

## Year 9 – Developing Technology

### Task 1 – Drones Overview

Drones are playing an increasingly important role in all our lives; surveillance, leisure and potentially parcel delivery.

#### Aim

- Research the forces which act on a drone and how these are changed to manoeuvre it.
- Also investigate the materials which are used and have been developed to make drone flight possible.

#### Success Criteria

- Calculate the forces required to move the drone in a given direction.
- Explain the choice of materials used to make drones and the advantages these materials have over older materials.
- Identify situations in the home where plastic has replaced another material and explain why this has happened.

Extra task if you cannot access a computer but can use your phone.

Use this link:

<https://www.bbc.co.uk/search?q=drones>

or

Search BBC news website for “Drones”.

Watch the clip called - “The stealthy little drones that fly like insects”.

Lots of information showing a drone with flapping wings rather than propellers and talk about the advantages of this approach.

There are also other useful drone articles and videos on this site too.

## Task 1 – Drones

The physics of flight and chemistry of composition (what they are made from).

### Part 1 – How do drones get flight?

Physics revision - Forces.

Click on the links and watch the BBC bitesize clips

<https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zkcpfcw>

<https://www.bbc.co.uk/bitesize/topics/z4brd2p/articles/zr3xh39>

### Summary

There are two types of forces p\_\_\_\_\_ and p\_\_\_\_\_ .

Forces can be b\_\_\_\_\_ or u\_\_\_\_\_.

### The physics of flight

Click on the links

<https://www.youtube.com/watch?v=6Bc2nuOuRjM>

This one goes into a little more detail but the animation is very good

<https://www.wired.com/2017/05/the-physics-of-drones/>

### Key points and questions.

The force of gravity acts in which direction?

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To stay level the upward force from the propellers must equal the weight of the drone.

To move the drone higher what must happen to the upward force?

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To move the drone sideways (eg to the right) the propellers on the left hand side (1 and 4) must spin faster to give more upwards force and the propellers on the right hand side (2 and 3) must spin slower to reduce their upward force.

To stay level the total upward force must not change.



Use the above information and the drone diagram to complete the table.

The drone has a weight of 60N.

P1 means propeller 1

Run	Upthrust (N)				Total (N)	Movement	
	P1	P2	P3	P4		Up/down or level	Left/right or stationary
1	15	15	15	15			
2	20	20		20	80		
3	20	10	10	20			
4	10	10	10		40		
5	5		25	5	60		

More information about drone technology can be found at:-

[https://www.nesta.org.uk/archive-pages/drones-a-history-of-flying-robots/?qclid=Cj0KCQjws\\_r0BRCwARIsAMxfDRhvKTne7JiAsCuzt08xGaoeB5E6NkbmyOWeEX9LtnXNpy](https://www.nesta.org.uk/archive-pages/drones-a-history-of-flying-robots/?qclid=Cj0KCQjws_r0BRCwARIsAMxfDRhvKTne7JiAsCuzt08xGaoeB5E6NkbmyOWeEX9LtnXNpy)

## **Part 2 - The chemistry of composition.**

Click on the link- read the information and watch the video.

<https://matmatch.com/blog/what-are-drones-made-of/>

The article tells us that drones are made using four key types of material.

Aluminium, Lithium ion batteries, Thermoplastics and Carbon fibre reinforced composites (CRFCs).

**Use the Periodic table** given to you in the work pack which was sent home to find:-

The chemical symbol for

- a) Aluminium
- b) Lithium
- c) Carbon

Now attempt to answer these questions:

1. Which of these elements are metals and which are non-metals?
2. What raw material are plastics made from?
3. What advantage does plastics have over metal when used to build the frame of the drone?
4. Think of an object in your house which is now made of plastic but used to be made from metal. What are the advantages of using plastic?
5. Is there an object in your house that is made of metal and plastic could not replace it? Explain why.
6. When making the frame of the drone what properties are you looking for in the material being used?
7. What advantages does aluminium give when used as the cover for the motors?
8. What are the advantages of using Lithium ion batteries over Nickel-Cadmium (Ni-Cd) batteries to power the drone's motors?