



EXPLORING AERONAUTICS

Part I

Section 3

Appendices



Appendix 1: Aeronautics Glossary

accelerate

To speed up.

For example, when an airplane takes off it accelerates down the runway until enough lift is created by the air flowing over the wings so that it can fly.

aerodynamics

A field of fluid dynamics that studies how gases, including air, flow and how forces act upon objects moving through air.

aeronautics

The study of flight and the science of building and operating an aircraft.

airflow

The motion of air molecules as they flow around an object, such as a wing.

airfoil

An object with a special shape that is designed to produce lift efficiently when the object is moved through the air. For example, the cross-section of a wing is an airfoil.

ailerons

Control surfaces on the trailing edge of each wing that are used to make the aircraft roll.

When flying straight and level, moving the control stick to the right will raise the aileron on the right wing and lower the aileron on the left wing. This will cause the aircraft to roll to the right.

aircraft

A machine used for flying.

Airplanes, helicopters, blimps and jets are all aircraft.

airplane

An aircraft that uses the force of air on its wings (called lift) to fly.

**air pressure**

The force created by air pushing on a surface.

altitude

The height of an object, like an airplane, above sea level or above the earth's surface.

analyze

To take something apart so it can be examined and studied.

angle of attack

The angle of a wing to the oncoming airflow.

A pilot pulls back on the control stick to raise the elevator. This causes the aircraft to pitch which increases the angle of attack.

aviation

The operation of aircraft.

There are three types of aviation: general, commercial and military.

axis

A straight line, through the center of gravity, around which an aircraft rotates.

For example, an aircraft rolls around its longitudinal axis which is a straight line that runs through the center of the aircraft, from the nose to the tail.

balanced forces

Opposing forces that are pushing or pulling against each other an equal amount.

For example, if you and a friend pull on a rope, in the opposite direction with the same force, neither of you will move. This is because the forces are balanced.



Bernoulli, Daniel

Daniel Bernoulli was a Swiss mathematician. He was born on February 8, 1700 in Groningen, Netherlands. As a university student he studied philosophy and logic. His favorite subjects were mathematics and mechanics. From 1725 to 1733 he worked as a mathematician with his brother, Nikolaus, at the St. Petersburg Academy of Sciences in Russia. He then worked as a professor at the University of Basel in Switzerland until his death on March 17, 1782.

He is famous for his work in the field of fluid dynamics. In 1738 he wrote a book called Hydrodynamica. In this book he explained his theories about how gases and fluids move, and how the speed at which they move affects the pressure they exert on objects they flow around. This is the basis for the explanation of lift. His work helped to lay the foundation for aeronautics which would be developed many years later.

Bernoulli's Principle

Daniel Bernoulli explained that the faster molecules within a fluid move, the less pressure they exert on objects around them. This applies to all fluids, including water, air and gases.

For example, the water in a pond will exert more pressure on the pond's bottom, than a flowing stream with the same amount of water will exert on the streambed.

biplane

An airplane with two sets of wings.

The first airplane ever built had two sets of wings, one on top of the other.

camber

The curve of an airfoil.

center of gravity

The force of gravity acts on every individual part of an object, like an airplane. However, engineers often treat the force of gravity on all the parts of an object as a single force acting on a point in the object called the center of gravity.

chord line

A line from the front of an airfoil (the leading edge) to the trailing edge .



cockpit

A compartment in the front of the airplane where the flight crew performs their job of flying the aircraft.

commercial aviation

The business of operating aircraft that carry passengers by commercial companies.

Airline companies such as American Airlines, United Airlines and many others are examples of commercial aviation. A Boeing 747 is an example of an airplane that is owned by a company and operated in commercial aviation.

Computational Fluid Dynamics (CFD)

The science of using supercomputers to solve complex mathematical equations that predict how an object like an aircraft responds to the air flowing around it.

CFD is a Tool of Aeronautics that enables engineers to “fly an aircraft in a computer”.

computer

An electronic machine that receives, processes and presents data.

A computer can be programmed to perform complicated tasks, like solving complex mathematical equations or controlling a flight simulator.

control surfaces

Parts of an aircraft that are activated by the controls to change the airflow around the surfaces of the aircraft.

The changes in airflow cause the aircraft to roll, pitch, or yaw. Examples of control surfaces are: ailerons, elevators and rudders.

controls

Devices which allow the pilot to direct the movements of an aircraft.

Examples of controls are: rudder pedals that control the rudders and cause the airplane to yaw; throttles that control the engines which generate thrust for the airplane; and the control stick that controls the ailerons and elevators which cause the airplane to roll and pitch.



data

Information that is collected from an experiment.

For example, an engineer in a wind tunnel may collect data about how much lift is created by a certain wing shape.

decelerate

To slow down.

When an airplane comes in to land, it decelerates and rolls to a stop.

delta wing

A sweepback wing that looks like a triangle from above. The trailing edge of the wing is the base of the triangle.

The XB-70A is an example of an airplane that has a delta wing. The XB-70A can fly faster than twice the speed of sound at an altitude of 70,000 feet.

dihedral angle

The upward angle of the wings that is formed where the wings connect to the fuselage.

drag

The force that resists the motion of the aircraft through the air.

One type of drag is caused by air molecules. As the aircraft flies through the molecules, they resist the motion of the aircraft. This resistance is due to friction between the air molecules and the surface of the aircraft. Airplanes are streamlined to decrease the drag force.

elevators

Control surfaces on the horizontal part of the tail that are used to make the airplane pitch.

Pulling back on the control stick will raise the elevators. This causes the aircraft to pitch and increase the angle of attack.

empennage

The parts of the airplane located at the tail end.

The empennage includes the horizontal stabilizer, the vertical stabilizer, and elevators.



engine

A machine that uses combustion to create energy.

An airplane will normally either have jet engines or engines that drive one or more propellers. In either case, the engines provide the thrust force that pushes the airplane through the air.

engineer

Someone who designs and builds mechanical or electrical devices.

For example, an aeronautical engineer designs and builds aircraft. To do this, an aeronautical engineer must study aeronautics and understand fluid dynamics and aerodynamics.

experiment

A set of controlled procedures designed to test an idea or hypothesis.

For example, a flight simulation engineer will design an experiment to test whether or not a pilot can control an airplane with a new wing design.

Federal Aviation Administration (FAA)

The FAA is a government agency, under the Department of Transportation, that oversees all aviation within the United States.

The FAA controls, for example, airport safety, air traffic control, licensing of pilots, inspection of aircraft, and investigates aviation mishaps.

fin

Another word for the vertical portion of the tail.

flaps

Moveable parts of the trailing edge of a wing that are used to increase lift at slower air speeds. Flaps increase lift by changing the shape of the airfoil.

