

# Flight Dreams - Folding into Flight

Title: Folding into Flight

Developed by: Rita Wilson

**Suggested Grade Level(s):** P-6 and can be adapted at all elementary grade levels and possibly for basic introduction to flight for secondary school students as well. With younger children, extra sets of helping hands would be valuable. With older children, there are many possible extensions of each experiment.

**Suggested Length of Class Time:** This lesson is composed of three different paper airplane design/constructions. They can be done separately, over a period of days, or in combination. There are potential extensions for each experiment. The estimated time for each experiment is noted and does not include the extensions. The times allow for students (or the class as a whole) to record what happened.

**Subject areas:** Language arts, Science, Math, Art

**Rationale:** These hands on lessons give students an opportunity to experience the basic principles of flight through the familiarity of paper airplanes. The designs chosen are simple enough that every student can be successful. They can be extended past the initial folding and flying to introduce the idea of controls, elevators, rudders, and ailerons. Students can experiment, design, observe, record, and have fun.

**Logistics:** The actual enactment of the individual experiments will depend on the age of your students. Planes can be folded step by step as a whole group at a centre with adult guidance or in small groups working together from instruction sheets.

\*When setting up, it is important (and makes success more likely) if you have a sample of each step of the plane folded in advance (labeled with the step number), so that you can show them what it will look like as you do that step. By practicing ahead yourself, it will be much easier to guide the students.

## *Classroom setup:*

It's important to be aware that you need a space for the students to fly their planes - a clear space and high ceiling. If you're having students measure distance, you might want to mark the floor with tape each metre or five metres, whatever you decide as a class.

## *Materials:*

- Paper – this can be from the recycle bin, as long as it is flat. 8 ½ x11. If you decide to introduce variable later, you can use different weights of paper and have students note the differences
- Tape
- Pencil

- Ruler
- Recording sheets (see appendix)

*Optional* – Markers, crayons, to decorate planes and Scissors for experimenting with elevators, etc.

*Suggested Resources:*

- Introductory Flight lesson plan: "Flight Dreams – Flight Factors"
- Bibliography (see appendix)

**Suggested Outcomes:**

*Science:*

- Explore how characteristics may change through manipulation
- Explore movement of birds, planes
- Identify, solve and evaluate problems that arise while constructing objects
- Use materials to build objects that move in a specific manner
- Describe position of objects
- Identify factors that affect movement

*Math:*

- Demonstrate an understanding of and apply concepts and skills associated with measurement
- Develop spatial sense and understanding of position in space
- Solve problems involving the collection, display and analysis of data

*Language Arts:*

- Explore possible solutions to problems
- Respond to and give simple directions
- Record experiences
- Engage in a research project

*Art:*

- Explore and manipulate a range of materials

**Introduction:**

This lesson would be a valuable follow-up to "Flight Factors", giving students the chance to experience and experiment with the creation of their own flying machines, after gaining an understanding of the basic principles. Start with a graph with results of the following questions:

- Who has made a paper plane, who hasn't?
- Did it fly, didn't it?

Or present a challenge. Show them a piece of paper and ask for suggestions about how they could make it fly. (They could work in small groups for five minutes and bring back their results to share with the other children.)

Explain that they will have the opportunity to act as aeronautical engineers (makers of paper airplanes) for the next few days. They will construct three different planes. If you

are going to extend the lesson to the basic engineering for controlling the planes, you can mention that at this point.

*\*If you are ending with an “Air Fair”, this would be a great time to introduce that idea, so they'll be aware of what they're working towards.*

### Suggestions for Teaching and Learning:

Decide what you want to do with each experiment. It's possible to decorate planes with markers, crayons, etc. It's also possible to use the Aviation Alphabet (see appendix) if they want to name their planes. With each plane, there is the option of experimenting further with elevators, rudders and ailerons (see appendix).

*\*If you are measuring flight distances, this can be a whole class measurement exercise or you can mark the floor out ahead of time yourself.*

**Experiment #1: *Darting Around*** (time – 30 minutes for basic plane folding, flying, recording). Add time for any extensions.

