

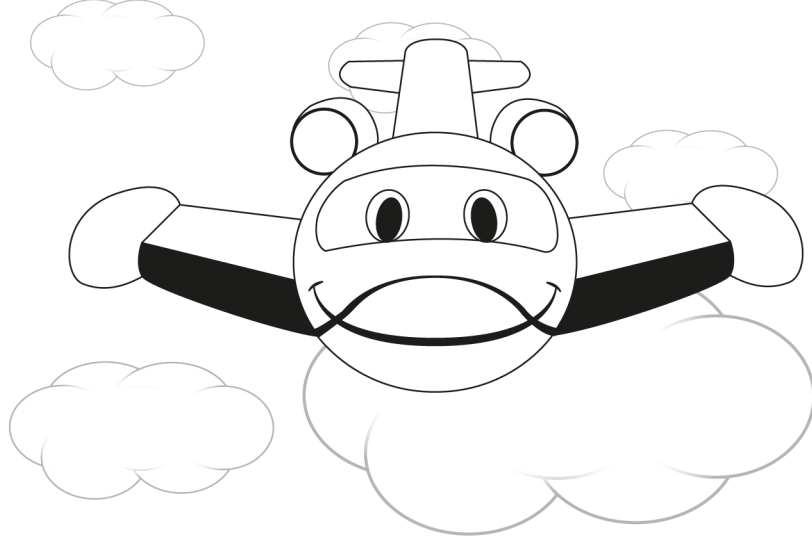
# Aviation

with Donnie the  
Duncan Jet



**DUNCAN**  
AVIATION

# Welcome to **DUNCAN** **AVIATION**®



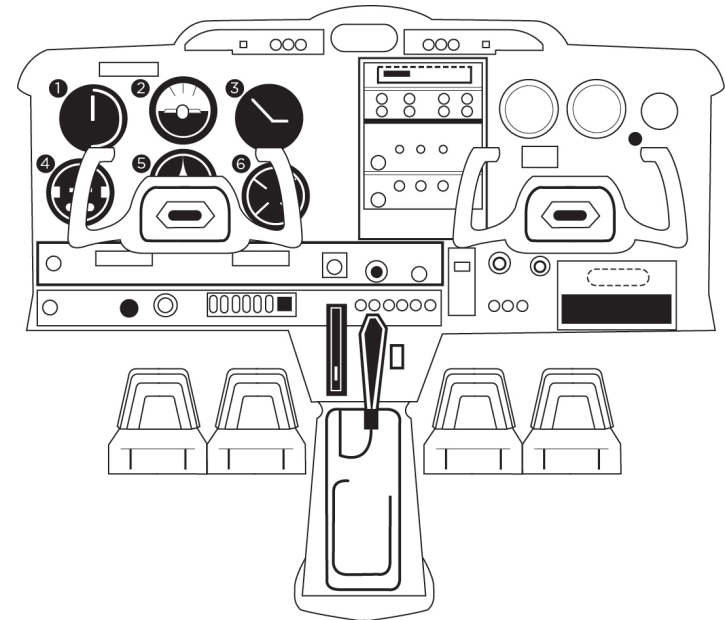
Hi kids! I'm Donnie the Duncan Jet. Join me in learning about aviation, explore the different parts of an aircraft and have fun playing games.

Here's a fun fact to get you started:  
Did you know that airplanes use a different kind of fuel than your car? Airplanes use jet fuel, which is a blend similar to diesel fuel.

## What are the Main Instruments?

Although the cockpit may seem confusing at first, most aircraft have six basic instruments to aid the pilot during flight.

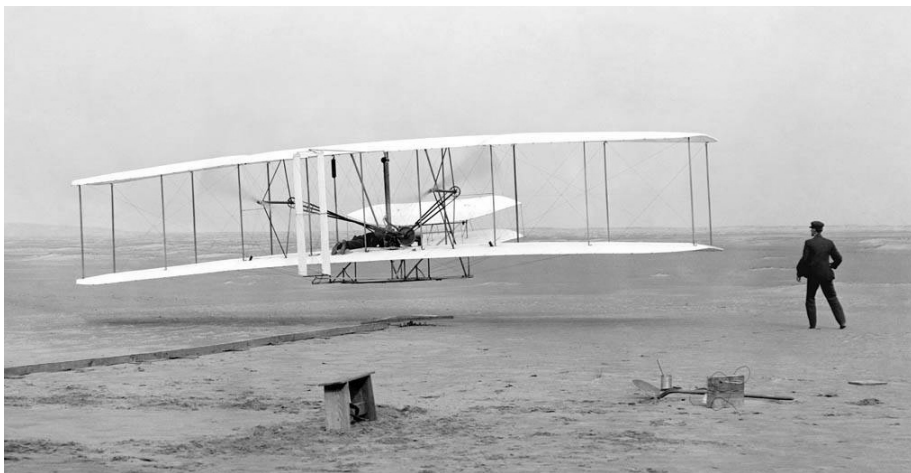
- 1. Airspeed Indicator:** This instrument shows how fast the aircraft is traveling through the air; similar to a speedometer in a car.
- 2. Attitude Indicator:** This instrument functions as an artificial horizon. It shows whether the aircraft is banking to the left or right and if the nose is above or below the horizon.
- 3. Altimeter:** This instrument shows the aircraft's altitude in feet above mean sea level, which is a function of barometric pressure.
- 4. Turn Coordinator:** This instrument features a miniature airplane inside the dial and gauges turn rate and direction.
- 5. Heading Indicator:** This instrument functions as a compass to indicate the current heading direction of the aircraft.
- 6. Vertical Speed Indicator:** This instrument measures the change in air pressure as the aircraft ascends or descends and registers the change in altitude in feet per minute.



# Wright Brothers

Orville and Wilbur Wright were two American brothers credited with inventing and building the world's first successful airplane and powered human flight on December 17, 1903.

