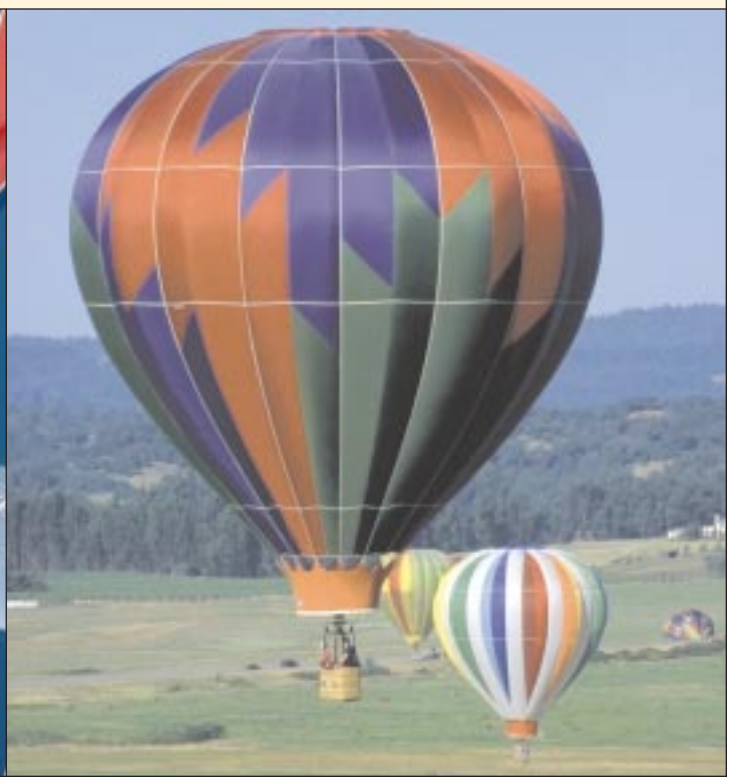
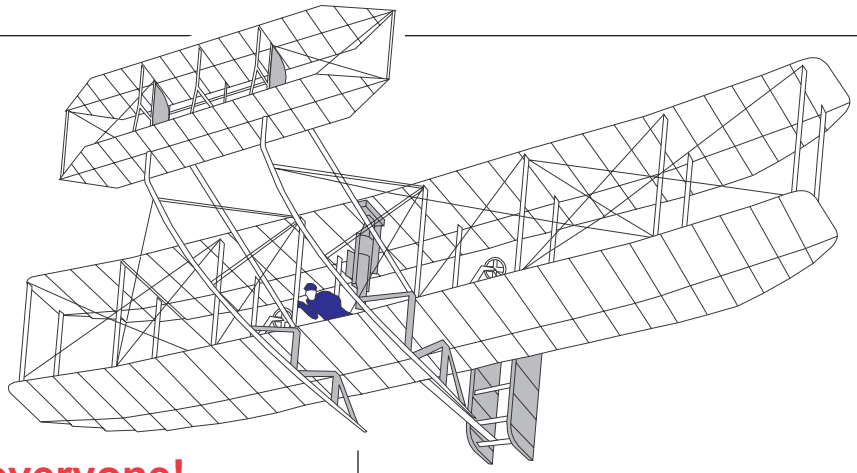
A TEACHER'S GUIDE TO AVIATION

INCLUDES THE FOLLOWING:

Bringing Aviation into the Classroom, The Basics of Flight, Flight Training, Career Information, Useful Aviation Facts, and a Guide to Resources





Aviation is for everyone!

Just over one hundred years ago, powered flight — carrying man where he chose, not just the way the wind blew — was still an idea, a dream of the Wright brothers and others for whom the sky was the limit.

Today, the earth is traversed daily by thousands of flights. In the United States alone, more than 51 million flights are made, transporting more than 697 million passengers each year. Satellites are in orbit around the earth, other planets have been explored, and spacecraft are exploring our solar system and the universe beyond. In one century, the growth of aviation has been more revolutionary, more dramatic, and more far-reaching in its impact than perhaps any other area of human achievement. The miracle of flight is a daily fact of life, affecting everything from the food we eat, to the clothes we wear, to how we conduct business and communicate.

