Cable Car Challenge

See images and advice worksheet at the end of this file

Task Outline: The students are members of a rescue team which is travelling cross country and the way ahead is blocked by a deep river. They need to cross the river. There is a suspended cable which you should use to carry a rescue package to the other side of the river. The student challenge is to work in pairs to design, build and test a vehicle which will cross the river by running on the suspended cable and drop the package on the other side. They may examine/use the test rig throughout the workshop.

Their vehicles should be able to:

- Cross the river by running on the suspended cable
- Stop at the far side
- Carry the rescue pack supplied
- Be capable of being placed on the cable without dismantling
- Be balanced and stable at all times
- Be started and stopped by making/breaking the electrical supply to the motor by use of a simple switch. Trailing wires from the switch to vehicle are okay, but it shouldn't need to be pushed along the suspended cable!

A suggestion is a drive system powered by battery/electric motor combination, with a speed reducing pulley system used to drive the vehicles along the cable.

Students can only use the materials and tools provided

Help and Guidance for Students: The students will be given a pack of materials for making their models, however, they don't necessarily need to use all the materials supplied. Care should be taken when drilling and using hot glue guns. They must be used at supervised work stations which are properly equipped to ensure a safe and accurate result.

Here are some suggestions of how the students might approach the problem:

1. Talk within their pairs and, with advice from teachers or volunteer engineers about the task, draw possible solutions
2. Examine the pack of materials given and discuss how they could use them to build the vehicle
3. Decide which idea would work out best
4. Allocate tasks to each team member

Use the test rig provided to test their models—the kits have cable included – this can be ignored as the Test Rig is provided

Students should also be aware that:

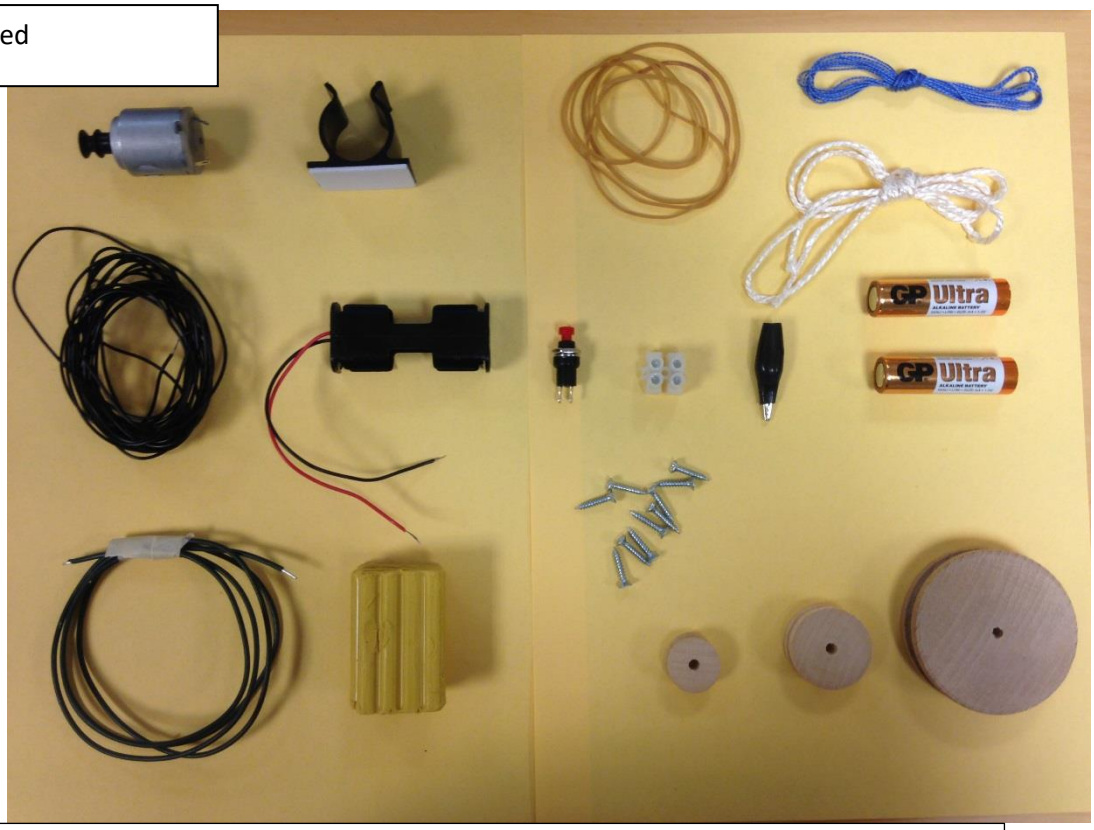
- Their vehicle should have a drive wheel to run along the cable

