

# Overview of the SABER Mission and Launch Vehicle Design

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## Mission Overview

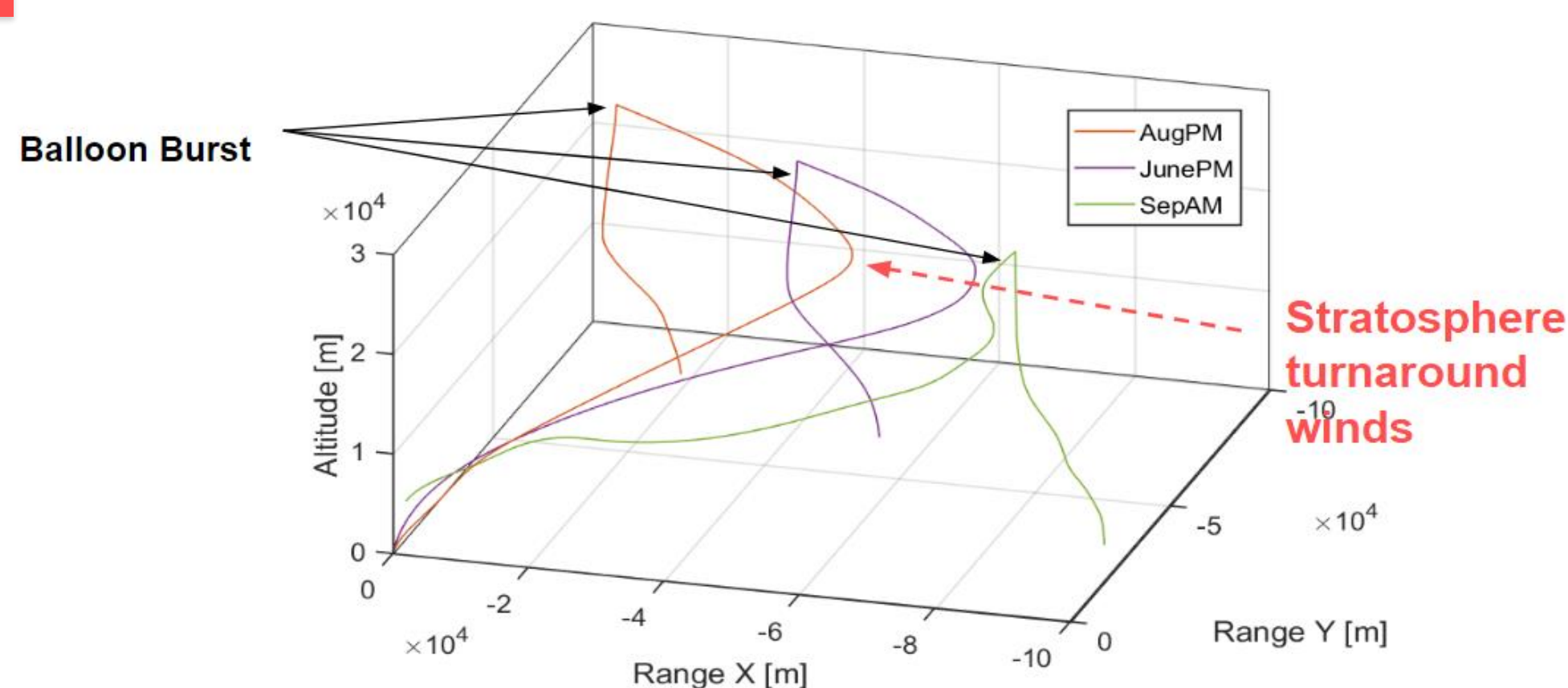
The *Suborbital Atmospheric Balloon Elevated Rocket* (SABER) mission is a university student developed space launch vehicle. The vehicle uses a high altitude launch to maximize commercial solid fuel rocket motor range capabilities. Our system uses a single stage rocket powered by an O-8000 solid fuel motor launched off a zero-pressure balloon and gondola system. The mission objective is to take 2-5 kg payloads to altitudes of 70-110 km. SABER will utilize standard amateur rocket architecture combined with ballooning to lower development time and reduce costs.

