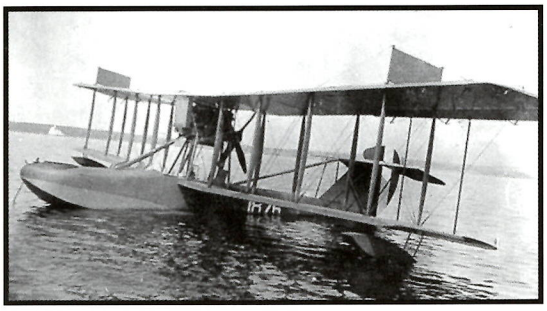
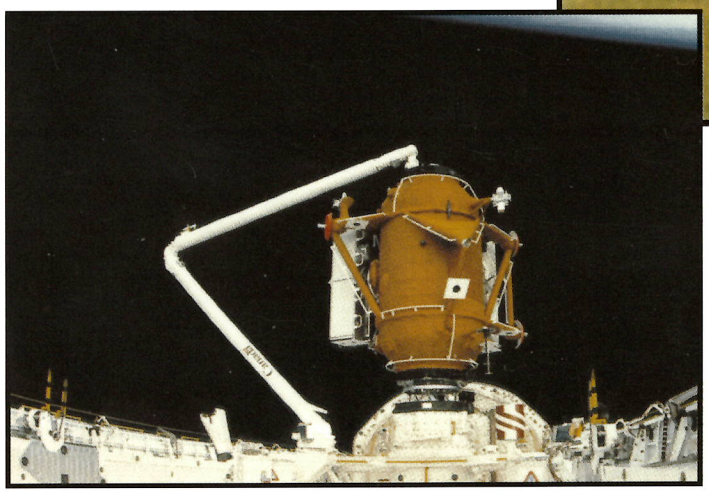
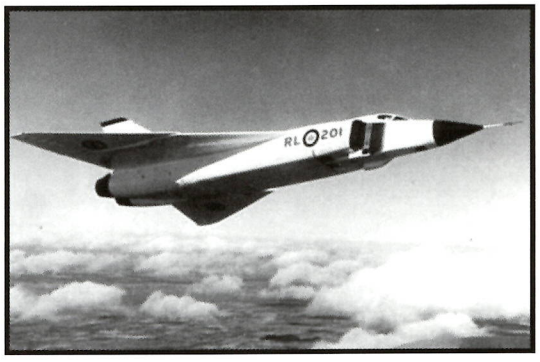
Altitude is Everything

Canadians in the Sky







AIR FORCE

Transport Canada Transports Canada

Canada

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Minister of Transport | Ministre des Transports

Ottawa, Canada K1A 0N5

This book celebrates 100 years of flight, and every page recounts the proud flying accomplishments of Canadian women and men.

From the pioneering flight by J.A.D. McCurdy in 1909 to the more recent space voyages of astronauts like Marc Garneau and Roberta Bondar, this country has played a prominent role in aviation and space.

Time and again, Canadians have shown vision and courage in the air. Our flying aces showed the way in wartime. In peacetime, the early bush pilots braved the elements to explore the North. The expertise of Canadian aircraft manufacturers is recognized around the world. At home, our prosperity and quality of life benefit from one of the best flight networks carrying goods and people across the country and abroad.

Transport Canada is proud to support this activity booklet and its efforts to encourage young Canadians to learn more about this country's exciting achievements in flight.

Ottawa
May 2003

Hon. David M. Collenette
Minister of Transport

Canada

Dear Friends of Aviation:

This is a very special year for aviation, and world history in general, as we recognize the 100th Anniversary of Orville and Wilbur Wright's first flight. This milestone will be marked by yearlong celebrations across Canada, and by many other countries around the planet, including the United States, England, Australia and even China. Canada as a nation is singularly indebted to the Wright Brothers' magnificent achievement. Aviation opened up our North and remains an essential lifeline to many areas of our vast country. Canada's industrial base has a significant aerospace component that affects our daily lives in so many ways. Canada's Air Force continues to support our proud and distinguished role as International Peacekeepers and in providing humanitarian aid to all corners of the globe. Once referred to as the "Aerodrome of Democracy," Canada remains a world leader in aviation excellence in so many areas - Flying Training, Flight Safety, Space Exploration, Commercial Aircraft Production, and Navigation, to name but a few.

To honour this Centennial, the Altitude is Everything Campaign has created this book, *Canadians in the Sky*, for your enjoyment and education. It was prepared with the hard work of many dedicated people. You will find it interesting, informative and fun, and it is our sincere hope that it will give you a better appreciation of Canada's proud aviation heritage. Please join all Canadian aviation professionals as we celebrate 100 years of accomplishment!

Don Pearsons

Don Pearsons
National Chairman
Canadian Centennial of Flight Campaign
Altitude is Everything

It All Started When....

Who Are These People?

Celebrated inventor Alexander Graham Bell, along with Canadian engineers F.W. "Casey" Baldwin and J.A.D. McCurdy, joined with Americans Thomas Selfridge and Glenn Curtiss, to form the Aerial Experiment Association. The Association's mission was a bold one. They were working hard to prove that, of all things, controlled powered flight in a heavier-than-air machine was possible.

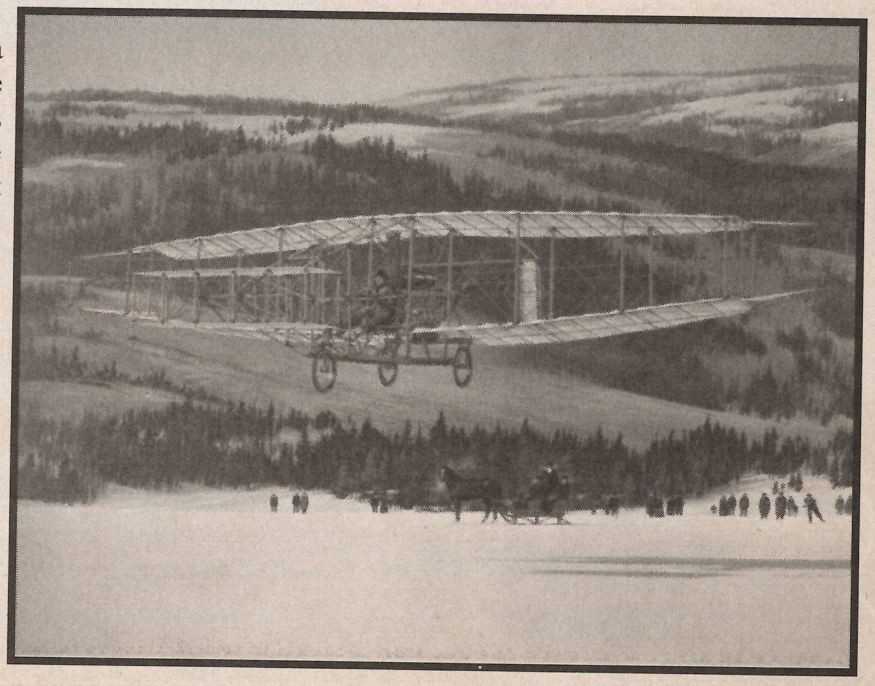
Did you know?

