Team 511: Microgravity Machine

FAMU-FSU Engineering

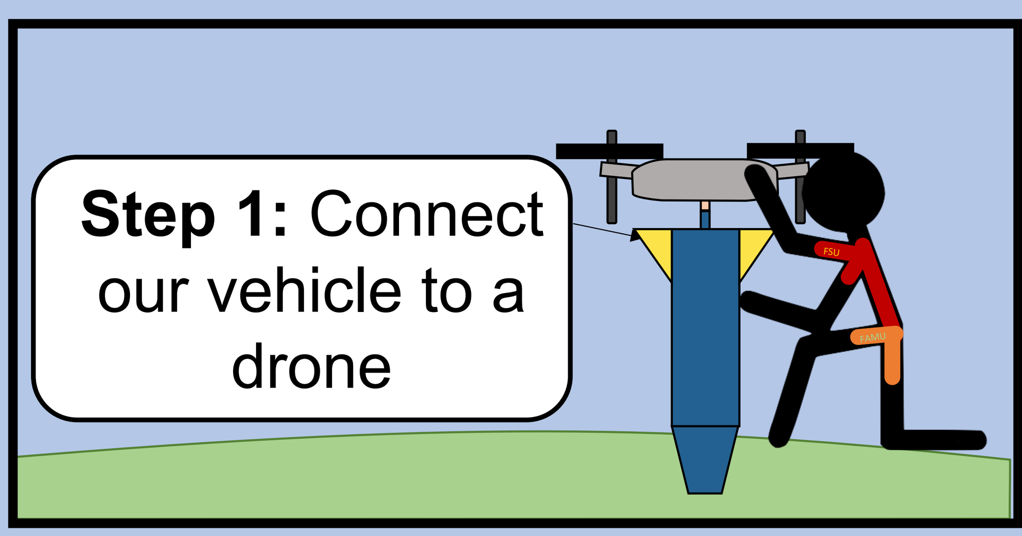
Samuel Duval, John Tietsworth, Thomas Lenz, Collin Gainer, Pedro Simán

Objective:
Design a reproducible system that when dropped from a drone, will achieve microgravity during descent and be safely recovered for reuse.

Key Goals

1. Achieve microgravity during descent.
2. The device can be recovered for multiple consecutive trials.
3. The device will meet weight requirements.
4. The device is reproducible.