## Vehicle Performance Simulations

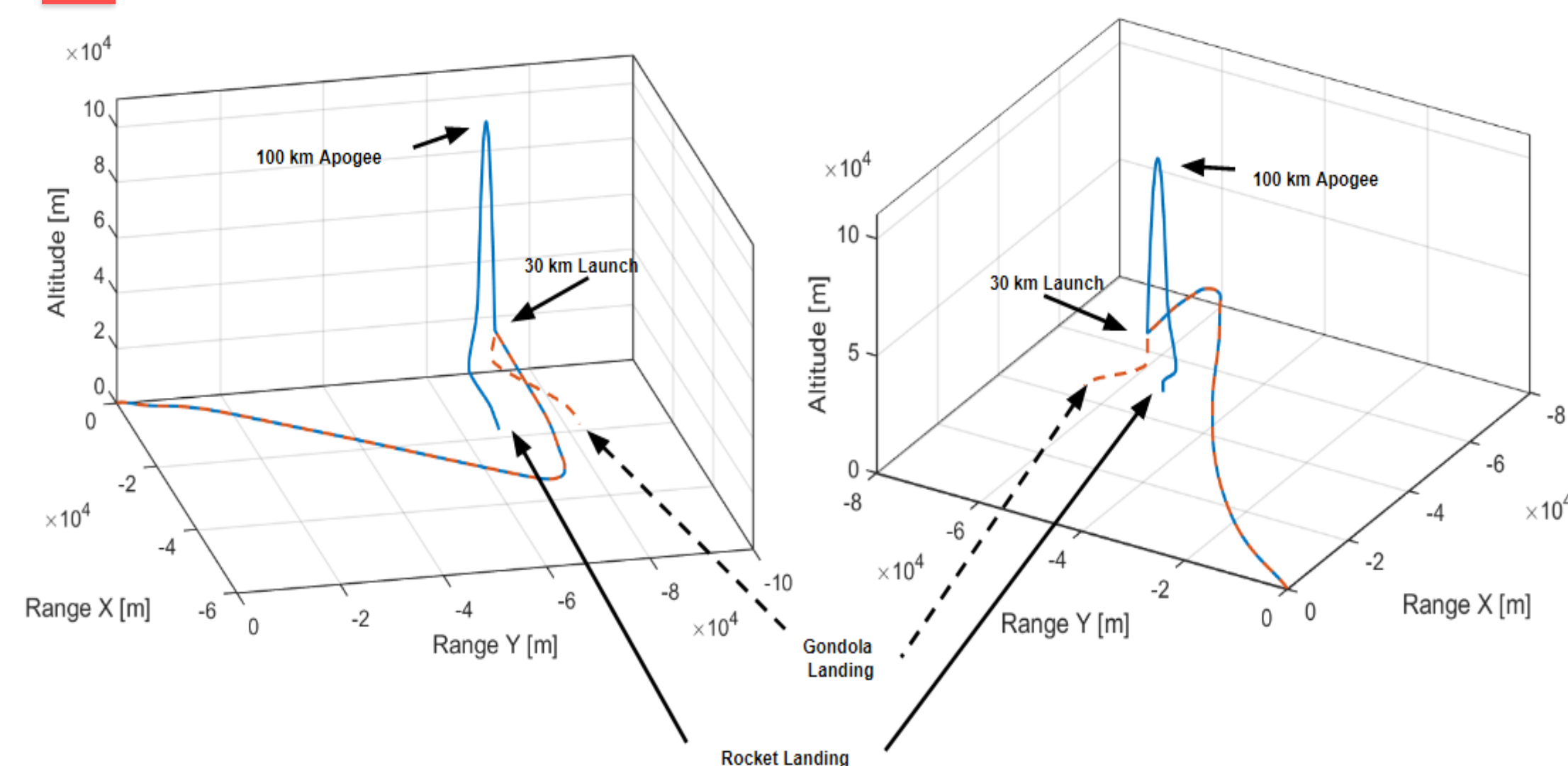
High altitude simulations run in a 6DOF Simulink simulation

