

# Glossary

## A

**Abort.** To terminate an operation prematurely when it is seen that the desired result will not occur.

**Advection.** In weather, the term used for the horizontal transport of heat by the wind.

**Absolute altitude.** The actual distance between an aircraft and the terrain over which it is flying.

**Advisory Circular (AC).** An FAA publication that informs the aviation public, in a systematic way, of nonregulatory material.

**Accident.** An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. (NTSB 830.2)

**Aeronautical Information Manual (AIM).** A reference publication for pilots.

**Airworthiness Directive (AD).** A regulatory notice sent out by the FAA to the registered owner of an aircraft informing him or her of a condition that prevents the aircraft from meeting its conditions for airworthiness. Compliance requirements will be stated in the AD.

**Adiabatic process.** In weather, the change of the temperature of air without transferring heat. In the adiabatic process, compression of the air mass results in the warming of the air; conversely, the expansion of the air mass results in cooling of the air.

**Administrator.** The FAA Administrator or any person to whom he or she has delegated authority in the matter concerned.

**Aeronaut.** A person who operates or travels in a balloon or airship.

**Aeronautical Decision-Making (ADM).** A systematic approach to the mental process, used by pilots to consistently determine the best course of action in response to a given set of circumstances.

**Aeronautics.** The branch of science that deals with flight and with the operations of all types of aircraft.

**Aerostat.** A device supported in the air by displacing more than its own weight of air.

**Automated flight service station (AFSS).** An air traffic facility that provides pilot briefings and numerous other services.

**AGL.** Above ground level.

**Aircraft.** A device that is used or intended to be used for flight in the air.

**Airport.** An area of land or water that is used for the landing and takeoff of an aircraft.

**Altimeter.** A pressure reading device that, when properly calibrated, indicates the height of the aircraft above mean sea level (MSL). An altimeter is a required instrument in a balloon, as directed by 14 CFR part 31, Airworthiness Standards: Manned Free Balloons.

**Altimeter setting.** The station pressure (barometric pressure at the location the reading is taken) which has been corrected

for the height of the station above sea level.

**Ambient air.** Air surrounding the outside of a balloon envelope.

**Anabatic winds.** In weather, a wind that blows up the slope of a hill or mountain due to increased heating along the valley walls.

**Annual inspection.** A maintenance term directed by 14 CFR part 91, section 91.409, which states that “no person may operate an aircraft unless, within the preceding 12 calendar months, it has had—(1) an annual inspection...and has been approved for return to service...”

**Apex line.** A line attached to the top of most balloons to assist in inflation or deflation. Also called crown line or top handling line.

**Approved.** Approved by the FAA Administrator or person authorized by the Administrator.

**Archimedes’ Principle.** The Greek mathematician’s principle of buoyancy, which states that an object (a balloon) immersed in a fluid (the air) loses as much of its own weight as the weight of the fluid it replaces.

**ATC.** Air Traffic Control.

**Automatic Terminal Information Service (ATIS).** The continuous broadcast (by radio or telephone) of recorded noncontrol, essential but routine, information in selected terminal areas.

**Automatic Weather Observing System (AWOS).** Continuous broadcast (by radio or telephone) of weather conditions at selected locations.

## B

**Ballast.** Gas ballooning term; used to control buoyancy, and therefore altitude, during flight. Ballast, usually in the form of sand or water, is carried aloft by the gas balloon at launch. As the balloon pilot needs to adjust altitude, a small amount of ballast is jettisoned overboard, thereby reducing the gross weight of the balloon at that point in time. The balloon will then rise to a new pressure altitude, where it will remain until there is another dynamic change in the lift equation.

**Balloon.** A lighter-than-air aircraft that is not engine driven, and that sustains flight through the use of either gas buoyancy or an airborne heater.

**Balloon Federation of America (BFA).** A national association for balloon pilots and enthusiasts in the United States, and affiliated with the National Aeronautic Association. Information about the BFA can be found at [www.bfa.net](http://www.bfa.net)

**Balloon flight manual.** A manual containing operating instructions, limitations, weight, and performance information, which must be available in an aircraft during flight. Portions of the flight manual are FAA approved.

