Cm#: FAST-TEV-013

Preliminary

ENVIRONMENTAL VERIFICATION TEST PLAN OUTLINES

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    - Reason for test (workmanship, survival or performance in certain environments, obtaining data to verify math model, qualification of design, acceptance of flight item, etc.)
    - Origin of requirements (requirements document, verification plans, etc.)
    - If a retest state reasons
  1.3 Pass/Fail Criteria
    - Identify levels that may not be exceeded or levels that must be achieved.
  1.4 Test Item Description
    - Dimensions
    - Weight
    - Physical attributes (center of gravity, etc.)
    - Unit type (ie flight, protoflight, prototype, spare, etc.)
    - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
    - Serial number
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    - Safety Plan
    - Contamination Control Plan
    - Handling Procedures
    - Operation Hazard Analysis

2.0 Test Organization
  2.1 Test Team
    - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor	Mechanical Lead
Quality Assurance Representative	Test Facility Engineer
Contamination Engineer	Safety Representative

3.0 Special Precautions/Instructions

3.1 Safety

- Safety considerations
- Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)

3.2 Precautions

- Restrictions on adhesives, cleaning agents, etc.
- Identify sensitive areas of test item
- ESD precautions

3.3 Contamination

- Requirements for the facility
- Bagging
- Gloves

3.4 Emergencies

- State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
- Notification procedures

4.0 Test Requirements

4.1 Test Operations

- Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.

4.2 Procedure Redlining

- Identify those with authority to redline document

5.0 Data Acquisition/Reduction

5.1 Acquisition

- Specify parameters to be monitored at specific locations.

5.2 Reduction

- Form in which data is to be prepared and analyzed (PSD plots, level vs. frequency, etc.)

6.0 Support Equipment

6.1 Instrumentation

- Tabular listing of required instrumentation (accelerometers, strain gauges, etc.)
- Locations of instrumentation (include figures or sketches)
- Identify controlling instrumentation
- If no instrumentation required, state so.

6.2 Support Equipment

- Identify all project GSE
- Include layout of GSE
- Identify what facility is expected to provide
  - Test fixtures
  - Electrical services
  - Tables and chairs
  - Telephones
  - Storage for items for extended testing
  - Crane operators for lifts
  - Contamination support
  - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Order tests will be performed (testing is typically completed in one axis prior to preceding to the next)
- Identify data analysis required during test sequence (data analysis typically performed after test)
- Identify when functional/performance tests will be performed and note durations
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Test levels for each test should be presented in tabular and/or graphical format
- Note test duration for random vibration
- Note frequency and number of cycles at full level desired (frequency is limited by shaker max displacement of .75")

7.3 Test Limits (if applicable)

- Identify any special limiting requirements

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture surveys should be specified
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the fixture on/in the facility
- description of how test item is mounted to fixture
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

ACOUSTICS TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Type of test (Acoustics)
- 1.2 Test Objectives
  - Reason for test (workmanship, survival or performance in certain environments, qualification of design, acceptance of flight item, etc.)
  - Origin of requirements (requirements document, verification plans, etc.)
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
  - Identify levels that may not be exceeded or levels that must be achieved.
- 1.4 Test Item Description
  - Dimensions
  - Weight
  - Physical attributes (CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
- 1.5 Test Facility
  - Acoustics Test Facility
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor	Mechanical Lead
Quality Assurance Representative	Test Facility Engineer
Contamination Engineer	Safety Representative

3.0 Special Precautions/Instructions
- 3.1 Safety
  - Safety considerations
  - Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)
- 3.2 Precautions
  - Restrictions on adhesives, cleaning agents, etc.
  - Identify sensitive areas of test item
  - ESD precautions
- 3.3 Contamination
  - Requirements for the facility
  - Bagging
  - Gloves
- 3.4 Emergencies
  - State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
  - Notification procedures

4.0 Test Requirements
- 4.1 Test Operations
  - Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.
- 4.2 Procedure Redlining
  - Identify those with authority to redline document

5.0 Data Acquisition/Reduction
- 5.1 Acquisition
  - Specify parameters to be monitored at specific locations.
- 5.2 Reduction
  - Form in which data is to be prepared and analyzed (PSD plots, etc.)

