



**EUROPEAN COMMISSION**  
Directorate-General for Defence Industry and Space

Innovation and Outreach  
**Innovation, Start-ups and Economics**

**CALL FOR EXPRESSION OF INTEREST  
IN ORBIT DEMONSTRATION/VALIDATION (IOD/IOV)  
EXPERIMENTS  
HORIZON EUROPE R&I PROGRAMME**

*Disclaimer: this Call is not binding for the European Commission and does not preclude future decisions.*

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## **1. DESCRIPTION OF THE INITIATIVE**

### **1.1. Background**

One of the main objectives of the Space strategy for Europe is to foster a globally competitive and innovative European space sector in particular by improving support to technological maturation, for sub-systems, equipment and technologies, including in-orbit demonstration and validation activities, to reduce time to market.

To ensure EU non-dependence and competitiveness in technologies, there is a clear need for a regular, sustainable, cost-effective and responsive In Orbit Demonstration/Validation (IOD/IOV) service in the EU. Space flight heritage in real conditions and environment is often required to de-risk innovations such as new technologies, products, concepts, architectures, and operations techniques are they for unique or recurrent, institutional or commercial missions.

Although flight opportunities do exist, these are often difficult to find ad hoc at affordable cost and/or in the required timeframe.

For this purpose, a set of activities to provide IOD/IOV services were introduced in the Horizon 2020 programme for Research and Innovation. This activities are continued also under the successor programme for Research and Innovation, Horizon Europe<sup>1</sup> that cover all necessary tasks to prepare, provide and operate spacecraft(s), together with the related ground segment, which accommodates the selected IOD/IOV experiments.

The main challenge of the overall IOD/IOV activities is to provide a regular and cost-effective solution for common flight ticket actions (management, spacecraft design, including reuse of existing solutions, assembly, integration and tests, launch and operations), based on EU solutions both for the spacecraft (i.e. platform, experiments accommodation, operations in orbit including preparation) and associated Ground Segment and for the launch services.

The activities foreseen in the Horizon Europe In-orbit demonstration/ Validation (IOD/IOV) service include:

- System studies, at ground and space level, including the compatibility with the available launchers;
- Input to the launch mission analysis performed by the launch service provider;
- Selection, assembly, integration and testing of the spacecraft(s) and related ground segment;
- Management of interfaces with and between the different IOD/IOV experiments, between the spacecraft and the launcher and between the spacecraft and the ground segment;
- Preparation of the spacecraft(s) for the flight;
- In-orbit testing and operations including data provision.

For experiments forming a complete system (i.e. system provided as a spacecraft ready to be launched), the actions will include the provision of flight opportunities with EU manufactured launchers. These encompass mission analysis, verification of interfaces

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<sup>1</sup> Horizon Europe Work Programme 2021-2022, 7. Digital, Industry and Space (European Commission Decision C(2021)7804 of 28 October 2021).

between the spacecraft and the launcher, preparation of launch campaign and flight up to the injection of the spacecraft(s) on the required orbit(s).

Concerning launch aspects, IOD/IOV should support the European launcher exploitation policy, therefore relying as far as possible on EU manufactured launcher solutions launched from the EU territory.

In line with Horizon Europe, the implementation of the IOD/IOV activities is indirectly managed by the European Space Agency (ESA) for the entrusted tasks that include:

- i. Support to the Commission in the pre-selection of IOD/IOV experiments;
- ii. Interface with IOD/IOV experiments' providers;
- iii. Implement the IOD/IOV Projects for IOD/IOV experiments needing aggregation on IOD/IOV Spacecraft(s);
- iv. Implement the IOD/IOV Projects for IOD/IOV experiments in the form of complete systems;
- v. Procure and manage launch services for IOD/IOV Projects;
- vi. Perform system engineering.

## **1.2. Objectives**

The purpose of this Call for Expression of Interest is to gather feasible experiments, which could be considered for IOD/IOV actions.

IOD/IOV experiments are defined as innovative technologies, products, concepts, architectures, and operations techniques that require in orbit demonstration/validation. Experiments may be instrument, equipment, technologies, system experiment, missions, industrial payloads, etc. Experiments may be accommodated on IOD/IOV Spacecraft(s) or be provided as complete system(s).

Only experiments which have reached a sufficient maturity level will be considered to proceed as IOD/IOV experiments. It shall be noted that experiments will have to bear the costs of their own development up to and including the flight models.

Experiments will be self-standing with direct mechanical, thermal, electrical and data interfaces with the IOD/IOV spacecraft. Direct interfaces mean that the development of a dedicated space unit managing each proposed experiment is not required. Complete systems will be directly compatible with the selected launcher.

