

AEROSPACE IN CLASS
LEARNING SCENARIO

How Things Fly:
Fly, Grandma, fly!



Funded by the **Airbus Foundation** and coordinated by **European Schoolnet** (EUN – the network of 34 European Ministries of Education), the **Aerospace in Class Project** is about piloting STEM resources from the **Airbus Foundation Discovery Space**, a digital portal for aerospace exploration, connecting students, parents and educators across the globe with professionals in the field, bringing today's research and technology to life. The creation of this Learning Scenario is supported the **STEM Alliance** (an initiative that brings together industries, Ministries of Education, and education stakeholders to promote STEM education and careers to young Europeans) and by **Scientix**, funded from the European Union's H2020 research and innovation programme – project Scientix 4 (Grant agreement N. 101000063). The content of the document is the sole responsibility of the organizer and does not represent the opinion of the European Commission (EC), nor is the EC responsible for any use that might be made of the information contained.

How Things Fly: Fly, Grandma, fly!

By Nektarios Farassopoulos

Abstract

Grandma Mary is very scared of flying in bad weather. In this Learning Scenario, students will experiment with a DIY (Do it yourself) glider and create a presentation / poster to persuade Grandma Mary how safe it is to fly despite bad weather conditions.

The learning scenario is addressed to primary school students aged 8 to 12 years old. Students will understand how a plane can fly safely in bad weather conditions. Also, they will experiment with planes, create a simple electrical circuit and, finally, using their creativity (arts, crafts and/or a computer, if available) they will present their conclusions on how planes are protected during a storm.

Keywords

Means of Transport, Flight, Weather, Electrical Circuit, Simulations, Experiments

Table of summary	
Subject	Environmental Studies, Physics, Language, STEM, Art
Topic	Science of flight, electrical circuits
Age of students	8-12 years old
Preparation time	Ca. 30 minutes
Teaching time	135 minutes (3 sessions of 45 minutes each; depending on the age of students) ¹
Online teaching material	Voki (http://tinyurl.com/vjns9a6) or similar way of introducing Grandma Mary's fear of flying. DIY electrical circuit instructions: https://www.wikihow.com/Make-a-Simple-Electrical-Circuit https://www.youtube.com/watch?v=oDUAvXsK1g Electrical circuit simulation: https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc
Offline teaching material	Paper, crayons, scissors, markers, carton paper, aluminium foil, batteries, cable, hair dryer, fridge
Airbus Foundation Discovery Space resources used	How airplanes fly in bad weather DIY Glider in 9 steps: https://www.instructables.com/id/DIY-Glider/

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¹ If rushed, teachers may want to extend the time teaching this learning scenario. A couple of extra sessions of 45 minutes each could be beneficial to students.

Integration into the curriculum

The Greek national curriculum stipulates that:

- In the fourth grade, students learn about means of transport.
- In the fifth grade, students learn about weather and its effects on our daily life.
- In the fifth grade, students learn to make their own simple electrical circuits.

In other curricula they include these topics as well although it might be at different ages.

Aim of the lesson

Students will understand how a plane can fly safely in bad weather conditions.

Students use their creativity to experiment with planes.

Students will use arts and crafts (or a computer, if available) to present their conclusions on how planes are protected during a storm.

Outcome of the lesson

After creating a DIY glider and experimenting with it, students will present their conclusions in the form of a poster or a presentation.

Trends

Collaborative learning: Learning and working in pairs/small groups

Project-based learning: Students solve a problem according to the instructions that are given to them.

21st century skills

- **Creativity:** students can develop their creativity through interesting experiments and making a presentation
- **Collaboration:** by working in small groups (3-4 students each) students can learn how to work together, exchange ideas and learn by their peers' comments
- **Communication:** students can enhance their communication skills by presenting their conclusions to their classmates in a successful way.

Activities

Activity	Procedure	Time
	Session 1	45 min
1. Problem	Students are introduced to Grandma Mary's problem: <i>"Grandma Mary lives in South-o-polis and wants to travel to North-o-polis to visit her grandson who is an Erasmus+ student there. Her only option is using an airplane. But this is her first time flying. She is very scared especially of flying in bad weather conditions. She wants to visit her grandson very much, but she can't overcome her fear!"</i>	5 min