A pilot will extend the flaps when the airplane is landing. By extending the flaps, the pilot is increasing the camber of the wing, the size of the wing and the wing's angle of attack. All of these actions will cause lift to decrease so the airplane can land more slowly.



flight simulation

A Tool of Aeronautics in which a flight simulator on the ground is used to create an environment where a pilot sees, hears and feels like he or she is in a real aircraft.

Flight simulation is used to investigate how an aircraft responds to a pilot's movement of the controls.

flight test

A Tool of Aeronautics in which a real aircraft is flown to gather data which will accurately describe the capabilities of that aircraft.

Flight test is used to investigate how fast, how far and how high an aircraft can go, and how it handles and performs.

fluid dynamics

The study of how fluids move.

Fluids include water and gases (such as air).

force

A push or a pull in a certain direction, that can be measured.

Examples of forces are your hand pushing on a doorknob, and a propeller pulling an airplane through the air.

forward sweep wing

A wing that is swept toward the front of the airplane, unlike most fast airplanes which have wings that are swept toward the back of the airplane.

The X-29 aircraft is an example of a supersonic jet that has forward sweep wings. The X-29 is capable of going over one and one-half (1 1/2) times the speed of sound.

fuselage

The part of the airplane to which the empennage and wings are attached.

The fuselage is where the passengers and cargo are located. It is streamlined so that it produces the least possible drag.

general aviation

The operation of aircraft that belong to the public.



gravity

The natural force that pulls an object toward the earth.

We experience gravity as weight. An airplane must generate enough lift to counteract the weight of an aircraft .

horizontal stabilizer

The horizontal part of the tail.

The horizontal stabilizer helps to increase the stability of the aircraft. It is also known as a tailplane.

hypersonic

Velocity greater than five times the speed of sound.

The Hyper-X is a reusable launch vehicle that will fly into space and return. It will fly at hypersonic speeds as it re-enters the atmosphere.

hypothesis

A prediction which needs to be tested to tell if it is correct.

An engineer can offer the hypothesis that a particular wing shape will not create enough lift to enable an airplane to fly. His or her hypothesis must then be tested using one or more of the Tools of Aeronautics to determine if it is correct.

instruments

Tools used to observe, measure and control .

For example, pilots use instruments to measure and observe the altitude, speed and direction of an aircraft.

jet engine

An engine that works by creating a high-velocity jet of air to propel the engine forward.

landing gear

Another word for undercarriage.

The landing gear is often retractable - it can be pulled into the fuselage of the aircraft to reduce drag.



lateral axis

The axis extending through the center of gravity of an aircraft, and parallel to a line connecting the tips of the wings.

The lateral axis is sometimes called the "y" axis. Pitch is a motion around the lateral axis.

leading edge

The front edge of an airfoil.

The leading edge is normally rounded and thicker than the trailing edge.

lift

A force that is perpendicular to the airflow around an aircraft.

In normal, forward flight, the lift force "lifts" the aircraft into the air. Engineers design airplanes so that the lift created by the wings opposes the weight force.

longitudinal axis

The axis extending through the center of the fuselage from the nose to the tail.

The longitudinal axis is sometimes called the "x" axis. Roll is a motion around the longitudinal axis.

military aviation

The operation of aircraft that belong to the Armed Forces.

The Air Force YF-23 is an example of an aircraft that is flown only by the military.

model

A copy of an object that is often times smaller than the original.

Wind tunnel engineers create a model of an aircraft to put in a tunnel. The model is a precise replica of the outside of an aircraft.

molecule

The absolute tiniest part of something, that can still be called by that name.

For example, two hydrogen atoms and one oxygen atom make up one molecule of water.



monoplane

An airplane with one set of wings.

Most aircraft built today have only one set of wings and are classified as monoplanes.

National Advisory Committee for Aeronautics (NACA)

NACA was a government agency that was started in 1917. NACA guided research in aeronautics until 1958 when its name was changed to the National Aeronautics and Space Administration (NASA).

National Aeronautics and Space Administration (NASA)

In 1958, NASA was created as a government agency to replace NACA. NASA's charter is to expand frontiers in air and space, to inspire and serve America, and to benefit the quality of life on Earth.

opposing forces

Forces that are pushing or pulling in the opposite direction.

For example, lift is perpendicular to the airflow around an aircraft. If the aircraft is flying straight and level, the lift force (which is pulling up) will be opposing the weight force (which is pulling the aircraft toward the earth).

payload

The load carried by an aircraft that includes passengers and cargo.

pilot

A person who flies an aircraft.

pitch

A rotational motion in which an airplane turns around its lateral axis.

Pushing forward on the control stick will lower the elevators, which forces the tail upward. The pilot will then see the nose of the aircraft fall or pitch.



pressure

A force being exerted on part of a surface.

When you stand, your feet put pressure on the ground. Air pressure refers to air molecules pressing against a surface like the bottom of a wing.

propeller

A device that consists of blades (shaped like airfoils) that spin around a central hub, like a fan.

An engine causes the blades to turn. When the blades turn, they create thrust by biting into the air and forcing it to move back. The amount of thrust can be controlled by changing the speed of the propellers.

pull

To use force to bring something closer.

The force of gravity pulls objects closer to the Earth.

push

To use force to move something ahead or to the side.

During takeoff the thrust force, created by the engines, pushes an airplane down the runway.

reconnaissance

In aviation, to fly over and look closely at an area below to gather information about it.

research

A carefully planned and performed investigation, searching for previously unknown facts.

regimes of flight

A way of placing aircraft into different categories based on their speeds.

The regimes of flight are subsonic, transonic, supersonic and hypersonic.



roll

A rotational motion in which the aircraft turns around its longitudinal axis.

Pushing the control stick to the left will raise the aileron on the left wing and lower the aileron on the right wing. This will cause the airplane to roll to the left. The pilot will see the left wing tip fall and the right wing tip rise.

rotational motion

The turning of an object, like an airplane, around an axis, or a propeller around a hub.

Pitch, roll and yaw are the rotational motions of an airplane around the lateral, longitudinal and vertical axes.

rudder

A control surface on the trailing edge of the vertical part of the tail that is used to make the aircraft yaw.

The rudder is controlled by rudder pedals. Pushing the left rudder pedal will tilt the rudder to the left. This will cause the nose of the aircraft to turn to the left.

scientific method

A systematic way of solving a problem or answering a question using observation and measurement.

The six steps of the scientific method are: state the problem, create a hypothesis, design an experiment, perform the experiment, organize and analyze the data, draw conclusions.

simulator

A device that creates an environment that is as close as possible to reality.

In flight simulators, engineers create a cockpit environment identical to the one in a real airplane. In a flight simulator a pilot will see, hear and feel like he or she is in a real aircraft.

speed of sound

The speed at which sound waves travel.

