Glossary

A

Absolute charging – occurs when the whole craft is charged.

Acceleration – when a body is subjected to the application of a force over a continuing period of time.

Ace – a pilot who shot down five enemy aircraft.

Active communications satellite – a satellite, such as Courier 1B, that received signals from ground stations, amplified them and then rebroadcast the signals to receiving stations on Earth.

Advanced technology jets – jets which used technology such as features which reduce noise levels, fuel use, and exhaust emissions and control by fly-by-wire throughout normal flight.

Advection – lateral heat transfer that is important in the global circulation of air.

Advection fog – fog formed when wind blows moist air over a cold surface and the surface cools the air to its dew-point temperature.

Aerial photography – a highly specialized photography using special films that can be used to spot and map crop damage due to disease or insects.

Aerial refueling – to refuel a plane in midair.

Aerobatics – stunt-flying involving an aircraft that can stand tremendous forces and that can fly upside down, right side up, and everything in between. It also requires a skillful pilot.

Aeronaut – balloonist.

Aeronautics – the science and art of flight through the atmosphere.

Aerospace – a compound term used to describe the atmosphere and space as one medium.**Aerospace**

engineering – prepares a person to work on either aircraft or spacecraft design and production programs.**Agricultural**

applications – aircraft that seed, fertilize, and apply pesticides to almost 200 million acres of farmland annually.

Ailerons – small flaps on the wings that help control the plane.

Airborne – transported or designed to be transported by air.

Aircraft carriers – commercial airlines that are considered common carriers and are in business to serve the public. They are closely regulated and controlled to ensure the safety of the public.

Airfoil – parts of an airplane, such as wings, tail surfaces, and propellers, designed to cause a dynamic reaction from the air through which it moves.

Airframe rocket system – serves to contain the other systems and to provide the streamlined shape.

Air pump – invented by Torricelli, Von Guericke, and Pascal to study vacuums.

Airspeed indicator – informs the pilot of the speed through the air in terms of miles per hour and/or knots.

Air superiority – complete command of the air.

Air taxis – aircraft that provides transportation on a nonscheduled or demand basis. Also used for emergency transportation.

Air traffic control – concerned with keeping aircraft safely separated to prevent accidents.

Airways – three-dimensional highways in the sky and another subdivision of controlled airspace.

Alto – middle altitude clouds where the stratus and cumulus shapes are found and called altostratus and altocumulus.

Altimeter – aneroid barometer that reads in feet of altitude and is calibrated to atmospheric pressure in inches of mercury.

Angle of attack – the angle created by the pilot during takeoff (the angle between the chord line and the oncoming relative wind).

Anorthosite – the most common rock on the moon composed of almost entirely one mineral, feldspar.

Antique aviation – involves either funding or restoring a vintage aircraft or building replicas of old airplanes from original plans.

Apogee – that point in the orbital trajectory or flight path where the orbiting body is most distant from the body being orbited.

Aptitude – the special talents and natural abilities which a person possesses.

Area Navigation System (RNAV) – more of a computer controlled navigation system than a set of stations and receivers. This system uses VOR-type radio stations or GPS as reference points, but allows the pilot or navigator to fly directly from the airport of origin to the destination airport without following the airways.

Asteroids – rocky and metallic objects orbiting the Sun, too small to be considered planets.

Atmosphere – sometimes called "an ocean of air surrounding the earth" or "a gaseous covering." A gaseous fluid that reacts to any force.

Atomizing – one phase of the combustion process.

Attitude indicator – a gyroscopic instrument that provides an artificial horizon to the pilot.

Aurora australis – colored lights, which appear in the southern latitudes.

Aurora borealis – northern lights. The visible emissions from polar magnetic storms which produce sporadic radiant emissions from the upper atmosphere over middle and high latitudes.

Autogiro – a rotating-wing aircraft that achieves slow flight and vertical takeoff by the use of a freely rotating rotor replacing or supplementing the wings but is driven forward by a conventional propeller.

Automated Terminal Information System (ATIS) – a voice recording of a tower controller that tells the pilot about the wind, clouds, visibility, and any other restrictions that the runways may have.

Automatic Direction Finder (ADF) – another type of radio receiver used to determine direction, but does not provide as much information as the VOR.

B

Ballast – a heavy substance for controlling ascent.

Ballistics – the study of the arc of a nonorbiting body.

Barnstormers – ex-military aviators who flew war-surplus aircraft around the country, circling over a village or small town to attract attention and landing on a nearby farm to offer rides to individuals for a fee and put on flying exhibitions. They also called themselves a "flying circus."

Barometer – measures the pressure of the atmosphere.

Basalt – a hard, heavy dark gray rock with tiny holes form which gas has escaped.

Beam-ride guidance – missiles that are built to fly along a beam that is aimed at or kept on the target.

Bernoulli's principle – states "as a fluid's speed increases, the pressure within the fluid decreases." So the pressure on top of an airfoil must be less than the pressure below.

Bipropellant – the oxidizer is stored in one container and the fuel (reducer) in another.

Black hole – probably began as a large star that exhausted its nuclear fuel and collapsed inward on itself resulting in gravity so strong that nothing is allowed to leave it.

Blitzkrieg – lightning war devised by Germans.

Bombers – large, long-range aircraft with a mission to reach into the enemy's homeland and destroy the ability to wage war.

Burnout velocity – the velocity required to place a spacecraft on its intended trajectory that is attained when the rocket engine ceases to produce thrust.

Business aircraft – 78 percent are single-and piston-engine aircraft and 21 percent are twin-and piston-engine aircraft.

Business aviation – the use of a private-or company-owned general aviation aircraft for business purposes.

Buzz bomb – bomb that produced a unique sound caused by a pulsejet engine mounted in a "stovepipe" above the fuselage.

C

Cambered – curved upper surface on a wing to increase lift.

Canards – horizontal surfaces forward of the main wings and are used for trim and control.

Cargo carriers – carriers that carry mainly freight, but now are also allowed to carry passengers.

Catalyst – a substance, which speeds up a chemical reaction but undergoes no permanent chemical, change itself.

Ceiling and visibility unlimited (CAVU) – when the sky is clear of clouds, the winds are calm, the air is cool, and there is no haze.

Centralized control – bringing together of all air assets as one unit.

Centrifugal force – a force moving or directed away from the center of rotation, which is a factor that affects the circulation of air or wind.

Charter services – aircraft and pilot hired by people who cannot afford to own their own aircraft but need to get somewhere in a hurry.

Chemical propulsion system – involves the mixing and burning of a chemical fuel and a chemical oxidizer to produce the hot, expanding gases needed to provide thrust.

Chemosphere – an important region due to a number of important photochemical (radiant energy and chemical) reactions which occur in it.

Chord (airfoil) – an imaginary line that connects the leading edge with the trailing edge of the airfoil.

Chromosphere – above the photosphere. This sphere of color extends to about 15,000 miles.

Circular orbit – an orbit that maintains a virtually constant altitude above the Earth's surface.

Cirrus clouds – clouds that are wispy, thin and lacy. They are high altitude clouds.

Cislunar space – the space between the Earth and the moon.

Civil Air Patrol (CAP) – a federally chartered, private, nonprofit corporation that is also the official civilian auxiliary of the U.S. Air Force. Its threefold mission is emergency services, aerospace education, and cadet programs.

Civil airport – airport operated or owned by citizens for private or business purposes.

Civil Reserve Air Fleet (CRAF) – composed of commercial airliners, which have been designated by the Department of Defense for use in time of national emergency.

Clear-air turbulence (CAT) – may exist at different places and altitudes but be completely invisible. The causes may be one or a combination of: convective currents, windshear, and obstructions (such as mountains) to wind flow.

Close ground support – air power used to support army ground operations.

Close support aircraft – aircraft that supports or cooperates with friendly surface forces, consisting of air attacks with guns, bombs, guided airborne missiles or rockets on hostile surface forces.

Cold front – when a cold air mass replaces a warmer air mass, the boundary is called a cold front.

Cold welding – when moving parts fit with only a tiny air space between them. In a vacuum the tiny amount of air which kept them separated escapes and they weld together.

Combat aircraft – aircraft used by the military such as bombers and fighters.

Combined arms operations- the army and air force used in combination with each other.

Combustion chamber – a chamber or cylinder-like assembly in a rocket engine, jet engine, or the like where the propellant is exploded.

Comet – a small, irregularly shaped body whose tiny nucleus is composed of water, ice, rock and frozen gases.

Command guidance – electronic guidance, outside the rocket, wherein signals or pulses sent out by an operator cause the guided object to fly a directed path.

Commercial aviation – a segment of general aviation which deals with using general aviation aircraft for hire as a commercial (money-making) business.

Compass deviation – the deviations caused by electrical power and metal in the airplane that affects the compass. The pilot must use the compass correction card kept in the aircraft if he flies by the magnetic compass.

Composites – super-strong, but lightweight, nonmetallic, epoxy graphite materials used in aircraft construction.

Compound helicopters – a conventional helicopter wit extra forward thrust provided by either a jet or propeller unit.

Compounds – molecular bonding of two or more elements.

Compression wave – a type of shock wave that is formed when the air must move aside as a leading edge passes.

Condensation – to change to a denser form as from a gas to a liquid.

Condensation nuclei – small particles that serve as surface for condensation of water vapor.

Conduction – heating by direct contact.

Conic projection – a type of map projection formed by projecting the surface of the earth on the surface of a cone and unrolling this to a plane surface on which the parallels of latitude are then concentric circles and the meridians equally spaced radii.

Continental air mass – a dry air mass.

Controlled airspace – airspace that has several subdivisions and is shown on aeronautical charts. It is subject to control by FAA air traffic controllers.

Control rocket system – the system that carries out whatever the rocket's guidance system dictates should be done.

Convection – heat transfer by vertical motion.

Conventional – landing gear consisting of two wheels forward of the aircraft's center of gravity and a small, third wheel at the tail.

Coplanar transfer – accomplishing transfers and maneuvers within a given plane.

Coriolis effect – rotation of the Earth influences any object moving over its surface such as the atmosphere in motion.

Corona – a division of the Sun's atmosphere known as the crown. An enormous area of faint white light that visibly extends outward from the Sun's surface.

Corporate jet – a turbojet called a bizjet that is expensive to buy and to operate.

Cosmic rays – rays of extremely short wave length and great penetrating power, which bombard the Earth from beyond its atmosphere.

Coupled valve – two propellant valves, opened by a single piston, operating through a crosshead, causing fuel and oxidizer to enter the combustion chamber at the same time.

Cowling – removable metal covering that houses the engine and sometimes also a portion of the fuselage of an aircraft.

Crater – a depression formed by the impact of a meteorite.

Cryogenics – an area of science concerned with the production of low temperatures and the effect of such temperatures on matter.

Crystalline – having the structure of a crystal like salt or sugar.

Cultural features – landscape marked by people such as mines, highways, and railroads.

Cumulus clouds – piled up lower altitude clouds that look "bumpy."

Cyclone – a hurricane that occurs in the Indian Ocean.

D

Dead reckoning – involves the systematic consideration of all factors that will and could affect the flight.

Density – how many molecules of air are squeezed into a given volume.

Density impulse – another measure of a propellant's thrust according to the volume involved.

Dew point – the temperature at or below which water vapor will condense.

Differential charging – occurs when one part of a spacecraft gets charged and has a different charge than another part of the craft.

Differential GPS Landing System – used to fit GPS approaches to the community's needs and still satisfy the aviator.

Dirigibles – rigid airships like large balloons. A lighter-than-air craft that can be propelled and steered.

Distance-Measuring Equipment (DME) – the time it takes a signal to go from the aircraft to the VORTAC and return, converted to nautical miles distance between the airplane and the station.

Dog fight – German and Allied aircraft battled in the air using an aircraft equipped with an interrupting gear which connected a machine gun to the aircraft engine and prevented the gun from firing when a propeller blade was lined up with the gun's muzzle.

Downlink – the communication link from the satellite to the earth station.

Drag – a slowing force acting on a body (as an airfoil or airplane) moving through air, parallel and opposite to the direction of motion.

Drag devices – devices such as speed brakes, air brakes, dive flaps or drag parachutes used to produce a significant amount of drag without affecting the airfoil's lift.