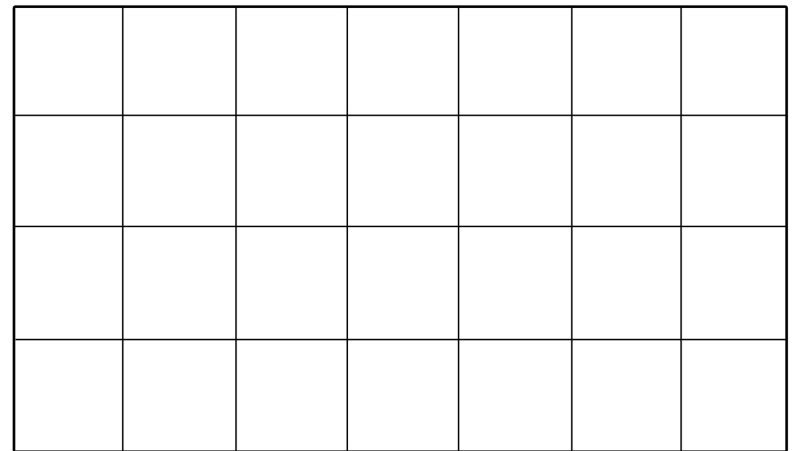
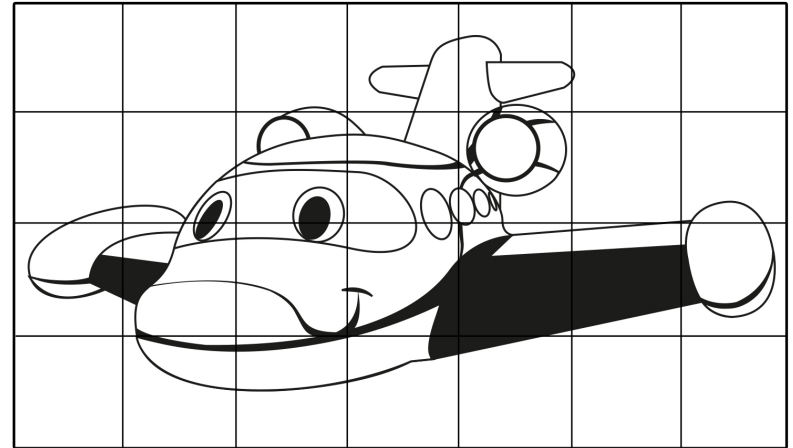
Flyer I, their most ambitious plane weighed more than 600 pounds and had a wingspan of 40 feet. The brothers flipped a coin to see who would be the first pilot. Orville won. With his brother at the controls, Wilbur pushed the plane down a short wooden ramp and it lifted into the air. Flyer I remained airborne for twelve seconds and travelled just 120 feet. By the end of the day, both brothers had made successful flights, with Wilbur covering a record 852 feet in 59 seconds. Through hard work and never giving up, the Wright brothers left Kitty Hawk, North Carolina, that day having done the impossible.



First Flight, December 17, 1903. Orville piloting and Wilbur running at wingtip.

# Grid Art Drawings

Draw the plane below in the empty grid area.  
Use the squares to help guide you.





Amelia Earhart, 1937

# Aviation Heroes

**Bessie Coleman:** On June 15, 1921, Coleman received the first pilot's license issued to an African American, male or female, from the Federation Aeronautique Internationale.

**Charles A. Lindbergh:** Lindbergh flew solo in the "Spirit of St. Louis," a single 220-horsepower Wright Whirlwind engine, from New York to Paris in May 1927. Lindbergh completed the 3,600-mile journey in 33 hours and 29 minutes.

**Amelia Earhart:** On June 17-18, 1928, Earhart became the first woman to cross the Atlantic by air as a passenger. As a pilot, Earhart set out in June 1937 to circumnavigate the world and vanished near Howland Island in the Pacific Ocean.

**Chuck Yeager:** On October 14, 1947, Yeager was the first person to break the sound barrier. With that flight, he travelled faster than any human being ever had.

**Baroness Raymonde De Laroche:** The first woman to receive a pilot's license. In 1919, the Baroness set a women's altitude record of 15,700 feet.

**Charlie Taylor:** The "unsung hero of aviation," who built the engine that powered the Wrights' first airplane.

**Louis Blériot:** Frenchman Blériot was the first to successfully fly across the English Channel in a small, 25-horsepower machine on July 25, 1909, at 4:35 a.m.

**Jeana Yeager and Dick Rutan:** On December 14, 1986, Yeager and Rutan took off to break one of aviation's last records: to fly around the world non-stop and non-refueled. The round-the-world flight of Voyager lasted nine days, three minutes, and 44 seconds, finishing back at Edwards Air Force Base on December 23, 1986.

# Aviation Heroes Word Search

Find and circle the list of words below in the puzzle.

Bessie Coleman  
Charles Lindbergh  
Amelia Earhart  
Chuck Yeager  
Solo Flight  
Baroness De Laroche

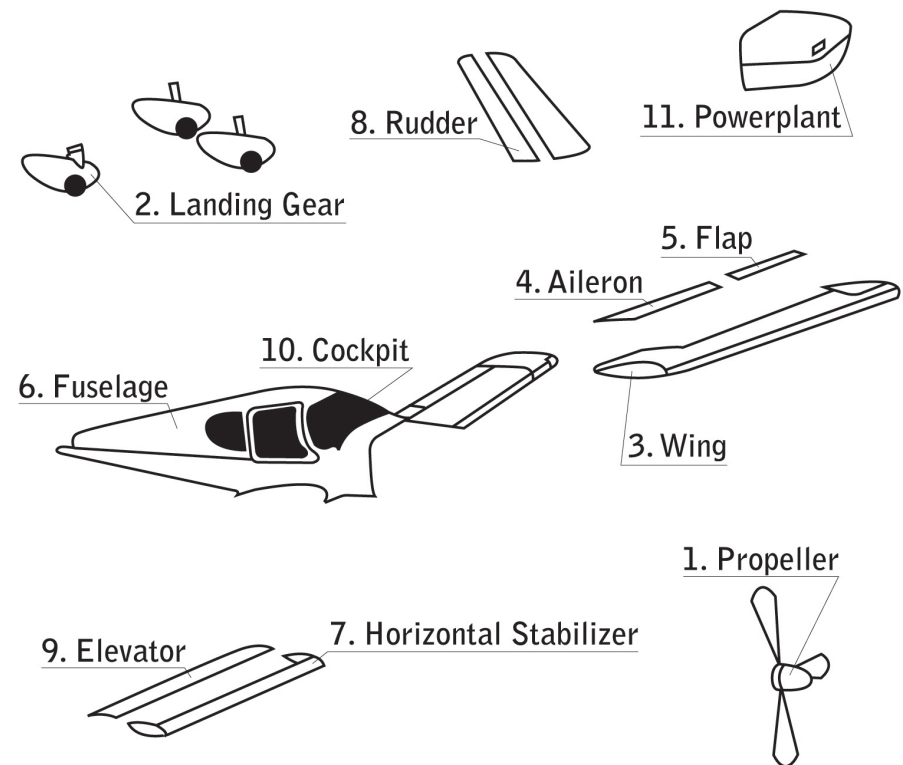
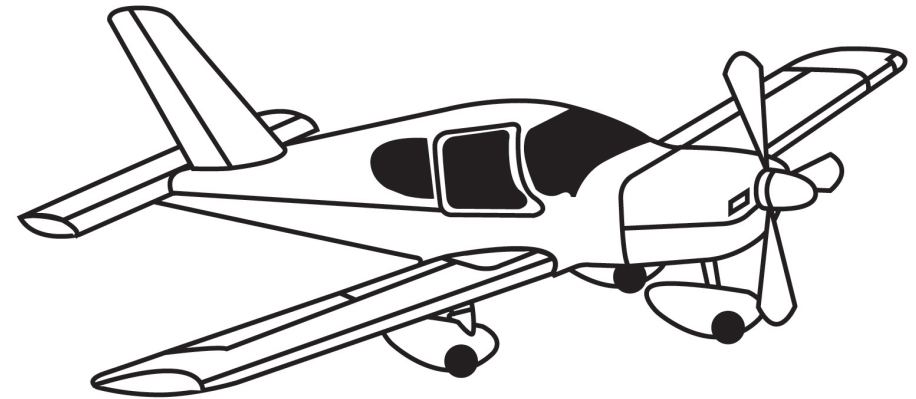
Altitude  
Charlie Taylor  
Louis Blériot  
Fly  
Jeana Yeager

