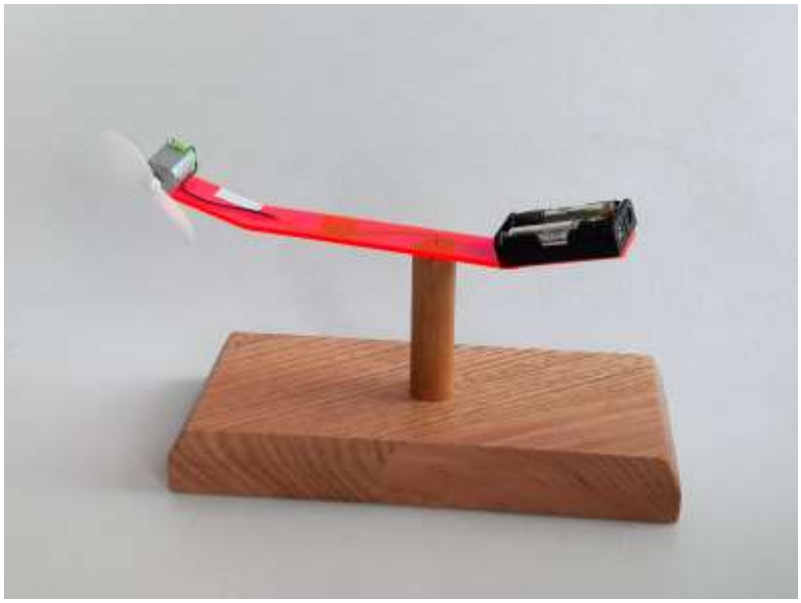
BALANCE PLANE
(Code: BALAN)

DESCRIPTION

In this simple design and construction project, a beam is used, with an electric motor and a propeller on one end and a battery holder on the other end. It is placed in a balanced state, on a vertical upright.

This beam is designed to be rotated about its central point, in a horizontal plane, by the motor-driven propeller.

LEVEL:	Introductory
HOURS TO CONSTRUCT:	5 - 8 hours
SKILL DEVELOPMENT:	• Planning and Design • Manufacturing • Soldering • Mechanical • Electrical • Basic physics



OVERVIEW – Balance Plane

WHAT'S IN THE KIT?

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

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 – Pack of 4 or BATTALK40 – Pack of 40)
- ☐ Multi strand hook-up wire – in a variety of colours (WIREHU10)
- ☐ Hot glue (GLUESTK) **or** double-sided tape (TAPEDS or TAPEDS20x15x1)

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

- ☐ Material for the beam (wood, PVC or acrylic sheet, plywood, balsa, etc.)
- ☐ Material for the upright vertical post (dowel, metal, etc.)
- ☐ Material for the base
- ☐ Nail – 2.5mm diameter
- ☐ 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 EXPERIMENTING

- ☐ Stopwatch (STOP)
- ☐ Tachometer (Hand held) (TACOHH)
- ☐ Tiny amount of oil
- ☐ Balanced weights

TOOLS REQUIRED

The following tools are required. Several are available from Scorpio Technology, and can be ordered separately if required (item codes in brackets):

REQUIRED TOOLS	ORDERING CODE
Assorted hand tools (depending on materials used)	-
Hammer	HAMMERCP/HAMMERCL
Ruler and pen	-
Craft knife	CRKNF
Drill – hand or electric	
Drill Bit – 2.3mm	DB2.3
Drill Bit – 3.0mm	
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

ABOUT THE PROJECT

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

DESIGN PHASE

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

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

- ☐ Evaluate the suitability of various materials, such as wood, plastic, plywood or balsa wood
- ☐ Evaluate available technologies that can be used, for example:
  - 3D printer
  - laser cutter (which allows more interesting shapes than usual)
- ☐ Take into account overall size of the device and weight distribution of the beam-mounted components
- ☐ Consider the practical aspects of construction and assembly. For example, determining the equilibrium point (centre of balance)

MAKING / CONSTRUCTION

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

- ☐ Make and assemble the *BALANCE PLANE* beam, post and platform they have designed
- ☐ 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
- ☐ Insert the batteries and determine the equilibrium point
- ☐ Attach the beam onto the platform
- ☐ Test and adjust the *BALANCE PLANE*
- ☐ Troubleshoot any problems!

DOES THE TEACHING UNIT INCLUDE ANY THEORY?

The Teaching unit does not have a THEORY section, but it does include an APPLICATION section that allows further experimentation:

- ☐ Determining revolutions per minute of the beam
- ☐ Calculating speed and distance travelled by the end of the beam
- ☐ Observing the effect of friction on speed
- ☐ Altering the position of some of the components and their effect
- ☐ Adding balanced weights and observing their effect on beam rotation