OVERVIEW

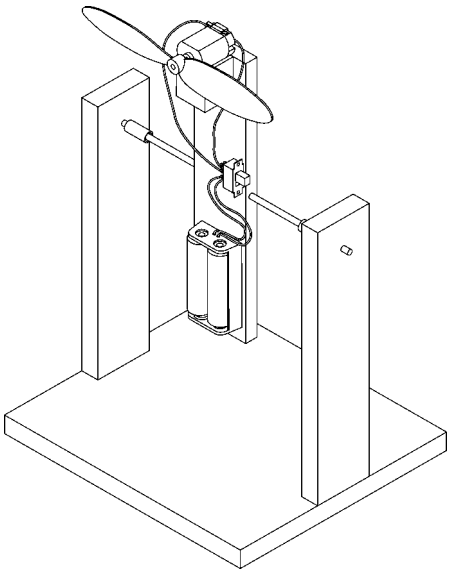
WHIRLY
(Code: WHIRLY)

DESCRIPTION

The *WHIRLY* is a very simple project, consisting of a single rotating beam. This beam has an electric motor with a propeller, mounted at one end. A battery holder is on the other end of the beam and counter-balances them. The beam is mounted on an "axle" (shaft) at the beams' centre of gravity.

When the *WHIRLY* is switched on, the motor spins the propeller, thus rotating the beam around its axle.

LEVEL:	Introductory
HOURS TO CONSTRUCT:	5 - 7 hours
SKILL DEVELOPMENT:	• Planning and Design • Manufacturing • Soldering • Mechanical • Electrical • Basic physics



OVERVIEW – Whirly

WHAT'S IN THE KIT?

- ☐ All the mechanical and electrical components required to make the *WHIRLY* work including the motor, battery holder, propeller, shaft (rod) and switch.
- ☐ A detailed teaching unit with a complete parts list, design suggestions, general construction guidelines and suggestions for testing *WHIRLY* model.

WHAT ELSE IS NEEDED?

The following items are required and are available from Scorpio Technology, but need to be ordered separately:

- ☐ 2 x Battery – AA (BATTAA or BATTALK40)
- ☐ Multi strand hook-up wire (WIREHU10)
- ☐ Single-sided adhesive tape (TAPESS)
- ☐ Hot glue (GLUESTK) **or** Double-sided adhesive tape (TAPEDS or TAPEDS20x15x1)
- ☐ We recommend the following spares when buying class sets of kits to replace parts damaged or lost by students:
  - Steel rod - 2.5mm x 500mm (STR2.5 – Pack of 5 or STR2.5-20 - Pack of 20)

The following material is to be supplied by the student / teacher:

- ☐ Material for the components (PVC or acrylic sheet, plywood, etc.)
- ☐ Material for the stand (Timber, metal, PVC or acrylics sheets)
- ☐ A small piece of timber (such as pine) to drill a shallow hole in order to rest the propeller boss and mount the motor shaft

SUGGESTED ITEMS FOR TESTING

- ☐ Small handheld digital tachometer (TACHOHH)

TOOLS REQUIRED

The following tools are required. Several are available from Scorpio Technology, and can be ordered separately if required:

REQUIRED TOOLS	ORDERING CODE
Assorted hand tools (depending on materials used)	-
Hammer	HAMMERCP/HAMMERCL
Ruler and pen	-
Craft knife	CRKNF
Soldering Iron and Soldering iron stand: – a good quality soldering iron, with a fine tip **or**	SOLDIRN SOLDIRNSTD
Soldering station	SOLDSTN
Solder: – 0.71mm 60/40 solder is recommended	SOLD500
Wire strippers	WIRESTR
Side cutters	SIDECUT or SIDECUTM
Mini Bolt Cutters	BOLTCUTM
Drill Bit – 3mm	-
Drill Bit – 10mm	-

ABOUT THE PROJECT

The major features of this project are the planning, design, construction and assembly stages of a simple whirly model.

DESIGN PHASE

- ☐ Create your own unique *WHIRLY* design based on our drawings. Focus on component relationships, rather than dimensions. This provides scope for students to individualise their *WHIRLY* design and increase their engagement in the project.

During the **Design phase**, students will need to:

- ☐ Evaluate the suitability of various materials, such as PVC, acrylic, plywood, balsa wood or metal
- ☐ Evaluate available technologies that can be used, for example:
  - 3D printer
  - laser cutter (which allows more interesting shapes than usual)
- ☐ Take into account weight distribution and ease of operation
- ☐ Consider the practical aspects of construction and assembly.

MAKING / CONSTRUCTION

Once the Design process has been completed, the students will be able to start **building their design**. They will:

- ☐ Make the *WHIRLY* beam
- ☐ Mount the propeller onto the motor
- ☐ Mount the motor, switch and battery holder on to the beam
- ☐ Wire up and solder the battery holder, motor and switch
- ☐ Make and assemble the stand they have designed
- ☐ Insert the batteries and determine the equilibrium point
- ☐ Assemble the rotating beam, stand and pivot shaft
- ☐ Test and adjust the *WHIRLY*
- ☐ Troubleshoot any problems!

DOES THE TEACHING UNIT INCLUDE ANY THEORY?

The Teaching unit does not have THEORY but does have an IDEAS FOR FURTHER INVESTIGATION section that involves:

- ☐ Making a few different beams to test and compare
  - Effect on rotation
  - Pivot points / centre of balance / balance point
  - Speed of rotation
  - Speed of rotation to weight
  - Distance travelled in one rotation
  - Acceleration of each beam