Engine  
Dick Rutan  
Record  
Pilot  
Nonstop

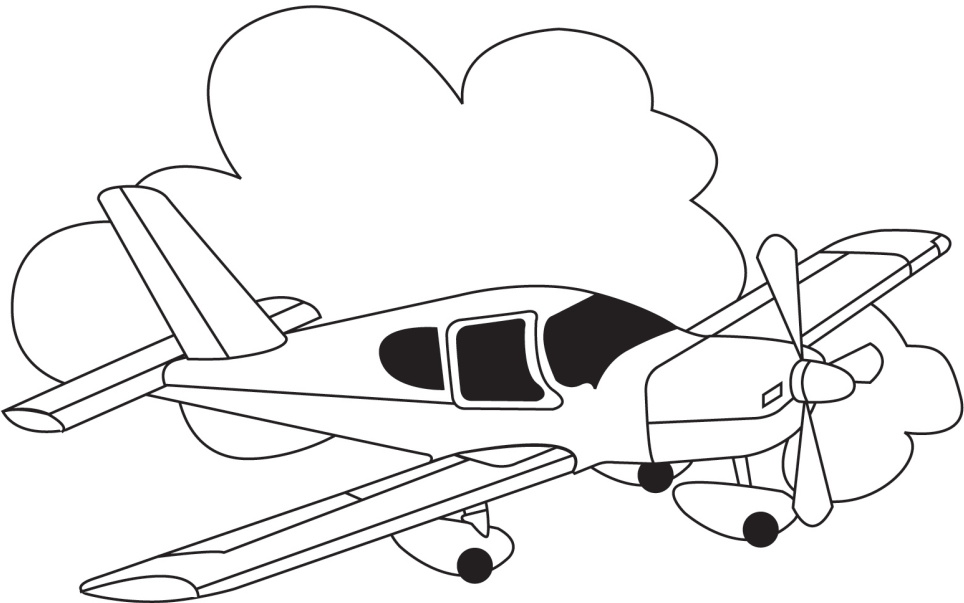
P	N	R	O	I	S	C	K	E	J	D	U	C	R	R	R	O
A	I	Y	E	A	E	A	G	U	D	O	L	A	H	O	C	T
M	E	Y	L	N	T	G	S	Y	E	I	A	L	E	N	H	O
E	H	C	O	R	A	L	E	D	S	S	E	N	O	R	A	B
L	H	K	B	T	L	M	N	D	N	L	G	N	O	E	R	D
I	R	L	S	R	E	I	E	L	U	I	S	L	C	L	L	R
A	R	E	F	I	E	S	R	L	N	T	Y	E	A	L	E	N
E	I	E	C	C	A	T	A	E	O	A	I	O	S	C	S	G
A	R	S	T	T	N	E	Y	P	T	C	E	T	O	N	L	B
R	D	C	H	U	C	K	Y	E	A	G	E	R	L	T	I	E
H	S	O	L	O	F	L	I	G	H	T	D	I	Y	A	N	L
A	T	O	I	R	E	L	B	S	I	U	O	L	S	L	D	A
R	N	A	T	U	R	K	C	I	D	R	F	L	L	S	B	E
T	R	J	E	A	N	A	Y	E	A	G	E	R	I	N	E	A
O	H	O	H	E	N	E	C	R	P	I	C	Y	C	P	R	B
D	E	C	G	I	R	B	H	E	E	O	U	K	L	E	G	L
F	H	N	I	E	L	L	E	Y	Y	N	L	T	O	U	H	S

# Aircraft Parts

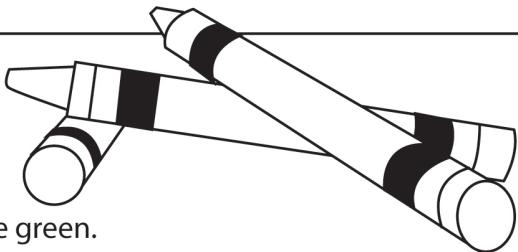
- 1. Propeller:** The turning blades pull the aircraft through the air.
- 2. Landing gear:** The wheels used to take-off from the runway and land.
- 3. Wings:** Give life and support the weight of the aircraft.
- 4. Aileron:** The outside edges of the wing that are moveable on the plane.
- 5. Wing Flaps:** They can only turn down and act as brakes when landing and create lift for take-off.
- 6. Fuselage:** The body of the aircraft that holds passengers and cargo.
- 7. Horizontal Stabilizer:** Balances the aircraft.
- 8. Rudder:** Moves left or right and helps to keep the plane steady.
- 9. Elevator:** Moves up and down to make the aircraft pitch up or down.
- 10. Cockpit:** Where the controls are and where the pilot and co-pilot sit.
- 11. Powerplant:** An engine is used to power an aircraft. There are four types of powerplants.  
Piston engine: turns a propeller.  
Jet engine: uses a turbine.  
Turboprop: jet engine combined with a propeller.  
Turboshaft engine: jet engine and a rotor to lift a helicopter.



# Aircraft Coloring Challenge



Color the PROPELLER green.  
 Color the POWERPLANT dark blue.  
 Color the FUSELAGE red.  
 Color the WINGS yellow.  
 Color the AILERONS purple.  
 Color the FLAPS light blue.  
 Color the RUDDER orange.  
 Color the ELEVATOR pink.  
 Color the LANDING GEAR lime green.



