Design of a Sounding Rocket for Maximum Altitude

Hamlin, Scott

In this engineering project, a sounding rocket using an 80 Ns motor was optimized for altitude. A numerical simulation was used to model the rocket's flight characteristics. Through the simulation, parameters such as motor and rocket configuration were altered to achieve optimum altitude. The project started with a basic rocket configuration with a 3 in diameter body tube. Once the rocket configuration with the optimum mass, rocket components, size of parts, and motor was simulated, the maximum altitude (according to the simulation) was determined. Next, a hollow rocket design was used to limit the amount of drag subjected to the rocket. This was achieved by using a 3 in diameter body tube surrounding a smaller inner tube, which contained the motor. Both 24 and 29 mm diameter motors were simulated. The smaller diameter motors allowed for minimized drag, but had lower total impulse than the larger diameter motors. The decrease in drag did not compensate for the lower total impulse. As the total impulse of the motors increased, so did the apogees. The highest impulse F class motor available was the F10. Although this motor had the highest impulse (76 Ns), it had a very low thrust, and was more affected by wind. The F50T (69 Ns) was the optimum motor for average conditions. The theoretical optimum mass of each rocket design was determined to maximize apogee. A model rocket was constructed and tested with a recording altimeter in order to verify the simulation.

Awards Won: