OFFICIAL RULES FOR 2015 JPL INVENTION CHALLENGE

The JPL Annual Invention Challenge is ready for its eighteenth year. The title for this year's contest is the **"Ball Fling 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, M/S T1723, located in Building T1723-128, or e-mail to paul.d.macneal@jpl.nasa.gov.

OBJECTIVE: Create a device that can propel three supplied playground balls to three different targets in less than 60 seconds. Point values are awarded for each successfully completed target. The winner will be the team whose device accumulates the most points.

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 (found on website) must be filled out and submitted to Public Services prior to midnight November 14, 2015. Completed entry forms should be directed to Public Services at FAX (818) 393-4641, or sent via email to Rhonda.M.Dash@jpl.nasa.gov. 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:
   https://gateway.jpl.nasa.gov/sites/JPL-ID/Pages/Default.aspx

REGISTRATION – SCHOOLS

3) In order to make it easier to process badging at JPL, each team must email their completed, typed entry form (found on website) to Rhonda.M.Dash@jpl.nasa.gov. Additionally, to make the badging process flow smoothly each team must **mail** a printout of their completed student team entry form and the "Authorization and Release for Photos, Audio and/or Video Recordings of and/or Artwork" agreement form (found on website) 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 use the appropriate form filled out and signed by their parent or guardian. **The emailed entry form and entire set of video release forms must be filled out and submitted to Public Services no earlier than August 31, 2015 and be postmarked no later than midnight October 3, 2015. 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, 2015. Questions regarding the entry forms can be

directed to Rhonda.M.Dash@jpl.nasa.gov 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 person, 18 or over, student or adult, will need to fill out a special form which is processed by the Public Services Office. The process takes nearly three weeks; therefore, if anyone plans on attending the contest at JPL, and they are a foreign national, it is important that they contact Public Services prior to November 6, 2015.

Additions or corrections to the registration forms and/or video release forms need to be mailed to the Public Services Office with a postmark no later than Wednesday, November 25, 2015. 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 90 student team entries will be permitted to compete at the regional competitions. Student teams will compete at a regional competition held on Saturday, November 21, 2015 at either Augusta Hawkins High School in Los Angeles or Chapman University in Orange. Details for the regional competitions will be sent to all registered teams. The top five teams with the highest score from each regional competition will be invited to compete at the JPL contest held on Friday, December 4, 2015 (see Rule 5 below). In addition, the next 10 teams with the highest scores between both regional competitions will also be invited to compete at the JPL contest.

LOGISTICS

5) The date and time for the final contest is Friday, December 4, 2015 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. In the event of heavy rain (more than mist), the contest will be held indoors. 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 propel three official playground balls (described in Rule 6d) to three separate targets (described in Rule 8) and have the ball hit the ground within ball landing area (described in Figure 1). Only three "launches" are allowed and each ball can only be "launched" once. Each team is allowed to receive points for any particular target only once. The targets are located 5 meters away from the device set-up area as shown in Rule 7. If the ball hits the ground for the first time outside of the landing area, 15 points will be deducted from the accumulated total of points.
    b. Be initiated by a single operation (cut a string, flick a switch, pull a pin, etc.)

provided by the contestant for each launch of the playground ball. Only one contestant is allowed in the set up area at the initiation of the launch. No human power may be used during the initiation of the device to add dynamic or potential energy to produce motion of the ball. All stored energy systems must be energized prior to starting each launch. Teams are allowed to reposition the device between "launches" of the ball, but are not allowed to touch the device to hold alignment.

c. The length and width are limited to 2 meters (6 feet 6 inches). All portions of the device must reside within the designated set-up area prior to, during, and after each launch attempt. The area projects up from the ground to an unlimited height. Violations of this rule will disqualify the point count for each attempt in which a violation occurs.

d. Be able to accept the officially supplied playground balls. The playground balls (Champion Sports – Rhino Poly PlayBall; purchased from Epic Sports SKU E27329) weigh between 290 and 297 grams (10.2 and 10.5 ounces) and have an outer diameter of 17.8 cm +/- 0.25 cm (7.00" +/- 0.10"). No alterations in any manner can be made to the ball including, but not limited to, inflating the ball, deflating the ball, adding adhesives, or applying tapes. Causing any ball to leak or lose its air supply will disqualify the device.

e. Be able to complete the task in less than 60 seconds.

f. Utilize safe energy sources. Examples of disallowed energy sources are chemical explosions, caustic gases, and rocket motors. High pressure gas systems and other questionable sources must be cleared through Paul MacNeal and the Safety Coordinator prior to performing at both the regional contest and the final contest.

g. Be made from any materials as long as they are non-toxic and safe.

h. Place the official entry number provided by the contest organizer (3" high numbers or larger) on at least two sides of the device for easy identification.

i. Not use any clamps, tape, or any other means to attach to the ground. The device must only rest on the ground, however heavy weights may be used.

j. Not use any remote control devices of any kind.

k. Be able to adapt to non-level ground (see Rule 7).

l. SPECIAL RULE FOR SCHOOL TEAMS ONLY: To avoid plagiarism, each team that competes at the regional contest will have photographs taken of their

device. The basic concept of the device (energy source type, ball movement methods, and size) must be maintained. Minor modifications to the device are allowed within these constraints.