## **1.3. Constraints and requirements**

Experiments shall comply with the following constraints and requirements:

- a) The launch of the dedicated IOD/IOV missions will be performed as far as possible with EU manufactured launcher solutions launched from the EU territory.
- b) The candidate experiment providers are expected to perform all Product Assurance (PA) activities (including Configuration Management, Quality Assurance, Safety, EEE Components, Materials, Mechanical Parts and Software Product Assurance), according to plans drawn up by the provider, during all phases of the project to ensure that the experiment will perform its functions as intended with a high probability of success.
- c) Besides the delivery of the flight model, the experiment provider will support, for its experiment(s), the integration and testing of the spacecraft and as required with engineering analysis, engineering models and adaptations to interface requirements.

d) The approach for the achievement of the experiment qualification (TRL 7) and flight readiness from the current TRL level (preferably 5/6) shall also be part of the providers' response.

e) In order to establish the full Technical Dossier (description and interfaces requirements) of the experiment, the experiment provider shall engage a dialogue with ESA at the request of the Commission.

At the project implementation stage, Interface Document(s) including all technical and programmatic interfaces will be established by the spacecraft integrator with the support of experiment(s) provider(s) and the Launch service provider and will be applicable to the experiment provider(s). Experiment (s) provider(s) and other concerned entities shall provide adequate visibility to ESA given its role to ensure the overall coherence of interfaces. The requirements of each pre-selected IOD/IOV experiments may be adjusted up to the time of the System Design Review to ensure compatibility at system level with the spacecraft.

f) The candidate IOD/IOV experiments needing aggregation are expected to comply with resources and interfaces compatible with:

- a. Small satellites missions in the range of 150 kg;
- b. Cubesat missions with a volume of 3U or 6U format.

g) The candidate IOD/IOV experiments in the form of complete systems are expected to be compatible with EU manufactured launcher solutions.

h) Indicative overall planning:

- Flight model delivery: from 2023 to early 2024
- Indicative launch: 2023 – 2025

## 2. CALL FOR EXPRESSION OF INTEREST

### 2.1. Submission process

The Call for Expression of Interest shall be open until **Monday 31 May 2022, 17:00 (UTC)**.

Applicants are invited to submit their proposal for one or several experiments. Each experiment shall constitute a separate candidature file.

All correspondence and documentation shall be sent in English.

Applicants are kindly invited to register by email to [DEFIS-IOD-IOV@ec.europa.eu](mailto:DEFIS-IOD-IOV@ec.europa.eu) their intention to apply. The registration of interest does not entail any obligation to participate.

Applications shall be sent to [DEFIS-IOD-IOV@ec.europa.eu](mailto:DEFIS-IOD-IOV@ec.europa.eu) with "**Call for Expression of Interest – IOD/IOV experiments**" in the subject line, together with the completed annexed forms.

The Commission will inform all participants on the outcome of their application.

Any requests for additional information must be made in writing to the Commission using the following e-mail address [DEFIS-IOD-IOV@ec.europa.eu](mailto:DEFIS-IOD-IOV@ec.europa.eu).

## 2.2. IOD/IOV experiment selection process

This chapter describes the different steps of the selection process, from the analysis of the received application, to the final IOD/IOV experiment selection.

### 2.2.1. Analysis of received applications

First, each application will be assessed on the basis of the following criteria:

No	Criteria	Threshold/ Score
1.	<p><b>Technical fit:</b></p> <p>Acceptable technology readiness level for actions to be considered for the IOD/IOV service;</p> <p>Compatibility and complexity of the experiment needing aggregation in terms of interfaces and resources (e.g. Self-standing experiments, simple mechanical/thermal/electrical/data Interfaces with the host spacecraft, mass, volume, etc.) or compatibility with EU launcher for complete systems.</p>	<b>15/20</b>
2.	<p><b>Programmatic fit:</b></p> <p>Need and justification for the experiment demonstration and exploitation plan.</p> <p>Analysis of experiment programmatic elements (e.g. risks, planning, funding, etc.).</p> <p>Analysis of challenges related to the business case following IOD/IOV opportunity (if applicable), industrial competitiveness, European non-dependence, scientific challenge, etc.</p>	<b>20/30</b>
3.	<p><b>Policy relevance:</b></p> <p>Compliance with Union policy objectives stemming from: Horizon Europe, Space Programme components (EGNSS, Copernicus, GovSatCom, SSA), Space Strategy for Europe, Secure connectivity programme, European Quantum Communication Infrastructure, Space Traffic Management, other relevant Union programmes.</p>	<b>20/30</b>
4.	<p><b>Complementarity:</b></p> <p>Analysis of action in comparison with other existing/ planned actions within ESA, EU Member States/ associated countries or industry.</p>	<b>10/20</b>
	<b>Total (threshold/ score)</b>	<b>65/100</b>

### 2.2.2. *Pre-selection*

Applications that meet the threshold for each criterion will go through a pre-selection process.