- The rotational speed on the 10mm pulley on the electric motor's spindle is too fast to drive the vehicle directly. Therefore the students will need to construct a pulley system so that the speed reduction pulley (60mm) revolves much slower than the electric motor's pulley. They can then fit a small drive pulley onto the same axle as the 60mm pulley. This drive pulley will run along the suspended cable, driving the cable car.

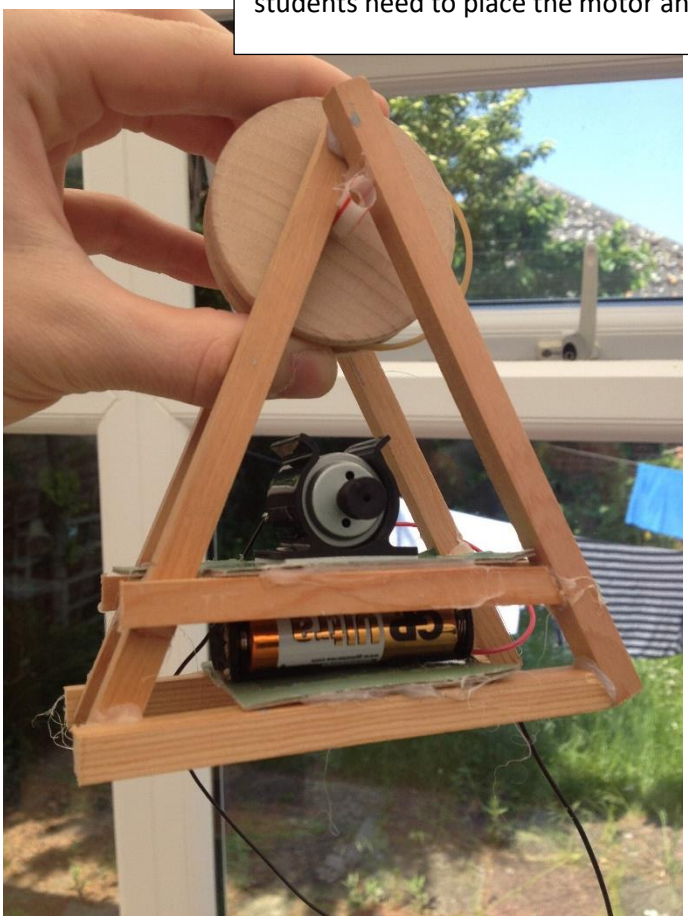
- Students can use a mitre box so that they can produce angled joints or they can secure joints with card as shown in the diagram below

