



SCRAMBLER

Read the General Rules in the manuals and on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Competitors must design, build, and test a mechanical device, which uses the energy from a falling mass to transport an egg along a straight track as quickly as possible and stop as close to the center of a Terminal Barrier without breaking the egg.

A TEAM OF UP TO: 2 **IMPOUND:** Yes **EYE PROTECTION:** None **TIME:** 10 Minutes

2. **CONSTRUCTION:**

- The Scrambler must consist of an egg transport and an energy propulsion system. These may be separate or combined into a single unit. In the ready-to-launch configuration, the entire Scrambler, including the egg, must not exceed 1.00 m in height and depth and not exceed 0.75 m in width.
- The egg transport must be designed to travel a minimum of 8.20 m and stay within a 1.50 m track width before coming to a complete stop as close as possible to the center of the Terminal Barrier.
- All energy used to propel the egg transport must come from a falling mass not to exceed 2.00 kg. The mass must be part of the energy propulsion system and need not travel with the egg transport. Any part of the Scrambler whose potential gravitational energy decreases and provides energy to propel the egg transport after the falling mass is released is considered to be part of the falling mass. To facilitate mass measurements, the Scrambler must be impounded with the mass detached.
- The stopping mechanism must be contained completely within the egg transport and work automatically. The egg transport must not be remotely controlled or tethered.
- The egg must rest on top of two $\frac{1}{4}$ " wooden dowels which extend out a maximum of 4.0 cm from a rigid, unpadded and flat backstop for the egg. The bottom of the wooden dowels must be between 5.0-10.0 cm above the track. The backstop must be built of any rigid material and it must have a flat surface of 5.0 ± 0.2 cm wide by 5.0 ± 0.2 cm high by 1.27 cm (0.50") thick. To facilitate timing, an additional vertical $\frac{1}{4}$ " wooden dowel must be permanently attached from the top center of the rigid backstop such that it will cross the laser path of the photogate system which must be placed approximately 20.0 cm from the floor. A picture of a sample backstop will be available on www.soinc.org.
- The Event Supervisor must provide an uncooked grade A large chicken egg (one per team and selected by the competitors) with the rounded end of the egg to be placed against the backstop. The rounded end of the egg must be visible to the Event Supervisor after attachment. Tape must be provided to secure the egg to the transport with no tape placed on the front or rear 2.0 cm of the egg.
- Competitors must start the Scrambler by using any part of an unsharpened #2 pencil with an unused eraser (provided by the Event Supervisor) to actuate a release mechanism.
- Only the wheels of the Scrambler are allowed to contact the floor. If any piece falls off the Scrambler during the run, it is a construction violation.
- No electrical or electronic devices may be used on the Scrambler, its alignment devices, or any tools (with the exception of any type of calculator).

3. **THE TRACK:** At the Event Supervisor's discretion, more than one track may be used. Teams must be given the option to choose which track they will use. Both runs by a team must be made on the same track.

- The track must be on a smooth, level, and hard surface with a Terminal Barrier extending across its end. Space is needed on each side of the track and beyond the Terminal Barrier to allow for error in the Scrambler's path.
- One-inch tape must be used to define the track's Start Line, the 0.20 m Line, the 8.20 m Line and Track Width Lines up to the Terminal Barrier.
- The center of the Start Line must be marked on the tape by the Event Supervisor. The center of the Terminal Barrier must also be marked.
- The Terminal Barrier must be located at a chosen distance 8.70-11.70 m from the Starting Line in 1.00 m intervals for Regional, 0.50 m intervals for State and 0.10 m intervals for the National Tournaments. The distance must NOT be announced until all Scramblers have been impounded.
- If used, a photogate timing system must be installed at the 0.20 m Line and the 8.20 m Line at a height of approximately 20.0 cm.

4. **THE COMPETITION:**

- The entire Scrambler system must be impounded before the start of the event. Tools for adjusting the Scrambler, test data, and measuring/calculating devices to assist in making accurate adjustments to the Scrambler need not be impounded.
- Only competitors and the Event Supervisors will be allowed in the impound and track areas while the teams are competing. Once competitors enter the event area, they must not leave the area or receive outside assistance, materials or communication.
- Teams must be given a total of 10 minutes to make up to 2 runs with their Scrambler. During this time teams may adjust their Scrambler, but they must not increase the falling mass once it has been measured.



