

## **Rubber Band Helicopter (45 Minutes - Coach Scheduled Event)**

**Description:** Contestants will build and test one paper cup helicopter of any design using the materials provided at the competition.



**Participants per team:** 2

### **Spirit of the competition:**

- It is a rules violation if coaches, parents, mentors, or spectators enter the competition area or communicate with the team members at any time during the competition. Violation of this rule will place the team below all other teams.

### **Safety Requirements:**

#### **Safety glasses labeled ANSI Z87.1+ (impact rated)**

- All competitors must wear their eye protection during any competitor's flight phase of the competition.
- If a team does not have the required eye protection, they will be given the opportunity to obtain it, time allowing, but will not receive extra time.
- If a team is unable to obtain eye protection, the team will not compete and will receive a no-show score.



### **Teams Need to Bring:**

- Pencils, a ruler/straight edge, scissors, and a team chart showing testing results for flying a practice helicopter on a ≈22 cm by 30 cm sheet of paper. Minimum requirement: 6 tests with different rubber band sizes, with and without weights.

### **Materials Provided at Event:**

- 1 ≈15cm Propeller
- 1 ≈Craft Stick
- 1-Jumbo Paperclip
- 2- Rubber bands – student choice from an assortment of sizes #64, #33, and #19
- 1-Sheet of Card stock ≈22 cm by 30 cm.
- 50 cm of 2.54 cm Masking tape
- 1 ≈ 150 ml Paper Cup
- 2 ≈ 1.6-gram tin split shot fishing weights
- Pliers

### **The Competition:**

**The estimated time to finish the written test is 15 minutes and 45 minutes for the entire event.**

**The written test and the construction phase may occur simultaneously.**

**Teams will be trying to have their helicopter hover without touching the highest point in the launch area.**

**Part 1 – Written Test: Timed 15 minutes**

The team members will take a test on the principles of rotary flight.

**As a part of the written test the team will estimate the time their helicopter will stay aloft.**

**Part 2 -Construction Phase: Timed 15 Minutes**

Teams will build their helicopter using any of the materials provided. They do not have to use all of the materials provided.

- If the team chooses to use the weights a pair of pliers will be available.

- Rotation of the helicopter (clockwise, counterclockwise, horizontal, or vertical) is a team choice.
- The height distance will be announced during the building phase.
- Contestants may test their devices in the building area, and at the discretion of the event supervisor, test them from the official launch location.
- Teams must write their team number on their helicopter.
- During the construction phase the team will give the Event Supervisor their estimate for the time that their helicopter will stay airborne without touching the highest point of the launch area.

### **Part 3 - Flight Phase: 15 Minutes**

- Each team will have two launches of their helicopter.
- Maximum height will depend on the launch area ceiling or obstruction.
- All teams will release their helicopter from a height 1 meter from the floor of the launch area.
- Participants will announce their intention to launch their helicopter by saying “3, 2, 1, Launch.”
- Time will start when judges see the helicopter leave the hand of the student.
- The Event Supervisor and at least one judge will record the time a team’s helicopter stays airborne without touching the top of the launch area or any obstruction.
- Timing will continue until the helicopter touches the top of the launch area, an obstruction, or lands on the floor.
- The Event Supervisor will record and average the flight times for both launches. Times will be recorded in seconds to the nearest 1/100.

### **Scoring:**

Teams will receive two weighted rankings. These rankings will be added to find the final placements. The team with the lowest sum will place first.

- 75% - Teams will be ranked based on the longest combined flight times to the nearest 1/100 of a second.
- 25% - Teams will be ranked based on their written test score.

Teams are also placed in tiers based on adherence to the challenge instructions. Within each tier, teams will be ranked based on the scoring criteria for the challenge.

- Tier 1: Teams with no violations.
- Tier 2: Teams whose device loses a part or has golf fall out.

### **Scoring Example:**

Equation: (written test ranking x 0.25) + (car ranking x 0.75) = final ranking

- Team A ranks 3<sup>rd</sup> on the written test. This scores 0.75 ranking points. The team also scores 5<sup>th</sup> on their distance to target. This scores 3.75 ranking points. The team’s final ranking score is 4.5.
- Team B ranks 2<sup>nd</sup> on the written test. This scores 0.5 ranking points. The team also scores 7<sup>th</sup> on their distance to target. This scores 5.25 ranking points. The team’s final ranking score is 5.75.
- Team A places first in the rankings.

### **Possible Resources:**

Division A will not release previous tests, or the exact resources used by the Event Supervisor or test writer for any events. The listed resources are meant as a starting point, Division A does not endorse one method over another, and it is up to the competitor to research further.

- [Instuctables: How to make a helicopter for kids out of a coffee cup.](#)
- [University of West Virginia: Rubber Band Helicopter - STEM CARE Lesson](#)
- [Rubber Band Helicopters](#)