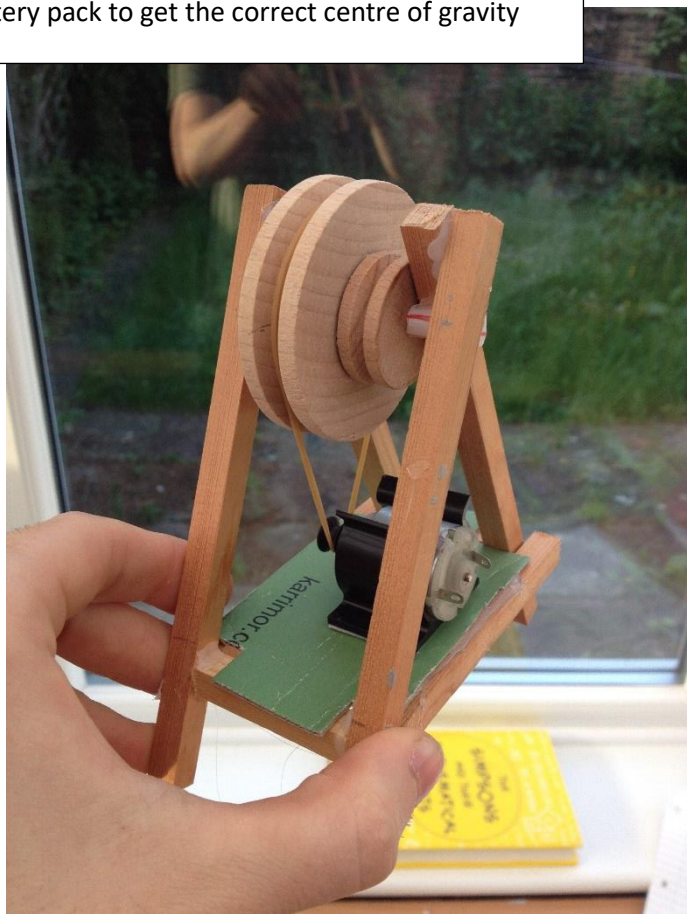
SEE NEXT PAGES FOR PHOTOGRAPHS OF THE KIT AND TWO WORKING MODELS. ALSO THE ADVICE SHEET THAT STUDENTS WILL HAVE.