# Crossword Puzzle

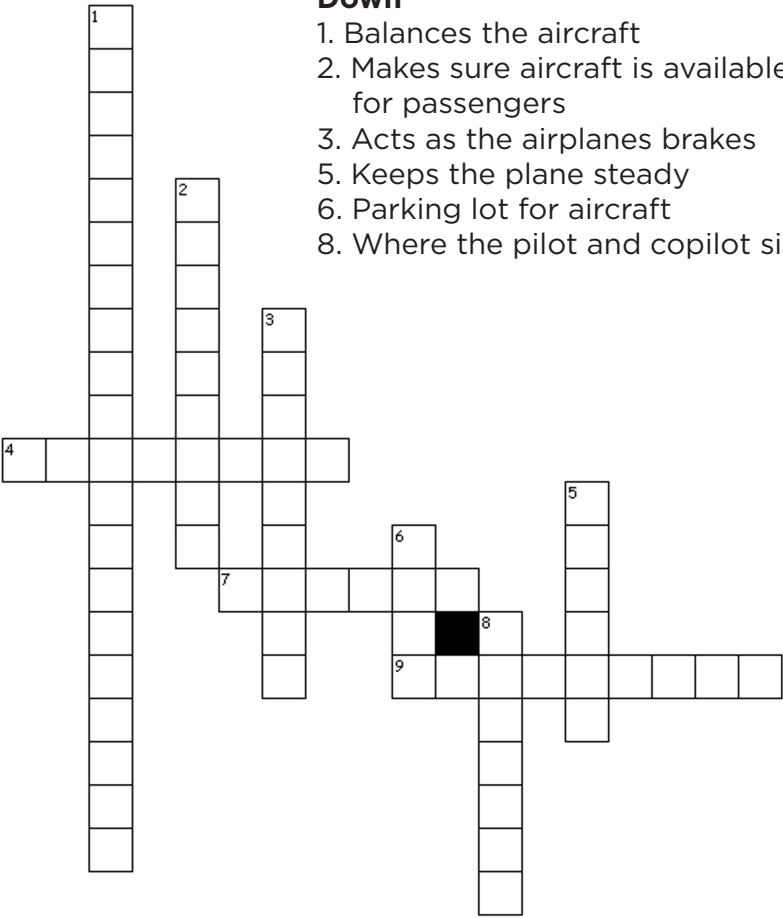
Use the definitions as a clue to the word that goes into the corresponding blank spaces.

### Across

- 4. Body of the aircraft
- 7. Garage where a plane is parked
- 9. Pulls aircraft through the air

### Down

- 1. Balances the aircraft
- 2. Makes sure aircraft is available for passengers
- 3. Acts as the airplanes brakes
- 5. Keeps the plane steady
- 6. Parking lot for aircraft
- 8. Where the pilot and copilot sit



Across: 4. Fuselage 7. Hangar 9. Propeller  
 Down: 1. Horizontal Stabilizer 2. Scheduler 3. Wing flaps 5. Rudder 6. Ramp 8. Cockpit



# What is Business Aviation?

The sector of aviation which concerns the operation or use of aircraft by companies for the carriage of passengers or goods as an aid to the conduct of their business, flown for purposes generally considered not for public hire and piloted by individuals having, at the minimum, a valid commercial pilot license with an instrument rating.

## Business Aviation Jobs

**Flight Department Manager:** Leads the group of people who fly, maintain, schedule and service the company aircraft. This person has either a college or advanced degree with a lot of previous experience working as either a pilot or maintenance technician.

**Business Pilot:** This is the person who actually flies the aircraft. An operating license must be earned to meet qualifications to fly the kind of aircraft operated by the company.

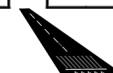
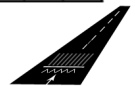
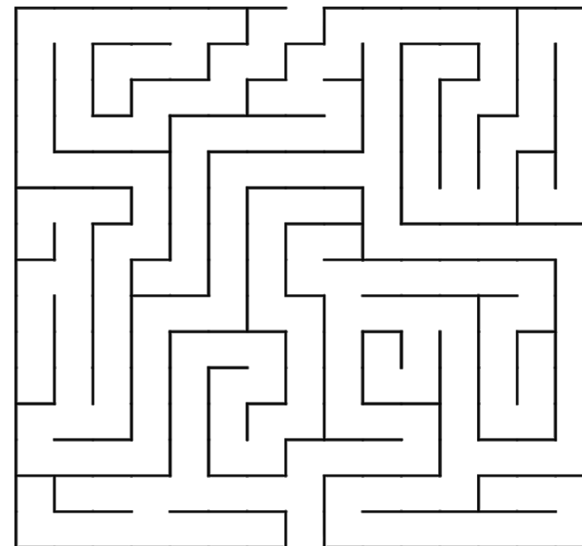
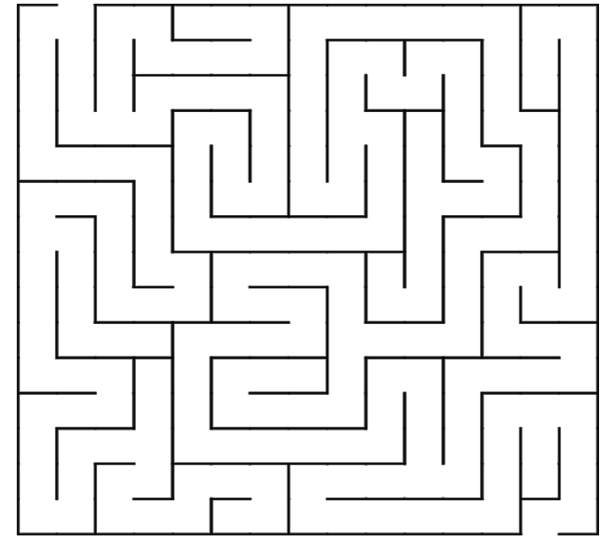
**Mechanic/Maintenance Technician:** This person makes sure that all parts of the aircraft are working properly and fixes the aircraft when something on it is broken. College or training from a school that specializes in aviation is required to receive a license showing qualifications. To keep skills sharp, training one or more times a year is required.

**Scheduler:** This person makes sure the aircraft is available for passengers through communication with the mechanic and that the aircraft is in working condition. They also schedule the pilots to fly the aircraft.

**Flight Attendant:** This person flies on the aircraft along with the passengers and is in charge of waiting on them and keeping them safe.

**Line Service Reps:** These people fuel the aircraft, wash it and perform other tasks to help the mechanics make sure the aircraft is ready to fly.

