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Announcement of Opportunity for hosting payloads on PSLV Orbital Experiment Module (POEM)

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1. Introduction

Technology development in the domain of Space science and technology needs to be demonstrated in the space environment for further development. A common methodology adopted for this in the satellite domain is to integrate the payload into a satellite which carries the payload and provides the main bus to support the payload operations. However, for various organizations looking to qualify their payloads in space environment the development of an entire satellite is resource intensive & may not be cost effective.

The PSLV Orbital Experiment Module (POEM) which uses the "spent PS4 stage" (fourth stage of PSLV) offers an effective platform for carrying out space qualification of payloads & to carry out in-orbit scientific experiments. POEM has standard interfaces & packages for power generation, telemetry, tele-command, stabilisation, orbit keeping & orbit manoeuvring and hence can be used to design, develop and validate experimental payloads.

IN-SPACe in collaboration with ISRO, has announced the opportunity to host payload on the upcoming POEM missions tentatively scheduled during November, 2023 and June, 2024. **Last Date to apply is August 25, 2023.**

2. About PSLV Orbital Experiment Module (POEM)

The Indian Space Research Organisation (ISRO) has come up with the idea of using the spent terminal stage of PSLV to perform experiments that would require space qualification. This idea aims to utilise the terminal stage (PS4) as a platform on which the scientific experiments can be mounted and tested after separation of all satellites. The experimental payloads can utilise the standard interfaces of POEM, without being concerned about requirements like power, Navigation, attitude control, data management & specific requirements including tele-command (which would be needed if they have to test it as part of a satellite).

The capabilities of POEM have been demonstrated in two PSLV missions, latest being PSLV-C55. A brief of payload hosted on POEM-2 mission onboard PSLV-C55 is given below for reference

- **PILOT** (Pslv In orbitaL Obc and Thermals) is developed by Indian Institute of Space Science & Technology (IIST) comprising 3D printed subsystem package structures with COTS OBC. OBC is successfully executing flight software in the orbit and thermal data is gathered for model validation.
- **ARIS** (Advanced Retarding Potential Analyzer For Ionospheric Studies) is developed by IIST capable of Ionospheric and Space weather studies via electron and Ion flux and energy measurement. ARIS Data successfully received, apart from regular data & special events like recent geomagnetic storms were detected during data processing.
- **STARBERRY SENSE** by Indian Institute of Astrophysics (IIAP) is an Experimental compact star sensor based on commercial, off-the-shelf components. Sky Images are received. The payload is operational and performing as expected.
- **DSOL** (Dhruva space Satellite Orbital Link) by Dhruva Space is a configurable transceiver for TT&C and payload data download with high data rates in S&X band with multiple modulations. Successful data reception confirmed from ISTRAC Port Blair ground station.
- **DSOD-3U** (Dhruva space Satellite Orbital Deployer) by Dhruva Space is a Commercial India-made deployer for 3U CubeSats. Successful Deployment status confirmed.
- **DSOD-6U** (Dhruva space Satellite Orbital Deployer) by Dhruva Space is a Commercial India-made Deployer for the delayed deployment of CubeSats into Low Earth Orbit and higher orbits. Mission successful with confirmation of on-demand/planned delayed deployment.
- **ARKA-200** Hall-Effect Thruster (HET) based Electric Propulsion System (EPS) is developed by Bellatrix Aerospace. EPS subsystem health check, heater operation & gas purging was successfully done. Power Processing and Control Unit worked as expected. Gathered valuable information for next EPS mission with thruster firing.

The coordination, and technical support for five of these payloads was extended by IN-SPACe with ISRO support. Each payload was unique and the valuable on-orbit data received offered, space flight heritage and new opportunities for future development.

3. Purpose of this Announcement of Opportunity (AO)

Proposals are solicited Indian industry/academia for novel space-based experiments to be configured in POEM of upcoming PSLV launches. The AO has a specific objective to invite

important payloads for inclusion in the POEM missions to strengthen / complement the space-based research activities taking place in industries/ academia within the country.

