Canadian Council for **Aviation** & **Aerospace**

# youth logbook

LEVEL 2

AGES 11+

11+

ccaa
Canadian Council for **Aviation** & **Aerospace**
Conseil canadien **de l'aviation et de l'aérospatiale**

# youth logbook
LEVEL **2**

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**January 2014**

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The development of this Youth Logbook was funded in part by the Government of Canada's Sector Council Program.

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This certifies that:

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youth logbook
LEVEL 2

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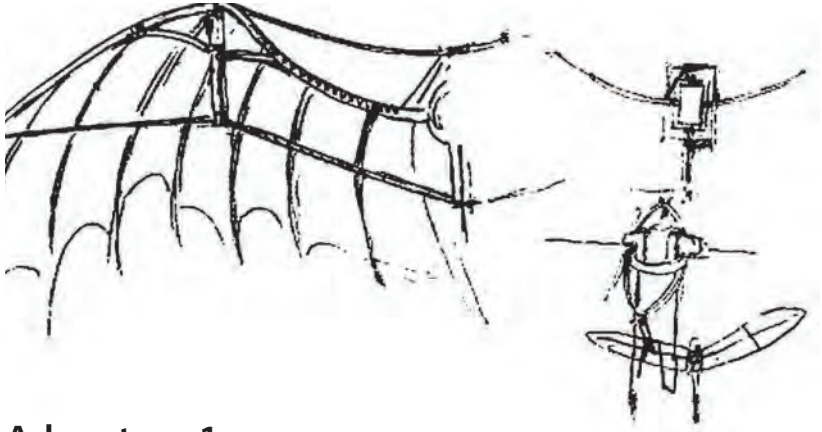
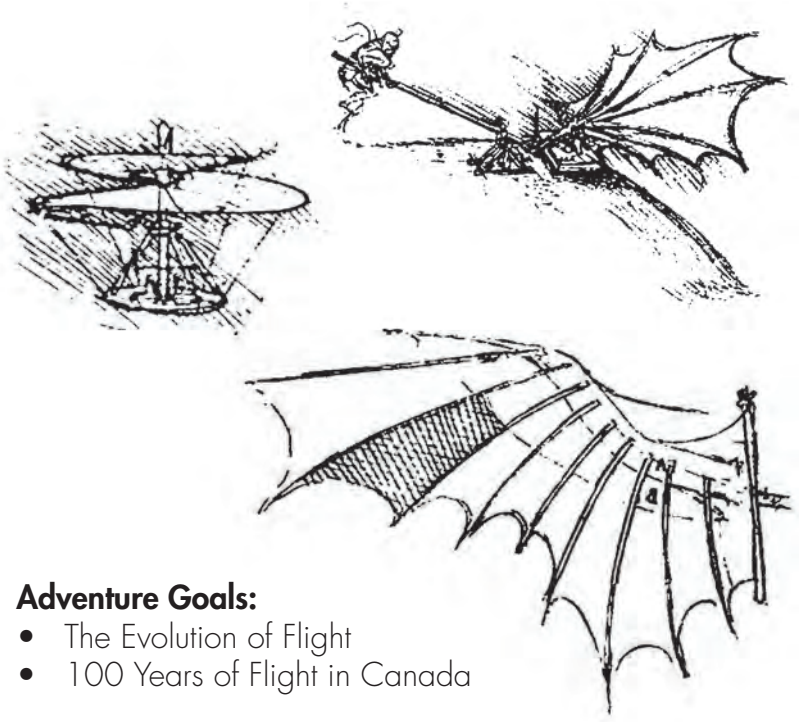
# CCAA Youth Logbook

## Adventure Guide



## Adventure 1

# flying through time



**Adventure Goals:**

- The Evolution of Flight
- 100 Years of Flight in Canada

## flightplan

Design your own flying machine.
Sketch your design in the space below.

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## flying through time

Throughout history, people have dreamed of flying. As early as 400 B.C., inventors began experimenting with the concept of flight. It took centuries of experimenting with different concepts, designs and materials in order to build the first successful flying machine.

Today, engineers continue to improve human flight as they strive to enhance the safety, efficiency and performance of our aircraft. Just as inventors did hundreds of years ago, today's inventors continue to ask questions, develop concepts, create designs, and build working models to test their ideas.

Visit or take a virtual tour of an aviation museum. In the space below, create a timeline for the evolution of flight.