Engage the students by explaining that this is the first plane design they are going to create, and that there will be two others that they will construct on future days and be able to make comparisons. Today they will get to fold, fly, and record what happened and what they noticed.

Explain that there are seven steps and that you will be doing it with them step by step and that they need to wait between steps. You can decide how you are going to organize flying time. Be clear about when they will have the chance to try their planes out. (With older children, there is always the option of giving them the directions and the chance to fold the planes themselves)

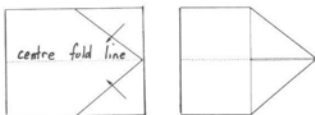
### *Darting Around*

1. Fold a piece of 8 ½ x 11 paper in half lengthwise and open.
2. Fold the top corners to the centre line.
3. Fold the just made upper corners (A) to the centre line.
4. Fold over and crease.
5. Fold one side (B) over to meet the centre line and crease. Do the same with the other side.
6. Time to swing your wings up so they're horizontal and you have a keel underneath to hang onto.
7. Last step. Put a piece of tape on the top to tape the two sides together.

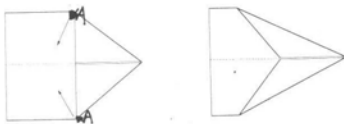
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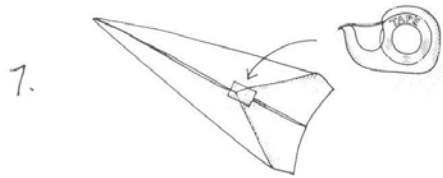


3.



4.





Well, there is another step, fly your plane!

*\*At this point of the experiment, the students can: simply experience flying, measure flights and note what their longest flight is, experiment with cutting elevators, etc.*

Students can be chosen (or volunteer) to demonstrate the results of their plane constructions.

Finally, there is the opportunity for the students to record, either as a whole group or on their individual recording sheets to go in their "Flight Folders". (see appendix for a sample record sheet)

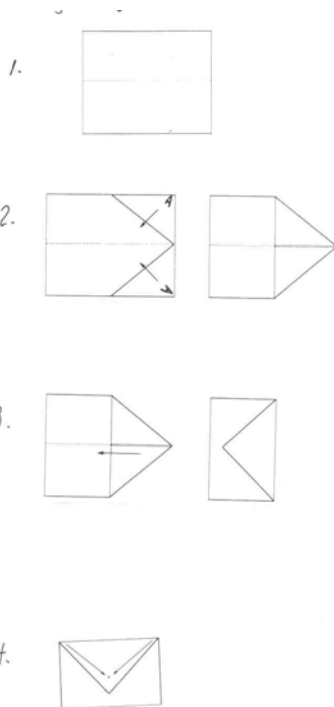
## Experiment #2: *Roaming Ranger*

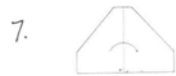
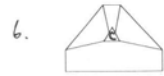
The experiment can be introduced by connecting it to a quick review by the students of Experiment #1. Explain that there are many different ways to fold paper, creating many different planes. You might ask the students what the purpose of this is? Do they think that it will affect the actual flight of the plane?

Introduce this plane, the *Roaming Ranger* and review the procedure they followed in the first experiment. Explain that this plane has one more step, and some of the steps are different than in the first plane. Again, you can outline what process the class will be following once the planes are made: when and where they'll fly, what they will do in terms of measurement, how they will be recording.

### *Roaming Ranger*

1. Fold a piece of 8 ½ x 11 paper in half lengthwise. Unfold and lay flat.
2. Fold the top corners (A) toward the centre fold. Make a crease on each fold.
3. Fold down the whole triangle that you just created in step 2. Crease the fold.
4. Measure up 4 cm. from the tip of the triangle and make a mark.
5. Fold in the top corners (B) so that the tip of each corner touches the mark you just made. Crease the fold.
6. Fold up the little triangle C so that it covers the corners of the folds you just made in Step 6.
7. Turn the paper over. Fold it up, along the centre line.
8. Make the wings by folding each side down. You want the wing's edge (D) to be even with the bottom of the plane.