E

Earth's gravitational field – a region associated with any distribution of mass in which gravitational forces due to that mass may be detected.

Electrical system – a generator mechanically attached to an aircraft's engine that provides the electricity required to charge the battery, start the engine, operate the radios, and operate navigation and landing lights.

Electric propulsion system – uses magnetic fields and currents to propel matter in small amounts.

Electrostatic charging – charging related to static electricity. The small electronic parts of a spacecraft, especially computer data bits, can be badly shocked by electrostatic charges.

Elevator – control surface that is responsible for pitch.

Elliptical orbit – any closed orbit that is not circular.

Encroachment – the noise factor or any other considerations at airports that might intrude on the neighboring communities.

Engine instruments – keep the pilot aware of how his thrust-producing device is operating.

Equatorial orbit – the orbit a satellite travels from west to east over the Earth's equator.

Escape trajectory – a spacecraft must accelerate to its escape velocity which causes the velocity of the spacecraft to be so high and the inertia so great that the spacecraft comes under the influence of another body's gravity before it reaches its apogee.

Escape velocity – the speed at which an object is able to overcome the gravitational pull of the earth.

European Space Agency(ESA) – an international organization composed of 14 European Member States which aims to provide cooperation in space research and technology.

Evaporation – the process by which liquid water molecules change to a gas or vapor state and enter the Earth's atmosphere.

Evaporation fog – steam that occurs when cold air moves over warm water; the water's normal evaporation process saturates the cooler air with water vapor, and the dew point is reached.

Executive aircraft – a typical executive transport is a twin-engine aircraft that is turbine-or piston-powered. The pilot must have special training, a multi-engine rating, and at least a commercial license.

Exosphere – the top of the atmosphere above the heterosphere. Known as the "region of escape."

Expansion wave – a shock wave that is formed when the air must fill back in as the trailing edge passes.

Extreme turbulence – turbulence where the entire aircraft may be tossed about and is practically impossible to control; structural damage to aircraft may result.

F

Federal Aviation Administration (FAA) – the United States Government agency, which is responsible for regulating air commerce.

Fighter escort – small pursuit aircraft used to escort large bombers and given the freedom to chase enemy fighters and shoot them down.

Fighters – aircraft that have the basic mission of destroying other aircraft.

Fixed-Base Operation (FBO) – a service station for airplanes.

Fixed landing gear – usually on less expensive, smaller airplanes because it is much less costly to build and maintain.

Flaps – attached to the trailing edge of the wing. When cruising, the flaps simply continue the streamlined shape of the wing's airfoil.

Flight instruments – inform the pilot of the altitude, the airspeed, and the attitude of the aircraft.

Flight Service Station (FSS) – provides all types of weather information for pilots.

Fog – a large mass of water vapor condensed to fine particles, at or just above the earth's surface.

Force – the cause of motion. Power or energy exerted against an object in a given direction.

Form drag – the shape of the aircraft that creates drag.

Forward-swept wings – wings sweeping which goes back more than 100 years. The design needed to be structurally stronger in high-speed flight.

Four-year colleges/universities – offers a broad education because students can choose from more electives in both humanities and science areas than those in junior college or vocational/technical schools can.

Fracto – a combining term which means broken and/or ragged.

Free fall – the motion of a body in space when the only force acting on it is that of a gravitational field.

Freezing level – may be around 15,000 feet during summer and perhaps as low as 1,000 feet above ground level on warm winter days.

Friction drag – caused by the friction of air particles rubbing against the parts of an airplane.

Frost – a feathery deposit of minute ice crystals or grains upon a surface or object, formed directly from vapor in the air.

Fuel system – includes everything that involves delivery of fuel to the engine including fuel tanks and fuel lines.

Fuselage – the basic structure of the airplane to which all the other parts are attached.

G

Galaxy – a grouping of billions of stars apparently merging into a luminous band that extends across the sky.

Gas-heating system – uses an external heat source to heat and cause the propellant to build the pressure necessary to provide thrust by exiting the exhaust nozzle at high velocity.

Gearbox – the gear including the change gear and the propeller shaft or driving chain by which power is transmitted from the engine to the live axle.

General aviation – all civil aviation other than flying done by scheduled air carriers and government agencies.

Geostationary orbit – an orbit stationed above one point on Earth's surface.

Glaze ice – formed and builds quickly as an airplane flies through supercooled rain droplets.

Global Positioning System (GPS) – consists of about 24 satellites in orbit around the Earth, several ground tracking stations, and a receiver in the aircraft.

Grain – a single piece of powder charge regardless of size of shape used in a rocket.

Gravitation – the term used to describe the force of attraction that exists between all matter within the universe.

Gravity – when gravitation involves Earth and a body or mass on or near the Earth.

Great circle – any circle on the Earth's surface that is made by a plane crossing through the Earth's center.

Grid system (graticule) – a system of coordinates that involves numbers across the top and letters down the left side. The Earth graticule uses 18 primary great circles going north-south and parallel small circles and two poles going east-west.

Ground speed – a measure of how fast the aircraft is going across the surface of the Earth. This is important in determining how long it will take to get from a start point to the destination.

Guerilla warfare – military actions carried out by small forces in the rear of an enemy with the purpose of harassing the enemy, interrupting his lines of communication, and destroying his supplies.

Guidance rocket system – a self-contained electronic unit that employs a computer and an inertial platform and may also have a star-tracking unit for space navigation.

Gyroscopic stability – a spinning flat weight that tends to line up on one of its axes. That axis is the one perpendicular to the face of the weight. Once the weight is aligned on the axis, it will remain there.

H

Hail – pellets or lumps of frozen rain or snow sometimes precipitated during a thunderstorm.

Hangers – a garage for airplanes which protects it from weather damage.

Haze – a concentration of water vapor, lighter than fog or clouds, but thick enough to reduce visibility.

Heading indicator – a type of compass with a gyroscopic device behind the compass card that tells the pilot which was he is flying.

Heat – the sum total energy of all moving molecules within a substance.

Heavy-lift – the largest and heaviest helicopters that were designed for military use.

Helium gas – a Very light inert gas used to inflate airships.

Hemisphere – half-sphere.

