



Engineers Australia
(Townsville Local Group)
& the JCU
School of Engineering



Mousetrap Racer

2007 COMPETITION RULES

1. PRELIMINARY

Engineers are called upon to design machines to meet a wide variety of criteria. In this case, a design is called for that encourages the minimal use of inexpensive materials and the maximum use of mechanical ingenuity and artistic flair.

A little money, some basic tools, heaps of patience and a sense of fun will be a big help as well.

2. OBJECTIVE

To design and build a machine, powered solely by the energy stored in the spring of a mousetrap, which can safely accelerate from rest to cover a distance of 10 metres, faster than its competitors.

3. THE TRACK

The track is straight, like a drag strip, and is built from flat sheet sections. The transverse joints are butted together and keyed to provide as small a disturbance as possible, however nothing is perfect so expect a small bump at these joints.

The track length is approximately 10 metres and its width is approximately 1.1 metres. A 50 mm high skirt is provided on each side of the track to redirect wayward racers. The skirt sections do not line up accurately so don't plan on running along the sides.

The track is painted.

4. RACER SPECIFICATIONS

Mouse traps constructed from both wooden and plastic bases are permitted. There will be NO SEPARATE DIVISION for each type of mouse trap. All entrees will compete as one field. You must use wooden or plastic mousetraps (examples of what these traps look like are attached) that are sold in supermarkets or hardware

stores. Mouse traps constructed using steel bases are not permitted for safety reasons.

You must not remove the bait holder or the trigger arm. The mouse trap must still be able to be 'Set' so that the vehicle can be left in a stationary position on the start line without needing to be held. A judge will 'start' the racer by depressing the bait holder with a pen.

Removal of sections of the timber or plastic base components is also not allowed. The complete racer must cross the finish line without loss of mass (i.e. nothing is to be left behind). For safety, all parts of the mouse trap racer must finish as one unit (i.e. the racer will be disqualified if a wheel comes off.)

The arm that gets the poor old mouse over the neck may be bent if you so desire, however an original section of this arm must remain so that the spring tension can be verified by the race scrutineers.

The torsion spring of the mousetrap must not be altered in any way (such as by adding an extra turn). Energy used to power the racer must only be stored in the mouse trap spring. Any entries using any other form of potential energy such as rubber bands, compressed air, weights on pulleys etc will be disqualified.

5. DESIGN AND CONSTRUCTION HINTS

SAFETY

The judges reserve the right to decide if an entry is considered unsafe to run.

THE MOUSETRAP

Due to variations in the strength of the spring in the mousetraps it might be wise to buy several and test them. You may discover that the more you use the spring the weaker it becomes, so once your racer is completed, don't test it too many more times until race day.

WHEELBASE

In the context of this race wheelbase is defined as the distance from the forward-most axle centre-line to the most rearward axle centre-line. (If you have only one axle then that's really ingenious)

There are many similarities between mousetrap racers and high powered dragsters:-

- Lowest elapsed time over a set distance
- Minimize energy and time loss spinning the wheels
- Steering is basically straight ahead
- Power to weight ratio is critical

Drawing from these similarities, make up your own mind about wheelbase.

STEERING

While every care will be taken to get the track flat and level in both directions, nothing is ever perfect. Slight warping of the track can occur.

Usually, if your racer touches the side skirts you will lose valuable time. Ideally, the racer will run straight down the middle, however this is not always easy to achieve and contingency plans may need to be made.

POWER TRANSFER and WHEEL SPIN

The torque delivered to the drive axle must be below the wheel slip threshold, otherwise time and energy will be lost. There is not much energy available in the first place so wheel slip should be avoided at all costs. Don't forget that different materials will exhibit different friction characteristics on the painted surface of the track. **MINIMISE YOUR LOSSES!**

ROLLING RESISTANCE

This is the resistance as a wheel rolls across a surface. It depends on the characteristics of the surface and wheel, the elasticity of both surfaces and the diameter and width of the wheel.

FRICTIONAL TORQUE

This occurs in the wheel bearings.

WIND RESISTANCE

A model with poor aerodynamics will have higher losses than one that is sleek.

WHEEL INERTIA

Each wheel has mass and takes energy to get it rotating.

TRAP KINETIC ENERGY

Plan a smooth, uniform torque transfer to your drive wheels.

6. DECIDING WHO WINS

Each racer is allowed up to 3 runs. The racer with the lowest elapsed time to successfully complete the 10 metre track is the winner. You may be having a horror of a day but if you lay down one scorcher of a run that is the one that counts.