CONTEST AREA DESCRIPTION

7) The contest site is located in front of the steps leading to Building 180. The site will contain two side-by-side areas for setting up and operating the device. The size of each set-up area is 2 meters by 2 meters. Each team will be randomly assigned to either operating area. The ground is concrete with a rough finish and has a slight slope (approximately 2 degrees across the width as shown in Figure 1). See Figure 1 for a description of the contest area.

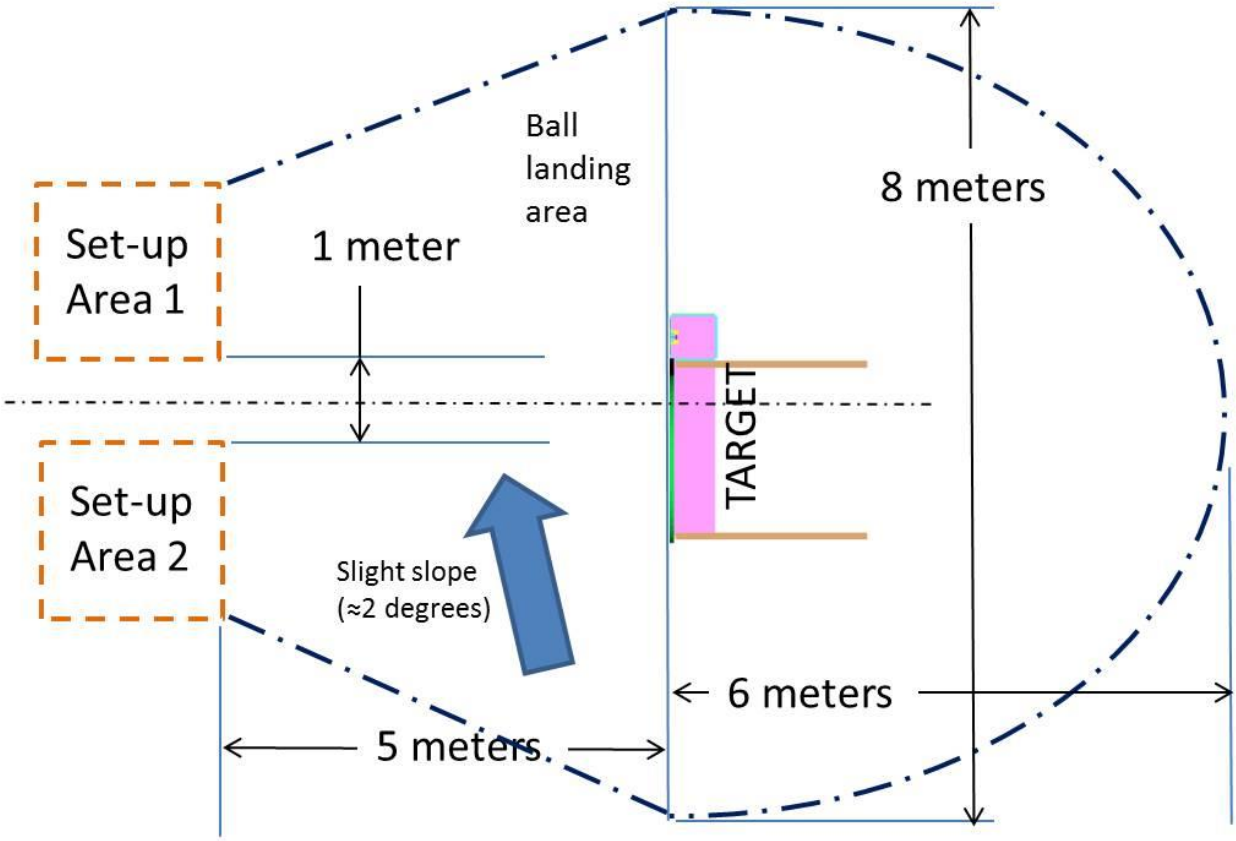

Figure 1. Contest Area – top view

TARGET DESCRIPTION

8) The target is described in Figure 2. There are three targets that are formed to simulate the appearance of the number "18". The point values for each target increase with difficulty (please refer to Rule 9). The lower circular 61 cm [24"] diameter opening receives points for having the ball completely pass through the opening. The upper circle 61 cm [24"] diameter opening receives points for having the ball completely pass through the opening. The third target is in the shape of a candle flame. Having the ball directly contact the flame is the way to receive points for this target. The flame is made out of 3/4" thick plywood. The flame is able to be knocked down if the ball comes in contact with the flame. It is hinged, but it utilizes a light spring latch to keep it upright. A direct hit of the flame will count as achieving the goal for this target. If the flame is knocked down by an indirect contact (candle base or other targets) no points can be awarded. Details of the construction of the target can be found on-line on the JPL Invention Challenge website.

