Welcome to the 2016 Kansas Science Olympiad Scrambler Event Presentation

Presented by
Sean Miller, P.E.

“What is my loftiest ambition? I’ve always wanted to throw an egg at an electric fan.”
– Oliver Herford
Sean Miller, P.E., M.B.A., LEED AP
Event Supervisor
Director/Energy Engineer - Knipp Energy Services

ASHRAE-Wichita Chapter
www.ashrae-wichita.org

“Nothing is particularly hard if you divide it into small jobs.”

– Henry Ford
“Things should be made as simple as possible but not any simpler.”

– Albert Einstein
Event Description

A team of up to two students must design and build a transport for an uncooked, Grade A chicken egg. The transport must be able to travel a set distance between 9.0 meters and 12.0 meters as fast as possible and stop as close as possible to a terminal barrier without breaking the egg. The only propulsion for the device must come from a falling mass not to exceed 2.0kg. The students do not know the track length until after all devices have been impounded.

The team with the lowest score in the event wins. The final score is calculated by the following method: (Distance + Time + Penalties).

“The joy of engineering is to find a straight line on a double logarithmic scale.”

– Thomas Koenig
Construction

Defining the “Device” (ETV & EPS)

Physical Constraints

RTR configuration must be 90cm high x 90cm long x 90cm wide max.

Purpose

ETV must travel a min. of 8.5m and stay within a 1.5m wide track and stop as close to the center of the terminal barrier w/o breaking the egg.

Propulsion & Energy

All propulsion must come from a falling mass 2.0kg or less

The ETV may not be part of the mass. No ramps!

The Scrambler must be impounded with falling mass detached.

“There are three possible roads to ruin - women, gambling and technology. The most pleasant is with women, the quickest is with gambling, but the surest is with technology.”

– Georges Pompidou
**Construction**

- **Mechanical only**
  - Stopping must be contained and automatic
  - No electronic devices are allowed!

- **Backstop**
  - Single piece of rigid material with flat surface 5.0cm+/-0.5cm high x 5.0cm+/-0.5cm wide x 1.27cm thick & be rigidly attached to the ETV. Nothing can be visible on flat side of backstop.
  - Egg must rest on two, non-padded ¼” wooden dowels extending perpendicular from backstop a max. of 4.0cm with the bottom of the dowels between 5.0-10.0cm above the track surface and within 1.0cm of the bottom of the backstop.
  - To facilitate timing a vertical ¼” wooden dowel must be attached vertically to the top of the backstop a min. of 20cm above the track.

“Obstacles are those frightful things you see when you take your eyes off of the goal.”

– Henry Ford
Construction

Eggs
- ES provides Grade A, uncooked chicken eggs, team selects the egg.
- ES provides tape to secure the egg. No tape on front/back 1.0cm
- Rounded end of the egg must touch backstop
- The tip of the egg must be the foremost point of the ETV but does not have to start on the line (i.e. EPS can be in front of egg)

Run Actuator
- Scrambler must be started with an unused #2 pencil provided by ES.
- Can actuate a release mechanism or be incorporated

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– Georges Pompidou
Construction

Track Contact
- All parts in contact at RTR are only ones that can contact floor.
- All ETV wheels must remain in contact with floor (i.e. no ramps)
- The Scrambler must not damage the track surface.
- The falling mass must not come in contact with the floor at any time.

Design/Construction Interrogation
- Students must be able to answer questions regarding design, construction and operation of the device per building policy.

“All of physics is either impossible or trivial. It is impossible until you understand it, and then it becomes trivial.”

– Ernest Rutherford
The Track

- The track must be smooth, level and hard surface. Heskett Center!
- The lane will be 1.5m wide and up to 12.0m long.
- There will be a line at 0.50m and at 8.50m across track for timing purposes.
- The terminal barrier will extend across the end of the track and the be at least 25.0 cm tall with the center marked. Placed at 1.0m for regional & 0.25 meter intervals for State.
- Distance will be between 9.0m and 12.0m and not announced till end of impound.

