Quest for the Stars. Exploring Rocket Staging and Its Effect on Fin Configurations, Year 3

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As advancements in space technology progress, rocket design has become a critical field of study. This project investigates the optimal fin configuration for a two-stage rocket to achieve higher apogees and velocities. This research focuses on four fin shapes: Right Triangle, Clipped Delta, Double Triangle, and Trapezoidal, and evaluates their effects on flight performance through simulated and live launches. Flight performance is quantified by apogee (maximum altitude) and velocity. Simulations provided initial performance data: the Right Triangle fins achieved the highest velocity (118.71 m/s) and apogee (276.48 m), followed by Double Triangle (262.13m), (115.52m/sec), Clipped Delta (253.2m), (113.29m/sec), and Trapezoidal fins (220.71m), (104.94m/sec). Live launches were conducted to validate the simulations, with Clipped Delta fins showing the highest apogee (263.75 m), though the Right Triangle fins demonstrated competitive results (259.28 m). Statistical analyses, including T-tests and P-tests, were conducted to assess the significance of these findings ($p<.05$). The study highlights the importance of fin shape in optimizing rocket flight performance. The results suggest that fin configuration significantly impacts a rocket's apogee and velocity, contributing to the understanding of experimental rocketry and advancing the development of efficient rocket designs.

Awards Won: