SPACE RIDER SERVICE

STS/PS   -   Fabio Caramelli

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→ THE EUROPEAN SPACE AGENCY

➢ SPACE RIDER MISSION

➢ IN FLIGHT AND GROUND SERVICE

➢ PROJECT STATUS AND PLANNING

➢ MULTI PURPOSE CARGO BAY

➢ CARGO BAY PREPARATION GOVERNANCE

➢ MARKET COVERAGE

Space Rider MISSION
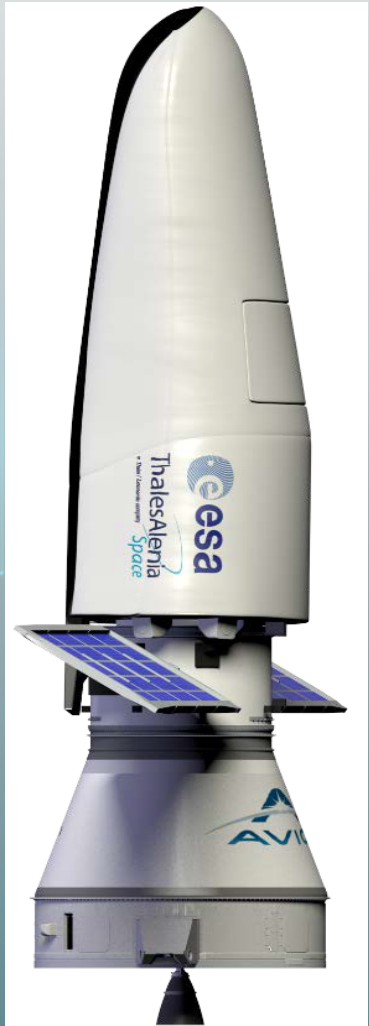
Objective: To provide a reusable orbital customizable/standardized system for multiple applications (microgravity, Earth observation, science, robotic exploration), integrated with Vega-C, able to perform in-orbit payloads operations, de-orbit, re-enter, land on ground, be relaunched after limited refurbishment

Implementation: To develop an unmanned, high-tech space laboratory to meet the required applications and provide an end-to-end service to Payloads:

➢ Launched on Vega-C, missions ranging from equatorial to SSO orbits

➢ Combining transportation, in-orbit PL operations, de-orbiting, re-entry, landing and reusability

➢ Composed by a stack of 2 modules

   AVUM Orbital Service Module

   - improved version of the AVUM+ for >2 months lifetime

   Re-entry Module

   - modified version of the IXV with a Multi Purpose Cargo Bay (MPCB)
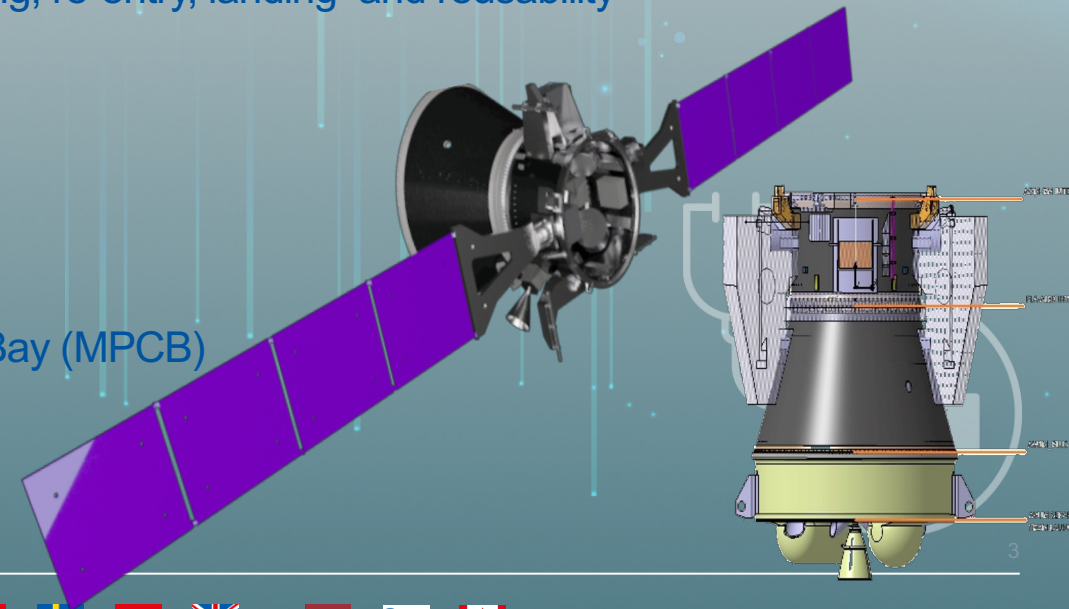
IN FLIGHT AND GROUND SERVICE

