

The JPL Annual Invention Challenge is ready for its eleventh year, or 10th Anniversary. The title for this year's contest is the "Aerial Car Race Contest". The objective and rules are listed below. Questions related to this contest should be directed to: Paul MacNeal at work phone (818) 354-7824, FAX (818) 354-5866, M/S 171-364, located in Building 171-208, or e-mail to paul.d.macneal@jpl.nasa.gov.

OBJECTIVE: Create a device that is able to traverse along a wire that is suspended above the ground. The winner will be the team whose device completes the course in the fastest time.

Rules:

ELIGIBILITY

- 1) The contest is open to all JPL employees, contractors, and immediate family members. The contest is also open to teams of students from Southern California middle schools and high schools providing that they have completed all required forms as outlined in rules 3 and 4 below.

REGISTRATION – JPL PERSONNEL

- 2) Applications for JPL employees, contractors, and immediate family members entering the contest must be filled out and submitted to Public Services prior to midnight November 21, 2008. Completed entry forms should be directed to Public Services at FAX (818) 393-4641, or sent via email to Margaret.R.Porter@jpl.nasa.gov. An entry form is included at the end of the rules. All entries will be time stamped based upon the time received. Only the first 20 JPL/contractor entries will be permitted to compete. Five alternates will be accepted in case some entries withdraw prior to the competition.

JPL employee family members and friends are welcome to watch the contest, but must be cleared through the security office prior to arrival. JPL employees must fill out the visitor request form as found in the link: <http://eis/international/visitrequest.html>.

REGISTRATION – SCHOOLS

- 3) In order to streamline the paperwork process at JPL, each team must **mail** their completed student team entry form (attached) and the "Authorization and Release for Photos and/or Video Recording" agreement form (attached) for each person (student, guest, teacher, and chaperone) planning to attend the JPL contest. Each video release form must be completely filled out and signed. If the student is under 18 years of age, then their parent or guardian must also sign. **The entire set of forms must be filled out and submitted to Public Services no earlier than September 8, 2008 and be postmarked no later than midnight October 4, 2008. Completed forms must be mailed to Public Services at Jet Propulsion Laboratory, M/S 186-113, 4800 Oak Grove Drive, Pasadena, CA 91109.** All entries will be time stamped based upon the time received. Student teams will be notified to verify their acceptance into the contest by October 8, 2008. Questions regarding the entry forms can be directed to Maggie Porter in Public Services at (818)354-0112. Each school is allowed no more than three teams. Internal school competitions are encouraged to select the top three

teams if necessary.

Any foreign student (18 or over) or adult will need to fill out a special form. Please contact Paul MacNeal so that he can fill out the form on your behalf. The process takes nearly three weeks, therefore, if you plan on attending the contest at JPL, and you are a foreign national, it is important that you contact Paul MacNeal (see introduction) prior to November 6, 2008.

Additions or corrections to the registration forms and/or photo release forms need to be mailed to the Public Services Office with a postmark no later than Thursday, December 4, 2008. Faxed forms will not be accepted. Failure to send in the signed video release form by the requisite time will prevent participation and access to the JPL contest for those students that fail to comply with this request.

SPECIAL RULES FOR SCHOOL TEAMS

- 4) Only the first 75 student team entries will be permitted to compete at the regional competitions. Student teams will compete at a regional competition held on Saturday, November 22, 2008 at California State University in Fullerton or Manual Arts High School in Los Angeles. Details for the regional competitions will be sent to all registered teams. The top five winners of each regional competition will be invited to compete at the JPL contest held on Friday, December 12, 2008 (see Rule 5 below). In addition, the next closest 15 entries between both regional competitions will be invited to compete at the JPL contest.

LOGISTICS

- 5) The contest date and time is Friday, December 12, 2008 between 11:30 AM and 1:00 PM. The contest is held at the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, CA 91109. The contest area is located north of the fountain area, in front of the Administration Building (Bldg. 180) steps. The contest will be held rain or shine. Check-in for the event will begin at 10:15 AM.

