

1. Overview

The Ramblin' Rocketeers successfully launched the Intimidator 5 Kit Rocket on Saturday, April 6th in Talladega, Alabama. The rocket was flown on an AeroTech L900 motor, reached an altitude of 5,462 feet, and was successfully recovered. The launch vehicle weighed 40 pounds which includes a dummy payload mass. Liftoff of the launch vehicle is illustrated below in Figure 1.



Figure 1: Launch Vehicle Lift-Off

2. Launch Configuration

2.1. Motor and Motor Retention

The motor for the Intimidator 5 Kit is a 75mm motor and requires an adapter. The adapter is composed of a central cardboard tube with an inner diameter of 75 mm. Running down the length of the tube are five centering rings which fit smoothly into the booster section of the launch vehicle. The bottom most centering ring, or the base centering ring, is larger and rests on the bottom of the booster section. The tube is secured through four #8-32 screws which screw

directly into the bottom of the booster section through the bottom most centering ring which is larger in diameter. The centering rings are made of plywood.

The motor is retained through a steel cable which is secured halfway from the bottom of the booster section using two ferels as well as epoxy. The attachment of the steel cable is illustrated below in Figure 1 and Figure 2. The top of the motor case features an eye bolt and steel wire is used to connect the steel cable to the eye bolt.



Figure 2: Steel Cable Attachment



Figure 3: Top of the Motor Section Inside the Booster Section

2.2. Recovery System

The launch vehicle features two Featherweight Screw Switch arming switches and two StratoLogger Pro altimeters. These components are utilized in two completely redundant and independent recovery wiring harnesses. The diagram for the recovery harnesses are illustrated below in Figure 1.

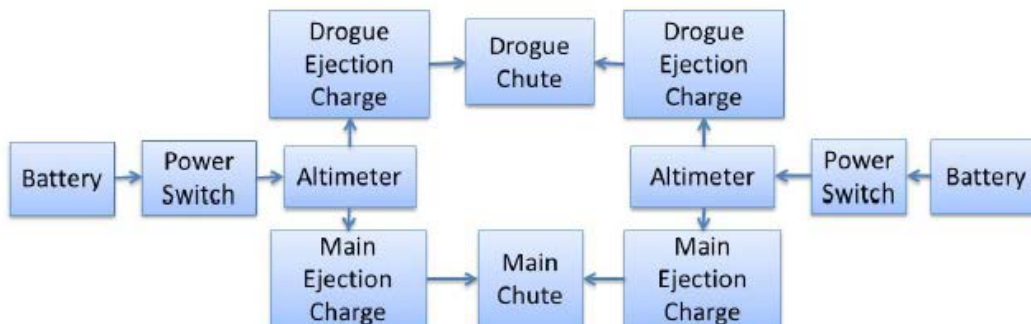


Figure 4: Recovery Wiring Harness Diagram

The Feather Weight Screw arming switches are illustrated below in Figure 1.

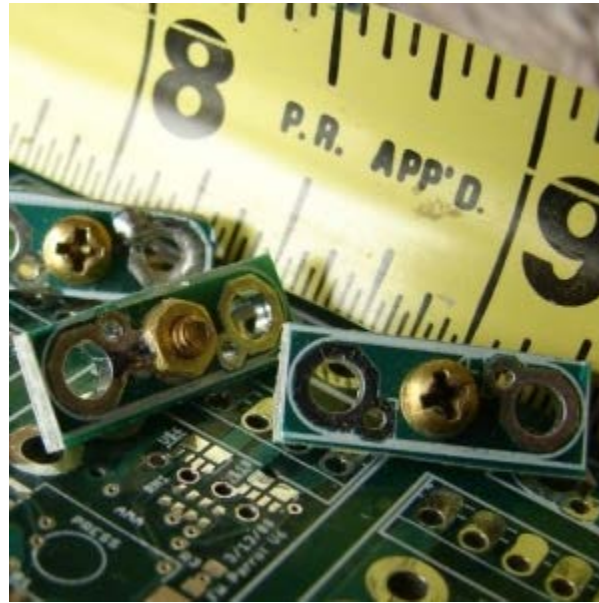


Figure 5: Feather Weight Screw Arming Switches

In addition, the launch vehicle utilized a 12 foot diameter main parachute and a 3 foot diameter drogue chute. The drogue parachute was deployed at one second after apogee and the main parachute was deployed at 500 feet. The main parachute and drogue parachute utilized two grams and one gram of black powder, respectively, for the two redundant black powder charges.

