December 8, 2020

NSF/CASIS Collaboration on Transport Phenomena Research on the International Space Station (ISS) to Benefit Life on Earth (NSF 21-525)
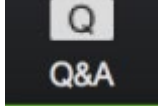
Ying Sun, Thermal Transport Processes, ENG/CBET, NSF
Ryan Reeves, ISS National Laboratory
Henry Nahra, NASA Glenn Research Center

Questions

- **Submit your questions using the Q&A module** ➡️

- Questions will be addressed in the Q&A period

- If your question is not answered, please feel free to email program contacts
    - Ronald D. Joslin, Fluid Dynamics, rjoslin@nsf.gov
    - William Olbricht, Particulate and Multiphase Processes, wolbrich@nsf.gov
    - Nora F. Savage, Nanoscale Interactions, nosavage@nsf.gov
    - John W. Daily, Combustion and Fire Systems, jdaily@nsf.gov
    - Ying Sun, Thermal Transport Processes, yisun@nsf.gov
    - Shahab Shojaei-Zadeh, Transport Phenomena Cluster, sshojaei@nsf.gov
    - Ryan Reeves, Center for the Advancement of Science in Space, rreeves@issnationallab.org

- Webinar materials (slides and recording) will be posted on the webinar web page (https://www.nsf.gov/events/event_summ.jsp?cntn_id=301730&org=CBET)

Outline

- Program overview and key changes in this year's solicitation

- Feasibility review process and conducting experiment on the ISS

- Flow Boiling and Condensation Experiment (FBCE) facility

- General Q & A

Program overview

NSF/CASIS: TRANSPORT PHENOMENA RESEARCH IN SPACE TO BENEFIT LIFE ON EARTH

- **Pre-proposal evaluation by CASIS** Doable on ISS; benefits on Earth
  - Feasibility review for operational feasibility and terrestrial economic benefit

- **NSF provides funding support to**
  - Conduct research, prepare experiments for onboard ISS, collaborate with service providers, provide preliminary analysis to conduct experiments, analyze and interpret data, and disseminate results

- **CASIS will assist grantees in**
  - Translate ground-based experiments and technologies into the space-appropriate hardware

NSF 16-518 Fluid Dynamics

NSF 17-517 Combustion & Thermal Transport

NSF 18-521 Fluid Dynamics & Particulate Multiphase

NSF 19-525 Transport Phenomena Research

NSF 20-501 Transport Phenomena + Nanoscale Interactions

NSF 21-525 Transport Phenomena
+ Nanoscale Interactions
Up to $400K / 4 year

Feasibility Form Due: Jan 11, 2021
Proposal Due: Mar 2, 2021

Key changes

- New hardware - flow boiling and flow condensation modules of NASA's Flow Boiling and Condensation Experiment (FBCE) facility - are available for this solicitation.

- Proposals must clearly justify the need for long duration microgravity environment on board ISS.

- Eligibility of PI and any Co-PI(s) is clarified based on "U.S. Persons" definition.

  - 'U.S. person' means any U.S. citizen or alien admitted for permanent residence in the U.S., and any corporation, partnership, or other organization organized under the laws of the U.S.

- Maximum number of awards has increased from 7 to 9.

Solicitation specific review criteria

- To what extent does the proposal justify the need for long-duration microgravity and/or extreme conditions on board ISS for successful execution of the proposed research?

- Does the proposal list implementation partners or, if partners have not been identified, describe the services needed to complete the proposed research?

- To what extent does the proposal demonstrate the investigators' capabilities and related experience relevant to the proposed project?
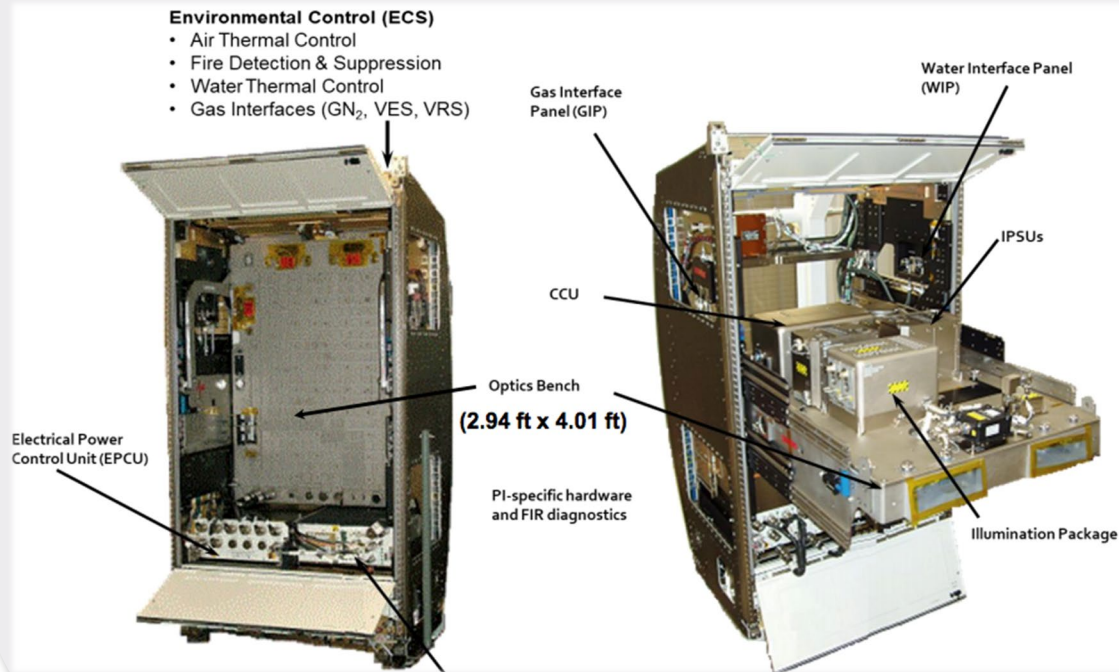
CASIS will facilitate investigators in identifying service providers, in assessing the feasibility of possible hardware and experiment modifications, and in developing a realistic budget and time frame for the project.

Flow Boiling Condensation Experiment (FBCE) Facility

Flow boiling module

FBCE (source: NASA)

- Special interest for TTP this year is fundamental research in flow boiling and condensation using NASA's FBCE facility to benefit life on Earth.

- Combining novel machine learning, data-driven, and advanced modeling approaches with the ISS experiments to better understand heat transfer, fluid dynamics, and interfacial stabilities is welcome.

- Projects planning to utilize the flow boiling module need to be flight ready by April 2022.