# BYU Rocketry

## 2019 IREC & Spaceport America Cup

### Objective

BYU Rocketry competed in the 2019 Intercollegiate Rocket Engineering Competition at the 3rd Annual Spaceport America Cup in Las Cruces, NM by building an 8-foot High Power rocket to send an 8.8 lb. CubeSat payload 10,000 ft. above ground level. Over 100 collegiate teams from around the world will competed.

### Payload Bay

3U CubeSat Payload: Cold-Gas Guidance, Navigation, and Control Payload (CG GNC) that uses compressed gas and nozzles to demonstrate cold-gas propulsion.

### Avionics Bay

Onboard electronics control dual parachute deployment events at specific altitudes based on barometric pressure sensors while collecting navigation data.

### Main Parachute Bay

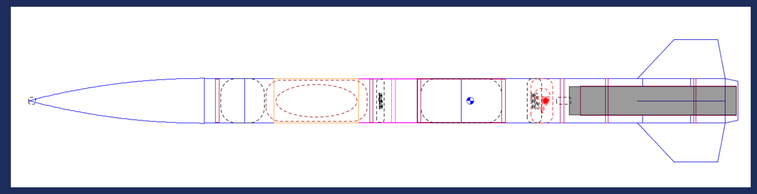
One 72” parachute, wrapped in Nomex blanket and attached to 30 ft. Kevlar shock cord, deploys 1200 ft. above the ground during descent to land the rocket at 37 ft/s.

### Motor Mount

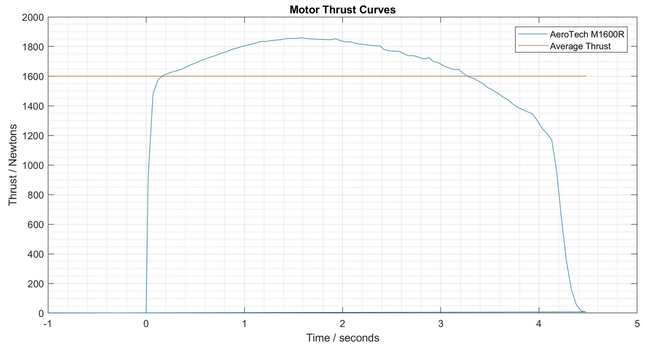
Kevlar motor retention assembly, through-the-wall carbon fiber fins, kevlar inner tube and carbon fiber centering rings for concentric thrust.

### Modeling and Testing

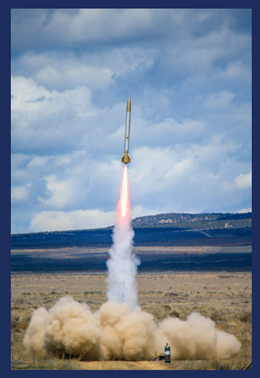
Flight simulations were conducted using open-source software to fine tune the mass of the rocket so the target altitude of 10,000 feet could be reached.



The rocket is powered by a commercial Aerotech M1600R solid fuel motor.




One test launch to 10,000 ft. was performed in April on a M1600R commercial Aerotech motor.



### OUTCOME

The rocket flew to 9,000 feet before ejecting the payload. Unfortunately during the payload ejection the ejection blast released the main and drogue chutes. The bulkhead attached the nosecone ripped off making the nosecone unrecoverable. However the payload was recovered successfully along the with the rest of the rocket. The payload received an honorable mention from the judges


### LESSONS LEARNED

- New composites used for the bulkheads and airframe need to be further tested to determine mechanical properties.
- Stronger shear pins need to be used to ensure that payload ejection does not release both main and drogue chutes.
- Electronics overheating while on the launchpad was a major problem. A cooling system needs to be incorporated in future designs.

Sponsors: BYU Brigham Young University, MiSUMi

**Team Members:** Joseph Andrews, Bradley Buttars, Mark Johnson, Zachary Lawless, Jodi Pham, Harris Rothaermel, and Mark Sweeney

**Faculty Advisers:** Dr. Andrew Ning