If you stand a distance away from a friend and say something to him, the sound waves of your voice will travel very quickly to the ear of your friend. The speed of sound is the speed at which those waves traveled.



spoiler

A device, normally located on the top of the wing, for changing the airflow around a wing to reduce lift.

Pilots deploy spoilers when they land so that the airplane is no longer "lifted" into the air.

stability

The condition of being steady.

A motion of an aircraft is said to have stability, or be stable, if the aircraft will return to that motion after a disturbance, without the pilot having to move the controls.

stabilizer

A surface that helps to provide stability for an aircraft.

An airplane has two stabilizers: a vertical stabilizer and a horizontal stabilizer. Stabilizers are like the feathers on an arrow, which keep the arrow pointed in the right direction.

stall

A breakdown of the airflow over a wing, which suddenly reduces lift.

When an airplane stalls it will usually drop suddenly. Pilots know how to recover from a stall and smooth out the airflow over the wings to produce more lift again.

straight wing

A wing that sticks straight out from the fuselage - it does not slant to the front or the rear.

The ER-2 is an example of an aircraft that has straight wings

streamline

To shape an object so that it creates less drag and moves smoothly and easily through the air.

Airfoils are streamlined, as is the fuselage.

subsonic

Velocity less than the speed of sound.

The MD-11 is a subsonic aircraft because it never flies above the speed of sound.



supercomputer

A computer that is especially designed to receive, process and present very large amounts of data very quickly.

The Cray Y-MP is an example of a supercomputer that is resident at NASA Ames Research Center and is used for CFD.

supersonic

Velocity greater than the speed of sound.

The SR-71 is characterized as a supersonic aircraft because it travels from three to four times the speed of sound. A supersonic aircraft can fly from New York to London in less than two hours.

sweepback wing

A wing that is slanted toward the rear of the airplane.

The F-18 aircraft is an example of a supersonic jet that has sweepback wings.

tailplane

Another word for a horizontal stabilizer.

takeoff

The process of using the thrust of the engines to accelerate an airplane down a runway until enough lift is generated so that the aircraft begins to fly.

test pilot

A pilot that is specially trained to test aircraft.

Test pilots must be exceptional pilots, have a complete understanding of aeronautics and aerodynamics, and be able to accurately write and speak about what they see, feel and hear during the testing of an aircraft.

thrust

A force created by the engines that pushes an aircraft through the air.



tool

A device or process that is used to do some kind of work.

A handheld calculator is a tool for doing mathematics accurately and quickly. The Tools of Aeronautics (CFD, Wind Tunnel Testing, Flight Simulation and Flight Test) are processes that use special devices to perform research in aeronautics.

trailing edge

The rear edge of an airfoil.

The trailing edge is normally thin and sharp. The ailerons are normally located on the trailing edge of the wing.

translational motion

Motion along a straight line, such as an axis.

The translational motions of an aircraft are forward and back along the longitudinal axis, side to side along the lateral axis, and up and down along the vertical axis.

transonic

Velocity between nine tenths (.9) and one and four tenths (1.4) times the speed of sound.

The X-1 was the first aircraft to fly faster than the speed of sound. Several versions of the X-1 were built. One succeeded at flying twice the speed of sound at an altitude of 90,000 feet.

turbulence

Air flow which is not smooth and steady.

When an airplane flies through turbulent air, it can unexpectedly rise, drop, roll, pitch or yaw very abruptly.

undercarriage

The part of an aircraft that provides support while the aircraft is on the ground. It includes wheels, shock absorbers and support struts.

There is an undercarriage unit under the nose of the aircraft as well as approximately midway back, under the fuselage. Undercarriage normally includes rubber tires, but may have skis for landing on snow or floats for landing on water.



variable sweep wing

Wings that are hinged so they can be slanted forward or backward during flight. The F-14 aircraft is an example of a supersonic jet with variable sweep wings.

velocity

The speed of an object, in a certain direction.

vertical axis

The axis extending straight up and down through the center of gravity of an aircraft. The vertical axis is perpendicular to the longitudinal and lateral axes.

The vertical axis is sometimes called the "z" axis. Yaw is a motion around the vertical axis.

vertical stabilizer

The vertical part of the tail.

The vertical stabilizer helps to increase the stability of the aircraft. It is also known as a fin.

weight

The force of gravity acting on an object.

The weight force pulls an aircraft toward the Earth and must be overcome by a combination of lift and thrust.

wind tunnel testing

A Tool of Aeronautics that involves placing a model of an aircraft or part of an aircraft into a wind tunnel and using instruments to gather data while air is blown by the model.

Wind tunnel testing is used to investigate and accurately describe the effects of airflow on an aircraft or part of an aircraft.

wind tunnel

A wind tunnel is a tube or cylinder in which a model of an airplane or part of an airplane is placed.

Air is blown past the model so that it experiences the same forces as it would if it were actually flying. The struts that hold the model in place measure these forces.



wing

A part of an airplane that is attached to the fuselage.

Wings are shaped like airfoils and are used to provide lift for the airplane. There are four basic types of wings: straight, sweep, delta and variable sweep.

yaw

A rotational motion in which the aircraft turns around its vertical axis. This causes the aircraft's nose to move to the pilot's right or left.

Pushing the right rudder pedal will tilt the rudder to the right. The pilot will see the nose of the aircraft turn to the right.



Appendix 2: Resources and References

Print Material

The following lists of print materials, video materials, associations, web sites and kits and games simply serve as a reference which offer additional materials and information to the classroom teacher. These lists are not to be considered an endorsement by NASA Ames Research Center.

Teacher Readings

Aerospace Balloons: From Montgolfiere to Space

Edwin J. Kirschner
Aero Publishers, Inc.
Fallbrook, CA
1985
ISBN: 0-8168-0951-8

The Airplane Book

Cheryl Walsh Bellville
Carolrhoda Books, Inc.
Minneapolis
1991
ISBN: 0-87614-686-8

Airplanes of the Future

Don Berliner
Lerner Publications
1988
ISBN: 0-8225-1580-6

The American Heritage History of Flight

Edited Alvin M. Josephy, Jr.
American Heritage Publishing Co., Inc.
NY
1962

Bag of Smoke: Man's First Reach for Space

Lonzo Anderson
Alfred A. Knopf
New York
1968
68-22248

Blimps

Roxie Munroe
E. P. Dutton
New York
1989
ISBN: 0-525-4441-6

The Complete Book of Airships: Dirigibles, Blimps & Hot Air Balloons

Don Dwiggin
Tab Books, Inc.
Blue Ridge Summit, PA
1980
ISBN: 0-8306-9696-2

Cross Sections: Look Inside Planes

Michael Johnstone
Dorling Kindersley
London
1994
ISBN: 1-56458-520-4

A Dream of Wings

Tom D. Crouch
W.W. Norton & Company
New York
1981
ISBN: 0-393-01385-5

Experimenting with Air and Flight

Ormiston H. Walker
Franklin Watts
New York
1989
ISBN: 0-531-10670-5

Fantasy in Flight

C. Burton Cosgrove
Hatfield History of Aeronautics
Albuquerque, New Mexico
1974

A Field Guide to Airplanes of North America

M.R. Montgomery & Gerald L. Foster
Houghton Mifflin Company
Boston, MA
1984
ISBN: 0-395-35313-0