**Basket.** That portion of a hot air balloon that carries the pilot, passengers, cargo, fuel, and instruments.

**Blast valve.** The valve on a propane burner that controls the flow of propane burned to produce heat.

**Bowline knot.** Pronounced boh' lin. A common knot that is easy to tie and untie and will not slip.

**Btu (British thermal unit).** A measurement of heat. The amount of heat required to raise 1 pound of water from 60 to 61 °F.

**Buoyancy.** In ballooning, when the balloon is zero weight and is neither climbing nor falling.

**Burn.** A common term meaning to activate the main blast valve and produce a full flame for the purpose of heating the air in the envelope.

**Burner.** See Heater.

## C

**Capacity.** See Volume.

**Captive balloon.** Commonly used to describe a balloon that is permanently anchored to the ground.

**Category.** According to Title 14 of the Code of Federal Regulations: (1) As used with respect to the certification, ratings, privileges, and limitations of airmen, means a broad classification of aircraft. Examples include: airplane; rotorcraft; glider; and lighter-than-air; and (2) As used with respect to the certification of aircraft, means a grouping of aircraft based upon intended use or operating limitations. Examples include: transport, normal, utility, acrobatic, limited, restricted, and provisional (14 CFR part 1).

**Ceiling.** The lowest broken or overcast layer of clouds or vertical visibility into an obscuration.

**CFR.** Code of Federal Regulations.

**Charles' Law.** If the pressure of a gas is held constant and its absolute temperature is increased, the volume of the gas will also increase. This principle is particularly relevant in gas ballooning.

**Checklist.** A tool that is used as a human factors aid in aviation safety. It is a systematic and sequential list of all operations that must be performed to properly accomplish a task.

**Class.** According to Title 14 of the Code of Federal Regulations: (1) As used with respect to the certification, ratings, privileges, and limitations of airmen, means a classification of aircraft within a category having similar operating characteristics. Examples include: single-engine; multiengine; land; water; gyroplane; helicopter; airship; and free balloon; and (2) As used with respect to the certification of aircraft, means a broad grouping of aircraft having similar characteristics of propulsion, flight or landing. Examples include: airplane, rotorcraft, glider, balloon, landplane, and seaplane.” (14 CFR part 1)

**Coating.** A thin synthetic added to the surface of balloon fabric to lessen porosity and ultraviolet-light damage.

**Cold front.** In weather, the leading edge of a cold air mass displacing a warmer air mass.

**Cold inflation.** Forcing cold air into the envelope, giving it some shape to allow heating with the heater.

**Commercial pilot.** A person who, for compensation or hire, is certificated to fly an aircraft carrying passengers or cargo.

**Controlled airspace.** Airspace designated as Class A, B, C, D, or E within which air traffic control service is provided to some or all aircraft.

**Convection.** Generally, the transfer of heat energy in a fluid. As applied to weather, the type of heat transfer occurring in the atmosphere when the ground is heated by the sun.

**Cooling vent.** A vent, in the side or top of the balloon envelope, which opens to release hot air, and that closes after the release of air automatically.

**Crew chief.** A crewmember who is assigned the responsibility of organizing and directing other crewmembers.

**Crown line.** A line attached to the top of most balloons to assist in the inflation and deflation of the envelope. Sometimes referred to as apex line or top handling line.

**Currency.** Common usage for recent flight experience. In order to carry passengers, a pilot must have performed three

takeoffs and three landings within the preceding 90 days. In order to carry passengers at night, a pilot must have performed three takeoffs and three landings to a full stop at night (the period beginning 1 hour after sunset and ending 1 hour before sunrise).

## D

**Dacron.** The registered trade name for polyester fabric developed by DuPont.

**Declination.** A term useful in map reading. Declination is the difference between true north and magnetic north, and is usually defined on an aviation sectional map or a topographical map.

