



Heat flow probe for robotic landing missions to Europa and the other icy moons

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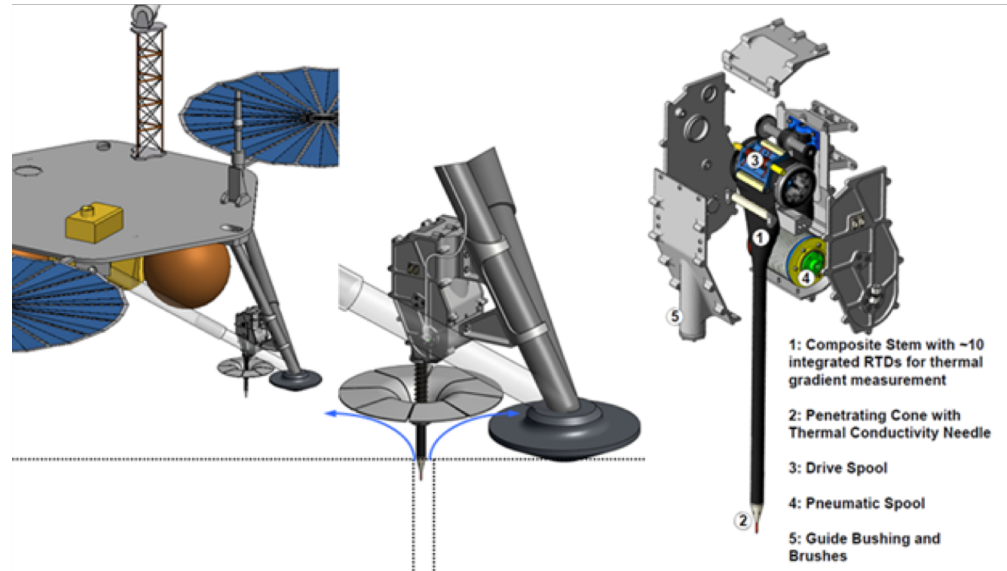
Target: Surface of Europa and the other Icy Moons

Science:

- Heat transport through Europa's ice shell
- Heat budget of Europa's subsurface ocean
- Thickness of the ice shell
- Thermal conductivity of the subsurface ice

Objectives:

- A TRL-3 prototype system that integrates the stem deployment and the excavation system that can penetrate at least 2-m into the Europa ice simulant at ~100 K and in near-vacuum, mainly to prove the concept.
- (2) A prototype of the instrumented stem that can measure the thermal conductivity of the Europa simulant at ~100 K and in near-vacuum.
- (3) Computer simulation models of the thermal environment of Europa's surface and shallow subsurface that allow us to determine the depth of probe penetration desired and the time duration of the measurements necessary for properly quantifying the transient signals from the insolation and the flow of the endogenic heat coming from the deeper interior.



Heat Flow Probe

Key Milestones:

- Develop and test ice simulant June 2018
- Investigate two excavation approaches:
 - Mechanical drill Dec. 2018
 - Melt probe June 2019
- Develop thermal models Dec. 2019
- Fabricate probes and test penetration in
 - vacuum 3.5 chamber Dec. 2019
 - 6 m tall freeze June 2020

CoIs: Kris Zacny/Honeybee Robotics

TRL (1) to (3)