

District \_\_\_\_\_  
The Rotary Technology Tournament  
Re-Inventing The Wheel



The VTOL Launcher  
General Guidance 2008

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## The VTOL Launcher Information for Organising Clubs

- ◆ The task is to fire a sphere vertically into the air and for it to reach a height of 3 metres minimum. If the venue has a flat ceiling of less than that height, then the task sheets must be adjusted accordingly or at the very least, the pupils told of the modification on the day.
- ◆ The Intermediate and Advanced tasks require the teams to deploy a parachute device at a minimum height of 3 metres. The Basic task does not involve a parachute.

The thinking behind this task is that teams will attach a cotton ripcord, which, at a minimum height of 3 metres, will pull open the parachute.

The advanced teams have to contain their sphere within a carrier vehicle – could be a rocket shape made from card. At 3 metres the sphere should disengage from the carrier and then deploy the parachute. Both of these actions could be operated by the ripcord idea.

- ◆ The task requires the teams to fire their device by means of a trigger/release mechanism. The trigger is an important aspect of the design. To ensure that teams realise this fully, on testing, the device must be loaded and armed ready to fire. For a period of 10 seconds there must be no human contact whatsoever. Firing may then take place – hopefully this will avoid catapult style firing.
- ◆ Teams have been asked to provide a baseboard 300mm square. Their model will be built on the baseboard and at testing this can be clamped in position by means of a pair of G cramps or clips of some kind to give the model a firm foundation.

In order for this to happen the organising club will need to provide a board, chipboard, blockboard or similar approx. 300 x 400 x 20mm. The board could be mounted on blocks of wood to raise it off the surface by about 50mm to enable the G cramps or clips to mount the team's baseboard. (Remember the cramps)

- ◆ The task requires the teams to launch their device vertically, this is tested in an approximate fashion by requiring the device to pass through a 300mm hoop mounted 1 metre above their launcher. Clubs will need to make or provide a hoop made from garden wire and mounted to the framework of a projector screen with tripod legs (or similar).
- ◆ Also attached to the tripod will be garden canes mounted telescoping end of the screen upright to reach a height of 3 metres at which point will be a horizontal cross bar to indicate that the sphere has reached the minimum height required. You will need a tape measure to judge 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> nearest the centre landing point at each level. A stopwatch will be required to time the 10 second trigger release delay.
- ◆ The task can be achieved without the use of glue guns but if you wish them to be used provide them and a supervised glue table and power points.

Collect in the portfolios for marking over lunch – teams might need them to continue construction.

The availability of battery powered drills has caused expensive table damage in recent years. Where drills and screws are to be used it is suggested that a supervised drill table is provided. All tasks can be achieved without the use of drills, screws and glue guns by stapling card to support wood joints. Axles can be mounted on a chassis by stapling card triangles with holes punched in them either side of the chassis to take the wheel axle. All tasks have a general advice sheet for teachers highlighting construction methods, electric motors and the use of pulleys and the possible need to design and build a switch.

Teachers should not advise / help their students. Either, they form teacher's teams to undertake the advanced task, or Rotary can organise seminars / talks for teachers on what Rotary can offer schools or speakers from local industry on their use of technology. It may be appropriate to mark down teams who are consistently helped by teachers.

### **Judging and Moderation.**

Some clubs use judges to assess one aspect only (say Planning) for all teams, whilst other clubs, use pairs of judges to assess all aspects of a small group of teams at the same task level.

It is suggested that judges work in pairs. If only one pair of judges is required to assess all teams at one task level, moderation should not be needed.

Where several pairs of judges are needed for a large numbers of teams at the same level, ensuring that a team is assessed by two pairs of judges gives the opportunity to compare assessors marking levels and correct as required.

Realisation/Manufacture should take into account good practice in the use of tools.

A pre-start talk by the chief Judge can help harmonise marking by giving examples and defining the rules to be applied such as:

No tools other than those listed may be used / any tools may be used.