6.0 Support Equipment
- 6.1 Instrumentation
  - Tabular listing of required instrumentation (accelerometers, etc.)
  - Locations of instrumentation (include figures or sketches)
  - Identify controlling instrumentation
  - If no instrumentation required, state so.
- 6.2 Support Equipment
  - Identify all project GSE
  - Include layout of GSE
  - Identify what facility is expected to provide
    - Test fixtures
    - Electrical services
    - Tables and chairs
    - Telephones
    - Storage for items for extended testing
    - Crane operators for lifts
    - Contamination support
    - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Identify data analysis required during test sequence (data analysis typically performed after test)
- Identify when functional/performance tests will be performed and note durations
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Test levels for each test should be presented in tabular and/or graphical format
- Note test duration

7.3 Test Limits (if applicable)

- Identify any special limiting requirements

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling.
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture if required
- Identify attachment points if the item is to be suspended in test cell.

9.3 Test Set-up

- Description of set-up configurations of test item in facility
- description of how test item is located or suspended in cell

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

MASS PROPERTIES TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Types of tests (random vibration, sine sweep, sine burst, shock, etc.)
- 1.2 Test Objectives
  - Reason for test (obtaining data to verify math model)
  - Origin of requirements (requirements document, verification plans, etc.)
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
- 1.4 Test Item Description
  - Dimensions
  - Approximate weight
  - Physical attributes (estimated CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
- 1.5 Test Facility
  - Toledo Scales (weight)
  - Mass Properties Measurement Facility ,MPMF, for items greater than 50 pounds (weight, CG, MOI, and/or POI)
  - TRIDYNE for CG of items less than 25 pounds
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor
Quality Assurance Representative
Contamination Engineer
Mechanical Lead
Test Facility Engineer
Safety Representative

3.0 Special Precautions/Instructions

3.1 Safety

- Safety considerations
- Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)

3.2 Precautions

- Consider resonances in spin balance
- Restrictions on adhesives, cleaning agents, balance weight materials, etc.
- Identify sensitive areas of test item
- ESD precautions

3.3 Contamination

- Requirements for the facility
- Bagging
- Gloves

3.4 Emergencies

- State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
- Notification procedures

4.0 Test Requirements

4.1 Test Operations

- Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.

4.2 Procedure Redlining

- Identify those with authority to redline document

5.0 Data Acquisition/Reduction

5.1 Acquisition

- Specify parameters to be monitored at specific locations.

5.2 Reduction

- Identify form in which data is to be prepared (typically tabular)
- Weight
- Longitudinal location of CG referenced to the interface plane
- Longitudinal location of balancing machine bearing planes and spacecraft correction planes, referenced to the interface plane
- Unbalance (magnitude and phase) in each machine bearing plane (initial and final values)
- Correction weights and their locations
- Record of interface and reference surface nominal radii and runouts including longitudinal location of reference surface
- Moment of inertia data (may need to compare residual unbalance with specification)
- Product of inertia data

6.0 Support Equipment

6.1 Instrumentation

- Instrumentation is usually an integral part of the test equipment

6.2 Support Equipment

- Identify all project GSE
- Include layout of GSE
- Balance weights (who will supply the weights for test for dynamic balance?)
- Identify what facility is expected to provide
  - Test fixtures
  - Electrical services
  - Tables and chairs
  - Telephones
  - Storage for items for extended testing
  - Crane operators for lifts
  - Contamination support
  - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Order tests will be performed (weight, CG, MOI,etc) and axis (testing is typically completed in one axis prior to preceding to the next)
- Identify data analysis required during test sequence (data analysis typically performed after test)
- Identify when functional/performance tests will be performed and note durations
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Desired accuracy for each test should be presented
- Identify correction planes for balance weights and method of attachment
- Allowable balance weight

7.3 Test Limits (if applicable)

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture measurements should be specified (if fixture designed by project please consult with code 750.2 for guidance)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item and reference point
- Identify correction planes for balance weights and method of attachment
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the fixture on/in the facility
- description of how test item is mounted to fixture
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