Flight Without Formulae*

A. C. Kermode (fifth edition updated by Bill
Gunston)
Longman Scientific & Technical
London, England
1989
ISBN: 0-582-02698-9

High Speed Flight

Bill Sweetman
Jane's Publishing Company Limited
London
1983
ISBN: 0-86720-661-6

A History of Aircraft*

F. Alexander Magoun and Eric Hodgins
Whittlesey House
McGraw-Hill Book Company, Inc.
New York
1931

Introduction to Flight*

John D. Anderson, Jr.
McGraw-Hill Book Company
New York
1989
ISBN: 0-07-001641-0

Jane's Encyclopedia of Aviation

Compiled & edited by
Michael J.H. Taylor
Crescent Books
New York
1995

Ladybirds

Henry M. Holden
Black Hawk Publishing Company
Mt. Freedom, New Jersey
1991
ISBN: 1-87963-011-7

The Lore of Flight

John W.R. Taylor
Barnes & Noble, Inc.
New York, NY
1996
ISBN: 0-7607-0364-7

Man with Wings A Pictorial History*

Edward Jablonski
Doubleday & Company, Inc.
Garden City, NY
1980



Milestones of the Air, Jane's 100
Significant Aircraft

Compiled by H.F. King, M.B.E.
Edited by John W.R. Taylor
McGraw-Hill Book Company
New York, NY
1969

The Prehistory of Flight

Clive Hart
University of California Press Berkeley, Ltd.
London, England
1985
ISBN: 0-520-05213-7

Research Airplanes: Testing the Boundaries of Flight

Don Berliner
Lerner Publications
1988
ISBN: 0-8225-1582-2

Searching the Horizon: A History
of Ames Research Center 1940-1976

Elizabeth A. Muenger
The NASA History Series
Washington D.C.
1985

Unconventional Aircraft

Peter M. Bowers
Tab Books
Blue Ridge Summit, PA
1990
ISBN: 0-8306-8450-6

Up, Up and Away: The Science of Flight

Dr. David Darling
Dillon Press
New York
1991
ISBN: 0-87518-479-0

Whitewings: Excellent Paper Airplanes
(Future of Flight Series/ Boxed
Assembly Kit for 15 Models)

Dr. Y. Ninomiya
Running Press
1994
ISBN: 1-561-3800-75

Whitewings: Excellent Paper Airplanes
Assembly Kit (Heritage Series)

Dr. Y. Ninomiya
Running Press
1989
ISBN: 0-894-71700-6

Whitewings: Excellent Paper Airplanes
Assembly Kit for 15 Models (Original Series)

Dr. Y. Ninomiya
Running Press
1987
ISBN: 0-894-71571-2

Women of the Air

Judy Lomax
Dodd, Mead and Company
New York
1987
ISBN: 0-396-08980-1

Student Readings

Amazing Flying Machines

Alfred A. Knopf
Dorling Kindersley Limited
London
1992
ISBN: 0-679-92765-4

Aviation and Space Science Projects*

Dr. Ben Millspaugh
Tab Books (A division of McGraw-Hill, Inc.)
New York
ISBN: 0-8306-2157-1

Cross Sections: Look Inside Planes

Michael Johnstone
Dorling Kindersley, Ltd.
London, 1994
ISBN: 1-56458-520-4

The First Air Voyage in the United States

Alexandra Wallner
Holiday House
New York, 1996
ISBN: 0-8234-1224-5

The First Flight Across the United States:The Story of Calbraith Perry Rodgers
and His Airplane, the *Vin Fix* (First Books)

Richard L. Taylor
Franklin Watts, Inc.
New York 1993
ISBN: 0-531-20159-7

The First Solo Flight Around the World:The Story of Wiley Post and His
Airplane, the *Winnie Mae* (First Books)

Richard L. Taylor
Franklin Watts, Inc.
New York 1993
ISBN: 0-531-20160-0

The First Unrefueled Flight Around the World:The Story of Dick Rutan and Jeana Yeager and
Their Airplane, *Voyager* (First Books)

Richard L. Taylor
Franklin Watts Inc.
1994
ISBN: 0-531-20176-7

Flight

Robert Burleigh
Philomel Books
New York
1991
ISBN: 0-399-22272-3

Flying Free: America's First Black Aviators*

Philip S. Hart
Lerner Publications Company
Minneapolis, MN
1992
ISBN: 0-8225-1598-9

The Fool of the World and the Flying Ship:

A Russian Tale
retold by Arthur Ransome
Sunburst Books
1995
ISBN: 68-54105

The Glorious Flight: Across the
Channel with Louis Bleriot

Alice and Martin Provensen
Viking Press
New York
1983
ISBN: 0-670-34259-9

High in the Sky (Supersmarts)

Steve Parker
Candlewick
New York
1997
ISBN: 0-763-60128-4

How it Works: The Worlds of Flight

Bill Gunston
Barnes and Noble Books
New York, 1997
ISBN: 0-7607-0427-9

How Jet Engines are Made (How it is Made)

Julie Moxon
Facts on File
New York
1985
ISBN: 0-861-00037-9

Jets (The Usborne Young Scientist Series)

Mark Hewish
EDC Publications
1997
ISBN: 0-860-20051-5

Lost Star: The Story of Amelia Earhart

Patricia Lauber
Scholastic Inc.
New York, NY
1988
ISBN: 0-590-41159-4

Planes, Gliders, Helicopters
and Other Flying Machines

Terry Jennings
Kingfisher Books
New York
1993
ISBN: 1-85697-869-9

Research Airplanes: Testing the Boundaries of Flight
(Discovery)

Don Berliner
Lerner Publications Company
1988
ISBN: 0-822-51582-2

Sky Pioneer: A Photobiography of Amelia Earhart

Corinne Szabo
National Geographic Society
Washington, D. C., 1997
ISBN: 0-7922-3737-4

The Story of Flight*

Scholastic Voyages of Discovery
Scholastic Inc.
New York
1994
ISBN: 0-590-47643-2

The Story of Flight: Early Flying Machines, Balloons,
Blimps, Gliders, Warplanes And Jets (Voyages of
Discovery)

