ACCEPTANCE STAMP AND DATE

APPROVALS *(Printed or Typed and Signed)*

26. PROJECT ENGINEER	DATE	27. QUALITY ENGINEER	DATE
28.		29.	
30.		31.	

JSC Form 1225 (Rev February 7, 2000) (MS Word August 1996)

Figure A-1 Task Performance Sheet

		5. Page	of
TASK PERFORMANCE SHEET CONTINUATION PAGE NASA - LYNDON B. JOHNSON SPACE CENTER		4. TPS NO.	
		6. MOD NO.	

20. OPER SEQ. NO.	21. OPERATIONS *(Print, Type, or Write Legibly)*	VERIFICATION 22. TECH.	23. QA/DV

JSC Form 1225A (Rev February 7, 2000) (MS Word August 1996)

Figure A-2 Task Performance Continuation Sheet

1. JPIC

Discrepancy Report/Material Review Record
NASA - Lyndon B. Johnson Space Center

2. Page 1 of ____

3. Ref. Doc #	4. JOB #	5. DR #	
6. Name of Top Assy.	7. Drawing or P/N	8. S/N or Lot #	9. Qty.
10. Name of Sub Assy	11. Drawing or P/N	12. S/N or Lot #	13. Qty.
14. Name of Component	15. Drawing or P/N	16. S/N or Lot #	17. Qty.

18. Description of nonconformance

19. Initiator's name (print and sign)	20. Title/Stamp No.	21. Org.	22. Location	23. Date
24. Responsible Engineer/Mail Code	25. CHRP Code	26. CAGE Code	27. Time/cycles used	

xx. Category ☐ Critical ☐ Major ☐ Minor

29. PRACA Reportable ☐ Yes ☐ No

30. Configuration Change? ☐ Yes ☐ No

31. Waiver? ☐ Yes ☐ No

32. Corrective Action ☐ Yes ☐ No

FIAR # _____ DCN # _____ Waiver # _____ CAS # _____

33. Final Disposition
☐ Rework ☐ Repair ☐ Change Classification ☐ Scrap
☐ Use-as-is ☐ Return to vendor/supplier ☐ Written in error

34. MRB Req'd?
☐ Yes ☐ No

35. Final Acceptance Stamp and Date

Material Review Board
(approvals must be typed or printed and signed)

36. Stress Engineer	Date	37. Materials Engineer	Date
38. Project Engineer	Date	39. Quality Engineer	Date
40. Other (print or type title)	Date	41. QA Rep. (NASA)	Date

T1 Resp. Org. T2 HW Type T3 Prev. Cond. T4 Fail. Mode T5 Defect T6 Remedial Act. T7 Cause T8 Recur. Ctrl. T9 Perf. Org. T10 Proc. Flow

JSC Form 2176 (Rev August 10, 1999) (MS Word Sep 97)

Figure A-3 Discrepancy Report/Material Review Record

1. IDR #

2. DR #

Discrepancy Report/Material Review Record

NASA - Lyndon B. Johnson Space Center

3. Page ____ of ____

Continuation Sheet

4. Insp. Pts.	5. Seq. No.	6. Instructions *(Print, type, or write legibly)*	7. Verification Stamps Tech.	Qual.

8. Final Acceptance Stamp and Date

JSC Form 2176A (Sep 97) (MS Word Sep 97)

Figure A-4 Discrepancy Report/Material Review Record Continuation Sheet

1. DR #

2. Page ____ of ____

Discrepancy Report/Material Review Record

NASA - Lyndon B. Johnson Space Center

Summary Sheet

3. Configuration Change?	4. CCBD #	5. PRACA #
☐ No ☐ Yes DCN #		

6. Remedial Action

7. Root Cause

8. Corrective Action (Recurrence Control)

MRB APPROVAL

9. Stress Engineer (Print and sign)	Date	10. Materials Engineer (Print and sign)	Date
11. Project Engineer (Print and sign)	Date	12. Quality Engineer (Print and sign)	Date
13. Other (Print and sign)	Date	14. QA Rep. (NASA) (Print and sign)	Date

JSC Form 2176B (Oct 97) (MS Word Sep 97)

Figure A-5 Discrepancy Report/Material Review Record Summary Sheet

1. DR #

2. Page ___ of ___

Discrepancy Report/Material Review Record

NASA - Lyndon B. Johnson Space Center

Multiple Disposition Coding Sheet

	T1 Resp. Org.	T2 HW Type	T3 Prev. Cond.	T4 Fail. Mode	T5 Defect	T6 Remedial Act.	T7 Cause	T8 Recur. Ctrl.	T9 Perf. Org.	T10 Proc. Flow
A.										
B.										
C.										
D.										
E.										
F.										

