

## **Announcement of Opportunity (AO)**

### **Development of Technologies for sustained Indian Human Space Program and Space Exploration**

#### **1. Introduction**

ISRO's Human Space Program will endeavour to send humans to destinations from low earth orbits and beyond. Human Space Mission requires innovations and creative technologies for space explorations which will lead to widening of scientific knowledge, economic growth, value addition to the quality of life of a common man and thus national development. There is need to build capabilities to derive scientific benefits from ISRO's Human Spaceflight Program.

There is also a need to establish long term research as well as plan for necessary facilities, human resource developments for optimal utilisations of experimental applications and technological developments for societal usage.

This opportunity will enable national research/academic institutions to harness their expertise and capabilities towards development of technologies for space exploration.

#### **2. Purpose of the AO**

Proposals are solicited from national research/ academic institutions for developing affordable and indigenous cutting edge technologies for human survival in low earth orbits and beyond for space exploration.

##### **2.1 Tentative List of Technological Development Areas**

<b>SI No.</b>	<b>Technology Development Areas</b>
1.	Radiation Hazards Characterisation and Mitigation Techniques
2.	Space Food and Related Technologies
3.	Inflatable Habitats Technology
4.	Human Robotic Interfaces
5.	Thermal Protection Systems
6.	Environmental Control And Life Support Systems
7.	Green Propulsion

8.	Advanced Materials
9.	Debris Management And Mitigation
10.	Energy Harness And Storage
11.	In-situ 3D Manufacturing Technologies For Space
12.	Fluid Technology and Management
13.	Space Bioengineering
14.	Bio-Astronautics
15.	Simulated Gravity Technologies
16.	Human Psychology For Long Term Missions
17.	Space Medicine And Diagnosis
18.	Any Other Relevant Technology Related To Human Space Program

### 3. Submission of the proposal

The Principal Investigator (PI) of the proposal should

- I. Provide necessary details and usage of technology/solution for human space program which can bridge the gap in terms of affordability and indigenisation.
- II. Be capable of developing a space qualified payload/solution.

The Proposal is to be submitted in the specified format given in Annexure-A. The summary table given in Annexure-B also must be filled. The complete proposal with all the relevant details to be submitted through the Head of the institution (send the advance copy in “Word” and the signed pdf copy by speed post/email) to:

Director, Directorate of Human Space Programme, ISRO Headquarters, Antariksh Bhavan, New BEL Road, Bangalore-560094.

Email: [dhsp-ao@isro.gov.in](mailto:dhsp-ao@isro.gov.in)

**The last date for receiving the proposal is 15 July, 2020**

Late submission will not be accepted beyond the above timeline.

#### **4. Review of the proposal**

In order to identify the suitability of the proposal to the Human Space Program, the proposers may be requested to interact with a review committee as and when required. The final selected proposals are expected to incorporate suggestions made by the review committee.

#### **5. Selection Process**

ISRO shall constitute a Selection Committee for scrutiny the proposals. The screening of the proposals will be based on scientific benefits, relevance, technical content and feasibility perspective.

#### **6. Terms and Conditions**

- I. ISRO reserves the right to scrutinize any or all proposals received in response to this AO, or modify a proposal at any stage of consideration.
- II. ISRO reserves the right to select or not to select any proposals received in response to this AO, depending upon need, novelty of intended applications, technical suitability to the mission, delivery schedule, quality & reliability factors.
- III. The research / academic institute shall not hold ISRO responsible for any harm or bodily injury or death, any loss of equipment or property during payload module realization.
- IV. Developed payloads shall not be allowed to carry any chemical or nuclear substances, biological samples that are prohibited by the COSPAR guidelines on planetary protection (for more details please visit website <https://cosparhq.cnes.fr/assets/uploads/2019/12/PPPpolicyDecember-2017.pdf>).
- V. It shall be declared and ensured by the PIs of the selected payloads that they will not result in any harmful contamination of the outer space environment.
- VI. Principal investigator should provide the information about source of funding to develop payloads/ facility developments.
- VII. All selected proposals will be evaluated before the flight by Reliability and Quality (R & Q) Team from ISRO. ISRO reserves the right to cancel the selected payloads from flight if it poses risk in any form to quality and safety aspects of the mission.
- VIII. The developed proposal by PIs in collaborations with ISRO, shall not be allowed to be used for marketing/business purposes without prior permission. ISRO reserves the right to accord permission on such cases, considering the overall national interests.

- IX. Any/ All Intellectual Property Rights such as patents, copyrights, design rights etc. acquired by the research academic/institute (payload) or the PI, through the design and realization of payload modules, shall be jointly owned by ISRO and the research institute, regardless of funding support from ISRO or otherwise.
- X. Any commercialization of such IP rights shall be done by the research institute only with the consent / permission of ISRO, on mutually agreed specific terms and conditions, which shall be determined on a case by case basis by ISRO.