*Example:*
**Timeline for the evolution of spaceflight**
**1961** Mercury Redstone 3 put first American in space
**1965** Gemini 1V – first extravehicular activity
**1981** First Shuttle mission
**2005** 5th Anniversary of continuous human presence in space

**TIMELINE**

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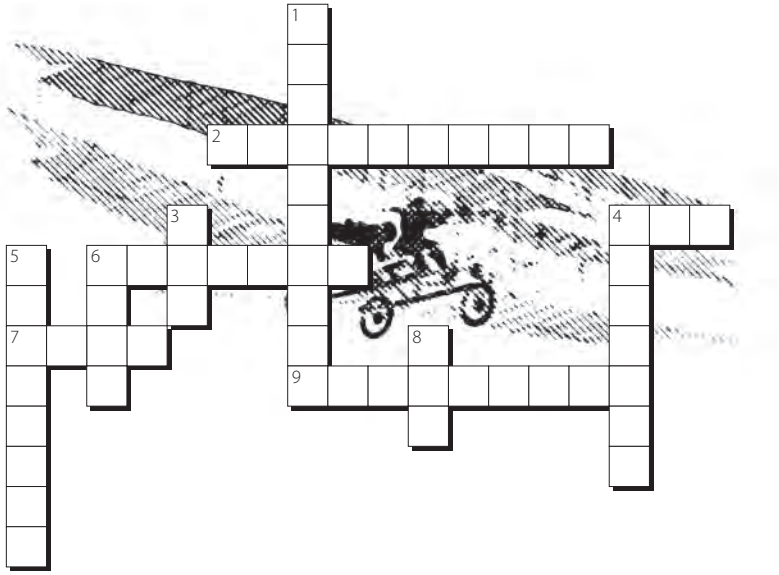
# Canada takes flight

In 2009, we will be celebrating 100 years of flight in Canada. Research Canada's first flight and use what you have learned to complete the crossword puzzle below.



**Down**

1. The first heavier-than-air machine to fly in Canada
3. The runway used for this aircraft was made from …
4. The site of this historic event
5. This historic event took place in 1909 in the month of …
6. The aircraft flew approximately half a …
8. The aircraft was a product of what association?

**Across**

2. Canada's first flight took place in the Province of …
4. The aircraft flew over a …
6. Designer and pilot of the first aircraft to fly in Canada
7. A famous inventor who was involved in Canada's first flight
9. This inventor's most famous invention was…

| Date | Parent/Teacher Initials |
|---|---|





notes

notes





# Adventure 2
# plane parts

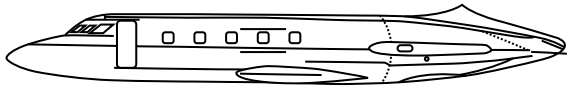
**Adventure Goals:**

- Get to Know the Parts of the Plane

# plane parts

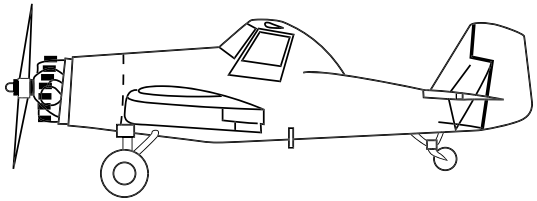
**Fuselage**

The main body of the plane is called the *fuselage*. It is generally a long, streamlined (a shape that offers the least possible resistance to a current of air) tube shape. The fuselage is what is left if the wings, engine, landing-gear, and tail surfaces are removed. It also contains the cockpit, where the flight crew sits.



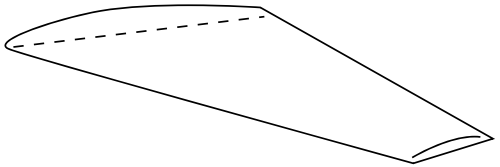
**Landing Gear**

The structure under the fuselage that supports the aircraft is called the *landing gear*. The landing gear is not only used when landing the plane, but is required for take-offs and for taxiing the airplane from one location to another. Some aircraft use skis or pontoons for landing gear instead of wheels.



**Wings**

The *wings* are the main supporting or lifting surfaces of an airplane. A wing is an airfoil (shaped surface that produces lift and drag when moved through the air), which helps provide lift when air flows around it. The size and shape of the wing determine how high and fast the aircraft can fly.





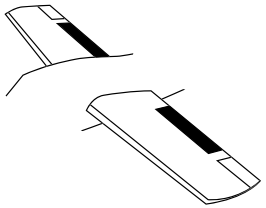




# plane parts continued

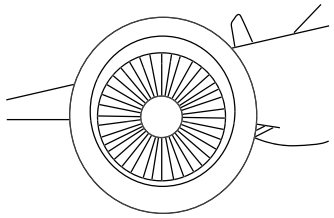
**Flaps**

The *flaps* are movable parts of the wing that extend and retract to increase both lift and drag at reduced air speeds. They allow safer landings and take-offs.



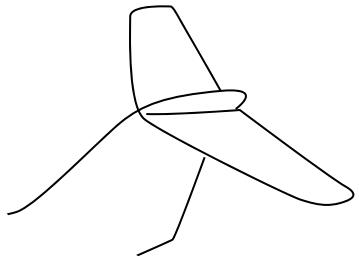
**Engine**

The *engine* provides the power or thrust required to push or pull the aircraft through the air. Some aircraft use propeller engines instead of jet engines.



