ANNOUNCEMENT OF OPPORTUNITY

For the launch with the SPACE RIDER Re-usable Free Flyer Platform integrated with VEGA C

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European Space Agency
Agence spatiale européenne

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1 ACRONYMS

AO	Announcement of Opportunity
AOM	AVUM Orbital Module
FMA	Final Mission Analysis
NoI	Notice of Intent
P/L	Payload
RM	Re-entry module
S/C	Spacecraft
SRS	Space Rider System
SSO	Sun Synchronous Orbit

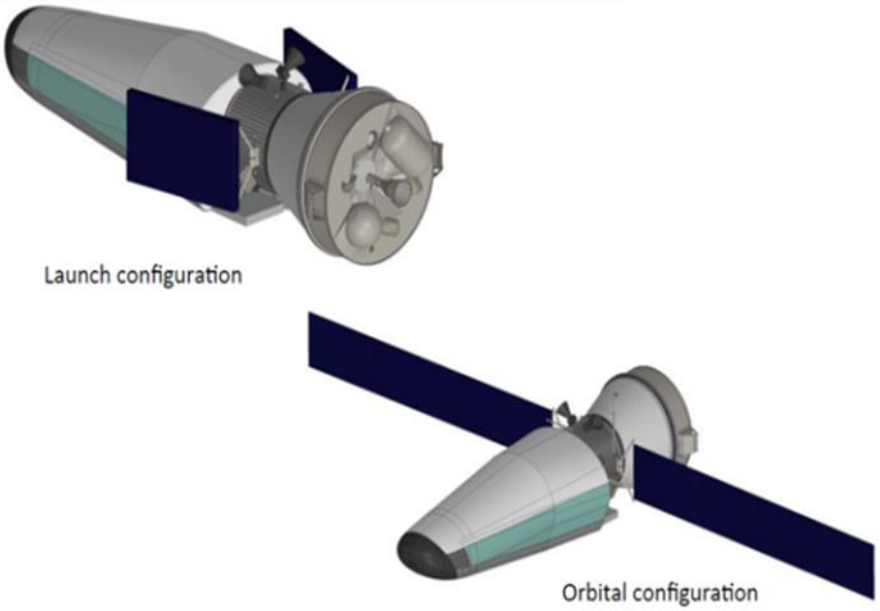
2 INTRODUCTION

The Space Rider (SR) is an affordable, independent, reusable end-to-end integrated space transportation system for routine access to and return from low earth orbit. Integrated with the Vega-C Launcher System, Space Rider will transport payloads for an array of applications, orbit altitudes and inclinations compatible with the performance of the launch system.

The SR builds on the ESA development, qualification and flight experience of Vega and IXV, enabling users access to and return from low Earth orbits for a wide variety of applications such as (but without being limited to):

- Micro-gravity experimentation;
- In-orbit Demonstration & Validation of technologies for exploration, orbital infrastructure servicing, Earth observation, Earth science, Telecoms, …;
- In-orbit Applications for Earth monitoring, satellites inspections, …;
- Educational missions;
- European pathfinder for commercial services in access and return from Space.

The Space Rider is launched atop the Vega-C launcher from Europe's Spaceport in Kourou, French Guiana, will stay in orbit up to 2 months or more, and will re-enter on Earth for the recovery of the users payloads. After the flight, the SR will be refurbished for the next mission.



The SR is integrated with the Vega C Launch Vehicle to reach low Earth orbit, composed by the following two modules:

- the SR-AOM (AVUM Orbital Module);
- the SR-RM (Re-entry Module), reusable and refurbished after each flight.

The Vega C is composed by four stages, three based on the use of solid propellant motors (i.e. P120C, Z40, Z9) and one based on the use of liquid propellants (i.e. AVUM). The Vega C is launched from the Europe's Spaceport in Kourou, French Guiana.

The SR-AOM is a modified version of the Vega C upper stage, able to supply power, manoeuvres and attitude control in orbit to the whole SR system, up to the separation of the two modules prior to return to Earth.

The SR-RM is a modified version of the IXV (Intermediate eXperimental Vehicle) demonstrator, integrating a Multi-Purpose Cargo Bay (MPCV) for payloads integration, able to perform ground landing and to re-fly after limited refurbishment.

The SR MPCB allows the accommodation of multiple payload configurations as well as the necessary structures for mechanical fixation and thermal control. It also provides the capability for accommodating a pressurized and environmentally controlled compartment for payload hosting, upon demand from the user. Upon MPCB doors opening, the SR enables the exposure of the payloads to the space environment (e.g. radiation) as well as to an angle of view of at least 90 deg. The internal volume available of the SR MPCB is 1.2 m^3,

able to accommodate up to 800 Kg of pure payloads instruments[1] mass, depending on the instrumentation density, either for a single payload or a multiple payloads configurations.

The SR mission consists of the following subsequent phases:

- **Pre-launch phase**: this phase includes pre-integration and tests, transport to launch site at the Europe's Spaceport in Kourou in French Guyana, final integration and tests, installation on launcher and transport to launch pad;
- **Launch and ascent phase**: this phase includes the Vega-C launch vehicle mission, where the SR is injected into a near-circular orbit around the Earth, with nominal inclinations ranging between 5 and 55 deg (upon mission needs), extendable up to SSO under specific conditions;
- **Orbital flight phase**: this phase includes payloads operations for a period up to two months and more, where the SR will be flying freely around the Earth, with each orbit lasting approximately 90 minutes;
- **De-orbiting phase:** this phase includes the AOM-RM separation, starting from the cruising altitude of around 400 km, 30 minutes before landing;
- **Re-entry and Landing phase**: this phase includes the AOM destruction and RM landing, the latter going from hypersonic to transonic flights till the triggering of a subsonic parachute deployment, slowing down the RM until M=0.2 at an altitude between 6 and 10 Km, followed by the deployment of a guided parafoil for a controlled descent till the landing site, currently baselined in Santa Maria Island in the Azores (Portugal) for missions with inclination equal or higher than 37 deg, or alternative landing sites for equatorial missions with lower inclinations;
- **Post-Landing phase:** this phase includes the payloads retrieval and RM transportation to refurbishment facilities;
- **Post-Flight phase**: this phase includes the RM inspection, analysis and refurbishment for next flight, planned to be carried out within six-month timeframe.

