

Level 2 Rocketry Report

Jack Edwards

2024

Design Overview

For this level 2 rocket I have chosen to go with dual deployment of parachutes for the recovery system to help prevent the rocket from drifting far away from the launch site this is needed as the rocket is simulated to fly up to 2627 meters (8619 ft) as shown in Figure 1 in Open Rocket Simulations. A drogue chute launched at the apogee and a main chute launched at 250 meters during descent, the descent velocity with the drogue chute deployed was simulated to be -20 m/s, with the main and drogue chute deployed simulated to be -7.4 m/s as shown in Figure 2 in Open Rocket Simulations. The parachutes shock cord will be epoxied to the internal side of the tubes in the rocket.

The avionics will be stored within the coupler held between two bulkheads with the main parachute in the payload tube and the drogue parachute in the booster tube. Launch lugs will be added to the rocket at the bottom and the theoretical loaded centre of gravity. Four fins will be made and placed in slots near the bottom of the rocket for stability. The boat tail will extend out further down than the fins to prevent damage to the rocket when landing. A centring ring will be placed at the following locations, just below the fins, just above the fins, and at the top of the motor tube. Materials were chosen based on availability by the UC Aerospace Level 2 program.

Bill of Materials

Fibreglass - approximately 2kg, as determined from open rocket (Nose cone, tubes, coupler, bulkheads, fins)
3D printed PLA for a Boat tail
Aluminium nose tip
3 wooden centering rings
Epoxy to join everything together
1220mm diameter parachute from patriot rocket
500mm diameter drogue parachute
Shock cord

Timeline of Build

Manufacturing for components over semester 2 of 2024 and the summer of 2024
Dry fitting of all components in the summer of 2024
Assemble all components using epoxy in the summer of 2024/2025
Full completed assembly by 2 weeks before the 2025 NZRA national launch day

Open Rocket Simulations

All simulations in Open Rocket were run with the K1154-P motor supplied by VT Propellants.

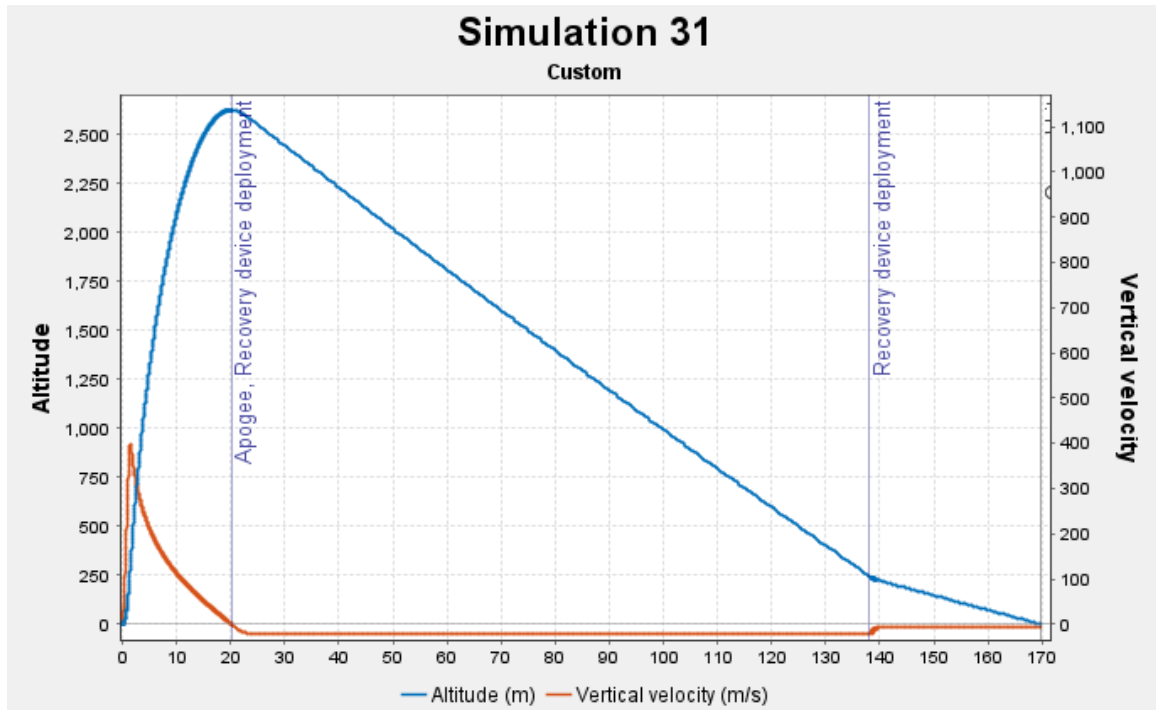


Figure 1: Altitude and vertical velocity compared to the time of rocket flight.

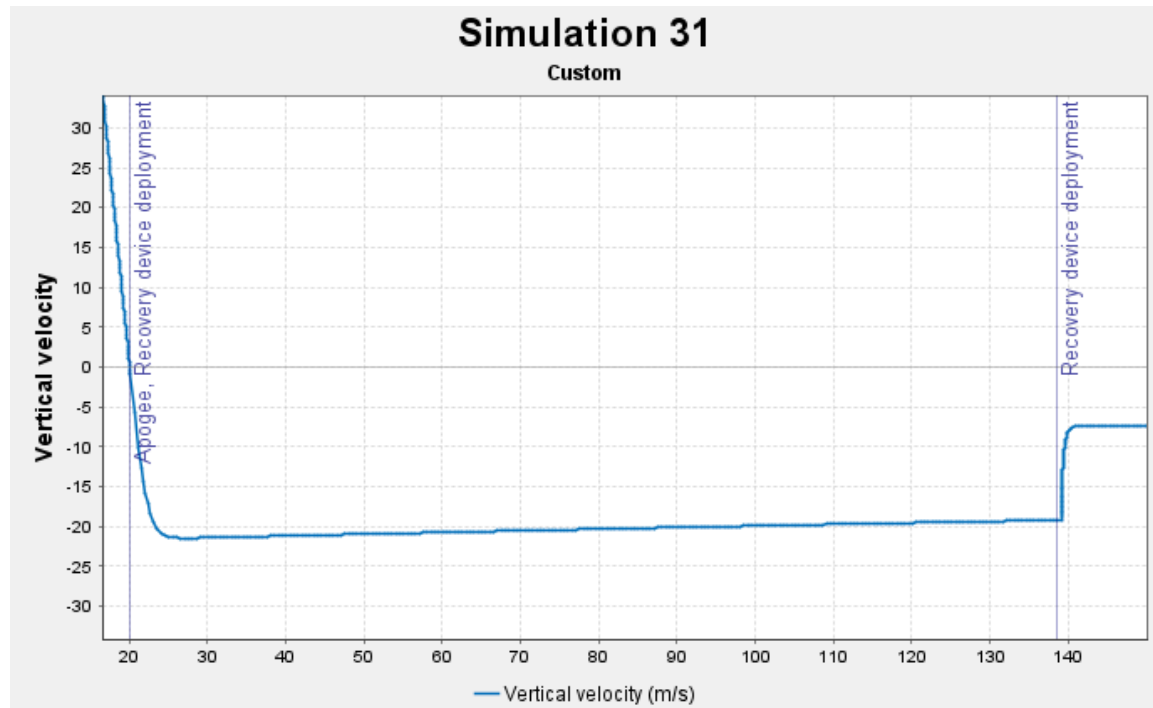


Figure 2: Decent velocity compared to time of rocket with parachutes deployed.