**Tail**

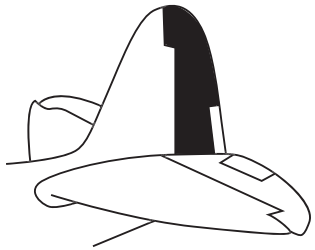
The *tail* is at the back of the plane. It can be separated into several parts, such as the horizontal stabilizer and the vertical stabilizer. It is used for stability and helps to keep the plane flying straight.



## plane parts continued

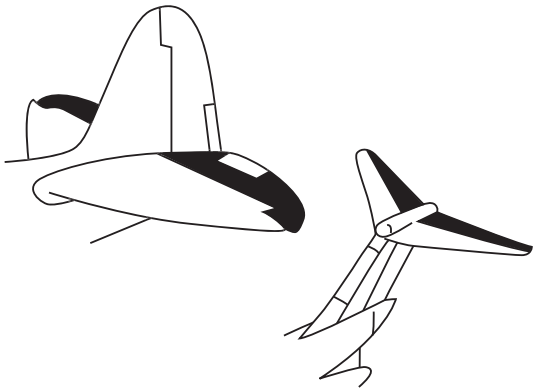
**Rudder**

The *rudder* is the vertical portion of the tail. The rudder can move left and right just like the rudder on a boat. It is used to stabilize the aircraft during take-off and landing, and can control the left and right movements of the aircraft.



**Elevator**

The *elevator* is the moving part of the horizontal stabilizer that is attached to the edge of an aircraft's tail. As the name suggests, the elevator helps an aircraft ascend and descend.



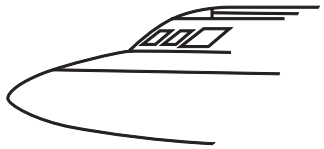




## plane parts continued

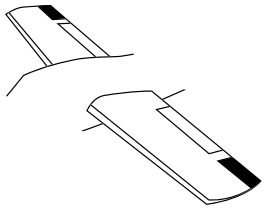
**Cockpit**

The *cockpit* is the very front of the aircraft where the flight crew sits. The cockpit contains all of the instruments and controls required to fly the aircraft.



**Ailerons**

The *ailerons* are the hinged back edge of an aircraft's wing. Ailerons are the primary control surfaces on the wing, and help roll (bank) the aircraft left to right.



# plane parts puzzle

Using the 9 plane parts listed below, complete the Aviation Su Doku Puzzle. Each aviation piece should be used only once in each row, each column and each block of 9. Draw the missing part or write the corresponding part number in each empty puzzle space below.

| Cockpit | Landing Gear | Wings | Ailerons | Engine | Tail | Rudder | Elevator | Flaps |
|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |

## AVIATION SU DOKU

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 5 | | 2 | | 1 | 4 | | | |
| 3 | 1 | | 5 | | 2 | 6 | | |
| | 9 | 6 | 7 | 8 | | | | 1 |
| 7 | | | | | 6 | 8 | 9 | |
| | 8 | 3 | 4 | 7 | 5 | 2 | 1 | |
| | 6 | 1 | 8 | | | | | 7 |
| 8 | | | | 4 | 7 | 1 | 6 | |
| | | 7 | 2 | | 8 | | 3 | 5 |
| | | | 3 | 5 | | 7 | | 8 |

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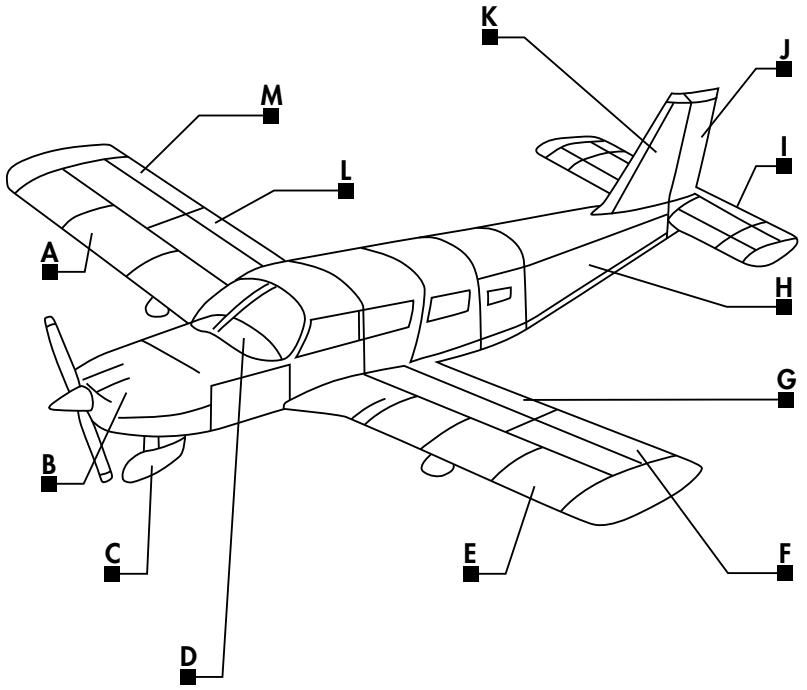
# what's what?

