

Summary

The EROSS IOD program aims to an in-orbit demonstration of rendezvous and robotic technologies to support the development of future commercial On-Orbit-Servicing application.

The EROSS-IOD demonstration program includes the transfer from the servicer to the companion spacecraft of a so called Orbit Replaceable Unit (ORU).

As an opportunity of an in-orbit demonstration of new technologies, it is proposed to house a secondary payload within the test ORU.

The secondary payload will be operated after the completion of the nominal rendezvous/robotic demonstration (Typically 3 months after launch) for a duration not exceeding 9 months.

The main constraint for this secondary payload are (detailed interface specification will be issued after preselection)

- Fit within 400mm*200mm*200mm
- Mass not exceeding 15 kg
- Power not exceeding 80 W

The secondary P/L is expected to be delivered as a fully tested package ready to be integrated at late stage of the EROSS-IOD servicer (before environment test) by mid-2025

The interface for handling, fixation and launch lock will be delivered by the EROSS-IOD manufacturer

Definition

In this document the following definition will be used :

Servicer, the main component of the EROSS-IOD a spacecraft capable of rendez-vous and robotic capabilities

Dummy client. A spacecraft launch together with the servicer and used as a test satellite for rendez-vous and robotic demonstration

Composite : the servicer mechanically attached to the dummy client

Orbit Replaceable unit : -the object of this specification-, a standalone P/L designed to be transferred robotically from the servicer to the client, and operated attached on the client ,

Host Spacecraft : The S/C on which the ORU is mechanically and electrically connected

Standard interface : an electromechanical device allowing to mechanically and electrically connect with a matching interface.

Description of mission

The ORU is delivered as a fully tested standalone unit prior to the servicer environmental test campaign. It is mounted via hold and release mechanism (HRM) and standard interface on the servicer.

During the initial phase of the EROSS IOD (rendezvous demonstration) the ORU remains attached to the servicer and switched off. The ORU remain however powered via the standard interface and active thermal control is possible The duration of this phase is 3 months

At the end of the rendez-vous/robotic demonstration mission the ORU is robotically transferred and connected to the dummy client

During the mission extension duration (9 months) the ORU will remain attached to the dummy client and can be operated. The dummy client itself remains attached to the servicer who ensure the attitude control

At the end of the mission the servicer/dummy client composite perform a controlled reentry

Interface requirements

The ORU shall fit within a volume not exceeding 400 mm*200 mm*200 mm (TBC)

The mass of the ORU shall not exceed 15kg

The ORU shall be fitted with 2 passive standard interface

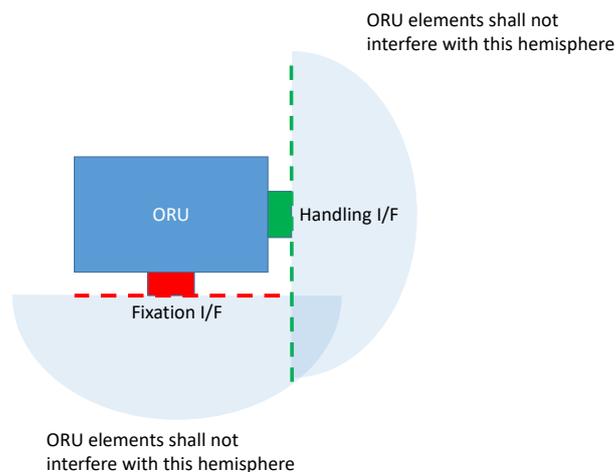
- One of type A for handling by the robotic arm
- One of type B for fixation on the host S/C

Handling I/F

The handling interface is used by the robotic arm of the servicer to pickup the ORU and position it on the client S/C

The ORU shall be fitted with a type A passive standard interface

No ORU elements shall be present in the outbound hemisphere delimited by the plane normal to the handling interface axis



A 3D navigation aids shall be implemented beside the handling interface

The navigation aids shall fit within a volume 150mm*150mm*50 mm

The edge of the navigation aid shall be positioned 125mm from the center of the handling interface

The handling I/F and the navigation aids will be provided by the servicer manufacturer

Fixation I/F

The fixation interface is used to mechanically and electrically coupled the ORU to the host S/C (either the servicer or the client

The ORU shall be fitted with a type B passive standard interface

No ORU elements shall be present in the outbound hemisphere delimited by the plane normal the handling interface axis

The handling and the fixation interface axis shall make an angle greater or equal to 90 deg

The fixation I/F will be provided by the servicer manufacturer

Mechanical

During launch the ORU shall be supported by

- 4 Hold On and release mechanism (HRM)
- Standard interface

Note : If needed (for instance to limit the thermoelastic stress) the HRM can be released shortly after launcher separation

