

**Pre-Flight Subsystems Check and Reentry Capsule Installation Procedure**

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**Approvals**

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(to be updated)

# Introduction

## Test Purpose and Objectives

Prior to flight, the reentry experiment payload will be put through a series of pre-flight systems checks and tests to confirm that the payload interfaces correctly with the GSC power and telemetry connections on the rocket. The payload’s electronics will undergo a full electrical system power up and will initiate its data collection procedures. In addition to testing the functionality of the sensors and the GSC interface, the procedure will incorporate the installation of the reentry capsule into the locking and launching mechanism mounted on the payload deck. This procedure will include the insertion of two RBF pins (one mechanical, one electrical to inhibit any launching procedures during integrated testing), and will be conducted to prevent premature capsule ejection, ensuring the safety of nearby personnel and equipment.

Following the GSC connection test (~1 min) the system will return to a safe and continuous state and shut down. Each of the systems SD data cards will be offloaded and their data will be reviewed to confirm full systems functionality. When all payload integration testing has been completed, the RBF pins will be removed, arming the payload for uninhibited payload ejection during the flight.

# Quality Assurance (QA) Precautions

## QA provisions

For each of the test, the figures included on page 3 will serve as an instruction manual as the reentry capsule is installed in the launching mechanism. In addition, the test data collected on the SD card will be compared to benchmark data created during payload development to assure that the data is complete and coherent. Finally, to confirm that the power connection to the GSC is adequate, status indication LED lights will indicate successful power transfer to particular subsystems (lock motor, base station electronics board…etc). Quality assurance will be provided by a quality assurance supervisor during integration, as well as a Wallops Flight Facility engineer who has access to the installation procedure included in this document. In particular before the test occurs, QA will ensure safety of both the equipment and the personnel present.

# Test Resources

## Facilities

* Wallops Flight Facility Payload integration room

## Equipment

|  |  |  |
| --- | --- | --- |
| Equipment | | Quantity |
|  | GSC Power and Telemetry System | 1 |
|  | 25 Pin Telemetry Connector | 1 |
|  | 15 Pin Power Connector | 1 |
|  | RBF Mechanical Inhibit Pin | 1 |
|  | RBF Disconnect Electrical Inhibit | 1 |

## Non-subsystem Required Personnel

* Casey Kuhns (Systems Engineer)
* Maurice Woods (Quality Assurance)
* Robert Shiely (Structures Engineer)
* Aaron Adamson (Electronics and Software Engineer)

# Test Procedure

## General Test Concept

This test will be conducted in three parts:

1. Reentry Capsule Installation:

Installation of the reentry capsule requires the integration engineer to compress a spring (used to propel the capsule out of the rocket) and secure the capsule inside the payload. Therefore, during this process, the integration engineer must use caution to compress the spring properly, and securely lock the capsule to ensure that the capsule does not endanger any nearby personnel or equipment.

The installation procedure (supplemented by the illustrations at the beginning of this document) begins by loosely mounting the tail of the capsule on the “fingers” of the launcher interface. These interface fingers will sit in three dimples which will stabilize the capsule, and the center rod of the launcher will connect to the tip of the capsule tail through an electronics interface that will connect the base station computer to the reentry capsule. Next, the launcher spring will be compressed approximately four inches by pushing the capsule into its “armed” position. While the launcher spring is compressed, the locking cam will be rotated to the lock position, securing the lock latches into their respective latch seats (engraved into the side of the capsule tail). At this time, before the next tests are conducted, the mechanical and electrical RBF launcher inhibitor pins must be installed. This will ensure that, although the system will prompt the launcher to disengage the lock and launch the payload, the lock motor will not turn on, and the capsule will not be ejected from the payload.

1. GSC Power Connection:

The GSC testing module will be provided by Wallops Flight Facility, and will be used to test the ReX payload by Shawn Carroll. To verify that the GSC power is connected properly, a series of LEDs will indicate power transfer to each subsystem. First, the power connection will turn on the base station electronics computer. The computer will then provide power to the launcher mechanism, which will start the capsule unlocking process. LED’s will then signal the status of the locks being open or closed.

1. GSC Telemetry Connection:

The telemetry parallel port will enable the team to verify the current state of the system by providing event notifications based on the flight computer. This will allow the electronics and software engineer to determine if the computer is attempting to activate the system. Test data will be verified by removing the SD cards on the payload and confirming that the recorded data is consistent with a sample of successful test data (collected during development).

## Reentry Capsule Installation

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Capsule Installation Procedure** | **Date/Time** | **Initial** |
| **1** | Mount the tail of the capsule on the “fingers” of the launcher interface. |  |  |
| **2** | Compress the launcher spring approximately four inches by pushing the capsule into its “armed” position |  |  |
| **3** | Rotate the locking cam into the “lock” position |  |  |
| **4** | Connect the mechanical and electrical RBF launcher inhibitor pins |  |  |

## Applied GSC Power

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Applied GSC Power Procedure** | **Date/Time** | **Initial** |
| **1** | Connect the payload to the GSC supply |  |  |
| **2** | Confirm base station control board power LED indicator on |  |  |
| **3** | Confirm camera power LED indicator on |  |  |
| **4** | Confirm radio power LED indicator on |  |  |
| **5** | Confirm launcher lock motor power LED indicator on |  |  |
| **6** | Disconnect GSC supply |  |  |

## System Data Recording and Telemetry Test

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Recorded Data and Post Processing Procedure** | **Date/Time** | **Initial** |
| **1** | Connect the payload to the GSC supply |  |  |
| **2** | Disconnect GSC supply |  |  |
| **3** | Remove payload SD cards and copy test data to computer |  |  |