Glue guns allowed / not allowed.

Sellotape allowed / not allowed in construction.

Use of test track or rig.

### **Marking portfolios.**

Most students are familiar with the need to produce a project portfolio for school projects. The inclusion of a portfolio is to provide them with practise, not as an aid to the judges' assessments, which should be ongoing.

You can therefore have a separate judge to mark the portfolios, say over lunch, as team may need them back to continue the build process.

The portfolio should be marked on its effectiveness in documenting the projects progress, ideas, designs and reasons decisions were made. Students are asked to include:

- All drawings and working sketches.
- Reasons for choosing the final design.
- How the team was organised.
- How ideas were thought of and developed.
- Challenges that had to be overcome.

# Rotary Technology Tournament

## Aide Memoire for task and judging

This aide memoire does not replace the RTT General Guidance for Organisers but highlights some aspects related to the task, the judging and maximising team entries.

**Note: Keep the details of the task restricted to 'a need to know' group prior to the event as schools should not know the task detail prior to the event!**

1. The organising committee should familiarise themselves with the three task levels, the materials required and the assessment criteria.
2. Schools generally start working on their next years' school diary in March/April. It is therefore a good idea to announce the date of the following year's event at the current event and then confirm it with a results letter to all schools invited whether or not they entered.
3. A phone round to school secretaries will confirm any changes of Head Teachers or Heads of Technology and invites to both are a good idea.
4. Teachers often have problems identifying student names for teams very far in advance but expressions of interest can be obtained to ascertain the number and task level of teams to be expected.
5. Confirmation of team member's names and team entries can be sought with a letter enclosing the school information sheet and tools list. At this time you can advise teachers of a key aspect of the task if you feel it is needed for your schools.
6. Acknowledge entries and enclose another copy of the school information sheet with tools list as a reminder.
7. The chief judge and judges should familiarise themselves with the task, materials, and assessment sheet as soon as possible.
8. Materials could be ordered with neighbouring clusters so that bulk packs can be split and surpluses traded if team numbers change at the last minute.
9. Don't forget to copy enough task sheets etc. for guests and visitors, and have extra Intermediate task sheets available for any upgrading Basic teams.
10. Most tasks now call for teams to produce a project portfolio to contain all design work and other information. Assessment of the portfolio is therefore difficult prior to the final test and judges will need to plan for this.
11. A review of team solutions by the chief judge can be made to all present after the final test to give the judge's time to complete assessments and marking.
12. A student feed back form similar to that in the Handbook or attached provides useful feedback on the task and the event. Analysis of this feedback can be sent to schools with the results and the date for next years' tournament
13. Information sent in advance to schools should not include the task title or any task details other than the Teacher Information sheet and the Information for Schools sheet. Task sheets and material list sheets are issued to the teams on the day.
14. Make the students feel at home by smiling and making eye contact. Ask leading questions starting with 'how', 'why' or 'what' and encourage them

## Assessment Sheet – VTOL Launcher

### Team

No.....School.....Level.....

### Planning & Teamwork

Little use of time to plan                    1 2 3 4 5 6 7 8 9 10                    Careful planning and use of time.

Suffered working as individuals            1 2 3 4 5 6 7 8 9 10                    Cohesive team, all involved.

### Design Analysis

Problems not fully understood  
Simple analyses of problem                1 2 3 4 5 6 7 8 9 10                    Good understanding and analysis

Simple understanding of  
physical constraints                         1 2 3 4 5 6 7 8 9 10                    Good understanding of  
constraints and principles

### Design Development

Only one idea used                         1 2 3 4 5 6 7 8 9 10                    Several ideas studied

Design problems unresolved              1 2 3 4 5 6 7 8 9 10                    Clear ideas and best one developed  
With drawings and dimensions

### Realisation (Manufacture)

Making skills poor                         1 2 3 4 5 6 7 8 9 10                    Well made product

