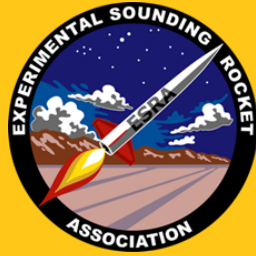


THE ASCENT AND DESCENT OF WUSHOCK STARDUST

AND THE SHOCKERS FROM MARS



"THE STARS ARE NEVER FAR AWAY"

- DAVID BOWIE

AE 528/628 Senior Design
2019 - 2020

THE COMPETITION

2020 Spaceport America Cup
Intercollegiate Rocket Engineering
Competition [IREC]

THE CATEGORY

10,000 ft Commercial Off-The-Shelf

THE MISSION

Fly an 8.8-pound payload on board our rocket, WuShock Stardust, to a precise altitude of 10,000 feet, and then return it safely to the ground.

THE PLAN

Design our rocket to overshoot the target apogee, and then activate the ADS to slow it down during flight.

AERODYNAMICS

We built our own trajectory tool in MATLAB to model launches, and validated it using flight data from other WSU rocket projects.

PROPULSION

We chose the Aerotech M2000R motor for its steady thrust curve, quick burn time and high thrust-to-weight ratio.

STABILITY & CONTROL

We designed our fins and layout to ensure the rocket was stable while avoiding weathercocking.

STRUCTURES

Our primary airframe material is G10 fiberglass. Our fins are slotted into the body tube to ensure rigidity.

ACTIVE DRAG SYSTEM [ADS]

Our ADS keeps track of the rocket's behavior during flight, and deploys flat blades called 'airbrakes' out of the rocket body to adjust its trajectory to changing flight conditions.

Initially, the target apogee is set at 10,100 feet; this changes to the competition goal of 10,000 feet as the rocket approaches apogee. This strategy gives the ADS clearance to adjust in case of unexpected events such as wind gusts.