Label the parts of the plane below:




1. Cockpit _____
2. Elevator _____
3. Engine _____
4. Fuselage _____
5. Landing Gear _____
6. Left Aileron _____
7. Left Flap _____
8. Left Wing _____
9. Right Aileron _____
10. Right Flap _____
11. Right Wing _____
12. Rudder _____
13. Tail _____

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notes





# Adventure 3
# we can fly

**Adventure Goals:**

- All About Air
- Principles of Flight
- Other Industries Making use of Bernoulli's Principle

All things that fly need air.

Moving air produces the energy required to push and pull on all things moving through it. From birds, kites, and balloons to gliders, planes, and even the space shuttle as it lands, moving air is required to produce flight.

## it's all about air

**Air has mass** Air is made up of tiny particles that have mass. Mass refers to the amount of stuff that something is made of.

**Air has weight** Since air has mass, the Earth's gravity is attracted to it and gives it weight.

**Air has pressure** Since air has weight, it presses on things around it (pressure). The more air there is, the more pressure: less air, less pressure.

**Air is moving** Air particles or molecules are constantly moving. Moving air has a force that can lift things into the sky.

**Air is a fluid** Air flows in a way similar to water and other liquids. Even though air, water and even things like honey seem very different, they all follow the same mathematical principles.

did you KNOW?

*Air and water behave in such a similar way that basic aerodynamic tests can be effectively performed underwater.*



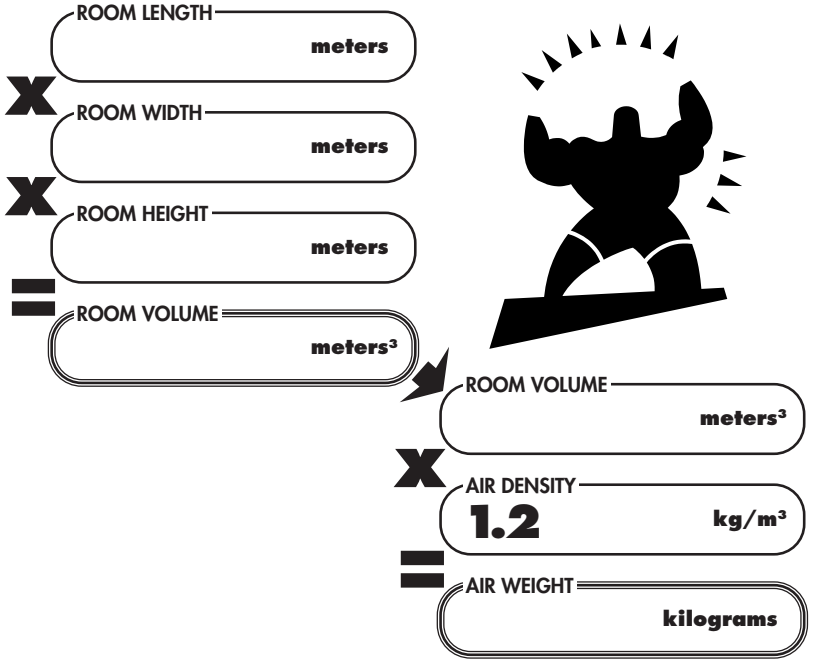




## under pressure

The earth's atmosphere is pressing on every square inch of our bodies with a force of 1.2 kilograms per cubic meter.

Using this fact, weigh the air in your room by calculating the room's volume in cubic meters and multiplying it by 1.2.




did you KNOW?

**The pressure's on.... how come we don't feel it?**

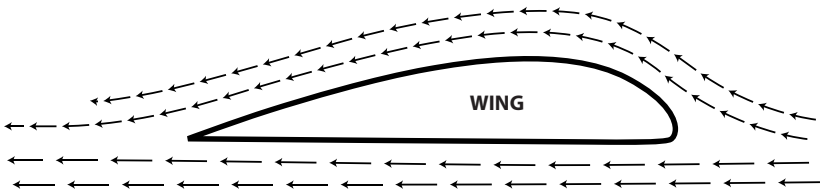
*The pressure in your lungs and in other spaces of your body equalizes the pressure of the air around us. We only notice air pressure when its push increases or decreases.*

Date Parent/Teacher Initials

# Bernoulli Principle

In the 1700s Daniel Bernoulli discovered that when air moved quickly over a surface, the air pressure decreased. When the speed of the air decreased, the air pressure increased. This is now known as the Bernoulli Principle.

Air pressure also helps things fly. When an airplane flies, air hits the leading edge (front edge) of the wing. Some of the air moves under the wing, and some of it goes over the top. The air moving over the top of the curved wing must travel farther to reach the back of the wing; consequently it must travel faster than the air moving under the wing. Therefore the air pressure on the top of the wing is less than that on the bottom of the wing. The higher pressure under the wing pushes the plane up, creating lift.




did you KNOW?

