

2007 JPL Invention Challenge – Rules and Objectives

The JPL Annual Invention Challenge is ready for its tenth year. The title for this year's contest is the “**Play a Song 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) 393-5239, M/S 301-486, located in Building 301-475SS, or e-mail to paul.d.macneal@jpl.nasa.gov.

OBJECTIVE: Create a device that is capable of performing two tasks. The first task is to replicate a C Major. The second task is to play at least the first ten notes of a recognizable song of your choice in proper pitch, tempo, and meter. No electronic speakers or electronically produced or amplified sounds are permitted. Points will be awarded for overall appearance, overall creativity, task 1, and task 2 with a total possible point count of 100 points. The winner of the contest will be the person/team whose device receives the highest number of 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 must be filled out and submitted to Public Services prior to midnight November 21, 2007. 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 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 10, 2007 and be postmarked no later than midnight October 5, 2007. 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 9, 2007. 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, which is processed by the Public Services Office. 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 Public Services prior to November 1, 2007.

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, November 20, 2007. 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 17, 2007 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, November 30, 2007 (see Rule 5 below). In addition, the next closest ten entries between both regional competitions will be invited to compete at the JPL contest.

LOGISTICS

- 5) The contest date and time is Friday, November 30, 2007 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 a mechanically operated musical device that can produce reasonably loud, quality notes of good tone and resonance.
 - b) Be capable completing Task 1, which is to produce an ascending C Major scale, starting with middle C (reference 261.63 Hz). The time to complete

Task 1 must be between 5 and 15 seconds. If you choose, you can start either an octave above middle C (reference 523.25 Hz) or an octave below middle C (reference 130.81 Hz).

- c) Be capable completing Task 2, which is to replicate at least the first ten notes of a recognizable song (sheet music to be provided to the judges prior to starting this task) with proper tone, tempo, and meter in greater than 5 seconds and less than 20 seconds.
- d) Be initiated by a single operation (cut a string, flick a switch, pull a pin, etc) provided by the contestant for each task. No human power may be used to add dynamic or potential energy to produce the musical notes. The device may be reset prior to the start of Task 2.
- e) Be physically no wider than 2.50 meters [98 inches], or longer than 2.50 meters [98 inches], or taller than 3.00 meters [118 inches]. These dimensions are strictly enforced at the beginning of each task.
- f) Be able to adapt to uneven ground. See Rule 7 for details of the Contest Site.
- g) Not use any remote control devices.
- h) Not be a commercially purchased music box.
- i) Not utilize any electronic speakers or electronically produced or amplified sounds.
- j) There are no weight restrictions.
- k) The device may use existing musical instruments (except for music boxes).
- l) All construction materials are acceptable, except that no explosives, caustic chemicals, or other materials that might cause personal injury are allowed.
- m) Utilize safe energy sources. Examples of unsafe energy sources are chemical explosions and high pressure gas systems. Questionable sources must be cleared through Paul MacNeal and the Safety Coordinator prior to performing. Electrical power from a standard 120 V source (15 amps maximum) is allowed. The electrical cord may extend beyond the size as specified in Rule 6e.

CONTEST FACILITY DESCRIPTION

- 7) The contest site is outdoors in front of Building 180. The ground is made from concrete and has a slight slope. Three operating sites will be utilized. The contestant will be randomly assigned to either Area 1, Area 2, or Area 3.

SCORING

- 8) In many of the previous Invention Challenge Contests, scoring has been a relatively straight-forward system. This year, a major challenge for the teams is to strive for a high score based on the judging criteria below. Creativity will be awarded, as well as artistic appearance. Please consider these extra attributes as design requirements. The criteria have been reviewed by many individuals and are as clear and concise as can be reasonably expected. As is always the case, the judge's decision is final and is not subject to question. Good luck.

Points are awarded as follows:

- a) The maximum allowed total of points that can be accumulated is 100 points.
- b) Points for general appearance and functionality of device (25 points maximum)
 - i) Appearance of device (10 points maximum)
 - (1) A graduated range of points from 0 to 10 depending on whether or not the device appears to be attractive. Features such as a well-made, colorful, and visually striking will be awarded more points than features that show poor workmanship, visually plain, and dull.
 - ii) Creativity of device (15 points maximum)
 - (1) A graduated range of points from 0 to 15 depending on whether or not the device is an invention that has combined traditional or new musical instruments with a clever and unique way of mechanically operating the device. Please refer to a two minute video available on the Internet that shows a computer generated graphic video, <http://www.youtube.com/watch?v=FtkjuchHF4>, of a very unique musical invention to get an idea of what is meant by awesome creativity.
- c) Points for Task 1 (40 points maximum)
 - i) Timeliness of completing the C major Scale is a requirement. Task 1 is considered a failure if the task is completed sooner than 5 seconds or later than 15 seconds. No points will be awarded for Task 1 if the time requirement is not met.
 - ii) Loudness of the notes (15 points maximum)
 - (1) A graduated range of points from 5 to 15 is awarded for notes that are heard from the device without using an optionally supplied microphone. The full 15 points can be awarded if the notes are clearly heard by members of the crowd up to 30 feet away from the device. Five (5) points can be awarded if the notes can be heard by a judge standing only 5 feet away from the device. If the device makes unwanted sounds (loud motors, loud compressors, loud squeaks, etc), then the ability to hear the notes will be diminished. These types of diminishing features will be taken into account when awarding points in this category. The points awarded in this category are subjective and the judges' decisions are final. For the benefit of the audience (and with no penalty for points awarded in this category), the contestant is encouraged to use the optionally supplied microphone for devices that are barely audible at a distance of 5 feet from the device.
 - (2) 0 points will be awarded in this category if the notes are not audible beyond 5 feet from the device. In this case, the contestant is encouraged to use the optionally supplied microphone so that points in other categories may be awarded.
 - iii) Accuracy of the notes (tone) (15 points maximum)
 - (1) 15 points if all notes are accurate to the C Major scale. Judges' decisions are final. Accuracy can be defined as a note that deviates less than a half tone from the prescribed tone. A C major scale contains notes of C, D E, F, G, A, B, and C.

