Four teams selected for CAN-RGX 2024-25

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Students for the Exploration and Development of Space (SEDS-Canada) has selected the four teams among a pool of applications for the 2024-25 Canadian Reduced Gravity Experiment Design Challenge (CAN-RGX). The competition challenged post-secondary students attending Canadian universities and colleges to submit a proposal for a small scientific payload to be tested onboard the National Research Council of Canada's (NRC) Falcon 20 research aircraft, capable of simulating reduced gravity environments, similar to those found in the International Space Station.

Two students per team will get to fly onboard the aircraft as Mission Specialists to operate their experiments. Each flight will consist of 10 parabolic maneuvers to allow students to run their experiments and collect all the necessary data for subsequent analysis on the ground. The Falcon 20 is one of the world's best microgravity planes; it provides the closest environment to that of real zero gravity. Each parabola will provide up to 20 seconds of near zero-G. As the NRC's primary research aircraft, the Falcon 20 is capable of helping the next generation of researchers realize their future potential in the space sector. With support from the NRC and the Canadian Space Agency (CSA), CAN-RGX is the only competition of its kind in Canada.

The selected teams are:

- **Lunar Mill:** The team from the University of Waterloo's Lunar Mill project will study the effects of reduced gravity on the processing of lunar regolith simulants. The Lunar Mill experiment will explore three different milling methods to decrease regolith particle size, with the goal of improving techniques for metal extraction, oxygen production, energy harvesting, and material development on the Moon. Each method will be tested to determine how altered gravity affects the efficiency of particle processing. The physical properties of the simulant will be evaluated before and after flight, and the processed regolith will be used in an application-based experiment to support technology development for lunar infrastructure.

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- **Mission SpaceWalker:** The team from the University of Alberta aims to develop a microgravity-compatible bioreactor for cultivating cyanobacteria to support sustainable life systems in space. This project will utilize Synechocystis sp. PCC 6803, a cyanobacterium capable of oxygen production and nitrogen fixation, to explore its potential for long-term space missions. The bioreactor is designed to leverage capillary action to distribute nutrients, manage waste, and inject carbon dioxide, providing an optimal growth environment without the need for gravity. By ensuring even nutrient delivery through capillary tubes, the project supports in-situ resource utilization for future missions, such as oxygen generation and food production on Mars or other planetary habitats.

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- **Space MENS:** The team from University of British Columbia - Okanagan will study menstrual hygiene management in microgravity, focusing on fluid dynamics and hygiene during tampon removal. Using synthetic vaginal models (synginas), the experiment will simulate microgravity conditions by extracting tampons saturated with a blood simulant during a parabolic flight. High-resolution cameras will capture droplet formation and dispersion, with analysis via computer vision. This study will provide data for menstrual hygiene protocols on long-duration missions, supporting gender-inclusive safety and comfort in space.

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- **Team MERCURY:** The team from McMaster University will investigate the effectiveness of a mixing and compression system designed to create a concrete-like material using lunar regolith and resin in microgravity. By examining various binder-to-regolith ratios, they will assess sample strength and structure under simulated lunar conditions, aiming to develop reliable construction techniques for lunar infrastructure. Through this experiment, the team aspires to contribute to Canada's expertise in in-situ resource utilization, advancing construction capabilities for future space habitats and supporting long-term missions on the Moon.

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The four teams must now complete the Preliminary Design Review, which they will present to a panel of judges including experts in microgravity sciences from CAN-RGX's collaborating agencies, including the NRC and the CSA. After finalizing their designs, the teams will build their experiments in order to submit the next milestone, the Critical Design Review. Finally, the team will demonstrate the functionality of their experiment for the Flight Readiness Review before they are cleared to fly on-board the NRC's Falcon 20.

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