C.23 INSTRUMENT CONCEPTS FOR EUROPA EXPLORATION 2

NOTICE: Amended on August 23, 2018. To give more time to proposers from Hawaii affected by Hurricane Lane, the Step-2 proposal due date for this program element has been delayed to September 7, 2018.

July 18, 2018. The point of contact (POC) for this program element has changed. The new POC is Mitch Schulte.

Amended June 1, 2018. The page limit for the central Science-Technical-Management section of proposal is 15 pages. New text is in bold and deleted text is struck through. The due dates are unchanged.

May 17, 2018. This amendment presents final text for this program element, which was previously released as draft for community comment. Consolidated feedback on the draft text and NASA's responses have been posted under "Other Documents" on the NSPIRES page for this program element. Step-1 proposals are due June 22, 2018, and Step-2 proposals are due August 24, 2018.

1. Scope of Program

The Instrument Concepts for Europa Exploration (ICEE) 2 program supports the development of instruments and sample transfer mechanism(s) for Europa surface exploration. A sample transfer mechanism is defined as a lander-mounted mechanism for handling sample and/or sample containers for presentation or transfer to scientific instruments. It includes any sample processing needed by all in situ instruments. The goal of the program is to advance both the technical readiness and spacecraft accommodation of instruments and the sampling system for a potential future Europa lander mission.

The program is noteworthy in that all awardees will be required to collaborate with the pre-project NASA-JPL spacecraft team and potentially other awardees. This collaboration will provide the opportunity for co-development of potential instruments, the sample acquisition and delivery system, and the lander itself, as all of these require maturation in a compatible system. The complexity of the mission and the anticipation of very limited spacecraft resources require this collaboration and co-development to develop a solid mission formulation capable of achieving the scientific goals.

This opportunity is open to any instrument concept addressing one or more of the Science Definition Team (SDT) objectives in "*Europa Lander Study 2016 Report*" posted under "Other Documents" on the NSPIRES page for this program element. However, instrument concepts must be compatible with the Europa lander mission architecture described in the report above as well as fit within the payload resource constraints described in Section 2.1. It is a priority for NASA to invest in development of instrument concepts in the strawman science payload, but selections will not be limited to those concepts. It is expected that multiple awards for similar instrument concepts will be made.

While specific technology readiness levels (TRL) are not prescribed for the ICEE 2 program, instrument concepts must be at TRL 6 in the 2021/2022 timeframe. Proposers are encouraged to target as early as possible in this timeframe. It is the responsibility of the proposers to describe a convincing development path extending beyond the ICEE 2 period of performance that will meet this timeframe. If selected, as part of the funded effort selectees will evolve this path into a detailed technology development plan and begin executing it. Other appropriate activities during the two year period of performance include developing requirements and flowing them down to the subsystem level and across to the spacecraft; developing the instrument architecture; conducting acquisition planning; completing heritage assessment; conducting performance, cost, and risk trades; identifying and mitigating development and programmatic risks; initiating engineering development activities; creating preliminary system-level designs; and developing time-phased cost and schedule estimates. It is not expected that all of these activities will be undertaken during the period of performance, and it is the responsibility of the proposers to prioritize these efforts such that TRL 6 is achievable no later than the end of 2022.

The ICEE 2 program also seeks to mature the accommodation of instruments on the lander, especially regarding the sampling system. This accommodation will require close interaction (including face to face) between the NASA-JPL pre-project lander study team and ICEE 2 selectees. Such interactions are necessary to not only exchange technical information but also to enable collaborative discussions of issues and solutions regarding instruments, the sample acquisition and delivery system, and the landed element. It is anticipated that some of these collaborative discussions will take place in a group setting with all selectees and the NASA-JPL lander study team.

Prospective proposers are encouraged to review the documentation posted under other documents on the NSPIRES web page of this program element to learn more about the current lander mission concept, recognizing that the lander element will continue to mature as study continues

2. Programmatic Considerations

Proposers to this program are not required to provide a data management plan.

2.1 Special Requirements for Proposals

All proposals submitted to this program must specify:

- The science objectives of the proposed instrument concept. The science objectives, investigations, and measurements must be clearly stated, and the relationship among them explained.
- Relationship to SDT science objectives. The relationship between the science investigations and measurements of the proposed instrument concept must be concisely linked and contrasted to the SDT objectives provided in "*Europa Lander Study 2016 Report*."
- The capabilities of the proposed instrument concept and their relationship to proposed science objectives. The anticipated performance specifications of the instrument concept must be provided as well as the relationship between them and

the measurements necessary to support the science objectives. This relationship must be clearly explained and rationalized.