Material use inappropriate                1 2 3 4 5 6 7 8 9 10                    Effective use of materials

### Portfolio

Content poor, little effort                2 4 6 8 10 12 14 16 18 20                    Well documented & good  
drawings & ideas

### Final Test

#### **Novelty of trigger**

Functional but lacking finesse            1 2 3 4 5 6 7 8 9 10                    Novel, innovative & works  
remotely

#### **Success of Launch**

Does not launch                            1 2 3 4 5 6 7 8 9 10                    Goes through hoop & reaches  
required height

#### **Parachute deployment**

Does not deploy                            1 2 3 4 5 6 7 8 9 10                    Deploys at correct height  
and slows descent

#### **Landing position**

Nearest centre	bonus of 20 points
2 <sup>nd</sup> Nearest	bonus of 15 points
3 <sup>rd</sup> Nearest	bonus of 10 points

TOTAL.....points

# Rotary Technology Tournament



## The VTOL Launcher

### Materials List

	Per team
Square section wood 10mm x10mm x 600mm Jelutong or pine	4
Wood dowel 4mm diameter 600mm long	3
Rubber bands 75mm x 3mm or similar	4
A4 card about 180 gsm	3
A4 card about 285gsm	1
Garden wire, 1mm thick. flexible	3 m
Plastic bags to make parachute say medium size freezer bags	1
Turned paper ball 35mm dia. (or Ping Pong ball)	1
Small screw eyes	2
Plastic / Polystyrene cup	1
Reel of cotton (min 4m)	1
Small roll of sellotape	1
Paper clips 27mm	4

It would be a good idea to have a few 300x300mm x 10mm MDF baseboards for teams who forget to bring them.

Most materials are available from Hertfordshire Supplies [www.hertsdirect.org/supplies](http://www.hertsdirect.org/supplies) or phone 01707 292300. Hertfordshire Supplies will deliver in Herts, Beds, Bucks, Essex, Suffolk, Kent, West Sussex, Hampshire, Oxfordshire, Northants, Coventry, Birmingham, Southampton, Portsmouth, Luton and Milton Keynes.

Other materials suppliers are:

Opitec – 02380 446515 [www.uk.opitec.com](http://www.uk.opitec.com)

TEP – 01992 716052 [www.tep.org.uk](http://www.tep.org.uk)

Elastic Bands [www.eurooffice.co.uk](http://www.eurooffice.co.uk)

[www.craftpacks.co.uk](http://www.craftpacks.co.uk) for pulleys, motors, wood, dowel, wire, battery holders etc.

# Rotary Technology Tournament



## The VTOL Launcher Basic Task

Your task is to design and build a **V**ertical **T**ake **O**ff and **L**anding device to launch a package of meteorological instruments into the air.

### The package:

- **Must be launched using a trigger/ release mechanism**
- **Must be launched vertically**
- **Must reach a minimum height of 3 metres**
- **Must return to earth as near as possible to the launch site**

You should read the following notes carefully and ensure that you fulfil the requirements of the task.

You have been given a pack of materials from which your design should be constructed. The package of meteorological instruments is simulated by the sphere and attachments to it are allowed.

It is **not** permitted to fire the device by holding an elastic band in your fingers. The trigger mechanism is an important aspect of this task. The launcher must be loaded and armed ready for launch for a minimum of 10 seconds with no physical contact.

Vertical take off will be judged by your ability to launch the vehicle to pass through a 300mm diameter hoop held 1000mm vertically above your launcher.

**You will not be allowed to begin construction for the first 30 minutes**, during which time you should carefully consider a minimum of two possible solutions and plan your production.

Marks will be awarded for :

- evidence of planning and use of teamwork.
- analysis of the design problem and awareness of constraints.
- development work and communication of ideas.
- quality of construction and appropriate and careful use of materials.
- degree of innovation and novelty of the trigger/release mechanism.
- proximity of landing to launch site
- Your portfolio

Good luck and enjoy the challenge.