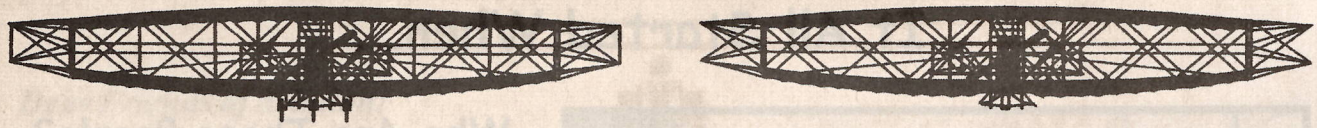
The first Canadian to fly a powered, heavier-than-air machine was Casey Baldwin on March 12, 1908, but he made that flight in the United States, at Hammondsport, New York.

The first winged aircraft to fly on its own power in Canada was the Silver Dart!

It may look odd to us now, but the *Silver Dart* was considered to be one of the finest flying machines of its day.

The first person to make a flight in a powered, heavier-than-air machine in Canada was Casey Baldwin's associate, J. A. D. McCurdy. He piloted the Aerial Experiment Association's *Silver Dart* over the frozen Bras d'Or Lake at Baddeck, Nova Scotia on February 23, 1909. It was a first for a British subject anywhere in the British Empire.





Can you find what is missing from the drawing on the right of the Silver Dart? Sketch it back in so that J.A.D. McCurdy can successfully finish his flight!

Where Did The First Canadian Pilots Go To Learn How To Fly?

In the very early days of aviation in Canada, some pilots learned how to fly the hard way: they built their own flying machines. Most early experiments were undertaken by mechanics and engineers. Later, many pilots took a test offered by the Aero Club of America. If they passed the test, they were given a pilot's license. The ultimate license was the Fédération Aéronautique Internationale (FAI) Aviator's Certificate. This French-headquartered body was the aviation authority for the entire British Empire.

Can you guess?...

How many pilots in Canada held Aero Club of America licenses just before the First World War broke out?

Circle the answer you think is right:

225 1000 42 2 812

Answer on page 20

Before the First World War broke out in 1914, the only Canadians who had Aero Club of America pilot's licenses were J.A.D. McCurdy and William M. Stark.

J.A. D. McCurdy started flying in New York State in the U.S. before he made his famous flight in Canada over Nova Scotia.

Can you guess?... In which Canadian province did William Stark start his aviation career?

Answer on page 20

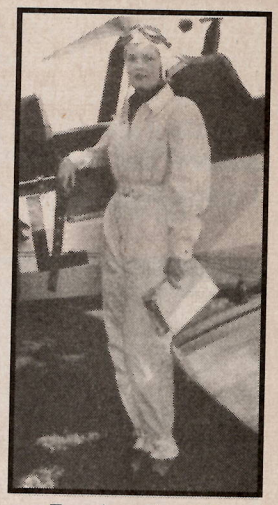
Who were the first women in the sky?

It was a very brave thing for anyone to do in 1912. On April 24, Olive Stark was the first woman in Canada to fly in (or in this case on) a heavier-than-air machine. Mrs. Stark, perched on a plank fastened to the lower wing of a Curtiss pusher biplane owned by her husband W. M. "Billy" Stark, flew from a field near Minoru Park, close to Vancouver.

Though women flew before 1920, some as aerobatic barnstormers, it took until 1928 for a Canadian woman to get her own Canadian pilot's license. Eileen Volick passed her test at Hamilton on March 13, 1928. The first woman to earn a Canadian commercial pilot's license was Jessica Jarvis of Toronto. Many women qualified for licenses, but they couldn't get work.

Marion Orr

In an era when most women did not work outside their homes, women couldn't find jobs as professional pilots until the military needed "ferrying" services during the Second World War. A number of Canadian women flew for the Air Transport Auxiliary during the Second World War. . They delivered new aircraft from factories to squadrons and ferried other aircraft between Commonwealth air force flying stations. No plane was too big or too fast - these women flew with distinction almost every aircraft the RCAF operated during the Second World War. One famous Canadian aviatrix was Marion Orr.



Jessica Jervis

More On Pioneering Women

Wendy Clay was the first woman to learn to fly in the Canadian Forces. She was a military doctor who received her "wings" at CFB Moose Jaw, Saskatchewan in 1974. Her reason for learning to fly was to better understand the physiology problems associated with jet flight. Wendy Clay ended her military career as the Canadian Forces Surgeon General holding the rank of Major General, the first and only woman to reach that rank.

In November 1979, three women who had been selected for pilot training with the Canadian Forces, commenced training at CFB Portage La Prairie, Manitoba, on Beechcraft Musketeers. They were Leah Mosher, Deanna Brasseur and Nora Bottomley.

In February 1989, Air Force flying instructors Deanna Brasseur and Jane Foster were the first women pilots in the Canadian Forces to qualify on the McDonnell Douglas CF-18 Hornet, Canada's front-line multi-role fighter.

The first female aeronautical engineer in North America was Elsie MacGill. MacGill was Chief Engineer at Canadian Car and Foundry Co. Ltd., and helped develop standards for Airworthiness to help make all aircraft safer.

Elsie MacGill

The first Canadian woman to be hired by a major airline was Rosella Marie Bjornson. She started flying Fokker-F28s with the Winnipeg-based airline Transair Limited in April 1973. She currently flies Boeing 737s with Air Canada (she was previously with Canadian Pacific) as Captain.

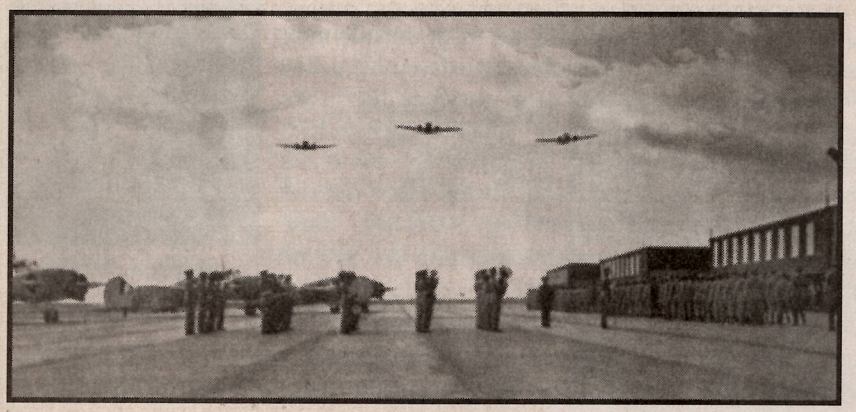
Can you guess?... How many wings were on the aircraft that took Olive Stark for a ride in 1912?

Answer on page 20

Flight Training in Canada

Canada has been a leader in flight training since the earliest days of powered flight. During the First World War, Britain's Royal Flying Corps (RFC) established the RFC Canada at Camp Borden, Ontario. This was the first military flight training program in Canada.

Civil (non-military) flight training was promoted through local flying clubs across Canada with assistance from the Royal Canadian Air Force (RCAF) in the late 1920s and later following the Second World War.
During the Second World War, the wide-open expanses of land and flying areas safe from attack made Canada a natural training location. The British Commonwealth Air Training Plan was established to train aircrew and ground trades not only from the RCAF but from other Commonwealth countries such as the United Kingdom, Australia and New Zealand. The military worked closely with local flying clubs and commercial aviation operators across Canada who helped train air and ground crews.