This is the kit provided

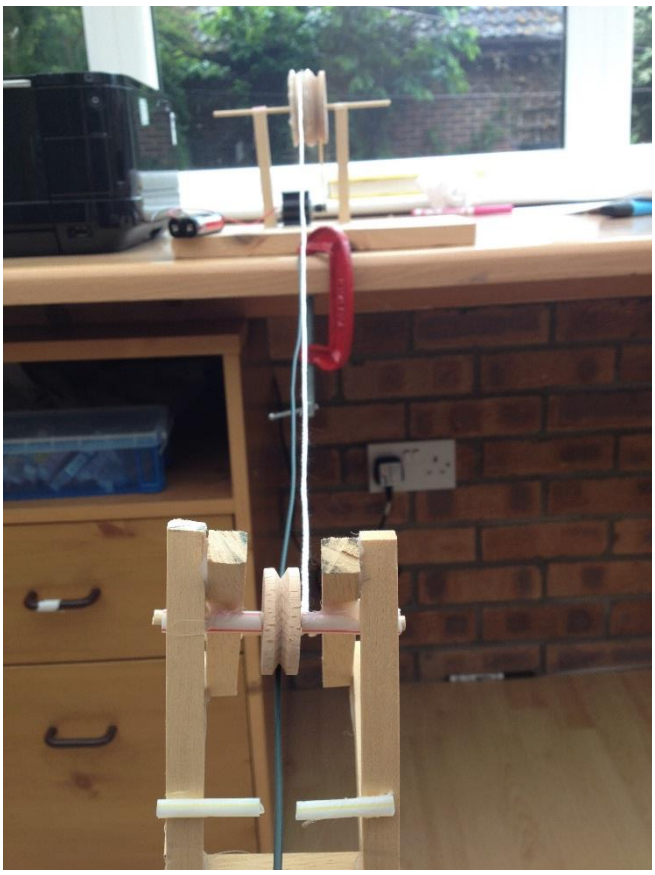


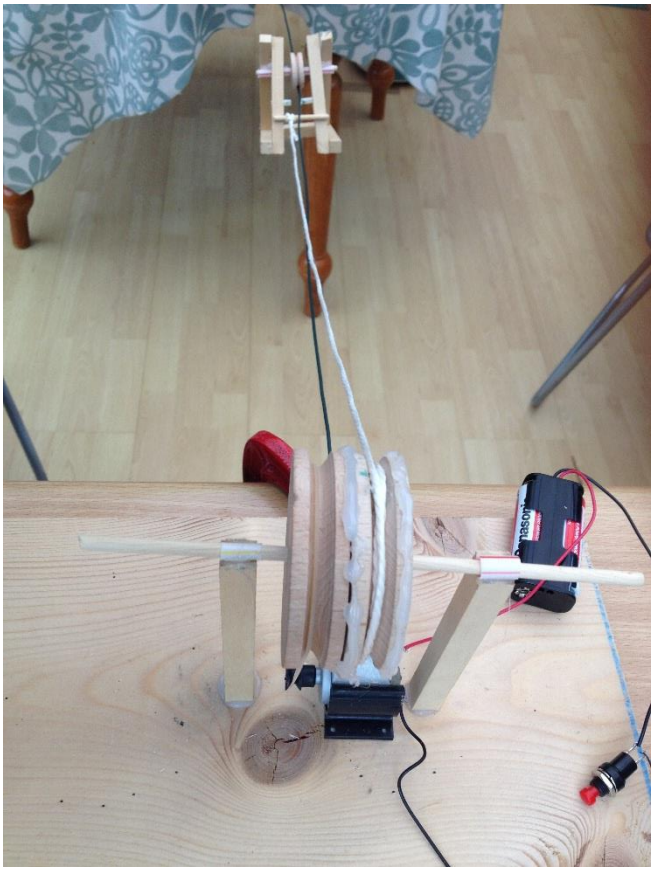
This is the ideal model using all the kit – this cable car has the motor on board and the students need to place the motor and battery pack to get the correct centre of gravity