In launch configuration the first resonant frequency of the ORU shall be above 140 Hz

In launch configuration the ORU shall sustain the following mechanical loads

- Sinus TBD
- Random TBD
- Shock TBD

The ORU side HRM mechanism will be provided by the servicer prime

Thermal

The ORU shall be designed to be thermally decoupled from the servicer or dummy client

The ORU shall be designed to receive Sun flux from any direction (including the face of the fixation interface which can be illuminated during robotic transfer)

Active thermal control, if any, shall be autonomous and shall **not** rely on host S/C data acquisition/commanding

Electrical

The ORU shall be compatible of a 28 V unregulated bus (24V / 35 V TBC) from the host S/C

The ORU ground shall be connected to a specific pin (TBD) of both handling and fixation standard interface

The ORU shall not draw more than 80 Watt from the host S/C when operational (including 20% maturity margin)

The ORU shall not draw more than 20 W (TBC) from the host S/C when powered off for thermal control

The ORU shall be designed to remain completely unpowered during transfer by the robotic arm for a duration not exceeding 90 minutes

90 minutes to allow transfer operation to be spread on two consecutive ground visibility pass

Command and control

It shall be possible to switch off the ORU via the fixation interface

The ORU shall not generate more than 200 Mbits per day (TBC)to be stored/downloaded to Ground by the host S/C

Note : this data volume limit do not apply if the ORU embed a direct communication link to ground (based on 400 Mbit/sec with a single 8 min pass per day)

Pointing

The ORU shall be compatible of the following pointing performance (at fixation interface level)

- Absolute Pointing Error (APE) : TBD
- Absolute measurement error (AME) : TBD

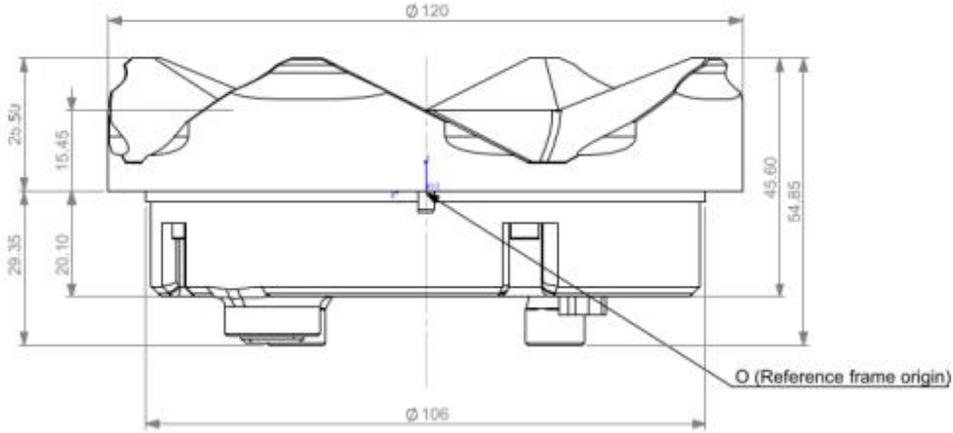
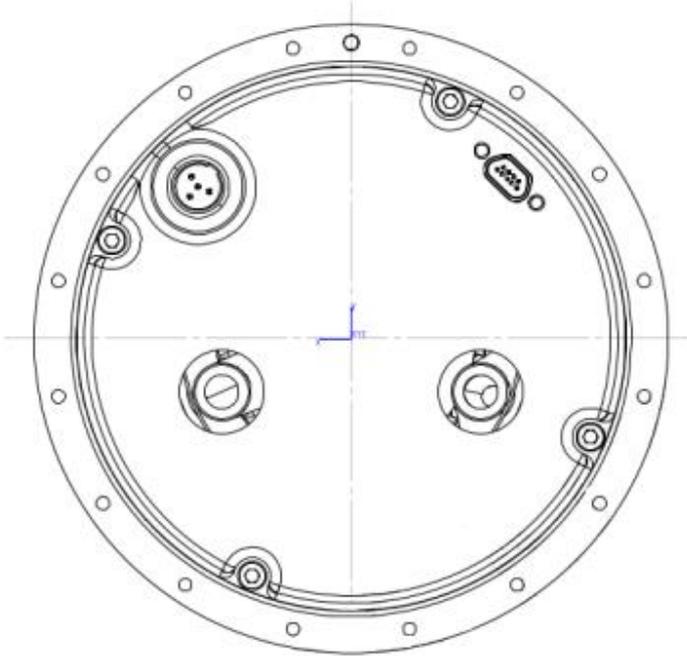
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Lifetime

The ORU shall be designed for the following lifetime

- On ground : 12 months
- On Orbit : 12 months (LEO or GEO orbit)

Type A passive standard interface



Type B Standard interface