- Technology developments to mitigate risk. Proposers should describe specific technology developments or testing to be pursued if selected and how these activities will reduce risk and mature the instrument concept.
- Spacecraft accommodation. Proposals should provide an initial assessment of spacecraft accommodation of the proposed instrument concept, including a comparison to a similar instrument in the strawman science payload (if any). The resources dedicated to the entire payload are given below, and proposers should note these allocations must be shared among all instruments. As with all surface missions, the Europa lander mission concept is extremely limited in its ability to accommodate resource growth during mission development, and proposers to this program element must utilize conservative realism when estimating resource needs for instrument concepts.
    - Lifetime: 20 days on surface
    - Mass: 33 kg (26.6 kg current best estimate (CBE) with 32% margin)
    - Volume: 34,500 cm^3 (maximum expected value)
    - Energy: 1,600 W-hrs (CBE for payload for entire surface mission)
    - Data Volume: 600 Mbits (CBE for payload for entire surface mission)
- Two-year awards. Proposals are limited to a duration of two years, but standard rules for no cost extensions will be followed. NASA may choose to release an Announcement of Opportunity to solicit flight instruments before the end of this period of performance.

2.2 Additional Selection Considerations

In addition to standard evaluation definitions given in the ROSES *Summary of Solicitation* Section VI (a) and Appendix D of the *NASA Guidebook for Proposers*, the following will also be evaluated as part of merit:

- The extent to which the proposed instrument concept supports the science objectives, investigations, and measurements of the current Europa Lander mission concept described in the documents posted with the solicitation;
- The likelihood that the proposed instrument concept can be accommodated on the lander and within the operational concept described in the "addendum to the *Europa Lander Study 2016 Report*" posted under "Other documents" on the NSPIRES web page of this program element. Note that the operational concept minimizes ground in the loop and relies extensively on automation.
- The likelihood that the proposed instrument concept can reach TRL 6 no later than the 2021/2022 timeframe.

2.3 Reporting Requirements

The following deliverables shall be required of institutions that receive awards. In cases where subcontract arrangements exist, consolidated project reports are the responsibility of the PI. The proposed budget should provide for these reporting requirements.

- A detailed assessment of the spacecraft accommodation necessary for the proposed instrument. Awardees are required to engage the NASA-JPL pre-project Europa Lander study team to enable this assessment and share this report with the study team no later than the end of Year 1.
- Biannual and final briefings to program managers at NASA Headquarters. The biannual briefings may be conducted via teleconference, but budget should be allocated for a final briefing to take place at NASA Headquarters in Washington, DC.
- Complete final report to NASA Headquarters not to exceed 10 pages of text (excluding figures).

2.4 Participation in Other Programs

This program does not participate in the Early Career Fellowship program or the NASA Postdoctoral Program

3 Proposal Submission Process

In order to facilitate the early recruitment of a conflict-free review panel this program element uses a two-step proposal submission process described in program element C.1, Section 2.

Proposers are reminded that Step-1 proposals are mandatory and must be submitted by the proposing organization. The Scientific/Technical/Management section of a Step-1 proposal is restricted to the 4000-character text box on the NSPIRES web interface cover pages.

Proposals must follow all formatting requirements that are described Section IV(b)ii of the ROSES Summary of Solicitation and in Section 2.3 of C.1 The Planetary Science Research Program Overview. Violation of these rules is sufficient grounds for a proposal to be rejected.

4. Summary of Key Information

Expected program budget for first year of new awards	~ $15M/Year
Number of new awards pending adequate proposals of merit	~ 15 ICEE 2 awards
Maximum duration of awards	2 Years
Due date for Step-1 proposals	See Tables 2 and 3 of this ROSES NRA.
Due date for Step-2 proposals	See Tables 2 and 3 of this ROSES NRA.
Planning date for start of investigation	~6 months after Step-2 proposals are due
Page limit for the central Science-Technical-Management section of proposal	~~25~~ **15** pp; see also Table 1 of the *ROSES Summary of Solicitation* and Section 3.7 of the *NASA Guidebook for Proposers*. **[Amended June 1, 2018]**

Relevance	This program is relevant to the planetary science questions and goals in the NASA *Science Plan*. Proposals that are relevant to this program are, by definition, relevant to NASA.
General information and overview of this solicitation	See the *ROSES Summary of Solicitation*.
Detailed instructions for the preparation and submission of proposals	See the *NASA Guidebook for Proposers* at http://www.hq.nasa.gov/office/procurement/nraguidebook/.
Submission medium	Electronic proposal submission is required; no hard copy is permitted.
Website for submission of proposal via NSPIRES	http://nspires.nasaprs.com/ (help desk available at nspires-help@nasaprs.com or (202) 479-9376)
Web site for submission of proposal via Grants.gov	http://grants.gov (help desk available at support@grants.gov or (800) 518-4726)
Funding opportunity number for downloading an application package from Grants.gov	NNH18ZDA001N-ICEE2
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