- Shorter time from/to lab to/from space – shorter time to data compared to S/C standard

- Ground & Space management – reduced users constraints
  → *Power, thermal control, data-handling, telemetry no longer in charge of the instrument user*

- Reduced safety constraints wrt manned ops

- Low G-forces & jitter during flight compared to ISS; High quality microgravity (<1E-5 g)

- Low G-forces during re-entry & airfield landing

- Fast access to the experiment back on the airfield

- Return capability: high downmass/upmass ratio

- Users privacy (e.g. experiment design, data, operations, Ind. knowledge protection)

- Vehicle design based on flight proven ESA IXV vehicle

PROJECT STATUS AND PLANNING
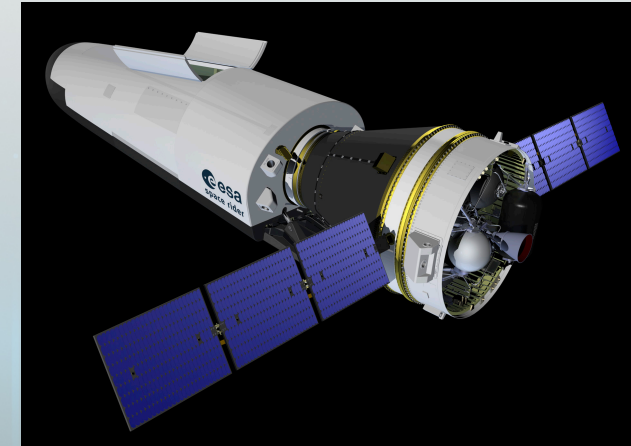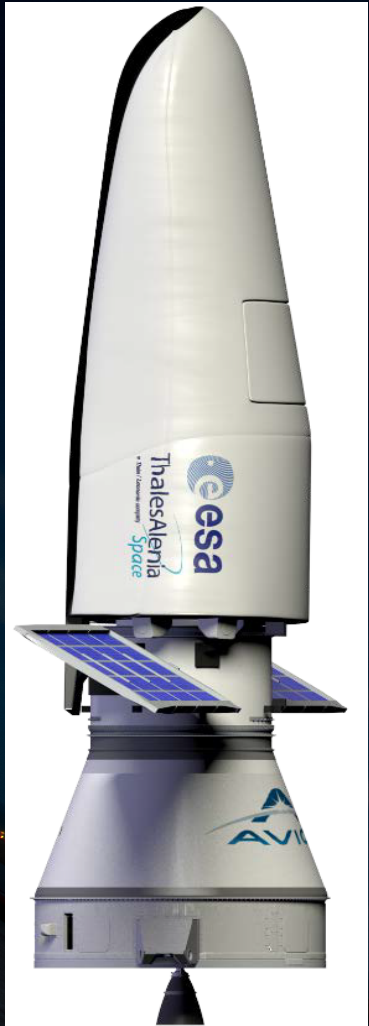
➤ **Project Phase D preparation**:
- Space Segment negotiations concluded and agreed, activities starting in October 2020 with a Bridging Phase to bring the Project to system CDR in June 2021 and re-align with new input from Ministerial Council.

