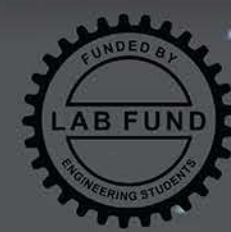# CUBESAT – ZERO GRAVITY ATTITUDE CONTROL SYSTEM

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BACKGROUND

- A CubeSat is a miniature satellite (10cm x 10cm x 10cm) typically used for:
  - Data Collection
  - Educational Projects
  - Commercial Applications
- Due to reduced gravitational conditions experienced when orbiting Earth, satellites require the use of an Attitude Control System that controls its trajectory and orientation
- The CubeSat will be utilized by Elyse Hill, a doctorate student at the University of Guelph, for her future studies in Adaptive Control Theory and Aerospace Systems
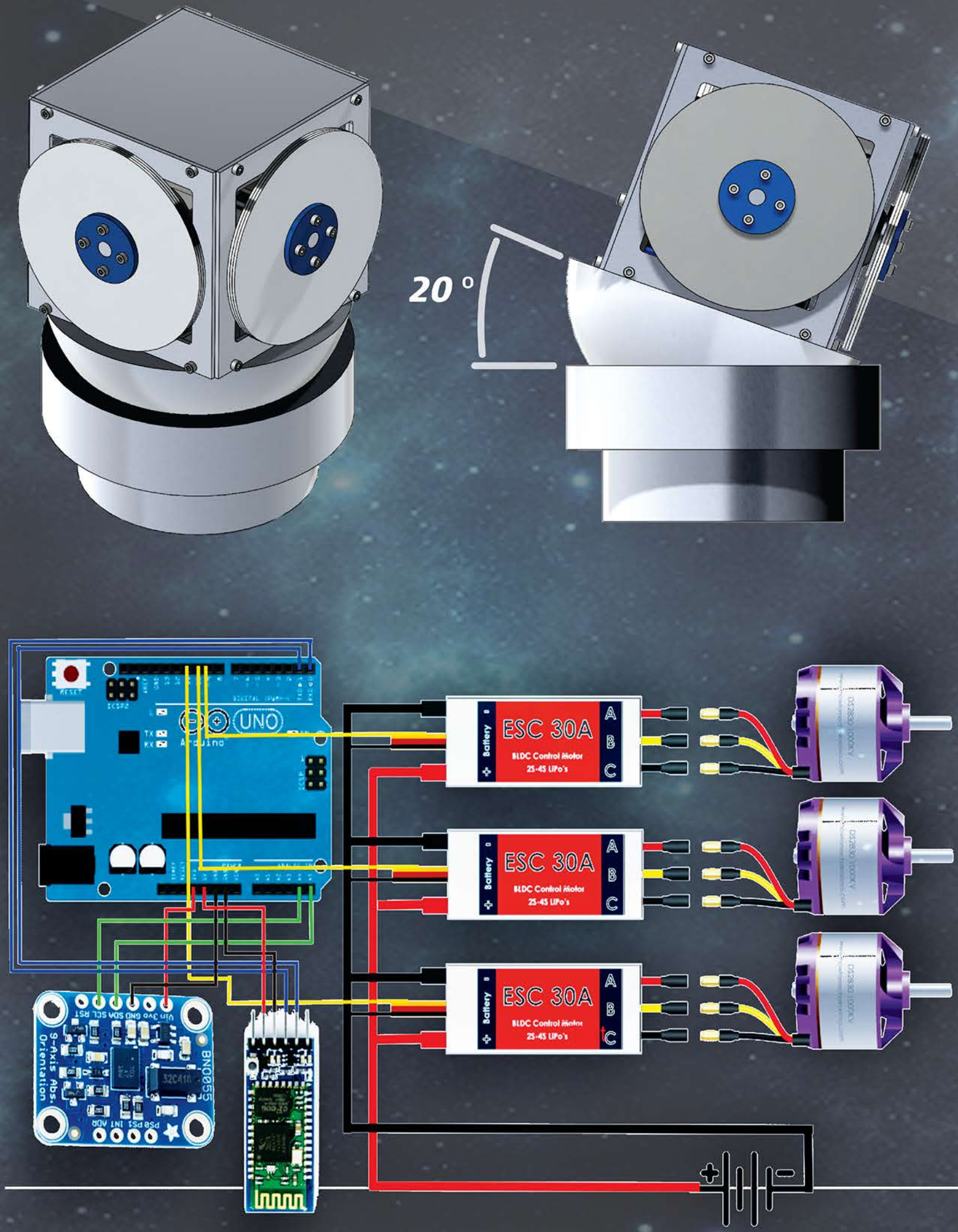
PROBLEM STATEMENT