Editors: Dan Hagedorn & Sheila Keenan
Scholastic Trade
1995
ISBN: 0-590-47643-2

Strange and Wonderful Aircraft

Harvey Weiss
Houghton Mifflin Company
Boston
1995
ISBN: 0-395-68716-0

Timelines Flight: Fliers and Flying Machines

David Jefferis
Franklin Watts
New York
1991
ISBN: 0-531-15233-2

The Tuskegee Airmen: Black Heroes of World War II

Jacqueline Harris
Dillon Press
Parsippany, New Jersey
1996
ISBN: 0-382-39215-9

The Visual Dictionary of Flight
(Eyewitness Visual Dictionary)

Dorling Kindersly Books
London, Great Britain
1992
ISBN: 1-56458-101-2

What's Inside? Airplanes

Dorling Kindersly Books
London, Great Britain
1992

The Wright Brothers: How They Invented the
Airplane

Russell Freedman
Holiday House
New York, 1991
ISBN: 0-8234-0875-2



Videos

Basic Aerodynamics
FlighTime video series

Let's Go Flying, Kids
Meridian House
1994
1 (800) 260-3434

Tell Me Why Video Series: Flight
Black Hawk Publishing Company
P.O. Box 24
Mt. Freedom, NJ 07970
(201) 895-4672

NOVA: Adventures in Science Daredevils of the Sky
WGBH
1994

60 minutes
1 (800) 255-9424

NOVA: Adventures in Science Aircraft Carrier!
WGBH
1994

60 minutes
1 (800) 255-9424

NASA Video Catalog Collection:

These videos can be obtained from any Research Center's Educator Resource Center by submitting a blank video tape.

- | | |
|---|--|
| <p>01 Aeronautics
General overview of the principles of aeronautics and flight.</p> | <p>764 Aerodynamics (1986)
Principles of flight from the era of the Wright Brothers to the Space Shuttle are illustrated in this 35-minute video, using a range of experiments that can be done in the classroom.</p> |
| <p>02 Aerodynamics
Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.</p> | <p>1011 Reaching for Tomorrow (Future of Aeronautics) 1989
This 30-minute video tape describes Dryden Flight Research Facility which is NASA's premier installation for aeronautical flight research.</p> |
| <p>04 Aircraft Communications and Navigation
Includes digital and voice communication with aircraft; air navigation systems; air traffic control.</p> | <p>1014 Flight for the Future (1990)
The aeronautical research performed at Ames Research Center is described in this 30-minute video. The four tools of aeronautics are covered from CFD, to wind tunnels, to flight simulation through flight test.</p> |
| <p>32 Communications and Radar
Includes radar, land and global communications; communications theory and optical communications.</p> | |
| <p>612 Milestones of Flight (1988)
This 25-minute video tape traces the history of flight from Langley's first attempts to the Space Shuttle. Uses live footage from many history making events.</p> | |



Associations

Aerospace Industries Association of America, Inc.
1250 Eye St. NW
Washington, DC 20005

Airline Pilots Association
1625 Massachusetts Ave. NW
Washington, DC 20036

Air Traffic Control Association
220 N. 14th St., Suite 410
Arlington, VA 22201

Air Transport Association of America
1709 New York Ave., NW
Washington, DC 20006

Aircraft Owners and Pilots Association
421 Aviation Way
Frederick, MD 21701

American Institute of Aeronautics and
Astronautics
370 L'Enfant Promenade SW
Washington, DC 20024

Aviation Distributors and
Manufacturers Association
1900 Arch St.
Philadelphia, PA 19103

Civil Air Patrol
Building 714
Maxwell AFB, AL 33112-5872

Experimental Aircraft Association
Educational Division
Wittman Field, Oshkosh, WI 54903-3086

Federal Aviation Administration
Aviation Education APA-100
800 Independence Ave. SW
Washington, DC 20591

General Aviation Manufacturers
Association
1400 K St. NW, Suite 801
Washington, DC 20005

National Agricultural Aviation
Association
115 D St. SE, Suite 103
Washington, DC 20003

National Air Transportation Association
4226 King St.
Alexandria, VA 22302

National Association of Air Traffic
Specialists
4780 Corridor Place
Beltsville, MD 20705

National Transportation Safety Board
Office of Public Affairs
800 Independence Ave. SW
Washington, DC 20591

The Ninety-Nines, Inc.
Will Rogers World Airport
P.O. Box 59965
Oklahoma City, OK 73159
Soaring Society of America, Inc.
P.O. Box E
Hobbs, NM 88241

United States Hang Glider Association
P.O. Box 8300
Colorado Springs, CO 80933

4-H Aerospace Education
National 4-H Program
U.S. Dept. of Agriculture
Room 38605
Washington, DC 20250



Air Transport Association of America
Public Relations Committee
1709 New York Ave. NW
Washington, DC 20006

American Helicopter Society, Inc.
217 North Washington St.
Alexandria, VA 22314

Aircraft Electronics Association
P.O. Box 1981
Independence, MO 64055

Cessna Aircraft Company
Air Age Education
P.O. Box 1521
Wichita, KS 67201

National Air and Space Museum
Public Relations Department
7th St. and Independence Ave. SW
Washington, DC 20560

NASA
Educational Affairs Division
Code XEO, NASA Headquarters
Washington, DC 20546

National Association of State Aviation Officials
Metro Plaza One, Suite 505
8401 Colesville Road
Silver Spring, MD 20910

Web Sites

URL: <http://www.eng.fiu.edu/aero/tools.html>

Appropriate user: teacher or student

Information offered: Describes the basics of how an airplane flies and how it is navigated. Included are many pictures and diagrams of the fuselage, empennage, landing gear, wings, and the importance of each. The study is divided into the following six chapters: Structure of an airplane, characteristics of the Flight Atmosphere, Principles of Flight, The Four Forces of Flight, Flight Navigation, and Aircraft Propulsion.

Possible correlation: This URL would be most appropriate for at least eighth grade and above. Teachers would find this valuable as a refresher to the principles of aeronautics as well as a site to access other links, history, and career information on aeronautics.

URL: <http://www.mcet.edu/nasa/index.html>

Appropriate user: elementary through high school teachers

Information offered: This URL offers a five part, live, interactive broadcast series. These broadcasts are designed to inspire students and engage these learners in science and flight. Some examples of the core concepts would include: air has weight, lift results from Bernoulli's principle, history of human flight, the aerodynamics of flight, the four forces of flight, basic flight instruments, etc. Pre- and post-activities are suggested for teaching the concepts and is divided into three levels. Level 1 indicates appropriateness for elementary, Level 2 is for middle school, and Level 3 is for high school as a general guide.



Possible correlation: This URL provides a wealth of information on aeronautics, aviation science activities, History, and Literature, for the three different levels stated above. There are cool links, live broadcasts, and forums to explore as a teacher or student.