Canadian Prime Minister William Lyon Mackenzie King received a letter on January 1, 1943 from United States President Franklin Delano Roosevelt. In it, he described Canada as the "Aerodrome of Democracy". By the end of the Second World War, the British Commonwealth Air Training Plan graduated 131,553 aircrew trainees. Of this total figure, 72,835 were Canadians. A further 5,296 Royal Air Force and Fleet Air Arm aircrew were trained in Canada under other circumstances.
In the 1950s, during the darkest days of the Cold War, Canada once again became a major training site for pilots. Many European aircrew trainees from North Atlantic Treaty Organization (NATO) countries were sent here to train with young Canadians.
The legacy of military flight training in Canada continues today in the form of the NATO Flying Training Programme in Canada. It was set up to train new aircrew from Canada, other NATO members and other allied countries.

Go to:www.nftc.net/index.html

Today, when introducing teenagers to flying as part of the Royal Canadian Air Cadet Program and Young Eagles Program, or the training of new military or civilian aircrew, Canada can draw upon its proud heritage of flight training.

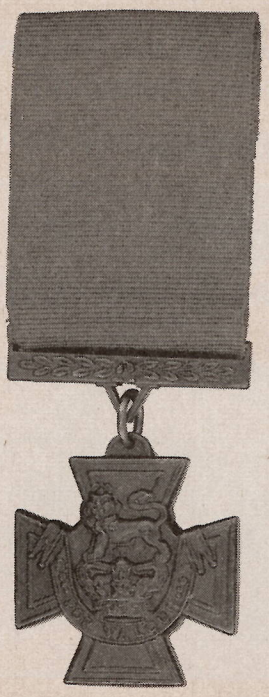
Can you name?...

1. The four Commonwealth countries that participated in Canada's first air training plan?
2. The first military flight training plan in Canada?
3. The respectful nickname given by President Roosevelt to Canada during the Second World War?

Answer on page 20

Heroes During War And Peace

The Victoria Cross



The Victoria Cross, the highest honour for gallantry in the face of the enemy awarded in the British and Commonwealth forces, was given to seven Canadian airmen.

Flyers who received the Victoria Cross for bravery in the First World War

Major William Avery "Billy"' Bishop of Owen Sound, Ontario, was the first Canadian pilot to be awarded a Victoria Cross.

Second Lieutenant Alan Arnett McLeod of Winnipeg, Manitoba, was the youngest Canadian airman to receive a Victoria Cross.

Major William George "Billy" Barker, of Dauphin, Manitoba, earned a Victoria Cross in October 1918.

Did you know?

During the First World War, when airplanes were still new, one third of all allied pilots who shot down more than 30 enemy aircraft were from Canada, in spite of Canada's small population of just over 8 million people.

Billy Bishop was nominated twice for the Victoria Cross, and awarded his Victoria Cross for single-handedly attacking a German airfield.

Quick-Q: How old was the youngest Canadian pilot to receive a Victoria Cross for bravery?

Answer on page 20

On March 27, 1918, while flying an Armstrong-Whitworth FK.8 with the Royal Flying Corps No. 2 Squadron, Second Lieutenant Alan A. McLeod and his Observer Lieutenant A. W. Hammond were attacked by a number of German fighters. Their aircraft was immediately set on fire. McLeod bravely stepped out on to the wing and skillfully steered his aircraft to a crash landing in a desolate area known as "No Man's Land." Both men received wounds in the encounter with the Germans. Second Lieutenant McLeod grabbed Hammond and dragged him to the relative safety of some British trenches.

"Billy" Bishop, VC

Alan McLeod, VC

William Barker, VC

Four very brave Canadian airmen who sacrificed their lives while serving Canada during the Second World War.

These four airmen were posthumously awarded (awarded after death) the Victoria Cross for extreme bravery:

- Pilot Officer Andrew Charles "Andy" Mynarski, Royal Canadian Air Force, from Winnipeg.
- Flight Lieutenant David Ernest Hornell, Royal Canadian Air Force, from Mimico, Ontario.
- Squadron Leader Ian Willoughby "Baz" Bazalgette, Royal Air Force Volunteer Reserve from Calgary.
- Lieutenant Robert Hampton Gray, Royal Canadian Naval Volunteer Reserve (flying with the Royal Navy's Fleet Air Arm) from Nelson, British Columbia.

Quick-Q: Do you recall from elsewhere in this book how many countries were included in the British Commonwealth Air Training Plan? _____ Answer on page 20

More information about these brave men, may be found at:
www.vac-acc.gc.ca/printer/sub.cfm?source=history/secondwar/citations/mynarski
www.rootsweb.com/~onlanark/NewspaperClippings/RCAF.htm
www.lancastermuseum.ca/bazalgette.html
www.navalmuseum.ab.ca/gray.html


Andrew Mynarski, VC


David Hornell, VC


"Baz" Bazalgette, VC


Robert H. Gray, VC

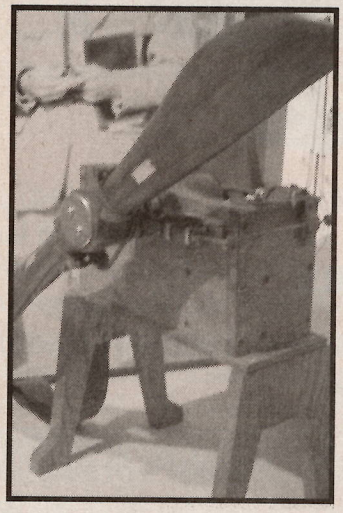
Air Mail, Canadian Heroes and Firsts

The aviation pioneers of Canada

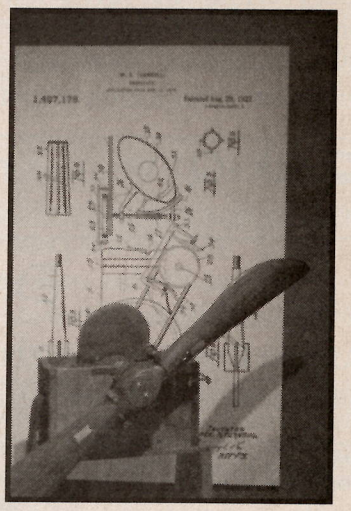
Canadians worked with friends and competitors in the United States to design and build flying machines. Both Canadians and Americans were members of the now-famous Aerial Experiment Association that organized the first flight of the *Silver Dart* at Baddeck, Nova Scotia.

Canadians pioneered some of the most exciting aviation "firsts"!

First Canadian wind tunnel leads to world's first variable pitch propeller



In 1902, Wallace Turnbull of Rothesay, New Brunswick, built the first wind tunnel in Canada. He then experimented with wing angles and propeller designs. The result? Turnbull revolutionized North American airplane technology with his design of a variable pitch propeller- an aircraft propeller that could be adjusted to different angles for taking off, cruising and landing. Flying was made easier since airplanes with these propellers flew more smoothly, used less fuel and could carry heavier loads.