Activity	Procedure	Time
	<p>Students are asked to persuade Grandma Mary that it is safe to travel by plane even during winter when the weather is bad.</p> <p>One way of introducing the problem is via Voki: http://tinyurl.com/vjns9a6</p>	
2. Conversation	<p>The teacher and the students will discuss the problem and where they can look for more information. Possible sources of information include:</p> <ul style="list-style-type: none"> - https://www.flights.com/blog/is-it-safe-to-fly-through-a-storm/ - https://en.wikipedia.org/wiki/Aviation_safety#Aviation_safety_hazards <p>Alternative/additional activities for younger students:²</p> <p>Teachers will separate the students in small groups. Instead of performing experiments students will draw in groups what they think it would happen in each case.</p> <p>Carefully read the following questions and create your own paintings. If you are still in school, you can use paper and crayons. If you have computer/tablets in your class, you can use a paint app and if you are on distance learning you can use this app for collaborative paintings: https://awwapp.com/#</p> <p>Q1: What would happen if a plane flies during rain?</p> <p>Q2: What would happen if a plane flies during a thunderstorm with lightning?</p> <p>Q3: What would happen if a plane flies during snowing?</p>	10 min
3. Video	<p>Students will watch the Airbus Foundation Discovery Space video on how planes fly in bad weather.</p>	5 min
4. Instructions	<p>Students will be given the following task: They have to experiment with a DIY glider and then create a poster or a presentation to persuade Grandma Mary that it is safe to travel by plane even in bad weather conditions.</p>	5 min
5. DIY glider	<p>Following the Instructables, students will create their own DIY glider in small groups.</p>	20 min
Session 2		45 min
6. Test glider	<p>Students and the teacher can test the gliders and how they fly indoors and outdoors (optional).</p>	15 min

² Extra time should be added to the learning scenario if teachers decide to do this extra activity.

Activity	Procedure	Time
7. Experiment 1 - Rain	The first weather condition to experiment on is rain. In small groups, the students can use different materials (e.g., paper, plastic membrane and cloth) to fold their glider and then try to sprinkle water on it. Then, they check if their glider is wet. They will conclude that if they use aluminium foil (as the aluminium which is used in real planes and it has been mentioned in the airbus video), the glider will stay dry. Then they test to see if it still flies as before.	15 min
8. Simple electrical circuit	<p>Students in small groups will create a small circuit based on these instructions:</p> <p>https://www.wikihow.com/Make-a-Simple-Electrical-Circuit</p> <p>Also, if it is possible, they can use this simulation:</p> <p>https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc</p> <ul style="list-style-type: none"> - The wires should be insulated for safety reasons - The light bulb is better to be around 15-25 volts so a single battery can power it - You can easily attach the wires on a 4.5-volt battery or on a 9-volt battery. <p>Teachers should give enough time to students to make their experiments on how they should connect all the parts to make the bulb light up. The teachers should avoid showing the right "answer" and should let the students to find out for themselves the right way to connect all the parts of the circuit.</p>	15 min
Session 3		45 min
9. Experiment 2 - Lightning	The second weather condition to experiment on is lightning. They will keep their glider folded with aluminium foil and using the electrical circuit they will try to understand if the metal can protect the plane from lightning. (Unfolding the glider, they will notice that the carton is not burned). Then they test to see if it still flies as before.	15 min
10. Experiment 3 - Ice	<p>The third weather condition to experiment on is ice (snow). The teacher prepares this experiment a few hours before the class (or students prepare it for the next day). He/she puts a glider covered with aluminium foil in the freezer. After a few hours they get the glider out of the freezer and use a hair dryer to melt the ice (simulating Bleed Air as it has been mentioned in the Airbus Foundation Video). Then they test to see if it still flies as before.</p> <p>In case there is no available fridge in the school this experiment can be performed as homework with the help of the parents.</p>	15 min
11. Poster / Presentation	After all the experiments, students will create posters (using craft materials) or presentations (using a PC and an app) in	15 min

Activity	Procedure	Time
	small groups to present their conclusions and persuade grandma Mary it is totally safe to travel by an airplane in bad weather conditions.	

Assessment

Questionnaires (can be used before and after the implementation of the learning scenario). See [Annex 1: Quiz Sample Questions](#). Answers to the quiz can be found in [Annex 2](#).

Teacher's feedback

The author of the Learning Scenario adapted the lesson for online teaching through a number of online activities. Detailed information can be found in [Annex 3](#).

About the Aerospace in Class Project

The "Aerospace in Class" Project is about integrating STEM resources from the Airbus Foundation Discovery Space in classes for 8- to 12-year-old students. The project is funded by the **Airbus Foundation** which is committed to bringing together the products and people of the global aerospace company Airbus to help address the challenges of today's society. Youth development is one of the pillars upon which the Airbus Foundation is built, empowering young people for the challenges of tomorrow. The **Airbus Foundation Discovery Space** is a [digital portal](#) for aerospace exploration, connecting students, parents and educators across the globe with professionals in the field, bringing today's research and technology to life. [European Schoolnet](#) is coordinating this project. EUN is the network of 34 European Ministries of Education, based in Brussels, which aims to bring innovation in teaching and learning to its key stakeholders: Ministries of Education, schools, teachers, researchers, and industry partners.



The "Aerospace in Class" Project has also been supported by the STE(A)M Partnerships programme of Scientix, funded from the European Union's H2020 research and innovation programme – project Scientix 4 (Grant Agreement N. 101000063), coordinated by European Schoolnet (EUN). The content of the document is the sole responsibility of the organizer and it does not represent the opinion of the European Commission (EC), and the EC is not responsible for any use that might be made of information contained.