Many teachers are finding that aviation is an exciting and useful subject to teach, incorporating as it does all the basics of learning: history and social studies, math, physics, language arts, earth and physical science, and mechanics. Even civil law, sociology, and other topics can be taught through aviation education.

As an added plus, aviation offers myriad career and job opportunities for young people. Contributing $771 billion to the economy, or more than 12 percent of the Gross National Product (GNP), U.S. aviation and related industries employ some eight million Americans. People are needed to fill positions in many areas, including avionics and air traffic control equipment repair, airline pilots, and mechanics. Commercial and general aviation provide hundreds of careers, from airport manager to aerial applicator to flight engineer to aircraft interior designer. With the exponential growth in air travel and continuing advances in aviation, today's students will be able to choose from an exciting and varied array of career and job opportunities.

This guide is presented as an introductory resource for teachers and counselors (elementary through post-secondary) who wish to utilize aviation in their curriculum or learn more about flying and career opportunities for their students. Several pages of this brochure are suitable for photocopying, if desired, for classroom and student use.

Aviation has come a long way since the first flight in 1903.

- U.S. civil aircraft, numbering more than 215,000, fly almost 47 million hours a year.
- The 206,000 general aviation aircraft comprise 96 percent of the U.S. civil aircraft fleet. General aviation is defined as all flying except that by the military and the airlines.
- More than 640,000 Americans are pilots, of whom nearly 6% are women. The airlines employ about 70,000 men and women in cockpit crew positions.
- More than 500,000 hold certificated, non-flying jobs in aviation.
- The United States has more than 19,000 landing facilities. These include airports, heliports, STOLports (short takeoff and landing), and seaplane bases. General aviation serves all these facilities; the major scheduled airlines fly into less than 400 airports nationwide.
- The William B. Hartsfield International Airport in Atlanta, GA is the busiest airport in the world with more than 900,000 operations a year. Van Nuys Airport near Los Angeles is the busiest general aviation airport in the world with almost 532,000 operations annually.
- Aviation is an extremely safe mode of transportation. An accident with fatalities occurs less than 1.3 times in 100,000 flying hours in U.S. general aviation, and about once in two million U.S. major airline departures.

Many airports, like this one, host the public for open houses and airshows.

You too can fly!

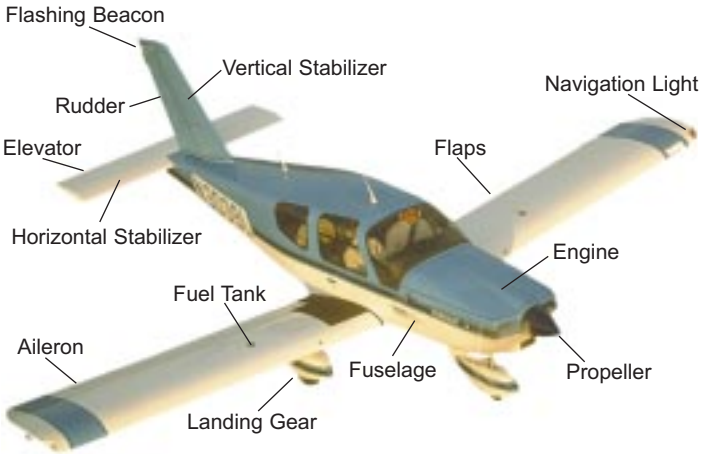
Learning to fly is both fun and challenging, and attainable by almost anyone. It's probably not as difficult or expensive as you might think, and the rewards are great. The three basic requirements are that you must be at least 16 years old, pass a basic medical exam, and speak English. If you have always wanted to fly and you meet those requirements, keep reading!

To obtain your private pilot certificate you must log a minimum of 40 hours of flight time. At least 20 of those hours will be solo flights. "Ground school" will also be part of your training, either with your flight instructor or at a local school or training facility. You can actually fly at any age, but you must be 16 to solo. If you pass a routine medical exam (don't worry if you wear glasses or contacts, that's fine!) and pass both a multiple-choice written test and the FAA flight test, you will be a private pilot!