# Rotary Technology Tournament

Re-Inventing The Wheel

## The VTOL Launcher Intermediate Task

Your task is to design and build a **Vertical Take Off and Landing** device to launch a package of meteorological instruments into the air.

The package:

- **Must be launched using a trigger/release mechanism**
- **Must be launched vertically**
- **Must deploy a parachute device at a minimum height of 3 metres**
- **Must return to earth as near as possible to the launch site**
- **May be contained within a carrier vehicle if you wish**

You should read the following notes carefully and ensure that you fulfil the requirements of the task.

You have been given a pack of materials from which your design should be constructed. The package of meteorological instruments is simulated by the sphere and attachments to it are allowed.

It is **not** permitted to fire the device by holding an elastic band in your fingers. The trigger mechanism is an important aspect of this task. The launcher must be loaded and armed ready for launch for a minimum of 10 seconds with no physical contact.

Vertical take off will be judged by your ability to launch the vehicle to pass through a 300mm diameter hoop held 1000mm vertically above your launcher.

**You will not be allowed to begin construction for the first 30 minutes**, during which time you should carefully consider a minimum of two possible solutions and plan your production.

Marks will be awarded for :

- evidence of planning and use of teamwork.
- analysis of the design problem and awareness of constraints.
- development work and communication of ideas.
- quality of construction and appropriate and careful use of materials.
- degree of innovation and novelty of the trigger/release mechanism.
- Successful deployment of the parachute and duration of flight
- proximity of landing to launch site
- Your portfolio

Good luck and enjoy the challenge.

# Rotary Technology Tournament

Re-Inventing The Wheel



## The VTOL Launcher Advanced Task

Your task is to design and build a **V**ertical **T**ake **O**ff and **L**anding device to launch a package of meteorological instruments into the air.

The package:

**Must be launched using a trigger/ release mechanism remotely from a distance of 1 metre**

**Must be launched vertically**

**Must be contained, at launch, in a carrier vehicle**

**Must separate and disengage from the carrier at a minimum height of 3 metres**

**After separation, the package must deploy at parachute**

**Must return to earth as near as possible to the launch site**

You should read the following notes carefully and ensure that you fulfil the requirements of the task.

You have been given a pack of materials from which your design should be constructed. The package of meteorological instruments is simulated by the sphere and attachments to it are allowed.

It is **not** permitted to fire the device by holding an elastic band in your fingers. The trigger mechanism is an important aspect of this task. The launcher must be loaded and armed ready for launch for a minimum of 10 seconds with no physical contact.

Vertical take off will be judged by your ability to launch the vehicle to pass through a 300mm diameter hoop held 1000mm vertically above your launcher.

**You will not be allowed to begin construction for the first 30 minutes**, during which time you should carefully consider a minimum of two possible solutions and plan your production.

Marks will be awarded for :

- evidence of planning and use of teamwork.
- analysis of the design problem and awareness of constraints.
- development work and communication of ideas.
- quality of construction and appropriate and careful use of materials.
- degree of innovation and novelty of the trigger/release mechanism.
- Successful deployment of the parachute and duration of flight
- proximity of landing to launch site
- Your portfolio

Good luck and enjoy the challenge.

# Rotary Technology Tournament



## The VTOL Launcher

### Team Materials List

Please check that you have the following materials and report any missing items to a steward within the first 15 minutes.

10mm square wood approx. 600mm length	4 lengths
Wood dowel 4mm dia.	3 lengths
A4 card – thin	3 sheets
A4 card – thick	1 sheet
Sphere	1
Plastic bag	1
Screw eyes	2
Polystyrene cup	1
Cotton	1 reel
Rubber bands	4
Sellotape	1 reel
Wire	3 m
Paper clips	4

# Rotary Technology Tournament



## Teacher Information – send to schools

### Construction Methods

Care should be taken to use construction tools carefully; use drill boards as necessary, but watch the depth drilled to avoid damage to work tables.