Did you know? The first official mail delivery in Canada by aircraft was made safely on June 24, 1918. Captain Brian Peck and Corporal E.W. Mathers flew 120 letters from Montreal to Toronto while flying a Curtiss JN-4 s/n C.203
Previously, people felt that the only safe way to send their letters was by rail, boat or road. This meant that people who lived in tiny villages in remote corners of the country waited a very long time for their mail. Before airmail, many communities in the North received their mail and medicines only by dogsled.

Quick-Q: How many pieces of mail do you think are currently delivered in Canada each day by airmail? _____ Answer on page 20

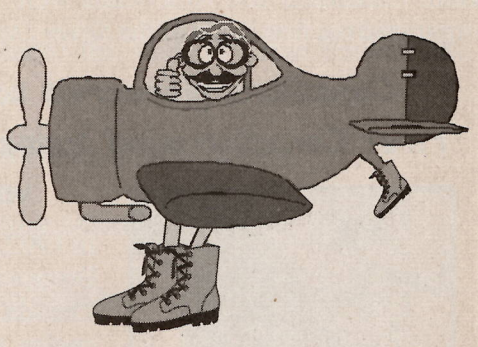
Canadian Airmail

The first international airmail from Canada was flown from Vancouver on March 3, 1919. The mail was flown to Seattle, Washington in a Boeing C-700 seaplane piloted by E. Hubbard

By the mid-1930s, Canada was moving more freight by air than all other countries in the world put together. Bush flying companies also carried medicines, did surveys, and sometimes rescued people. In the late 1920s and 30s delivery of airmail transformed some remote communities by reducing the impact of isolation.

A freezing innovation

Altitude definitely is everything, and if the propellers of an aircraft accumulate a thick coat of ice in bad weather, the plane will fly very poorly and lose altitude. If the ice isn't removed, the aircraft will not be able to stay airborne because there is not enough thrust from the propellers to keep it up. Canadian scientists came to the rescue in 1941. Ottawa's John Orr and T.R. Griffith developed a way to wrap propellers with a 'rubber shoe' made with pieces of rubber and heating wires that safely removed the ice.



Devices very similar to Orr and Griffith's invention are still used today on propeller-driven aircraft, made of either a thin rubber mat or custom-cut foam with wire heating elements inside, similar to those in a toaster. Sometimes the rubber mat is glued right on to the propeller. Also, a form of spray-on de-icer is often used.

Quick-Q: What kind of 'shoe' can you put on an aircraft? _____
Answer on page 20

Explorers of Canadian skies

After the First World War, 2,000 skilled pilots returned from overseas looking for work. Hundreds of aircraft manufactured for the war were declared surplus and could be bought very cheaply.

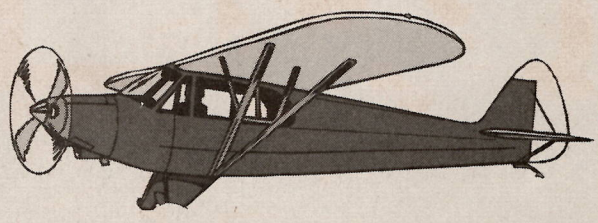
Question: What new profession did some of these pilots choose, using their formidable flying skills and those inexpensive aircraft? _____
Answer on page 20

Barnstormers supplemented their performance incomes by teaching others to fly. When people got over the novelty of seeing airplanes, some pilots turned their eyes to the Canadian North. This was good timing: the mining and forestry industries were ready to put them to work.

Quick-Q: The very first bush pilot in Canada was from what province? _____
Answer on page 20

Stuart Graham was a First World War pilot in the Royal Naval Air Service. He became the first bush pilot in Canada, organizing aerial forest patrols in 1919 for the Laurentide Paper Company in Quebec. Later, he was a test pilot for the RCAF and an expert in aerial photography. In 1944, Mr. Graham was a member of a Canadian delegation that helped create the International Civil Air Organization (ICAO), the United Nations organization that decides on the laws of the sky.

The thousands of lakes and rivers in unexplored areas of Northern Canada offered natural landing strips to airplanes fitted with floats and skis. The extreme conditions of flying in winter led to important developments in aircraft technology, including landing gear for ice and snow.



What's missing? Bush planes had different landing gear for different jobs. Draw one of the three kinds of landing gear on this bush airplane.

Early Bush Planes and Jets

Did you know?

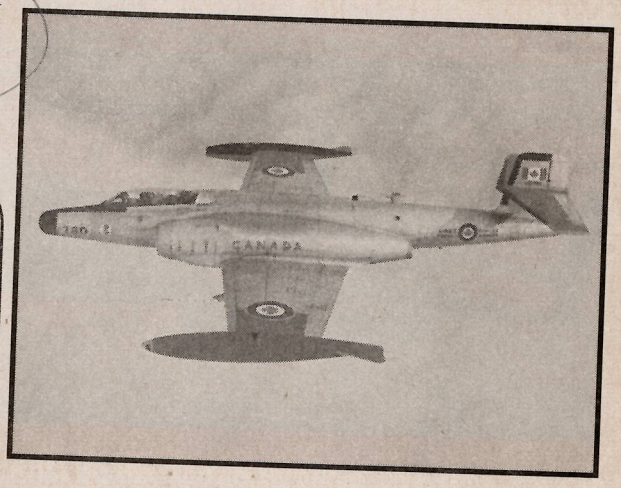
Dutch-born Robert Noorduyn designed a popular bush plane called the Norseman while living in Montreal. It not only served as a bush plane but also as a military transport and utility aircraft during and after the Second World War. A small number of civilian companies still employ Norsemans in bush flying operations.

Some of the premier builders of Canada's aviation industry

Bombardier Aerospace of Montreal owns aircraft manufacturers Canadair Ltd., de Havilland Aircraft of Canada Ltd., Learjet Corporation (Wichita, Kansas) and Short Brothers (Belfast, Northern Ireland.) This Canadian company is the third largest manufacturer of civil aircraft in the world.

Can you believe it?

In 1949 the C-102 Jetliner built by A.V. Roe Canada Ltd (Avro Canada) was the very first passenger jet built and flown in North America. It first flew August 10, 1949 at Toronto. The test pilot was J.H. "Jimmy" Orrell. The world's first jet passenger aircraft, the de Havilland DH-106 Comet flew only 13 days prior to the innaugaral flight of the Avro Canada C-102 Jetliner. The aircraft's maximum speed was 805 km/h (500 miles per hour) which was roughly double the maximum of existing propeller airliners.
Trans-Canada Airlines, the country's aviation flag carrier, turned down an opportunity to purchase the first Avro C-102. Further development was ceased and the company put all its resources into designing and building a different aircraft, Avro Canada CF-100 Canuck two-seat all-weather fighter jet. The one and only example of the Jetliner was cut up for scrap metal.
Another Avro Canada aircraft that caused a sensation when it was tested as a prototype also ended up on the scrap heap. A movie was made about this jet that was never developed beyond the test aircraft before it was cancelled.



Can you guess?...

