



SCRAMBLER

DESCRIPTION: Prior to the competition the contestants will design and build a mechanical device, which uses the energy from a falling mass to transport an egg along a straight track, stopping as close to a terminal barrier as possible without breaking the egg. The distance to be traveled will be announced at the beginning of the event after the devices have been impounded. Participants must bring and wear proper eye protection when warranted by their device. See <http://www.soinc.org/general/protection/>

A TEAM OF UP TO: 2

IMPOUND: YES

APPROXIMATE TIME: 20 min.

1. CONSTRUCTION:

- The Scrambler will consist of an egg transport and an energy propulsion system. These may be separate or combined into a single unit. The entire Scrambler device must fit into a 1.000 m cube when in the ready to launch configuration. If the egg transport is placed diagonally to fit in the cube, it must be launched from that position.
- All energy used to propel the egg transport must come from a falling mass not to exceed 1.000 kg. The mass may be part of the propulsion system and need not travel with the egg transport. Any part of the device whose potential gravitational energy decreases after the falling mass is released is considered to be part of the falling mass. The judges will measure the mass. The mass must be quickly and easily removed for measuring. It is suggested the device be impounded with the mass already detached. The uppermost part of the falling mass may not be higher than 1.000 meter from the floor when released.
- Energy from the falling mass may be transferred to other energy storage devices but they must be in their lowest energy state prior to releasing the mass. Additional sources of mechanical energy may be used to stop the device. The Scrambler may not contain any electrical/electronic devices.
- The egg transport should be designed to travel any distance from 8.000-12.000 meters as quickly as possible without leaving a 2.000 meter wide lane and come to a complete stop with the egg as close to the terminal barrier as possible. The stopping mechanism must be contained completely within the egg transport and work automatically. The egg transport may not be remotely controlled or tethered in any way to guide it or to make it stop.
- The egg transport must have a rigidly attached mount with a flat backstop for the egg. The backstop and bottom surface that the egg rests on must rigid and unpadded.
- An uncooked grade A large chicken egg (1 per team - provided by the judges) must be mounted with the bottom of the egg 5.0-15.0 cm above the floor, the rounded end of the egg resting against the rigid backstop and the "pointed" end of the egg extending at least 2.0 cm in front of the foremost part of the transport. Tape will be provided to secure the egg to the transport if needed, however no tape may be placed on the front 2.0 cm of the egg.
- If used, sighting/aligning devices must be attached to the Scrambler and remain installed during a run.
- Substances that may damage the floor or interfere with subsequent runs may not be applied to the wheels or floor.

2. THE COMPETITION

- The entire Scrambler system must be impounded before the start of the event and will be released from impound when the team has finished competing. Appeals by teams will not be processed after they remove their device from impound unless it has been released by the appeals committee.
- Once teams enter the event area to compete, they may not leave the area or receive outside assistance, materials or communication until they are finished competing.
- The competition will be on a straight and level 2-meter wide lane on a relatively smooth, hard, low-friction surface (e.g., hardwood, tile, stone) with a terminal barrier extending completely



SCRAMBLER (CONT.)

across its end. The terminal barrier will be located at a randomly chosen distance 8-12 m from the starting line (in whole meter intervals for regional, half meter intervals for state and the tenth meter intervals for the national tournaments).

- Teams will be given a total of 10 minutes to make up to 2 runs with their device. They may not back up the transport device on or near the track to set the distance into the stopping mechanism. During this 10-minute period teams may adjust their device, but they may not increase the falling mass once it has been measured. If the device cannot start at least one run within the 10-minute period, the team will receive participation point(s) only. A run may be completed if the mass has been released before the 10 minutes expires.
- The pointed tip of the egg will be placed even with the starting line anywhere along its length prior to the beginning of each run. All parts of the Scrambler and egg must be behind the starting line and within the 2-meter wide lane when the mass is released.
- The contestants may hold and release either the egg transport or the falling mass to start the run. They may not hold both. The mass and device may not be pushed or pulled to start it. All energy must come from the falling mass.
- The Run Time begins when the falling mass is released and ends when the egg transport comes to a complete stop.
- Once the falling mass has been released, the egg transport may not be touched until it has come to a complete stop. Contestants may not guide the egg transport in any way once the falling mass has been released.
- The transport should finish as close as possible to the terminal barrier without leaving the 2-meter lane. The Stopping Distance will be measured between the barrier and the point on the egg closest to the barrier, perpendicular to the plane of the terminal barrier. The time for judges to measure the Stopping Distance will not be included in the 10 minutes.
- If the egg is broken (as defined by cracking the egg enough to leave a wet spot on a paper towel) on the first run, a second run will not be permitted.

SCORING:

- The Performance Value for each run will be

$$\text{Performance Value} = [3 \times \text{Run Time (in seconds)} + \text{Stopping Distance (in cm)}]$$
- Teams will be ranked using the single run that will give them the best overall place. The team with the run with the lowest Performance Value and no penalties will receive 1st place.
- Runs that meet any of the penalty conditions below will be ranked by their Performance Value in a second tier after all runs that do not meet any of these conditions
 - The egg is broken (as defined by cracking the egg enough to leave a wet spot on a paper towel)
 - Any part of the egg transport (other than the egg) makes contact with the barrier.
 - Any part of the egg transport runs outside of the lane at any point of the run.
 - The device doesn't travel at least $\frac{1}{2}$ the chosen track distance.
 - Any rule under "CONSTRUCTION" or "THE COMPETITION" that does not have a specific penalty is violated

See: <http://www.soinc.org/events/scrambler/> for more information