"The major difference between a thing that might go wrong and a thing that cannot possibly go wrong is that when a thing that cannot possibly go wrong goes wrong, it usually turns out to be impossible to get at and repair."

– Douglas Adams
Competition

- Impound ETV, EPS & any materials to repair or bring in compliance
- Only ES & students are allowed in impound and track areas during the competition and no outside help is allowed.
- Teams get 8 minutes to setup and complete 2 runs.
- Teams can measure track but not with ETV and only during 8 minutes
- Don’t apply substances or materials to device that can damage the floor
- ETV & EPS must start within 2.0m of the start line and within the 1.5m track width. Tip of the egg does not need to start on the line.
- EPS may be held in place at launch but not ETV
- If the ETV doesn’t move or egg doesn’t cross the start line after actuation then the run does not count and the team can still complete 2 runs but time will still be running.

“Some things need to be seen to be believed.”

– Guy Kawasaki
Competition

The Run Time starts when the dowel on top of the backstop crosses the 0.5 meter line and ends when it crosses the 8.5 meter line or if it stops before the 8.5 meter line.

Photogate timers will be used with backup.

The Event time (8 min.) will be stopped before launch and after the ETV has stopped for the ES to take necessary measurements and will be visible to competitors for the entire run.

If the egg is broken (i.e. leaves a wet spot on a paper towel) the team is assessed a penalty and the distance is taken from the center of the terminal barrier to the point of impact.

If the time and/or distance cannot be measured (i.e. the ETV starts early, the ETV is picked up too soon, the ETV doesn’t reach the 0.5m line or the ETV passes the terminal barrier) the run will be considered a Failed run.

“One has to watch out for engineers - they begin with the sewing machine and end up with the atomic bomb.“

– Marcel Pagnol
Scoring

Lowest Score wins

Run Score = Distance + Time + Penalties

Distance Score = measurement from the center of the terminal barrier to the pointed tip of the egg to the nearest 0.1 cm

Time Score = Run Time (s) X 10

Competition Penalties are assessed 1,000 points (max. 4,000)

Construction Penalties are assessed 5,000 points (max. 15,000)

Scramblers not impounded during the impound period will receive a penalty of 10,000 points.

Teams that do not start a run in the 8 minutes or have two failed runs will receive participation points only.
Scoring

- **Competition Penalties (+1,000 points per infraction up to 4,000)**
  - Broken Egg
  - Transport in Contact with the Barrier
  - Traveling outside of the Lane
  - Passes 0.5m line but does not pass the 8.5 meter line
  - Violations of rules listed under COMPETITION section
- **Construction Penalties (+5,000 points per infraction up to 15,000 max.)**
  - Violations of rules listed under CONSTRUCTION section
- A vehicle not impounded during the impound time incurs a 10,000 point penalty

“The engineer has been, and is, a great maker of history.”

– James Kip Finch
Commentary

What’s New in 2015?
- Everything for Division B!

The Most Common Penalties
- Backstop dimensions not in compliance
- Backstop not rigid to the vehicle
- Teams forget to use a pencil to start
- Mass hitting the ground
- Questions about the rules

“Scientists dream about doing great things. Engineers do them.”

– James A. Michener
If design were reducible to a set of principles, wouldn’t we find an awful lot of similar houses, gardens, cars, rooms? You’d have no variety.

– Gitte Lindgaard
“Engineers like to solve problems. If there are no problems handily available, they will create their own problems.”

– Scott Adams
Types of Devices:

The Pendulum Device (graphics by www.scioly.org)

“A little knowledge is a dangerous thing. So is a lot.”

– Albert Einstein
Types of Devices:
- Pulley or String Launcher (graphics by www.scioly.org)

“Science increases our power in proportion as it lowers our pride.”