Help Donnie find the runway through the maze.



# Flying Fun Facts

2.9 million passengers fly every day in and out of U.S. airports.

Almost 11 million U.S. jobs are generated by aviation.

As a whole, aviation accounts for 2% of global CO2 emissions and business aviation accounts for 2% of that. So, business aviation contributes 0.04% of global emissions.

The flight data recorders in airplanes are called “black boxes,” although they are really bright orange.

The speed of sound, or Mach 1, at sea level is 761.2 miles per hour or 661.5 knots.

The farthest paper airplane flight was 289 feet 9 inches.

It would take a plane flying 400.2 miles per hour 20 years to fly the 93,205,678.8 miles from the Earth to the Sun!

The white smoke behind airplanes is actually water vapor. Water is a by-product of combustion. The “contrails” occur at specific altitudes each day depending on the atmospheric conditions.

For a pilot starting a career, you need approximately 2,000 hours of flight time and as much multi-engine time as possible to be competitive in the job hunt.

The world’s largest passenger airliner is currently the Airbus A380. The A380 is a double-deck, wide-body, four-engine jet airliner that can hold 853 passengers. It has a design range of 9,800 miles and a cruising speed of 560mph.

# 4 Forces of Flight

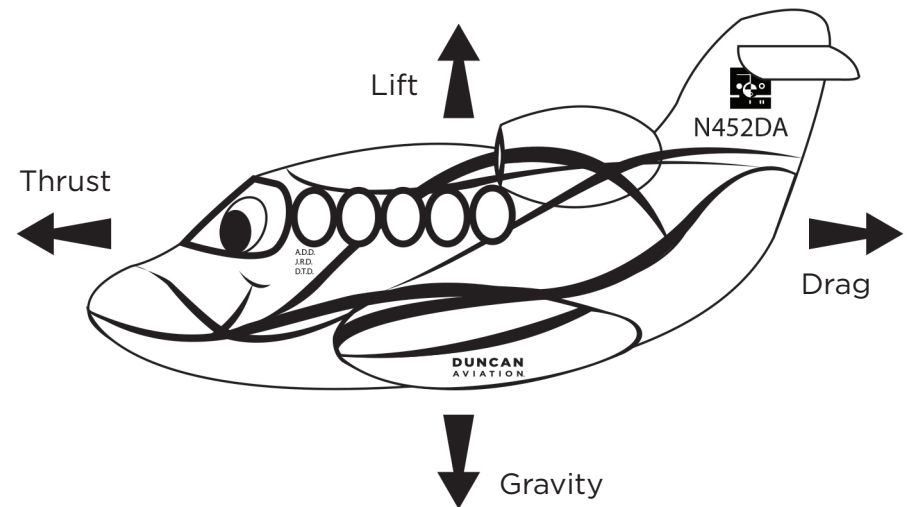
When an aircraft is flying straight and level there are four forces that are in action: drag, thrust, lift and gravity.

**Drag:** Air resistance that slows the forward movement of an aircraft.

**Gravity:** The force that pulls all objects toward the earth.

**Lift:** The upward force that is created by the movement of the air above and below the wings of the aircraft. The air flows faster above the wing and slower below creating a difference in pressure that tends to keep an aircraft flying.

**Thrust:** Is the force that moves an aircraft forward through the air. Thrust is created by a propeller or a jet engine.





# What is an FBO?

When business aircraft arrive at airports, they have special terminals to take care of their needs. These special terminals are called fixed base operations, or FBOs for short.

There are three main parts to an FBO.

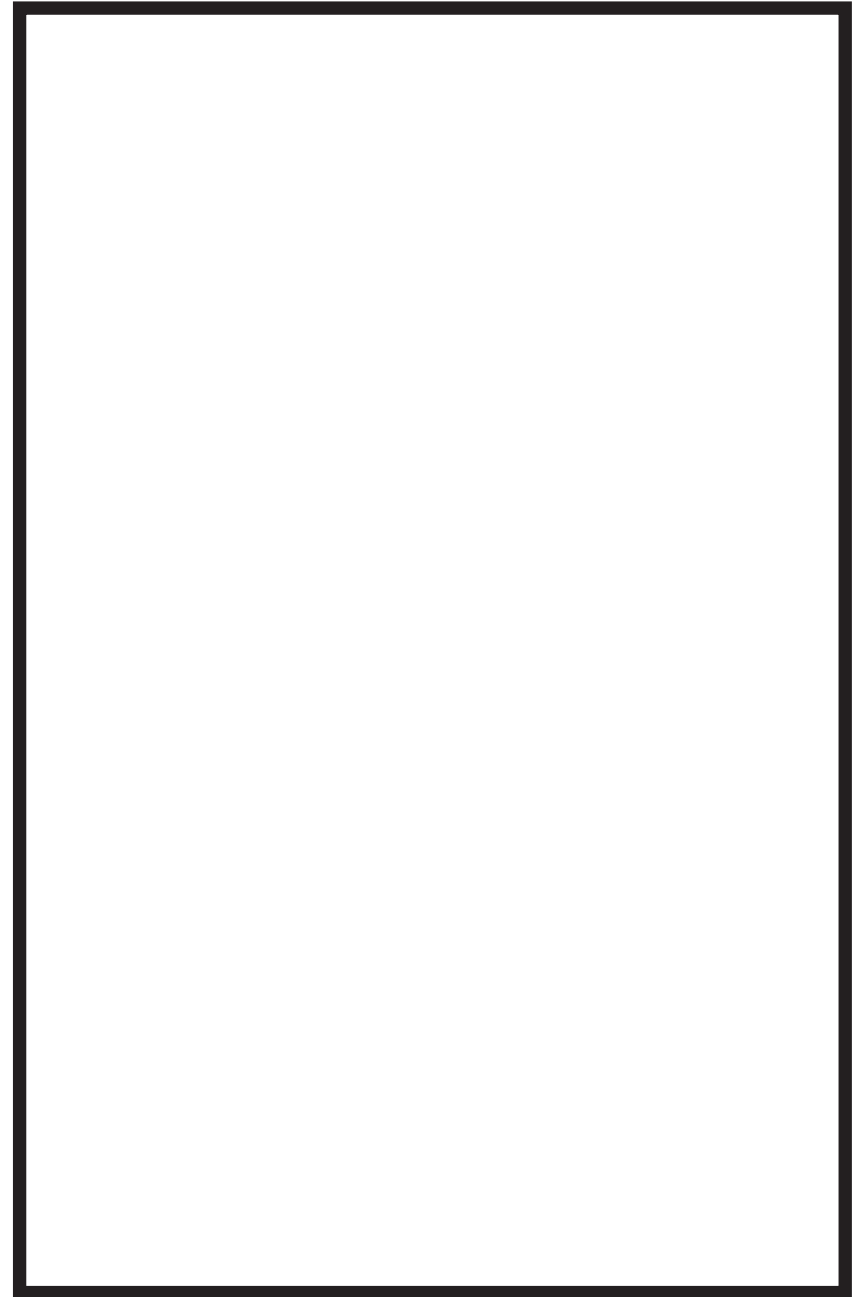
**Hangar:** Is like a garage where an airplane is parked. The hangar is large enough to hold several aircraft, either airplanes or helicopters, when they are not flying.

