Junior Tech Challenge

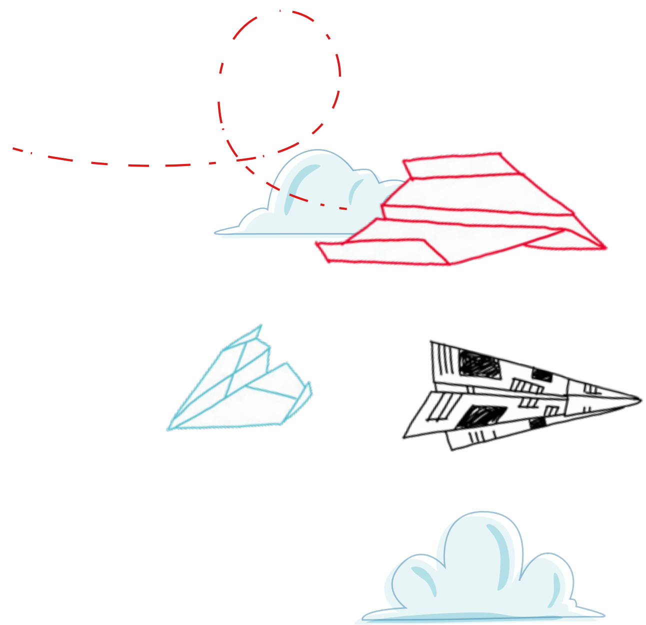
The practical side of science and tech

STUDENT HANDBOOK

Intended for:
Intensive ESL Project, Elementary Cycle 3
Science and Technology Program, Elementary Cycle 2 & 3

TAKE OFF!

2023-2024 EDITION



Name:

Team Members:

Team Name:

A program of

RÉSEAU TECHNOSCIENCE
Together for a new scientific generation

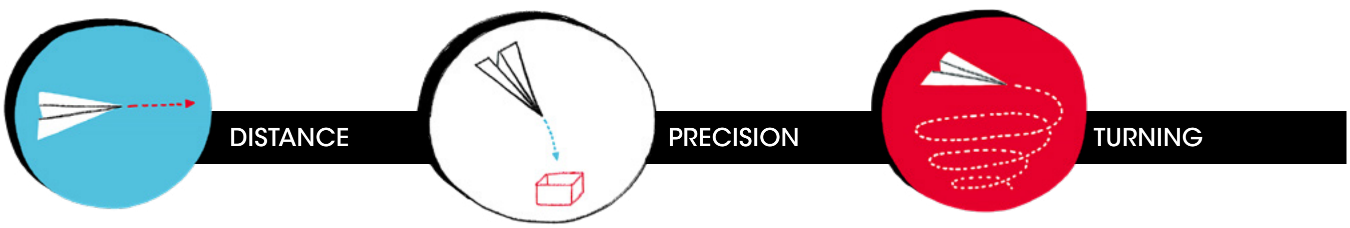
We've just received some troubling news! The city's carrier pigeons have fallen ill with a rare disease! But don't you worry, with a bit of rest, they will all make a full recovery. The real concern now is who will step in during their absence? There are hundreds of people eagerly awaiting messages transported by these pigeons, so we must find a solution soon!

Do you have any ideas on how to help them? There must be a way! What if you were to construct paper airplanes that will carry these messages to their intended recipients? But be warned, to effectively replace the pigeons, your airplanes must be capable of flying long distances, be precise, and some of them may even need to execute turns.

Do you have any ideas on how to build a paper airplane that will carry out this mission? One thing is for sure: the carrier pigeons are counting on your help!

THE CHALLENGE

To design paper airplanes that will complete different tasks.



