

TCC Engineering Club Design Contest

Motorized Cable Car

Friday, April 19, 2013

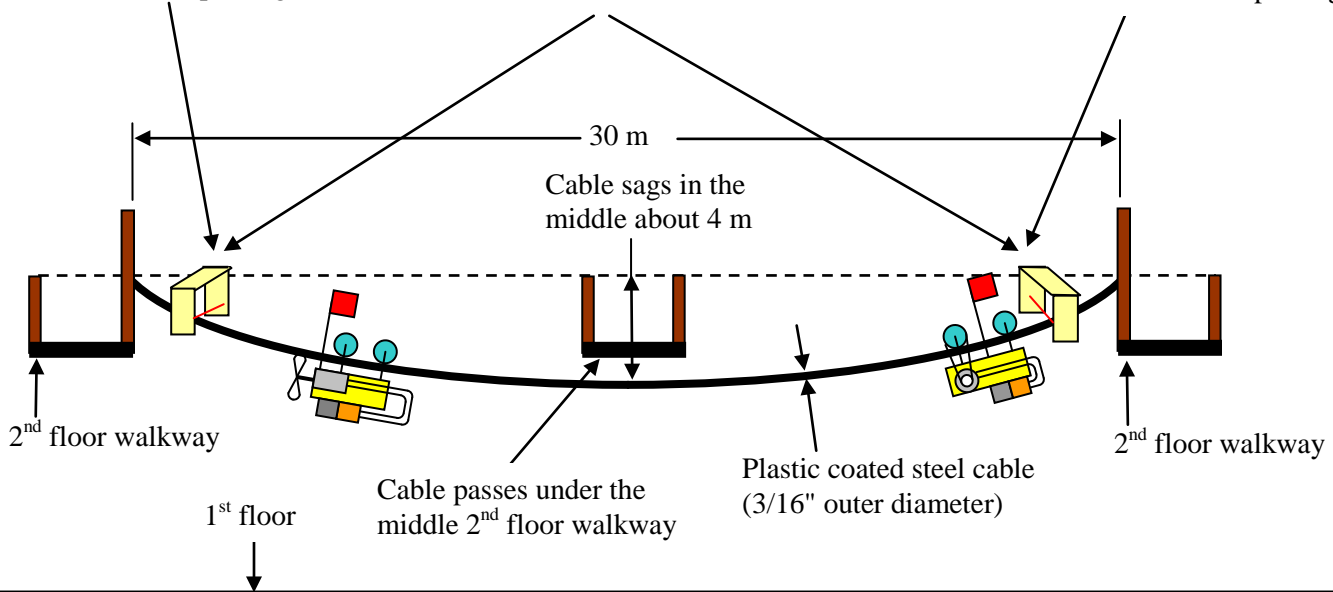
Location: The competition will take place in the Advanced Technology Center (ATC) main hallway (the cable will run between two of the upper walkways).

Cable setup: (not drawn to scale)

Ending Position: Timer stops when cable car breaks beam of second photo gate

Photo Gates: Are focused about 1.5 cm above the cable and will be located about 30 cm from either end of the cable.

Starting Position: Timer starts when cable car breaks beam of first photo gate



Object of the contest

- Build a vehicle that is powered by a 9V battery and a specified motor from JameCo Electronics.
- The car must travel the length of the cable which is stretched between the first and third walkway (2nd floor) and passes under the middle walkway in the ATC. The distance between the first and third walkways is about 30 meters. The cable will sag about 4 meters in the middle allowing it to pass under the middle walkway.
- The timer begins when the cable car breaks the beam in the first photo gate.
- The timer stops when the cable car breaks the beam in the second photo gate.
- The car that completes the course in the shortest time wins.
- Detailed contest rules are provided below.

