TENNESSEE SCIENCE OLYMPIAD 2013

Elastic Launch Glider (Division C)

Science Olympiad Coaches Workshop
University of Tennessee
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Terminology

- Roll - rotation about the long axis
- Yaw - rotation about the vertical axis
- Pitch - rotation about the axis through the wings
- Incidence (angle) - angle of wing above long axis

- Fuselage or “fuse” - main body
- Ailerons - hinged flaps on wings that control roll
- Horizontal stabilizer or elevator - horizontal part of tail
- Vertical stabilizer or rudder - vertical part of tail

Glider Design

- Must be able to withstand force of launch
- Lightweight and aerodynamic
- Different grains of balsa
  - A-grain: soft, malleable
  - B-grain: mid-range
  - C-grain: harder, more stiff
- Blunt nose
- Ambroid cement or CA/superglue (easily softened with acetone)
- Key element: incidence (0-0)

Launch

1. Hold the launcher in one hand and glider attached to the elastic loop in the other.
2. Stretch the elastic the desired amount, and hold the system vertically.
3. Slightly offset glider horizontally away from launch handle (less likely to hit it)
4. Tilt the system 10-20° from vertical (for easier transition into its glide)
5. Roll the glider (rotate it about long axis) about 45° for corkscrew ascent

Stick launchers allow for wrapping to adjust band length

PRACTICE!

Find a grip/launch technique that works
Rules/Specifications

- Wood, foam, carbon fiber, glue, paper, plastic film
- Non-metal ballast (i.e. clay)
- Must weigh less than 10 grams
- Kits are ok, but no pre-glued joints
- Wingspan not to exceed 30cm
- Blunt nose (chapstick cap test)
- Labeled with team name
- Flight logs

Flight logs

Four parameters for at least 10 flights prior to competition

- Required data parameters for each flight:
  1. Estimated/recorded peak flight height
  2. Approximate length of elastic loop (relaxed)
  3. Flight time
- Some suggested parameters are: (pick 1 or add your own)
  - Orbit diameter
  - Launch angle
  - Cross section of elastic loop
  - Height at transition to glide pattern

Competition

- 6 minutes
- 5 official flights using 1 or 2 gliders or launch handles
- Must declare as "official" before launch
- No extra time for repair/recovery
- Base score: sum of 2 longest flights
- Tie-breaker: longest non-scored flight

Penalties

<table>
<thead>
<tr>
<th>Violation</th>
<th>Deduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flight Logs are Incomplete</td>
<td>10% deduction from each flight</td>
</tr>
<tr>
<td>Flight Logs are not turned in</td>
<td>30% deduction from each flight</td>
</tr>
<tr>
<td>Building Violation</td>
<td>2nd tiered (scored below all legal devices)</td>
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</tbody>
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Materials/Resources

- Science Olympiad Student Center
- Freedom Flight Models
  - [http://www.freedomflightmodels.com/paypal.htm](http://www.freedomflightmodels.com/paypal.htm)
- YouTube: Science Olympiad - Elastic Launch Glider 2
  - [http://www.youtube.com/watch?v=Mp5YCny0r44](http://www.youtube.com/watch?v=Mp5YCny0r44)