

# **PB-HME Workshop Small Missions Initiative**

ESA-HQ, Paris 6 July 2023

June 2023

ESA UNCLASSIFIED – For ESA Official Use Only

#### Contents



#### 1. Introduction

- 2. Concept
- 3. Implementation approach
- 4. Back-up information:
  - 1. OSIP call
  - 2. Evaluation Criteria



#### Introduction



Aim of *Small Missions* initiative: to offer programmatic opportunity for E3P Participating States with small to medium contribution to become more visible actors in the implementation of ESA exploration strategy

**This initiative** could play an important role in preparing way for larger Exploration missions. It shall contribute to implementation of goals of **Terrae Novae strategy** and in particular:

- Increase scientific knowledge of Moon and Mars and to use Low Earth Orbit for scientific research
- Prepare and provide elements on critical path leading to horizon goal of Europeans to Mars
- Stimulate development of new industrial capabilities and exploration services with applications from Earth orbit to Moon and Mars
- Close technology gaps in areas relevant to exploration needed for future missions and exploration infrastructure
- Inspiring the general public and increase the general interest in space activities

#### 💻 🔜 📲 🚍 💳 🕂 📲 🔚 🔚 📰 🔚 📲 🔚 🔤 🛶 🚳 🍉 📲 🚼 📰 📾 📾 📾 🌬 👘 → THE EUROPEAN SPACE AGENCY

# **Guiding Principles**



#### • Create new opportunities for targeted players

Relevant participation of SMEs, mid-caps and research institutions in small and medium contributing States as prime or subcos will be favoured in Phase A/B1 selection process

It is proposed that Large System Integrators will be excluded from being lead proposer of a mission concept for Phase A/B1, although being able to participate as subcontractors

Affiliates of LSIs operating in small and medium Participating States will not be penalized in Phase A/B1 selection process.

Proposers will be invited to elaborate possible development approaches (including funding sources) that could be different from classical ones foreseeing a Phase A/B1 followed by Phase B2/C/... for traditional infrastructure procurements

#### • Ensure full competitive approach for mission selection

Mission outlines will be assessed on their clarity, credibility and completeness when competing for selection. They should be aligned with the Terrae Novae exploration strategy

#### • Leverage previous initiatives and AOs

Several ideas for small missions for Exploration have already been collected through past initiative e.g. SysNova. Interested consortia will have to apply again to Small Missions process.

The approach will be presented to IPC as well

#### 💳 🖬 🚼 💳 🖛 📲 📲 🔚 📲 🔚 📲 💳 🖛 🕼 🕨 📲 🛨 🖬 📾 🗰 👘 🔶 The European space agency

### **Destinations**



#### **Destinations:**

- Destination Moon: e.g. fly-by satellites, orbiters and potentially also surface assets as rovers (small rover, swarm concept, rover for harsh environment ,...) if transportation services (including landing) are available (not currently the case, landing opportunity with Argonaut > 2030)
- Destination Mars: e.g. fly-by satellites, orbiters and surface assets (penetrators,...)

#### Moon as destination for the first OSIP call to be implemented as of Period 4

**Destination for Period 5 following assessment of the outcome of the first call** 

# **Small Missions: Period 3 and budget**



In Period 3, proposal to collect and evaluate ideas via OSIP call open to all ESA PS and to mature them to a level corresponding to **Phase B1** (SRR). In Period 3 budget for :

Phase A/B1

• Pre-Phase A studies from **BA-Preparatory Element** 

PrePhA(BA)

OSIP

 Phase A/B1 expected to be provided by ExPeRT following guiding 100 principles

Subject to funding availability, implementation phase planned to start in Period 4 with expected implementation phase duration up to launch of 3-4 years (conceivably longer for a mission to Mars). Predicated Cost at completion:

- Small Mission to the Moon (e.g. Orbiter) around 50 M€
- Small Mission to Mars around 150 M€ (tbc).





■ PrePhaseAs ■ Phase A/B1s ■ Phase B2/C/D/E

#### 🖣 🔜 📲 🚛 💳 🛶 📲 🔚 📲 🔚 📲 🚍 🛻 🚳 🌬 📲 🚼 🖬 ன 📾 🐏 🐏 🔺 🔸

CMIN

## **Small Mission destinations vs costs**



Proposed cost limit is challenging for missions to Moon (but feasibility has been already demonstrated), even more for Mars, but not unrealistic if adequate infrastructures are available for communication and propulsive transfer services. Availability of services is under assessment by ESA and it will help to define destination areas of OSIP call

#### Small missions to the Moon

- opportunities provided by rideshare launches (e.g. Arianespace), where spacecraft is one of a cluster of small payloads or a secondary payload have been already assessed in Period 2 and launch cost will fit in proposed overall cost for a Small Mission to Moon
- Proposer will be encouraged to consider use of communication resources such as Lunar Pathfinder and in due course, Moonlight communications and navigation services expected to be available before end of this decade

#### **Small Missions to Mars**

could be carried by either a rideshare with a large planned mission (e.g. NASA Ice Mapper Mission is a
possibility) or by a propulsion service