3. Predictions

The performance specifications plotted below in Figure 6 were obtained by a simulation algorithm created in MATLAB. Based on the liftoff mass of the launch vehicle, a standard atmosphere, the launch vehicle will reach a maximum altitude of 5,274 feet on the selected flight motor. Also, the calculated maximum velocity is 440 ft/s and the calculated total drift is 1980 feet in 15 mph of wind.

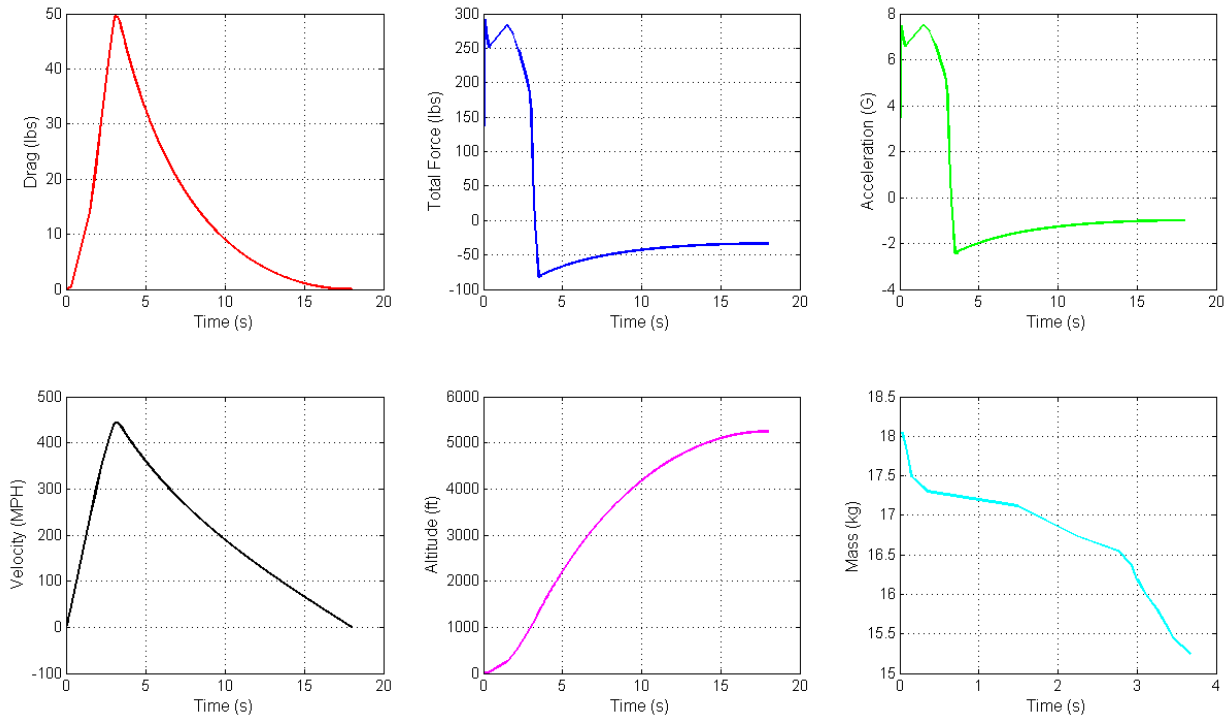


Figure 6: Performance Prediction Plots

4. Results

The launch vehicle reached apogee at 5,462 feet above ground level and was successfully recovered. The launch vehicle drifted 2,095 feet from the launch pad. The Launch vehicle's altitude and velocity during time is illustrated below in Figure 5.

