Simplified Safety Review Process for Cubesats utilizing BIRDS Bus

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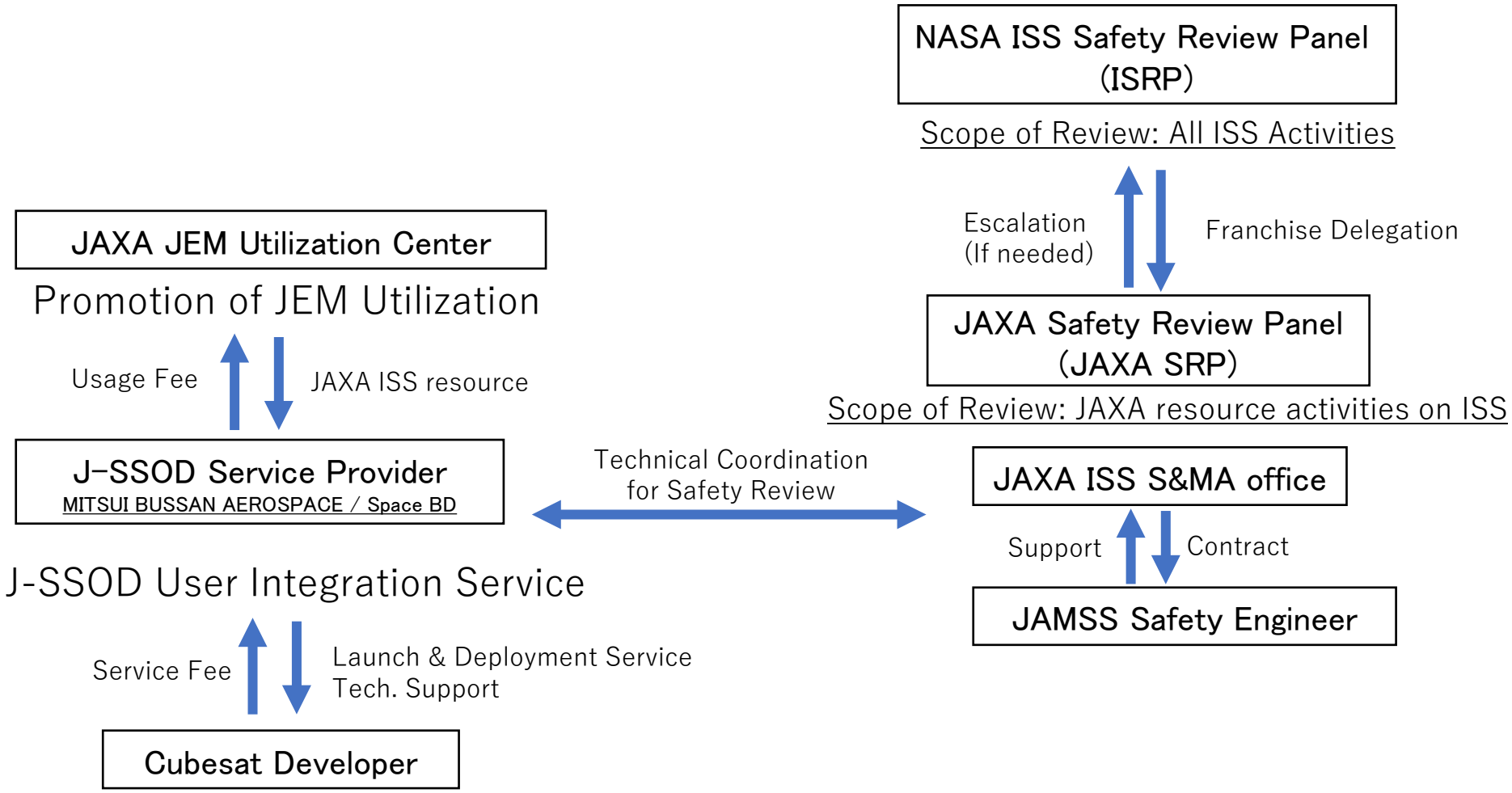
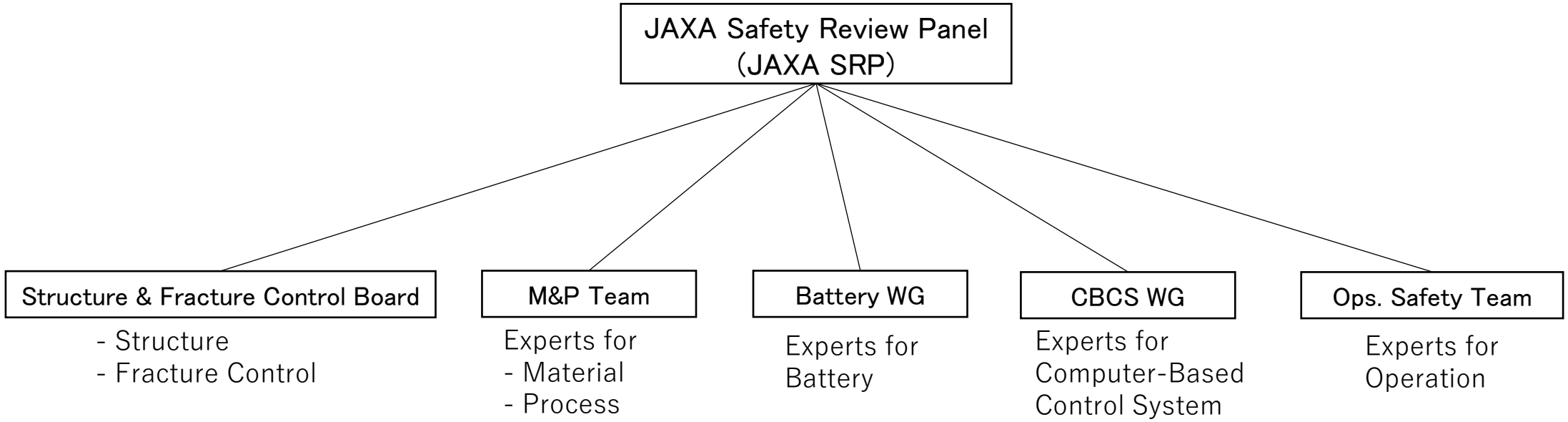
ISS Safety Review Organization



