Abstract #1715

English

Spinning Terrestrial-Analog Regolith Filtering eXperiment

Near-Earth asteroid mining is an industry which will have great importance to humanity. Asteroids, and other celestial bodies, contain valuable mineral resources. In the near future, these resources will be needed and, as such, methods of mining for use in microgravity environments must be developed. The STARFOX project is a venture the University of Saskatchewan Space Design Team is taking, as part of the First Annual Canadian Reduced Gravity Experiment Design Challenge. It is designed to study mineral classification of asteroidal regolith in microgravity by using a rotating apparatus to generate centrifugal force as a substitute for Earth's gravity. The goal of the project is to determine how effectively the design can sort oversized from undersized particles, using nothing but centrifugal force. Construction of the apparatus is expected to be complete by late March, 2017. It features a single parabolic sieve, the specifications of which are being determined through mathematical modelling involving CI-V3 asteroid regolith simulant. Multiple prototypes have resulted in modifications to the final model. During testing, the primary variable which will be controlled is the RPM of the apparatus, as this is directly related to the force being applied to the simulant. Atmospheric conditions, including temperature, humidity, and pressure, will be considered during testing. RPM, power consumption, and amounts sorted will be used to analyze sorting efficiency.

French

No abstract title in French

No French resume

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Biographies

Biography submitted with the abstract

Subject to change. John Matthew Gjevre is a 2nd year engineering physics student at the University of Saskatchewan. David Forseille is a 4th year chemical engineering student at the University of Saskatchewan.

Biography in the user profile

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PROJECT STARFOX

STARFOX members presenting

Carson Daly
David Forseille
John Matthew Gjevre
Jordan Himmelsbach

Other STARFOX members

Adam Lozinsky
Liam Gray
Skylar Koroluk
Aaron Peters

Date of Presentation: 3 May 2017, 14h
Location of Presentation: 516D

Agenda

- Who we are
  - University of Saskatchewan Space Design Team
  - Project STARFOX
- What we’re doing
  - Canadian Reduced Gravity Experiment Challenge
  - Our Experiment
- How we’re doing it
  - Particle Simulation
  - The Build
- Future Use

University of Saskatchewan

University of Saskatchewan Space Design Team


ERC
EUROPEAN ROVER CHALLENGE

Canada
NRC·CNRC

This year’s challenge!