*Large passenger planes can't fly much higher than 12 km above the earth's surface. The air at higher altitudes is just too thin to create the lifting force required to hold these large planes in the air.*

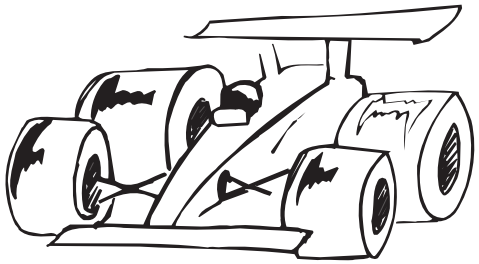






# other industries affected by air

Many race cars use some of the same principles used in flight to enhance their performance on the ground. How is the car depicted below using the Bernoulli Principle to enhance its performance?



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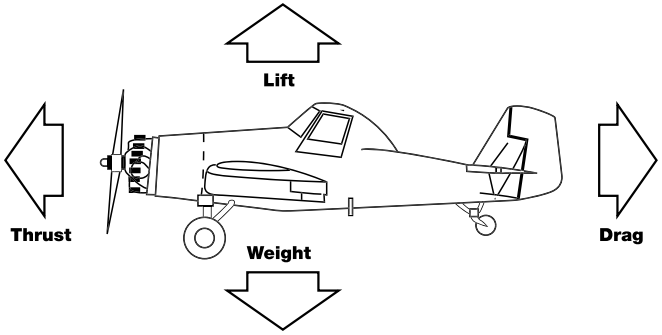
# forces in flight

There are four basic forces reacting together with air during flight: weight, thrust, drag, and lift.




**Weight** Anything with mass has weight. Weight is caused by gravity, which pulls the aircraft down toward the earth.

**Lift** A positive force that pushes an object up against the weight.

**Thrust** A positive force that moves an object forward.

**Drag** A negative force that works against thrust to slow an aircraft down. Drag is the resistance of air to anything moving through it.