**Annexure-A**  
**Format for submitting the proposal**

**1. Title of the proposal and brief abstract**

**2. Category of Institution: (and partners, if any)**

- a. Government Institute
- b. Private Institute
- c. Non-profit research/teaching institute

**3. Contact Details:**

- a. Institution: Postal address, Telephone number, Website
- b. Contact Point (Principal investigator or project team leader): Name, Phone number, Mobile number, Email.
- c. Number of years of PI or project team leader before superannuation.

**4. Mission objective**

- a. Technology demonstration/development
- b. Any other (to be specified)

**5. Source of funding:**

(Please provide all relevant details. Document support to be submitted when asked)

- a. Sponsored by Government department or Ministry
- b. Under any sponsorship (please specify)
- c. Collaboration with a foreign university or agencies.
- d. Management of fund
- e. Any other source

**6. Details of the proposal:**

- a. Executive summary
- b. Scientific/Technological objectives
- c. Detailed scientific/technological justification
- d. Anticipated results and significance compared to contemporary research

**7. Payload details, wherever applicable: (Please provide all relevant details)**

- a. Mass, Power, Volume, Dimension, Unregulated Power Supply requirement
- b. Requirement of on board data storage. Whether real time data transmission capability required and if so, total volume of data to be transmitted and data rate.
- c. Design approach and specifications, development process, test, evaluation and collaboration procedures.

- d. Development strategy: lab model, PM, EM, Flight model.
- e. Plan for data processing, storage, archival and payload interface plan.

**8. Infrastructure available with the institution for the proposed Research:**

- a. Technical and Scientific team with domain experts (including research students)
- b. Collaborating institutions
- c. Laboratory facilities
- d. Details of available test equipments and test facilities.
- e. Available fund

**9. Requirement of additional infrastructure, if any**

- a. Manpower
- b. Fund
- c. Laboratory facilities for development, qualification and calibration
- d. Test equipments and test facilities
- e. Plan for testing/qualification outside the institute, if yes, give details.

**10. Nature of support sought from ISRO**

- a. Funding support (limited funding support from ISRO)
- b. Technical consultancy
- c. Clean room support
- d. Environmental test support
- e. Any other, project related support

**11. Schedule of realization and delivery**

- a. Detailed PERT chart and time schedule for completion of the development including Proto Model / Verification model, which should have the same design and approximately same size as Flight model.
- b. Detailed PERT chart and time schedule for development, testing and calibration of Qualification Model (Should be identical in Mass, Volume and Design as Flight Model and should undergo all environmental tests) and Flight Model from T0, assuming T0 being the date of approval for the project proposal.
- c. Time schedule for the solution of a problem in terms of simulation results, chemical formula/composition and technological advancement in the existing systems.
- d. Half year wise budget detail

**12. Past experience of the principal investigator and team with similar technology development/research conducted if any?**

**13. Any other special requirement**

## Annexure-B

### Summary Table

<b>1</b>	Title of proposal		
<b>2</b>	Principal Investigator name and official designation, address Co PIs name & designation, address		
<b>3</b>	Category (select from 2.1)		
<b>4</b>	Primary objectives		
	I. New Science/Technology		
	II. Extension/ Improvisation to the previous findings		
	III. Supplementary / complementary science		
<b>5</b>	Instrument specifications required to meet proposed objectives		
<b>6</b>	New technologies to be developed (if any)		
<b>7</b>	Critical components procurements / availability / shelf life issues (if any) for realizing the instrument		
<b>8</b>	Expected maximum mass of the payload		
<b>9</b>	Expected maximum raw power (assume a 70% efficiency for DC-DC units)		
<b>11</b>	Commanding operation and monitoring requirements		
<b>12</b>	Payload Data		
	1. Storage requirements (on board)		
	2. Data transmission rate requirements (if any)		
	3. Latency		
<b>13</b>	Institutional Infrastructure (for proposed activities)		
	(a) Human resource details:		
	(b) Relevant test facilities		
	(c) Any other		
<b>14</b>	Budget requirements (price break up)		
<b>15</b>	Schedule – time frame for delivery	Qualification Model	Flight Model
<b>16</b>	List of non-space grade components		

Item no 5, 7 to 13 applicable, if any payloads development is involved

**Declaration:**

I/We declare that all the information/ technical details furnished above are factually correct to the best of my/our knowledge.

I/We further declare that, I/we would utilize the financial resources provided under this proposal by ISRO/DOS for the proposed activities.

I/We further declare that the payload proposal shall not contain any chemical or nuclear substances/ biological samples that are prohibited by COSPAR guidelines, neither shall result in any harmful contamination of outer space environment.

Signature

Name

Date & Place

Official Seal