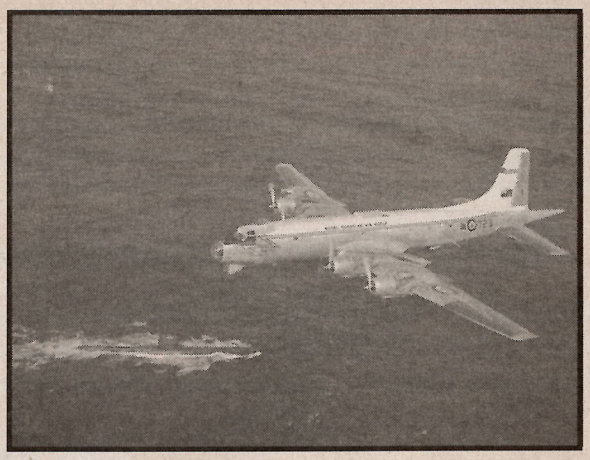
The name of this aircraft? _____
What is the difference between a gas turbine engine and a reciprocating engine? _____

Answers on page 20

Go to the following sites to see how a jet engine works:
www.aircav.com
www.travel.howstuffworks.com/turbine.htm
www.gregbrownflyingcarpet.com/turbine_engines.html

The piston engine powered all early aircraft (with the exception of gliders and the rare rocket propelled aircraft) prior to the development of the gas turbine engine. Piston engines come in inline, radial or horizontally opposed designs and are either liquid cooled or air cooled. With today's technology, more advanced piston aircraft engines designs are being produced. Piston engines remain an important feature in today's modern light aircraft industry.

The four-engine hunter of the sea.



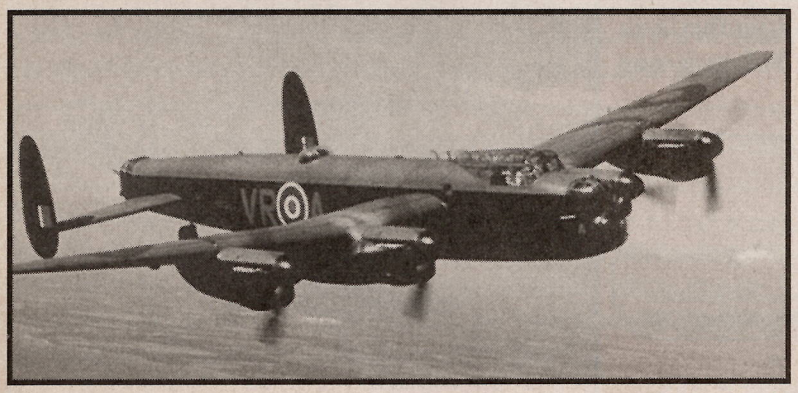
The mighty RCAF (and later Canadian Forces) Canadair CP-107 Argus was once the world's outstanding maritime reconnaissance and anti-submarine patrol plane. Its endurance was legendary. The Argus was powered by four Wright R-3350-TC981 EA-1 Turbo Compound engines. The engine is a twin row, supercharged, air-cooled, radial engine with 18 cylinders and a displacement of 3,350 cubic inches. Each engine produces 3,700 horsepower. On the 2nd of October 1959, an Argus flew non-stop from Naval Air Station Barbers Point, Ewa Beach, Oahu (Hawaii) to RCAF Station North Bay, Ontario. The crew were airborne for 20 hours and 10 minutes.

Significant Canadian Aircraft

Name that plane

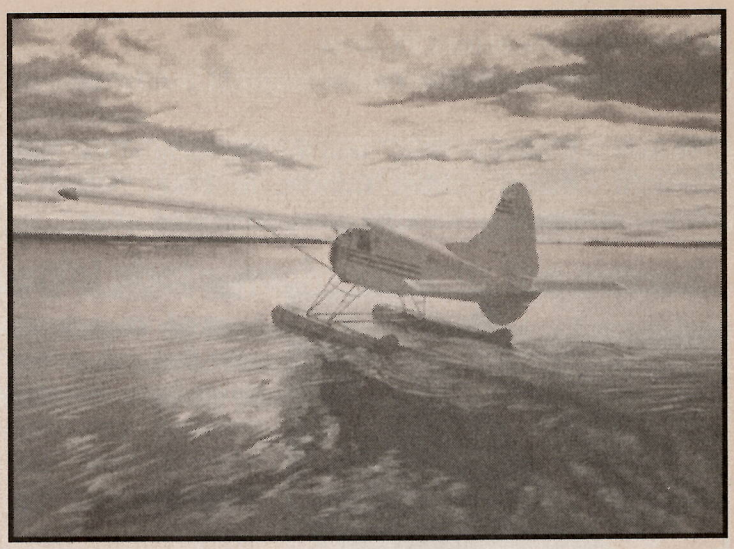
Can you think of the name of a famous Canadian aircraft?
If you can, write it here: _____

Some aircraft are named after storms, animals, swords and even planets. Canadians have built, and continue to build, some very special airplanes. De Havilland Aircraft Canada, in Downsview (Toronto) manufactured several types of aircraft used during the Second World War: the Tiger Moth biplane trainer and the de Havilland Mosquito fighter bomber. Canadian Vickers of Cartierville (Montreal) built the Consolidated Canso amphibian, while Victory Aircraft of Malton, (Toronto) built the most successful night heavy bomber of the war, the Avro Lancaster.



There were numerous other notable Canadian aircraft manufacturers who contributed greatly to the war effort as well. They included Boeing Aircraft of Canada at Sea Island (Vancouver); National Steel Car at Malton, (Toronto); Fleet Aircraft of Canada in Fort Erie, Ontario; Fairchild Aircraft Corporation at Longueuil (Montreal); Federal Aircraft Limited in Montreal, Quebec: Canadian Car and Foundry at Fort William, (Thunder Bay) Ontario; McDonald Brothers Aircraft in Winnipeg, Manitoba and Noorduyn Aviation Limited of Montreal.

Canadian Car and Foundry, in Fort William, Ontario, built 1,451 Hawker Hurricanes under license from Hawker Siddeley Aircraft Ltd.in England. This was one of the most important and versatile fighter airplanes of the Second World War. A number of Hurricanes built in Canada served in RAF and RCAF squadrons during the famous Battle of Britain and later clashes with the enemy. Canadian-built Hurricanes equipped RCAF Home War Establishment squadrons in Canada that provided air defence. Some of these Canadian Hurricanes even operated from the decks of merchant aircraft carriers.



During 1950s, Canadair built a fighter jet under license from the parent company North American Aviation in California, ranked as one of the best in the world. The Orenda-powered F-86 Sabre.

An aircraft that's been called "the best small utility airplane in the world" was built in Canada. It is the De Havilland DHC-2 Beaver. The Beaver was specifically designed for bush flying. It was the answer to the bush operator's prayers. The first of 1,650 aircraft built at the plant in Downsview (Toronto), first flew on the 16th of August 1947. Around 900 Beavers served with the U.S. Army and U.S. Air Force in peacetime and combat. Beavers are truly rugged airplanes. Many are still flying in commercial operations in a variety or roles. After the Beaver, de Havilland Canada designed and built the DHC-3 Otter, DHC-4 Caribou, DHC-5 Buffalo, DHC-6 Twin Otter, DHC-7 Dash 7 and DHC-8 Dash 8.

Quick-Q: Count how many aircraft there are on these two pages with "creature" names. Write down the number here: _____ Answer on page 20

All weather warrior

Avro Canada built 692 CF-100 Canucks designed for all weather fighting. The Canuck or 'Clunk' as it was affectionately known, could operate in bad weather and in the safety of darkness. The first flight took place on January 19,1950. Canucks equipped air defence squadrons in Canada and served with the RCAF in France and Germany. The aircraft was later adapted as an electronic warfare aircraft with Canadian Air Forces. The Belgian Air Force was the only foreign air force to operate the CF-100. The last CF-100 flight took place on June 28, 1982 at St. Hubert, Quebec.