Heterosphere – begins at about 55 to 60 miles in altitude where the molecules and atoms of the gases are spaced much farther apart. At this level, gravity influences the gases according to mass with the heaviest found in the lower part and the lighter gases found in the upper part.

High-inversion fog – a low cloud fog formed by condensation of water vapor at or near the top of cool air that is covered by a warmer air layer.

Hohmann transfer – minimum energy transfer that was developed by a German engineer named Walter Hohmann and is a practical method of space maneuver to this day.

Homing guidance – require that the rocket "home in" on the target that is radiating heat or light.

Homosphere – extends from Earth's surface up to an altitude of about 60 miles. That region in which the gaseous composition and mixing are relatively constant.

Humidity – the amount of water vapor in the air.

Hurricane – a strong tropical cyclone (usually in the West Indies) with winds that often surpass 100 mph and have been clocked at more than 200 mph.

Hybrid helicopters – a variety of advanced helicopter concepts lumped together which, in one way or another, attempt to solve the problem of using the rotor for vertical takeoff and landing without impeding forward flight.

Hybrid propellant – systems that use both liquid propellants and solid propellants in combination within the same engine.

Hybrid rockets – rockets that use hybrid propellant systems.

Hydraulic system – may operate the brakes, lower the landing gear, move the flight controls, and extend and lower the flaps. The mechanical advantage of this system allows the pilot to exert great pressure on the aircraft control systems or structures.

Hydrogen gas – discovered by Henry Cavendish in 1766. A "flammable air" that is lighter than air and was first used to fill balloons.

Hydrographic features – water features.

Hypergolic – a biopropellant that is self-igniting.

I

Icing – the act or process of atmospheric moisture freezing upon the surfaces of an aircraft.

Igniters – any device, chemical, electrical, or mechanical, used to ignite.

Ignition characteristics – starting every time in the same way, choosing between a continuous or restartable propellant, and safety are all properties of a propellant considered for ignition.

Induced drag – caused by lift vector pointing in the same direction as the drag vector.

Induced lift – induced lower pressure on the top of the wing due to the camber.

Inertia – the force produced by the reaction of a body to an accelerating force, equal in magnitude and opposite in direction to the accelerating force.

Inertial guidance – a self-contained unit that automatically adjust the rocket after launching to follow a given flight path, the mechanisms reacting to inertial forces during flight.

Insolation – the rate at which the Earth's surface is heated by solar radiation.

Institutes – special schools that place more emphasis on subjects that are essential to doing the job that the student is preparing for. Students take several courses in the humanities and earn a bachelor's degree.

Instructional aviation – aviation that teaches a pilot how to fly, usually in small single-engine airplanes.

Instrument Flight Rules (IFR) – weather conditions at an airport during which a pilot must use instruments to assist takeoff and landing.

Instrument Landing System (ILS) – is used only within a short distance from the airport and only when the purpose is to land the airplane.

Interdiction – air attack directed on a route or area to deny its use to the enemy.

Intergalactic space – within the galaxy.

Internal Navigation – a self-contained unit located within the aircraft that needs only to be programmed for a starting point and destination.

International Civil Aviation Organization (ICAO) – an international organization dedicated to standardizing aviation functions.

International courts – a judicial assembly between or among nations.

International customs – a usual practice carried on by tradition and enforced by social disapproval of any violation, between or among nations. Those practices accepted by nations as the right way to act.

International law – the rules generally observed and regarded as binding in the relations between states or nations.

International treaties – written agreements or contracts between or among nations that are legally binding to those who sign them.

Interplanetary space – measured from the center of the sun to the orbit of its outermost planet.

Interstellar space – between or among the stars.

Ion – an atom that carries a positive or negative electrical charge as a result of losing or gaining one or more electrons.

Ionosphere – reflects certain radio waves, which allows them to be received at stations far away from the broadcasting station. An outer region of the atmosphere that consists of layers of ionized air particles.

Isobars – lines drawn on maps to join points having the same barometric pressure. When isobars are far apart, the wind is weak; when they are close together, the wind is strong.

J

Jet stream – a comparatively narrow current of air which moves around the Northern (and Southern) Hemisphere of the earth in wavelike patterns. Compared to a "river" of wind moving at high speed.

Joined wings – an aircraft with its main wing swept upward and backward connected at the tips to the rearward wing which would be swept forward and downward, resembling the shape of a diamond.

Joint-use airport – airport where civil aviation and military aviation share the runways.

Jumbo jet – wingspan was 65 feet longer than the 707, and its fuselage was nearly 90 feet longer and almost twice the diameter.

Junior college – a school giving training in only the first one or two years of the standard college course.

Jupiter – the fifth planet from the Sun and by far the largest planet in our solar system.

K

Kamikazes – Japanese pilots who gave their lives in suicide attacks against US naval ships. They were to crash their aircraft loaded with bombs into a Navy ship.

KREEP – a rock found on the moon which has not been found on Earth.

L

Laminar air flow – smooth flow pattern of air around an object.

Land-sea breeze phenomena – convection currents along shorelines produce heated air rising upward, which cause advection currents (wind) to flow from the water over the warmer land during the day. During the night, convection currents develop over the warmer-than-land water and cause the wind to blow from the land toward the water.

Lateral axis – an imaginary line that runs from one wingtip through the fuselage and exits the other wingtip. Also called the pitch axis.

Latitude – planes of the Equator that are parallel small circles and two poles.

Leading edge (airfoil) – the edge that meets relative wind first.

Leeward – the part or side of an object (such as a mountain) that is sheltered from the wind or is farthest from the source of the wind and is usually dry.

Lenticular – clouds that have a lens-like shape (double convex) and usually form in the mountains.

Light-lift – helicopters used in the military for observation and transportation of personnel. In the civilian community, they are used as executive transport and for many commercial uses such as crop dusting, construction and hauling personnel and light cargo.

Light turbulence – turbulence usually found in hilly and mountainous areas, below 5,000 feet when the air is colder than the Earth's surface (soon after the passage of a cold front) and at anytime the wind is blowing about 20 mph.

Light-year – the distance a photon can travel in one of Earth's calendar years.

Liquid propellants – a propellant in a liquid state which may be bipropellant or monopropellant.

