

Space Elevator Race Rules

Field

- The field will consist of 4 ribbons beside each other at 2-foot intervals. Up to 4 robots will run at the same time.
- The floor will have mats to help cushion the fall of robots or satellites, but probably not enough to prevent damage should your robot disengage from the ribbon.
- up to three people from a team may enter the field to attach or detach a robot.
- Once robots have been attached to the ribbons, all humans must remove themselves from the field, behind the erected barriers before the round may begin.
- Robots must be started from 8 to 10 feet away. At the judge's signal you will give your robot the signal to go.
- No one is to enter the arena until the "all clear" signal has been given at the end of a run.

Ribbon

- The space elevator ribbon will be about 20 feet long and is a 3-1/16" wide nylon "Caution" tape.
 1. Home Depot ("500' Heavy Duty Reinforced Caution Tape", Empire manufacturer, SKU 719-282; often in tool aisle).
 2. [Amazon Reinforced Caution Tape: http://www.amazon.com/Empire-Level-76-0600-Reinforced-Construction/dp/B001DZB4UG/ref=sr_1_1?ie=UTF8&qid=1370395348&sr=8-1&keywords=Reinforced+Caution+Tape](http://www.amazon.com/Empire-Level-76-0600-Reinforced-Construction/dp/B001DZB4UG/ref=sr_1_1?ie=UTF8&qid=1370395348&sr=8-1&keywords=Reinforced+Caution+Tape)
- The ribbon is pulled taut. Note that because the ribbon is woven nylon, there may be frayed edges on the ribbon. Also, over time the ribbon will become worn. Robots will need to deal with this.
- The ribbon has very little play, and as a result is unable to be seriously deformed by wrapping it around wheels, etc.

Robots:

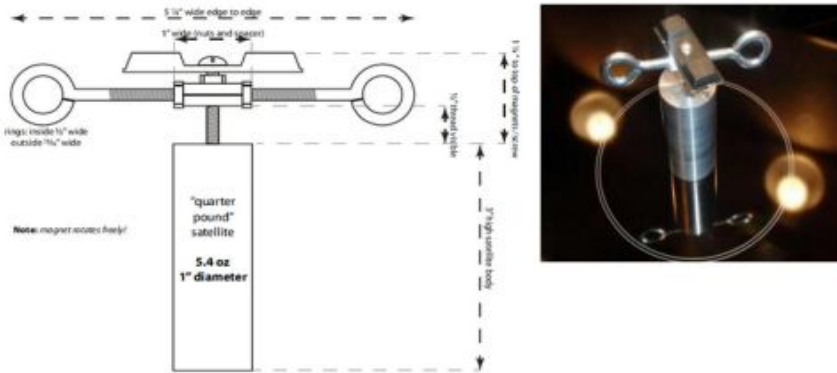
- Robots must be able to be fastened onto an existing ribbon without access to the ends of the ribbon. That is, you will need to attach your robot to the ribbon by clamping onto it from the side, not by feeding the ribbon through it.
- Robots should keep track of the time since the start signal, and make every effort to be on or near the ground level at the end of the 5-minute round
- Size and weight limits:
 1. 16" diameter centered around the ribbon
 2. 20" maximum height
 3. 12 pound weight limit

- Robots may not extend beyond this size at any time.
- Robots may not damage the field or ribbon.
- They may only use friction on the ribbon to lift themselves.
- No sticky substances, and nothing may penetrate the ribbon when climbing.
- Any robot damaging a ribbon will be disqualified.
- Any robot that looks to the judges like it might damage the ribbon will be stopped from further runs until the issue is resolved to the judges' satisfaction.
- Robots must be started from 8 to 10 feet away. At the judge's signal you will give your robot the signal to go.
- You may use whatever remote starting mechanism you desire, but other than signaling the robot, it may not provide any extra push or energy to your robot.
- Your signaling device may not interfere with other robots.
- Make your robot as robust against extraneous signals as you can.
- Some example signaling devices: visible light, IR or RF signals, or perhaps a pin being pulled by a string.
- False starts will be penalized, but be allowed to continue.
- Robots must be completely autonomous, carrying a maximum of 4 satellites at any given time up the ribbon.
- Satellites will remain attached to the steel plate until the end of the round.