➤ **Landing Sites**:
- Trade of among different landing sites on going, including the Azores Islands and Kourou
- Objective is to establish a baseline landing scenario suiting programme complex technical and programmatic objectives

➤ **Payloads Selection**:
- In parallel to the vehicle design and development activities
- Selection of the experiments for Maiden Flight Aggregate is in progress
- Payloads mission preparation process is defined with pre-selected sub Aggregators, a preliminary list of experiments identified
- Process to reach signature of Launch Service Agreements will finalise the selection process
- In parallel engineering activities to ensure proper allocation and services to the identified Payloads in coherence with vehicle design characteristics and offered services is on going with Sub Aggregators
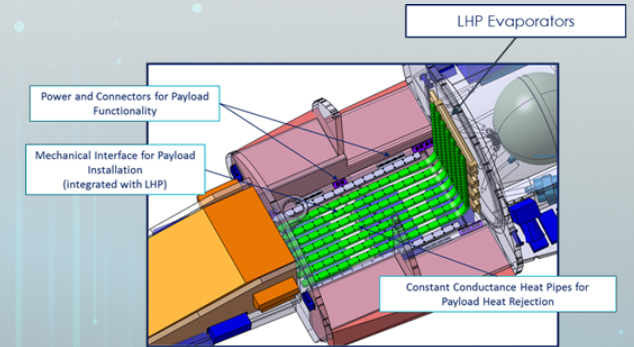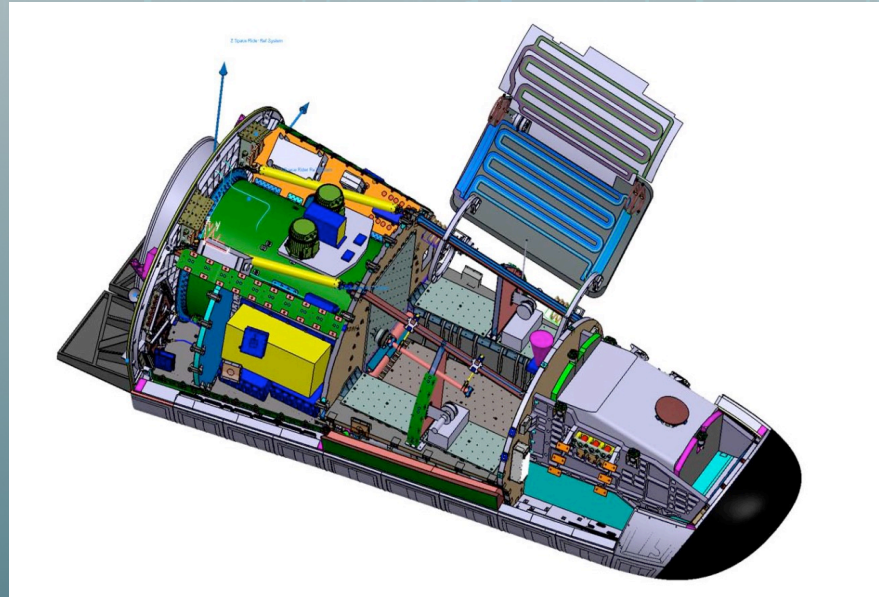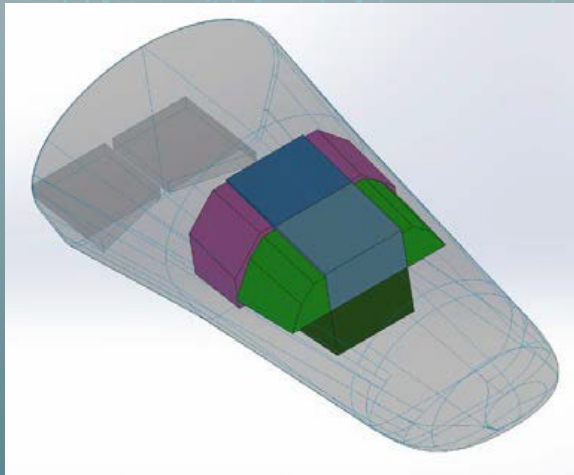
➤ **Major Milestones**:
- SystemCDR >> mid 2021
- Maiden Flight >> mid 2023

