Subject: Physics
Key stage: 3
Topics covered: investigating motion, interpreting distance-time graphs and speed-time graphs

Investigating motion

This experiment is a fun way to investigate the relationship between speed, time, distance, and acceleration. The main piece of equipment used in this investigation, the DynaKar, has been designed specifically for this kind of investigation.

What you will investigate

The relationship between speed, time and distance and the effect of air resistance on acceleration.

Equipment:
(All the equipment and software you need can be purchased from www.sciencescope.uk)

- A DynaKar
- DynaKar 2 Metre Track (The 1 metre track can be used though the results will be less visable)
- Logbook Graphing Software

Getting started:

Set up your DynaKar 3 Metre Track. Raise one end of the track to a height of around 75cm. Secure the raised end to a retort stand using the brackets provided with the track.
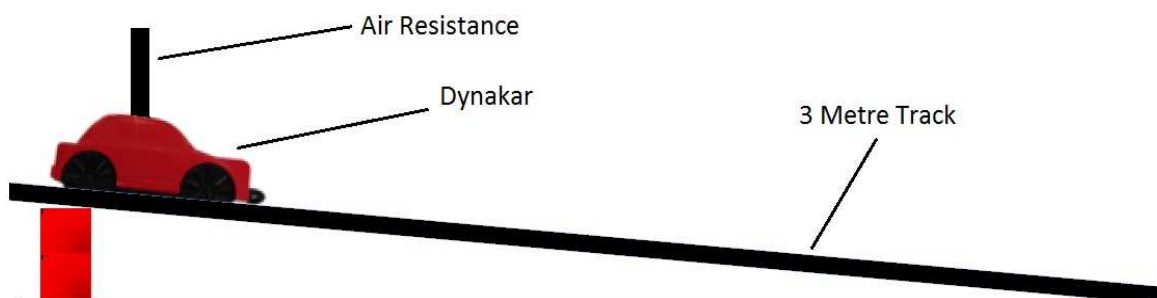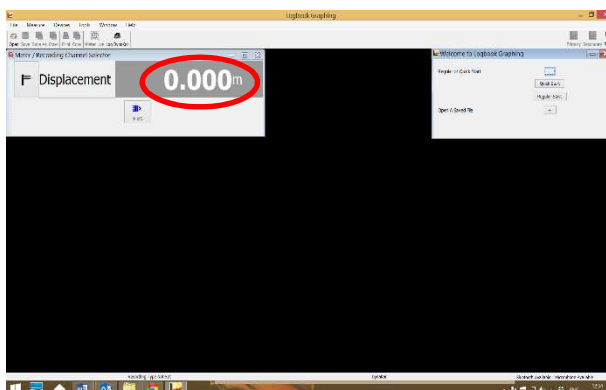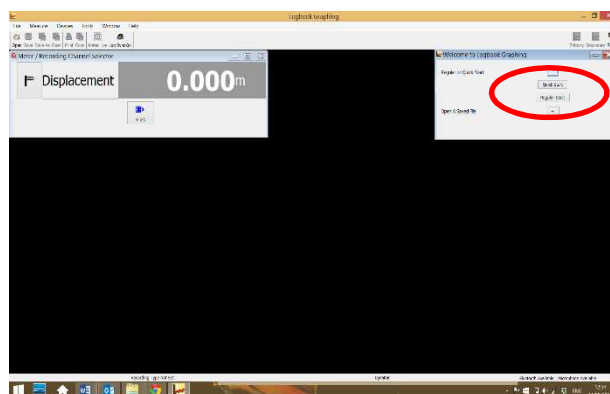
The experiment

Open Logbook Graphing and plug the DynaKar wireless dongle into a USB port. Turn the DynaKar on.

Check the dongle is connected to the DynaKar by moving the DynaKar wheels back and forth. The displacement log will vary.
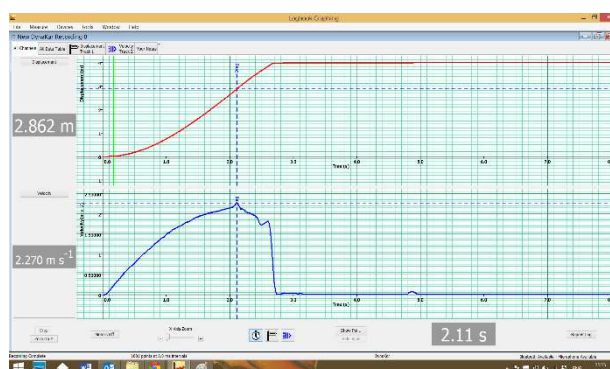
(If you have any problems connecting Logbook Graphing to the DynaKar please refer to the instruction sheet provided with it).

Place and hold the car at the top of the track and select "Quick Log" on Logbook Graphing.

Release the DynaKar down the track. The software will log the DynaKar's displacement and velocity.

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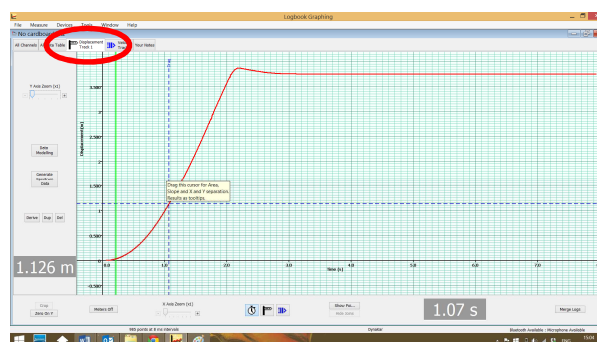
Analysing the results

You can analyse the data in a variety of ways using the Logbook Graphing Software.