Long-haul jets – commercial jet airliners such as the Douglas DC-8 and the Convair 880 and 990.

Long-range bombing – bombing long-distance targets requiring aircraft with bigger engines and fuel tanks.

Long-range navigation – used by aircraft as a means of navigation using ground-based radio stations, a receiving unit aboard the aircraft and special LORAN navigational charts.

Low explosive – solid propellants that produce force without causing a massive, destructive explosion.

Lift – the upward force that opposes the pull of gravity.

Lighter-than-air – a concept that must be met to achieve flight. Balloonists were first to develop the concept.

Longitude – the 18 primary great circles going north-south.

Longitudinal – front to back of an aircraft. (roll)

M

Mach number – determined by Ernst Mach as being the speed of sound through a medium.

Magnetic course – the course according to the magnetic compass heading or direction. The difference between magnetic north and true north must be subtracted from or added to the true-course direction. Otherwise, the airplane will not follow the true course drawn on the chart.

Magnetic storms – (also called electromagnetic or radiation storms) are characterized by a sudden onset of radiation bursts in which the magnetic field undergoes marked changes in the course of an hour or less.

Magnetosphere – the region of the Earth's atmosphere where ionized gas plays a big part in the dynamics of the atmosphere and where the geomagnetic field plays an important role.

Major carrier – the largest carriers in terms of the number of passengers carried regardless of the length of the routes.

Manned spacecraft – spacecraft carrying one or more human beings.

Maritime air mass – a humid air mass.

Mars – the fourth planet in our solar system that is also called the Red Planet because it appears as a small reddish light when viewed with the naked eye.

Mass – the amount of material in an object.

Mechanical instruments – instruments that work by means of direct mechanical linkage (such as a gear attached directly to the engine to give a reading on how fast the engine is operating) or on the principle of the gyroscope.

Mercator projection – maps in which the earth's surface is shown as a rectangle, with the meridians as parallel straight lines spaced at equal intervals and the parallels of latitude as parallel straight lines intersecting the meridians at right angles but spaced further apart as their distance from the equator increases. The areas become increasingly distorted toward the poles.

Mesosphere – a region of the atmosphere starting at 30 miles up to about 50 miles altitude.

Meteoroid – any of the small, solid bodies traveling through outer space.

Microburst – caused when a column of air is quickly cooled (usually by rain) and rapidly falls toward the Earth.

Microwave Landing System (MLS) – broadcasts much wider beams than the ILS – both horizontally and vertically.

Missile – a rocket-propelled vehicle with a weapon or warhead as the payload.

Mission-adaptive wings – the wing changes to create its most efficient shape for a variety of conditions.

Moderate turbulence – turbulence that requires aircraft occupants to wear seat belts and unsecured objects move about.

Modular air vehicle – air vehicles from different aircraft sections that allow the airplane to do different missions. This mixing and matching of sections allows the vehicle to meet the needs of country defense.

Momentum – the product of mass and velocity.

Monocoque – French word meaning single shell. It depends on the covering or skin to provide the required strength to resist the stresses of flight.

Monopropellant – liquid oxidizer and fuel existing together in the same storage tank.

Moon dust – a fine dust that covers the surface of the moon.

Moon rocks – rocks on the moon that have remained exposed on the lunar surface for periods as long as 500 million years without being destroyed.

Multi-spectral imaging – a satellite imaging system that observes radiant energy. This imaging can give useful information about crops, ocean currents and natural resources.

N

Napalm bombs – a firebomb that was made of 110-gallon tanks of jelled gasoline, which when dropped, would explode and burn an area some 250 feet long and 80 feet wide.

NASA's "vomit comet" – an airplane that flies as high as it can and then dives straight down putting its passengers in free fall for almost a minute.

National Aeronautics and Space Administration (NASA) – a government organization with a threefold mission. First, to explore, use, and enable the development of space for human enterprise. Second, to advance scientific knowledge and understanding of the Earth, the solar system and the universe and use the environment of space for research. Third, research, develop, verify and transfer advanced aeronautics, space and related technologies.

Navigation instruments – help the pilot find the way from the point of departure to the destination.

Nebulae – any of several dark or bright misty, cloudlike patches seen in the night sky, consisting of groups of stars too far away to be seen singly.

Neptune – the outermost of the gas planets and the fourth largest planet in the solar system. It is eighth in distance from the Sun.

Neutrosphere – in this region, there is little ionization compared to that which takes place in the ionosphere.

Newton's First Law of Motion – states that a body in a state of rest and a body in motion tend to remain at rest or in uniform motion unless acted upon by some outside force.

Newton's Law of Universal Gravitation – states that two bodies attract each other with a force directly proportional to the square of the distance between them.

Newton's Second Law of Motion – states that the rate of change in the momentum of a body is proportional to the force acting upon the body and is in the direction of the force.

Newton's Third Law of Motion – for every action there is an equal reaction in the opposite direction.

Nimbo – the combining term to indicate that a cloud is at the moment producing precipitation or is capable of producing precipitation.

Noise abatement procedures – usually involve a very quick climb by the aircraft after takeoff. Also, the aircraft might try not to fly over certain areas on the ground.

Non-coplanar transfer – a transfer that does not occur in the same plane because Earth satellites are at many different altitudes and at various angles to the equator.

Nonhypergolic – a bipropellant that is nonself igniting.

Nova – stars that are not stable; they flare, subside, and flare again.

Nozzle (of a rocket engine) –a "bell-shaped" duct that allows the escaping exhaust to expand thereby lowering its pressure.

O

Oblique-wing aircraft – this aircraft wing changes form during flight for optimum lift under different circumstances and can be rotated to different positions for the best aerodynamic characteristics.

Occluded front – when a warm air mass, lying between two cold air masses, is lifted up by the cold air mass behind it. The rapidly lifted warm air cools and creates a low and severe precipitation can sometimes occur.

Orbits – paths described by one body in its revolution about another body.

Ornithopter – flying machines that are kept aloft and propelled by flapping wings, described first by Leonardo da Vinci.

Outgassing – bubbles escaping from a spacecraft which can cause damage to delicate sensors and lenses.

Oxidation – the combination of oxygen with another substance.