MODAL TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Type of test (modal analysis)
- 1.2 Test Objectives
  - Reason for test (obtaining data to verify math model)
  - Origin of requirements (requirements document, verification plans, etc.)
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
  -
- 1.4 Test Item Description
  - Dimensions
  - Weight
  - Physical attributes (CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
  - Results from Dynamic Finite Element Model (frequency, effective mass, shapes)
- 1.5 Test Facility
  - Modal Survey Test Facility
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor
Quality Assurance Representative
Contamination Engineer
Mechanical Lead
Test Facility Engineer
Safety Representative

3.0 Special Precautions/Instructions
- 3.1 Safety
  - Safety considerations
  - Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)
- 3.2 Precautions
  - Restrictions on adhesives, cleaning agents, etc.
  - Identify sensitive areas of test item
  - ESD precautions
- 3.3 Contamination
  - Requirements for the facility
  - Bagging
  - Gloves
- 3.4 Emergencies
  - State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
  - Notification procedures

4.0 Test Requirements
- 4.1 Test Operations
  - Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.
- 4.2 Procedure Redlining
  - Identify those with authority to redline document

5.0 Data Acquisition/Reduction
- 5.1 Acquisition
  - 16 channel digital data acquisition system
- 5.2 Reduction
  - The data reduction will be provided into universal file format

6.0 Support Equipment
- 6.1 Instrumentation
  - Tabular listing of required instrumentation (accelerometers, strain gauges, etc.)
  - Locations of instrumentation (include figures or sketches)
- 6.2 Support Equipment
  - Identify all project GSE
  - Include layout of GSE
  - Identify what facility is expected to provide
    - Test fixtures
    - Electrical services
    - Tables and chairs
    - Telephones
    - Storage for items for extended testing
    - Crane operators for lifts
    - Contamination support
    - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Identify location of nodes and correlate to math model
-

7.3 Test Limits (if applicable)

- Identify any special limiting requirements

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture surveys should be specified
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the fixture on/in the facility
- description of how test item is mounted to fixture
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

STATIC LOADS TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Types of tests
- 1.2 Test Objectives
  - Reason for test (survival or performance in certain environments, obtaining data to verify math model, qualification of design, acceptance of flight item, etc.)
  - Origin of requirements (requirements document, verification plans, etc.)
  - State number of load cases to be performed
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
  - Identify levels that may not be exceeded or levels that must be achieved.
- 1.4 Test Item Description
  - Dimensions
  - Weight
  - Physical attributes (CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
- 1.5 Test Facility
  - Portable Static Test Facility, Universal Static Test Facility, or Universal Testing Machines
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor	Mechanical Lead
Quality Assurance Representative	Test Facility Engineer
Contamination Engineer	Safety Representative

3.0 Special Precautions/Instructions
- 3.1 Safety
  - Safety considerations
  - Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)
- 3.2 Precautions
  - Restrictions on adhesives, cleaning agents, etc.
  - Identify sensitive areas of test item
  - ESD precautions
- 3.3 Contamination
  - Requirements for the facility
  - Bagging
  - Gloves
- 3.4 Emergencies
  - State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
  - Notification procedures

4.0 Test Requirements
- 4.1 Test Operations
  - Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.
- 4.2 Procedure Redlining
  - Identify those with authority to redline document

5.0 Data Acquisition/Reduction
- 5.1 Acquisition
  - Specify parameters to be monitored at specific locations
- 5.2 Reduction
  - Form in which data is to be prepared and analyzed

6.0 Support Equipment
- 6.1 Instrumentation
  - Tabular listing of required instrumentation (strain gauges, LVDTs, etc.)
  - Locations of instrumentation (include figures or sketches)
- 6.2 Support Equipment
  - Identify all project GSE
  - Include layout of GSE
  - Identify what facility is expected to provide
    - Test fixtures
    - Electrical services
    - Tables and chairs
    - Telephones
    - Storage for items for extended testing
    - Crane operators for lifts
    - Contamination support
    - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Test levels for each test should be presented in tabular and/or graphical format

7.3 Test Limits (if applicable)

- Identify any special limiting requirements

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture surveys should be specified
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the hardware in the facility
- description of how test item is mounted to fixture or facility
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