7. PRIZE CATEGORIES

A perpetual trophy (that will be retained by the winning school for the year) will record 1st place and there will be prizes in the following categories:

Part A

Quickest 10 m Run

1st Prize \$200.00

2nd Prize \$100.00

1. All entries will be inspected for compliance with the Technical Aspects of the Mousetrap Racer Construction.
2. Each entry will have its three 10 m run times recorded.
3. The winner will be the entry with the quickest time to successfully complete the race track.
4. The judges decisions in any matter are final.

Part B

Most Original Entry Prize \$50.00

The judges shall take into account the ingenuity of design in judging the most original entry.

Prizes will be paid in cash to a representative of the winning team's school.

The intent of the prize is as a reward to the students for the effort of not only competing, but in producing winning designs. Accordingly, the prize money is to be appropriately distributed by the school to the members of the winning team and at the discretion of the school, a portion may be retained by the school to cover costs.

8. ENTRY

One or two team(s) with a **maximum six students per team** from each secondary school may enter by submitting

Entry Form 1 by Monday 20th August, to:

**MOUSETRAP RACER COMPETITION
c/ Regional Coordinator, Engineers Australia
School of Engineering
James Cook University
Townsville 4811**

Entry Form 2 is to be brought to the competition with the racers. Mousetrap Racers will not be accepted into the competition unless accompanied by the completed entry form.

Racers are to be delivered to the judges a minimum of 15 minutes prior to the start of the competition. The judges will then scrutinise them before judging commences.

9. COMPETITION VENUE

James Cook University Open Day
at the
School of Engineering
Sunday 2nd September
Start time 12 noon

11. ENQUIRIES

All enquiries are to be directed to:

Bronwyn Wood, Regional Coordinator, Engineers Australia

Ph: 4781 6327 E-mail: bwood@engineersaustralia.org.au

12. CONCLUSION

Building mousetrap racers is just one of many activities promoted by Engineers Australia and JCU School of Engineering. It is hoped that the Mousetrap Races and other activities will fuel your interest in Engineering and other technical careers. It is important to build up the engineering skills base in Australia to promote economic growth and prosperity.

STEPS THAT COULD BE USED IN PERFORMANCE EVALUATION

Calculate the energy available in the Mousetrap

Calculate the theoretical maximum velocity of the vehicle

Calculate the maximum possible Acceleration

Calculate the distance taken to reach Maximum Velocity

Calculate the time taken to reach Maximum Velocity

Calculate the time to travel the remaining distance

Calculate the total time to cover the 10 metres

Design the Drive Ratio

Neat Websites:

Use these sites as guides only – don't forget that you must stick to the rules of the competition!

<http://www.docfizzix.com/>

<http://home.flash.net/~funtraps/cars.htm>

<http://can-do.com/uci/ssi2002/mousetrap-racer.html>

<http://www.mousetrap-vehicles.com/articles.cfm>



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MOUSETRAP RACER COMPETITION 2007
Sunday 2nd September, 2007
ENTRY FORM 1
Intention to Compete - Secondary Schools

PLEASE PRINT.

SCHOOL NAME & ADDRESS:

..... Postcode:

TEAM NAMES (Maximum of two teams per school with up to six students per team)

1 2

ADDITIONAL TEAMS

Do you wish to enter additional teams if they can be accommodated? YES/NO

Number of extra teams that your school would like to nominate.

CONTACT REPRESENTATIVE:

Name:

Phone Numbers: (B/H) (A/H) FAX

Email address if available.....

Signature: Date:

1. This form is to be submitted by Monday 20th August to:

MOUSETRAP RACER COMPETITION
c/ Regional Coordinator, Engineers Australia, School of Engineering,
James Cook University, Townsville, 4811

2. There is no entry fee.



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MOUSETRAP RACER COMPETITION 2007

ENTRY FORM 2

Entry Form 2 is to be brought to the competition with the racers. Racers will not be accepted into the competition unless accompanied by the completed entry form.

PLEASE PRINT

TEAM NAME (to be attached to racer):

TEAM MEMBERS' NAMES (maximum of six):

- | | | |
|---------|---|-------|
| 1. | 4 | |
| 2. | 5 | |
| 3. | 6 | |

SCHOOL NAME & ADDRESS:

..... Postcode:

CONTACT REPRESENTATIVE:

Name:

Phone Numbers:(B/H).....(A/H).....FAX

Email address if available.....

STATEMENT (To be signed by a supervising parent/teacher)

I hereby certify that the entry submitted by this team was built entirely by the team members and complies with the 2007 rules of the competition.

Signed:

Date:

Name (please print):

Position:.....