- (2) 10 points if only one note is out-of-tune or
- (3) 5 points if two to three notes are out of tune or
- (4) 0 points if more than three notes are out of tune.
- iv) Quality of the notes (resonance) (10 points maximum)
 - (1) 10 points if the notes sound clear and hold their tone reasonably long (0.5 seconds is sufficient), or
 - (2) 5 points if the notes are either clear or hold their tone for a long period, or
 - (3) 0 points if the notes are not clear and heavily damped out (muffled).
- d) Points for Task 2 (35 points maximum)
 - i) Timeliness of completing the first ten notes of the song is a requirement. Task 2 is considered a failure if the first ten notes are completed sooner than 5 seconds or later than 20 seconds. No points will be awarded for Task 2 if the time requirement is not met. Please note that remaining notes in the song can take longer with a maximum playing time of 60 seconds.
 - ii) Intonation of the song (10 points maximum)
 - (1) Sheet music needs to be handed to the judges prior to the start of Task 2. The song will be played on an electronic organ prior to the start of Task 2. Accuracy can be defined as a note that deviates less than a half note from the prescribed tone. The judges' decisions are final.
 - (2) 10 points if the first ten notes are audible and generally in tune to the song picked by the contestant, or
 - (3) 5 points if some of the first ten notes are out of tune, or
 - (4) 0 points if most of the first ten notes are out of tune.
 - iii) Meter of the notes (10 points maximum)
 - (1) 10 points if the pattern of the notes follows the song in proper meter, or
 - (2) 5 points if only some of the song follows the proper meter, or
 - (3) 0 points if most of the song fails to follow the proper meter.
 - iv) Bonus points for the song (15 points maximum)
 - (1) A graduated range of points from 0 to 15 depending on whether or not the chosen song shows any added features worthy of bonus points. Added features could include adding half tones (sharps or flats), creating chords (simultaneous note playing), playing much more than just the first ten notes, utilizing complex patterns or meter, producing loud tones, adding percussion instruments, etc.

CONTEST PROCEDURE

- 9) The order in which teams will participate is selected by a random process. Each contestant will be given a location (in Area 1, Area 2, or Area 3). The contestant and his/her team will be given an eight-minute period of time to set-up, complete Task 1 and Task 2, 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. You will be asked if you choose to use a wireless microphone to help amplify the sounds that your device creates. Be aware that using a microphone may result in an award of fewer points for that category (8.c.ii). You are allowed to position and secure the

microphone on the device, but no human is allowed to hold the microphone.

The official starter will give a countdown (3...2...1...GO!) for the start of operation for Task 1. 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 C Major scale has been completed. Once Task 1 has been completed, the contestant is allowed to reset the device and get ready for Task 2.

The sheet music handed to the judges will be played on an electric organ prior to the beginning of Task 2 to acquaint the judges with the chosen song. The official starter will give a countdown (3...2...1...GO!) for the start of operation for Task 2. 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 first ten notes of the song have been completed. The contestant is allowed to let the device continue to play the remainder of the song and may terminate the device at any time prior to the 60 second time limit. Once Task 2 has been completed the contestant will then be asked to quickly remove their device from the contest site and place their entry in an area designated by contest officials for further judging.

OFFICIAL SCORING

- 10) The time will be averaged by two or more official timers. Only if the time limits are out of the prescribed range (Task 1 between 5 and 15 seconds; Task 2 between 5 and 20 seconds (first ten notes only)) is the time recorded. If the time limit is out of the prescribed range, then no additional points can be awarded for that task. The team of judges will agree on all of the scoring, record the values, total the points, and hand the results to the field judge.

AWARDS

- 11) Trophies will be divided into two categories: JPL employees/family/contractor entries and school team entries. Trophies for highest point total 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, equal trophies will be awarded. Certificates will be issued for the lightest, heaviest, smallest, largest, most unusual, most artistic, most creative, and loudest designs.