**Ramp:** Is a parking lot for aircraft where things can be loaded, unloaded or parked.

**Terminal:** FBOs have terminals. The terminal is a place where passengers and crew members can wait and read magazines and newspapers, watch TV or use the Internet. Weather systems are also provided so pilots can stay current on the weather status and plan their flights accordingly.

FBOs also take care of aircraft. Fuel and other aircraft services are provided including aircraft maintenance and providing ground power units, or GPUs. A ground power unit is a battery for aircraft that allows pilots to turn on features in the aircraft to prepare it for its passengers.

Draw and color three things that can fly in the sky.



# Cryptogram

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
19	24	5	13	11	6	16	7	18	3	14	4	9	22	17	23	10	1	2	25	26	8	21	15	12	20

5 4 11 19 1 11 13 6 17 1 25 19 14 11 17 6 6

25 19 15 18 18 22 25 17 23 17 2 18 25 18 17 22

19 22 13 7 17 4 13

1 11 10 26 11 2 25 19 23 23 1 17 19 5 7

18 22 2 25 1 26 5 25 18 17 22 19 22 13 4 19 22 13 18 22 16

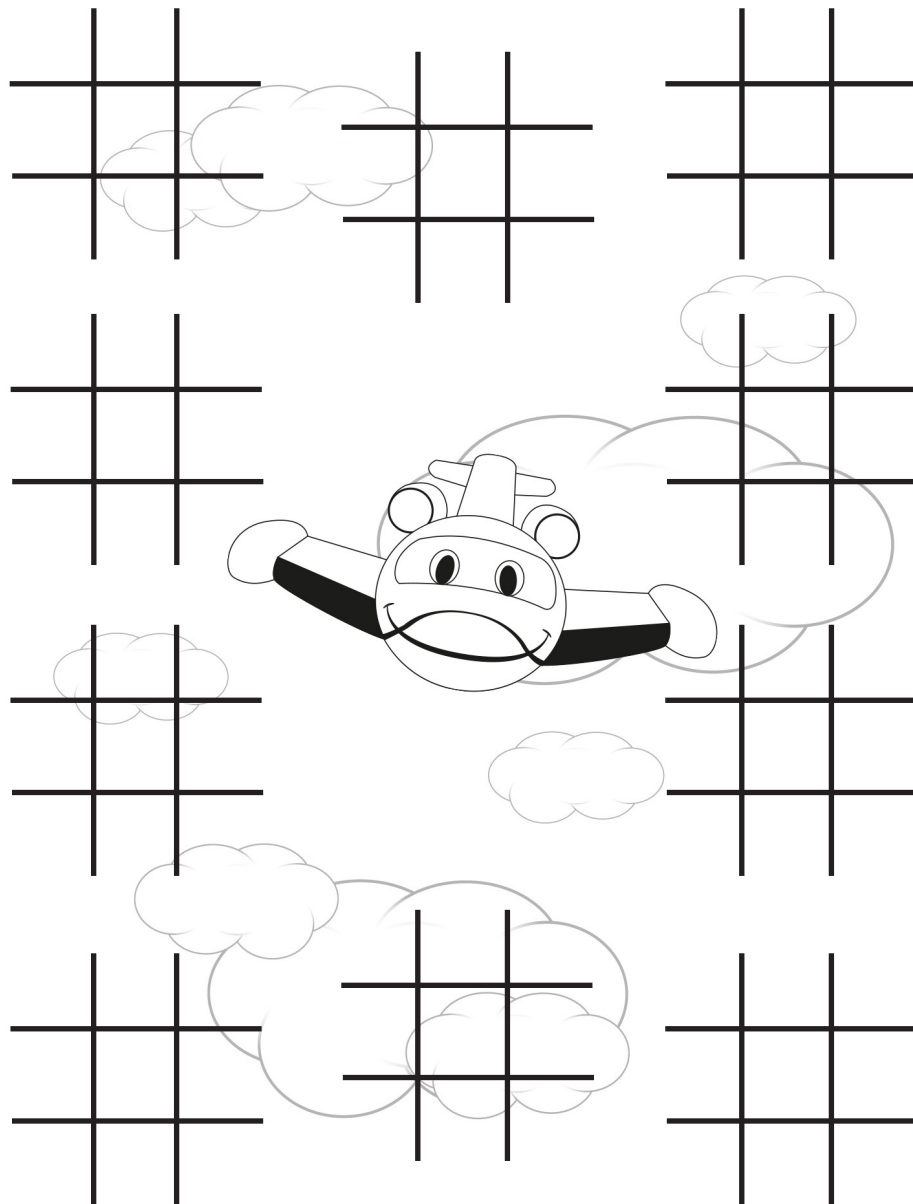
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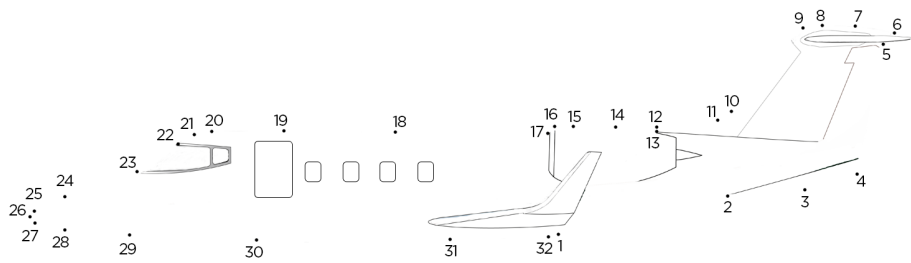
5 7 11 5 14 21 7 11 11 4 2 13 17 21 22

