"Braking distance of a bike"

Physics

Subject: Physics

Overview:

This experimental procedure is a simple way of measuring the speed of a bike (or large trolley) with a known wheelbase using a pair of pressure mats. The procedure can then be used to produce a braking distance versus speed graph.

Equipment required: LogIT DataLogger
2 Pressure mats
Carpet mats (to protect pressure mats)
Thin ply Boards (used to provide a smooth surface to place the mats if required)
Bike and pilot
Tape measure

Hazards:

It is suggested that the teacher or helper rides the bike.
If an exercise is being performed, make sure it is appropriate for the student and performed in a suitable location.
Always check your local regulations or the school advisory service such as CLEAPSS or SSERC for guidance on the use of any hazardous material or source.

Suggested setup:

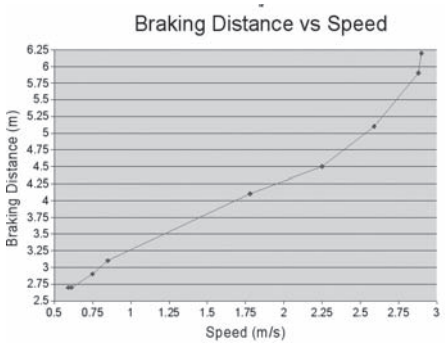
1. Measure the wheelbase of the bicycle. This can be done either where the wheels touch the ground or from the centre nut of each wheel.
2. Place the two mats a set distance apart eg. 1 metre.
3. Mark a line after the second mat which is longer than the wheelbase to make sure that the rear wheel has cleared the second mat. This line marks where the brakes need to be applied.
4. Connect the sensors to the datalogger and then connect to the computer.
5. Select timing from the datalogging software.

Note: Do make sure the mats are protected. Carpet tiles are a good idea.
Connect the mats to the datalogger and the datalogger to the computer.
Start the timing software (see LogIT Lab or Insight manual) and select 'Time' from sensor A to B.

Suggested Method:

1. Start the timing software.
2. Cycle over the two mats.
3. The speed of the bike is then recorded.
4. Apply the brakes of the bike when the marked line is reached.
5. Measure the distance travelled by the bike after this line.

Note: It does not matter when the rear wheels run over the mats as the software will ignore the second trigger of each mat and record one speed.



Results:

A graph can be plotted of braking distance against speed.
Students can predict what graph shape they should obtain.
Can you explain the shape?

Going further:

Was this an accurate test? If not why not?
What other tests could you perform using the bike and a running track?