

Flying Start Challenge



Materials In Engineering

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Objectives

- To be able to differentiate between material types and categorise them into groups such as metals, plastics and ceramics
- To be able to give engineering applications of various materials
- To effectively carry out material testing activities and record results
- To be able to interpret data and test results to decide and justify which material is most suitable for an aircraft wing.

Types of Materials

Complete the table below to sort the materials into categories based on their properties:

Timber, Iron, Zirconia, Mercury, UPVC, Glass, Nylon, Limestone, Aluminium, Porcelain, Acrylic, Silk, Gold, Bamboo, ABS, Mercury, Bone China.

Metal	Plastic	Ceramic	Natural
			Timber
Gold			
	Acrylic		
		Zirconia	

Select one material from each category and give an application for it. Try to stick to engineering applications. You can use the internet to do some research. There is an example below to help you.

Material	Application
Gold	Used as a conductor in electronics such as mobile phones and computers.

The design of an aircraft must take in consideration a multitude of factors such as efficiency, comfort, safety and reliability. However, the importance placed on each of these aspects entirely depends on the type of the aircraft being designed which can vary from fighter jets to commercial aeroplanes.

As a result, the design of the aircraft has to meet specific requirements which influence the complexity of its structure and the materials used in its construction. A wide range of materials may be used in the design of the aircraft to make use of properties such as strength, elasticity, specific weight and corrosion resistance.

Material testing provides vital data to design engineers which they then use to determine which materials to incorporate into their aircraft design.

You are designing the wing of a passenger plane. You need to consider the materials you will use in its construction by carrying out some material testing. Think about the properties of an aircraft wing such as: strength, weight, corrosion resistance, cost and environmental impact.

You need to carry out relevant tests on a number of materials in order to decide which material(s) is best suited for the wing design. Each test should measure one of the properties mentioned above.

You need to plan and conduct tests for **at least two** of the properties and record your findings. Carrying out additional tests and providing more detail in your methods & conclusions will allow you to gain more marks.

Here is an example of a test you could carry out:

Strength testing:

1. Choose 5 different materials to test and predict which material you think will be the strongest and the material that will be the weakest.
2. Suspend each material over a gap, such as between two piles of books, and tape down each end.
3. Place items onto the material until it breaks.
4. Weight the items and record the weight each material could withstand.
5. Rank each material from strongest to weakest in a table and see if your predictions were correct.

Once you have your test results you need to decide which material you are going to use for the aircraft wing.

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You will need to justify your answer, quoting results and data from your material tests.

You also need to explain why you have not chosen the other materials. You could talk about the costs and environmental impacts of each material - such as sustainability and carbon footprint.