HIGH CAPACITY CENTRIFUGE (HCC) TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Type of test (strength qualification)
- 1.2 Test Objectives
  - Reason for test (survival or performance in certain environments, obtaining data to verify math model, qualification of design, acceptance of flight item, etc.)
  - Origin of requirements (requirements document, verification plans, etc.)
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
  - Identify levels that may not be exceeded or levels that must be achieved.
- 1.4 Test Item Description
  - Dimensions
  - Weight
  - Physical attributes (CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
- 1.5 Test Facility
  - HCC
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor
Quality Assurance Representative
Contamination Engineer
Mechanical Lead
Test Facility Engineer
Safety Representative

3.0 Special Precautions/Instructions

3.1 Safety

- Safety considerations
- Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)

3.2 Precautions

- Restrictions on adhesives, cleaning agents, etc.
- Identify sensitive areas of test item
- ESD precautions

3.3 Contamination

- Requirements for the facility
- Bagging
- Gloves

3.4 Emergencies

- State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
- Notification procedures

4.0 Test Requirements

4.1 Test Operations

- Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.

4.2 Procedure Redlining

- Identify those with authority to redline document

5.0 Data Acquisition/Reduction

5.1 Acquisition

- Specify parameters to be monitored at specific locations.

5.2 Reduction

- Form in which data is to be prepared and analyzed (PSD plots, level vs. frequency, etc.)

6.0 Support Equipment

6.1 Instrumentation

- Tabular listing of required instrumentation (accelerometers, strain gauges, etc.)
- Locations of instrumentation (include figures or sketches)
- Identify controlling instrumentation
- If no instrumentation required, state so.

6.2 Support Equipment

- Identify all project GSE
- Include layout of GSE
- Identify what facility is expected to provide
  - Test fixtures
  - Electrical services
  - Tables and chairs
  - Telephones
  - Storage for items for extended testing
  - Crane operators for lifts
  - Contamination support
  - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Identify data analysis required during test sequence (data analysis typically performed after test)
- Identify when functional/performance tests will be performed and note durations
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Test levels for each test should be presented in tabular format
- Note test duration
-

7.3 Test Limits (if applicable)

- Identify any special limiting requirements

8.0 Pre-test Operations

- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture surveys should be specified
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the fixture on/in the facility
- description of how test item is mounted to fixture
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed

EMI/MAGNETICS TEST PLAN

1.0 Introduction

1.1 Purpose

- Name of test item
- Name of project, payload, and/or system
- Types of tests (magnetics, RE, CE, RS, CS, etc.)

1.2 Test Objectives

- Reason for test (survival or performance in certain environments, qualification of design, acceptance of flight item, etc.)
- Origin of requirements (requirements document, verification plans, etc.)
- If a retest state reasons

1.3 Pass/Fail Criteria

1.4 Test Item Description

- Dimensions
- Weight
- Physical attributes (CG, etc.)
- Unit type (ie flight, protoflight, prototype, spare, etc.)
- Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
- Serial number

1.5 Test Facility

- Identify EMI facility (Large or Small EMI Facility, 20' or 40' Coil Magnetic Facility
- Large EMI facility requires lengthy test cables and additional man-hours for equipment cleaning and personnel working in the cleanroom environment.
- Specify intended location for performance of the magnetic testing if other than the magnetic test site.

1.6 Desired Test Date

1.7 Work Directive Number (assigned after completion of plan)

1.8 Fiscal and Labor JONs

1.9 Applicable Document

- PAR
- GEVS-SE
- Safety Plan
- Contamination Control Plan
- Handling Procedures
- Operation Hazard Analysis

2.0 Test Organization

2.1 Test Team

- Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

Project Manager *
Test item Representative *
Verification manager *

* required

Test Conductor
Quality Assurance Representative
Contamination Engineer
Electrical Lead
Test Facility Engineer
Safety Representative

- List <u>all</u> personnel supporting testing because an access list will need to be generated for evening and weekend testing and the Magnetic Test Site access.

3.0 Special Precautions/Instructions

3.1 Safety

- Safety considerations
- Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)

3.2 Precautions

- Restrictions on adhesives, cleaning agents, etc.
- Identify sensitive areas of test item
- ESD precautions
- External magnetic fields
- Deperm precautionary needs
- Transmitters/receivers
- EED's
- etc.