11 15 25 11 22 13 13 17 21 22 21 18 22 13

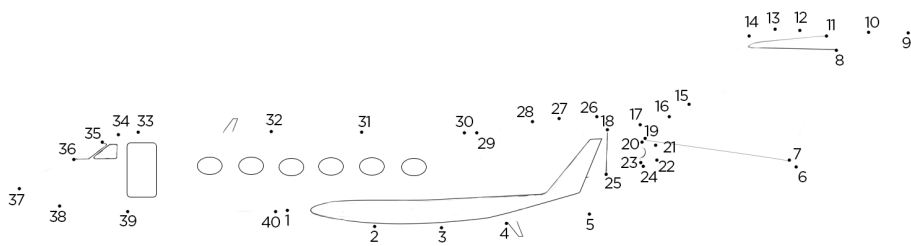
# Tic Tac Toe Three in a Row



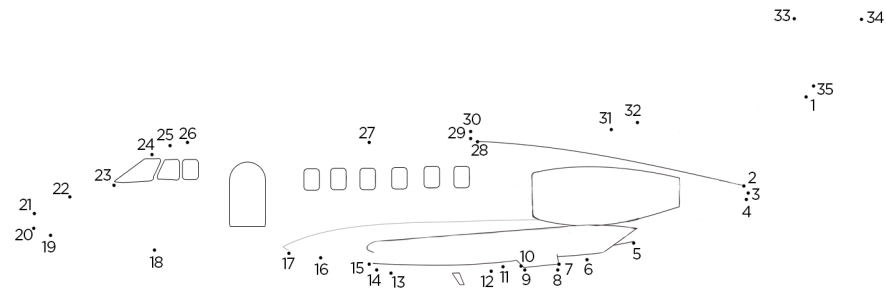
# Connect the Dots



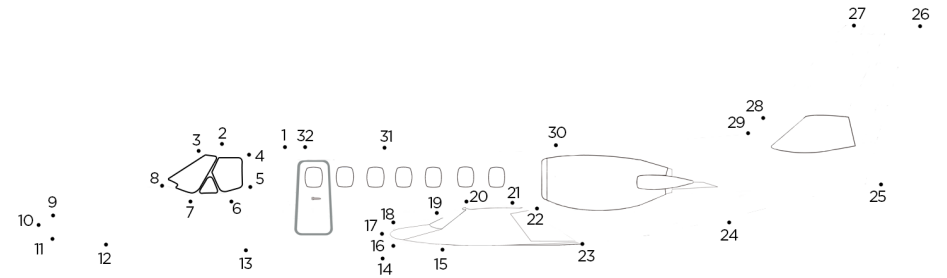
**Lear 55**



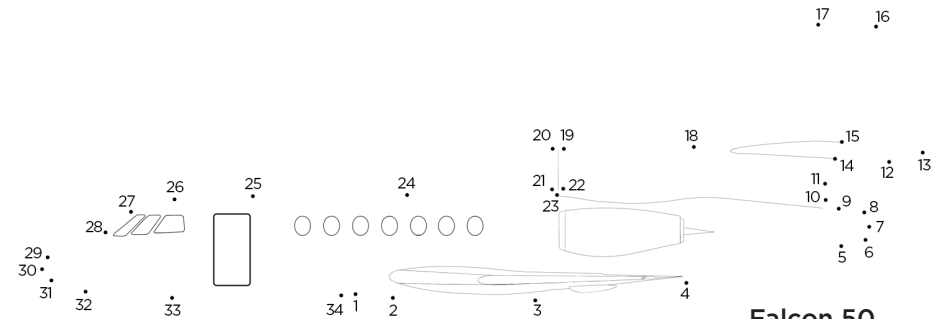
**Gulfstream 450**



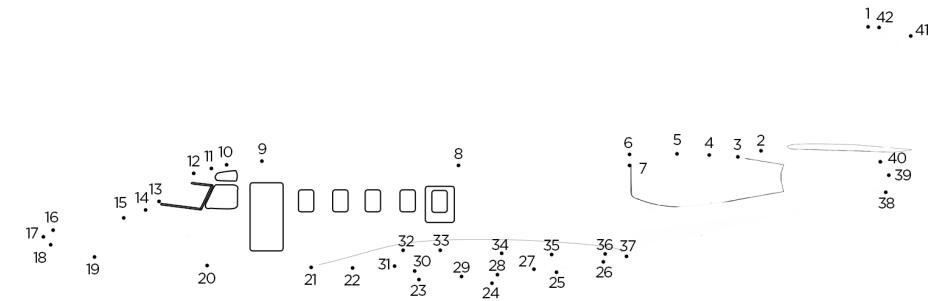
**Hawker 800**



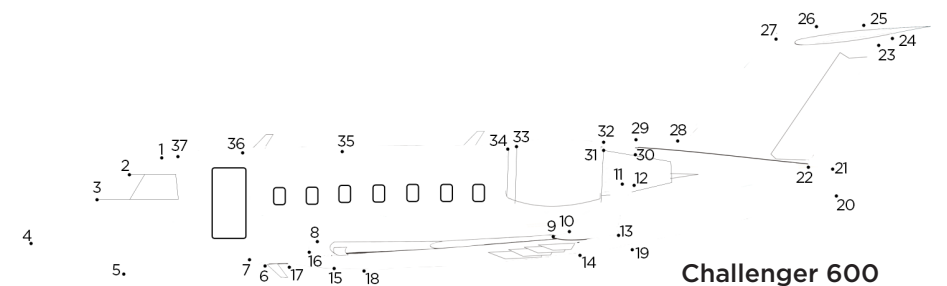
**Citation 560**



**Falcon 50**



**Astra/G100**



**Challenger 600**

# Definitions

**Aerobatics:** stunts, such as rolls and loops, performed in general aviation aircraft specially designed to withstand the stresses of such manoeuvres.

**Aeronautical Charts:** maps of the airspace designed to help pilots navigate.

**Airframe:** the structure of the aircraft, not including the powerplant or engine.

**Airline:** a company that is in the business of providing scheduled transportation.

**Airport:** a field from which aircraft land and takeoff.

**Airspeed:** the speed of an aircraft relative to the air.

**Air Traffic Control (ATC):** the system of ground based facilities that coordinates the movement of aircraft by tracking their progress using radar and communicating with pilots via radio.

**Airway:** highway in the sky.

**Altimeter:** a device that measures changes in air pressure to calculate how high an aircraft is flying.

**Altitude:** the height that an aircraft is flying above the ground, expressed in the number of feet above sea level.

**Approach:** the phase of flight in which an aircraft has started its descent toward its destination airport.

**Autopilot:** short for “automatic pilot,” this is a control system that keeps an aircraft on a set course or speed so that the pilot does not have to steer or add power to the aircraft.