## notes

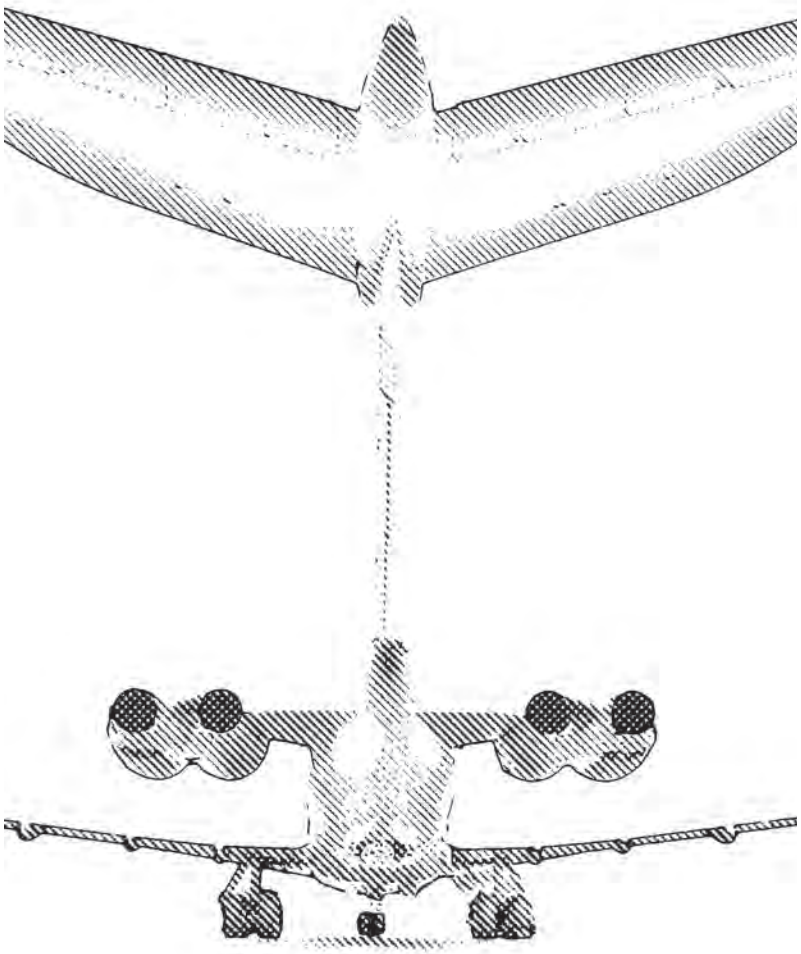
notes





## Adventure 4

# shaping how we fly



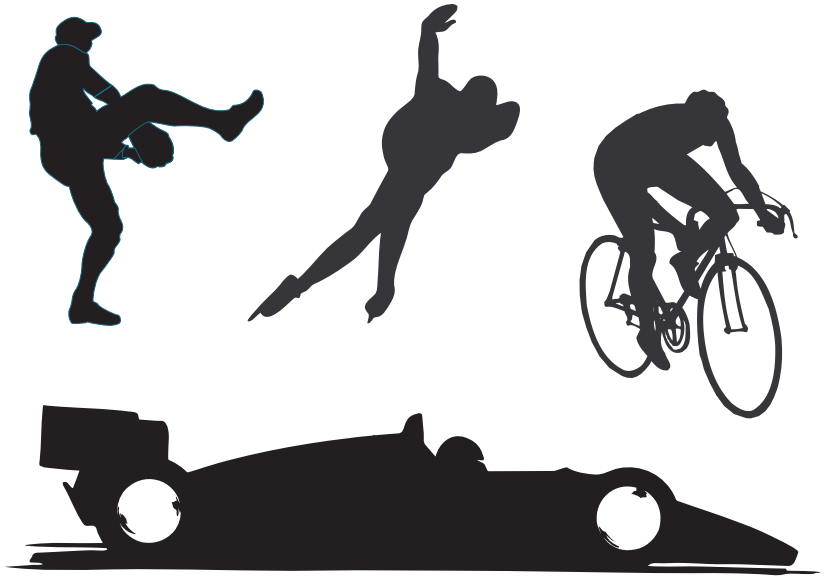
**Adventure Goals:**

- Importance of Structures and Shapes
- Design Features that Make Use of the Properties of Air

# aerodynamics

The word *aerodynamics* comes from two Greek words: *aerios* (air) and *dynamis* (powerful).

Aerodynamics is the study of how air flows around things. From race cars to curve balls, from cyclists to speed-skaters, aerodynamics affects the motion of all things through air.







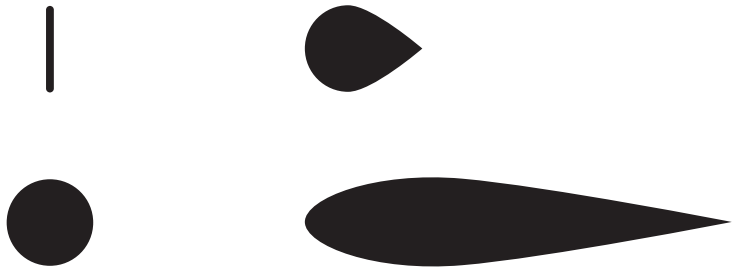
# what a drag

Aerodynamics engineers study the way in which air flows around objects.

Air will push against any object moving through it — this is called aerodynamic drag. The shape of an object can greatly affect how much drag there is. A shape that allows the air to flow smoothly around it will produce less drag. Drag causes an object to move slower.

Aerodynamic shapes offer the least resistance to the flow of air. Look at the shapes below. Draw arrows identifying the air flow around each shape.

Which shape do you think is the most aerodynamic?



Test your hypothesis by logging onto www.camc.ca/windtunnel/ to see how these objects perform in a wind tunnel. Document your results below.

1. The most amount of drag _____
2. The least amount of drag _____

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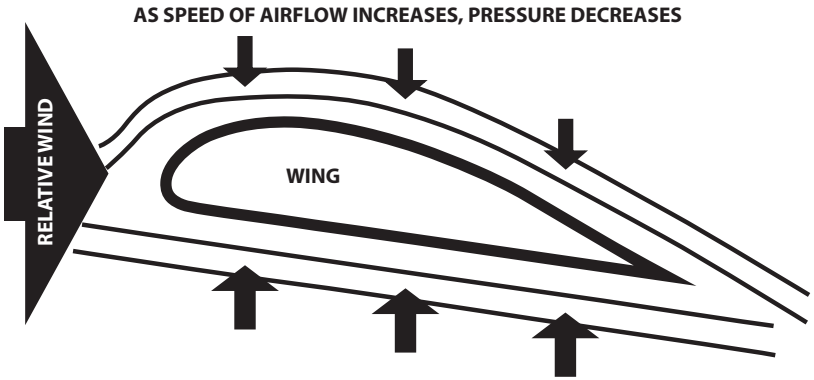
|---|---|

# the shape of speed

## Design Features that Make use of Air

When an airplane flies, it pushes the air around it out of the way. Wings are designed to help increase the airflow over the wing while decreasing it under the wing. The faster the air moves, the lower its pressure becomes. The faster moving air above has less pressure than the slower moving air below.



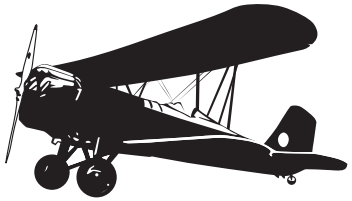

The difference between the higher pressure on the bottom and the lower pressure on the top creates the lifting force on the wing. This allows the wing to lift the plane off the ground. Many factors affect the amount of lift a wing creates: the size and shape of the wing, the angle at which it meets the oncoming air, the speed at which it moves through the air, and even the density of the air.





