

TCC Engineering Club Design Contest

Motorized Cable Car

Friday, May 1, 2015, 12:00 - ?

Revised:
1-10-15

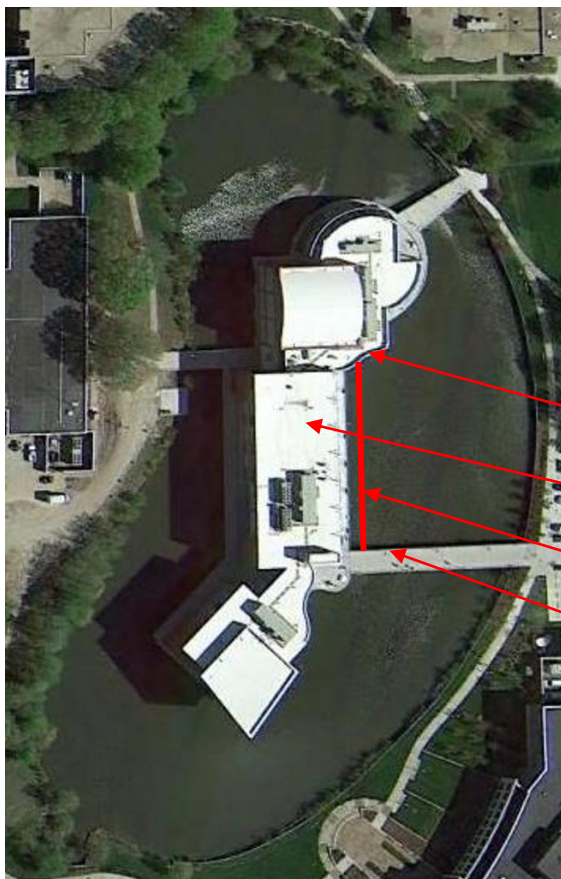
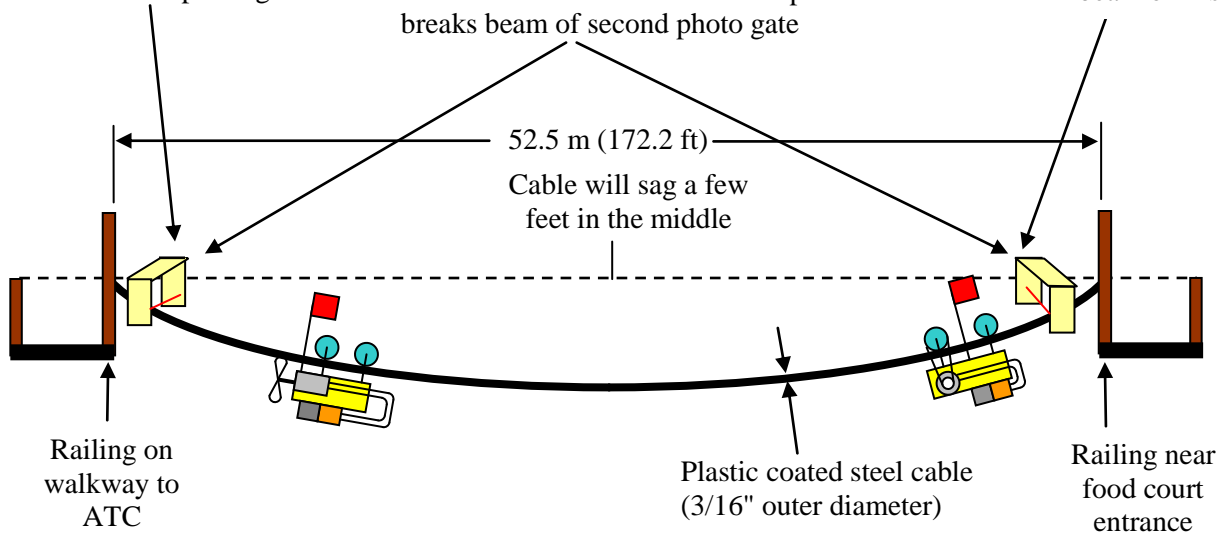
Location: The competition will take place over the lake near the walkway in front of the bookstore in the Student Center.