3.3 Contamination

- Requirements for the facility
- Bagging
- Gloves

3.4 Emergencies

- State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
- Notification procedures

4.0 Test Requirements

4.1 Test Operations

- Narrative describing responsibilities for handling, crane operation, installation, etc.

4.2 Procedure Redlining

- Identify those with authority to redline document

5.0 Data Acquisition/Reduction

5.1 Acquisition

5.2 Reduction

- Provide information on criticality of test data or test report with regard to flight certification needs.

6.0 Support Equipment

6.1 Instrumentation

6.2 Support Equipment

- Identify all project GSE
- Include layout of GSE
- Identify what facility is expected to provide
  - Special test equipment
  - Battery cart (current capacity and voltage setting)
  - Shuttle power line impedance simulation network or other LISN
  - Test fixtures
  - Electrical services
  - Tables and chairs
  - Telephones
  - Storage for items for extended testing
  - Crane operators for lifts
  - Contamination support
  - Hydraset (code 754 policy to use hydraset for all flight hardware)

7.0 Test Program

7.1 Phases/Sequence

- Order tests will be performed
- Identify data analysis required during test sequence
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications

- Define applicable test requirements
- If other than standard GEVS-SE levels, provide the following information relating to the EMC test:
  - Graphs of narrowband and broadband conducted and radiated interference test limits
  - Power line modulation levels and wave form for audio and RF susceptibility tests.
  - Power line transient susceptibility levels. <u>This specification is critical as hardware damage can result if improperly specified</u>.
  - Provide known information on either launch or flight RF environment that would warrant increasing the RF field level at specified test frequencies during susceptibility tests.
  - Provide recommended antenna locations for RF susceptibility and radiated interference tests. Susceptibility locations should be for most likely area(s) of sensitivity to RF fields at a particular frequency band; radiated interference location(s) should be for most likely high levels of noise.
- Define areas of interest regarding magnetics tests, if other than routine GEVS-SE. Specify dipole moment design limit and characteristics of known magnetic devices on the test item.
- Provide an outline of the functional test procedures planned for execution during pre and post test checkout and during susceptibility and generated interference testing. Note that the highest test item sensitivity modes should be specified during susceptibility testing and the noisiest modes should be specified during the interference testing. Also, it is difficult to correlate failure modes if the test item is changing its operational mode simultaneous with the scanning of the frequency range that occurs during EMC testing, so that a static test item operating mode is preferable.

7.3 Test Limits (if applicable)
- Identify any special limiting requirements

8.0 Pre-test Operations
- State briefly the activities that need to be performed prior to arrival of the test item
- Provide estimate of time to conduct pre-test functional tests.
- Note if other tests will be run in order to take advantage of the anechoic or shielded characteristics of the facility.
- Provide information concerning communications needs during test, including possible desirability for time correlation between EMC frequency scans and test item functional performance data records.
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)

9.0 Test Operations

9.1 Test Item
- Include sketches or drawings of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

9.3 Test Set-up
- Description of set-up configurations of the fixture on/in the facility
- Description of how test item is positioned in facility

10.0 Post Test Operations
- Instructions concerning removal of test item
- Instrumentation removal should be addressed

THERMAL VACUUM/THERMAL BALANCE TEST PLAN

1.0 Introduction
- 1.1 Purpose
  - Name of test item
  - Name of project, payload, and/or system
  - Type of test (thermal vacuum, thermal balance, bakeout)
- 1.2 Test Objectives
  - Reason for test (workmanship, survival or performance in certain environments, obtaining data to verify math model, qualification of design, acceptance of flight item, etc.)
  - Origin of requirements (requirements document, verification plans, etc.)
  - If a retest state reasons
- 1.3 Pass/Fail Criteria
  -
- 1.4 Test Item Description
  - Dimensions
  - Weight
  - Physical attributes (CG, etc.)
  - Unit type (ie flight, protoflight, prototype, spare, etc.)
  - Identify presence or absence of items such as spacecraft appendages, attach fittings, connectors, etc.. Identify presence of non-flight items.
  - Serial number
- 1.5 Test Facility
  - Chamber Number
- 1.6 Desired Test Date
- 1.7 Work Directive Number (assigned after completion of plan)
- 1.8 Fiscal and Labor JONs
- 1.9 Applicable Document
  - PAR
  - GEVS-SE
  - Safety Plan
  - Contamination Control Plan
  - Handling Procedures
  - Operation Hazard Analysis

2.0 Test Organization
- 2.1 Test Team
  - Identify personnel involved with composing test plan, developing levels, and performing test. Include codes and telephone extensions.