Oxidizer – either another chemical compound or maybe oxygen in pure form – liquid oxygen.

Ozonosphere – a special region of the atmosphere that performs the very important function of shielding us from ultraviolet and infrared radiation that could be fatal.

P

Para-frag bombs – bombs with small parachutes attached to fragmentation bombs so that the allied bombers could come in low over the airfield and drop their bombs without exploding the plane that just dropped the bomb.

Particulate matter – dust and very small particles of matter.

Passenger terminal – designed to handle passengers, baggage, and cargo. Most have large waiting rooms for passengers to relax as well as places to eat, purchase tickets, and rent cars.

Passive communications satellites – those satellites, such as Echo I, that does nothing more than to reflect radio and television signals.

Patrol aircraft – aircraft used by utility companies to inspect pipelines or power lines.

Payload – whatever the rocket is carrying.

Performance instruments – tells how the aircraft has responded to commands.

Perigee – the opposite of apogee – that point where the orbiting body is closest to the body being orbited.

Personal aviation – the use of an aircraft for other than business or commercial use.

Photosphere – the portion of the Sun which gives light. It is composed of mostly hydrogen and helium and is very hot.

Pilotage – navigating by reference to visible landmarks.

Pluto – the outermost planet of the solar system, discovered in 1930, ninth in distance from the Sun.

Polar air mass – a cold air mass.

Polar magnetic storms – solar disturbances observable only in the polar areas.

Polar orbit – involves a path that crosses or nearly crosses the North and South Poles during each orbit.

Powered flight – aircraft having, producing, or propelled by means of engines.

Precipitation – when visible water falls in the form of rain, sleet, snow, and hail.

Precise Positioning System (PPS) – the military's encoded signal.

Pressure – air at higher altitudes is under less pressure than air at lower altitudes. Standard day pressure is 14.7 psi, or 29.92 on a mercury barometer. All air molecules pressing down upon all the molecules below them. Pressure is exerted in all directions with a given volume of air.

Pressure gradient – the rate of pressure increase or decrease on any atmospheric plane, usually a horizontal plane, for any given distance.

Pressure instruments – uses the principle that pressure decreases with height to tell the pilot about the performance of the aircraft.

Prime meridian – the great circle line that passes from the North Pole to the South through Greenwich, England.

Probes – satellites or spacecraft that either fly by, orbit or land on a celestial body, other than Earth.

Progressive burn rate – an instantaneous spread of the flame-front along the entire surface of the hole and as more and more surface area is exposed by burning, more and more thrust is produced.

Propellant – the oxidizer and reducer which propel the rocket.

Propfan system – combines the air-moving efficiency of the turbofan engine with the thrusting efficiency of the propeller causing a dramatic reduction in fuel consumption while retaining the turbofan's high power and the speed it makes possible.

Propulsion rocket system – includes the propellant used, the containers for the propellant, all plumbing that may be required to get the propellant from the containers to the engine, and the rocket engine itself.

Pulsar – known as a pulsating star because it flashes electromagnetic emissions (radio or other waves) in a set pattern.

Pure jets – a jet using a type of propulsion where all of the thrust is provided by the jet exhaust.

Q

R

Radar – radio detecting and ranging by means of emitting radio signals and observing and analyzing the minute signals reflected from an object to detect range, bearing, and other characteristics of the object.

Radiation – energy radiated in the form of waves or particles such as the heat energy of the sun that reaches Earth.

Radiation hazards – intense amounts of radiation found with the Van Allen portion of the magnetosphere that can be damaging to astronauts and to satellites.

Radial – each degree line, in a 360-degree circle, extending away from the site.

Radiation fog – fog that forms at night when land surfaces radiate much of the heat absorbed from the sun back into space.

Ramjet engine – the simplest type of all-jet engines because it has no moving parts. The force of inertia "rams" air into a streamlined chamber where it is compressed slowed down, mixed with fuel, ignited, and released.

Ramps – a large paved area for parking airplanes.

Reaction engine – a rocket engine where the action of the rocket's exhaust gases produces a reaction, forcing the rocket in the opposite direction.

Reciprocating engine – certain parts of the engine move back and forth in straight-line motion. This straight-line motion has to be changed to rotary motion for turning the propeller of an airplane.

Reconnaissance aircraft – aircraft used by the military to watch an enemy or potential enemy in order to keep track of what they are doing.

Reducer – the substance to be oxidized.

Regional-commuter aircraft – smaller airlines that carry passengers within a certain limited geographical region. They serve many of the smaller cities that the larger airlines have dropped.

Regressive burn rate – the most thrust is produced shortly after ignition, and it diminishes thereafter.

Relative humidity – the method used to tell you the amount of water vapor that can still enter an air mass before it becomes saturated.

Relative wind – opposite the flight path and impacts the airfoil at any angle to the chord line.

Retractable gear – landing gear that retracts in order to get them out of the airstream and thereby reduce drag.

Retrothrust – negative thrust (moving down from a higher to a lower orbit require negative thrust).

Rille – one of several long, narrow telescopic valleys on the surface of the moon.

Rime ice – form when the airplane is flying through supercooled cloud condensate. If allowed to accumulate, it will reduce lift and become a danger to flight.

Rocket – operates on the same principle as the firework rocket, consisting of a combustion chamber and an exhaust nozzle, that carries either liquid or solid propellants which provide the fuel and oxygen needed for combustion. A type of power plant that is used to propel something (payload).

Rotary engines – an air-cooled engine with the cylinders arranged in a round fashion. The crankshaft was fastened solidly to the airframe and allowed the engine and the attached propeller to spin around the fixed crankshaft.

Rotary-wing aircraft – a large rotor (propeller) on top of a helicopter, which is made up of a number of blades, each like a wing, and as the rotor whirls, the blades move through the air causing, lift.

Rotor blades – the airfoils in the rotor of a rotary-wing aircraft.

Rotor clouds – clouds that show by their shape and motion that the air coming over the mountain is spinning on an "axis" that parallels the mountains linear shape.

Rotor hub – the central component of a rotor, to which the blades are attached and where the rotor is attached to the drive shaft.

Rotor system – a complete system of rotating airfoils that supplies all or a major part of the lift supporting an aircraft.