Cable setup: (not drawn to scale)

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

Photo Gates: Will be focused about 5 cm above the cable and will be located about 30 cm from either end of the cable. Timer stops when cable car breaks beam of second photo gate

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



- The cable will run between two railings on Student Center walkways.
- The cable will be over the water (about 1 m from the walkway along the front of the Barnes & Noble bookstore).

Railing near food court

Barnes & Noble Bookstore

Cable

Railing on walkway near ATC

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 two railings close to the walkway in front of the bookstore in the Student Center. The length of the cable is about 52.5 m (172.2 ft). The cable will run over the water (about 1 m from the walkway in front of the Student Center). The cable will be tightened somewhat using turnbuckles, but will still sag significantly in the middle.
- 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 judges may decide to use a stopwatch as a backup.
- The car that completes the course in the shortest time wins.
- Detailed contest rules are provided below.

Parts kit

- May be purchased from Paul Gordy in H-115 (822-7175, PGordy@tcc.edu), Kenny Grimes in H-118 (822-7278, KGrimes@tcc.edu), or from TCC Engineering Club officers.
- Includes the following items:
 - 1) JameCo DC motor (12,586 RPM, 6-12V, shaft diameter 0.091" (2.3mm), Catalog Number 232040 (or MD5-2070), www.jameco.com)
 - 2) 1" sample of the cable (to help you properly size your wheels). The cable is a plastic coated 3/32" steel cable. The outer diameter of the cable (including the coating) is about 3/16".
 - 3) 9V battery connector (contestants must provide their own standard 9V alkaline battery for the competition)
 - 4) EGR 110 students will be provided kits at no cost. However, if they wish to compete for prize money they will need to pay the \$10.00 registration fee before the day of the competition.

Entry fee

\$10.00 – includes a parts kit as described below

Prizes

- 1st Place (fastest) - \$75.00
- 2nd Place (2nd fastest) - \$50.00
- 3rd Place (3rd fastest) - \$35.00
- 4th Place (4th fastest) - \$25.00

Required components – Every cable car must use the following items:

- JameCo DC motor (12,586 RPM, 6-12V, shaft diameter 0.091" (2.3mm), Catalog Number 232040 (or MD5-2070), www.jameco.com) – no other motor can be used.
- 9V battery (standard alkaline battery – rechargeable batteries not allowed)
- Only one motor and one battery may be used on the vehicle.
- Each vehicle must be capable of breaking the photo gate beams that are focused about 5 cm above the cable and are positioned about 30 cm from either end of the cable.