Ignition Altitude	Rocket Mass	Max Velocity	Max Accel.	Max Q	Apogee	Ignition to Apogee
25 km	44 kg	1160 m/s	305 m/s <sup>2</sup>	26 kN/m <sup>2</sup>	92 km	125 s
30 km	44 kg	1165 m/s	310 m/s <sup>2</sup>	14 kN/m <sup>2</sup>	100 km	125 s
35 km	44 kg	1168 m/s	312 m/s <sup>2</sup>	7.5 kN/m <sup>2</sup>	107 km	125 s

## Balloon Ascension Analysis



## Vehicle Recovery Analysis



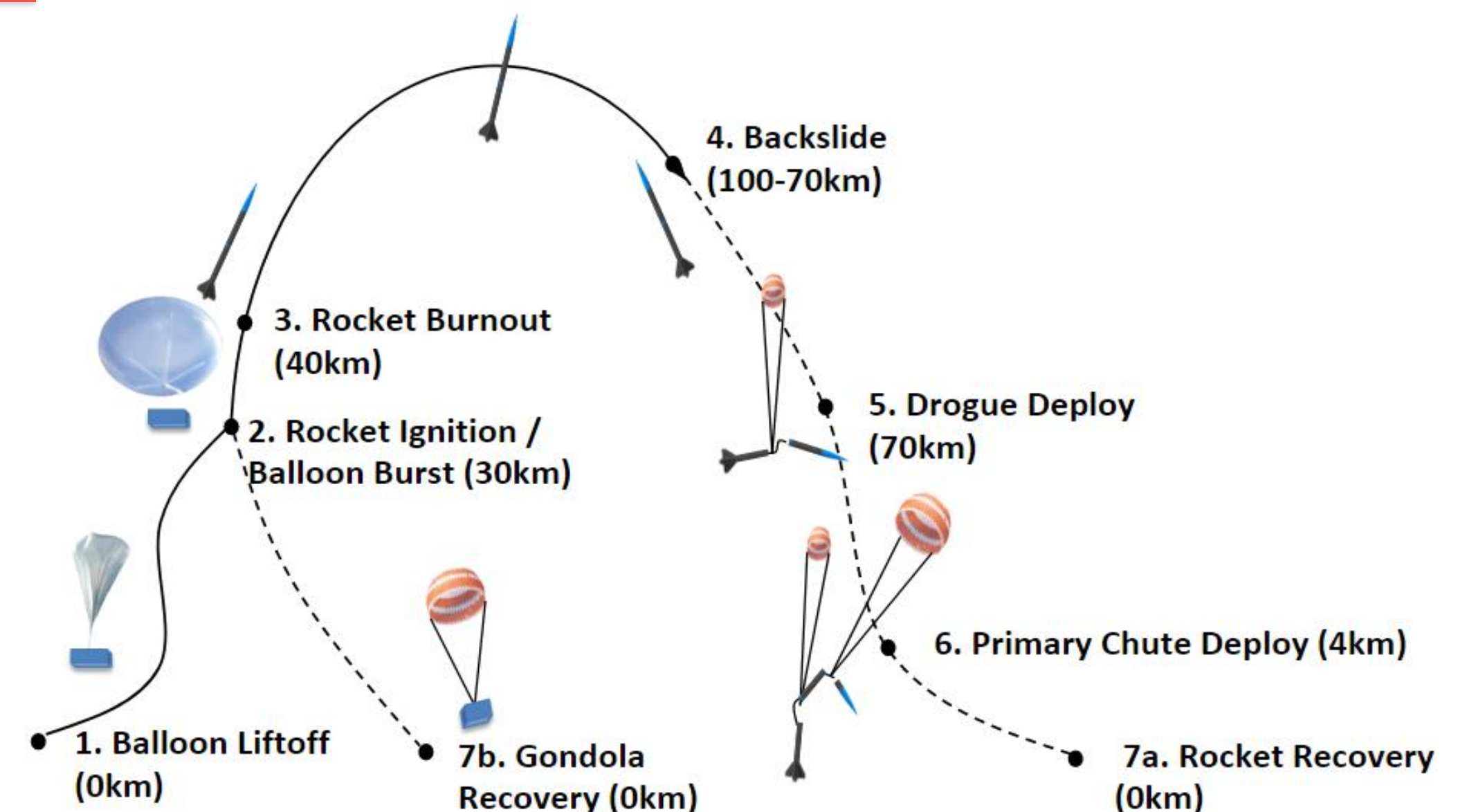
## Conclusions

SABER's mission concept has the capabilities to put space within the reach of student engineering teams. The platform combines ballooning and rocketry to create a space launch vehicle that bypasses development of propulsion and cuts costs using commercial motors and amateur systems. The SABER mission plan is to fly in 2019 with the start of hardware prototyping this semester.