Competition Day

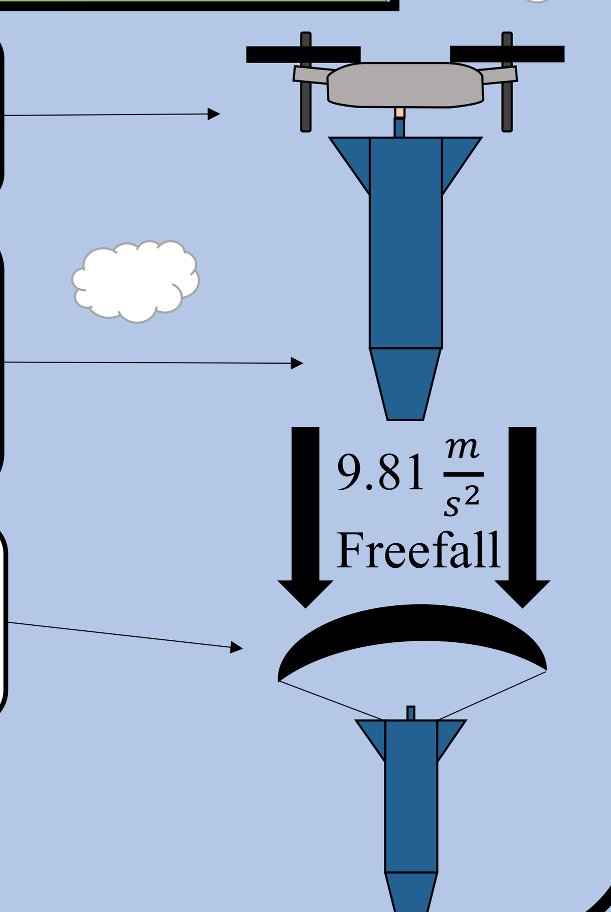


Step 1: Connect our vehicle to a drone

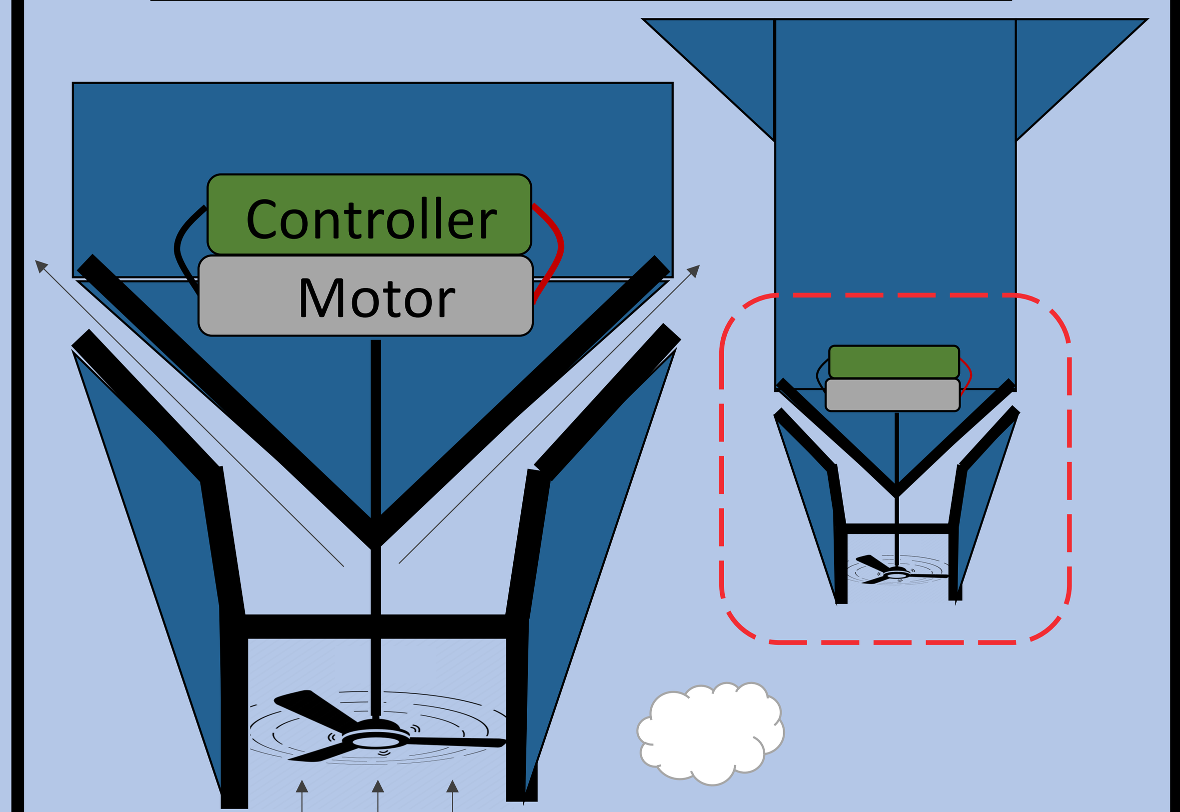
Step 2: Lift the vehicle to 900 ft

Step 3: Drop the vehicle and engage propulsion

Step 4: Deploy parachute



Propulsion System