Safety Review Organization in JAXA



Franchise Review Criteria(FRC)

SAR(Safety Assessment Report) consists of several Hazard Reports(Structure, Battery, Collision with ISS etc.).
Each Hazard Report is classified according to the criteria agreed between NASA ISRP and JAXA SRP.
We call it “Franchise Review Criteria(FRC)”
Safety review process depends on the FRC.

FRC	Safety Review Process
#1	Fully Delegated to JAXA SRP Review & Approval
#2	NASA Technical Reivew is mandatory
#3	NASA ISRP Review & Approval is mandatory

For Cubesat deployed from J-SSOD, there is a specific FRC in addition to the generic FRC.

Table 7.1 NASA ISRP/JAXA SRP Franchise Review Criteria (FRC)*

1) JAXA SRP Franchise Safety Review for JAXA JEM, payloads and JAXA systems <ENDS ITEMS> and other Japanese ISS support hardware for
   a) Category (Cat) 1 hardware**
   b) 1298 only (no Unique Hazard Reports (HR))**
   c) Series/Reflight hardware with no control and verification method change ** (e.g. PCG sample, ExHAM sample)
   d) Level of Containment (LoC) HR (except 3)a)
   e) Other Unique HR which is covered by delegated MOA (i.e. Structure / Fracture / M&P/Battery)**
   f) FRC1 Cubesat Hazard Reports***
   g) Integrated Experiment Hazard Assessment (IEHA)****

2) JAXA SRP Franchise safety review (with NASA Liaison SE Support)
   a) Other Unique HR which is not covered by MOA
      Examples are as follows:
      - Unique IVA
      - Pressure System HR
      - Combustion and Fire HR
      - Safety Critical Mechanism HR applying MA2-00-057
   b) Maintenance and Trouble Shooting related HR for onboard IVA **
   c) HR related to an anomaly which has occurred at previous flight,
   d) Modified Series/Reflight items with controls and/or verifications change
   e) CBCS items covered by delegated MOA
   f) Unique HRs covered by EPDC MOA
   g) JAXA Generic NCR applied HR*****

3) NASA ISRP safety review for specific Unique HRs (JAXA to review others as part of franchise)
   a) LoC HR (for THL-3,4, FHL-3,4)
   b) HR with an NCR
   c) Pyrotechnic HR
   d) Collision HR for collision between EVA attached/detached payload and for Cubesat deployed from HTV-X
   e) EVA HR
   f) NASA EVR HR

FRC checksheet for JAXA Cubesat

JAXA CubeSats System & Operation Summary Rev. D

Item Name : ここをクリックしてテキストを入力してください。

<CubeSats Description (in English)>

•Mission *(Purpose , Mission period, Operation outline, etc)*	ここをクリックしてテキストを入力してください。
•Size *(multiple of 1U size. If multiple satellites are in scope of a single SAR, also indicate how many)*	xx U: Number: xx ea
•Orbital Lifetime	(Less than) xx years
● Dimension(mm)	Stowed Config. : ここをクリックしてテキストを入力してください。mm Deployment Config. *(If applicable)*: ここをクリックしてテキストを入力してください。mm
●Mass(kg)	ここをクリックしてテキストを入力してください。Kg (per 1 ea)
● System Overview *(Include CubeSat picture)*	**Check the box, if applicable.** *(If one of check boxes is checked for all categories, this item may qualify as NASA / JAXA Franchise Criteria (FRC) "1".)* a. Deployment mechanism ☐ *No items to deploy* ☐ *Only simple antenna(s) and/or paddle(s) are deployed, whose controls meet any one of the conditions in (*)* *(*)* *1. Meet the JSSOD ICD to preclude deployable from sticking inside JSSOD.* *2. Perform a Deployment Demonstration Test. Unique HR will be created.* *3. Have redundant burn wires and 3 inhibits, Unique HR will be created.* *For all the other cases, list Item(s) to be deployed:* ここをクリックしてテキストを入力してください。 b. Battery *Type :* ここをクリックしてテキストを入力してください。 *Capacity :* ここをクリックしてテキストを入力してください。 ☐ *No batteries over 80Wh*