CAN-RGX Competition

- Falcon 20
- Microgravity

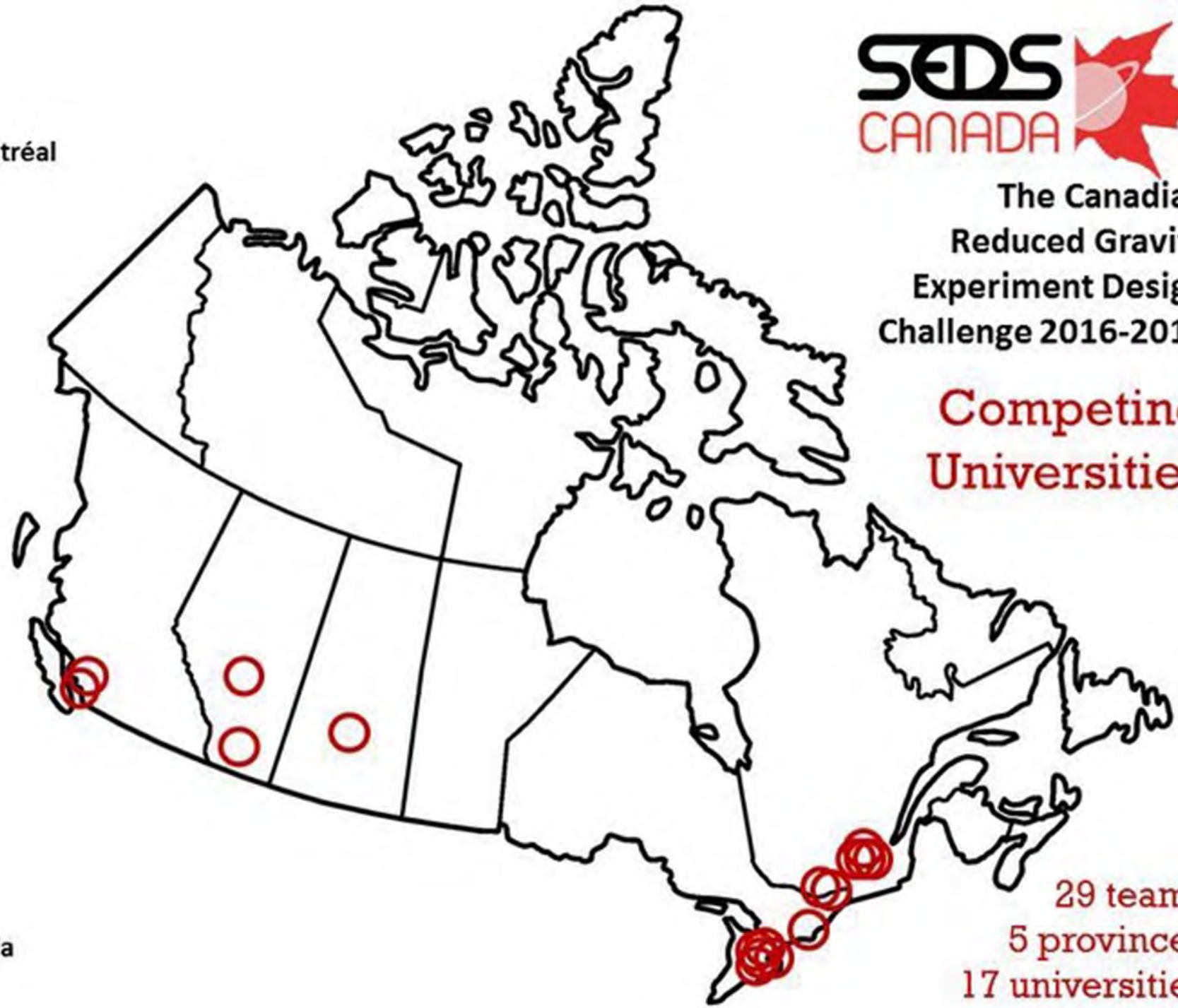
Québec
- McGill University
- Université de Montréal
- Université du Québec à Montréal
- Polytechnique Montréal

Ontario
- University of Toronto
- York University
- Ryerson University
- University of Waterloo
- Guelph University
- Queen's University
- University of Ottawa
- Carleton University

