***\*Notice:***

***This file is an example based on generic satellite design and does not guarantee to be approved on the review process for launch or deployment. In accordance with design of each satellite, this document may have to be changed. Details of this template are subject to change without notice. Please change YELLOW sentence according to each satellite.***

***(本文書は標準的な設計の衛星を想定した一例であり、打上げ・放出のための審査プロセスでの承認を保証しているものではありません。各衛星の設計によって内容を変更する必要があります。また、本テンプレートの内容は予告なく変更される場合があります。黄色の箇所を各衛星に応じて変更してください。)***

[Satellite Name]

Wire Strength Test Report

Initial Release: DD/MM/YYYY

[Project Team Name]

Revision History

|  |  |  |  |
| --- | --- | --- | --- |
| Version | Date | Writer | Annotations |
| 1 | DD/MM/YYYY | XXX | Initial Release |
| 1.1 |  |  |  |
| 1.2 |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

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# **Purpose**

This document summarizes the result of wire strength and proof test report for [Satellite Name] which will be deployed from JEM Small Satellites Orbital Deployer (J-SSOD).

***\*Notice:***

***This file should be prepared when Option 2 is selected in JPAH vol.8 section 4.2.2.2(3) or JMX-2011303 section 6(5). If the deployment mechanism is not identified as the hazard, there is no test requirement for the wire from safety point of view.***

***(本文書は、JPAH vol.8 4.2.2.2項(3)やJMX-2011303 6項(5)でOption2を選択した場合に作成する必要がある。展開がハザードに識別されない場合は、ワイヤーに対する安全上の試験要求はない。)***

# **Applicable Document**

1. JX-ESPC-101132-C JEM Payload Accommodation Handbook-Vol.8-

Small Satellite Deployment Interface Control Document

**Section 2.1. Mechanical Interfaces**

2.1.8. Structural Strength

1. A satellite shall have a sufficient structural strength with a necessary margin of safety through the ground operation, testing, ground handling, launch and on-orbit operations. Launch environment is defined in the section 2.4.1.
2. Each rail shall have a sufficient structural strength with considering that the rail is subject to compression force at 46.6 N due to a preload from the Backplate and main spring of J-SSOD.

**Section 4.2. Safety Assessment**

4.2.2.2. Unique Hazards

1. Deployable Structure

Option 2 (When not satisfying the requirement described in 2.1.4. (6)):

Even in the event of an inadvertent deployment, a unique hazard report will be required in consideration of hazards of inappropriate deployment of the satellite due to stick inside the J-SSOD. As safety design and verification methods for this hazard, one of the following can be chosen.

1. 2 Fault tolerance design

If deployable components have two failure tolerance based on the Section 1.3.1 “Applicable Document” (1) JSX-2010026 during the period from launch to deployment by the J-SSOD, it has sufficient safety control against a hazard of inadvertent deployment. In this case, the control is required for the restraint wire of the deployable components based on the applicable document (12), JMX-2012694 “Structure Verification and Fracture Control Plan for JAXA Selected Small Satellite Released from J-SSOD”.

1. JMX-2011303E Structure Verification and Fracture Control Plan

for JAXA Selected Small Satellite Released from J-SSOD

**Section 6 Fracture Control Plan**

(5) Deployable Structure

Table 6-4 Control for wire mechanism of deployment structure

| No. | Requirement |
| --- | --- |
| 1 | More than two wires are required for one constraining object |
| 2 | Test to withstand the expected maximum load by only one wire as proof test. Refer to section 7.2 |
| 3 | Inspect not to exist appearance abnormality after the proof test. Refer to 7.2 |
| 4 | Add cautions when using in the assembly procedure. |
| 5 | If contact between wire and the other structure is inevitable, the contact surface of the structure shall be rounded adequately. |
| 6 | If wire mechanism has a knot, the looseness shall be prevented by adequate method |

**Section 7 Structure Verification Plan**

7.2 Strength Test

The following tests shall be conducted for the wire mechanism for the deployment system. The test result shall be approved by SFCB.

In the case of non-metallic wire, the creep characteristics of the wire shall be observed before the tests. Each test shall be started after finishing the 1st creep and 2nd creep. The test load for measurement of the creep characteristics is the restraining load for the deployment with 1.0 as safety margin.