- To build a functioning CubeSat apparatus with the ability to maintain a desired attitude based on a user's specified input orientation
- This requires the design of an air bearing test bed system that can rotate in 3DoF in order to simulate the effects of zero gravity in outer space
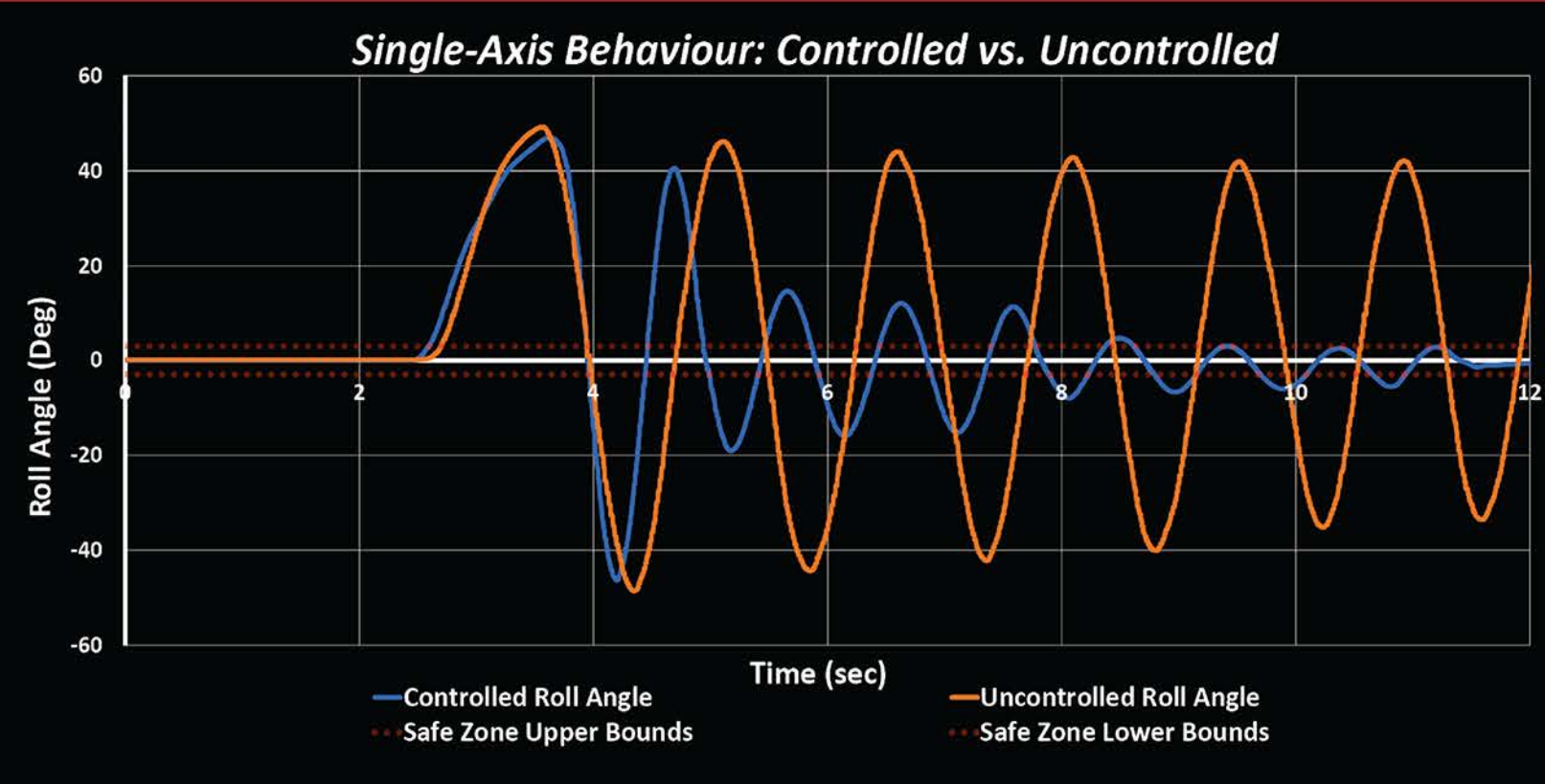
OBJECTIVE

- To design, build, and test a proof of concept CubeSat that demonstrates a functioning Attitude Control System
- To integrate a responsive control system to manipulate the Cube's orientation
- To design and implement a semi hemispherical air bearing to mimic the frictionless environment of space

PROPOSED DESIGN

RESULTS AND ANALYSIS

Single-Axis Behaviour: Controlled vs. Uncontrolled

- Controlled Roll Angle
- Uncontrolled Roll Angle
- Safe Zone Upper Bounds
- Safe Zone Lower Bounds

FUTURE WORK

- Simulate the complete effects of a zero-gavity environment by extending the test bed's range to 360 degrees about every axis

- Integrate light source tracking capabilities with the use of a machine vision camera

ENGINEERING

Mechanical