Sure, learning to fly takes time and money, but it's an investment for a lifetime. You can spread training over a year or more and loans are available. Many people only fly at their local airport on weekends, while others go to intensive flight schools or aeronautical universities. Costs vary considerably depending on where you live and the kind of flight school you attend, but figure on spending $3,000-$5,000. Most people complete the requirements for a private pilot certificate in 6-12 months.

Okay, I'm ready! Where do I start? Probably the best way to start is to check the Yellow Pages under "Flight Training," "Aircraft," "Aviation," or "Flight Schools," or the Internet (www.aopa.org or www.beapilot.com) to find your local airport where flight training is given. Then go to that airport and visit the fixed-base operators (FBOs). The airport may have one or more FBOs, which are general aviation businesses that provide flight instruction, rent and sell aircraft, sell fuel, and provide hangar and tie-down space for aircraft. Check out the FBO's airplanes, instructors, curriculum and prices, and go for an introductory flight. If you like what you see, go for it!

The parts of an airplane

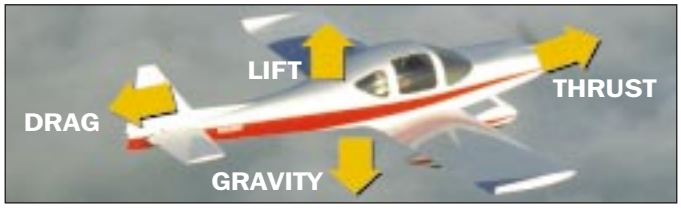


What keeps an airplane in the air?

Let's look at the simple, natural laws that allow airplanes to lift off the ground, stay in the sky and move forward.

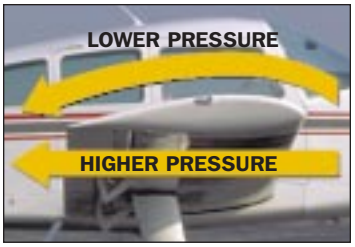
An airplane in flight is the center of a continuous tug-of-war between four forces: lift, gravity, thrust and drag.

Gravity acts on the airplane in flight, just as it does on people and objects on the ground. What over-comes gravity and allows the airplane to fly is lift.



Lift is created when the forward motion of the plane (and its wing) means air must flow over the wing.

Theories include Bernoulli's Law, angle of attack, and airflow deflection.



1) Air flowing over the curved top surface of a wing (airfoil) must travel faster than air flowing under the essentially flat bottom of the wing. According to Bernoulli's Law, this difference in speed produces lower pressure above the wing than below it, and the difference in pressure produces lift (see diagram).

2) To generate lift on symmetric wings, the wing must be tilted with respect to airflow, so the flow travels farther across the top than under the bottom. This tilting is called angle of attack.

3) Downward airflow deflection occurs when air flows over the upper wing surface. Since for every action there is an equal but opposite reaction, the opposite action of the downward deflection is a push upwards (lift).

Pulling the plane (and the wing) through the air is thrust, the power of the engine. Thrust is opposed by drag, air resistance from a number of sources.

Learning to fly, you'll feel all these forces at work but you'll deal with them in a practical way, not in a theoretical way. Learning to fly is action-oriented and fun, not complicated theory.

During your flight training and ground school, you'll become familiar with all the basics of flight, parts of an airplane, and how the aircraft controls operate. Navigation, meteorology, flight physiology, and other topics essential to safe flight are also studied.

Careers in Aviation: *A wide range of jobs, in the air and on the ground*

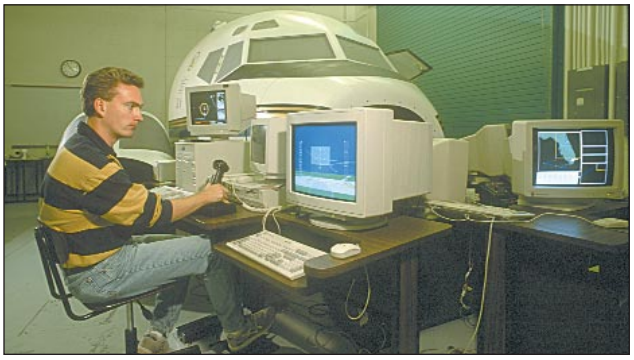
Almost eight million Americans are employed by the aviation industry and in aviation-related jobs in other sectors. They earn about $230 billion a year in wages and salaries in a great variety of occupations.