Rudder – a control surface that controls yaw (left and right movement) of an airplane.

Runway designations – runways are identified by a number which corresponds to a compass direction rounded to the nearest 10 degrees.

S

Satellites – a man-made object or vehicle intended to orbit Earth, the moon, or other celestial body for the transmission of space data.

Saturation – when the air is holding the maximum amount of water vapor for the existing temperature and pressure.

Saturn – the second largest planet in the solar system and the sixth from the Sun. Known for its famous rings.

Scintillation – the twinkling of the stars.

Scramjet engine – similar to ramjet engine except the air is not slowed to subsonic speeds within the engine.

Seaplanes – flying boats.

Self-reacting compound – one molecule contains atoms of both oxidizer and reducer and, upon ignition, reacts with itself, yielding energy as it breaks down or decomposes.

Semimonocoque – a fuselage structure that uses internal braces to help the skin carry the forces generated.

Severe turbulence – turbulence where aircraft may at times be out of control, occupants are thrown against seat belts, and unsecured objects are tossed about.

Shock wave – the sudden displacement of air and the resulting wedge-shaped wave formed by the air.

Short-haul jets – smaller jets such as the Boeing 727 and the DC-9.

Short-Takeoff-and Landing (STOL) – the ability of an aircraft to clear a 50-foot obstacle within 1,500 feet of commencing takeoff and to stop within 1,500 feet after passing over a 50-foot obstacle when landing.

Slats – protrusions from the leading edge of a wing that, when combined with the flaps, result in a significant increase in lift.

Small circle – any circle other than a great circle.

Smart weapons – weapons preferred because pilots could launch them far away from the targets and thus stay away from enemy defensive weapons.

Smoke – the vaporous matter arising from something burning and made visible by minute particles of carbon suspended in it.

Solar flares – a sudden and temporary outburst of energy from a small area of the sun's surface.

Solar powered aircraft – aircraft powered by the sun's rays.

Solar radiation – a process which causes evaporation by heating the oceans and large bodies of water.

Solar radio burst – large amounts of radio energy released by solar flares, which causes radio waves to become jammed.

Solar winds – steady electromagnetic emissions that are an extension of the Sun's corona into interplanetary space.

Solid propellants – a propellant in a solid state which is less costly and more reliable than the liquid type.

Sound barrier – the speed sound travels through air. Before 1947, it was believed that the speed of sound created a physical barrier for aircraft and pilots.

Sounding rocket flight – a rocket sent into, or even beyond the atmosphere, on a one-way trip to gather information.

Space – a place which extends infinitely in all directions and contains all the stars, planets, and galaxies in the universe.

Special use airspace – some special but relatively small areas of the airspace that most pilots have to avoid. Prohibited airspace and restricted airspace are clearly marked on aeronautical charts.

Specific impulse – the number of pounds of thrust delivered by consuming one pound of propellant (oxidizer/fuel mixture) in one second.

Speed of sound – how fast sound travels through a medium such as air. The speed of sound in air is about 761 mph when the air temperature is 59 degrees F.

Spin stabilization – the ability of a projectile to be steadied in flight by a rotating motion about its longitudinal axis.

Spoilers – device used to destroy lift. Found on top of the wing and in varying sizes.

Sports aviation – called "flying for fun." It is flying for some purpose other than transportation or business purposes.

Stabilizer (horizontal and vertical) – located on the tail with the horizontal stabilizer having the elevators attached and the vertical stabilizer having the rudder attached.

Stall – separation between the streamlines and the airfoil causing loss of lift producing low-pressure on the top of the wing.

Standard Positioning System (SPS) – the civilian public's signal.

Stealth bomber – an aircraft that is hard to see by radar.

Strafe – to rake (as ground troops or an airfield) with fire at close range and especially with machine-gun fire from low-flying airplanes or formerly with artillery fire.

Strategic airlift – transportation of personnel or cargo between the theaters of operation.

Strategic bombing – bombing enemy territory.

Stationary front – when air masses lose their "punch" and are not replacing one another.

Stratosphere – a region where temperature goes up with increase in altitude, beginning at 10 miles above the Earth and going to about 30 miles up.

Stratus clouds – clouds that stretch out/or cover as a layer.

Sublimation – happens when water molecules leave the frozen (solid) state and directly enter the atmosphere without first changing into a liquid.

Sudden ionospheric disturbance – produced by sunspots, solar flares, and other disturbances on the surface of the sun causing fluctuations in the output of the sun's rays. SIDs produces excess electrons in the atmosphere, and these will absorb radio waves.

Sunspots – any of the dark spots sometimes seen on the surface of the sun.

Sunsynchronous orbit – a polar orbit that keeps a satellite exposed to constant sunlight.

Supercritical wings – wing designed to delay the point at which an aircraft reaches supersonic speeds, thus delaying the increased drag.

Supernova – occurs when a star gives up great mass in one giant explosion of light and energy.

Supersonic – relating to speeds from one to five times the speed of sound in air.

Supersonic transports – a delta-wing aircraft, which could carry about 100 passengers and fly at about Mach 2.2 (such as the Concorde).

Swept-back wings – aircraft wings that are designed to be more efficient at high speeds for supersonic flight.

Swirl-jet type – a type, in which each propellant is introduced into the chamber in an inverted-cone-shaped spray, finely atomized and sufficiently diffused for adequate mixing with the adjacent spray.

T

Tachometer – an instrument that shows how fast the engine's crankshaft is turning (expressed in rpm).

Tactical airlift – transportation within a theater of operation.

Tail (empennage) – consists of the horizontal stabilizer and the vertical stabilizer.

Tandem – landing gear in an arrangement where the main gear consists of two sets of wheels, which are, located one behind the other on the fuselage.

Tankers – most of the time used for aerial refueling of bombers, fighters and attack aircraft. They can also transport passengers and cargo.

Taxiways – the roads that aircraft use to get to the runway.

Technical/vocational school – provide the majority of the formal technical education courses. In this type of school, many people learn the special trades and skills that are applicable to the industry they plan to join.

Temperature – the measure of the energy within a gas.

The Milky Way – the galaxy in which we reside, along with about 100 billion other solar systems and stars.