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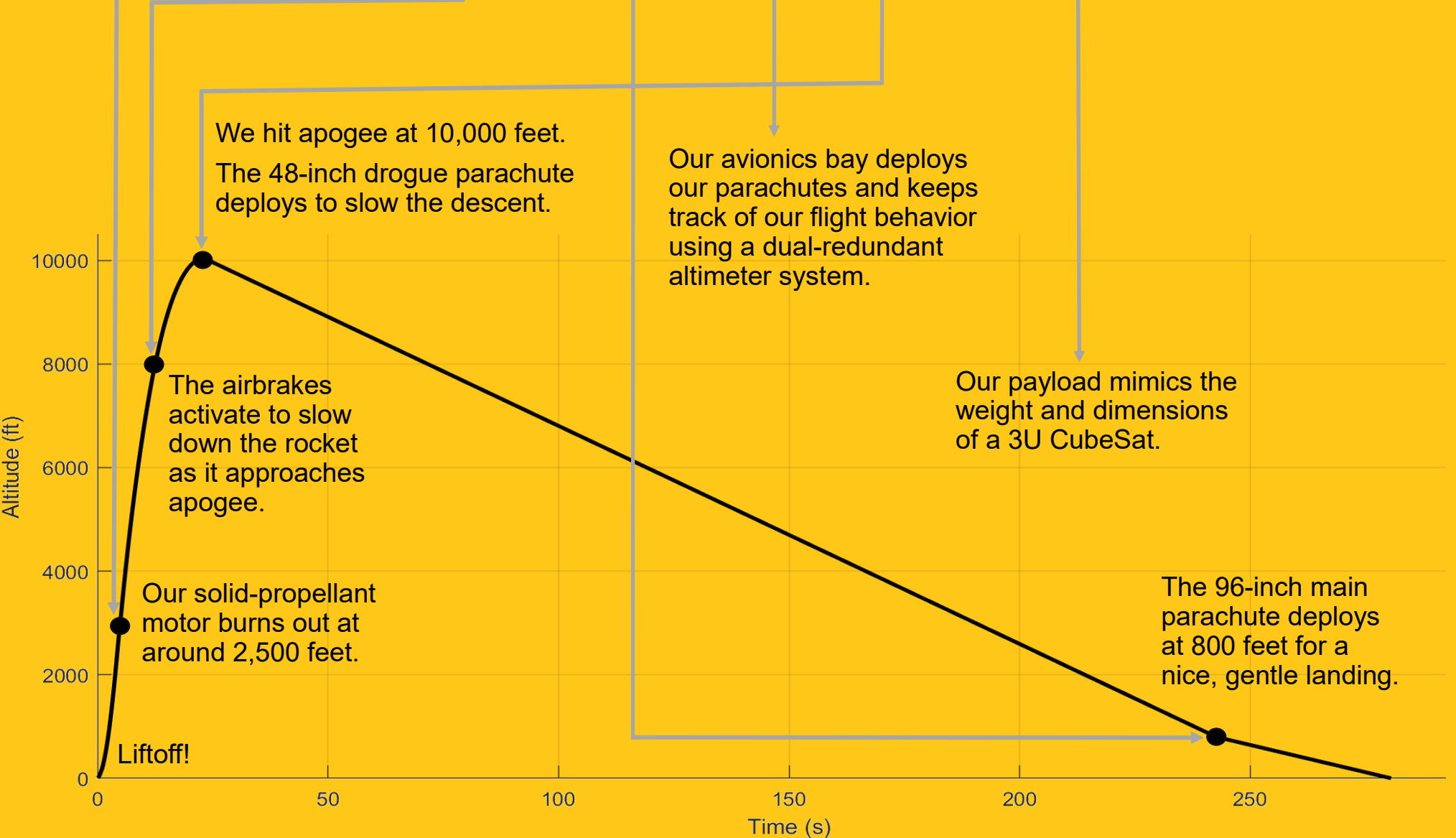
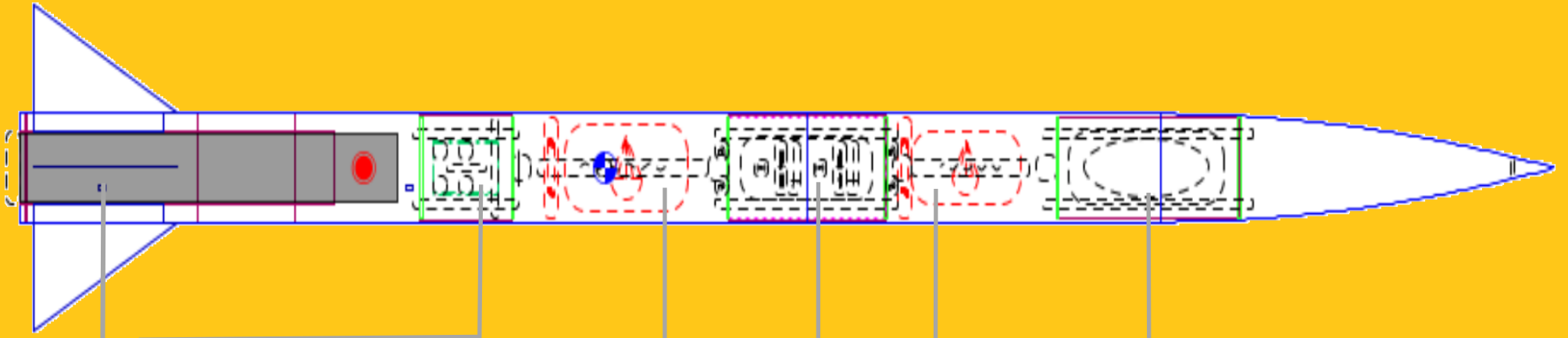
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We hit apogee at 10,000 feet. The 48-inch drogue parachute deploys to slow the descent.

Our avionics bay deploys our parachutes and keeps track of our flight behavior using a dual-redundant altimeter system.

Our payload mimics the weight and dimensions of a 3U CubeSat.

The airbrakes activate to slow down the rocket as it approaches apogee.

Our solid-propellant motor burns out at around 2,500 feet.

The 96-inch main parachute deploys at 800 feet for a nice, gentle landing.

Liftoff!