Pilots, flight attendants, aircraft mechanics, air traffic controllers, airport management and service personnel come most readily to mind; but the industry also offers opportunities in aircraft and electronics manufacturing, meteorology, shipping, travel planning, restaurant management, computer programming and operations, construction, and financial management.

Air transport is vital to the nation's economy and enriches its social structure. Besides providing rapid personal and business transportation, it hauls cargo, delivers the mail, and keeps our banking system running by flying financial documents overnight.

General aviation, which is all civilian flying except the airlines, includes such important activities as emergency medical evacuation, corporate air transportation, airborne law enforcement, environmental surveying and mapping, news and traffic reporting, crop dusting, pipeline patrol and a hundred others.

There are a great number of resources available on careers in aviation and college s cholarships. Check the back of this guide for contact information.



Encourage your students to explore resources to learn about careers such as:

- Agricultural pilot
- Airline pilot
- Military pilot
- Corporate pilot
- Flight instructor
- Airport manager
- Air freight cargo agent
- Operations chief
- Flight dispatcher
- Air traffic controller
- Flight attendant
- Reservations agent
- Aircraft manufacturing
- Computer programmer
- Avionics technician
- Security officer
- Meteorologist
- Financial manager
- Airframe and powerplant mechanic

Opportunities will be there, and the sky's the limit!

Aviation in the classroom: *A proven motivator, and fun too!*

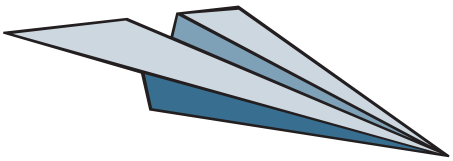
All across the country, teachers are finding that aviation is an interesting and enjoyable device for teaching virtually every topic, from social studies to math, from science to reading, from history to language arts. Students can relate aviation to "real life" and current events – a trip to the airport, watching the space shuttle on television, airline mergers and acquisitions.

Many schools are finding that their aviation and aerospace programs are outstanding student motivators, especially at the high school level. Group projects like building an airplane or glider and field trips to the airport motivate and interest young people. Although few of them will become pilots, many go on to careers they discovered during an aviation curriculum. Most gratifying, however, is the enjoyable and wide-scale learning that teaching aviation can generate.

Some activities and teaching ideas…

Elementary Level

- Fold and fly paper airplanes, or construct balsa or foam gliders and fly them in the playground or gym. Have contests for the farthest distance flown. Discuss the action of the four forces and how the control surfaces of the gliders affect flight (climb, stall, roll, etc.).



- Prove that air is a real substance: blow up balloons and pop them. Blow up a Ziploc bag and seal it. Show air resistance by dropping a sheet of paper, then a crumpled ball of paper, and finally a paper cone from a ladder; time the drops and discuss the results.

- Take a field trip to the airport, arranged through the airport manager, who may even allow students to board an aircraft. Locate and discuss basic parts of a plane – wings, fuselage, propeller, landing gear, engine, etc. Later, discuss what the students saw happening at the airport and have them draw pictures of their experience.

- Teaching modules could include units on balloons, airplanes, helicopters, airports, spacecraft, air and its properties, history of flight, aviation career awareness, etc.

Secondary Level

- Students construct mid-size, functional gliders using balsa wood and modeling materials. Concepts such as wing loading and weight-and-balance should be utilized, with concurrent classroom teaching of other areas such as navigation, systems and instruments, density altitude, etc.

- Have a career day at the airport. Presentations can be made by pilots, flight instructors, airport or operations manager, airframe & powerplant mechanics, FAA, state aviation agency, etc. Short flights for the students make the day a memorable one!