DEVICE RULES

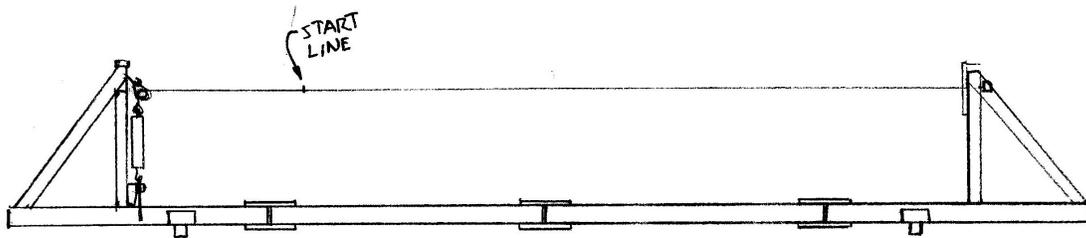
- 6) The device must have the following characteristics:
 - a) Be able to attach and detach to the wire (see Section 7 below) without causing any damage to the wire. Permanently bending the wire or breaking the wire is immediate grounds for disqualification.
 - b) Utilize safe energy sources. Examples of unsafe energy sources are chemical explosions, fireworks, rocket motors, and high pressure gas systems. Questionable sources must be cleared through Paul MacNeal and the Safety Coordinator prior to performing.
 - c) Be initiated by a single operation (cut a string, flick a switch, pull a pin, etc) provided by the contestant. No human power may be used to add dynamic or potential energy to produce motion in the device (especially along the length of the wire). The operator may not provide a “starting block” or otherwise help the device in any way.

- All stored energy systems must be energized prior to starting the task.
- d) Be no longer (as measured along the direction of the wire) than 75 cm (29.5 inches) at any time.
 - e) Not touch the ground or the wire support stand at any time (before or during the task) other than the turning plate described in Rule 7c.
 - f) Not have a mass greater than 1 kg (2.20 pounds).
 - g) Must be self-contained such that all portions of the device remain with the device and stay within the maximum length requirement specified in Rule 6d. Exceptions to this rule are the expulsion of harmless gases and liquids that are not hot (below 45 C temperature)
 - h) Must not utilize any form of remote control.
 - i) Be capable of physically touching the turning plate that is 5 meters away from the starting point and then reversing direction (see Rule 7f below).
 - j) Must be capable of a quick set-up time and removal time. Maximum allowable time including set-up, completion of the task, and removal from the course is 3 minutes.
 - k) Must complete the course in less than 60 seconds. If the device is still traveling after 60 seconds have expired, the distance traveled will be measured and recorded at the 60 second mark.

CONTEST FACILITY DESCRIPTION

- 7) The contest site is outdoors in front of Building 180. There is only one wire support stand for this year's contest. Teams will need to move quickly to ensure that everyone has an opportunity to compete. The wire support stand has the following features:
 - a) The wire is made from spring temper 302/304 stainless steel with an ultimate strength of over 200 pounds. The wire is purchased from McMaster.com and has part number 89085K19. The wire is 0.040" (1.016 mm) in diameter and has a smooth, bright finish. Samples of wire (24 feet in length) can be received directly from Paul MacNeal on a first-come, first-served basis.
 - b) The wire is stretched to a preload of 50 to 55 pounds (222 to 245 Newtons). For safety reasons, the preload is obtained by tightening a spring loaded scale that has a spring rate of approximately 12 pounds per inch (2.1 N/mm) [McMaster.com Part Number 1756T2]. As an example of the deflection of the wire under load, when a 1.00 pound (453 gram) mass is hung from the mid-span of the wire, the resulting "sag" of the wire is 1.25 inches (32 mm).
 - c) The wire is secured at one end (the turning point) and is wrapped around a pulley at the other end (near the starting/finish line).
 - d) The starting point on the wire is 5 meters (197 inches) away from the turning plate. The starting point is approximately 89 cm (35 inches) from the nearest point of the pulley.
 - e) The wire will be level and will be approximately 49 inches (1.24 m) above the ground. The support stand structure is approximately 39 inches (1.0 m) away from the suspended wire.
 - f) The turning plate is secured to the end post. It is ¾" plywood (19 mm) and is 40 cm by 40 cm square (16 inches by 16 inches) with a 1 cm (0.40 inch) diameter hole in the middle.

g) A sketch of the support stand is provided below. Detailed plans for making your own copy of the support stand can be obtained from Paul MacNeal. It is recommended that an alternative construction technique be utilized to save time and money. Simply tying the wire between two strong columns at least 6 meters apart and providing enough tension to keep the wire taut should be good enough for practicing purposes (refer to Rule 7b). For added authenticity (and safety) a spring scale can be used to measure the tension in the wire. The official support stand uses McMaster.com Part Number 1756T2.