**Aviator:** a person trained and qualified to fly an aircraft; a pilot.

**Avionics:** short for “aviation electronics,” any electronic system used on an aircraft, primarily for navigation and communication.

**Bank:** to tilt an aircraft laterally and inwardly during forward flight.

**Checklist:** a written list of procedures used by pilots to ensure that all the items that need to be accomplished during a flight are actually performed.

**Clearance:** permission granted by an air traffic controller that allows a pilot to taxi, land or takeoff.

**Certification:** official approval granted by a government agency qualifying a pilot or aircraft to fly.

**Collision Avoidance System:** a device that can detect when one aircraft is flying too close to another and tells the pilot to turn in order to avoid a collision.

**Compass:** a magnetic device that helps determine the direction an aircraft is flying.

**Control Tower:** the building from which air traffic controllers direct the movement of aircraft on and around the airport.

**Deicing:** a system or substance that removes ice that has formed on an airborne aircraft.

**Downwind:** moving in the same direction as the wind is blowing.

**Empennage:** the rear portion or tail of the aircraft.

**Federal Aviation Administration (FAA):** the U.S. Government agency that establishes and enforces rules for aviation.

**Flight Manual:** a guide issued by an aircraft manufacturer that contains official information regarding the speed, operating limits and other essential guidelines for safely operating an aircraft.

**Flight Plan:** a formal document that describes the intended course of a planned flight.

**Flight Service Station (FSS):** an official aviation information center that pilots use to obtain up-to-date information on weather and airport conditions before beginning a flight.

**General Aviation:** all flying activities other than commercial (airline) and military aviation. General aviation aircraft, which include everything from two-seat training airplanes to intercontinental business jets, can fly to about 10 times the number of airports that airliners can.

**Gross Weight:** the maximum weight that an aircraft is designed to carry when taking off.

**Heading:** the course or direction in which an aircraft is moving, generally expressed in degrees of a circle (from zero to 360).

**Helicopter:** a type of aircraft that uses a rotor or propeller mounted on top of the fuselage to takeoff and land vertically, which allows it to operate without using a runway or airport.

**Helipad or Heliport:** a small structure or paved area that is used by helicopters to takeoff and land vertically.

**Holding Pattern:** to fly in a circle until an air traffic controller clears a pilot to proceed toward his destination.

**Instrument Panel:** the section of the cockpit located in front of the pilot that houses all the instruments, gauges and indicators that tell the pilot important information, such as airspeed, altitude and heading.

**Jet:** a type of aircraft powerplant that uses a turbine, which increases the flow of air through an engine, for power.

**Knot:** a unit of aviation speed that equals one nautical mile per hour, which is equivalent to 1.151 miles per hour.

**Logbook:** a book that contains a record of flights made by a pilot or maintenance procedures performed on an aircraft during its lifetime.

**N Number or Tail Number:** the “license plate” of an aircraft that contains a series of numbers and/or letters that are painted on the fuselage near the tail of an aircraft. All aircraft registered in the United States have registration numbers that begin with the letter “N.”

**National Business Aviation Association (NBAA):** a Washington, D.C. based national trade association that is dedicated to enhancing the safety, efficiency and acceptance of business aviation. NBAA’s membership includes more than 7,500 companies that are involved in flying general aviation aircraft for business purposes.

**Nautical Mile:** the standard unit of distance used in aviation. It equals 6,080 feet or 1.151 miles.

**Navcom:** a shortened form of the words “navigational aids.” It refers to any system or device used to help guide a pilot while flying an aircraft.

**Nose:** the front portion of the aircraft.

**Notice to Airmen (NOTAM):** special announcement used to alert pilots of unusual conditions around an airport.

**Payload:** the total weight of passengers and cargo that an aircraft carries or can carry.

**Pitch, Roll and Yaw:** terms used to describe the three-dimensional movement of an aircraft. Pitch is the rotation of an airplane around its lateral axis. Roll is the motion of an aircraft around its longitudinal axis. Yaw is the movement of an airplane around its vertical axis.

**Preflight:** the testing procedure a pilot user before flying to ensure that an aircraft’s equipment and systems are working properly.

**Radar:** a shortened form of the words “radio detection and ranging.” Radar is a system that uses electronic pulses to measure how far away an object is. The distance is measured by timing how long it takes for the pulses to be transmitted from an airplane or ground facility and reflect or bounce off an object and return to their source.

Airborne radar is used to detect thunderstorms and other severe weather, while ground-based radar is used by air traffic controllers to track the direction and speed of aircraft.

**Range:** the maximum distance an aircraft can fly without being refuelled.

**Runway:** a strip of level, usually paved ground on which aircraft takeoff and land.

**Skin:** the outer covering of an aircraft, usually made of sheet metal, but also can be fabric or wood, especially on older airplanes.

**Spin:** a maneuver in which the aircraft, after experiencing an aerodynamic stall, descends with its nose pointing toward the ground while turning rapidly around its vertical axis.

**Takeoff:** the point in a flight when the aircraft leaves the ground or runway and becomes airborne.

**Taxi:** to move an aircraft slowly on the ground or on the surface of the water before takeoff or after landing.

**Throttle:** the cockpit lever that increases engine power, allowing an aircraft to takeoff or accelerate if it is already airborne.

**Touchdown:** the moment when the wheels of a landing aircraft touch the surface of a runway.

**Transponder:** a transmitter-receiver that sends a unique, coded signal to ground radars, thus allowing air traffic controllers to identify and track individual aircraft.

**Turbulence:** a disturbance or uneven flow of air that causes an aircraft to bounce in flight.

**Upwind:** flying an aircraft in the opposite direction the wind is blowing.

**Vector:** a heading given to a pilot by an air traffic controller via a radio communication.

**Visibility:** the distance that one can see clearly in the air.

**Weather Briefing:** the official forecast information that a pilot gets from a flight service station before departing on a flight.

**Yoke:** the control and steering wheel of an airplane, sometimes called the “stick.”

## Phonetic Alphabet

**A** ALPHA  
**B** BRAVO  
**C** CHARLIE  
**D** DELTA  
**E** ECHO  
**F** FOX TROT  
**G** GOLF  
**H** HOTEL  
**I** INDIA

**J** JULIET  
**K** KILO  
**L** LIMA  
**M** MIKE  
**N** NOVEMBER  
**O** OSCAR  
**P** PAPA  
**Q** QUEBEC  
**R** ROMEO

**S** SIERRA  
**T** TANGO  
**U** UNIFORM  
**V** VICTOR  
**W** WHISKEY  
**X** X-RAY  
**Y** YANKEE  
**Z** ZULU