Paper Airplane Lab Assignment

Activity Summary

In this activity, students will:

- Create a name and design for three (3) paper airplanes
- Present their paper airplane(s) to the class
- Complete a Self-Evaluation

Prior Knowledge

- ***Essential Skills***
- Making paper airplanes
- Use of stopwatches

Teaching Planning Notes

- Sign out books on paper airplane designs to share with the class
- Book access to computers in school (Option 1). Students could also do internet searches on paper airplane designs.
- Download designs and copy them as a class set. (Option 2)
  * http://bestpaperairplanes.com
  * www.wannalearn.com/Just_for_Fun/Making_Paper_Airplanes
  * http://www.onenorthpole.com/ToyShop/Paperairplanes.html
- Provide blank paper for students to draw their designs and names of the paper airplanes
- Provide a clutter free area (you may have to use the hallway or gymnasium)
- Provide a variety of types and sizes of paper
- Provide students with masking tape, stopwatches and metre sticks

Assessment of Student Achievement

Task	Tool / Type
Brainstorming	Fly Like an Eagle Graphic Organizer (Formative)
Lab	Fly Like an Eagle Observations and Calculations Worksheet (Formative) Fly Like an Eagle Analysis Worksheet (Formative) Fly Like An Eagle Student Lab Performance Rubric (Summative)
Presentation	Fly Like An Eagle Lab Performance Rubric (Summative)
Voting Ballot	Fly Like An Eagle: Voting Ballot (Formative)
Ranking ***Essential Skills***	Rank Your ***Essential Skills*** Worksheet (Formative)

Activity and Assessment Materials

- Paper Airplane Lab Assignment Sheet
- Graphic Organizer for Airplane Design
- Observations and Calculations Worksheet
- Student Lab Performance Rubric
- Rank Your ***Essential Skills*** Worksheet
- Graphic Organizer Answer Key
- Analysis Worksheet
- Voting Ballot
- Lab Performance Rubric

FOCUS ON LEARNING

Essential Skills:

Reading Text
Conducting Lab Activity

Document Use
Graphic Organizer

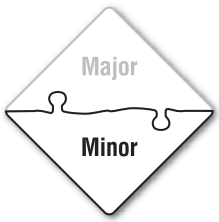
Numeracy
Observations and Calculations Worksheet

Writing
Observations and Calculations Worksheet
Analysis Worksheet

Oral Communication
Conducting Lab Activity
Presenting to Class

Thinking Skills
Conducting Lab Activity
*Ranking **Essential Skills** Worksheet*

Working with Others
Conducting Lab Activity
Presenting to Class



Curriculum Linkages For Ontario Educators

Essential Skills truly are everywhere and as teachers we are always teaching students the ***Essential Skills!*** As subject teachers and specialists, we know that many of the curriculum expectations we are accountable to teach and assess, also address the ***Essential Skills*** and while the linkages are not always readily apparent, the linkages exist nonetheless.

While this activity connects to a variety of courses, it is most closely aligned to the following course(s):

- Locally Developed Compulsory Credit Course, Grade 9 Science, SNC 1L

To assist you, the teacher, in making more transparent linkages, we have identified the following curriculum linkages for this activity.

Locally Developed Compulsory Credit Course, Science, Grade 9, SNC 1L

Coded Overall Expectations	Coded Specific Expectations
SILV.01 - illustrate how science is a part of daily life;	SIL1.01 – describe how the procedures, skills, and tools employed in different areas of science are also evident in daily life (e.g., microscopes and balances, the use of statistical evidence to make decisions);
SILV.02 - use appropriate scientific skills, tools, and safety procedures to investigate problems;	SIL2.01 – formulate questions about problems or issues that can be scientifically tested (e.g., Which paper airplane flies the farthest or fastest? Which metal retains more heat? Which colour/brand of hair dye lasts the longest? Which pair of sunglasses are the best filters of the sun's rays? Which location enables us to see the stars most clearly at night?);
	SIL2.03 – conduct investigations safely, using appropriate lab equipment (e.g., use scales, rulers, voltmeter/ammeter, stopwatch for making measurements);
	SIL2.04 – observe and record data, using a variety of formats (e.g., diagrams, data tables, webs, graphic organizers, using computers, as appropriate) including the use of SI units, where appropriate;
	SIL2.05 – assess data to make inferences and conclusions and to answer questions and refine procedures;
	SIL2.06 – communicate plans, observations, and results using a variety of oral, written, and graphic representations, and including the use of SI units, where appropriate (e.g., tables, charts, journals, using a variety of technologies).