**Density altitude.** As defined in the Pilot's Handbook of Aeronautical Knowledge, FAA-H-8083-25, "pressure altitude corrected for nonstandard temperature." However, a more pertinent definition is that in the Airman's Information Manual, which explains density altitude as being nothing more than a way to comparatively measure aircraft performance. See paragraph 7-5-6 of the AIM for a complete discussion.

**Deflation panel.** A panel at the top of the balloon envelope that is deployed at landing to release all hot air (or other lifting gas) from the envelope. A parachute top is a form of deflation panel.

**Designated pilot examiner (DPE).** A person appointed by the Administrator who may accept application for certificates, administer practical exams, and issue pilot certificates. DPEs are considered to be technically qualified, and must have a good industry reputation for professionalism and integrity.

**Drag line.** A gas balloon term used to describe a large, heavy rope, deployed at landing, which orients the balloon (and rip panel) to the wind, and transfers weight from the balloon to the ground, creating a landing flare.

**Drop line.** A rope or webbing, which may be deployed by the pilot to ground crew to assist in landing or ground handling of a balloon.

## E

**Envelope.** Fabric portion of a balloon that contains hot air or gas.

**Equator.** The widest diameter of the envelope.

**Equilibrium.** When lift equals gravity, as in level flight. Equilibrium at launch is typically that temperature at which after the balloon has been inflated and is standing up (erect), the ground crew is able to hold the balloon in place by resting their hands lightly on the basket.

## F

**Fabric test.** Testing of the envelope fabric for tensile strength, tear strength, and/or porosity. Fabric tests are specified by each balloon manufacturer.

**False lift.** See Uncontrolled Lift.

**Federal Aviation Administration (FAA).** The federal agency responsible to promote aviation safety through regulation and education.

**Federal Communications Commission (FCC).** The federal agency which regulates radio communication and communication equipment in the United States.

**Flameout.** The inadvertent extinguishing of a burner flame.

**Flare.** The last flight maneuver by an aircraft in a successful landing, wherein the balloon's descent is reduced to a path

nearly parallel to the landing surface.

**Flight review.** Required for all certificated pilots every 24 months in order to retain pilot in command privileges. A flight review consists of at least 1 hour of flight training and 1 hour of ground training.

**Flight time.** According to Title 14 of the Code of Federal Regulations, the time from the moment the aircraft first moves under its own power for the purpose of flight until the moment it comes to rest at the next point of landing.

**Flight visibility.** According to Title 14 of the Code of Federal Regulations, the average forward horizontal distance, of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

**fpm.** Feet per minute.

**Flight Standards District Office (FSDO).** Field offices of the FAA, which deal with certification and operation of aircraft.

## G

**Gauge.** A device for measuring. Required gauges on a hot air balloon are the envelope temperature gauge (pyrometer) and the fuel quantity gauge for each fuel tank. Most balloons also have fuel pressure gauges.

**Gondola.** Portion of a gas balloon that carries the pilot, passengers, cargo, ballast, and instruments.

**Gore.** A vertical section of fabric, often made of two vertical, or numerous horizontal panels, sewn together to make a balloon envelope.

**Global Positioning System (GPS).** The Global Positioning System is a series (or “constellation”) of satellites circling the Earth, each broadcasting a unique signal. These signals, usually three or more, are detected by electronic units, and, thru triangulation and time delay sensings, provide an extremely accurate location readout of the GPS receiver. Many balloon pilots carry a small GPS unit on board the balloon to determine location, ground track and ground speed.

**Ground crew.** Persons who assist in the assembly, inflation, chase, and recovery of a balloon.

**Ground visibility.** According to Title 14 of the Code of Federal Regulations, prevailing horizontal visibility near the earth’s surface as reported by the United States National Weather Service or an accredited observer.

## H

**Handling line.** A line, usually ¼-to ½-inch diameter rope, attached to a balloon envelope or basket, used by the pilot or ground crew to assist in the ground handling, inflation, landing, and deflation of a balloon.