Annex 1: Quiz Sample Questions

True or False:

1. Airplanes use iron to protect from the storm.
2. A plane is made mostly of aluminium.
3. After a storm, the airplane has many scratches.
4. When a lightning strikes, aluminium guides the electricity of the plane.
5. If it is too stormy the plane will not fly for a bit, till the storm passes.
6. Rain drops glide off the plane when it flies.
7. When it is snowing, the planes do not fly.

Poll:

- a) Would you fly when it rains?
- b) Would you fly when it snows?
- c) Would you fly during a storm?
- d) Is it safe to fly in any weather conditions?

Annex 2: Answers to the quiz

1. False
2. True
3. False
4. True
5. True
6. True
7. False

Annex 3: Adaptions for Online Implementation

Introduction (Quiz)

Grandma Mary has a problem. Watch her speaking <http://tinyurl.com/vjns9a6> and answer the following questions:

1. What does she want?
 - a) To go on vacation
 - b) To visit her sister
 - c) *To visit her grandson*

2. What means of transportation does she need to use?
 - a) Ship
 - b) *Aeroplane*
 - c) Train

3. What is her problem?
 - a) The tickets are too expensive
 - b) There are no more tickets available
 - c) *She is afraid of flying in bad weather conditions*

Watch the Airbus video on [How Airplanes Fly in Bad Weather](#) and answer the following questions:

1. According to the video, is a plane safe to fly in bad weather conditions?
 - a) *True*
 - b) False

2. According to the video, a plane is made mostly of aluminium
 - a) *True*
 - b) False

3. According to the video, after a storm, the airplane has many scratches.
 - a) True
 - b) *False*

4. According to the video, when a bolt of lightning strikes aluminium guides the electricity off the plane
 - a) *True*
 - b) False

5. According to the video, if it is too stormy the plane will not fly for a bit, till the storm passes

- a) *True*
- b) *False*

6. According to the video, raindrops glide off the plane when it flies
- a) *True*
 - b) *False*

7. According to the video, when it is snowing the planes do not fly
- a) *True*
 - b) *False*

Conversation

In the following questions, there is no right or wrong answer. You just express your opinion.

1. Should Grandma Mary fly?
2. Is it safe to fly when it rains?
3. Is it safe to fly when it snows?
4. Is it safe to fly during a storm?
5. Do the weather conditions affect a flight?

Glider (poll)

Follow the instructions and create their own DIY glider: <https://www.instructables.com/id/DIY-Glider/> (you can ask an adult to help you).

1. Did you manage to create the glider?
 - a) Yes
 - b) No

2. How easy did you find the construction?
 - (very easy) 1 - 2 - 3 - 4 - 5 (very hard)

3. Did the glider manage to fly?
 - (very easily) 1 - 2 - 3 - 4 - 5 (not at all)

Experiment 1 - Rain

Fold the glider with aluminium foil and drop some water drops on it.

1. The water drops...
 - Stayed on the glider's surface
 - Slid down

2. The aluminium foil...
 - Is destroyed by the water
 - Has no damage

3. Unfold the aluminium foil. What do you see?
 - The glider does not have any damage
 - The glider has minor damages
 - The glider is destroyed

4. Unfold the aluminium and try to fly the glider again. Does it fly as previously?
 - Yes
 - No

5. Which are your conclusions?
 - The aeroplane is protected by the aluminium
 - The aeroplane is not protected by the aluminium

Experiment 2 - Lightning

The second weather condition to experiment on is lightning. You have to keep your glider folded with aluminium foil and, using the electrical circuit, you will try to understand if the metal can protect the plane from lightning. Then you can test the glider to see if it still flies as before.

Circuit instructions: <https://www.wikihow.com/Make-a-Simple-Electrical-Circuit>

Circuit simulation: <https://phet.colorado.edu/en/simulation/circuit-construction-kit-dc>

1. After the lightning, is the glider burnt?
 - Yes
 - No

2. Unfold the aluminium foil. What do you see?
 - The glider has no damage
 - The glider has minor damages
 - The glider is destroyed

3. Unfold the aluminium and try to fly the glider again. Does it fly as previously?

- Yes
- No

4. Which are your conclusions?

- The aeroplane is protected by the aluminium
- The aeroplane is not protected by the aluminium

Experiment 3 - Snow

You have to put the glider covered with aluminium foil in the freezer. After a few hours, you can get the glider out of the freezer and use a hairdryer to melt the ice (simulating Bleed Air as it has been mentioned in the Airbus Foundation Video). Then you can test to see if it still flies as before.

1. Unfold the aluminium foil. What do you see?

- The glider doesn't have any damage
- The glider has minor damages
- The glider is destroyed

2. Unfold the aluminium and try to fly the glider again. Does it fly as previously?

- Yes
- No

3. Which are your conclusions?

- The aeroplane is protected by the aluminium
- The aeroplane is not protected by the aluminium