YOUR MISSION

CYCLE 2

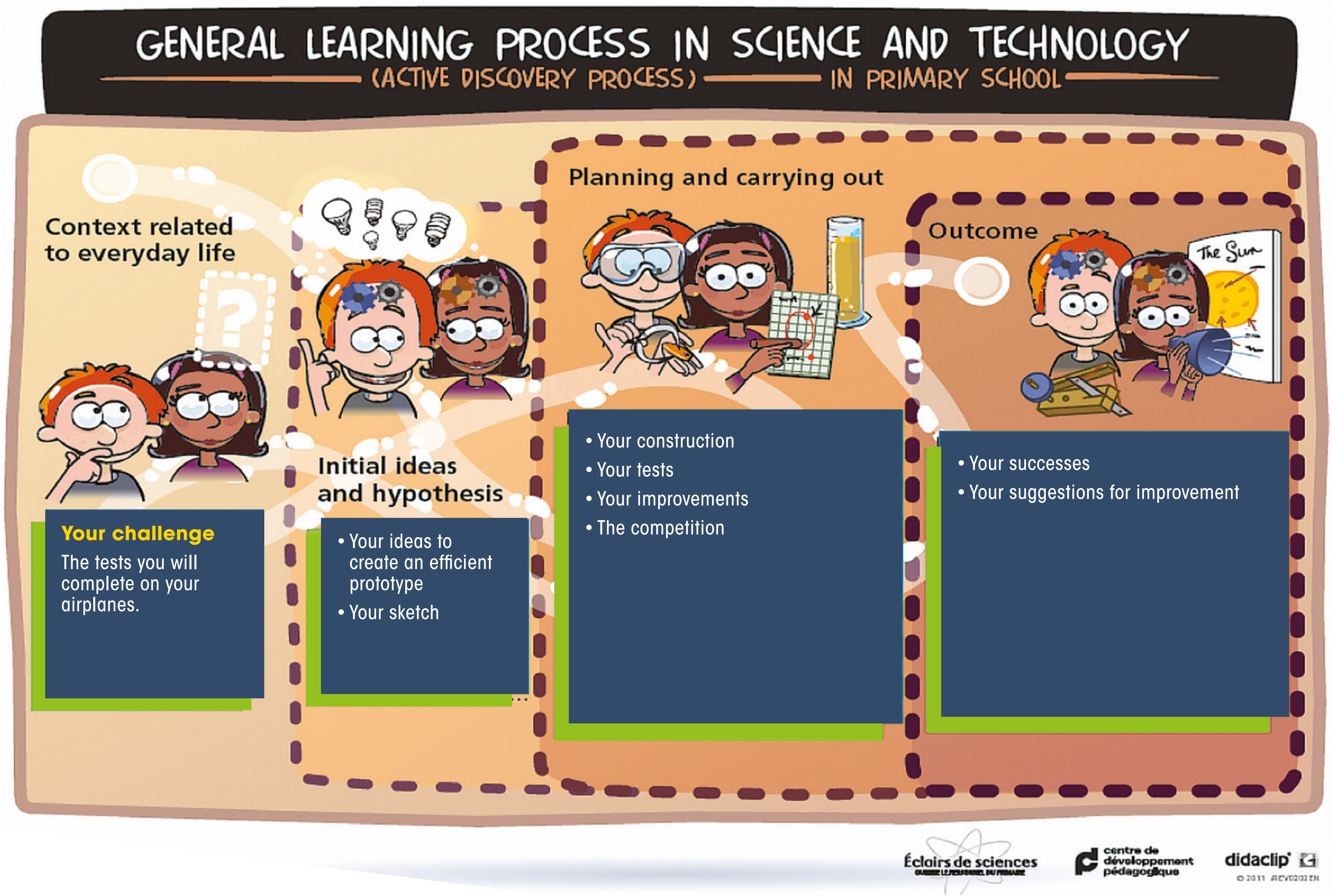
Design at least two different paper airplanes that will complete three challenges.
(1 or 2 challenges per airplane)

CYCLE 3

Design three different paper airplanes that will complete three challenges.
(1 challenge per airplane)

MATERIALS

To complete this challenge, your task is to craft paper airplanes using standard letter-sized printing paper, with a maximum size of 8 ½″ x 11″ inches. You can use adhesive tape or stickers, and the airplanes can be made up of more than one sheet of paper.