– Claude Bernard
Types of Devices:

- The Spring Launcher (graphics by www.scioly.org)

“More than ever the creation of the ridiculous is almost impossible because of the competition it receives from reality.”

– Robert A. Baker
Types of Devices:

- The Pushrod Launcher (graphics by www.scioly.org)

“There is no adequate defense, except stupidity, against the impact of a new idea.”

– Percy Williams Bridgman
Types of Devices:  
- The Ramp Launcher (graphics by www.scioly.org)  

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0.75m
Mass
Car
Ramp
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“Science is the labor and handicraft of the mind.”  
– Francis Bacon
Types of Devices:

- String Braking System (graphics by www.scioly.org)

"Theory guides. Experiment decides."

– Anonymous
“Introductory physics courses are taught at three levels: physics with calculus, physics without calculus, and physics without physics.”

– Prof. Anon
Types of Devices:

- Pad Braking System (graphics by www.scioly.org)

NOT ALLOWED!!!

“There ain’t no rules around here. We are trying to accomplish something.”
– Thomas Alva Edison
Hints

- Device Types
- Launcher Types
- Braking Systems
- Materials
- Time & Effort versus Luck
- Testing
- Strategy

“An egg is always an adventure; the next one may be different.”

– Oscar Wilde
“Nothing is particularly hard if you divide it into small jobs.”

– Henry Ford

Resources

- www.scioly.org
- www.soinc.org
Fun Facts

- 2016 is 20th year of Scrambler Event (my 14th year running it!)
- Kansas is the most decorated State in the Scrambler Event with 8 medal finishes at the National Tournaments including the 1999 National Champions

Past State Champions

- 2014 & 2015: St. James Academy MS
- 2009: St. Joseph Catholic MS
- 2008: Wilbur MS
- 2007: Andover Central HS
- 2002 & 2006: Maize HS

National Medalists

- 2007: Wichita Collegiate (2nd)
- 2006: Wichita Collegiate (6th)
- 2000: Maize HS (3rd)
- 1999: Maize HS (1st)
- 1999: Goddard HS (6th)
- 1998: Maize HS (4th)
- 1996: Wichita Heights (3rd)
- 1995: Wichita Heights (5th)

“You can’t unscramble an egg.”

– American Proverb
St. James Academy
Kansas
1st place
2014
Kansas State Tournament

Track Length: 10.0 meters
Time: 3.61 seconds
Distance from Barrier: 26.0 cm

Total Score: 4,958.3

“Chance favors the prepared mind.”
– Louis Pasteur
“Newton, forgive me.”

– Albert Einstein
Wichita Heights
Kansas
5th place
1995
University of Indiana

Track Length: 10.0 meters
Time: 3.32 seconds
Distance from Barrier: 0.65 cm
Total Score: 10.61

“Chance favors the prepared mind.”
– Louis Pasteur
ASHRAE-Wichita Chapter is the “unofficial” sponsor of the Scrambler Event for the Kansas State Tournament.

What is ASHRAE?
American Society of Heating, Refrigeration & Air-Conditioning Engineers

Mission Statement
To advance the arts and sciences of HVAC&R to serve humanity and promote a sustainable world.

The local Chapter of ASHRAE was founded in 1952. Our membership includes engineers, contractors, scientists, students and teachers. The Wichita Chapter has over 130 professional members and over 50 student members from both Wichita State University and the Wichita Area Technical College.

Worldwide ASHRAE has 52,000 members in 130 different countries.

Our Chapter ranked 3rd in the world out of 170 chapters each of the last two years based on ASHRAE scoring criteria taking into account membership involvement, sustainability work and community activism.

www.ashrae-wichita.org

“Scientists investigate that which already is; Engineers create that which has never been.”

– Albert Einstein
Email us with any questions or comments. We particularly like good comments. Good luck and see you all in April for the 2016 Kansas State event.

Sean.miller@trane.com

“All your Scramblers are belong to us.”

- Anonymous