IOD/IOV experiments will be given priority based on their marking. In case of ex-æquo, IOD/IOV experiments that received a higher score on the policy relevance criterion will be given priority.

IOD/IOV experiments needing aggregation will undergo an accommodation analysis with a view to allocating the highest number of experiments to IOD/IOV mission(s).

Considering available resources, a list of pre-selected IOD/IOV experiments will be established.

### 2.2.3. *Experiment selection*

For experiments needing aggregation, the final selection will be confirmed by the European Commission after the System Design Review (SDR) that will validate the feasibility of the relevant IOD/IOV mission. The requirements of each pre-selected IOD/IOV experiments will be reviewed and may be adjusted up to the time of the SDR to ensure compatibility at system level with the spacecraft.

The final selection of the IOD/IOV experiments in the form of complete systems will be confirmed based on flight availability.

## 2.3. **Application Package**

The application is composed of four parts.

Please complete all forms electronically and send them by email to [DEFIS-IOD-IOV@ec.europa.eu](mailto:DEFIS-IOD-IOV@ec.europa.eu) with the subject "Call for Expression of Interest – IOD/IOV experiments" by **31 May 2022 at 17:00 (UTC)**.

- Part I:** Application and compliance matrix (Annex I)
- Part II:** Commitment on Flight Model delivery (Annex II)
- Part III:** Legal Entity forms<sup>2</sup>
- Part IV:** Declaration of honour on exclusion criteria and absence of conflict of interest<sup>3</sup>

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<sup>2</sup> Please download from:

[https://ec.europa.eu/info/publications/legal-entities\\_en](https://ec.europa.eu/info/publications/legal-entities_en)

<sup>3</sup> Please download from:

[http://ec.europa.eu/employment\\_social/calls/pdf/dechonor\\_en.pdf](http://ec.europa.eu/employment_social/calls/pdf/dechonor_en.pdf)

## ANNEX I

### PART I: APPLICATION AND COMPLIANCE MATRIX

*The application should not exceed 30 pages.*

<b>1. Name of the proposed actions</b>	
<b>2. Applicant: Entity(ies) making the proposal and type (e.g. individual, consortium, industry, research centre, university)</b>	
Name of organisation(s) (Experiment provider)	
Country (ies)	
Person(s) <sup>4</sup> responsible for implementation	
Phone(s)	
Email(s)	
<b>3. Executive summary</b>	
<b>4. Objective of the proposed experiment</b>	
<b>5. Themes</b> <i>(e.g. Earth observation, Telecommunication, Navigation, Space Science, Technology, Space environment, quantum, connectivity)</i>	
<b>6. Type of experiment</b> <i>(e.g. instrument, equipment, technologies, system experiment, mission concepts, complete systems)</i>	
<b>7. Justification of the IOD/IOV</b> <i>(explain the necessity of the flight demonstration with respect to other options on ground and/or in space)</i>	

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<sup>4</sup> Where the application is being made by a group, one lead person should be identified.



**8. Previous space application/heritage of the proposed experiment**

**9. Funding plan of the experiment up to flight model delivery and associated tasks**

*Detailed description of the experiment funding plan (e.g. funding of development, including amount, date of availability of funds and remaining conditional clauses, if any, for the obtaining of these funds, including risk margin for, inter alia, potential additional qualification requirement or interfaces definitions required by the spacecraft, funding party(ies) demonstrated by letter(s) of intent)*

**10. Detailed development plan**

*Describe the development activities and related planning from the current status up to flight model delivery including design, models (Engineering Model, etc.), tests and qualification (Manufacturing Assembly Integration Testing/ Validation plan). An associated risk log should be included if any significant risk still remains with the development and schedule. Description of the development plan should also include the TRL increase from 5/6 to experiment qualification and flight readiness.*

**11. Policy relevance**

*(e.g. relevance for research and innovation programmes, Union space programme components, Space Strategy for Europe, Secure Connectivity programme, European Quantum Communication Infrastructure, Space Traffic Management, other relevant Union initiatives)*

**12. Detailed description of the experiment and justified compliance with interface**

*Detailed status of development demonstrating the estimated TRL, model philosophy, qualification status and verification activities up to TRL7. Interface control documents and budgets (mechanical, electrical, data, thermal) as input to the spacecraft requirements (or launcher interface requirements document when the proposals were for self-standing complete spacecraft). Please note that budget values provided for each experiment in the proposals are considered as values with margins, i.e. no additional margin is allocated.*

**a. Preliminary engineering drawings of the experiment**

*Indicate the required volume including all appendages, baffles etc.  
For experiments needing aggregation on:*

- *Small satellites in the range of 150 kg have a typical volume of around  $\frac{1}{2} m^3$  with half of the volume available for the total payload to be shared between the Experiments.*
- *Cubesat missions with a volume of 3U or 6U format.*