GENERAL LEARNING PROCESS IN SCIENCE AND TECHNOLOGY
(ACTIVE DISCOVERY PROCESS) IN PRIMARY SCHOOL
Context related to everyday life
Your challenge
The tests you will complete on your airplanes.
Initial ideas and hypothesis
• Your ideas to create an efficient prototype
• Your sketch
Planning and carrying out
• Your construction
• Your tests
• Your improvements
• The competition
Outcome
The Sun
• Your successes
• Your suggestions for improvement
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ACTIVITY 1 - FIRST FLIGHT

Legend

Folding to be carried out

Fold line

Front of sheet

Back of sheet

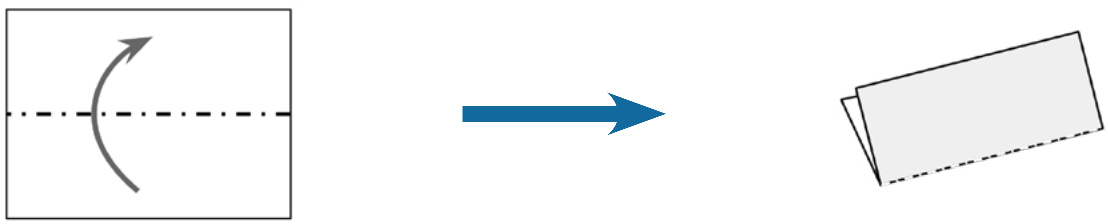
BUILDING AND FLYING A PAPER AIRPLANE

Follow these instructions to build the following paper airplane.

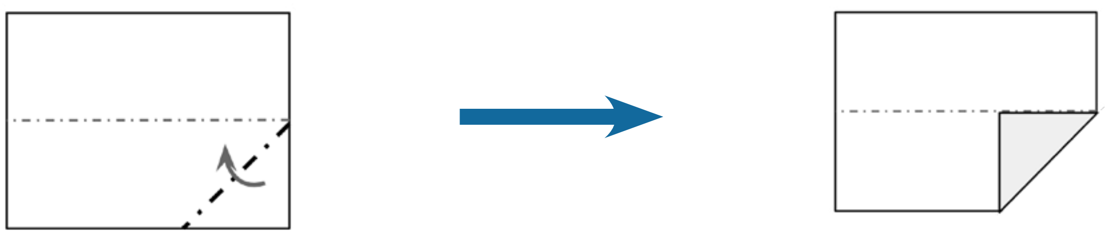
THE HUNTER MODEL

Steps | **Action** → **Results**

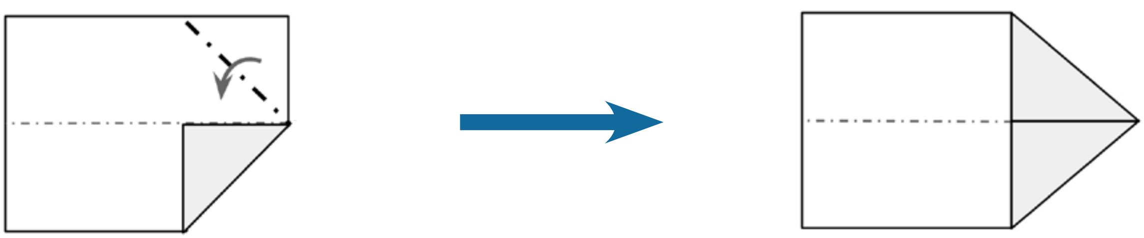
1 Take an 8.5″ x 11″ sheet of paper and fold the sheet in half lengthwise.