- Purchase or get a company to donate a flight simulator or use flight simulation software. For students wishing to take aviation ground school, explore the possibility of obtaining school credits for successfully passing the FAA private pilot written exam.

- Some schools build aircraft from scratch and find they need to limit class sizes because of overwhelming student interest. Other schools have been lucky enough to obtain—through donation or purchase—an old airplane or one that has been damaged. Rebuilding the aircraft is a multi-year project involving scores of students and the help of outside experts who serve as mentors. Building an aircraft involves manufacturing and construction principles, math, physics, mechanics, etc. Many students have gone on to explore piloting, manufacturing, maintenance, and engineering careers.

Aviation resources and information for the asking.

There is a wealth of information available from industry organizations about aviation education, careers, and all aspects of U.S. aviation-from aerospace manufacturing to aviation safety. In addition, your local airport manager may be helpful for information specific to your area, and chances are that your state aviation agency (usually within your Department of Transportation) will have materials useful to teachers and students.

Academy of Model Aeronautics
5151 East Memorial Drive
Muncie, IN 47302
765/287-1256
Fax: 765/289-4248
http://www.modelaircraft.org

Aerospace Industries of America
1250 Eye St NW, Ste 1200
Washington, DC 20005
http://aia-aerospace.org
202/371-8544
Fax: 202/371-8470

Air Line Pilots Association
535 Herndon Parkway
Herndon, VA 22070
703/481-4444
Fax: 703/689-4370
http://www.alpa.org

Air Transport Association
1301 Pennsylvania Ave NW, Ste 1100
Washington, DC 20004
202/626-4172
Fax: 202/626-4181
http://www.air-transport.org

Aviation Exploring Division
Boy Scouts of America
1325 Walnut Hill Ln
Irving, TX 75015-2079
214/580-2427
http://www.learning-for-life.org/exploring/aviation/index.html

Civil Air Patrol Cadet Program
105 South Hansell St
Maxwell AFB, AL 36112-6332
http://cap.af.mil
334/953-5095
Fax: 334/953-7771

EAA Aviation Foundation, Inc.
P.O. Box 3065
Oshkosh, WI 54903-3065
414/426-6815
Fax: 414/426-6765
http://www.eaa.org
http://www.youngeagles.com

Federal Aviation Administration
Aviation Education, APA 100
800 Indepedence Ave SW
Washington, DC 20591
http://www.faa.gov/education.htm

General Aviation Manufacturers Association
1400 K St NW, Ste 801
Washington, DC 20005-2485
202/673-1378
Fax: 202/842-4063
http://www.generalaviation.org

Helicopter Association International
1635 Prince Street
Alexandria, VA 22314
703/683-4646
Fax: 703-683-4745
http://www.rotor.com

National Aeronautics & Space Administration
Education Division/Code FE
400 Maryland Ave SW
Washington, DC 20546
http://www.hq.nasa.gov/

National Air & Space Museum
Education Services MRC 305
6th & Independence Ave SW
Washington, DC 20560
http://www.nasm.si.edu
202/786-2106
Fax: 202/633-8928

National Association of State Aviation Officials
Center for Aviation Research and Education
8401 Colesville Rd, Ste 505A
Silver Spring, MD 20910
http://www.nasao.org
301/585-0587
Fax: 301/585-1803

National Business Aviation Association
1200 Eighteenth St NW, Ste 400
Washington, DC 20036-2506
202/783-9000
Fax: 202/331-8364
http://www.nbaa.org/careers/

National Coalition for Aviation Education
P.O. Box 28086
Washington, DC 20038
http://www.aviationeducation.org

Professional Aviation Maintenance Association
1200 18th St NW, Ste 401
Washington, DC 20036-2506
202/296-0545
Fax: 202/296-0618
hq@pama.org
http://www.pama.org

University Aviation Association
3410 Skyway Drive
Auburn, AL 36830
334/844-2434
Fax: 334/844-2432
http://uaa.auburn.edu/uaahome.htm

Women in Aviation, International
3647 S.R. 503 South
West Alexandria, OH 45381
937/839-4647
Fax: 937/839-4645
http://www.wiai.org

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