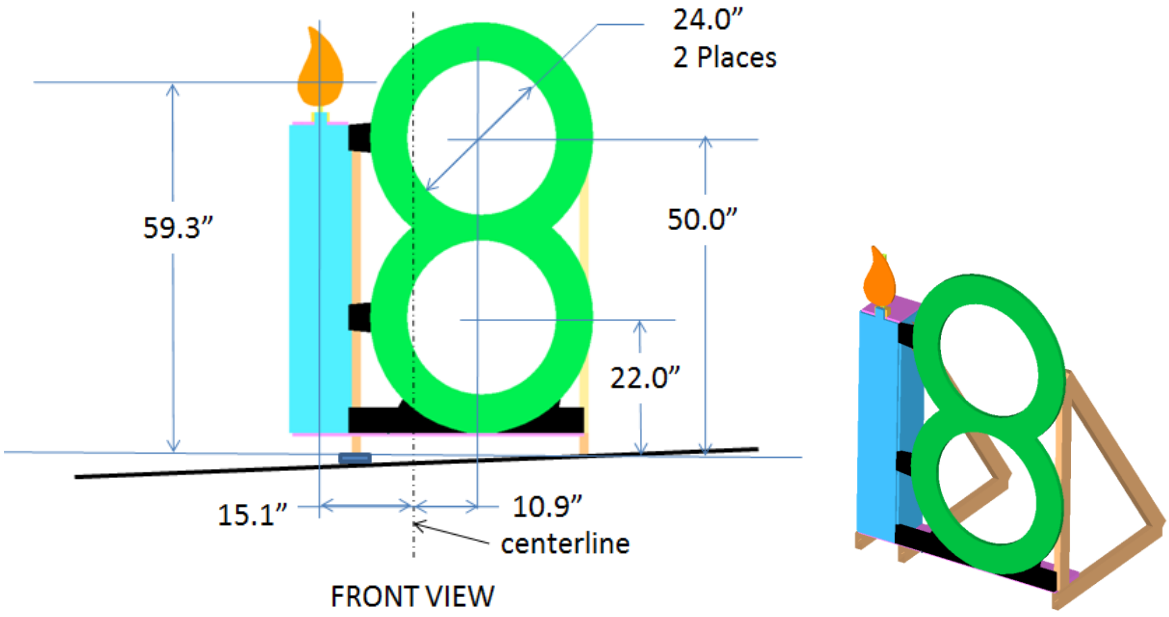

Figure 2. Target Description

SCORING

9) Scores will be awarded for each successfully completed target within the 60 second allotment of time. The referee will countdown the start of the time with an audible "3…2…1…GO!" The ball must have left the device prior to the 60 second time allotment for the point award (if eligible) to count.
    a. 10 Points are awarded for having a playground ball pass through the lower circle target.
    b. 20 points are awarded for having a ball pass through the upper circle target.
    c. 30 points are awarded for having a ball directly hit the flame.
    d. 10 bonus points are added each time the ball hits the ground prior to accomplishing any target.

e. Remember that 15 points will be deducted for each attempt in which the ball hits the ground for the first time outside of the ball landing area.
f. All other rules must be in compliance for the official score to be counted.

CONTEST PROCEDURE

10) The order in which teams will participate is selected by a random process. The team will be given a three minute period of time to setup their device. Safety advisors will be observing the team during their setup time and will warn and potentially stop the team if any setup operations can lead to potential accidents. Strict time limits will be imposed to ensure that all contestants are able to operate their device. At the beginning of the setup time period each team will be handed the three official playground balls. The team is responsible for placing the balls inside their device.

    Each team shall designate a speaker that is not involved with the device setup to talk about their team and their device during the setup period. The team will be asked if they are ready to proceed. The referee will give a countdown (3...2...1...GO!) for the start of operation for the device. The timer will start the time at the referee's direction. The timer will announce when 15 seconds are left out of the 60 second time period. The timer will say "STOP" in a loud voice when the 60 second time period has elapsed. The referee will determine which launch attempts earn points. All decisions are final.

    Spotters will assist the referee to ensure that the ball landed for the first time within the landing area (hitting the line counts as being in the landing area). The spotter's decisions are final. The spotters will notify the referee if any infractions have occurred. The referee will let the field judge know which "launches" were successful and if all rules have been complied with. The field judge will add up the point totals and deduct points if the referee indicates a penalty. All decisions are final.

    The winning team will be the team whose device scores the highest number of points. The maximum point value possible is 90 points. In the event of a tie, each team will be asked to setup their device and attempt to have the ball hit the flame in one attempt. If still tied, the teams will be asked to setup their device and attempt to pass the ball through the upper circle target in one attempt. Additional tiebreaker rounds will be held until a winner is declared.

AWARDS

11) Trophies will be divided into two categories: JPL employees/family/contractor entries and school team entries. Trophies will be given for first, second, and third place for each category at all contests (regional contests and the JPL contest). Certificates will be issued for the largest, smallest, lightest, heaviest, most unusual, most artistic, and most creative designs.