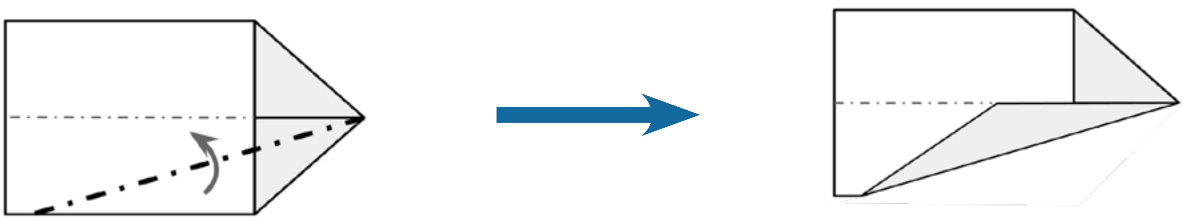
2 Unfold the sheet and fold the bottom right corner until it reaches the middle fold line.



3 Fold the top right corner until it reaches the middle fold line.



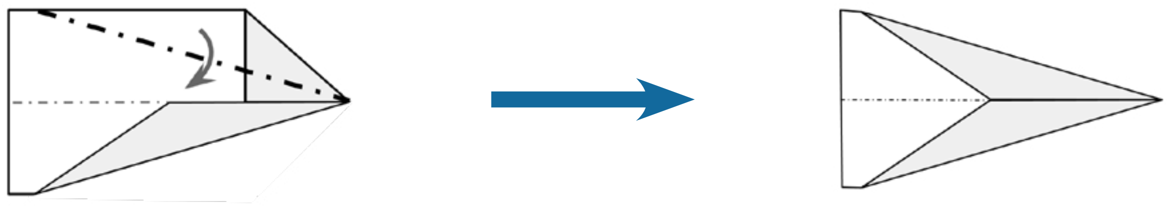
4 Fold the bottom right corner towards the middle fold line.



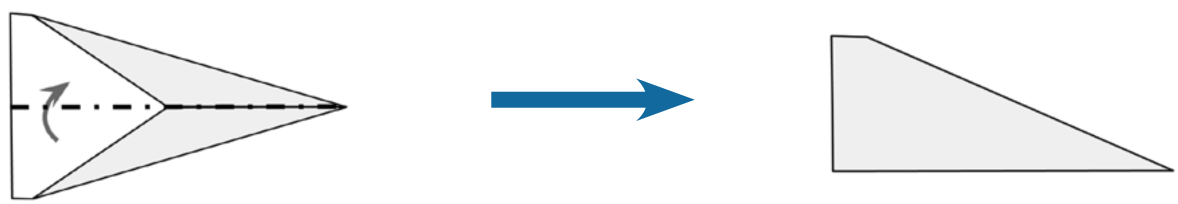
ACTIVITY 1 • FIRST FLIGHT (CONT.)

Steps | **Action** → **Results**

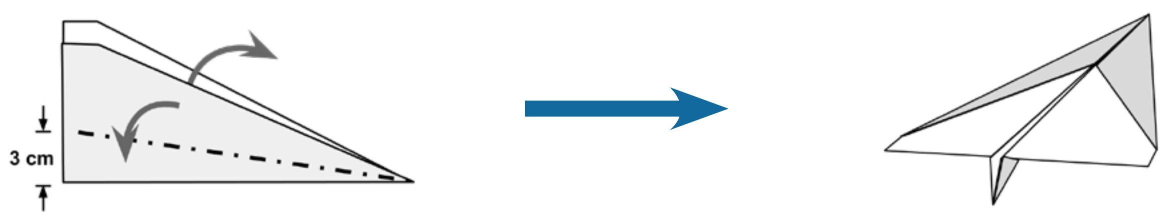
5 Fold the top right corner towards the middle fold line.



6 Refold the plane along the middle fold line.



7 Make the wings by folding the top parts of the plane along a diagonal line that goes from approximately 3 cm on the back of the plane up to its nose.