Saskatchewan
- University of Saskatchewan

Alberta
- University of Alberta
- University of Lethbridge

British Columbia
- Simon Fraser University
- University of British Columbia



SEDS CANADA

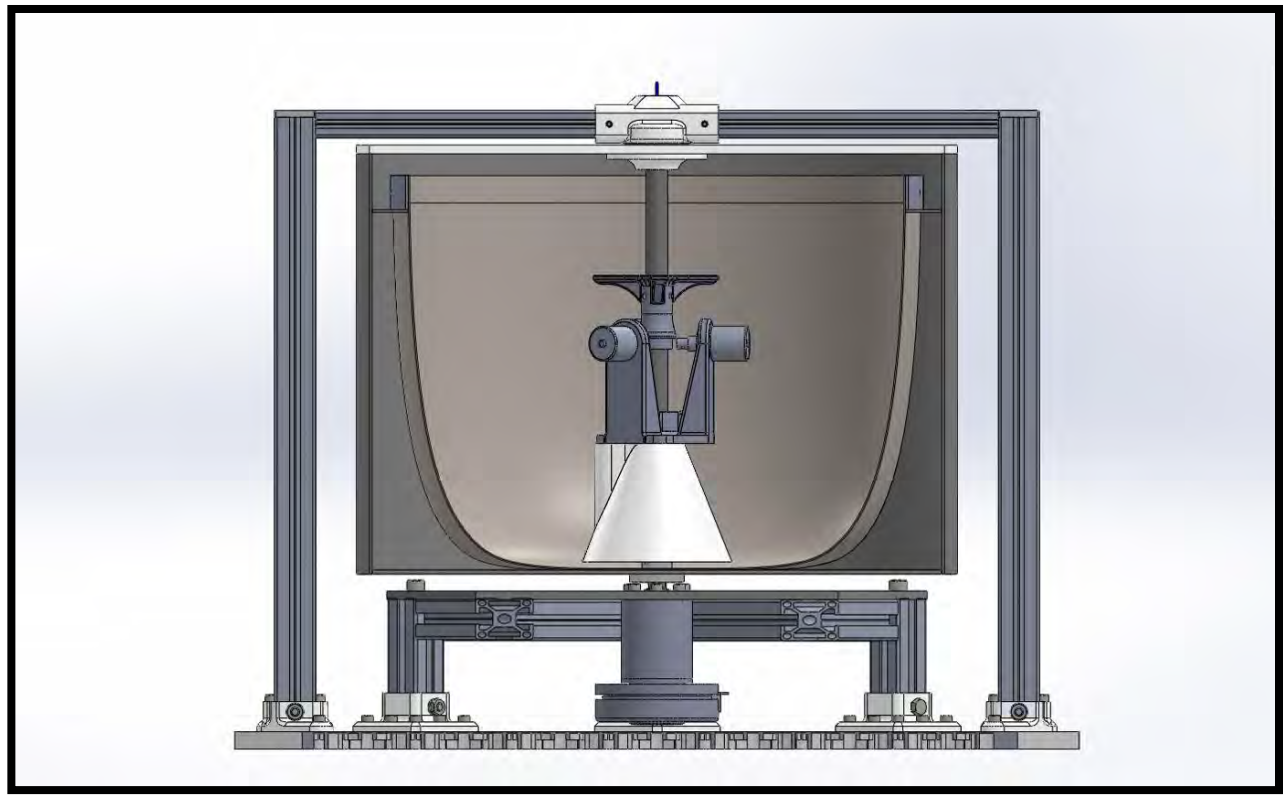
The Canadian Reduced Gravity Experiment Design Challenge 2016-2017

Competing Universities

29 teams
5 provinces
17 universities

PROJECT STARFOX

What is STARFOX?



- Centrifugal mineral screening
- Curved screen
- Proof of concept experiment

- Finer particles through screen
- Larger particles up sides

Objectives and Constraints

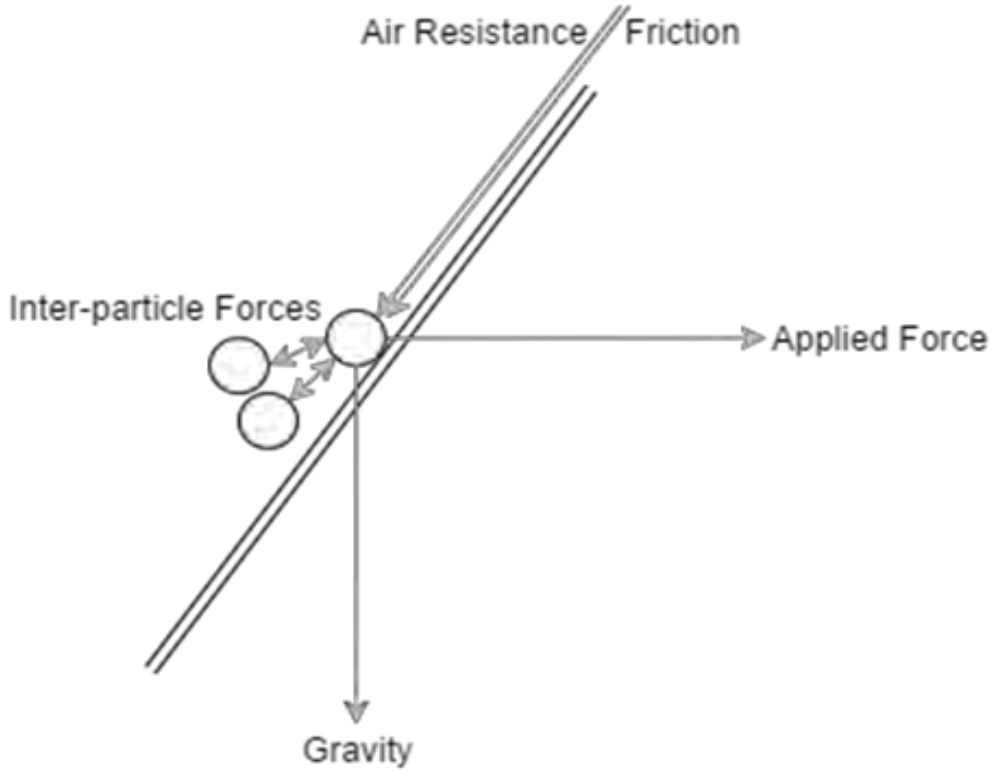
- Long screen
- Small precession
- Inexpensive
- Ease of construction