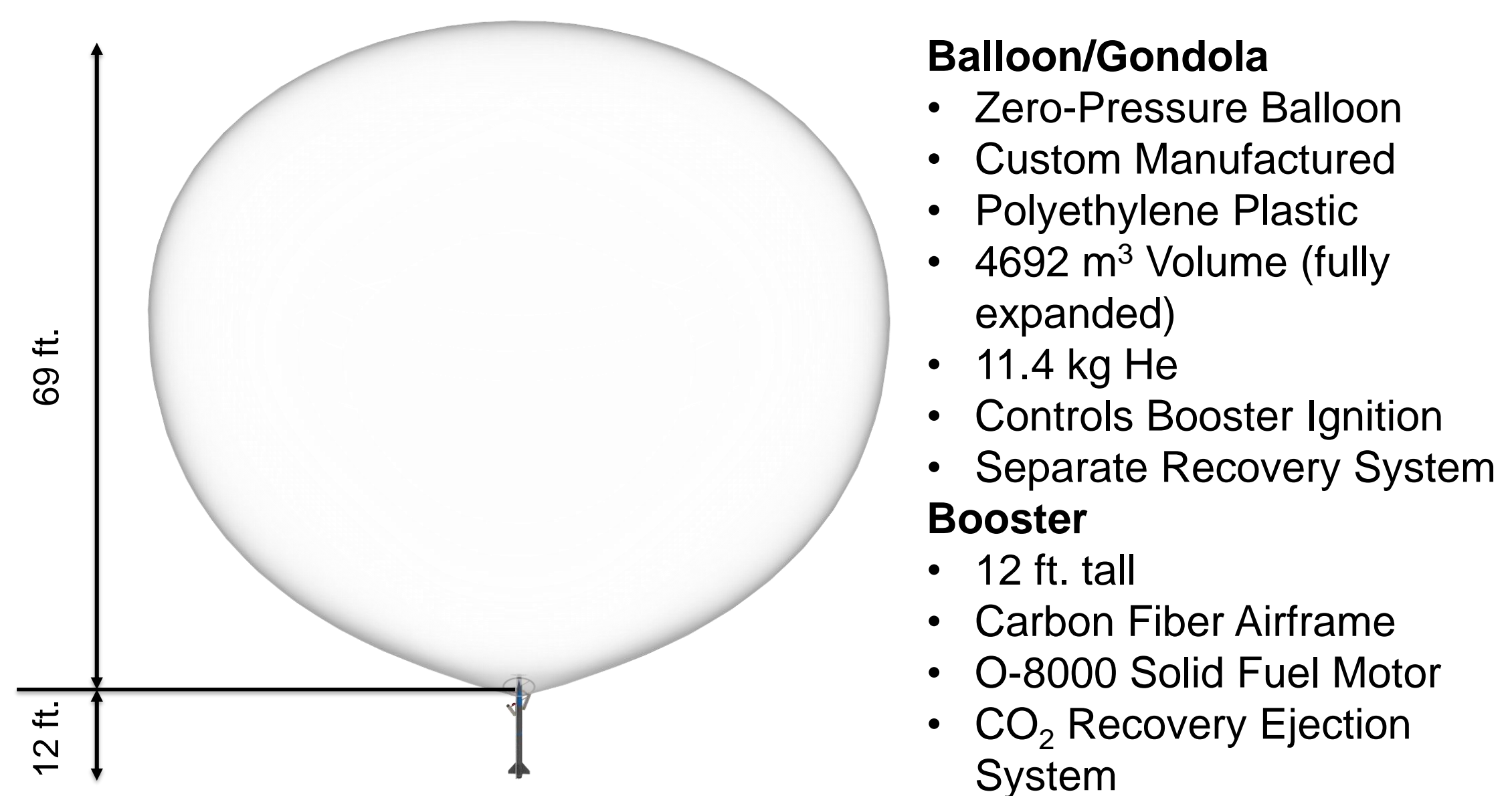
## Acknowledgements

Dr. Francis Wessling, Faculty Advisor  
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## Concept of Operations

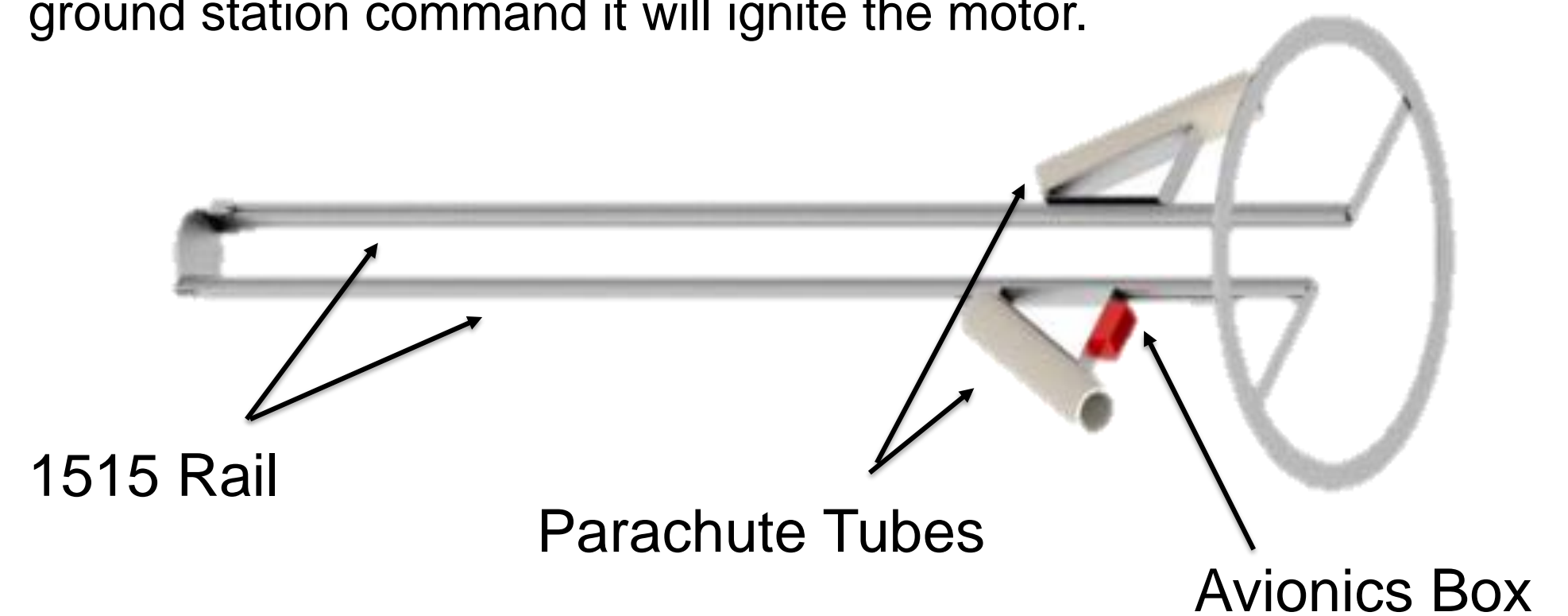


## Full Vehicle Overview



## Gondola Overview

The gondola will secure the rocket booster during ascent and, upon ground station command it will ignite the motor.



## Booster Overview

The booster is a single stage solid fuel rocket with three main sections. Airframe material is carbon fiber with fiberglass nose cone.