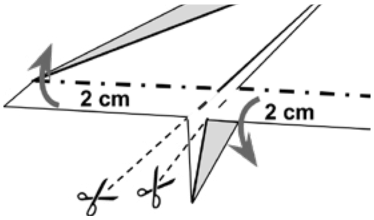


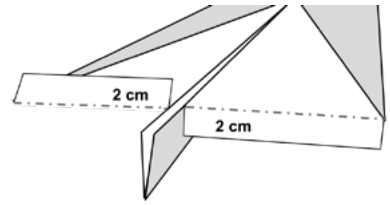
TEST YOUR AIRPLANE! HOW DOES IT REACT...?

Test Launches	Observations
... when you throw it using a light force?	
... when you throw it using a lot of force?	
... when you throw it with its nose pointing upwards?	
... when you throw it with its nose pointing downwards?	

MAKING THE WINGLETS

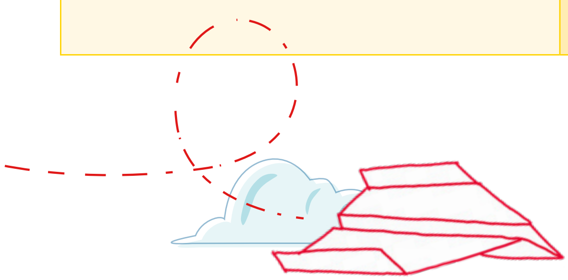
Steps	Action →	Results
8	Make a 2-cm incision on both wings along the fuselage. Fold the winglets in a way that allows you to position them upward or downward.	





DIFFERENT POSITIONS OF WINGLETS ON THE AIRPLANE.

 Neutral position	 Left winglet up	 Right winglet up
 Left winglet down	 Right winglet down	 Left and right winglets up
 Left and right winglets down	 Left winglet down and right winglet up	 Left winglet up and right winglet down



TESTING TIME!

What do you think will happen to the airplane with the winglets in the following position? Test your hypothesis.

MY FIRST FLIGHT	My Hypothesis
	**I think the paper airplane will...** ☐ fly in a straight line ☐ take a nosedive ☐ turn left ☐ spin ☐ turn right ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	
Conclusion	
I conclude that in this position, the winglets allow…	

MY SECOND FLIGHT	My Hypothesis
	**I think the paper airplane will...** ☐ fly in a straight line ☐ take a nosedive ☐ turn left ☐ spin ☐ turn right ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	
Conclusion	
I conclude that in this position, the winglets allow…	

MY THIRD FLIGHT	My Hypothesis
	**I think the paper airplane will...** ☐ fly in a straight line ☐ turn left ☐ turn right ☐ take a nosedive ☐ spin ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	

Conclusion

I conclude that in this position, the winglets allow…

MY FOURTH FLIGHT	My Hypothesis
 *Draw the position of the winglets.*	**I think the paper airplane will...** ☐ fly in a straight line ☐ turn left ☐ turn right ☐ take a nosedive ☐ spin ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	

Conclusion

I conclude that in this position, the winglets allow…

MY FIFTH FLIGHT	My Hypothesis
 *Draw the position of the winglets.*	**I think the paper airplane will…** ☐ fly in a straight line ☐ turn left ☐ turn right ☐ take a nosedive ☐ spin ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	

Conclusion

I conclude that in this position, the winglets allow…

MY SIXTH FLIGHT	My Hypothesis
 *Draw the position of the winglets.*	**I think the paper airplane will…** ☐ fly in a straight line ☐ turn left ☐ turn right ☐ take a nosedive ☐ spin ☐ make a loop
Test Launch	**Observations**
1st launch	
2nd launch	
3rd launch	

Conclusion

I conclude that in this position, the winglets allow…

ACTIVITY 2 - IT'S ALL ABOUT THE DESIGN!