Did you know?... A company in Montreal called Pratt and Whitney Canada builds engines that power commuter aircraft flying all over the world.

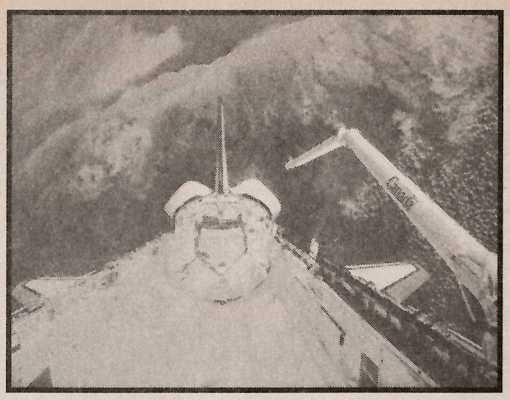
Inventions

More great Canadian firsts

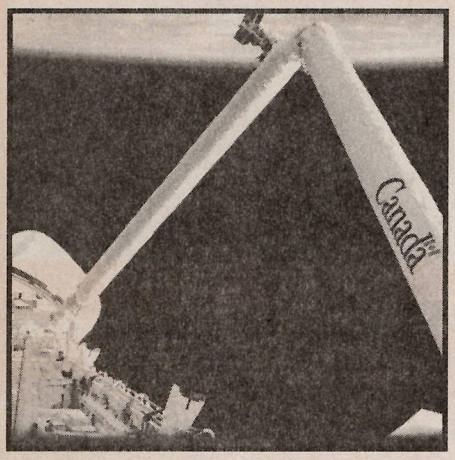
The first computerized navigational system in the world! Flyers had to rely largely on the stars and landmarks to guide them before a RCAF navigator came up with a new idea. J.E.G. Wright, who flew in the Second World War, created a machine that fit in an airplane's cockpit and continually computed the direction and distance to home. (from the *The Kids Book of Canadian Firsts* by Valerie Wyatt)

Did you know?... The first Canadian crash position indicator was invented in 1959 by two Ottawa scientists, Harry T. Stevinson and David M. Makow. Still in use today, a crash position indicator (CPI) sends an emergency radio signal after separating from the aircraft on impact. The CPI was built by Leigh Instruments of Carleton Place, Ontario.

To learn more about the CPI, go to:
www.ewh.ieee.org/reg/7/millennium/cpi/cpi_more.html.



"We have a Canadian first," said the President of the National Research Council, Larkin Kerwin, in 1981, "which is an achievement quite as beautiful as any other work of art."



This invention is a six-jointed maneuverable arm that can grasp and move huge objects with amazing precision. It was first used "out of this world" in 1981 on the space shuttle Columbia.

Can you guess?... What was this Canadian "work of art called"?_____ Answer on page 20

To read more on the Canadarm, go to:
www.ewh.ieee.org/reg/7/millennium/canadarm/canadarm_home.html

Aircraft and Surveys

Can you guess?... Why are aircraft important to the forest industry?
Write your ideas here_____

One of the first-ever aircraft forestry patrols in Canada was in Quebec, over the Saint Maurice Valley. The year was 1919, a decade after J.A.D. McCurdy's first flight. In ten years, aircraft had advanced from rickety things that could stay in the air for just a few minutes, to useful machines that could cross huge expanses of wilderness. Laurentide Air Services Limited was the first company to use photography to help map forest areas. After just two years, the firm was able to create detailed maps, survey thousands of miles of country, transport fire-fighting personnel and other passengers, and spot over 400 forest fires.

Forest fire fighters

The largest operational flying boats in the world are flown by Flying Tankers Incorporated, based at Port Alberni, British Columbia, on Vancouver Island. The former U.S. Navy aircraft have a (61 metre) wingspan. The Mars has four 18-cylinder Wright R3350-24WA Cyclone engines, each rated at 2,500 horsepower! When you see them on the lake, they look like winged whales. The Martin Mars can carry an incredible (60,000-pound 27,216-kg) load of a water and foam mixture.

One of the fastest-loading firefighting planes is Canadair's CL-215 water bomber, which can scoop up 5,400 litres of water in ten seconds, and drop it onto a fire in a flash.

Can you guess?... The name for some of the aircraft used by forest surveyors that could land on the water? _____ Answer on page 20

From the forest to the stars: aerial photography goes to the movies!

In 1922, British Columbia was the site for the shooting of the first aerial sequences used in Canada for a movie. The movie was called "The Unseeing Eye", and starred Hollywood actor Lionel Barrymore. The camera used was a Fairchild which also took excellent mapping photos of (3,690 square kilometres, 425 square miles) of forest.

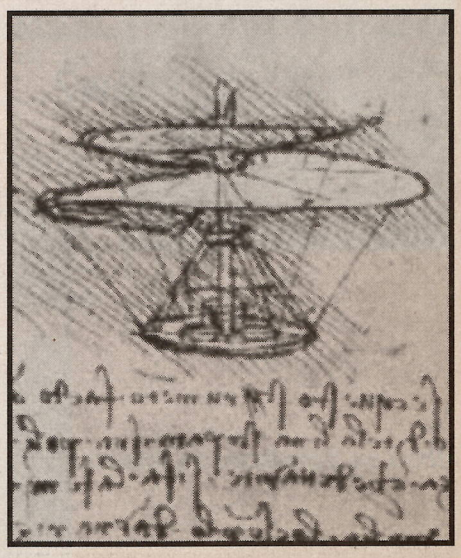
The beginning of passenger comfort

In the early aviation days, passengers in airplanes were just another kind of cargo. Passenger service was an offshoot of the freight and mail delivery done by bush pilots, taking people beyond their usual rail and road connections. For several years, passengers were part of the payload in cramped, noisy and cold cabins.

The first international flight in a heavier-than-air aircraft in Canada took place on the February 28, 1919. W.E. Boeing was flown to Vancouver, from Seattle, Washington in a Boeing C-700 seaplane piloted by Edward Hubbard.

Helicopters

Can you believe it?



You may have read that the famous Italian artist and inventor Leonardo da Vinci drew designs based on the basic principles of vertical flight. These sketches and his theories were the basis for future helicopter designs.

The RCAF's first operational experience with helicopters took place in April 1945. A United States Army Air Force (USAAF) Sikorsky R-4 was used in a rescue mission of RCAF airmen from a crashed Canso flying boat near Lake Morhiban in Labrador.

The first helicopter to serve with the RCAF was the Sikorsky H-5. It entered service on April 5, 1947.

The Intercity Airlines SG Mk. VI-C was the first helicopter designed in Canada. It was test flown at Dorval (Montreal), on July 9, 1947 by H.J. Eagle Jr.

Canada's first commercial helicopter company, Okanagan Helicopters, was formed by Carlyle "Carl" Agar at Penticton, British Columbia in 1947.

Can you guess?... In what year did Leonardo da Vinci make his sketches of the helicopters to be?