URL: <http://trc.dfrc.nasa.gov/ftintro/index.html>

Appropriate user: aeronautical/technical engineering (students and teachers)

Information offered: This URL provides a technical overview to the introduction to flight test maneuvers. It describes the process of gathering information which describes the capabilities of particular types of airplanes. This information is used to design future airplanes which can operate safely in the environment. Test maneuvers are also addressed and described in detail in sections following the introduction. Acceleration and deceleration, climb, roll, flutter, control pulses, etc. are various topics covered and listed in the index.

Possible correlation: This URL would be an informative resource for teachers who have technical background, but would not be appropriate for students due to the technical details and special terminology used.

URL: http://trc.dfrc.nasa.gov/lesson_plan/aerointro.html

Appropriate user: high school teacher

Information offered: This URL provides aeronautics lesson objectives from Dryden Flight Research Center at the high school level. These lesson objectives include understanding vertical flow, analysis of research data, projecting results of conclusions, and use of research results in real world situations. It is suggested that learner interaction should include: discussion of problems and solutions, discussion of the value of an inexpensive research tool that produces reliable results for understanding a phenomenon with the Water Tunnel Lesson, discussion of the value of research in real world constraints with the X-31 Lesson, and contributions from all learners including students, teachers, and experts.

Possible correlation: There is an aeronautics X-31 Water Tunnel Research Quiz that can be e-mailed to see what the students actually learned.

URL: <http://www.lerc.nasa.gov/WWW/K-12/windtunnel.html>

Appropriate user: elementary, middle school, or high school teachers

Information offered: The K-12 Wind Tunnel Homepage offers the user access to historical information of wind tunnels, general classroom aeronautics activities, build your own wind tunnel activity, and links to wind tunnels on the web. It provides a very clear explanation of the Bernoulli Principle and the first and second laws of motion, and then has question exercises and Space Mathematics worksheets for students to check understanding.

Possible correlation: The teacher can access activities, experiments, and lesson plans that will help explain some of the basic principle's of aeronautics.



URL: http://www.nasm.edu/GALLERIES/GAL_109/NEWHTF/HTF030.HTM

Appropriate user: elementary and middle school students

Information offered: The How Things Fly homepage is a great URL for elementary and middle school students to browse through and learn about several aspects of flight. Students study how balloons are like boats, why we can't fly like the birds, how a jet weighing thousands of pounds can fly, how air is stuff, and how spacecraft in orbit don't float, but they fall around the Earth. Included at the end of each page is a "Did You Know?" button, when pressed it reveals fun facts relevant to the topic studied.

Possible correlation: This URL provides an interactive and stimulating approach to discovering how things fly for students.

URL: <http://www.planemath.com/>

Appropriate user: teacher and elementary or middle school students

Information offered: This web site presents math and aeronautics in a fun way. Students can partake on a math lesson that is related to flight. They can create a flight path and find the shortest route between two cities, or look at plane capacity and figure out how many people can board the plane, fly a herd of buffalo to the prairies and evaluate the runway and takeoffs, or embark on a bird's eye view and learn to fly a rescue helicopter. You can go right to the lesson, get some help to get started, check out other web sites, or show a friend how to use this site and have fun learning about math and aeronautics.

Possible correlation: Teachers can find a list of other places on the world wide web to find math, aeronautics, or disability information. There is also a parent/teacher information site to find a resource list or look at math standards and objectives addressed by the program activities.

URL: <http://hermes.k12.ar.us/docs/think/web/models/mendocino/fly2.htm>

Appropriate user: elementary teachers

Information offered: At this web site, elementary teachers can find a flight unit. Listed are highlights from the materials used in this unit that includes design group applications, economic indicator, graphic organizer, and interned survey form used. Students' aircraft designs in rough draft and final copy form can be looked at. This is helpful so that teachers can get an idea of the great work that young students can create when inspired. There are also personal highlights for the teachers who wrote the units.

Possible correlation: Teachers can find a list of other Internet resources for further study of aeronautics and other teaching resources.



URL: <http://www/rspac.ivv.nasa.gov/observe/techpark/edu/edu.html>

Appropriate user: Teachers and students, K-12

Information offered: There are selected NASA projects that have been developed by educators, scientists, and technologists under cooperative agreements with NASA. The material is organized by grade level and topic, which makes it easy to browse and find what is needed efficiently. Topics that are available include aeronautics, atmosphere, land, space and water.

Possible correlation: There are links to various good sites for teachers provided at this web site. One can also find information on how to get schools linked to the Internet, on-line interactive projects, legislative issue, policies, and grants.

URL: <http://trc.dfrc.nasa.gov/shape/>

Appropriate user: High school teachers

Information offered: This web site provides glider event teaching strategies and sharing aeronautics projects electronically. The strategies focus on the importance of planning, introducing weather, the importance of a flight plan, aircraft preparation, emergency procedures, and final preparation. Decision points are emphasized where students must make critical decisions based on a particular scenario. The goal is to learn the mechanics of glider flight and the interaction of the weather, the forces of flight and drag and other considerations that allow people to make decisions in a certain situation.

Possible correlation: Teachers can see how this hands-on activity could be included with the curriculum and linked to an aeroevent.

URL: <http://www.allison.com/school/jet/layout.html>

Appropriate user: upper elementary and above

Information offered: This site is entitled "How a Jet Engine Works". It includes a basic, non-technical description of how a jet engine generates thrust. The individual components of gas turbine engines are discussed. An excellent page for those interested in knowing how "real" jet aircraft are powered.

Possible correlation: Good student research site.

URL: <http://aero.com>

Appropriate user: teachers

Information offered: A directory of links that lead to a variety of sources: software catalogs, collection of books, mail order catalogs and a classified advertisement section offering aviation type toys, listings of magazines, newspapers and newsletters. It also links you to sites involving ballooning, parachutes and helicopters.

Possible correlation: Research site for teachers.



URL: <http://www.avhome.com> (The Aviation Home Page)

Appropriate user: teachers and high school students

Information offered: An aviation directory that is simple and searchable. Each subject has a summary that gives you some information before you select it. The subjects cover the following: airlines, airports, clubs, organizations, companies, academies, universities, flight schools, federal and military resources, newspapers, magazines, museums, flight simulation, art, photography, poetry, meteorology, satellite images and more.

Possible correlation: Research site for teachers and high school students.

URL: <http://www.wmich.edu/aviation/wof> (World of Flight)

Appropriate user: junior high and up

Information offered: This site is maintained by an aviation sciences student at Michigan University and has an excellent graphic presentation. It offers the following topics: general aviation aircraft pictures under the Aircraft Directory, cockpit layouts in the Flight Deck Directory, a tutorial section that describes and informs on aeronautical topics and a weather icon that offers free up-to-date radar and satellite images.