# the shape of speed continued

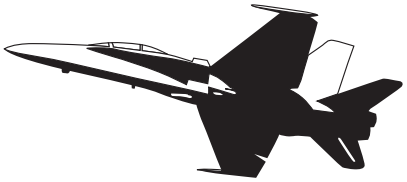
Below are some examples of different kinds of aircraft. Conduct research to identify an aircraft for each of the wing shapes listed below. Record the approximate air speed of the aircraft for each wing shape in the chart below and graph your findings on the next page.



Stearman 4-EM

## Rectangular

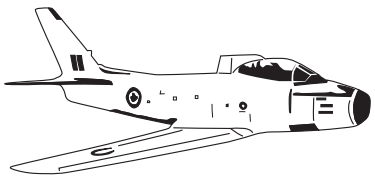
Air Speed _____



Douglas CF-18

## Trapezoid

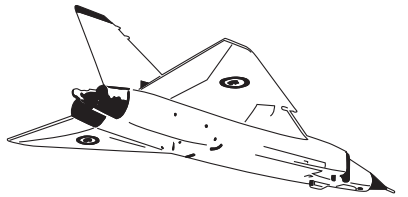
Air Speed _____



Canadair CL-13 Sabre V

## Sweptback Trapezoid

Air Speed _____



Avro CF-105 Arrow

## Triangle

Air Speed _____

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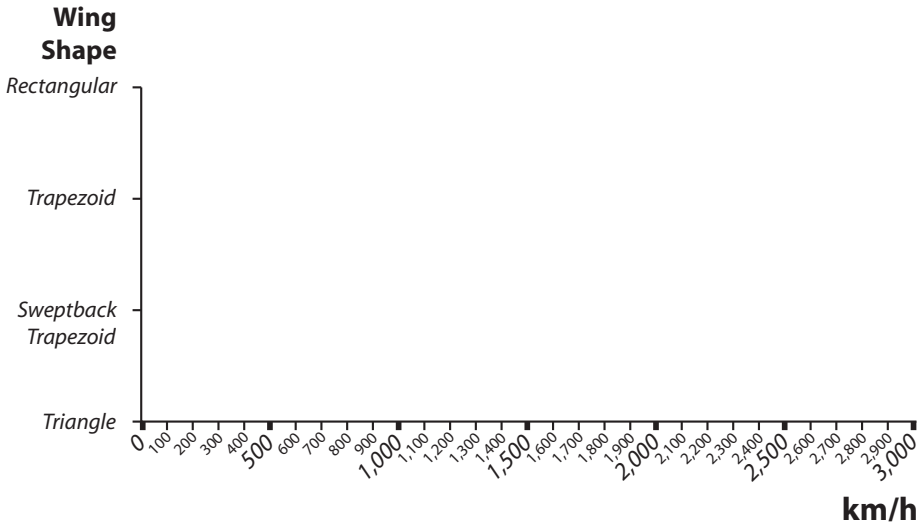
|---|---|
| | |

# the shape of speed continued




What have you learned about the size and shape of aircraft wings and how they relate to air speed?

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# the many shapes of flight

The wing shapes you just explored are used for different purposes, based on the properties of air and aerodynamics. Determine which wing shape would be best for the following aircrafts:

**Fighter aircraft:** _____

**Cargo aircraft:** _____

**Passenger aircraft:** _____

**Supersonic aircraft:** _____

**Acrobatic aircraft:** _____

did you KNOW? *The wingspan of a Boeing 747 jet is longer than the Wright Brothers' first flight.*

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notes





## Adventure 5

# safety first!

**Adventure Goals:**

- Workplace Safety

# safety: priority 1

Safety is the number one priority for the aviation and aerospace industry. Some of the safety rules in the aviation industry are:

1. identify and reduce fire hazards;
2. use and maintain tools and equipment in a safe manner;
3. know how to handle hazardous materials;
4. use personal protective equipment and clothing;
5. keep work areas clean and clear; and
6. use safe working techniques around aircraft.

**did you KNOW?** *Prior to 1926, a person could fly a plane carrying passengers or goods without obtaining a pilot's license.*

