

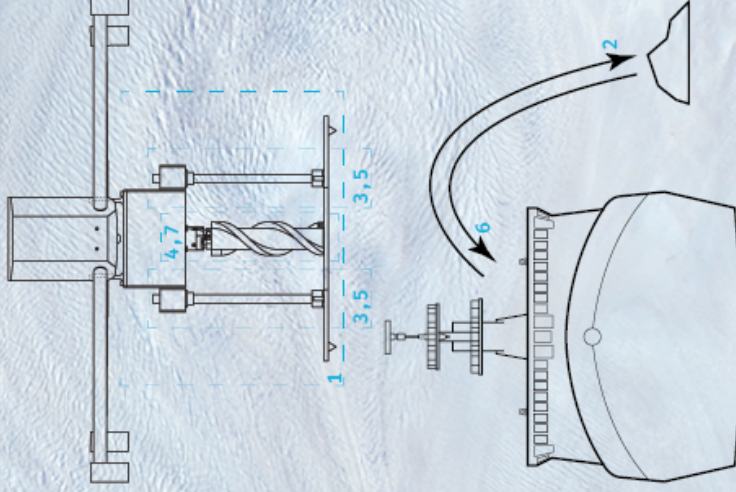
ICE CORE EXCAVATOR | ROBOTIC ICE DRILLING PAYLOAD

NSF Grant: 221834

ICE is a drone payload that remotely samples compacted snow-ice cores from drifting Arctic sea ice. Drone pilots remotely fly the drone and ICE payload from a ship to sea ice 1km away.

HOW IT WORKS

1. Scientists attach the ICE payload to their drone.
2. Drone pilots fly the drone with the payload equipped out to an ice floe drifting less than 1km away from their ship and land on top.
3. Once landed, ICE's actuated landing gear begins moving the payload downwards into the ice sample site.
4. Concurrently, ICE's auger begins drilling into the ice. The onboard control software autonomously manages the landing gear's feedrate into the ice and the drill's cutting speed.
5. After, the software determines it has completed drilling. It begins to push out of the ice with the landing gear with the newly sampled snow-ice core.
6. Finally, the drone pilots take off the drifting ice and return to the ship with to store the sample.
7. The operators then may choose to collect another sample by replacing the battery and drill shaft.



CHALLENGES

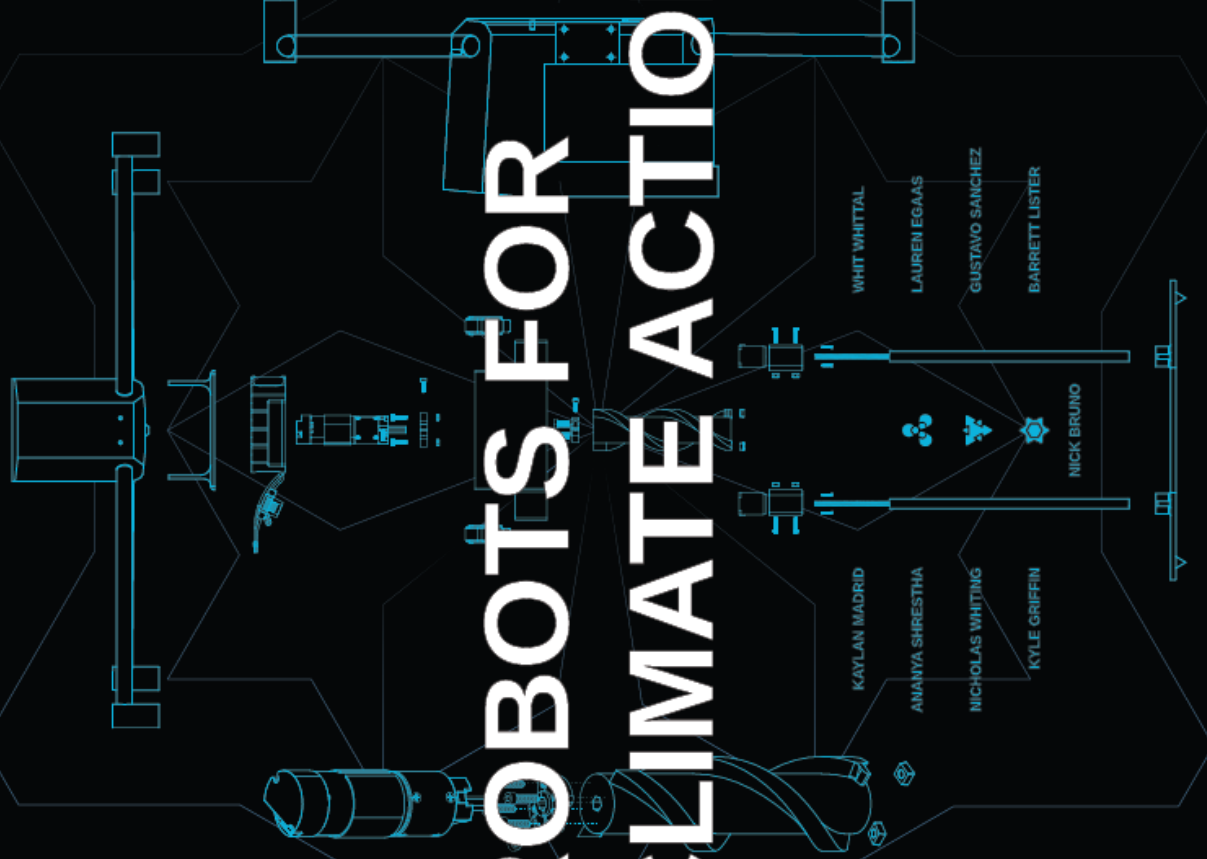
1. Ice coring machinery is typically large and heavy, which conflicts with the weight and size limits when integrating the payload to the multirotor drone
2. Drilling mechanics and geology are unfamiliar topics to the ICE team, which are major aspects to the project's development.

MOTIVATION

1. Remote sampling allows researchers to retrieve samples regardless of human accessibility to the sample site
2. Remote sample data is novel, providing greater fidelity to climate models
3. Drone sampling technology can be used in agricultural, science research, and many other fields

Illustration: Kaylan Madrid

ROBOTS FOR CLIMATE ACTION



Project: Inspiration Designer Engineer Scientist Educator