Possible correlation: Student research for reports, general exploration, weather discussions.

URL: <http://www.aircruise.com/aca/wia> (Women in Aviation)

Appropriate user: elementary and up

Information offered: This easy-to-use site links you to other hard-to-find resources in books, training, mailing lists, museums, publications, video tapes and upcoming events.

Possible correlation: Research resources and connection to other resources.

URL: <http://www.naa.ycg.org> (National Aeronautic Association)

Appropriate user: high school and up

Information offered: Mainly recruitment, but it also offers links to the following sites: Balloon Federation of America, Experimental Aircraft Association, Helicopter Club of America, Soaring Society of America, United States Hang Gliding Association. It also includes the top ten aeronautical records.

Possible correlation: A place to go to look for other resources.



URL: <http://www.faa.gov> (Federal Aviation Administration)

Appropriate user: junior high and up

Information offered: Once you wade through the goals, personnel and mandates you will find a wealth of good information. It is mainly text, but has plenty of information about the FAA.

URL: <http://accuwx.com> (Accuweather)

Appropriate user: upper elementary to adult

Information offered: This is an award winning weather site that is easy to navigate. There is lots of weather data and weather information. It is free for some weather samples, but for real-time weather information you will need to subscribe.

Possible correlation: If you wish to expand and discuss the role weather plays in flight, this is the site.

URL: <http://www.weather.com/> (The Weather Channel)

Appropriate user: upper elementary to adult

Information offered: Lots of easy-to-reference weather tidbits filled with facts and trivia. Special weather news, explanations and current features.

Possible correlation: If you wish to expand and discuss the role weather plays in flight, this is another good site.

URL: <http://stega.smoky.org/~dlevin/>

Appropriate user: upper elementary to adult

Information offered: This is an intensive, interactive handbook packed with data about over 600 different types of aircraft. The reviews include a description, brief history and technical data.

Possible correlation: Relates to vehicle types and regimes of flight and could be used for additional research on aircraft.

URL: <http://www.nasm.edu> (National Air and Space Museum)

Appropriate user: upper elementary to adult

Information offered: This virtual museum gives you an excellent look at aviation history. You can view exhibition galleries, educational programs geared for students, and be linked to other NASM resources.

Possible correlation: Visit here to see some of the actual vehicles that made history and to do further research on any of the topics covered in the Exploring Aeronautics unit.



URL: <http://www.AerospaceMuseum.org> (San Diego Aerospace Museum)

Appropriate user: upper elementary to adult

Information offered: This site has great graphics, well written history section and easy-to-use navigation. It is an excellent exhibit tour that covers the beginnings of powered flight all the way to the space age. If you can't get to the real thing, this on-line museum is great.

Possible correlation: This parallels part of the timeline section of the Exploring Aeronautics unit.

URL: http://www.southwind.net:80/~wknapp/air_cap?

Appropriate user: upper elementary to adult

Information offered: This site gives wonderfully written accounts and informative historical facts about the early aircraft years from 1911-1929. It gives additional information about some of the great aviators of the time.

Possible correlation: Additional information for research on other aviators not mentioned in the timeline.

URL: <http://www.unomaha.edu/~himbergr/flight.html>

Appropriate user: high school and above

Information offered: Although it mostly centers around the University of Nebraska at Omaha Aviation Institute's offerings, it does include the following: course lecture notes, programs and projects offered, careers in aviation, flight training, flying techniques for pilots.

Possible correlation: Great information for high school students interested in aviation career and study. Some interesting background information available here for teachers.

URL: <http://hawaii.cogsci.uiuc.edu/invent/airplanes.html>

Appropriate user: upper elementary and above

Information offered: This virtual museum tour on the invention of the airplane has fun graphics. It includes a gallery of aviation inventors, photo gallery and a list of relevant readings.

Possible correlation: It relates well with the history section and the regimes of flight. Students could use this as a research resource.



URL: <http://www.airfax.com/mof/>

Appropriate user: upper elementary and above

Information offered: This is actually the unofficial site on the Seattle Museum of Flight that was created by a loyal supporter of the museum. It has a wonderful selection of gallery photos. It includes some actual history making aircraft and some replicas. The organization is simple, yet effective.

Possible correlation: Good research site on vehicle types.

URL: http://www.ionet.net/~jellenc/ae_intro.html (Amelia Earhart)

Appropriate user: upper elementary and above

Information offered: This is an expertly written, illustrated and presented tribute to this aviatrix. The text is easy to read and covers her life. It also includes links to sites such as famous women in aviation and the Ninety-Nines.

Possible correlation: Good research for students wanting to learn more about this woman or to find links to other resource sites on female flyers.

URL: <http://www.dfrf.nasa.gov/PhotoServer/photoServer.html>

Appropriate user: upper elementary and above

Information offered: This site is filled with digitized delights of over 600 images of aircraft. The archive offers a vast selection of research aviation photos dating back to 1940. It also offers a Dryden fact sheet and flight research projects page.

Possible correlation: Excellent research site for copyright free photos of aircraft. Good as a resource for research on vehicle types.

URL: http://pchelp.inc.net/paper_ac.htm (Paper Airplanes)

Appropriate user: upper elementary and above

Information offered: This is a fun site offering step-by-step directions with diagrams for making paper airplanes.

Possible correlation: This is a good teacher resource for free paper airplane making instructions that can be used to illustrate the unit, for art and even to help students with ideas for the culminating air show event.



URL: <http://www.cyberspace.com/mbrunk/avpoem.html> (Aviation Poetry)

Appropriate user: upper elementary and above

Information offered: This simple site contains a comprehensively compiled list of aviation poems that deal with wartime insights, courage, thrills of flight, serenity of flying and personal experience. These are written by amateur and professional poets, but could serve as a resource for the teacher when looking for poems about flying to be shown as examples for students when doing the poetry writing parts of the literature section.

URL: <http://www.tc.faa.gov/ZDV/careers.html> (Your Career in Aviation- The Sky's the Limit)

Appropriate user: upper elementary and above

Information offered: This site is an extension of the FAA Aviation Education Program and gives information on a variety of careers one can find in the vast field of aviation. The information here is candid and contains an honest insight into the real world requirements, conditions and future outlook.

Possible correlation: Lots of good research information here for a career search.

URL: <http://www-groups.dcs.st-and.ac.uk/~history/index.html> (mathematics history as well as important mathematicians)

Appropriate user: upper elementary and above

Information offered: This site is loaded with information on mathematics. This archive was developed for learning about and experimenting with mathematics. It includes an extensive biography section of mathematicians, a spotlight section that features the mathematicians who were born or died on the current month/day, a birthplace map, a section on female mathematicians and an interactive segment on "famous curves." One can reach specific mathematicians through the chronological index, biographical index or the birthplace map. The interface is easy and fun to use even for upper elementary students. It is an excellent resource for biographical and historical research. The history index presents mathematical topics in their historical context and shows how these ideas developed over time. It even has a search mechanism that makes it quick to get right to the information one needs.