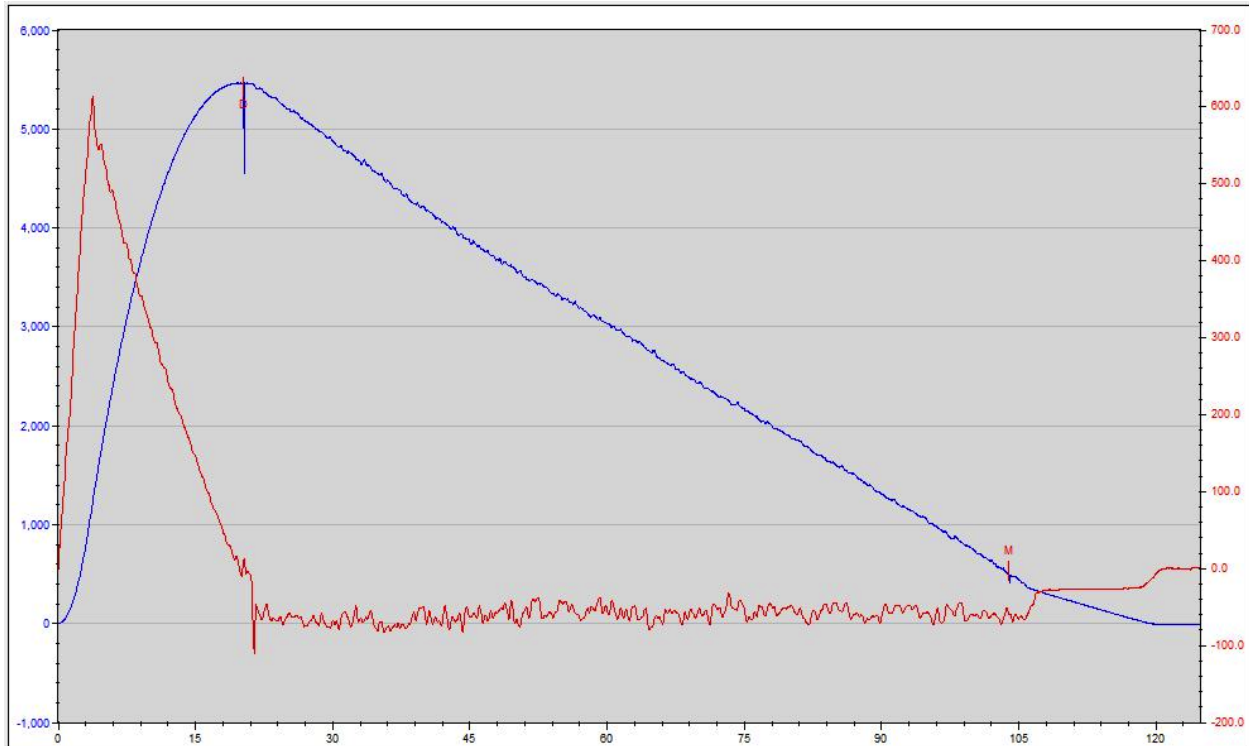


Figure 7: Altitude and Velocity vs. Time

The actual drift is 115 feet larger than the estimated drift but close enough to validate the drift calculation method. In addition, the 2,095 feet of drift is well within the 2500 foot drift requirement. The recovery of the launch vehicle is illustrated below in Figure 7.



Figure 8: Recovery of the Launch Vehicle

While the launch vehicle flew successfully the glue holding the base centering ring onto the motor adapter failed due to the load from the rocket motor being unevenly distributed to the motor adapter. To ensure the integrity of the motor adapter a second, larger centering ring made out of .5 inch thick aluminum will be placed on top of the base centering ring and the base centering ring will be re-glued. The aluminum centering ring is large enough to cover the motor tube and will sustain the impact of the motor.