33 Super-Roc Duration Competition

33.1 Scope

Super-Roc Duration Competition is open to single-staged single-motor model rockets whose body length is no less than the minimum allowed for the classes of the event (see below). The purpose of this competition is to achieve the greatest duration possible with the longest rocket possible without impairing the structural integrity of the rocket.

33.2 Structural Failure

An entry that comes apart, bends so as to crimp the body, or has a similar structural failure prior to ejection shall be disqualified.

33.3 Construction

Entries with bodies or significant structural parts made from hard or potentially unsafe material (e.g., hardwood doweling or fiberglass shaft) shall not be allowed

No metal structural components (permitted for retention hooks, eye bolts, etc)

No lighter-than-air components or pressurized vessels

Must incorporate launch lug

a. See http://www.estesrockets.com/rockets/accessories/302320-launch-lug-pack
b. A 36" long 3/16" diameter rod will be provided
c. Other alternative sizes/tower launchers are permitted but will not be provided
    i. No launch system that provides force to the rocket will be allowed

Limited to ONE Estes brand "D" size motor of any delay time

d. Motor cannot be modified (pieces of casing removed, shortened, etc)
e. See http://www.hobbylinc.com/Model_Rocket_Engine_Naming_Convention

33.4 Scoring

Super-Roc Duration Competition shall be scored as follows: the length in centimeters of the model, as measured from the tip of the nose cone to the end of the motor nozzle, up to the maximum length for that category, shall be awarded as static points. No additional points are awarded for any length beyond the maximum. The achieved duration of the model in seconds shall be awarded as flight points. The first piece of the rocket to reach the ground will determine the end time for duration. The static points and flight points thus obtained shall be multiplied to determine the total points for each flight. The contestant achieving the highest score is the winner.

Must be successfully recovered for valid attempt

a. Deployed parachute or streamer
b. Motor retained in rocket
c. No jettisoned material (fins, launch lug, etc.)

A second prize will be awarded to the most creative and glamorous rocket entered that make a qualifying flight. No hard criteria exist, but uniqueness and design creativity will be weighted more heavily in the event of 'equally glamorous' rockets.

33.5 Classes

This competition is divided into classes based on the permissible total impulse of the motor(s). The following classes of Super-Roc Duration Competition are established:

Motor Class	Minimum Length (centimeters)	Maximum Length (centimeters)
D	150	300

Recommendations

1. Balsa wood for fin materials (light, strong, and customizable)
2. Cardboard tubes for fuselage
3. Use RockSim for modeling, free one-month trial
    a. http://www.apogeerockets.com/rocksim_demo.asp
4. Leverage kit manufacturers for potential design factors
    a. Estes http://estesrockets.com
    b. Quest http://www.questaerospace.com/items.asp?Cc=MODELROCKETS&Bc=
    c. Estes Mean Machine will qualify for this competition with no modification; recommended for those with limited experience but want to participate

Design Considerations

1. Understand how duration and rocket length affect your score
    a. The length can vary from 150-300 cm; a maximum length rocket will only have to stay aloft ½ the time of a minimum length design for the same score
    b. Larger lengths can allow for more volume to contain drag increasing components (parachutes, streamers, etc)
    c. Duration has no maximum; excellent loiter design can overcome a simpler length centric design
2. Fin alignment does affect altitude achieved
    a. Unbalanced fins (around diameter of rocket) will cause the rocket to tilt due to imbalance, this prevents true vertical flight
    b. Angled fins (from direction of flight) will cause a spin; while this makes the rocket more stable it takes away energy that would normally contribute to vertical flight
3. Kit fins are designed for aesthetics
    a. Grossly oversized
    b. Highly swept (unnecessary and a friction contributor for slower rockets)
    c. Reference: http://www.apogeerockets.com/technical_publication_16.asp
4. Motor selection, even amongst equal impulse engines, is important
    a. The –X number indicates how long after burnout the ejection charge will activate; if this occurs before apogee performance is degraded and zippers are possible
5. Testing is the best way to ensure your design is feasible and performs well
    a. 10-15% of model rocket launches, from tiny to 100+ pounds, fail due to various reasons:
        i. Improperly secured motor (CATO)
        ii. Wrong type of motor (no ejection charge, incorrect delay, loaded on wrong stage)
        iii. Section couplings too tight (unable to eject parachute)
        iv. Parachute improperly packed
        v. Ejection charge destroys the parachute (plastic/paper)
        vi. Structural fin failure due to inadequate adhesion
        vii. Misaligned/mis-sized launch lug (torsion causes ripping)
    b. Even in a small model rocket, many failure modes exist
    c. Testing will determine problem areas before competition and allow re-work
    d. First flights can be problematic; work the bugs out beforehand