MULTI PURPOSE CARGO BAY

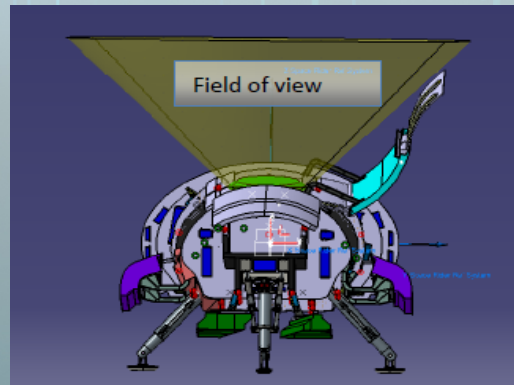## Payloads Services & Capabilities

✓ 1200 litres of conditioned cargo volume accommodating 800 kg PL in standard lockers

✓ 600 W Power supply, Thermal Control, Data-handling, Telemetry

✓ Low acceleration during re-entry and soft precision landing on ground

✓ Payload recovery

MULTI PURPOSE CARGO BAY

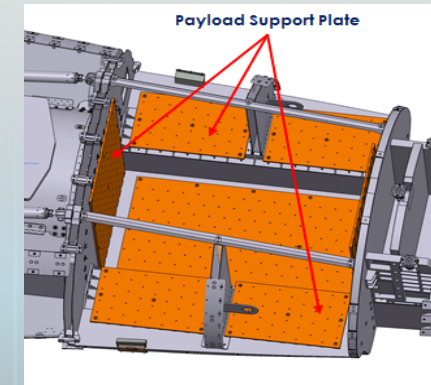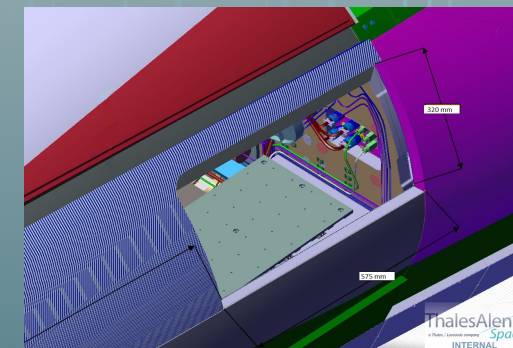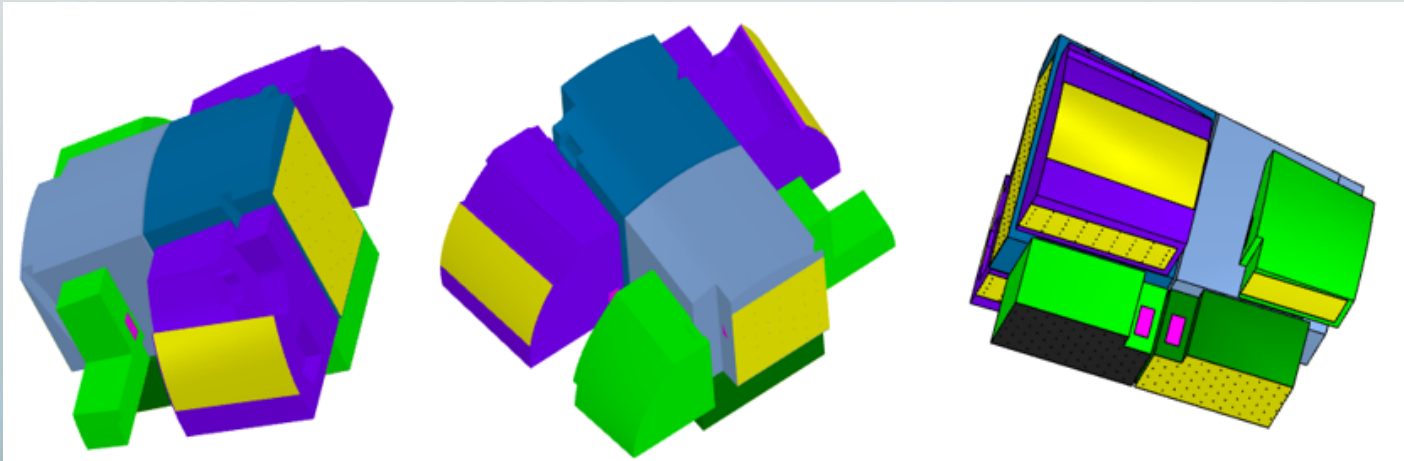Support plates with with standardised interfaces for Payloads accommodation

Wide angle field of view for Payload requiring such capability

Late access doors located on vehicle either sides to allow loading of Payloads until 24 hours before launch

PAYLOAD CAPABILITY: VIRTUAL LOCKERS
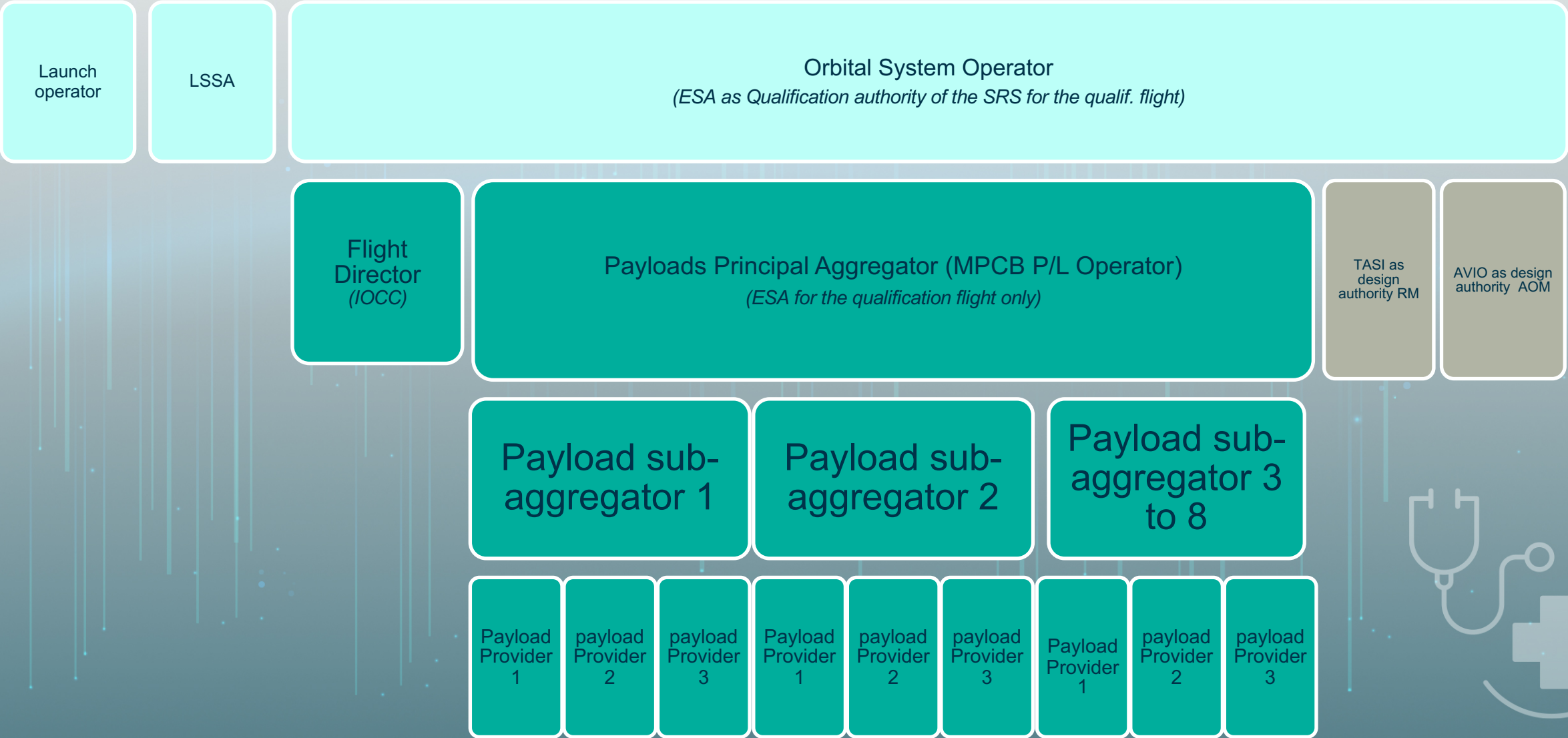

Defined by means of
- Stay-in Volume
- Power, thermal (in every direction including the cold face), data and mechanical interfaces
- Maximum power and a power schedule over the mission
- Maximum data rate and a data relay (TM & TC) over the mission
- Mass and MSI allocation
- Specific VL services (late access for example)

- Accommodation through 8 standardised lockers:
  - 2 lockers for Late Access
  - 4 lockers for µ-G
  - 1 locker for Field of View
  - 1 locker for Space Exposure
- further capacity in the non-conditioned part of the vehicle

Providing the following services
- Thermal Control cold plate
- Mechanical I/Fs plate
- Communication and Video (dedicated connectors bracket)
- Power (dedicated connectors bracket)

CARGO BAY PREPARATION GOVERNANCE

Launch operator

LSSA

Orbital System Operator
(ESA as Qualification authority of the SRS for the qualif. flight)

Flight Director
(IOCC)

Payloads Principal Aggregator (MPCB P/L Operator)
(ESA for the qualification flight only)