CONTEST PROCEDURE

8) The order in which teams will participate is selected by a random process. The contestant and his/her team will be given a three-minute period of time to set-up, complete the race, and remove the device from the contest site. Strict time limits will be imposed to ensure that all contestants are able to operate their device.

The official starter will give a countdown (3....2....1....GO!) for the start of operation for the device. Timers will start the time at the starter's direction. The timers will stop the watch at the direction of the official starter. The official starter will voice an audible "STOP!" when the device has either stopped moving or has had any solid portion of the device cross the start/finish line after touching the turning plate. The time will be averaged by two or more official timers. The official time will be recorded to the nearest 0.01 seconds on the entry form.

The distance traveled will be recorded if the device did not complete the course. The distance that the leading edge of the device has travelled will be measured and recorded as follows:

- If the device has not touched the turning plate, the distance travelled by the leading edge (front in this case) will be measured and recorded.
- If the device has touched the turning plate, that initial distance is recorded as 5 meters. The distance that it travels from its position when it was touching the turning plate to the point where it stops will then be measured and added to the 5 meter distance to arrive at the total distance traveled.
- The total distance traveled will be entered on the entry form. The judge's decision is final.

After the distance has been measured and recorded, the team must quickly remove the device from the wire and place their device in a viewing area as directed by volunteers.

AWARDS

- 9) Trophies will be divided into two categories: JPL employees/family/contractor entries and school team entries. Trophies for farthest distance traveled will be given for first, second, and third place for each category at all contests (regional contests and the JPL contest). In case of a tie, the recorded time will be used to break the tie with the faster time achieving the higher award. If two or more times are within 0.03 seconds of each other, equal trophies will be awarded. Certificates will be issued for the lightest, heaviest, smallest, largest, most unusual, most artistic, and most creative designs.

JPL EMPLOYEE, CONTRACTOR OR FAMILY MEMBER ENTRY FORM FOR 2008
INVENTION CHALLENGE

ENTRY NUMBER _____

Date Received: _____ Time received: _____

Name(s): _____

M/S: _____

Phone: (____) _____

E-mail Address: _____

Title of Entry (be creative): _____

Put entry number somewhere on the device

FOR OFFICIAL USE ONLY

Weight: _____ pounds

Length: _____ inches, Width: _____ inches, and Height: _____ inches

Time for operation: _____ seconds

Total distance traveled: _____ meters

Comments:

SCHOOL ENTRY FORM FOR JPL 2008 INVENTION CHALLENGE

ENTRY NUMBER _____

Date Received: _____ Time received: _____

School Name: _____

Single Point of Contact Information:

Name: _____

Phone: (____) _____

Email Address: _____

School Address: _____
Street City Zip Code

Team Name: _____ Entry Name: _____

Put entry number somewhere on the device

Team Member Names and Ages (if over 18, list Citizenship):

1) _____

2) _____

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

Chaperone/Teacher Names and Citizenship (mandatory)

1) _____

2) _____

Note: All persons planning to attend the JPL contest must fill out and turn in an "Authorization and Release for Photos and/or Video Recording Photography Release Form". Students under 18 years of age must also have their parent or guardian sign the form.

Teacher/Educator Advisor: _____

Phone of Advisor: _____

SCHOOL NAME _____ ENTRY NUMBER _____

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FOR OFFICIAL USE ONLY

Weight: _____ pounds

Length: _____ inches, Width: _____ inches, and Height: _____ inches

Time for operation: _____ seconds

Total distance traveled: _____ meters

Comments:

Passed Safety Inspection? _____

Jet Propulsion Laboratory
California Institute of Technology

4800 Oak Grove Drive
Pasadena, California 91109-8099



**AUTHORIZATION AND RELEASE
FOR PHOTOS AND/OR VIDEO RECORDING**

SUBJECT PRODUCTION: 2008 JPL Invention Challenge

I, _____, hereby grant to the California Institute of
(Person signing form)
Technology the right, without fee, to make and use photos and/or video tape recordings
of _____ in connection with the subject
(Person attending production)
production in any manner or form and for any lawful purpose at any time. I waive any right that I
may have to review or approve the finished product, or the use to which it may be applied. I
release and discharge the California Institute of Technology and its employees, and its
subcontractor(s) and employees from any liability to me by virtue of any representation that may
occur in the making or editing of said photos and/or video tape recordings.

I have read this agreement before signing below and warrant that I fully understand its contents.

Signed: _____ Date: _____

Address: _____

Parent or Guardian: _____ Date: _____
(if not of legal age)

School Name: _____

Entry # _____
(leave blank)