Circle the year in which you think Leonardo made those clever drawings:

1912 1483 1753 1692

Answer on page 20

Helicopters can do many things that other aircraft cannot, because they have vertical take off and landing (VTOL) capability. Helicopters don't need a long runway in order to lift into the sky. They can enter and exit from small lift-off areas, like cliff tops or the decks of ships. Some buildings have landing pads on their rooftops, called helipads. Some hospitals have helipads to receive helicopters that have rescued people from emergency situations out at sea, in remote towns or wilderness areas.

The Canadair CL-84 Dynavert was a unique Canadian designed aircraft that featured wings that tilted. This, along with very large propellers, allowed the aircraft to take off, hover and land like a helicopter yet fly like a conventional airplane when the wings were level.

To learn more about this strange-looking flying machine, go to:
www.aviation.technomuses.ca/Eng/Collection/sd024e.htm

Word search: What is the one thing that helicopters do that almost no other aircraft can? Find the word that describes this important ability.

There are other aircraft with VTOL capabilities, but there is another special function of helicopters that makes them so versatile. The ability to hover for prolonged periods of time allows the helicopter pilot and passengers to take photos, drop supplies into hard-to-reach places, recover lost goods or even pull people from danger.

Can you guess?... What are the names of some helicopters used today? _____

_____

Answer on page 20

Did you know?... One of the world's largest manufacturers of civil helicopters is Bell Helicopter in Montreal.

Leaders in Navigation

Air Navigation *"Since the earliest days of powered flight, one of the most important skills required is the ability to navigate. The ability to successfully navigate an aircraft from its start point to its planned landing point is important, not just for a pleasant ride, but also to ensure survival. In a country as large as Canada landing in the wrong place could mean being lost deep in the bush.*

The RCAF, in its earliest days was given the task of exploring our northern territories and Arctic deserts. This was an undiscovered land at a time when aerial navigation skills were very limited. While exploring our country, the RCAF pioneered many new methods that made Canada a world leader in the field of aerial navigation.

Today, Canada remains a leader in this field and other countries send their young navigators to the Canadian Forces Air Navigation School in Winnipeg to learn the art of navigation on Canadian-built DASH 8 aircraft equipped with special navigation learning consoles."
Transport Canada, NAV Canada

For more on NAV Canada, go to: www.navcanada.ca/navcanada.asp
For more on Transport Canada, go to: www.tc.gc.ca

Canada Goes to the Outer Limits

Do you know who these people are?

They are none other than the first Canadian man and woman to travel into space.

A Navy Commander at the time of his shuttle mission, Dr. Marc Garneau orbited earth in the space shuttle *Challenger* from October 5 to 13, 1984. Dr. Garneau is now the President of the Canadian Space Agency.

The first Canadian woman to travel to space was Dr. Roberta Bondar, of Thunder Bay, Ontario. Dr. Bondar's mission as Payload Specialist aboard the space shuttle *Discovery* took place from January 22 to 30 1992. Like Dr. Garneau and most other astronauts, Dr. Bondar has had several careers. She is a renowned scientist, educator and photographer.

Did you know?

Traveling to space is not always for exploration. Scientific experiments that cannot be conducted on Earth can be conducted in the weightless atmosphere of space.

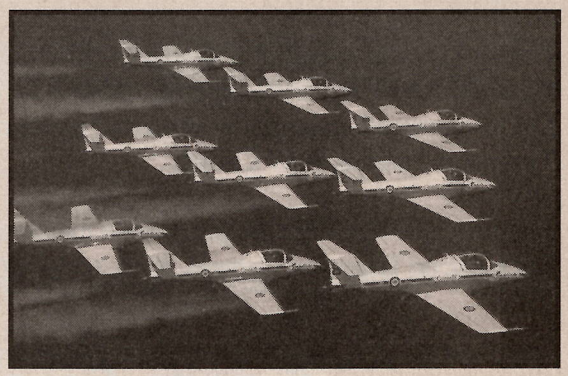
Quick-Q: Can you think of what some of these valuable experiments might be?_____

Answer on page 20

Visit: www.science.nasa.gov/headlines/y2003/16jan_sts107.htm

Get to know Canada's astronauts and learn about the many activities of the Canadian Space Agency by visiting the website: www.space.gc.ca

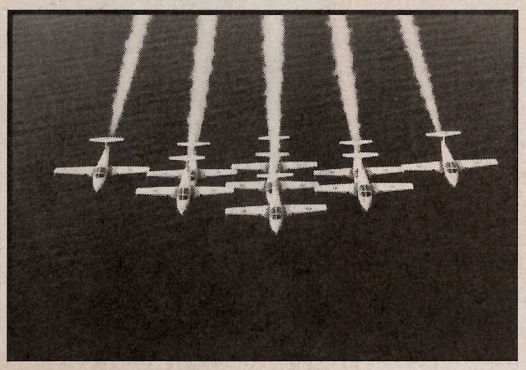
The Canadian Forces Snowbirds - Grace and Beauty in the Sky



As we read earlier, the pilots who returned to Canada after the First World War often took to aerobatic display flying, called barnstorming, as a way to make a living. In the 1920s, the RCAF formed its first aerobatic display team: the Siskins.

Throughout the years, Canada's Air Force has had many aerobatic teams and solo acts as goodwill ambassadors. They have thrilled air show crowds throughout Canada.

In August 1969, Colonel O. B. Philp was posted to Moose Jaw as the new Base Commander. For him this was the chance of a lifetime as the Air Force had just ended its aerobatic flying program and for the first time in years would have no display team for air shows. Col. Philp took advantage of the opportunity to create Canada's most famous display team of all time: "The Snowbirds." Although an unofficial team at first, they soon became official and later were assigned a squadron number, becoming the 431 Air Display Squadron. During the Second World War, Squadrons had been adopted by towns and cities across Canada. In 1999, during the 75th Anniversary of the Air Force, the towns were asked to re-adopt their old Squadrons. When the town of Simcoe, Ontario, was asked, it happily accepted the offer and re-adopted its old Squadron. You can imagine how happy the town was when they found out they had just re-adopted the Snowbirds. Today, the Snowbirds spend eight months each year traveling throughout North America to air shows with their Canadian-designed and built CT-114 Tutor aircraft, thrilling audiences of all ages with their exciting aerial displays of flying skills.



For more information on the Snowbirds, go to: www.snowbirds.forces.gc.ca

Canada's Air Force

Canada's Air Force is always ready to meet Canada's wide range of needs. With over 300 aircraft, the proud men and women of the air force survey and defend Canada and help move large numbers of people, equipment and aid all over the country and around the world. As well, they provide daring rescues as part of their search and rescue role, and work as peacekeepers in many parts of the world. They also help the Army, Navy and other government departments in their important jobs. Canadians should be proud of the dedicated and hard-working men and women of today's Air Force.

The Youngest Pilots

In 1933, Pat Sclanders and Wes Hodgson turned 17 and were able to get their pilots licences. They were the first boys their age who could be legal pilots, and both started lessons when they were 15. Today, the minimum age for a Student Pilot Permit is 16 for an airplane and 14 for an ultra-light. The minimum age for issuing a Private Pilot's License is 17; 16 for an Ultra-light License. Some kids start flying with parents or instructors before they turn 16, and take their Flight tests on their birthdays.