- Contained within Pelican case
- Weigh less than 45 kg
- Use < 600 W
- Free of hazardous materials

Physics of the Experiment

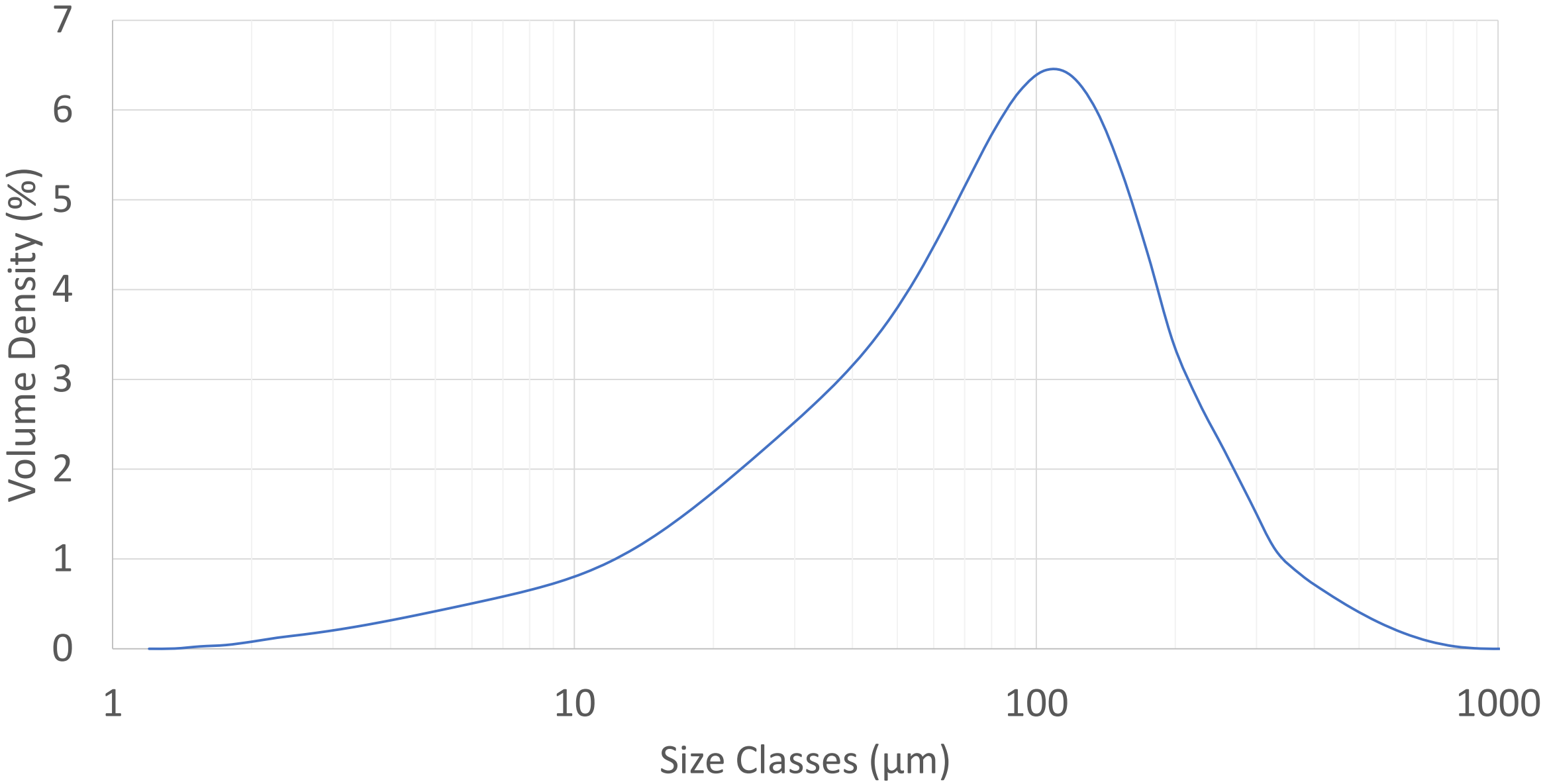
<u>Forces</u>

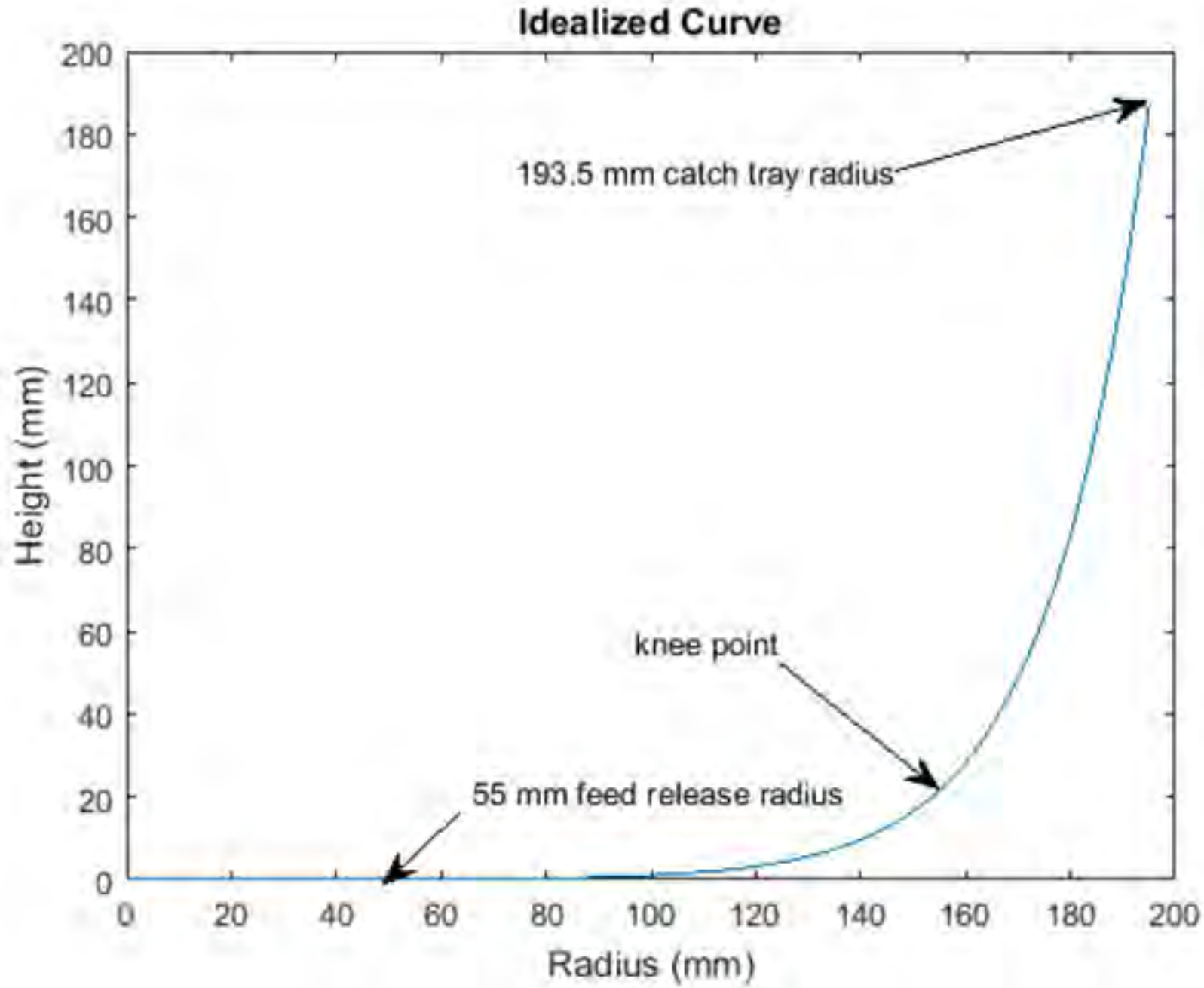
- Gravity
- Van der Waals
- Drag
- Friction
- Internal Forces