The data obtained from the DynaKar will be displayed in two graphs: a displacement-time graph and a velocity-time graph.
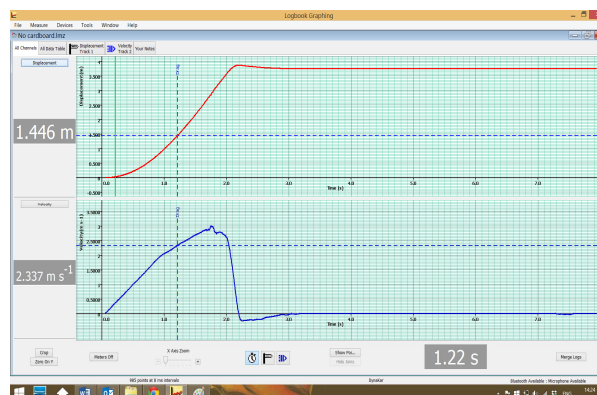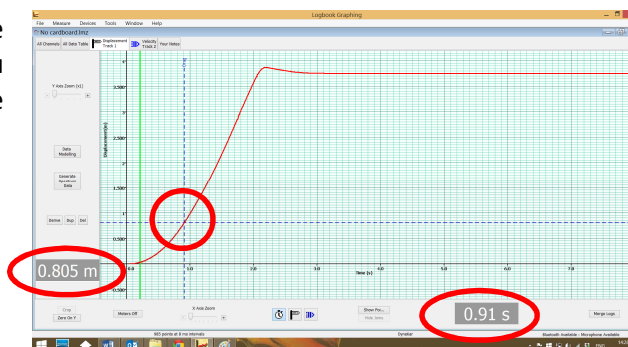

The displacement-time graph
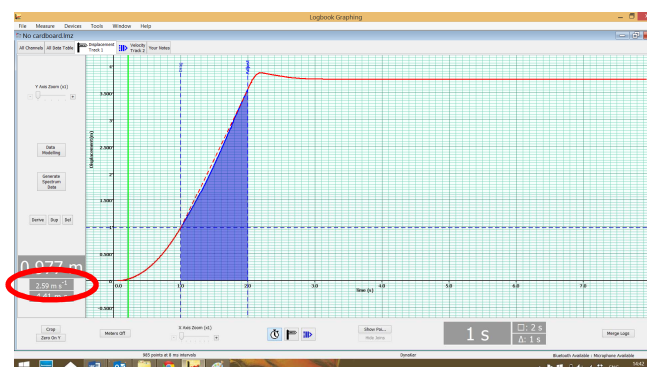
Select the displacement-time graph

Click anywhere along the curve to display the displacement and time at that exact point. You can use this to calculate the average speed of the dynakar using the formula:

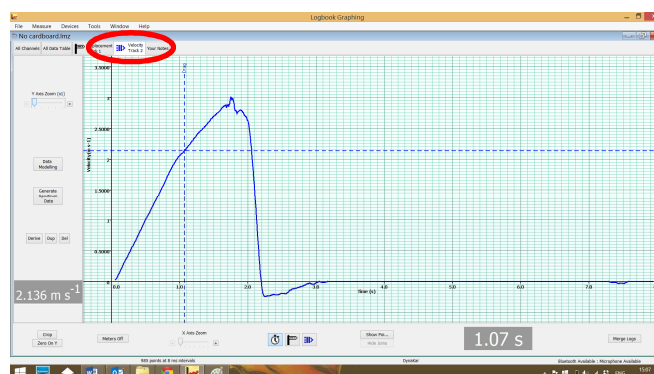$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

You can also calculate the average speed automatically using Logbook Graphing by clicking on one point and dragging to another.
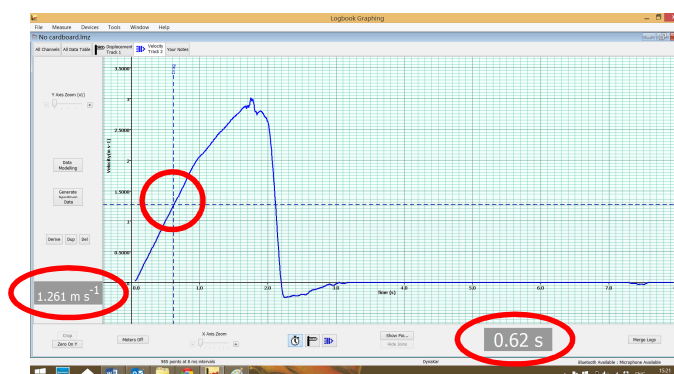

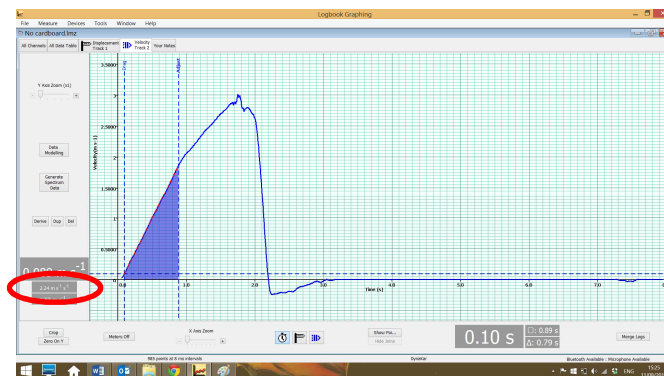**The velocity-time graph**

Select the velocity time graph

Click anywhere along the curve to display the velocity and time at that exact point. You can use this to calculate the average acceleration of the dynakar using the formula:

acceleration = change in velocity
time

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You can also calculate the average acceleration automatically using Logbook Graphing by clicking on one point and dragging to another.

Taking it further

See our experiment on the effect of air resistance on velocity and acceleration.

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