**Heater.** Propane-fueled device to heat air inside the envelope of a balloon, often referred to as a burner.

**Helium.** A light, inert gaseous chemical element mainly found as a natural gas in the southwestern United States. Used to inflate gas balloons and pilot balloons.

**Helicopter Emergency Medical Service (HEMS) Weather Display.** A product of the Aviation Digital Data Service, this computer program give weather information, both real-time and forecast, for a 5 kilometer square area nationwide. It can be viewed and downloaded at [www.weather.aero/HEMS](http://www.weather.aero/HEMS)

**Hydrogen.** The lightest of all gaseous elements. Commonly used in Europe for inflating gas balloons. Flammable by itself and explosive when mixed with oxygen. As opposed to helium, hydrogen is easily manufactured.

**Hypoxia.** An aeromedical term; means “reduced oxygen” or “not enough oxygen.”

**I**

**International Civil Aviation Organization (ICAO).** An agency of the United Nations, which has codified principles and techniques of international air navigation and fostered the planning and development of international air transport to ensure safe and orderly growth. ICAO has produced many international treaties to standardize aviation; the United States is a member of the ICAO, and as such, has agreed to many of the standardization efforts, most notably in the area of airspace nomenclature.

**Igniter.** A welding striker, piezo sparker, matches, or other means used to ignite the balloon pilot flame.

**Incident.** An occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations.

**Indicated altitude.** The altitude shown on a properly calibrated altimeter.

**Inoperative.** Not functioning or not working.

**Instructions for Continued Airworthiness.** A manual published by an aircraft manufacturer specifying procedures for inspection, maintenance, repair, and mandatory replacement times for life-limited parts.

**Integrated Airman Certification and Rating Application (IACRA).** An online application system that allows for the issuance of student, private and commercial pilot certificates without generating paperwork; all certificate application and approved is performed through the use of electronic “signatures.”

**Instrument.** According to Title 14 of the Code of Federal Regulations, A device using an internal mechanism to show visually or aurally the attitude, altitude, or operation of an aircraft or aircraft part. There are only two instruments required in a hot air balloon: vertical speed indicator (VSI) and altimeter.

## K

**Katabatic winds.** A wind produced by the flow of cold, dense air down a slope in an area subject to radiational cooling. Mountain winds are the most common form of katabatic winds.

**Kevlar®** A registered trademark for a DuPont Corporation product, a synthetic fiber created in 1965 which has a strength factor 5 times that of steel. Frequently used in balloon systems for suspension cables and control lines of various types. Generally, Kevlar® is used for the core of a suspension line, and will have a cover or sheath over the core, as Kevlar® is ultraviolet light sensitive.

## L

**Life-Limited.** An aircraft part whose service is limited to a specified number of operating hours or cycles. For example, some balloon manufacturers require that fuel hoses be replaced after a certain number of years.

**Light Aircraft.** Any aircraft with a maximum takeoff weight of less than 12,500 pounds. All presently FAA-certificated balloons are light aircraft.

**Limitations.** Restrictions placed on a balloon by its manufacturer. Examples are maximum envelope temperature and maximum gross weight.

**Log.** A record of activities: flight, instruction, inspection, and maintenance.

**LTA.** Lighter-Than-Air.

## M

**Maintenance.** The upkeep of equipment, including preservation, repair, overhaul, and the replacement of parts.

**Maintenance Manual.** A set of detailed instructions issued by the manufacturer of an aircraft, engine, or component that describes the way maintenance should be performed.

**Maintenance Release.** A release, signed by an authorized inspector, repairman, mechanic, or pilot after work has been performed, stating that an aircraft or aircraft part has been approved for return to service. The person releasing the aircraft must have the authority appropriate to the work being signed off.

**Master tank.** The propane tank, usually tank number one, that offers all appropriate services, such as liquid, vapor, and backup system.

**Maximum allowable gross lift.** The maximum amount of weight that a balloon may lift under standard conditions. Usually a part of the balloon's design criteria, and may be found on the type Certificate Data Sheet for that particular balloon.