The objective of this Announcement of Opportunity is to identify candidate Payloads for first and subsequent SR missions. The selection process is described in chapter 4.

3 DESCRIPTION OF THE OPPORTUNITY

3.1 General

This AO is open to any potential Customer of the Space Rider services, with no restriction of nationality, interested in flying:

A. Commercial Payloads;

B. Payloads operated by or for the benefit of Institutional entities.

[1] Net instruments, excluding any hardware required to the instrument to be operated since part of the services provided by the SR (e.g. thermal control, telemetry, power, propulsion, attitude and orbit control, …)

All potential Customers are invited to submit their application, as per paragraph 4.3 of this document.

3.2 Payload classes

The SR payloads shall be classified according to the following typology, operational needs and physical characteristics.

Payload typology:

- Telecom
- Observation
  - SUN
  - Earth
  - Deep space
- Biology
- Physical sciences
- Technology
- Exploration
- Education

Payload operational needs:

- Exposure to vacuum
- Exposure to radiation
- Shielding from radiation (identify type of radiation)
- In-flight mission duration
- Heat exchange constraints
- In-space data retrieval
- Separation from SRS (Y/N)
- Re-entry with SRS (Y/N)
- Micro-g minimum duration
- Micro-g quality level
- Altitude range

- Flight repetition (Y/N, frequency)
- Power requirements
- Optical access to Earth and/or Deep space
- Fine pointing attitude requirements
- Remote communication with payload / experiment
- Telemetry channels and transmission speed
- Cleanliness quality

Payloads characteristics:

- Mass
- Volume
- Shape and protrusions
- Accommodation constraints
- Mechanical, electrical, fluid, thermal Interfaces
- Ground and in-flight Services: command, monitoring channels

Classification of the payloads accordingly will enable the identification and elaborate of its launch service needs.

3.3 Orbital parameters

As indicated above, the SR will enable a wide variety of missions, where mission customizations are possible, according to a well-established missioning process inherited from the Vega launch system flight experience.

Potential Customers are therefore requested to explicitly identify, together with their preferred orbit, the flexibility of their Payload to other possible orbits.

3.4 Requirements and constraints

Potential Customers are recommended to review the SR User Guide included provided in Annex 1 and provide their feedback on potential non compliances or need for clarifications.

In order to perform the relevant pre-feasibility analysis, and consequently support the definition of possible aggregates of several payloads, potential Customers are requested to provide their response to the questionnaire in Annex 2.

Potential Customers shall identify their planned readiness for flight in their responses to this AO, considering that the SR maiden/first mission is planned for the first half of 2021, and the subsequent missions will be performed approximately every eight months.

4 SELECTION PROCEDURE

4.1 General scheme

The launch preparation procedure involves two steps:

STEP 1: SURVEY

- Issue of this Announcement of Opportunity with relevant Annexes;
- Submission of applications from potential Customers;
- Identification by ESA of suitable payloads to the maiden/first mission and identification of those earmarked to subsequent missions.

STEP 2: IMPLEMENTATION

Phase 0
Pre-feasibility analyses to confirm Payload preliminary acceptance for flight, including:

- agreement on Payload qualification requirements;
- agreement on launch service schedule;
- signature of Launch Service Agreement.

Phase I
Payload PSR (Pre Shipment Review). By this review, the Payload acceptance status (under user responsibility) will be endorsed by the launch service authority; the applicable documentation will include the previously agreed qualification rules and parameters to release authorisation for flight with Space Rider.

Phase II
FMAR (Final Mission Analyses Review). By this review, the detailed Payload mission analyses will be presented to users, their endorsement will release the Space Rider final mission preparation.

Phase III
POR (Payload Operations Review). By this review, the Payload operations for launch preparation and flight operations will be detailed, reviewed and endorsed. Agreement between user and launch service will be reached on all ground and flight phases where the Payload will be physically interfaced with the Space Rider System.

4.2 Flight service costs

The costs to be borne by Payload Customers will be identified based on the payload characteristics (i.e.: volume), mission requirements (i.e.: inclination) and flight service specific needs.

4.3 Responses to the Announcement of Opportunity

In response to the present AO, the potential Customers are invited to submit by May 15th, 2018 a Notice of Intent (NoI), prepared according to the guidelines provided in Annex 3, including a preliminary feedback to the technical requirements (Annex 1) and the filled questionnaire (Annex 2).

Any written communication shall be addressed to ESA Space Transportation Directorate, specifically to:

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ANNEX 1

Space Rider User Guide

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ANNEX 2

Space Rider Questionnaire

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ANNEX 3

Guidelines for Preparation of the Notice of Intent

NAME OF THE PROPOSING ENTITY:

CONTACT PERSON(S):

MAILING ADDRESS:
Tel.:
Fax:
E-mail:

Statement about intention.

Brief description of the experiment, including the following information:

- Name
- Typology
- Mission description
- Target orbital characteristics
- Mass
- Dimensions (protuberances, mechanisms…)
- Foreseen launch date
- Specific requirements concerning the launch service

Summary feedback on User Guide contents and discussion on possible major issues.