Possible correlation: In terms of aeronautics, it does not have a specific connection. Overall though it is an excellent resource.

URL: <http://www-hpcc.astro.washington.edu/scied/science.html> (Science and Mathematics Education Resources)

Appropriate user: upper elementary to teachers

Information offered: This education based site offers lots of science throughout the disciplines. It does have some information on aeronautics.

Possible correlation: Correlates to the "How an Airplane Flies" segment of the CD-ROM



URL: <http://www.faa.gov> (Federal Aviation Administration: Airport Tools)

Appropriate user: high school and above

Information offered: explains the functions of the FAA as they relate to the actual administration, air traffic control and flight safety. It also provides the latest news and information about aviation from the FAA's Office of Public Affairs (which includes the history of the FAA and information on turbulence), it also offers a link to "other aviation sites" which leads to "education" that connects you to other technical information offered by colleges.

Possible correlation: career information and education information as it expands the information base in aviation.

URL: <http://www.pweh.com/history/mile2.html> (Pratt and Whitney Engine Design Milestones)

Appropriate user: elementary to teacher

Information offered: easy-to-read timeline on the history of engines.

Possible correlation: great information on the technology of propulsion systems that relates to the "How an Airplane Flies" section of the CD-ROM.

URL: <http://www.aviation-history.com/> (Aviation History On-Line Homepage)

Appropriate user: upper elementary to teachers, very easy to use

Information offered: includes information on aircraft, aviators, engines, construction, theory as well as a link to even more aviation sites. It has interesting graphics that help to illustrate key points.

Possible correlation: The section on "Theory of Flight" directly correlates to the "How an Airplane Flies" segment of the CD-ROM. It has been designed for students to use.

URL: <http://www.aviation-history.com/index-engine.htm> (The Aviation History On-Line Museum)

Appropriate user: upper elementary to teachers

Information offered: Great information from the history of engines, to an explanation of how a jet engine works, to how each type of jet engine works. Nicely illustrated.

Possible correlation: Offers extra information about different kinds of jet propulsion systems which expands on the "How an Airplane Flies" section of the CD-ROM.

URL: <http://www-sci.lib.uci.edu/SEP/SEP.html> (Frank Potter's Science Gems)

Appropriate user: teachers

Information offered: This site offers teachers valuable lesson plans in physical science, earth science, life science, mathematics, engineering (aeronautics is found here), and technology. There's also information on great science discoveries of the 1990s.

Possible correlation: The engineering section includes additional aeronautics-related material.



Kits and Games

Take Off (geography game with flying theme)

Take Off! Inc.

P.O. Box 151

Redmond, WA 98073

1 (206) 883-3143

Action Pack FLIGHT

An interactive guide to aircraft and flight

Dorling Kindersley Publishing, Inc.

1996

Leonardo da Vinci's Flying Machine

Coast Kites

1996

NOVA Curiosity Kits: How to Fly

Curiosity Development, Inc.

1995

Science For a Week

Aeronautics Educational Design, Inc.

New York, NY 10014



Teacher Acknowledgments

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Wisner, NE

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Reno, NV

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Reno, NV

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Morgan Hill, CA



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Foresthill, CA

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Franklin Elementary School
Loomis Union Elementary S.D.
Loomis, CA

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Laveen, AZ

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Kihei, HI

Keisha French

Jessamyn Stidham

Atsa Biyaazh
Shiprock Alternative Schools
Shiprock, NM

Cheryl Burleigh

Charlotte Wood Middle School
San Ramon Vally U.S.D.
Danville, CA

Leta Neiderheiser

Parker Whitney Elementary School
Rocklin U.S.D.
Rocklin, CA

Mary Robillard

South Central Kansas Educational
Service Center
Clearwater, KS

John Olsen

Price Middle School
Cambrian Elementary School District
San Jose, CA

Carol Holtz

Charter School
Yuba City, CA

Jane Jacobs

Antelope Crossing Middle School
Dry Creek Joint Elementary S.D.
Antelope, CA

Liz Joy Bohnfalk

Eureka Elementary School
Eureka Union Elementary S.D.
Granite Bay, CA

Mike Laurence

Greendale School
Niagara Falls, Ontario, Canada

Exploring Aeronautics: The Science of Flight Educator Guide

Activities in Aeronautics

EDUCATOR REPLY CARD

To achieve America's goals in Educational Excellence, it is NASA's mission to develop supplementary instructional materials and curricula in science, mathematics, and technology. NASA seeks to involve the educational community in the development and improvement of these materials. Your evaluation and suggestions are vital to continually improving NASA educational materials.

Please take a moment to respond to the statements and questions below. You can submit your response through the Internet or by mail. Send your reply to the following Internet address:

http://ehb2.gsfc.nasa.gov/edcats/educator_guide

You will then be asked to enter your data at the appropriate prompt.

Otherwise, please return the reply card by mail. Thank you.

- With what grades did you use the educator guide?
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 College/University - _____ Undergraduate _____ Graduate
 Number of Students:
 _____ K-4 _____ 5-8 _____ 9-12 _____ Community College
 College/University - _____ Undergraduate _____ Graduate
 Number of Others:
 _____ Administrators/Staff _____ Parents _____ Professional Groups
 _____ General Public _____ Civic Groups _____ Other
- What is your home 5- or 9-digit zip code? _____ - _____ - _____
- This is a valuable educator guide?
 Strongly Agree Agree Neutral Disagree Strongly Disagree
- I expect to apply what I learned in this educator guide.
 Strongly Agree Agree Neutral Disagree Strongly Disagree

Fold along line and tape closed.

5. What kind of recommendation would you make to someone who asks about this educator guide?
 Excellent Good Average Poor Very Poor

6. How did you use this educator guide?
 Background Information Critical Thinking Tasks
 Demonstrate NASA Materials Demonstration
 Group Discussions Hands-On Activities
 Integration Into Existing Curricula Interdisciplinary Activity
 Lecture Science and Mathematics
 Team Activities Standards Integration
 Other: Please specify: _____

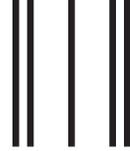
7. Where did you learn about this educator guide?
 NASA Educator Resource Center
 NASA Central Operation of Resources for Educators (CORE)
 Institution/School System
 Fellow Educator
 Workshop/Conference
 Other: Please specify: _____

8. What features of this educator guide did you find particularly helpful?

9. How can we make this educator guide more effective for you?

10. Additional comments:

Today's Date: _____ **EG-2003-07-001-ARC**



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