TASI as design authority RM

AVIO as design authority AOM

Payload sub-aggregator 1

Payload sub-aggregator 2

Payload sub-aggregator 3 to 8

Payload Provider 1

payload Provider 2

payload Provider 3

Payload Provider 1

payload Provider 2

payload Provider 3

Payload Provider 1

payload Provider 2

payload Provider 3

Opportunities for business in Space


Markets

- Life Science – Cell culture, crystallisation, microorganisms, bioprinting, medical devices
- Physical Science - Manufacturing and R&D
- Advanced In-Orbit Aerospace Technologies demonstration/verification (e.g. telecommunications)
- Specific observation data acquisition – Earth Science, magnetosphere, astrophysics
- In-Orbit Operations – Satellites inspection, space debris removal

Life Science examples

- Reg.Med. Applications, stem cell biology incl. acc. disease models etc..., infectious diseases
- Vaccine production-cristallisation
- Microorganisms, secondary metabolite, plant/microbes interaction
- 3D bioprinting
- New bio materials

Other examples

- Polymerisation, mixing & emulsions, Flow chemistry, Lyophilisation
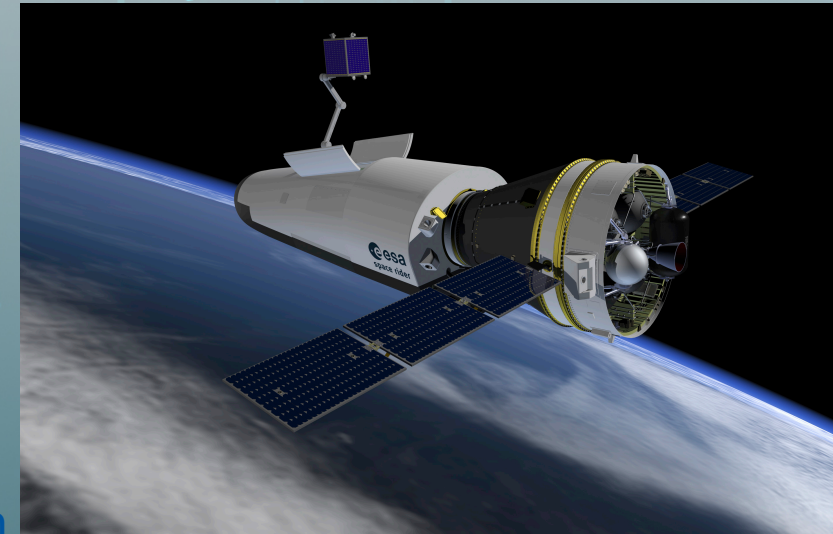
THANKS FOR ATTENTION

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