Would you like to take to the skies?

The Royal Canadian Air Cadets and the Young Eagles are two organizations that assist young people who want to learn how to fly.

You can find out all about the Royal Canadian Air Cadets or the Young Eagles by visiting their websites:
www.aircadetleague.com
www.youngeagles.org

If you visit one of the aviation museums across Canada, you can see the fragile flying machines that the brave early pilots flew. Grab a friend or relative, and take a tour. It will open your eyes to the daring of those aviation pioneers!

Find the aviation museum closest to you by contacting the Canadian Museums Association, at www.museums.ca

If you would like to get the feeling of flight, or learn more about aircraft without going to an airport, a few clicks of a computer mouse can take you away!

Web Sites! www.learnalberta.ca/thrillofflight/
www.atac.ca

Word Search

Famous inventor who worked to make aircraft successful in Canada
ALEXANDER GRAHAM BELL

The location of the first flight in Canada and the British Commonwealth
BADDECK, NOVA SCOTIA

Name of the aircraft that first flew in Canada over Baddeck
SILVER DART

Organizations that helped most non-military pilots get their flight training in the 1920s
FLYING CLUBS

An organization that helps young people learn to fly
ROYAL CANADIAN AIR CADET PROGRAM

The "seat" that Olive Stark, one of the first aircraft women passengers, sat on for her 1912 flight
A PLANK

The name of the first Canadian woman aircraft designer in North America
ELSIE MacGILL

The name of the small group of people who worked on early aircraft in Baddeck
AERIAL EXPERIMENTAL ASSOCIATION

Pilot who made history with first flight in Canada
J.A.D. McCURDY

A word for acrobatic flying in early days
BARNSTORMING

The home province of Canada's first bush pilot
QUEBEC

The name of Stuart Graham's aircraft
CURTISS FLYING BOAT

An aircraft that was brought to the screen by a movie starring Dan Aykroyd
AVRO ARROW

An aircraft named after an annoying insect
MOSQUITO

Highest and most prestigious British Commonwealth award for extraordinary gallantry in the face of the enemy.
THE VICTORIA CROSS

The eighteen-year-old Canadian pilot who received Victoria Cross
ALAN ARNETT McLEOD

One of the ways that mail was traditionally been delivered to people in remote Northern communities before aircraft
DOG SLED

First Canadian Air Force women certified to fly fighter aircraft
DEANNA BRASSEUR JANE FOSTER

Something that all helicopters can do that most other aircraft cannot
HOVER

Canadian Scientist who designed one of the first wind tunnels
WALLACE TURNBULL

Name of the first military flight training program in Canada
ROYAL FLYING CORPS OF CANADA

Special name for Canada because so many military pilots were trained in our country during the Second World War
AERODROME OF DEMOCRACY

Canadian Air Force Navigator who designed a computerized navigational system
J.E.G. WRIGHT

Name of the famous invention that put Canada in the forefront of space robotics
CANADARM

Name of the first Canadian man to go to Space
DOCTOR MARC GARNEAU

Name of the first Canadian woman to go to Space
DOCTOR ROBERTA BONDAR

A good place to go if you'd like to see what early aircraft looked like
AN AVIATION MUSEUM

A famous Canada acrobatic display team
THE CANADIAN FORCES SNOWBIRDS

Word Search

S	D	F	A	Y	L	P	A	F	U	G	C	E	P	W	X	U	X	L	T	J	P	V	A	G	N	R	B	J	L	R	V
S	E	E	A	V	K	G	C	U	Q	C	Y	G	A	P	A	P	V	S	X	E	Z	Z	M	C	O	Z	J	N	B	O	J
U	Z	R	A	S	R	J	M	U	V	Y	E	L	L	E	W	B	C	J	I	G	C	Z	F	L	I	U	V	A	W	Y	T
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A	B	O	U	Q	N	K	A	F	V	A	P	R	L	L	V	G	V	E	P	R	Y	E	J	C	A	E	P	A	X	L	O
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B	M	D	C	E	A	U	L	N	N	R	B	S	U	Y	I	V	Z	S	H	O	V	E	R	D	E	N	A	C	B	Q	Q
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Answer Key:

Page 2: a) 2

b) British Columbia. He started flying at Vancouver.

Page 3: There were two sets; it was a biplane.

Page 4: 1. Canada, Australia, New Zealand and the United Kingdom.

2. Royal Flying Corps in Canada

3. The "Aerodome of Democracy"

Page 5: He was 18, and the Victoria Cross was awarded for First World War actions against a far superior number of enemy aircraft.

Page 6: 4

Page 7: 2 million pieces of mail each day, which is approximately 100,000 to 150,000 kilos per day.

Page 8: a) A de-icer, these days sometimes called a "boot" or a "cuff".

b) Barnstorming. Flamboyant young men astonished crowds who had never seen an airplane.The aerobatics they had learned in the heat of the battle were transformed into an aerial ballet in the big sky over small prairie towns. These were Canada's first air shows!

c) Quebec

Page 9: a) Avro CF-100 Canuck

b) A cycle is a process that begins with certain conditions and ends with those same conditions. Reciprocating and turbine engines have similarities. Both power plants are air-breathing engines. Both engines have the same series of events (intake, compression, power, and exhaust). The difference is that in a turbine engine all of these events happen simultaneously, whereas in the reciprocating engine each event must occur in sequence. Another difference is that in a turbine engine each operation in the cycle is performed by a separate component; in the reciprocating engine all of the functions are performed in one component.

Page 11: 6

Page 12: The Canadarm

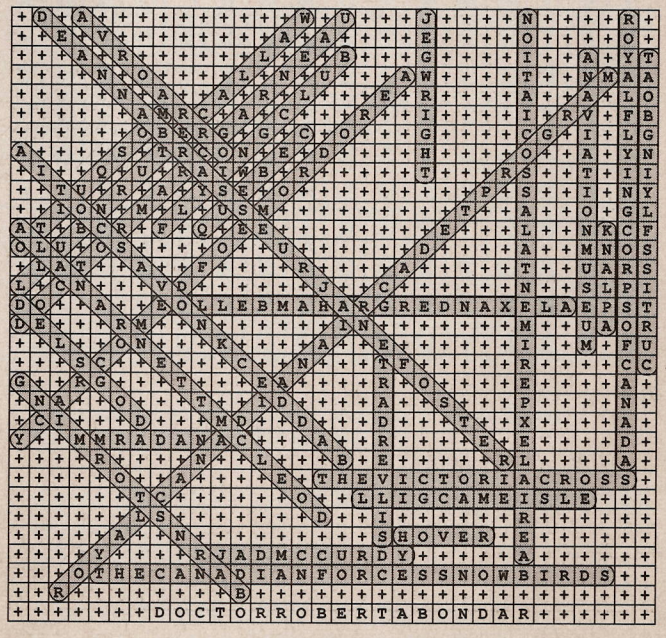
Page 13: Flying Boats

Page 14: a) 1483

b) Griffon, Labrador, Chinook, Twin-Huey, Jet-Ranger

Page 16: Improving auto engines, discovering new aromas and How the brain adapts to weightlessness

Word Search



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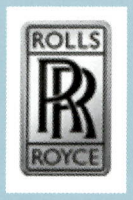

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