And Fly Away!!

You can choose, again, to have children measure length of flight, to experiment with ailerons, etc., or simply fly the planes. At the end, recording can be done in the whole group or in their individual "Flight Folders"

### Experiment #3: *The Sizzling Stunt Flyer*

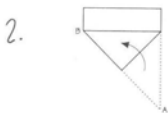
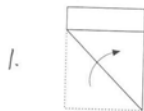
The students now have two experiences with constructing planes, so the introduction for this should be relatively simple. You might ask them what they expect, given the planes name, and what they have noticed about the two previous planes. Were there differences in how they flew? What else did they notice.

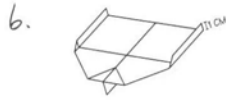
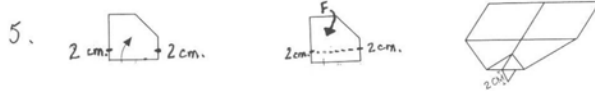
Once again, after having chosen how you are organizing the plane making, you can progress step by step (using your own pre-made steps as models, while demonstrating the folding in the steps) or with children working at a centre with an adult, or in a small independent group following the instructions on their own.

Outline at the beginning of the lesson what the expectations are for flights, measurements, modifications, and recording.

#### *Sizzling Stunt Flyer*

1. Fold up one corner of a sheet of 8 ½ x 11 paper to the opposite SIDE (not corner)
2. Fold over point A so that it meets point B.
3. Fold up the bottom tip C to the centre.
4. Fold the paper in half (D) to (E)
5. Make a mark 2 cm. from the centre fold on each side. Bring the top (F) down on each side to that mark (you've just made your wings.) Make a sharp crease.
6. Fold up each wing tip 1 cm.
7. Put a small piece of tape on the top of the plane to hold the wings together. Tape the keel at both ends too.





## FLY AWAY!

**Note:** *This plane has the potential to loop the loop, make circles, all kinds of stunts. It would be a good one to try the ailerons, etc. on and see what happens. Decide whether students are going to measure their flights and if they're going to record results of alterations, etc. Record in whole group or individually.*

## Extension of Ideas:

These experiments can be expanded in many directions. They can be a home/school connection by having the children share the experiments with their families, bringing the instructions home and making the planes together. They can be decorated and constructed into mobiles. They can be named, (using the Aviation Alphabet), photographed and made into a Book of Planes. A "Air Fair" can be organized, with each student constructing their "best" plane to demonstrate. This could be shared with other classes or with parents, with children demonstrating not only flight but also the steps that they followed to create their planes.

## Suggestions for Assessment:

Students could be asked to fold a piece of paper into something that will fly. Older students could be asked to teach other students how to make a plane. They could also be asked to explain how flight can be altered using ailerons, etc. Asking students to describe what they have noticed and learned through the experiments could be valuable.

## **Name Your Plane!**

Start your Identification with C, (that stands for Canada), then a hyphen, then 4 capital letters beginning with I for "ultra-light".

For example C-PRMW (those are my initials!) and it would read:

Charlie Papa Romeo Mike Whiskey if I was calling the tower and identifying my plane.

## **Air Fair Ideas**

You can create an Air Fair that fits your students' interests. After the students have been working on different models of planes, tell them that they are going to have the chance to participate in an Air Fair. They will have the opportunity to create one paper airplane (this can be done by individuals or they could work in a group).

On the day of the fair, each student or group is given five pieces of paper and tape. Scissors and ruler are available. There is a time limit to construct one plane.

Decide on the categories the planes will fly in, e.g., distance, time in the air, accuracy, and stunts.

Each plane could get three tries and student can use their best result and record. You could have points, but you could also just have students record and make a graph that shows what all the results were.

The possibilities are huge. Have fun!