Fly Like An Eagle

Names: _____ Date: _____

_____

_____

You will soon find out that this is not a crash course! You and your partner(s) have been hired by FunLife, (a fictitious toy manufacturing company) to design and create three paper airplanes that can either cover the greatest distance or have the greatest speed.

Your team must include a design and a creative fun name for each plane. Once your team has completed the investigation, you will demonstrate your fastest airplane and the one that covered the greatest distance to the class. Your teacher may request an employee of FunLife to attend the demonstration. At the end of this activity, you could earn valuable Air Mile prizes for the most creative name, the plane traveling the greatest distance and speed. By completing a ballot, your name could be drawn for a prize. All prizes have been sponsored by FunLife.

Materials:

- Paper
- Stopwatches
- Ruler
- Clutter free area

Fly Like An Eagle
Paper Airplane Design

"Working with Others", is an ***Essential Skill*** that is important to practice to be successful in the world of work. Brainstorming and being supportive of thoughts, opinions and contributions of others in a group are part of "Working with Others". Practice this ***Essential Skill*** while you and your partner(s), develop a graphic organizer similar to the one shown in Figure 1.

1. Brainstorm and identify as many factors that may affect the results of your paper airplane designs. In other words, what could you do to the paper airplane to make it go further or faster. Example, the type of paper. In each of the surrounding circles, name this factor.
2. Draw straight lines off the circles representing how the factor can be changed. For example, the type of paper could be cardstock.
3. Add as many circles and branches as necessary.
4. Once the graphic organizer is complete, start creating three designs of paper airplanes and proceed with the experiment.
5. Provide a sketch of your three designs on a piece of paper.
6. Create a name for each plane.

Graphic Organizer

(Factors that Influence
Paper Airplane Design)

