Appendix 2: Resource pack

National 4 Physics: Added Value Unit

Resource Pack: Car Safety

This resource pack gives details of areas that are suitable for the Added Value Unit.

Car safety research/investigation supports:

Unit: Dynamics and Space
Key area: Relationship between forces, motion and energy

- The use of Newton's first law and balanced forces to explain constant speed, making reference to frictional forces.

Background information

Topical issue: Road vehicle safety

Road vehicle safety is a continuous process to find improvements which will reduce the number of road accidents and the severity of any injuries, making road travel safer for everyone.

Research
Car manufacturers research and develop safety features for their vehicles then promote the improvements in order to reassure buyers that their cars are safe. European and government agencies also carry out research in all areas connected with car safety.

Governments carry out vehicle tests to ensure that the cars produced by manufacturers perform safely and meet required standards. Government testing allows the public to compare the safety performance of different cars by using the same standard tests.

Euro NCAP is a European agency set up by the UK and other European governments to investigate vehicle safety, and publish their findings. Euro NCAP organises crash-tests and provides motoring consumers with a realistic and independent assessment of the safety performance of some of the most popular cars sold in Europe.

Energy
Cars have kinetic energy when moving. During braking, the kinetic energy is transferred into heat energy by the brakes. The brakes heat up and then transfer the energy to the surroundings. During collisions, the kinetic energy will not be completely transferred into heat energy in the brakes, but may cause damage to the car and occupants during the collision.

Modern cars have safety features that dissipate kinetic energy during collisions to reduce injury to car occupants.

Added Value Unit task

The following areas of car safety research are suitable for the Added Value Unit task.

Your choice of research topic could be based on one (or more) of these areas.

1 Primary safety developments that have been applied to reduce the probability of an accident:

(a) Vehicle braking systems which help the driver keep control of the vehicle under emergency conditions.

(b) Tyre pressure monitoring systems. These warn drivers when tyre pressure is low and allow action to be taken before road holding and handling are affected.

2 Secondary safety developments that have been designed to reduce the injuries sustained during an accident:

(a) Seat belts have been improved to reduce the effect of a crash on the occupants of the vehicle.

(b) Air bags which inflate and cushion the occupants of the vehicle from damage when it moves during a crash.

(c) Side impact bars which dissipate the effect of a crash and spread the force over a larger area.

(d) Crumple zones which are designed to collapse a part of the vehicle and reduce the effect of the crash on the occupants of the vehicle.

Websites
The following websites contain information about research which has been carried out into car safety.

http://hyperphysics.phy-astr.gsu.edu/hbase/carcr.html#cc1

http://www.nhtsa.gov/Research/Databases+and+Software

http://www.theaa.com/allaboutcars/ncap/ncap_car_results.jsp?make=Fiat&modelYear=Doblo:2004&publicationDate=2004-06-01

http://www.theaa.com/motoring_advice/euroncap/crash_tests.html

http://www.thatcham.org/safety/pdfs/bumper_test_development.pdf

http://www.euroncap.com/Content-Web-Page/c6f9d381-1889-4c66-bfcd-c5c0a69a364d/technical-papers.aspx