SCRAMBLER (CONT.)

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A run is completed if the release mechanism is actuated before the 10 minutes expires. Measurements by the Event Supervisor must not be included in this time.

- d. Teams may use their own measuring devices to verify the track dimensions during their allotted time. They must not roll the egg transport on or near the track at any time prior to or during the competition.
 - e. Substances that may damage the floor or interfere with subsequent runs must not be applied to the wheels or floor. During their time, competitors may clean the track but the track must remain dry at all times.
 - f. The pointed tip of the egg must be placed even with the Starting Line anywhere along its length prior to the beginning of each run. All parts of the Scrambler must be behind the Starting Line when the release mechanism is actuated.
 - g. Sighting and/or aligning devices placed on the track are permitted but must be removed before the runs. Mounted sighting and aligning devices may be removed at the team's discretion prior to each run.
 - h. The Scrambler must be able to remain at the starting position in ready-to-launch configuration without being touched until triggered by the #2 pencil.
 - i. If a Scrambler does not move upon actuation it does not count as a run and the team may request to set up for another run, but must not be given additional time. If the Scrambler moves any distance after actuation, it must be considered a run.
 - j. Run Time starts when the dowel of the egg transport reaches 0.20 m and ends when it either stops or it passes 8.20 m. The Run Time is recorded in seconds to the precision of the timing device used.
 - k. Event supervisors are encouraged to utilize a photogate timing system for the primary time. If used, a backup handheld timer must also be used in case the system fails or the device does not trigger the photogates. If a photogate system is not available, lasers placed across the track at 0.20 m and 8.20 m would help the timekeepers be more accurate because all they have to watch for is the flash of light as the dowel cuts through the laser beam. If photogates are not being used, three timekeepers should be utilized with the middle time used as the official Run Time.
 - l. Once the egg transport starts a run, the competitors must not follow it down the track and must wait until called by the Event Supervisor to retrieve it. The 10-minute time resumes once competitors pick up their egg transport or begin to make their own measurements.
 - m. If any part of the Scrambler leaves the 1.50 m track the run must be placed in Tier 2. If any part of the Scrambler comes to a stop beyond the plane of the Terminal Barrier, the run must be placed in Tier 2 with a Run Score of 5000.
 - n. If the Scrambler passes the 0.20 m Line but stops before the 8.20 m Line, the timekeepers record the stop time, take run measurements and score the run in Tier 2.
 - o. If the egg is broken (as defined by cracking the egg enough to leave a wet spot on a paper towel) the run is scored as Tier 2. The Distance Score must be from the point of impact to the center of the Terminal Barrier. If the egg breaks on the first run, a second run must not be permitted.
 - p. If any part of the egg transport (besides the egg) touches the Terminal Barrier it is scored as a Tier 2 run.
 - q. If the time and/or distance cannot be measured for a Scrambler (e.g., the Scrambler starts before the Event Supervisor is ready, the competitors pick up the vehicle before it is measured, or it doesn't reach the 0.20 m line), it is a Failed Run.
 - r. Teams who wish to file an appeal must leave the Scrambler with the Event Supervisor.
5. **SCORING:** Best low score wins. The Run Score = Distance Score + Time Score
- a. The Distance Score is a point-to-point measurement from the center of the Terminal Barrier to the pointed end of the egg measured to the nearest 0.1 cm.
 - b. Time Score = Run Time X 5
 - c. Tiers: Teams are ranked using the single run that gives them the best overall rank.
 - i. Tier 1: A run with no violations.
 - ii. Tier 2: A run with competition violations.
 - iii. Tier 3: Any runs with construction violations or both competition and construction violations.
 - iv. Tier 4: Any teams with vehicles not impounded during the impound period.
 - d. If the competitors cannot start at least one run within the 10 minutes or those who have two Failed Runs must receive participation points only.
 - e. Ties are broken by this sequence: 1. Better non-scored Run Score; 2. Faster Run Time on the scored run.

Scoring Example: At a competition, a team's vehicle stopped with the pointed end of the egg 85.3 cm from the center of the Terminal Barrier with a Run Time of 6.67 s.

Distance Score: 85.3

Time Score: $\frac{33.35}{6.67 \times 5}$

Run Score: 118.65

Recommended Resources: The Scrambler DVD and training resources are available at www.soinc.org