The payload avenues that may be explored are listed below:

- Satellite bus technology development and space qualification of sub-systems
- Microgravity experiments
- Robotics technology demonstration
- Payload systems technology demonstration and space qualification of sub-systems

Each proposal will be scrutinized as per selection criteria mentioned in this document and the shortlisted proposals will be identified to be accommodated in the upcoming POEM missions on PSLV slated for launch in 2023-24 (tentatively in November, 2023) or 2024-25(tentatively in June, 2024) based on the payload realization timeframe, accommodation feasibility and any other criteria defined by IN-SPACe. **A separate application to IN-SPACe seeking the authorization for the establishment and operation of the payload shall be submitted by the selected applicant.**

Facilitation from ISRO if any, towards testing, realization or technical guidance may be sought through IN-SPACe by the shortlisted applicants. ***However, a separate commercial service agreement shall be signed with M/s NSIL with respect to the launch and associated logistics.***

4. Proposal Submission

4.1 Who can apply

An Indian entity (Government or Non-Government) such as academic/ research institution, industries looking to configure their payload on POEM.

The proposal must be submitted by an official authorised to certify, support and sponsor the investigation as well as the manage the financial aspects, on behalf of the Institution/Research Laboratories

Applicants are preferred to be currently involved in space-based research / validation of specific experiments in micro gravity conditions/ development of payloads for space-based applications/ or any competent team willing to develop space worthy experiments and have access to associated facilities for payload testing.

4.2 How to apply

The application for the hosting of payload on POEM should be made online, in the prescribed form available at http://www.inspace.gov.in . Please note that applications will be accepted through IDP only. **The last date for proposal submission is August 25, 2023 18:00 Hrs.**

4.3 What is expected

The applicants will clearly need to spell out the objective and requirements from the platform and should be capable of

i. Providing necessary details of the payload which can address proposed objective including the readiness of the payload for integration with the POEM.
ii. Assembling a capable team and lead the team to deliver a space-qualified payload.
iii. Ensuring that payload/ instrument meet the Qualification specified as per ISRO standards. (Guidelines given in Annexure II to be followed).
iv. Ensuring adequate funding to enter into a contract with NSIL for launch of the hosted payload.

5. Selection Criteria

Expert Committee (EC) constituted by the Chairman IN-SPACe, consisting of the members from IN-SPACe and ISRO, shall evaluate the proposals and recommend for configuring on the POEM on the basis of:

i. Innovation/Novelty/Societal benefits/Technology demonstration for future missions
ii. Feasibility of accommodation on the POEM (including readiness of the payload)
iii. Expertise & Experience in realizing payloads
iv. Facility & Infrastructure available
v. Payload parameters that could be supported by the POEM

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Annexure II

Guidelines for development of payload

1. Payload to be configured as a functionally standalone system. Mass & volume is to be limited to 10kg and standard 1U/2U/3U dimensions, if possible. Any waiver for mechanical interface/ mass is to be obtained from ISRO prior to design finalization.
2. Payload should be able to operate using 28V power bus (RAW power) provided from PS4-OP.
3. Payload to contain only MIL grade components. Use of commercial/industrial grade components is subject to satisfactory completion of specified acceptance tests.
4. RF payload frequency/ power & sensitivity to be finalized after payload interference study with the existing RF elements in PS4-OP/ passenger payloads.
5. D-Type/ Circular MIL grade connectors to be used for electrical interface.
6. Payload should be capable of re-configuring itself into intended configuration, in case of an unexpected power interruption during OP Phase.
7. Electrical interface & mechanical interface (signed by competent authority) reviewed and cleared by Selection committee to be made available tentatively about 3 months prior to the targeted launch date, to initiate interface preparation at the launch vehicle side. Further changes in the interface details are not allowed.
8. The payload should be made available for the integration into the POEM tentatively about 2-3 weeks before the launch.
9. Dummy mass/ balancing with identical mass & footprint to be made available in case of non-readiness of the system (after the realization of vehicle interfaces) for launch.
10. Payloads to be qualified / acceptance tested to the environmental test levels specified for PSLV.