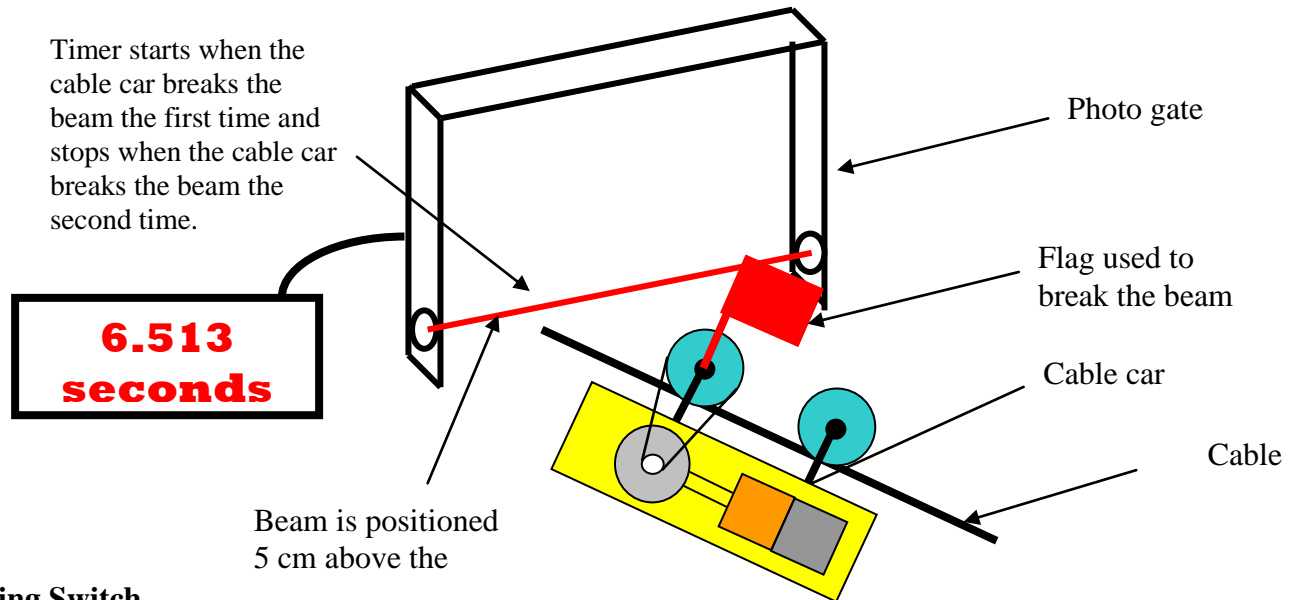
More contest rules and notes

- The contest is open to anyone who wishes to participate.
- 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. Note that EGR 110 instructors may require students to use pulley driven cable cars.
- 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.

- The cable will be steadied between each trial to make sure that it is not initially swaying.
- The vehicle can be no more than 30 cm length, 15 in width, and 30 cm in height.
- No part of the vehicle can extend more than 10 cm above the cable.
- 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).
- 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. The timer does not start until the vehicle passes through the photo gate, so the vehicle may be started at any point before the photo gate. There will be at least 1 foot between the photo gate and the end of the cable.
- An on/off switch is highly recommended.
- The vehicle cannot be interfered with or controlled by any person during the contest.
- Two trials will be permitted per contestant (or possibly three if time allows). The trials do not need to be consecutive since the contestant might wish to make repairs or modifications between trials. The fastest of the trials is used to determine prizes.
- If a cable car takes more than one minute to complete the course, the vehicle will be stopped and its trial will be disqualified.
- Contest officials will determine the time each vehicle takes to complete the course and if the vehicle properly completed the course. The judgment of the officials is final.
- Teams may submit a single entry if they wish; however, the team members would split any prize awarded.
- The contest officials will determine the order in which each contestant competes, but will try to accommodate students that wish to participate early or late to avoid schedule conflicts. The competition will begin at 12:00 and will continue until all vehicles present have competed. If a student or team cannot be present for the competition, they may appoint a substitute to run the vehicle for them.
- Sharing of any vehicle components between different contestants is prohibited (except batteries).
- Only one entry is permitted per student or team.
- Contest rules and specifications are subject to minor revision or modification.
- Engineering Club officers or faculty (or their appointees) will serve as judges. The judges' decisions are final in case of interpretation or discrepancy.
- Contact Paul Gordy (phone: 822-7175 or email: PGordy@tcc.edu) or Kenny Grimes (phone: 822-7278 or email: KGrimes@tcc.edu) if you have any questions.
- No refunds are given for any reason.
- 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, watch for announcements as the engineering club may sponsor a practice workshop about a week before the contest so that contestants may practice on a sample of the cable to be used. The workshop will probably be held in H-179 and use a shorter practice cable (25 ft or 7.62 m). Soldering irons, tools and parts will also be available for contestants to work on their vehicles at this time. The time and date will be announced later.
- You might consider including a design feature to keep your cable car from jumping off of the cable. The cable will be suspended over the water, so any cable cars or parts that fall off will not be retrievable.
- Some sort of padding will be placed at the end of the track to stop the vehicles after they pass through the photo gate the second time. Contestants may also designate a person to “catch” their vehicles after the timer stops if they wish.

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. 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.