Various other construction methods may be facilitated to promote creative thinking such as:

- Elastic bands to make flexible wooded joints.
- Thin wire to bind wood together.
- Card reinforcement stapled to wood or card joints.
- Axle mounts made from card, with holes punched in them, stapled to a wooden frame.
- Sellotape may be used if provided with materials.
- Quick setting, general purpose, glue such as UHU or Bostic.

### Electric Motors

Some tasks involve the use of small battery powered electric motors, pulleys and elastic bands. It is essential that designs minimize friction so that the maximum power is delivered.

A knowledge of the use of pulley ratios to reduce the speed of the motor would be an advantage.

An on / off switch may need to be designed and built from limited materials.

### Materials

All tasks use a limited selection of materials to inspire creativity and planning in their use to solve the problem set by the task. No other materials are allowed.

### Portfolios

Teams may be required to produce a project portfolio to document and record their work and should include:

- All drawings and working sketches.
- Reasons for choosing the final design.
- How the team was organised
- How ideas were thought of and developed.
- Challenges that had to be overcome.

# Rotary Technology Tournament



## Information for Teams – on the day

### The VTOL Launcher

The details of the task are given on the task sheet labelled Basic, Intermediate or Advanced depending on which team you are in.

The task is to fire a sphere to a minimum height of 3 metres.

Do not let the end result of the test cloud your thinking for other parts of the task. A trigger must activate the launching of the package. Holding the elastic in the fingers, catapult style, cannot be used to activate the firing.

At the final testing, to demonstrate that your trigger works and can be held in the armed state, it will need to be left with no physical contact for a period of 10 seconds. After the 10 second period you will be asked to fire the mechanism.

(For the Advanced teams and the Teachers, they will have to operate the trigger/release mechanism from a distance of 1 metre to the **nearest** part of the body.)

The package should fly to a minimum height of 3 metres. The effectiveness of the parachute will be assessed.

Bonus points will also be awarded to the teams landing as close to the original launching point as possible.

**Basic teams do not have to** use a parachute but can if they wish.

**Intermediate teams do not have to** use a carrying vehicle but can if they wish.

**Advanced teams must use both of the above.**

**Hint:** In order to ensure opening of the parachute or disengaging from the carrier vehicle at the required height, you have a reel of cotton.

**Portfolio: You** are required to submit a project portfolio containing as a minimum:

- All drawings and working sketches
- Reasons for choosing the final design
- How the team was organised
- How ideas were thought of and developed
- Challenges that had to be overcome

Good luck and enjoy the day.

# Rotary Technology Tournament

## Re-Inventing The Wheel



Information for schools – sent in advance

**Date of Tournament and venue:** *Insert your event details*

**Time:** Schools are asked to arrive at 9.00 am, and check in. The competition will start at 9.30am and the planned finish time is anticipated as 3.30pm

Each team will consist of 4 students and if possible should have an even gender balance. The year groupings of the students is flexible and is for each school to decide. It could be all team members from the same year group or a mixture.

Basic Tasks are for students in Key Stage 3 (ages 11 to 14)

Intermediate Tasks are intended for Key Stage 4 (ages 15 to 16)

Advanced Tasks are for students in years 12 and 13 (Sixth Form)

Accompanying teachers/technicians will be expected to participate in teacher teams following the Advanced team criteria therefore please bring tools and a baseboard for the teacher.

The number of teams accepted from an individual school will be determined by the capacity of the venue and the response from schools but is anticipated as one team at each level per school.

It is advisable to inform the students that they are expected to work in teams and will be assessed on:

- Planning – use of time and resources, team organisation and management.
- Design Analysis – analysis of the problem; awareness of physical constraints and principles.
- Design Development – generation of more than one idea and the development of the solution; presentation and communication of ideas.
- Realisation – making skills; appropriate use of materials.
- Their project portfolio.