**ESA role**: acting as facilitator and will monitor and investigate availability of services as communication, (navigation) and transfer

#### 9 💶 📲 🚍 💳 🛶 📲 🔚 📰 🔜 📲 🔜 🛻 🚳 🛌 📲 🖿 🛶 🖓 🐂 📲 🛨 🔤 📾 🖏 🔤 👘 → The European space agency

### **Process Summary**





\*

# Small Missions – Canvas Process Steps 1-2 & Structure Cesa

## Purpose of the required information:

Assess clarity & credibility of Scientific / Exploration content, ROM cost, and ability of proposer(s) to conduct required Pre-Phase A

**OSIP** Call

**Mission Outline** 

- Mission Outline Template
- Reference Documents (Terrae Novae 2030+, SciSpace Strategy, etc)
- FAQ: (tbc); can also be used as Clarifications repository during Call

 Sector
 -13
 Will be reached for other agenctive related to the experiment () have as suband () impact an exact has the based of the call and transmission () and transmiss

Specific **Points for Attention** to be addressed in Pre-Phase A proposal, stemming from Evaluation outcome ITTs for Pre-Phase A Structure

- No SoW
- Letter of Invitation, STC, draft Contract
- Based on Template proposal (cf EXPRO+)

Possibility to add specific Task(s)  $\rightarrow$  address various cases / possibilities stemming from OSIP Call selection

- Proposal assessment: along usual lines technical, financial, contractual – on completeness, clarity and credibility
   Formal proposal is self-standing: includes Scientific / Exploration contents (repeat and/or amend from OSIP Call)
- **Standard list ADs, RDs,** & specific ones (related to destination, type of mission...) stemming from OSIP call selection
- Standard list Deliverables

Plus potentially specific ones stemming from OSIP Call selection

### **Backup Slides**



Additional Information

- OSIP
- Anticipated Evaluation Criteria



10

#### The Open Space Innovation Platform

- ESA's innovation platform at ideas.esa.int
- Opening ESA innovation pipeline
- Change of logic: focus on idea ESA to help finding path in ESA
- Widely adopted as ESA's main portal for call for ideas
- Reactiveness by ESA is key since timing is driven by externals



Show More

ESA UNCLASSIFIED - For ESA Official Use Only



# THE INNOVATION PROCESS ON OSIP





# BA OBJECTIVE 1 -> PREPARATION (1/2)

#### PREPARATION OF FUTURE MISSIONS

- ightarrow prepares and enables future mission and programmes through
  - $\rightarrow$  pre-phase A studies (including CDF studies),
  - $\rightarrow$  phase-A studies and dedicated system analyses to establish robust trade-offs for mission designs
- $\rightarrow$  Across all ESA activity domains
- → Develops open competitive first designs of all new missions based on best concepts without geo-return constraints (encouraging wider participation)
- ightarrow Prepares new mission concepts and programmatic lines
- → What's Next: First ever fully open call for new mission concepts: >200 ideas, 47 retained for 13 workshops, 12 ITTs / studies
- $\rightarrow$  Supporting industry in faster introduction of MBSE
- $\rightarrow\,$  Exploring new roles of ESA
- $\rightarrow$  Regular reporting to DG and IPC (and via nebula.esa.int)





#### AGENDA 2025

→ "Digital continuity throughout projects allows the substantial reduction of cost and errors, and will shorten schedules. ESA will therefore digitalise its full project management, engineering by using Model Based System Engineering"

ESA UNCLASSIFIED - For ESA Official Use Only

#### 

# **BA OBJECTIVE 1 -> PREPARATION**







ESA UNCLASSIFIED - For ESA Official Use Only



### **Small Missions – Evaluation Criteria**



#	Criterion		Criterion encompasses	Selection OSIP	Selection A/B1
		1.1	Does the mission concept address an important problem or challenge indicated within the SciSpace Strategy or a SciSpacE White Paper?	✓	$\mathbf{\overline{N}}$
1		1.2	Is there a clear, well-grounded and elaborated scientific justification and motivation provided in response for the proposed mission objectives?	<b>√</b>	Ŋ
		1.3	Do the mission data products result in an advance in research which is incremental or radical/disruptive?	✓	$\mathbf{\overline{N}}$
		1.4	Do the results of the research provide a benefit to Earth or for space exploration?	<b>√</b>	M
	Scientific Content	1.5	Will the results (or other aspects related to the experiment) have a sustained impact on research in the future?	✓	M
	Scientific Content	1.6	Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, within the scope of the call and traceable to the identified objectives and hypothesis?	√	Ø
		1.7	Does the applicant acknowledge scientific risks and suggest mitigation?	✓	R
		1.8	Does the applicant have appropriate background and expertise for this proposed mission?	<b>√</b>	N
		2.1	Does the mission address an important problem or challenge indicated within the Terrae Novae 2030+ Strategy ?	✓	M
		2.2	Is there a clear, well-grounded and elaborated exploration justification and motivation provided in response for the proposed mission objectives?	<b>√</b>	
2		2.3	Does the mission lead to an advance in European exploration objectives which is incremental or radical/disruptive?	✓	M
	Exploration Content	2.4	Do the results of the mission provide a benefit to Earth or for space exploration?	<b>√</b>	
		2.5	Will the results (or other aspects related to the experiment) have a sustained impact on research in the future?	✓	M
		2.6	Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, within the scope of the call and traceable to the identified objectives and hypothesis?	4	
		2.7	Does the applicant acknowledge exploration risks and suggest mitigation?	✓	M
		2.8	Does the applicant have appropriate background and expertise for this proposed mission?	✓	N
	Technology Feasibility /	3.1	Are all critical technologies (including those of the payload) and their corresponding and projected TRL identified?		N
3		3.2	Are necessary activities for raising (by the end of Phase B2) TRL, their duration and responsible entities shall be identified?		
	Technology	3.3	Is the mission free from non-European mission-enabling or critical technologies? / All non-European technologies, if any, shall be identified.		
	Readiness	3.4	Does the applicant acknowledge technical risks and suggest mitigation?		
		4.1	Is the mission correctly reflected within the price and is the price fitting within the budgetary envelope?	[√]	N
4	General Programmatics	4.2	Is the background, capabilities and facilities of the consortium elaborated and deemed adequate?	[1]	M
		4.3	Are there measurable benefits for the purpose of the specific mission.		V
		4.4	Has a risk analysis of the programmatic (not technical) aspect been performed?		
	Feenemie	5.1	Does the mission enchances Startups, universities and/or schools participations within the programme?		
5	Objectives	5.2	Does this mission create new businesses or help existing businesses to grow?		
		5.3	Does the proposal show that the project would develop skilled workforce?		

#### Caption:

✓ Selection for pre-Ph.A

[✓] At level required (e.g. ROM Cost) for selection for Pre-Ph.A

☑ Selection for Ph.A/B1 (inc. outcome of / update from Pre-Ph.A)

15

→ THE EUROPEAN SPACE AGENCY

\*

# **Small Missions – Scientific Evaluation Criteria**



#	Criterion	#	Criterion encompasses
	Scientific Content	1.1	Does the mission concept address an important problem or challenge indicated within the SciSpace Strategy or a SciSpacE White Paper?
		1.2	Is there a clear, well-grounded and elaborated scientific justification and motivation provided in response for the proposed mission objectives?
1		1.3	Do the mission data products result in an advance in research which is incremental or radical/disruptive?
-		1.4	Do the results of the research provide a benefit to Earth or for space exploration?
		1.5	Will the results (or other aspects related to the experiment) have a sustained impact on research in the future?
		1.6	Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, within the scope of the call and traceable to the identified objectives and hypothesis?
		1.7	Does the applicant acknowledge scientific risks and suggest mitigation?
		1.8	Does the applicant have appropriate background and expertise for this proposed mission?

# **Small Missions – Exploration Evaluation Criteria**



#	Criterion	#	terion encompasses			
	Exploration Content	2.1	Does the mission address an important problem or challenge indicated within the Terrae Novae 2030+ Strategy ?			
		2.2	Is there a clear, well-grounded and elaborated exploration justification and motivation provided in response for the proposed mission objectives?			
		2.3	Does the mission lead to an advance in European exploration objectives which is incremental or radical/disruptive?			
2		2.4	Do the results of the mission provide a benefit to Earth or for space exploration?			
		2.5	Will the results (or other aspects related to the experiment) have a sustained impact on research in the future?			
		2.6	Are the conceptual framework, design, methods, and analyses adequately developed, well integrated, within the scope of the call and traceable to the identified objectives and hypothesis?			
		2.7	Does the applicant acknowledge exploration risks and suggest mitigation?			
		2.8	Does the applicant have appropriate background and expertise for this proposed mission?			

# **Small Missions – Technical Evaluation Criteria**



#	Criterion	#	Criterion encompasses
	Technology Feasibility / Technology Readiness	3.1	Are all critical technologies (including those of the payload) and their corresponding and projected TRL identified?
		3.2	Are necessary activities for raising (by the end of Phase B2) TRL, their duration and reponsible entities shall be identified?
3		3.3	Is the mission free from non-European mission-enabling or critical technologies? / All non-European technologies, if any, shall be identified
		3.4	Does the applicant acknowledge technical risks and suggest mitigation?

# **Small Missions – Programmatics Evaluation Criteria**



#	Criterion	#	Criterion encompasses
		4.1	Is the mission correctly reflected within the price and is the price fitting within the budgetary envelope?
4	General	4.2	Is the background, capabilities and facilities of the consortium elaborated and deemed adequate?
	Programmatics	4.3	Are there measurable benefits for the purpose of the specific mission
		4.4	Has a risk analysis of the programmatic (not technical) aspect been performed?

## **Small Missions – Economic Evaluation Criteria**



#	Criterion	#	Criterion encompasses
		5.1	Does the mission enhance Startups, universities and/or schools participations within the programme?
5	Economic	5.2	Does this mission create new businesses or help existing businesses to grow?
	Objectives	5.3	Does the proposal show that the project would develop skilled workforce?

20