

Lesson Plan

NEUROHEADWAY

Neuroscience Into Education

Introduction to Aerospace Engineering

Learning Objectives

- What is aerospace engineering?
- Desirable properties of an aircraft
- How do aeroplanes fly
- Careers in aerospace engineering

Lesson Plan

Slide	Topic	Description	Time
1-3	Introduction to Aerospace Engineering	Introduction to aerospace. Categories of aerospace engineering. Difference between aeronautical and astronautical engineering. Examples of crafts.	10
4	Why do aeroplanes fly	General discussion and thought provocation for students on why aeroplanes fly	5
5	Activity	Practical example of why aeroplanes fly	10
6	Forces on an aeroplane	Different forces acting on a plane. Introduction to lift force based on activity. Introduction to drag force	5
7	Activity	Practical example of making an airplane	15
8-9	Review	Understanding how they paper planes in the activity performed and what characteristics should a plane ideally have	10

10	Career Options	What can an aerospace engineer take up as a career	3
11	Next Module	Brief overview of what will be covered in the next module	2

Slide 1

Aerospace engineering is a fascinating subject. What is so common now, until 120 years ago, people could only dream about flying. Write from the time, the Wright brothers invented the first plane in 1903, we have seen great improvements in the field of aviation to the point that we managed to leave earth and fly into outer space. Today we will talk about some of the marvels of aerospace engineering and try to understand how planes fly.

In this picture, we see a fighter jet with a cloud puff near its mid body. This is a very special case and happens when the plane travels faster than the speed of sound. We will talk about this in future classes.

Slide 2

When you're struggling to do a task, occasionally someone might say, "It's not rocket science!" What he or she means is that the task you're doing isn't as difficult as building rockets. Have you ever wondered who actually does plan and build rockets? Aerospace engineers do!

Slide 3

Aerospace Engineering is a vast topic. But it can be divided into two broad categories. Aeronautical Engineering and Astronautical Engineering. Aeronautical Engineering deals with machines that fly within the earth's atmosphere while Astronautical Engineering deals with exploring space and making machines that can help in this endeavour.

Further differences and examples can be given by the teacher."

Slide 4

So why do airplanes fly?

Conduct a brainstorming session in class. Encourage creativity.

Slide 5 - Activity 1: Moving air and its ability to make things fly

Materials

1. Piece of tissue paper of dimensions



Figure 1: Dimensions of paper strip

Procedure

As the student holds the piece of paper at one end, it droops down. Explain to students that this happens because of gravity.

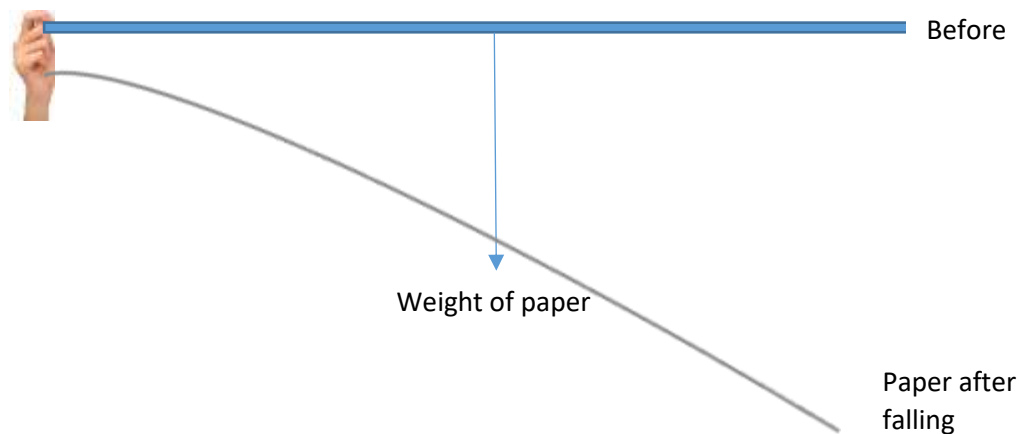


Figure 2: Initial arrangement of paper

Now, let the student blow on the piece of paper as shown in figure 3.

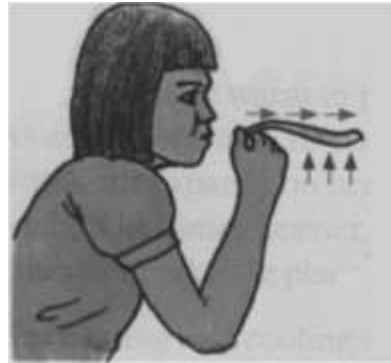


Figure 3: Depiction of procedure

We observe that the paper is pushed up and we can say that the piece of paper can now fly. Initially, gravity was pulling the paper down. But when air was blown on the top surface a counteracting force is generated on the paper which pushes the paper up. This force is called 'LIFT'.

LIFT is caused when there is a difference in pressure on two sides of the paper. When we blow air on the top surface, the pressure drops while the pressure under the paper remains the same as before. Since all objects move from high pressure to low pressure, the piece of paper goes up.

Slide 6

We learn about lift force that pushes the paper up when we blow over it. Looking at this figure, we can see that lift force acts on top of the plane which counteracts gravity.

You may ask, in airplanes, wind flows on both top and bottom of the plane. So there should be lift on both sides. The answer to this question is shape of the wing. The wing is designed in such a way that more force is generated on top than in the bottom. We can see shape of a wing in the figure.

Apart from Lift and Weight, there are two other forces. Thrust and Drag. Thrust force is generated by the big engines we see on the wings. This pushes the plane forward. Drag force is the opposite force generated because of incoming wind.

Have you tried walking on a windy day with an open umbrella? The opposing force that you feel is the drag force. These are the four major forces that act on the airplane.

If we know how to control them, we can make the plane fly.