Piece of paper

Book

1. If we drop these two objects from the same height and at the same time, which one will touch the ground first? Circle the object of your choice.

Explain your answer.

2. Is it possible for the sheet of paper and the book touch the ground at the same time? Explain your hypothesis.

I think that

Because

3. If we drop both bottles (*one empty and one full*) at the same time from a one-meter height, which one will hit the ground first?

Put an X in the box next to your prediction and explain it. After the experiment, put an X next to the result.

Prediction	☐ Empty ☐ Full ☐ Both will hit the ground at the same time.	Explanation: ______________________________ ______________________________ ______________________________
Result	☐ Empty ☐ Full ☐ Both hit the ground at the same time.	

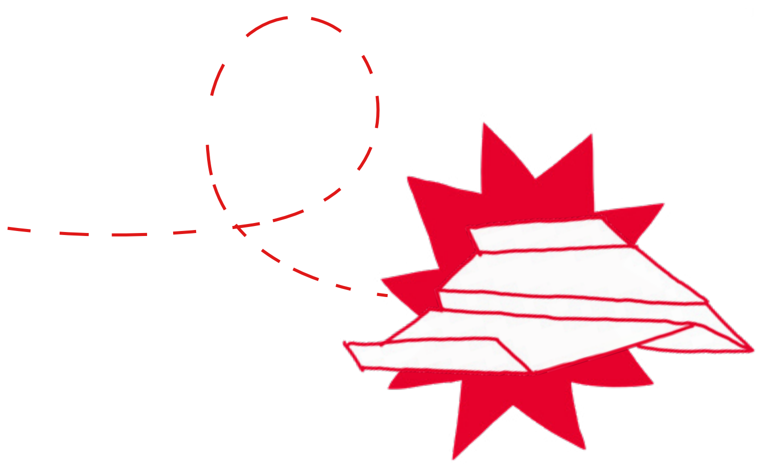
4. Will both sheets of paper touch the ground at the same time? For each situation, put an X next to your prediction. After the experiment, put an X next to the result.

	A	B	A	B	A	B
						
Prediction	☐ Yes ☐ No		☐ Yes ☐ No		☐ Yes ☐ No	
Result	☐ Yes ☐ No		☐ Yes ☐ No		☐ Yes ☐ No	

5. Conclusion : On Earth, everything is pulled towards the ground by gravity. To slow down a falling object, you must modify its

____

6. What will be important to remember about these experiments when you design your paper airplanes?



ACTIVITY 3 – WHICH MODELS WILL YOU CHOOSE?

Material: sheets of paper, adhesive tape, scissors, ruler.

♻ You can use paper from the recycling bin!

1. Review the airplane plans proposed by your teacher.
2. Choose and build 2 to 3 different airplane models.
3. Test each of your models using the types of observations in the table.
4. Compare and discuss your results with your classmates. Make a list of models that offered the best performances and note the elements that you could use in your future design.