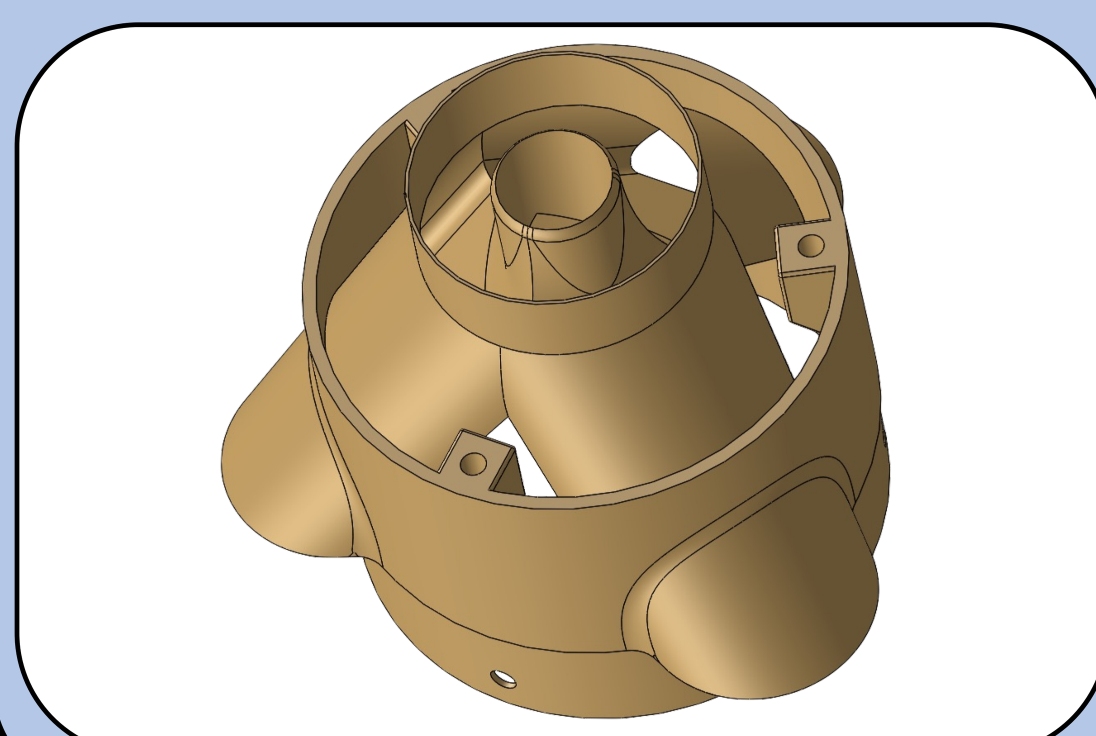


Motor is controlled by a speed controller. The thrust is varied to equal drag forces during descent.

Thrust Testing

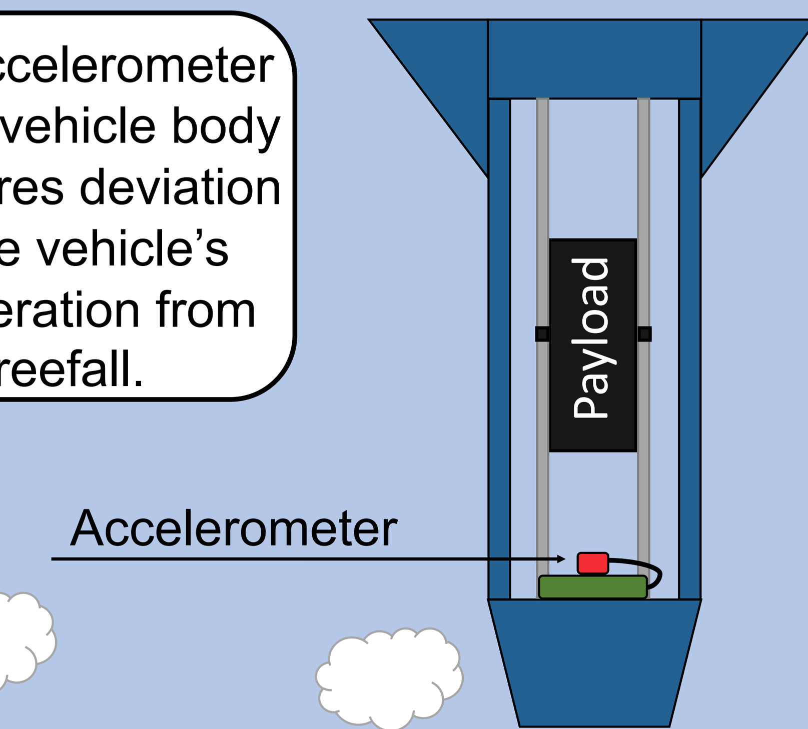
Max. Drag (CFD)	15.4 N
Fan Max. Thrust	28.0 N
Max. Ducted Thrust	18.5 N