3. Quality Engineer (Print and Sign) Date

JSC Form 2176C (Oct 97) (MS Word Oct 97)

Figure A-6 Discrepancy Report/Material Review Record Multiple Disposition Coding Sheet

LOCKHEED MARTIN

FLASH REPORT

For Safety and Product Assurance use only

NASA mishap no.	
OSHA file no.	

GENERAL INFORMATION	
1. Date (MM/DD/YY)	2. Time ☐ a.m. or ☐ p.m.
3. Building number/location	4. Specific area

5. Category of incident (check appropriate box)

☐ Injury/accident ☐ Fire

☐ Auto accident ☐ Explosion

☐ Chemical spill ☐ Other

6. Description of incident (explain what happened, including cause or description of failure)

7. SEAT involvement (name of organization)

PERSONNEL INVOLVED	
8. Name (last, first, middle initial)	9. Telephone
CONTACT PERSON	
10. Name (last, first, middle initial)	11. Telephone

FORM SEAT 094 (09/23/97)

Figure A-7 Flash Report

DISPOSAL INVENTORY
FOR MISCELLANEOUS HAZARDOUS WASTES

GENERAL NOTES:

1. Waste sources must be identified.
2. Exceptions:
   See JSCI 8837 (current issue) for disposal methods for batteries, ether, explosives, empty drums, paint and chemical containers, radioactive and biological wastes, and precious metals.
3. Containers must be waterproof.
4. Containers must be labeled; all unlabeled containers will be returned to generators for proper identification.
5. For pickup, call x32038

TO BE COMPLETED BY WASTE GENERATOR.

DATE
BUILDING NO.
ROOM NO.
NAME
PHONE EXTENSION
MAIL CODE
CARTON NO. _____ OF _____
Provide the following information at time of pickup: **PICK-UP TICKET NO.:**

INVENTORY

(Use a separate form for each carton of waste.
A copy of Inventory must be in or on each carton.)

IDENTIFICATION AND SOURCE OF WASTE	AMOUNT	IDENTIFICATION AND SOURCE OF WASTE	AMOUNT

JSC Form 1161 (Rev Aug 97) (MS Word Aug 97) COPY 1 - SHIPPING COPY 2 COPY 3 - ORIGINATOR

Figure A-8 Disposal Inventory for Miscellaneous Hazardous Wastes

Repetitive Operations Log						
Document Number : LS 71139-4 Rev ___						Page ____ of ____
Section Number	Step Number(s)	Test Conductor	Date	Tech	QA	Reason/Remarks

Figure A-9 Repetitive Operations Log

Deviation						Page ___ of ___
TPS Number:			Document Number:		Project Manager:	Test Engineer:
Dev No	Section	Step	Type (P/T)	Change		Reason
Originator:				Phone:	Date:	Quality Engineer:

Figure A-10 Deviation Sheet

Deviation Continuation Page				TPS Number:	Document Number:	Page ___ of ___
Dev No	Section	Step	Type (P/T)	Change	Reason	

Figure A-11 Deviation Continuation Sheet

APPENDIX B

Illustrations

N/A

DISTRIBUTION
FOR LS-71139-4B

NASA/JSC
EA5/L. Bauer
EA5/E. Strong
NT3/GFE Assurance Branch
SF/D. Grounds

LOCKHEED MARTIN
C20/G. Harvey
C42/M. Gerlach
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C64/R. Henneke
C64/D. Reed
C64/R. Trittipo
C64/T. Wiggins
S03/D. Babic
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