Parts kit

- EGR110 students will be issued a kit, as part of their course materials. Non-EGR110 teams may purchase a kit from Paul Gordy in H-115 (822-7175), Kenny Grimes in H-118 (822-7278), or from TCC Engineering Club officers.
- Included in the kit are the following items:
 - 1) One JameCo DC motor (12,150 RPM, 6-12V, shaft diameter 0.091" (2.3 mm), Catalog Number 232040, www.jameco.com)
 - 2) One 'Single-Pole, Single-Throw' (SPST) switch to start and stop the motor.
 - 3) One 9V battery (contestants should provide their own fresh battery for the competition)
 - 4) One battery connector
 - 5) A sample of the cable (to help you properly size your wheels). It is a plastic coated 3/32" (2.38 mm) steel cable. With the plastic coating, the outer diameter of the cable is about 3/16" (4.76 mm).

Entry fee (required for non-EGR110 students, optional for EGR110 students wanting to win prize money)

\$10.00 – includes a parts kit as described above.

Excess proceeds are for the Michael J. French scholarship fund, so no entry fee refunds are given for any reason.

Prizes

1st Place (fastest) - \$50.00

2nd Place (2nd fastest) - \$35.00

3rd Place (3rd fastest) - \$25.00

Cable car requirements

- The vehicle can be no more than 30 cm in length, 20 cm in width, or 30 cm in height.
- No part of the vehicle can extend more than 7.5 cm above the cable.
- The 9V battery must be a standard alkaline battery – rechargeable batteries not allowed.
- Only one motor and one 9V battery may be used on the vehicle.
- No additional sources of energy may be used to propel the vehicle (such as additional batteries, pre-stretched rubber bands, pre-compressed springs, balloons, CO₂ cartridges, etc).
- Each vehicle must be capable of breaking the photo gate beams that are focused about 1.5 cm above the cable and are positioned about 30 cm from either end of the cable.
- Sharing of any vehicle components between different contestants is prohibited (except batteries).

More Contest rules

- The contest is open to anyone who wishes to participate. However, only one entry is permitted per student or team.
- Competition will begin at 12:00 pm Noon, on Friday, April 19th, 2013 at the ATC building of the TCC VB campus.
- The contestant will place the vehicle on the cable and must be capable of starting the vehicle when a contest official indicates that the timer has been reset and is ready. An on/off switch is highly recommended.
- The timer will start when the vehicle passes through the first photo gate, so the vehicle may be started at any point before/behind this photo gate. There will be at least 30 cm available between the photo gate and the end of the cable.
- The timer will stop when the vehicle passes through the second photo gate at the other end of the cable.
- Contest officials will determine the elapsed time each vehicle takes to complete the course, and will determine if the vehicle properly completed the course. The judgment of the officials is final.
- If a cable car takes more than one minute to complete the course, the vehicle will be stopped and its trial will be disqualified.
- The vehicle cannot be interfered with or controlled by any person during the contest.
- The cable will be steadied between each trial to make sure that it is not initially swaying.
- Two trials will be permitted per contestant (or possibly three if time allows). The faster of the two trials is used to determine prizes. Contestants are permitted to make repairs or modifications between trials.
- Trials will continue until all vehicles present have competed. The contest officials will determine the order in which contestants competes, but will try to accommodate students wishing to participate early or late to avoid schedule conflicts. If a team cannot be present for the competition, they may appoint a substitute to run the vehicle for them.
- Engineering Club officers (or their appointees) will serve as judges. The judges' decisions are final in case of interpretation or discrepancy.
- Contest rules and specifications are subject to minor revision or modification.
- If you have any questions contact Paul Gordy (phone: 822-7175 or email: pgordy@tcc.edu), or Kenny Grimes (phone: 822-7278 or email: kgrimes@tcc.edu).

