

EXAMPLE OF NON-ISS MICROGRAVITY RESEARCH PLATFORM:

PURDUE 1

PURDUE 1, THE FIRST ALL- PURDUE SUB-ORBITAL RESEARCH MISSION

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Experiments onboard *Purdue 1*

1. **Spaceflight Liquid Interactive Control Experiment (SLICE)**

- Professor Steven Collicott will operate SLICE during spaceflight

2. **Human-tended Rotational Slosh**

- Graduate student Abigail Mizzi will operate Rotational Slosh during spaceflight

3. **Q-PNT: Quantum Positioning, Navigation, and Timing**

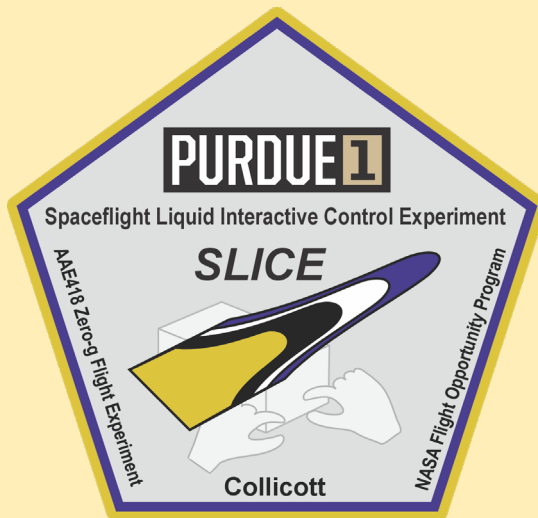
- Professor Shengwang Du leads this automated experiment as a team with Inflection.

4. **Purdue Research in In-Space Manufacturing**

- Professor Ajay Malshe leads this automated experiment in laser-assisted semiconductor processing.

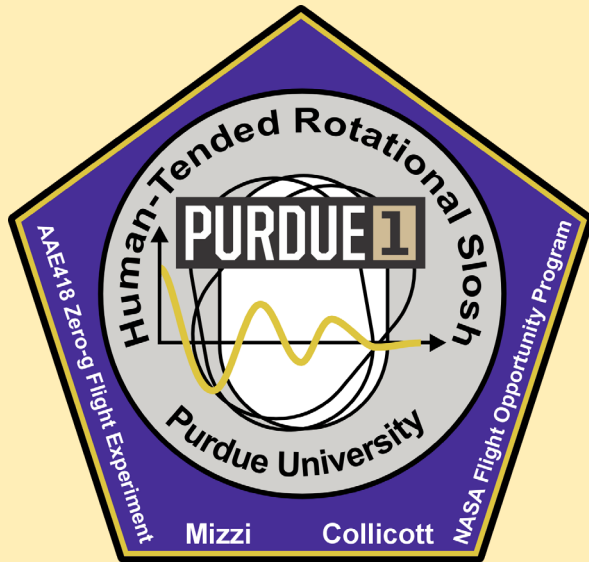
1. Spaceflight Liquid Interactive Control Experiment (SLICE)

- **SLICE** explores the motion of liquid and gas flowing together on a solid surface in the weightlessness of spaceflight. Wetting and surface tension dominate these complex flows.
- This motion is important to long-duration spaceflight: life support systems, plant growth systems, propulsion systems, even medical tools. It is difficult to model well and impossible to simulate in 1-g experiments. The weightlessness of spaceflight provides the ideal laboratory for this research.
- **SLICE** is the first human-tended large physical sciences experiment in sub-orbital spaceflight.
- **SLICE** was selected for funding by NASA Flight Opportunities Program in 2021 through a NASA solicitation.



2. Human-tended Rotational Slosh

- Purdue graduate student Abigail Mizzi will operate Rotational Slosh during spaceflight. She will be the first graduate student to perform their own thesis research in space.
- When a spacecraft rotates, such as to dock, this starts liquid propellants in motion in a partly-filled propellant tanks. When the spacecraft stops, the liquid motion continues. This is called sloshing. Like carrying soup in a bowl.
- How long this sloshing persists in spaceflight is very difficult to model in computers or in experiments on Earth.
- This experiment records video of slosh in response to rotations, for post-flight analysis back on Earth.
- Virgin Galactic's sub-orbital mission creates the same weightlessness as an orbiting spacecraft encounters.



3. Q-PNT: Quantum Positioning, Navigation, and Timing in Suborbital Flight

- Pls: Shengwang Du, Alexandra Boltasseva, Vladimir Shalaev, Joseph Lukens, Dana Anderson (Inflection)
- Postdoc, graduate and undergraduate students participate in the project.
- This project is about exploring a new kind of navigation technology called **Quantum Positioning, Navigation, and Timing**, or **Q-PNT**. Unlike today's GPS system, **Q-PNT** uses the laws of quantum physics to provide navigation and timing information that is far more precise than GPS. In the Purdue 1 mission, our goal is to take the first critical step toward that future. We will use laser light to cool and trap rubidium atoms to a temperature close to absolute zero, just a few micro-Kelvin. At this ultracold temperature, we will characterize the quantum properties of those atoms. This pathfinder experiment lays the engineering and scientific foundation for future quantum navigation systems that could one day guide satellites, spacecraft, and deep-space missions.

4. Purdue Research in In-Space Manufacturing



PI: Prof. Ajay Malshe

This project develops laser-assisted semiconductor processing and validation of 3D-printed components for in-space manufacturing.

The breakthrough is a compact, energy-efficient alternative to traditional furnaces, enabling repair, fabrication, and adaptation of electronics and structural parts directly in orbit.

This capability strengthens Space 2.0 infrastructure, reducing reliance on Earth-based supply chains while enabling advanced manufacturing and resilient electronics for digital hardware, in space, for digital infrastructure between Earth and Space.





No tuition nor State of Indiana funds are spent on *Purdue 1*

The professors have secured other funds for this mission.
Purdue alumni and friends are donating to launch our graduate student.

Boiler Up!