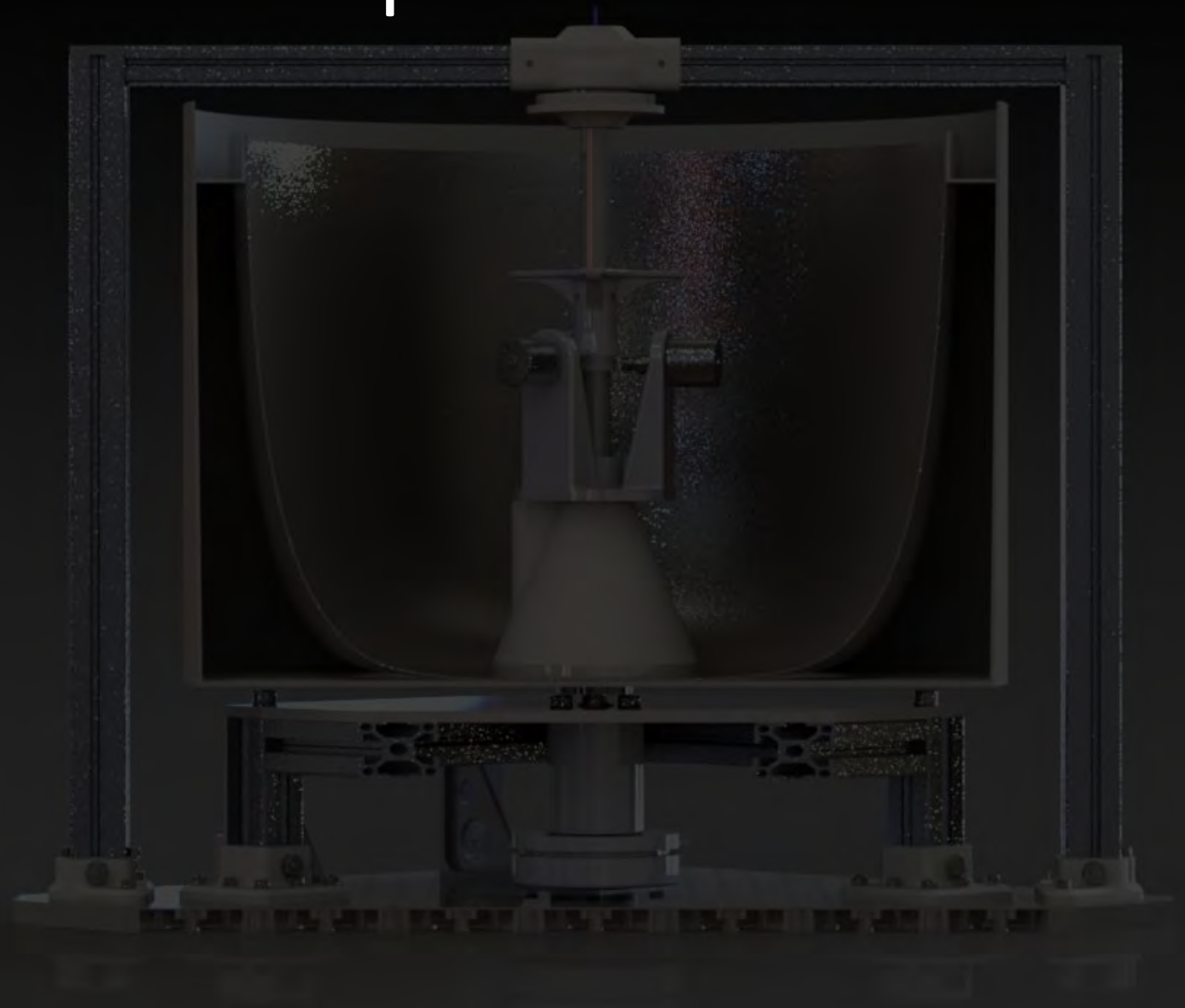
Simulations

Carbonaceous Chondrite Simulant

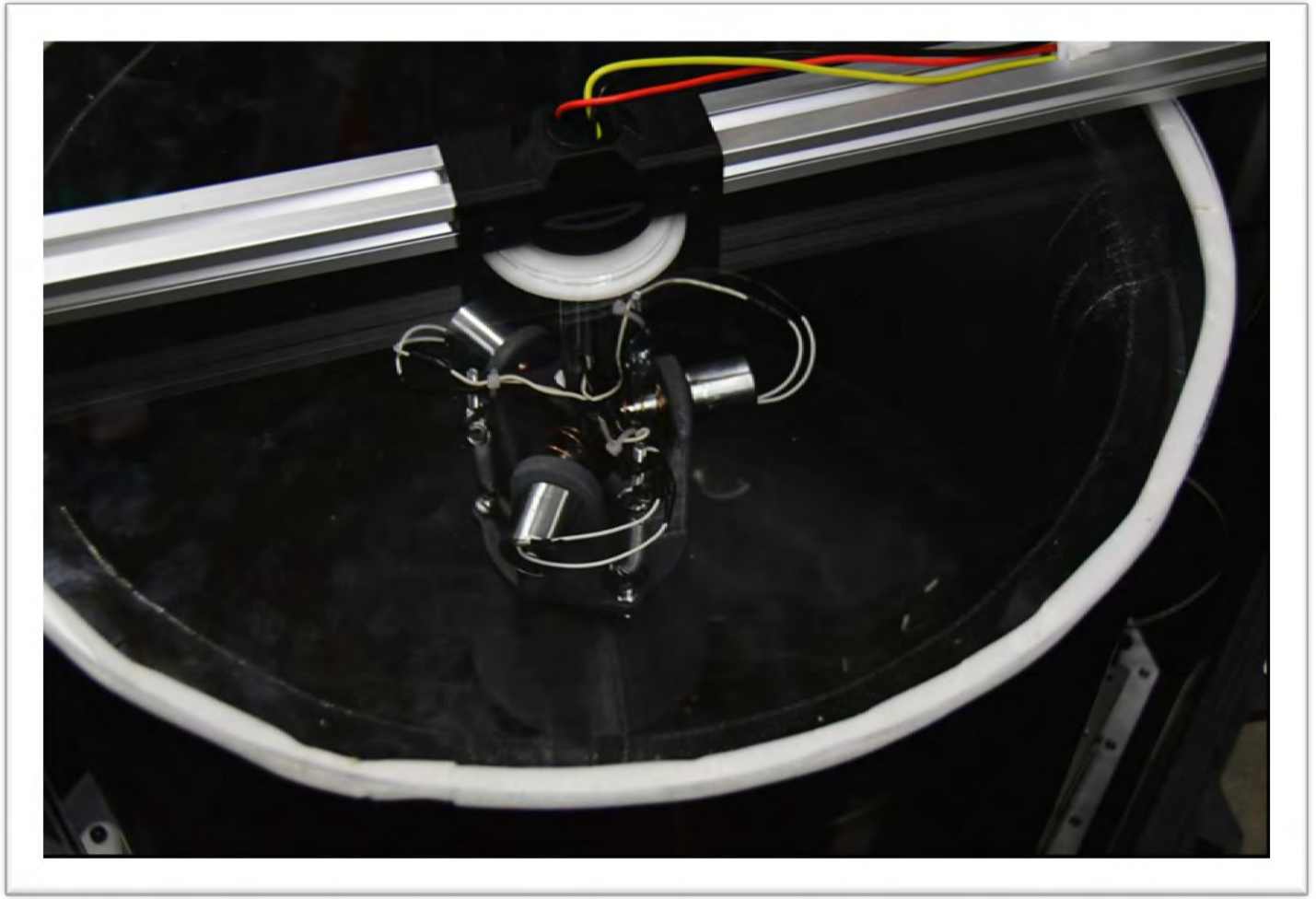



Idealized Curve
193.5 mm catch tray radius
knee point
55 mm feed release radius
Height (mm)
Radius (mm)
0
20
40
60
80
100
120
140
160
180
200

Technical Description



- Batch feed releases simulant (pictured right)



Video of Operation

Future Use

Experiment

- Later models applied to industry

- Adjusted for Lunar and Mars missions

Future Use

Team

- Falcon 20 microgravity experiment
- Additional national and international competitions

Sponsors

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APEGS

Association of Professional Engineers & Geoscientists of Saskatchewan

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