Second Stage

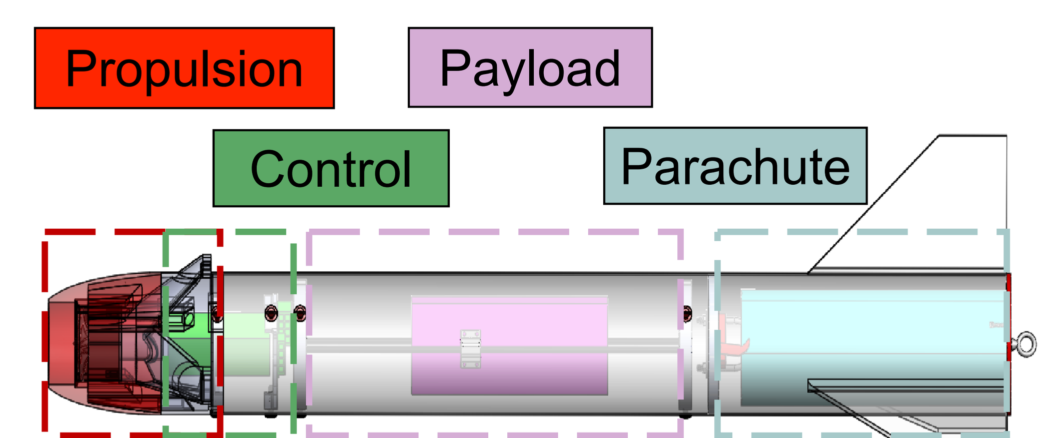


Control System

The accelerometer on the vehicle body measures deviation of the vehicle's acceleration from freefall.



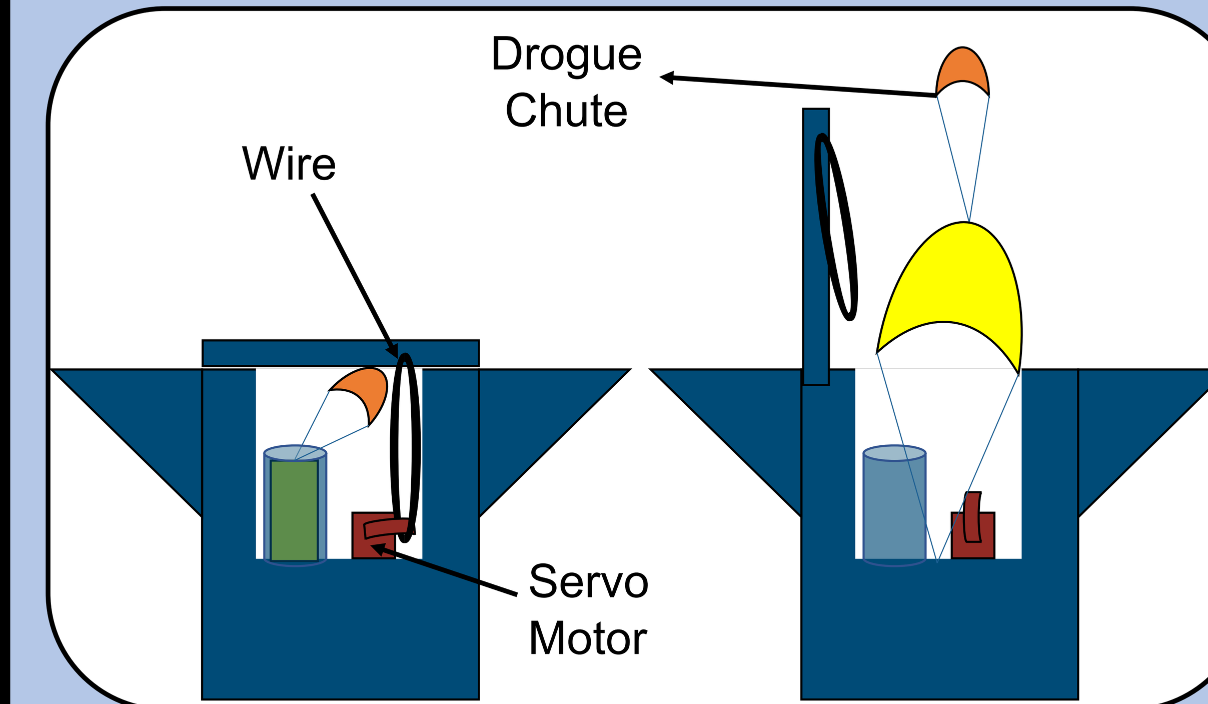
Thrust applied by motor increases according to F= m$\bar{a}$ where $\bar{a}$ represents the body's deviation from freefall.