JAXA CubeSats System & Operation Summary Rev. D

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c. Capacitor
☐ *No super capacitor, or capacitor used as a temporary/ alternate power source*
Capacitor (if used as a temporary/alternate power source)
Type : ここをクリックしてテキストを入力してください。
Capacity : ここをクリックしてテキストを入力してください。

d. Maximum RF radiation source
☐*No RF radiation source*
☐*Comply with criteria (**)*
☐*Non-comply with criteria (**) and 3 deployment switches for RF (One inhibit needs to be in the return leg).*
(**) OE-14-002, JX-ESPC-101132 and SSP50005

e. ☐No high energy source *(such as high voltage source over 32V, pressure vessel, pyrotechnics, etc.)*

f. ☐No propulsive system

g. Jettison Policy
☐ *Comply with all the following EAC (Expedited Approval Criteria) defined in PPD1011 Revision C*
Note: If satellite does not meet 2 or 5 below, additional data submittals are required. (See Attachment A)
1. Satellite has a cross sectional area on each of its three orthogonal sides greater than that of a sphere with a diameter 10 cm (78.5 cm2).
2. Satellite is 3U in size or smaller with orbital lifetime less than 25 years.
3. These aspects of the jettison have previously been analyzed and approved:
- Location and direction
- Deployer mechanism and speed
- Size and mass within deploy mechanism parameters
4. Satellite has an operational Ballistic Numbers which meets criteria.
5. Satellite does not have features that significantly change its trajectory or trackability..

JAXA CubeSats System & Operation Summary Rev. D

h. Deployer
Deploy from JEM (not from H-SSOD)

i. Laser
☐ *No laser*
☐ *Laser, whose controls meet either one of the conditions in (*):*
(*)
1. Verify with OE1296(V-47 or V-48 for NASA Form 1295/ V-7.1(a)or V-7.2(b) for JAXA Form 1295) for Class1 or 2 laser.

j. Visible LED
☐ *No LED*
☐ *LED (=< 10,000nits)*
☐ *LED (> 10,000nits), controlled by 3 inhibits for lighting (One inhibit needs to be in the return leg) or fully contained.*

k. Wire/Cable Sizing and derating
☐ *Comply with Technical Memo: "Checklist for the JAXA Battery powered Payloads".*

l. CBCS (FRC2 coordination is needed until nominal delegation)
☐ *No CBCS*
☐ *The hazard falls under FRC1 criteria (i.e. complied with the above condition) and CBCS is used for a single control of the hazard (Only General Req. of SSP50038C is applied)*

m. Items other than the above
☐ *Comply with FRC1 criteria of NASA/JAXA JOP(JSX-2013021)*

写真+CAD モデル
(展開機構,分離機構 等がある場合は、前後がわかるようにする)

Simplified Safety Review Process for Cubesats utilizing BIRDS Bus

- In recent years, the number of J-SSOD cubesats utilizing the BIRDS Bus developed by Kyutech has been increasing.
- Therefore, JAXA have coordinated with NASA ISRP on the tailored review process to simplify the safety review documents for cubesats utilizing the BIRDS Bus with the support of Kyutech.
- Main purpose of this activity is to reduce the amount of Safety Assessment Report(Input Data Package for ISS Safety Review) by imposing a constraint to use BIRDS Bus.

Key Concept of process development

[Scope]

The applicability of this process is limited to J-SSOD Cubesats only with FRC1 HRs.

It is aimed to minimize the process coordination duration, to operate the process as soon as possible.

[Fairness]

To ensure fairness to the two J-SSOD service providers, it is necessary to prepare a baseline SAR that everyone could refer to.

It owes to Kyutech's support, with sharing BIRDS-5 SAR as a baseline, and BIRDS Bus technical Information.

Activity Summary

- Jan. 2023: JAXA began to develop the process
- Jul. 2023: JAXA/Kyutech meeting:
  Kyutech agreed to support this process development
- Aug. 2023: JAXA/NASA ISRP meeting:
  Concurrence about general concept of this process
- Oct.2023: Baseline SAR(BIRDS-5) developed by Kyutech
- Nov. 2023: JAXA/NASA ISRP meeting:
  Concurrence about the detailed condition & process

Future Work

[Process Documentation]

We have drafted the process document including the simplified SAR format.

There are some review comments from J-SSOD Service providers.

We will incorporate that and established the document by the end of December.