It is anticipated that schools entering Key Stage 3 and 4 teams will have either a member of staff or a technician in attendance. Please ensure that you have fulfilled LEA requirements for taking pupils out of school. **Students should have experience in the safe use of the tools listed on the tool list.**

Materials for the task are provided on the day – no extra materials should be brought along as they will not be allowed by the judges.

**Each student should bring a packed lunch and each team tools in attached list.**

continued overleaf.....

Information for schools cont.

## **Tool List**

**Each team should bring with them: (and a spare set for a Teacher team)**

**Pencils and rulers**

**Paper stapler and staples**

**Scissors**

**Paper hole punch**

**Coloured Felt tip pens**

**Pliers**

**Bradawl**

**10 sheets of A4 paper for portfolio**

**Tube of fast setting, general purpose, glue such as UHU or Bostic**

**Sandpaper, small sheet of fine and medium**

**Bench hook or small vice**

**Safety goggles**

**Junior hacksaw and dovetail saw**

**300 x 300x 10mm MDF baseboard      for each team**

## ROTARY TECHNOLOGY TOURNAMENT

### Student Feedback Form

**What did you think of it?** Please let us know so that we can make it better next time.

If you agree with a statement give it a high score, if you disagree give it a low score.

	<b>Strongly disagree</b>										<b>Strongly agree</b>
<b>Team Work</b>											
The group got on well	1	2	3	4	5	6	7	8	9	10	
The team's decisions were made by everyone	1	2	3	4	5	6	7	8	9	10	
I listened to the ideas of other team members	1	2	3	4	5	6	7	8	9	10	
Other members of the team listened to my ideas	1	2	3	4	5	6	7	8	9	10	
Arguments within the group were sorted out	1	2	3	4	5	6	7	8	9	10	
<b>Effort</b>											
I worked hard on the task	1	2	3	4	5	6	7	8	9	10	
The team, as a whole, worked hard	1	2	3	4	5	6	7	8	9	10	

**Was it Fun?**

What mark out of 10 would you give the tournament for fun?.....

**What parts did you particularly enjoy? (circle the numbers)**

1. Thinking of ways to solve the problem.
2. Making the decisions as to which idea to use.
3. Making the device.
4. Showing the assessors your work.
5. Working with others.
6. Testing the device
7. Other (if so what?).....

**What parts did you not enjoy? (circle the blobs)**

- Thinking of ways to solve the problem.
- Making the decisions as to which idea to use.
- Making the device.
- Showing the assessors your work.
- Working with others.
- Testing the device
- Other (if so what?).....

What do you think we could do to make the event even better?.....

.....

.....

**Please turn over.**

**About You.**

Did you use any tools for the first time today?  
Yes / No

Have you worked in a team before?  
Yes / No

Have you had to solve problems like this before?  
Yes / No

If yes, what sort of problem?.....  
.....  
.....

Would you like to participate again next year with a new challenge Yes / No

Did you learn anything new today – if so what? .....  
.....  
.....  
.....  
.....

# Rotary Technology Tournament

## Teacher Feedback Form

**Task**.....

### The Task

Overall suitability and relevance of the task.....

.....

Did it relate to work covered or to be covered in the curriculum? .....

How do you rate the task?

KS 3            too easy                      about right                      too hard

KS 4            too easy                      about right                      too hard

KS 5            too easy                      about right                      too hard

How could it be improved?.....

.....

### Organisation:

Please rate the pre-Event communications and information: good    adequate    poor

Please rate the organisation on the day:    good    adequate    poor

What is the best time of year to run this event?.....

Does the RTT fulfil a need?.....

General comments.....

.....

Suggestions for improvement.....

.....

### Your School:

Is arranging for students to leave school a major problem?    Yes    /    No

Your name and school .....

.....