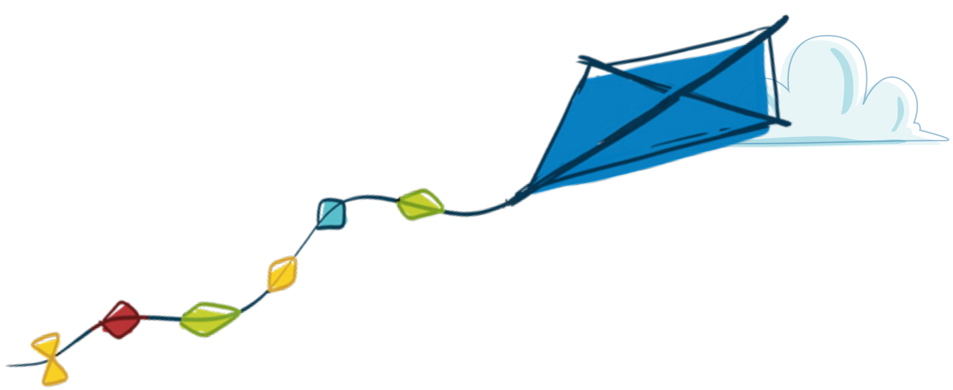
OBSERVATIONS OF MODELS

Types of observations	Name of model		
Distance travelled by the airplane (in cm).			
The frequency that the airplane landed at its intended destination.	☐ Always ☐ Often ☐ Sometimes ☐ Never	☐ Always ☐ Often ☐ Sometimes ☐ Never	☐ Always ☐ Often ☐ Sometimes ☐ Never
The ability of the airplane to execute turns. *Note: If there are winglets, note their position.*	☐ Right ☐ Left ☐ No turns	☐ Right ☐ Left ☐ No turns	☐ Right ☐ Left ☐ No turns

ACTIVITY 3 - WHICH MODELS WILL YOU CHOOSE? (CONT.)

COMPARING MODELS

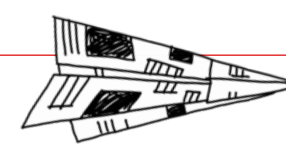
Types of observations	Name of model
Which model travels the greatest distance?	
Which model is the most precise in hitting a target on the ground?	
Which model can execute a right or a left turn?	



ACTIVITY 3 - WHICH MODELS WILL YOU CHOOSE? (CONT.)

FACTORS THAT INFLUENCE FLIGHT

Factors	How do these factors affect the flight of a paper airplane?
Shape of the airplane *(i.e. long, large, pointy nose, square nose, etc.)*.	
Shape and position of wings *(i.e. small, large, curved, near the middle, near the back, etc.)*	
Added winglets and their positions	
How the airplane is thrown *(force of the throw, angle of the incline, etc.)*	
Other:	



PREPARING TO MEET THE CHALLENGE

REVIEWING THE CHALLENGE

Before you start working on your airplanes, it's best to make sure that everything is in order. Let's review the design rules. Remember that the goal is to deliver messages to the people who are waiting for them!

Teams can use only the materials identified below:

- Letter-sized printing paper (up to 8 ½" x 11")
- Adhesive tape
- Stickers

The airplanes must resemble paper planes.
Planes can be made up of several sheets of paper.
Each model must be different and is required to pass at least one test.
The number(s) of each event to be completed must be written on the wing of each plane.

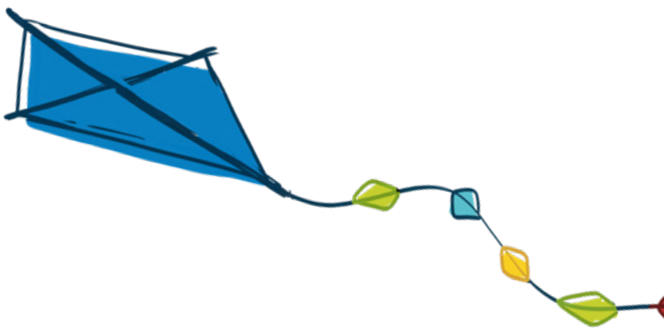
ALL ABOARD!

Research new paper airplane designs and find new ideas!

CHALLENGE 1 : DISTANCE

Which model(s) will you test? How many sheets of paper will you use?

Why did you make these choices?



CHALLENGE 2 : PRECISION

Which model(s) will you test? How many sheets of paper will you use?

Why did you make these choices?

CHALLENGE 3 : TURNING

Which model(s) will you test? How many sheets of paper will you use?

Why did you make these choices?

Criteria 1 – Appropriate description of the problem	A	B	C	D
Formulation of complete and relevant solutions				

ONE, TWO, THREE, TESTING!

Feel free to do more tests than the number suggested.

For each test, make note of your observations and any modifications that will improve your prototype.