Robot classes:

Robots can compete in one of two classes and each class will be judged separately. Robots may be brought by individuals or teams. Whichever class you choose to enter, your robot will need to pass an inspection to be allowed onto the space elevator ribbons.

1. **LEGO Only:** Robots built completely from LEGO, using standard LEGO building techniques (no gluing, cutting, melting, etc.). Use as many EV3s, NXTs, motors or sensors as you need. HiTechnic or MindSensor sensors are allowed. Any programming language may be used.
2. **(Almost) Anything Goes:** Robots may be built with anything else, including other building systems, including VEX or Tetrix. Homebrew robots are definitely welcome. You can use any processor, and any materials you wish. Restrictions are that your power source needs to be electric batteries, and all processing must be done on the robot.



Satellites

- Satellites: 3" high aluminum bar stock of various diameters, with perpendicular rings, and a magnet at the top. See pictures and drawing below
- The satellites will magnetically attach to the steel plate at the top of the ribbon, representing that they have been left in orbit.
- Approximate weight and numbers available for each robot
 1. Ten 1/4-pound satellites
 2. Ten 1/2-pound satellites
 3. Five 1-pound satellites

Satellite Dispenser

(optional)

- You may build a satellite dispenser that holds or even feeds the satellites to your robot each time it comes to the bottom.
- The dispenser may not be higher than 20", or wider than 18", centered on the ribbon, in the direction that the ribbon is wide.
- Length may be up to 30", in the direction perpendicular to the ribbon.
- The dispenser may not expand in size beyond these limits.
- It may be as automated as you like, but must as with the climbing robot, be completely autonomous.
- You may put as many of the satellites provided for your robot into your dispenser as you desire.

- You may not interact with the dispenser after the round starts.
- Note that the ground around the ribbon may be uneven or unstable (Ribbon being held down by mats and a bar). Your dispenser will need to deal with this.

Scoring:

- Each successful trip up the elevator to the top will score 10 points.
- A successful trip up will be one in which the robot gets within 2 inches of the top of the ribbon.
- Each successful trip back down will be worth 5 points.
- A successful trip down is one that ends at the floor, or at a height where your dispenser is able to pass it a satellite, where the robot has descended in a controlled fashion.
- Any satellite autonomously loaded from your satellite dispenser will get an extra 25 bonus points when they are carried up the ribbon.
- Preloaded satellites (for the first run up the ribbon) are allowed, but won't score this bonus.
- Each 1/4-pound satellite carried up is worth 2 points, with a 48 point bonus for successfully attaching it (via the magnet on the satellite) to the steel disk at the top of the ribbon.
- Carrying up a 1/2-pound satellite is worth 5 points, with a 95 point bonus for successfully attaching it to the steel disk.
- Carrying a 1-pound satellite up is worth 10 points, with a 190 point bonus for successfully attaching it to the steel disk.
- Only satellites remaining attached to the steel disk at the end of the round count for the bonuses.
- Any robot starting before the judge's signal will be penalized by 100 points, and any points scored prior to the actual start will also be forfeit.
- Robots will get up to three scored runs. The best run will be your official qualifying score.
- The final run of robots will be between the five highest scoring robots of each class. This final round will determine the first, second and third place winners.
- In the unlikely case of a tie, the lightest robot will be given preference. Judges' decision is final in this matter. Any question that arises in the interpretation of the rules will be decided by the head judge, guided by the spirit of the contest. The decisions of the head judge are final.

Registering:

Teams must pre-register to participate. Register at: <http://first3574.org>.

Include:

- Your team name
- Team member names (First & Last)
- Robot class : Lego Only or (Almost)Anything Goes
- Age group : Kids (15 and under) or Open (all ages)

Late registrations may be allowed as space permits. After the maximum number of teams are reached, we will keep a waitlist for the first few backup teams

This competition is meant for ALL. Adult coaches are required for teams in the Kids age group but should remain hands-off in the actual building and programming of their team's robot. Open teams do not require an adult coach.

Recommendations: Concentrate on building something that works reliably before building something that works fast. Build something simple that works before attempting something complicated. A robot that reliably ascends and descends the ribbon without carrying any satellite is better than one that attempts to carry four 1-pound satellites all at once, but stalls or jams on the ribbon partway up. Build as light as you can. Your robot should be able to tolerate motion in the ribbon. There will likely be both shaking and twisting. Bring a few sets of fresh batteries!

Please contact us with any questions.