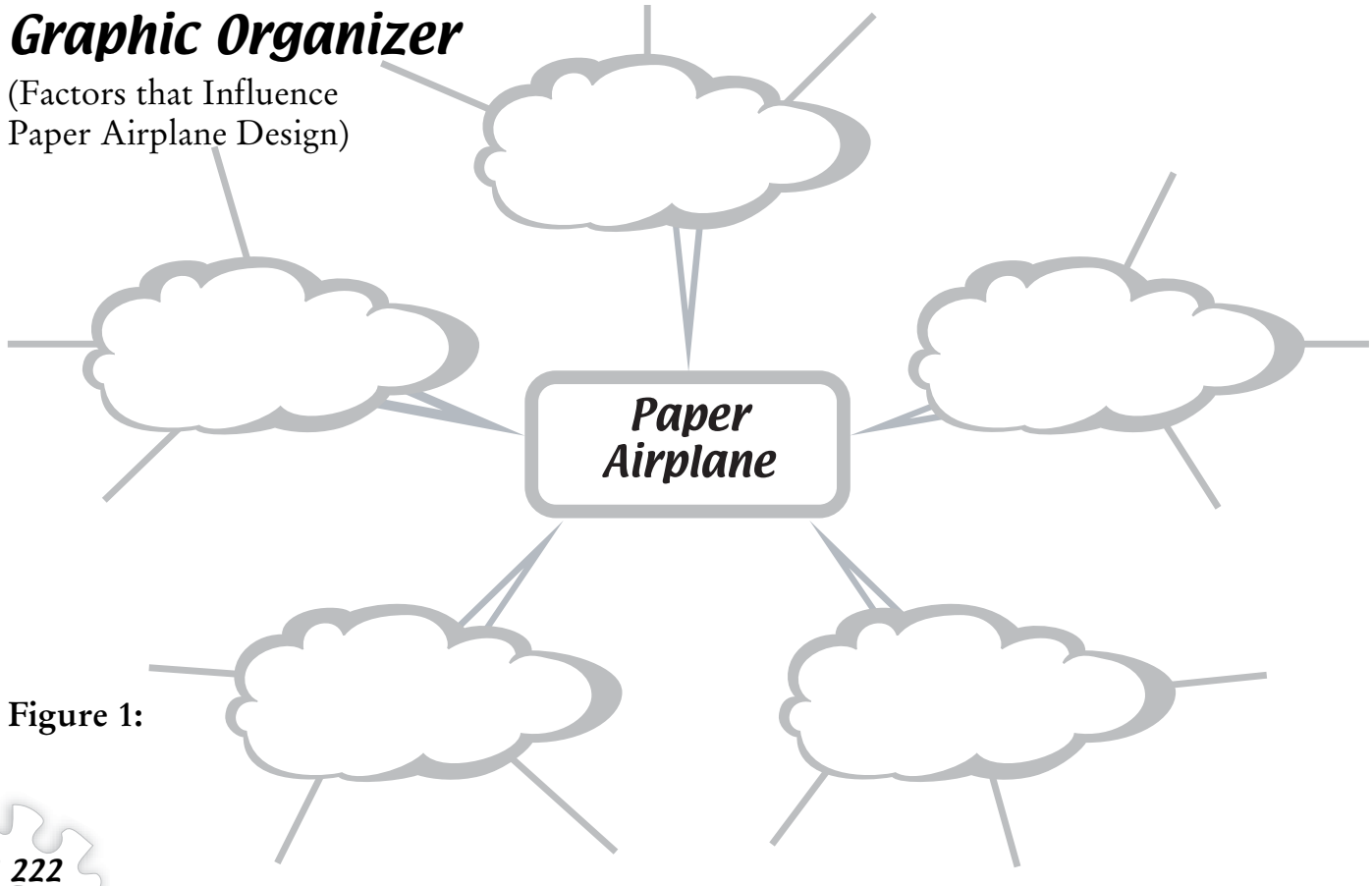


Figure 1:

Fly Like An Eagle
Paper Airplane Test

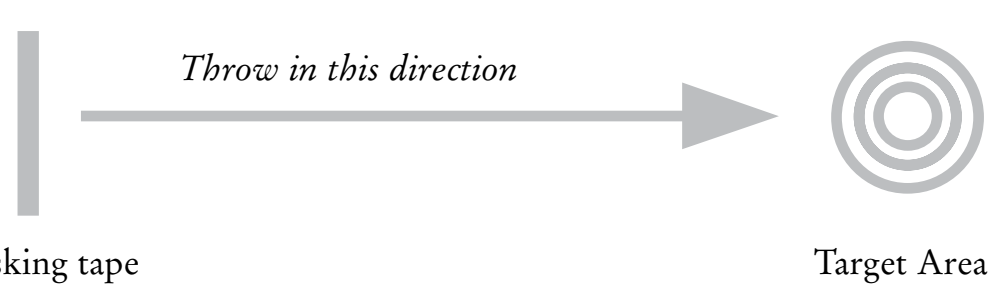


Figure 2

Working with Others, Oral Communication, Reading Text, Document Use and Numeracy are five of the ***Essential Skills*** you will encounter during the next phase of this activity.

1. Remember safety is extremely important. Make sure the area you are working in is free of any obstructions and people. Never throw a plane directly at another person, especially if the plane has a sharp, pointed nose. You will need to use the length of the classroom for this activity.
2. Place a line of masking tape on the floor away from the target area (at least 6 m). Refer to Figure 2.
3. The Air Traffic Controller should get a stopwatch and a metre stick from the teacher.
4. The Pilot should stand at the line of masking tape with his/her paper airplane.
5. The Air Traffic Controller gets the stopwatch ready to go and tells the Pilot when to throw the plane (start timing once the plane has left the Pilot's hand).
   Note: The Pilot should be aiming the plane towards the target area.
6. When the plane lands on the ground, the Air Traffic Controller should stop the stopwatch and record the time in seconds in the table of observations.
7. After the plane has landed, measure the distance between the line of the masking tape and the plane in the table of observations.
   [Note: we are only measuring the horizontal distance the plane travelled, it does not matter how high the plane flew]
8. Repeat the experiment two more times and record the data each time in the observation chart.
9. Repeat these steps for the remaining two planes. Be sure to switch roles of Pilot and Air Traffic Controller. Sign your name beside the appropriate role.
10. Remember to keep your planes because your team will be presenting the winner of each category to the class.