1. Strength Test (ultimate load)

To verify strength of the wire, the same lot of the flight wire shall be tested with the ultimate load which multiplies the design load(\*) by 2.0 as safety margin. The wire shall be tied by the same knotting method as the flight model. The wire shall be verified not to cut or not to be loosen the knot after the test.

1. Proof Test

To screen the flight wire, the flight wire shall be tested with the proof load which multiplies the design load(\*) by 1.2 as safety margin. The wire shall be verified not to cut or not to be loosen the knot after the test.

\*: Combined load of restraining load for the deployment and the environment load. The restraining force must be considered the case of one wire missing.

1. [Document Number] [Satellite Name] Flight Safety Assessment Report

for phase XXX

# **Test Method**

* 1. **Strength Test for Flight Equivalent Wire (ultimate load)**
1. **Creep characteristics**

The target wire which is the same lot as the flight model is pulled with the restraining load for the deployment (=XXX gf) to pass creep phase. Note that the load is considered the case of one wire missing. The length of the wire is measured periodically, and the length is verified not to be changed after sufficient test duration, since the creep characteristics has 1st creep phase and 2nd creep phase.

Test configuration is shown in Figure 3-1.

1. **Strength test**

After creeping, the target wire is pulled with ultimate load which multiplies the design load(\*) (=XXX gf) by 2.0 as safety margin. Note that the load is considered the case of one wire missing. And the wire is verified not to be broken nor damaged and the knot has no looseness.

Test configuration is shown in Figure 3-1.

\*: Combined load of restraining load for the deployment and the launch load (18.1G). The restraining force must be considered the case of one wire missing.

Same lot of flight wire

Test weight

* XXX [gf] for creep test
* XXX [gf] for strength test

Same knotting method as flight

Figure 3-1 Test configuration of wire strength test

* 1. **Proof Test for Flight Wire**
1. **Creep characteristics**

The flight wire is pulled with the restraining load for the deployment (=XXX gf) to pass creep phase. Note that the load is considered the case of one wire missing. The length of the wire is measured periodically, and the length is verified not to be changed after sufficient test duration, since the creep characteristics has 1st creep phase and 2nd creep phase.

Test configuration is shown in Figure 3-2.

Note that this test can be conducted concurrently with the test of 3.1(1).

1. **Proof test**

After creeping, the target wire is pulled with proof load which multiplies the design load(\*) (=XXX gf) by 1.2 as safety margin. Note that the load is considered the case of one wire missing. And the wire is verified not to be broken nor damaged and the knot has no looseness.

Test configuration is shown in Figure 3-2.

\*: Combined load of restraining load for the deployment and the launch load (18.1G). The restraining force must be considered the case of one wire missing.

Flight wire

Test weight

* XXX [gf] for creep test
* XXX [gf] for strength test

Same knotting method as flight

Figure 3-2 Test configuration of wire proof test

# **Test Results**

Date of test：[YYYY/MM/DD]

Place of test：[XXXX]

Table 4-1 Test Objectives

|  |  |  |  |
| --- | --- | --- | --- |
|  | Part Name | Part Number | Quantity |
| 1 | XXX | XXX | XXX |

## **Strength test**

1. Creep Characteristics

The test duration was XX days which is sufficient time to pass creep phase, and the length was not changed at the end phase of this test. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

Figure 4.1-1 shows the test result. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

1. Strength Test

Figure 4.1-2 shows the test result. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

## **Proof test**

1. Creep Characteristics

The test duration was XX days which is sufficient time to pass creep phase, and the length was not changed at the end phase of this test. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

Figure 4.2-1 shows the test result. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

1. Proof Test

Figure 4.2-2 shows the test result. After load was applied, the wire was not broken nor damaged, and the knot had no looseness.

1st creep

phase

2nd creep phase

3rd creep

phase

Time

Length

**Need to add photo of the test**

**Need to change to real data**

Figure 4.1-1 Test result of creep characteristics (load: XXX [gf])

**Need to add photo of the test**

Figure 4.1-2 Test result of strength test (load: XXX [gf])

1st creep

phase

2nd creep phase

3rd creep

phase

Time

Length

**Need to add photo of the test**

**Need to change to real data**

Figure 4.2-1 Test result of creep characteristics (load: XXX [gf])

**Need to add photo of the test**

Figure 4.2-2 Test result of strength test (load: XXX [gf])

# **Conclusion**

 The result of the wire strength test conforms to the requirement.