Assumptions:

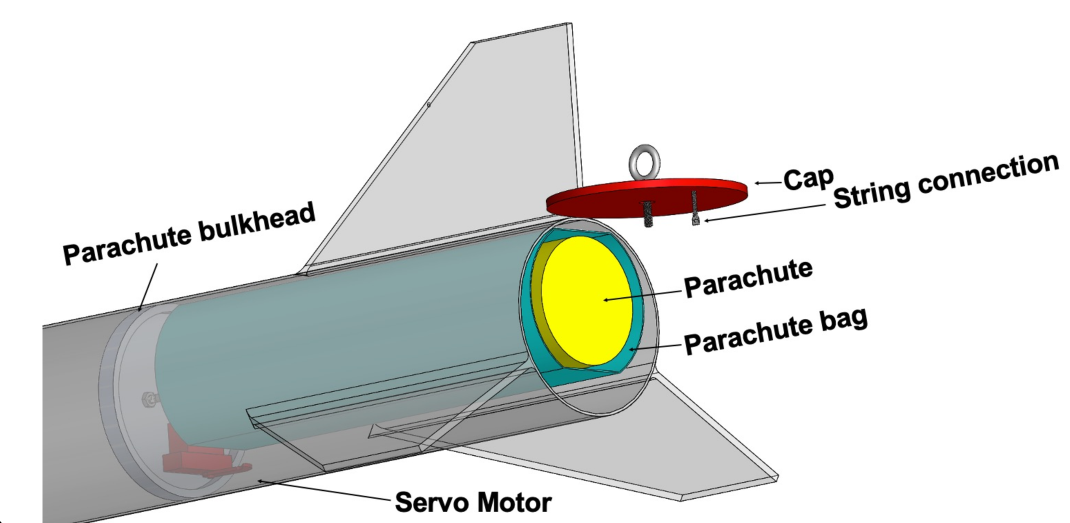
- Vehicle's path is clear of obstacles.
- Tested in standard earth atmosphere.
- Weather conditions aren't of concern.

Recovery System



Servo motor arm opens, and the drogue chute is released from the backdoor after 4 seconds of microgravity are achieved. The drogue chute then pulls the full-sized parachute that will help slow down the system.

Parachute Storage



Targets:

- Acceleration: $9.81\ \frac{m}{s^2}$
- Final Velocity: <5 $\frac{m}{s}$

Advisors: Dr. Ali, Dr. McConomy

Sponsor: Mike Conroy, FSGC