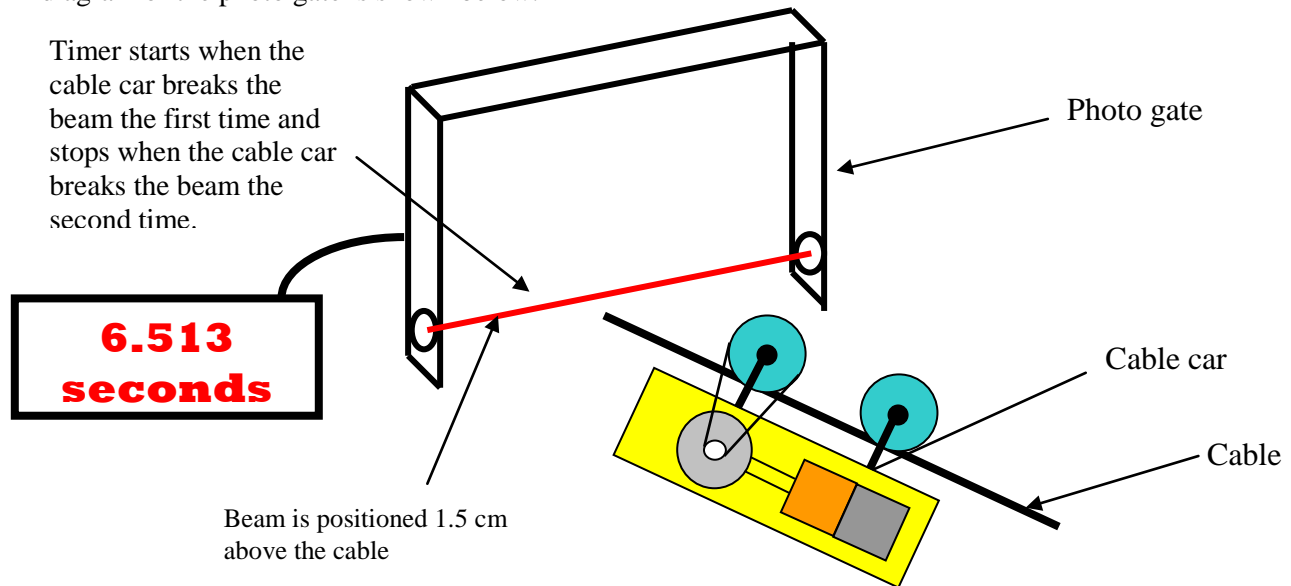
Other notes

- The cable will be set up early on the morning of the competition (or possibly a day or two before) so that students can practice before the actual event. Additionally, contestants may practice on a shorter practice sample of the cable to be located in H-151. Soldering irons, hand and power tools and parts will be available for contestants to work on their vehicles (as the H-151 classroom schedule permits).
- You might consider including a design feature to keep your cable car from jumping off of the cable. The cable will be suspended about 9 meters above the ATC atrium floor, so a car may be damaged if it falls.
- Some sort of padding will be placed at the end of the track to stop the vehicles after they pass through the second photo gate. Contestants may also “catch” their vehicles after the timer stops if they wish.

- Since this competition involves a sagging cable, cable cars might need to be geared lower to make the final climb. Also note that the sagging cable could begin to sway as the cable car travels along it.
- Note that the motor turns at a high speed (11,500 rpm). If you are using a gear or pulley driven vehicle, you may wish to use some sort of gear or pulley reduction or the motor will probably not be able to turn the desired load. Propeller driven vehicles, on the other hand, will benefit from the high motor speed. In past cable car contests pulley driven, gear driven, and propeller driven vehicles have performed equally well.
- Looking for small pulleys? Old VCR's are a good source.
- Looking for propellers? You might try Hobbytown USA, Hungates, or Debbie's RC World.

Photo Gate

The photo gate operates somewhat like the sensors that stop an automatic garage door from closing when something is in the way of the door. If something blocks the beam, the garage door stops moving or the photo gate starts or stops the timer. A diagram of the photo gate is shown below.



Starting Switch

Using a switch is highly recommended to start your vehicle. A helpful diagram is shown below. If the switch provided in the kit is not conducive with your design, any Single-Pole, Single-Throw (SPST) switch will work fine. An example is the Radio Shack "Micromini Toggle Switch" (SPST) – Catalog # 275-624 - \$2.99.