**b. Functional description of the experiment**

*The platform shall only be required to provide simple command & control & telemetry interfaces and the Experiment ensure autonomous functionalities.*

**c. Total mass of the experiment; mass breakdown, margins**

*Provide the overall mass of the experiment including possible appendages, brackets, thermal hardware etc.*

*For experiments needing aggregation:*

- *Small satellites in the range of 150 kg: typical mass allocated to the payload for small spacecraft is in the range of 70 kg to be shared between the experiments*
- *Cubesat missions with a volume of 3U or 6U format: typical mass for cubesat missions is limited to a few kg.*

**d. Field of view (if applicable)**

*Provide viewing direction, external surface and unobstructed field of view required by the experiment.*

**e. Experiment Pointing and alignment requirements (if applicable)**

*Specify experiment requirements such as pointing accuracy possibly detailed in terms of absolute/relative and performance/knowledge errors including stability requirements (e.g. thermo-elastic) and compatible with currently available small sat and cubesat platform.*

**f. Experiment Mechanical Interfaces**

*Indicate current qualification mechanical environment. As the Experiment will be launched on an EU manufactured launcher, it shall be compliant with the related mechanical environment (small satellite or cubesat). Typical domain can be obtained from the SSMS or MLS User's Manual.*

**g. Thermal Interfaces**

*Describe thermal interface of the experiment with the platform. The experiment shall preferably be thermally decoupled from the platform and have a typical operational range of -10C to +50C.*

**h. Electrical interfaces: average and peak power consumption for each mode of operation. Time profile.**

*Provide the power required by the experiment in the various modes and the average power requirement.*

*Typical average power available to the complete payload (including all Experiment's) is in the order of 75 W and a typical peak power up to 30 W per experiment can be provided. The power duty cycle for the Experiment will be determined depending on the overall demand. The power will be provided by one switched power line and should be considered non regulated (battery regulated*

*bus). Details specification of the power interface will be provided at spacecraft selection.*

**i. Interface with data handling. Bit rates of the experiment for different modes of operation, time profile, time reference/synchronisation required, etc.**

*The Experiment will be interfaced with the avionics of the spacecraft with data links. One link will be used for the commanding and housekeeping of the Experiment (typical data bus for small satellite platform or cubesat standard interface) and if required one high bit rate link will be provided for data collection with a maximum typical data rate of 100 Mb/s. Using these links the Experiment will have access to a minimum of TBD Gbit for data storage. Details specification of the interfaces will be provided at spacecraft selection. Data will be dumped to a primary ground station at TBD location.*

*Note: other specific interface should be generated by the experiment itself (self-standing experiment) as it cannot be guaranteed to be provided by the spacecraft.*

**j. Exploitation plan**

*Describe the exploitation of the in orbit data stemming from the experiment and identify any specific ancillary data requirements.*

**k. Operations scenario and mission phases**

*Provide description of the experiment operational scenario, modes of operations*

**l. Additional environment requirements**

*Describe any requirement beyond the following typical environment:*

- *Contamination and cleanliness requirements (standard ISO 8)*
- *Experiment magnetic cleanliness < 0.5 Am<sup>2</sup>*

**13. Mission needs**

*Describe the preferred orbit(s), typical orbits can be found on the Vega SSMS and Ariane 6 MLS user manual, mission constraints, mission duration, induced constraints on the spacecraft and other payloads, and other specific needs to be described*

**14. Issue / challenge**

*Commercial market (business case following IOD/IOV opportunity), industrial competitiveness, European non-dependence, scientific challenge, etc.*

**15. Please use this space to provide any other comments or additional information.**

**16. Compliance matrix**

*Please provide a declaration of compliance to the constraints and requirements listed in §1.3 of this document. Please provide rationale in case of partial and non-compliance.*

**17. Signature of organisation/partnership representatives:**

The signature certifies that the provided data result from the entity's commitments. In addition, the entity engages itself to inform immediately the Commission (by email to [DEFIS-IOD-IOV@ec.europa.eu](mailto:DEFIS-IOD-IOV@ec.europa.eu) if any changes occur.

At any stage of the experiment development, the entity may be requested to provide additional information to the Commission if necessary.

Name

Position

Date

ANNEX II

**Part II: Commitment on Flight Model delivery**

The undersigned, ....., in my capacity  
as.....

confirm the availability of the funding required for the Flight Model delivery  
and the associated tasks for the In orbit Demonstration/ Validation (IOD/IOV)  
Experiment(s) .....

I acknowledge that failure to demonstrate the compliance of the timely  
delivery of the Flight Model, as indicated in the planning, may result in a  
postponement or exclusion of the experiment.

Date .....

Place .....

Signature .....