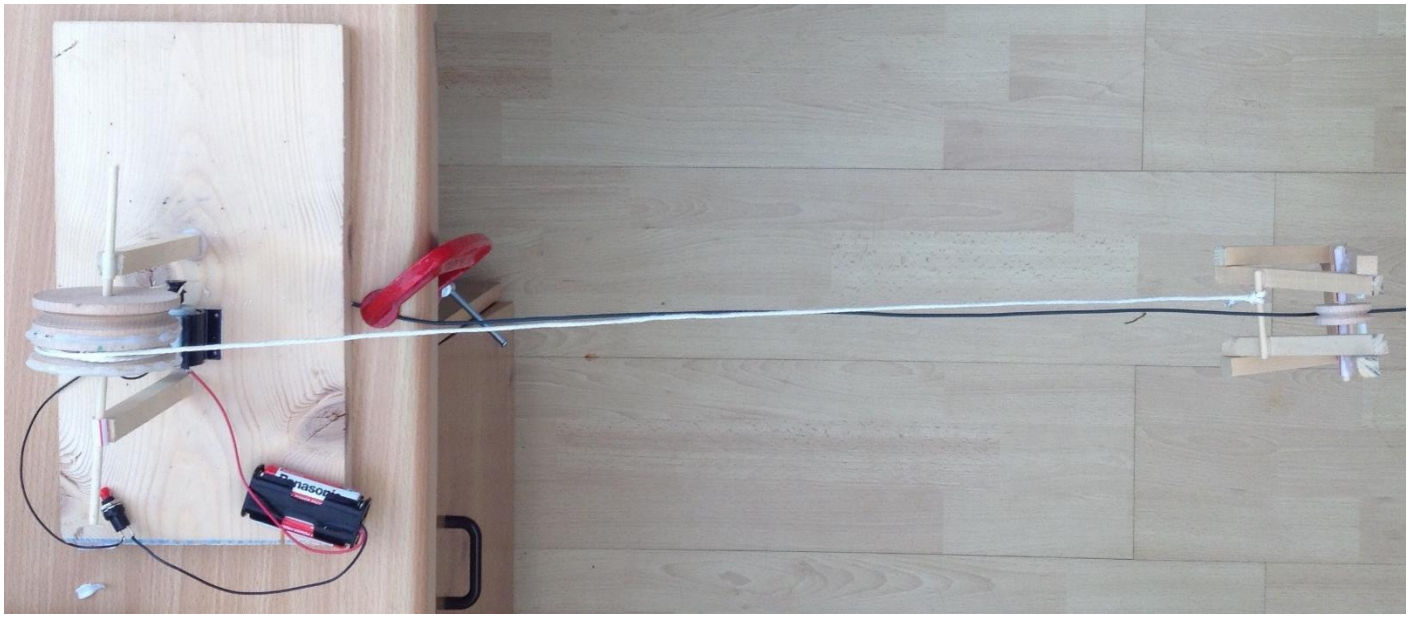




This model has the battery and pulley system fixed to one end of the cable such that the cable car is pulled across – in model 1 above the cable car could do a return trip by reversing the direction of drive of the motor simply by changing the contacts over but for this model another pulley system would need to be at the other end of the cable



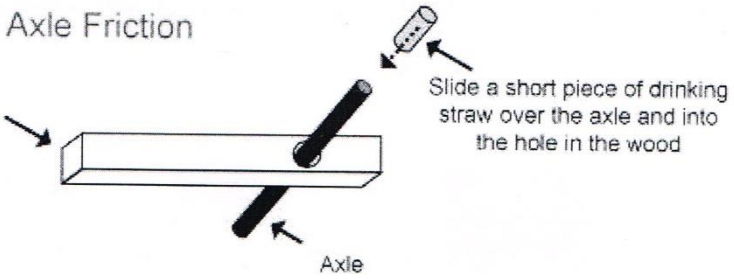




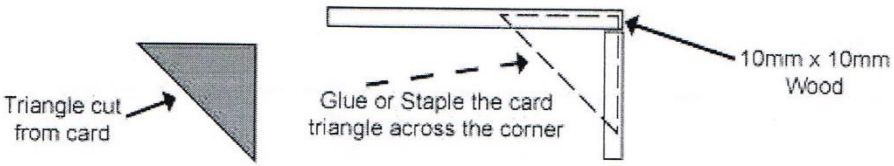
Rotary International District 1040 Technology Tournament

Construction Ideas.

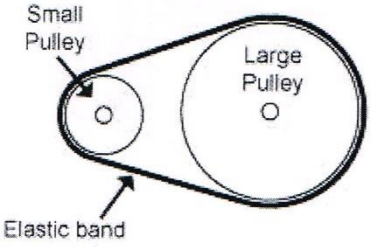
Helping Reduce Axle Friction



Joining Pieces of Wood



Using Pulleys to Change Speed



The distance around the large pulley, (circumference), is more than the distance around the small pulley. Looking at the drawing it is probably about twice the distance.

Therefore for every full turn of the large pulley, the small pulley will turn twice.

And for every full turn of the small pulley, the large pulley will only turn half way round.

Mechanical Page

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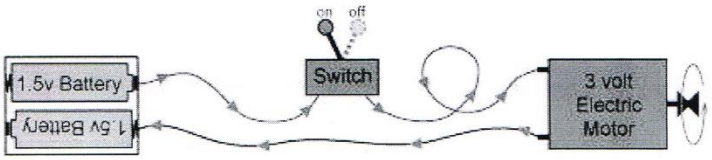
Construction Ideas.

Simple Electric Circuit, (for foundation & intermediate level only).



For the motor to operate, electricity must travel:-
1. From the battery to the switch.
2. Through the switch to the motor.
3. From the motor back to the battery.

CROSSING THE RIVER

THE TEST RIG

The test distance is 1 metre.
All measurements are in millimetres
The Rig must be firm, rigid and not wobble during testing.
The Rig can be clamped to a table, or screwed on to a base board

Drawings are NOT to scale. All measurements are millimetres.

The 2 kgs weight will maintain a constant tension on the "River Crossing Cable" throughout the tournament
An easy way to achieve a 2 Kg weight is by using a 2 ltr plastic milk container filled with water, or 2 x 1ltr bottles.