    Project Manager *
    Test item Representative *
    Verification manager *

    * required

    Test Conductor
    Quality Assurance Representative
    Contamination Engineer
    Thermal Lead
    Mechanical Lead
    Test Facility Engineer
    Safety Representative

  - List <u>all</u> personnel supporting testing because an access list will need to be generated for evening and weekend testing.

3.0 Special Precautions/Instructions

3.1 Safety

- Safety considerations
- Personnel safety concerns which arise as a result of test item, support equipment, or test facility (ie radioactive sources, explosive gasses, flammable material, cryogens, etc.)

3.2 Precautions

- Restrictions on adhesives, cleaning agents, etc.
- Identify sensitive areas of test item
- ESD precautions

3.3 Contamination

- Requirements for the facility
- Bagging
- Gloves

3.4 Emergencies

- State how possible emergency conditions might be accommodated (power loss, building evacuation, etc.)
- Notification procedures

4.0 Test Requirements

4.1 Test Operations

- Narrative describing responsibilities for handling, crane operation, installation of test fixture, etc.

4.2 Procedure Redlining

- Identify those with authority to redline document

5.0 Data Acquisition/Reduction

5.1 Acquisition

- From which instrumentation is data required for a test

5.2 Reduction

- Identify form in which data is to be analyzed and prepared

6.0 Support Equipment

6.1 Instrumentation

- Tabular listing of required instrumentation (thermocouples, etc.)
- Locations of instrumentation (include figures or sketches)
- Identify control instrumentation if required
- If no instrumentation is required, state so.

6.2 Support Equipment

- Identify all project GSE
- Include layout of GSE
- Identify what facility is expected to provide
  - Test fixtures
  - Electrical services
  - Tables and chairs
  - Telephones
  - Storage for items for extended testing
  - Crane operators for lifts
  - Contamination support
  - Hydraset (code 754 policy to use hydraset for all flight hardware)
  - Feed thru plates
  - Cold plates

Monitoring equipment
- QCM
- Cold finger
- RGA
- Scavenger plate
- Witness mirrors

7.0 Test Program

7.1 Phases/Sequence
- Special handling and safety concerns noted appropriately
- Note any special regular maintenance of the item which will required delay of testing

7.2 Specifications
- Test levels for each test should be presented in tabular form
- Include test profile (note the number of cycles and hot and cold starts)
- Identify method and location of controlling temperatures
- Method of heating and cooling (heaters, cold plates, etc.)
- Contamination criteria (measurement tools, levels, temperatures, etc.)
- Test predictions should be included in the form of a table. Sensor numbers, corresponding thermal math model nodes for that sensor, and expected temperatures for each of the thermal balance.
- Describe thermal balance cases to be performed and orbital cases to which these test cases correlate

7.3 Test Limits (if applicable)
- Identify any special limiting requirements
  - pump down rate
  - transition rates
  - hot and cold red limits

8.0 Pre-test Operations
- State briefly the activities that need to be performed prior to arrival of the test item
- Who will provide the test fixture, fixture availability for match drilling, and the need for fixture surveys should be specified
- When and where will instrumentation installation be performed (instrumentation typically installed by code 754)
- Proof test and loads and stability analysis of slings (All lifting fixtures must be properly certified before facilities will perform any lift operations)
- Pre-test bakeout of cabling or other items
- Calibration (for solar testing the calibration of the solar simulator and/or chamber should be identified in detail)
- Close out of blanketing

9.0 Test Operations

9.1 Test Item

- Include sketches or drawings of test item
- Identify primary axis of test item
- Identify deviations from flight configuration

9.2 Test Fixturing (if applicable)

- Include sketches or drawings of fixture
- Briefly describe fixture

9.3 Test Set-up

- Description of set-up configurations of the fixture on/in the facility
- description of how test item is mounted to fixture
- Identify mounting bolt torque requirements, shimming, etc.

10.0 Post Test Operations

- Instructions concerning removal of test item
- Instrumentation removal should be addressed