Fly Like An Eagle
Observations and Calculations Worksheet

Name of Pilot: _____

Name of Air Traffic Controller: _____

1st Plane	Time the plane was in the air (s)	The distance the plane travelled (m)
Trial 1		
Trial 2		
Trial 3		
Average Value	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =

Average Speed = $\frac{\text{average distance (m)}}{\text{average time (s)}}$ =

Name of Pilot: _____

Name of Air Traffic Controller: _____

2nd Plane	Time the plane was in the air (s)	The distance the plane travelled (m)
Trial 1		
Trial 2		
Trial 3		
Average Value	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =

Average Speed = $\frac{\text{average distance (m)}}{\text{average time (s)}}$ =

Fly Like An Eagle

Name of Pilot: _____

Name of Air Traffic Controller: _____

3RD PLANE	TIME THE PLANE WAS IN THE AIR (s)	THE DISTANCE THE PLANE TRAVELLED (m)
Trial 1		
Trial 2		
Trial 3		
Average Value	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =	(Trial 1 + Trial 2+ Trial 3) ÷ 3 =

$$\text{Average Speed} = \frac{\text{average distance (m)}}{\text{average time (s)}} =$$

Analysis Worksheet

The ***Essential Skills*** are embedded throughout this activity. Your skills in Reading Text, Writing and Thinking Skills will be enhanced in this phase.

1. a) Which design travelled the greatest distance? _____
   b) What qualities of your design helped in achieving the greatest distance?

   _____

2. a) Which design had the greatest speed? _____
   b) What qualities of your design helped in achieving the greatest speed?

   _____

   _____

3. a) Did the same airplane travel the greatest distance and speed? _____

   b) If no, explain. _____

   _____

Fly Like An Eagle

4. Did your team have any problems in making measurements?
   Was there any variation in the times and/or distances within your trial runs?

   _____

   _____

5. Why do you think it is necessary to do three trials?

   _____

   _____

   _____

Presenting Your Airplane(s)

Oral Communication and Working with Others are important ***Essential Skills*** to develop for this part of the activity. Your team will present the winning plane(s) to the class. Everyone in your group must participate in the presentation so decide on how you will equally divide up the task. During the presentation:

- Record the name of your plane on the blackboard and announce it to the class
- State the category of plane (e.g. travels the greatest speed or the greatest distance)
- Show the plane to the class and outline its performance features
- Demonstrate the flight of the plane in a safe and controlled manner
- Identify one of the above ***Essential Skills*** where your group excelled in and describe the situation.
- Identify one of the above ***Essential Skills*** where your group faced some challenges and describe the situation.

Fly Like An Eagle
Lab Performance Rubric

Categories/ Criteria	Level 1 (50-59%)	Level 2 (60-69%)	Level 3 (70-79%)	Level 4 (80-100%)
Thinking				
Analyzed data to make conclusions and to answer questions.	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness
Communication				
Effectively expressed and organized the name, category, design features of the planes.	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness
Recorded observations in data tables using SI units with accuracy.	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness
Application				
Followed procedure using the necessary safety precautions.	Limited Effectiveness	Some Effectiveness	Considerable Effectiveness	High Degree of Effectiveness

Note: A student whose achievement is below Level 1 (50%) has not met the expectations for this assignment.

Fly Like An Eagle: Voting Ballot

You could earn some valuable Air Mile prizes by completing the ballot below. When all the ballots are submitted, the teacher will determine the most popular creative name for an airplane. All of the ballots will then be put into a container and a draw will be made. The winner of the draw for most creative name, and the group with the most successful planes for distance and speed will win prizes. Prizes have been sponsored by FunLife.

Student Name: _____

Favourite creative name of paper airplane: _____

Fly Like An Eagle
Rank Your Essential Skills Worksheet

Throughout the Fly Like An Eagle activity, you used several of the ***Essential Skills***. Consider the ***Essential Skills*** you personally used and complete the chart below.

Here is a summary of the tasks you performed during this activity.

- Brainstorming
- Creating designs
- Building paper airplanes
- Role of Air Traffic Controller
- Role of Pilot
- Analysis of data
- Oral presentation

(1=none or little usage, 2=some usage, 3=moderate usage, 4=high usage, 5=very high usage)

Essential Skills	FLY LIKE AN EAGLE ACTIVITY				
Reading Text	1	2	3	4	5
Document Use	1	2	3	4	5
Writing	1	2	3	4	5
Numeracy	1	2	3	4	5
Oral Communication	1	2	3	4	5
Thinking Skills	1	2	3	4	5
Working with Others	1	2	3	4	5
Computer Use	1	2	3	4	5
Continuous Learning	1	2	3	4	5

Which ***Essential Skill(s)*** had the highest ranking? _____

Which ***Essential Skill(s)*** had the lowest ranking? _____

Fly Like An Eagle
Graphic Organizer
Answer Key