CHALLENGE 1 : DISTANCE

Test	Model (name or number)	Distance travelled (in cm)	Problem(s) encountered	Modification(s) made
1				
2				
3				
4				
5				
6				

ONE, TWO, THREE, TESTING! (CONT.)

Test	Model (name or number)	Distance travelled (in cm)	Problem(s) encountered	Modification(s) made
7				
8				
9				
10				

Which one of your models succeeded best in this challenge? ______________________________

Based on what you have learned, explain why this airplane performed better than the others.

ONE, TWO, THREE, TESTING! (CONT.)

CHALLENGE 2 : PRECISION

Test	Model (name or number)	Location where airplane landed	Problem(s) encountered	Modification(s) made
1				
2				
3				
4				
5				
6				

ONE, TWO, THREE, TESTING! (CONT.)

Test	Model (name or number)	Location where airplane landed	Problem(s) encountered	Modification(s) made
7				
8				
9				
10				

Which one of your models succeeded best in this challenge? ______________________________

Based on what you have learned, explain why this airplane better than the others.

ONE, TWO, THREE, TESTING! (CONT.)

CHALLENGE 3 : TURNING

Test	Model (name or number)	Direction plane turned	Problem(s) encountered	Modification(s) made
1				
2				
3				
4				
5				
6				

ONE, TWO, THREE, TESTING! (CONT.)

Test	Model (name or number)	Direction plane turned	Problem(s) encountered	Modification(s) made
7				
8				
9				
10				

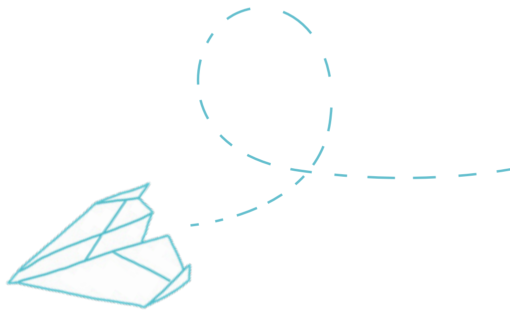
Which one of your models succeeded best in this challenge? ____________________

Based on what you have learned, explain why this airplane better than the others.

ONE, TWO, THREE, TESTING! (CONT.)

Now that you've completed all your tests, which models will you choose to use for the competition?

What are the differences among the models you've chosen in the tests leading up to the challenge?



Criteria 2 – Application of an appropriate procedure	A	B	C	D
Readjustment of procedure, as required				
Criteria 3 - Appropriate use of instruments, tools or techniques	A	B	C	D
Appropriate handling of tools and instruments				

TIME FOR TAKE OFF!

Are your planes ready? It's time to show off your skills and get ready for take-off!

Carry out the final test with your prototype.

Points will be calculated in the following way:

CYCLE 2

Best launch of Challenge 1 *(Distance)*	+	Two launches from Challenge 2 *(Precision)*	+	Two launches of Challenge 3 *(Turning)*	=	Total points

CYCLE 3

Best launch of Challenge 1 *(Distance)*	+	Two launches from Challenge 2 *(Precision)*	+	Best launch of each turn of Challenge 3 *(Turning)*	=	Total points

Here are some guidelines to follow during the competition:

- Do not cross the starting line with your feet.
- Throw the plane by hand.
- For the turn, throw the plane perpendicular to the starting line.

Make sure you think about how to launch your plane and consider what might affect its flight in the competition.

SCORING

Challenge 1 - Distance		*Challenge 2 - Precision*				*Challenge 3 - Turning*
	+		+		+	

Final score

=

REFLECTION

1. What was your best idea while planning or making your airplanes?
   My best idea was:

   Explain why:

2. What modification or adjustment would you make on one of your airplanes to make it fly more effectively?
   My modification would be:

   Explain why:

Criteria 4 - Appropriate use of scientific and technological knowledge	A	B	C	D
Produces explanations and uses terminology specific to Science and Technology				