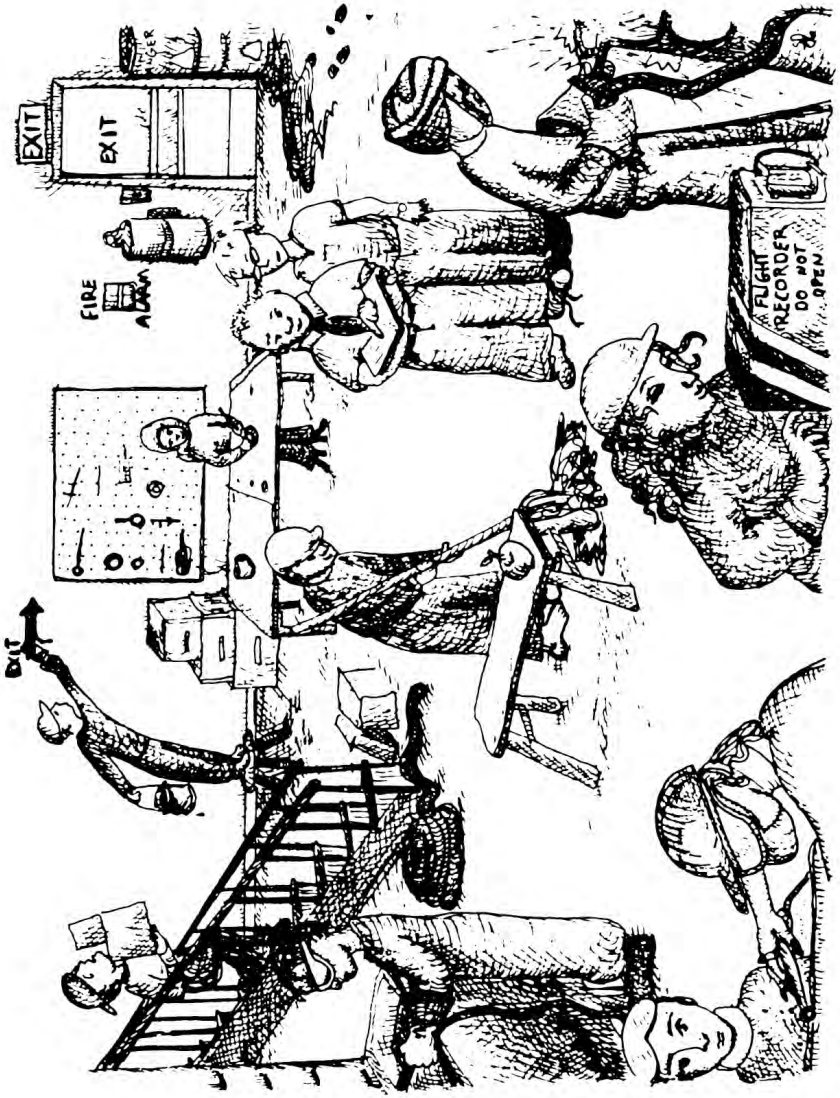






# be an investigator

Using the safety rules just discussed, identify all of the safety hazards in the following scene:

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notes





# Adventure 6
# aviation occupations

**Adventure Goals:**

- Get to Know Some of the Many Careers in Aviation and Aerospace

# career challenge

Visit CAMC's web site at www.camc.ca/careerguide/ and check out the online Career Guide. Find a career that interests you. In the space below write a brief explanation of why this career interests you.

Date

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# career connect

So many careers, so many opportunities! Here are descriptions of some of the many careers available in aviation and aerospace.

**Aviation Electrical/Electronics/Instrument Component Technician**
These technicians help install, maintain, and test all electrical and electronics equipment for the aviation and aerospace industries.

**Aviation Machinist**
Aviation Machinists work to build, repair and rework aircraft parts and specialized tooling.

**Aviation Welding Technician**
Aviation Welding Technicians are highly skilled welders specifically trained to work with aircraft structures and special materials, using a variety of advanced welding techniques.

**Aircraft Interior Technician**
Aircraft Interior Technicians are master craftspeople who use their various skills to build the inside of the aircraft.

**Aviation Painter**
Aviation Painters perform all aircraft paint work and are involved with stripping paint, cleaning, masking of the aircraft, and selecting and mixing the specialized paints.

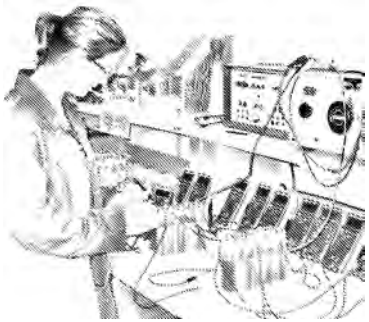
**Aircraft Gas Turbine Engine Repair and Overhaul Technician**
These technicians repair and rebuild the gas turbine engines of an aircraft. They are also responsible for inspecting and testing the engines.

**Aircraft Refueller**
Aircraft Refuellers ensure the safe and proper delivery of jet fuel. They are trained as advanced fire fighters.

**Aviation Maintenance Manager**
Aviation Maintenance Managers lead the group of skilled technical people who maintain the aircraft. They are highly skilled technically and have strong interpersonal skills.

## careerconnect continued

The illustrations below are of people working in the careers just described. Write the correct job description under each one.



TITLE

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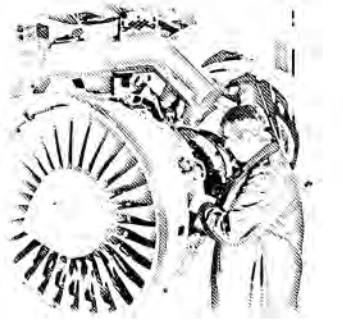

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Parent/Teacher Initials





## flightplan part 2

**Reinventing your Flying Machine…**

Use what you have learned throughout this logbook to redesign your flying machine.

Date

Parent/Teacher Initials

## notes





## notes