Thermosphere – a region of the atmosphere that begins at 50 miles up and extends outward to about 300 miles.

Throat (of a rocket engine)- the most constricted area or section of a duct or passage of a rocket nozzle that constricts the exhaust and thereby increases its velocity.

Thrust – the force exerted through the propeller shaft of an airplane due to reaction of the air on the revolving blades of the propeller and that moves the craft ahead.

Thrust vectoring – allows the thrust force to be pointed in any direction to assist lift, reduce the chance to stall, or allow the aircraft to fly at extremely high angles of attack and very slowly.

Thunderstorm – any storm accompanied by thunder and lightning.

Tilt-Rotor Research Aircraft (TRRA) – an aircraft where the entire propulsion unit turns.

Total velocity requirement – represents adding together of all the velocity requirements for all stages of the mission.

Trailing edge (airfoil) – the thin junction where the upper and lower surfaces come together at the rear of the wing.

Trainers – an aircraft used to train pilots.

Trajectories – the curved paths of objects hurtling through space.

Transport – its mission is to airlift personnel and material to wherever they are needed.

Tricycle – consists of three wheels, which make an airplane very easy to control on the ground.

Tropical air mass – a hot air mass.

Tropical weather – weather conditions in the tropics which can be continental (extremely varied) or oceanic (low pressure and light winds.)

Troposphere – that region in which people live, work, play, and fly, extending from the Earth's surface to about 10 miles above the Earth at the equator.

True airspeed – a measure of how fast the airplane is flying through the air.

True course – what the navigator indicates as the course the airplane will follow. This might include consideration of radio navigation stations, landforms such as mountains, or prohibited airspace.

Truss - a type of fuselage that is made of tubing welded in place to form a well-braced framework.

Turbine engines – use the force of hot flowing gases striking a turbine.

Turbofan engine – similar to turbojets except more air is pulled into the turbofan engine, they are much quieter, and more fuel-efficient. The limitations are speed and poor low-altitude performance.

Turboprop jets – a type of jet propulsion in which the gas turbine is fastened to a propeller that is used to propel the aircraft.

Turbulence – air that flows over the wing's surface and scrapes against the rough metal and is slowed down and churned up.

Turn-and-slip indicator – the turn indicator indicates the direction and rate of turn and the ball in the glass tube (inclinometer) indicates the quality of the turn.

Typhoon – a hurricane that occurs in the western Pacific.

U

Ultralights – small, lightweight aircraft, which began as, powered hang gliders.

Uncontrolled airports – airports with no control tower where the pilots must use common procedures to reduce the chances of collisions on the ground and in the air.

United Nations resolutions – formal statements of opinion or determination adopted by the United Nations such as those relating to the use of space and how all mankind should share its benefits.

Unmanned Air Vehicles (UAV) – small, pilot-less aircraft that perform missions, which do not require a pilot on board or which, are considered too dangerous or politically unwise for manned flight.

Unmanned spacecraft – research devices designed to add to our knowledge of the atmosphere and space.

Uplink – the communication link from the transmitting earth station to the satellite.

Upslope fog – fog that results when wind carries moist air up a mountain slope or sloping land until the air is cooled.

Uranus – the third largest planet in the solar system, seventh in distance from the Sun.

Useful load – subtract the empty weight from the maximum allowable weight from the maximum allowable weight to find how many pounds may be loaded into the airplane.

Utility aircraft – aircraft used by the U.S. Air Force to airlift important people or for operational support airlift.

V

Vacuum – completely empty space.

Vectors – a graphic mathematical illustration showing both direction and magnitude.

Velocity – the rate at which a body moves when a force is applied to it.

Vengeance weapons – two World War II German weapons called the V-1 and V-2. V-1 was nicknamed "buzz bomb" and V-2 was a rocket-propelled ballistic missile.

Vertical axis – an imaginary line that passes vertically through the meeting point of the longitudinal and lateral axes and is also called the yaw axis.

Vertical-Takeoff-and Landing (VTOL) – a method by which an aircraft can achieve forward flight, like a conventional aircraft, but can also takeoff and land without any horizontal movement at all.

Vertical velocity indicator- tells the pilot at what rate (in feet per minute) the airplane is climbing or descending.

Viscosity – a fluid's resistance to flow.

Viscous drag – when an object is placed in the path of moving air and the mutual attraction of molecules slows the rate of flow. This is transmitted to other air molecules that are actually touching the surface over which they are flowing.

Visual Flight Rules (VFR) – the general weather conditions the FAA considers a pilot can expect at the surface.

VOR receiver – a receiver that gives a pilot a way to tell where he is from a given ground point without actually seeing the point.

Vortices – form around the wingtips of an airplane and described as horizontal tornadoes. Strong swirling air currents.

V/STOL – vertical/short takeoff and landing aircraft could get into and out of small airports that were located close to the customer's destination.

W

Wake turbulence – a man-made turbulence caused by large aircraft in flight.

Warm front – when a warm air mass replaces a cold air mass, the boundary is called a warm front.

Wave drag – result of lost energy when air flows across a shock wave and undergoes a change in temperature, pressure, and velocity.

Waverider – a hypersonic or supersonic vehicle that has an attached shock wave along its leading fuselage edge. The vehicle appears to be riding its own shock wave.

Weather – the day-to-day changes in atmospheric conditions.

Weather radar – shows areas of precipitation, but its most important function is to show storm cells (thunderstorms) ahead.

Weight – force that directly opposes lift.

Windshear – an atmospheric condition in which changes in speed and direction of the wind occur.

Wind triangle – a tool used by the pilot to figure out where wind drift will cause the aircraft to fly over the ground. It can also be used to counter the effect of drift.

Wind tunnel – a device used in the design and development of virtually all aircraft flying today.

Windward – slopes of mountains that face the wind and are usually moistened with rain or snow.

Wing – primary source of lift with ailerons attached.

Winglets – small wings placed in a vertical position at the end of the wings to eliminate the vortices and improve the efficiency of the wing.

Whiteout – an atmospheric and surface condition in the Arctic in which no object casts a shadow, the horizon being indiscernible, and only very dark objects being seen. Snowfall which reduces visibility.

X

Y

Z