**METAR.** In weather, an acronym for Aviation Routine Weather Report, which is an observation of current surface reported in the standard international format. Routine METARs are transmitted hourly; there is a special report (as indicated by the acronym "SPECT") that may be issued at any time for rapidly changing weather conditions.

**Metering valve.** A valve on a balloon heater that can be set to allow propane to pass through at a specific rate.

**Methanol.** A type of alcohol, usually fermented from wood, required by most balloon manufacturers to be introduced into propane tanks annually to adsorb, and thus eliminate, small quantities of water from the fuel.

**Mildew.** A gray or white parasite fungus which, under warm, moist conditions, can live on organic dirt found on balloon envelopes. The fungus waste materials attack the coating on the fabric.

**Mooring.** Operation of an unmanned balloon secured to the ground by lines or controlled by anything touching the ground. See Title 14 of the Code of Federal Regulations, part 101.

**Mouth.** The bottom, open end of a hot air balloon envelope. Also called the "throat."

**MSL.** Mean sea level.

## N

**Neutral buoyancy.** A condition wherein a balloon is weightless and is neither ascending nor descending.

**Nitrogen charging.** A technique of adding nitrogen gas to propane tanks to increase fuel pressure. Used in place of temperature to control propane pressure in hot air balloons during cold weather.

**Nomogram.** Technically, a calculating chart with scales that contain values of three or more mathematical variables, widely used in engineering. In ballooning, a balloon's performance chart is a nomogram.

**Nonporous.** The state of having no pores or openings which will not allow gas to pass through. New hot air balloon fabric is nearly nonporous.

**Notice to Air Missions (NOTAM).** A notice containing information concerning facilities, services, or procedures, the timely knowledge of which is essential to personnel concerned with flight operations.

**Nylon.** The registered name for a polymeric fabric. Most balloon envelopes are made of nylon.

## O

**OODA Loop.** An aeronautical decision-making model particularly suited to ballooning. Originally devised by Col. John Boyd for use by Air Force combat pilots, it has come to be widely utilized in the business community. See the discussion in chapter 1 of this handbook.

**O-Ring.** A doughnut-shaped packing, usually rubber, used between two moving parts to act as a seal. Balloon heater and tank valves usually have O-rings between the valve stem and valve bonnet.

**Orographic.** A term pertaining to mountains or anything caused by mountains, as in orographic wind (wind formed by mountains) and orographic cloud (a cloud whose existence is caused by disturbed flow of air over and around a mountain barrier).

**Overtemp ( or over temperature).** The act of heating the air inside a hot air balloon envelope beyond the manufacturer's maximum temperature.

**Oxygen starvation.** The condition inside a balloon envelope where all available oxygen has been consumed by the heater flame and additional burning is impossible since propane must have oxygen to burn. In extreme cases, the blast flame and pilot light flame will extinguish after a long burn or series of burns and may not relight until the envelope has "breathed" additional air.

## P

**Parachute top.** A deflation system wherein the deflation port is sealed with a disc of balloon fabric shaped like a parachute. Lines attached to the edge of the parachute disc gather into a single line that may be pulled down by the pilot in the basket.

**Pibal.** Pilot balloon; a small helium-filled balloon sent aloft to help determine wind direction, velocity, and stability.

**Pilot in Command (PIC).** The pilot responsible for the operation and safety of an aircraft during flight.

**Piezo.** (Pronounced pee-ate' zo). A piezoelectric spark generator that is built into many modern balloon heaters to ignite the pilot light.

**Pilot light.** A small, continuously burning flame used to ignite the main "blast" flame of a balloon heater.

**Pilotage.** Navigation by visual reference to landmarks.

**Pinhole.** Any small hole in a balloon envelope smaller than the maximum dimensions allowed for airworthiness.

**Porosity.** A condition of the envelope fabric that allows hot air to escape. Excessive porosity requires increased fuel use and results in higher envelope temperatures.

**Positive control.** According to Title 14 of the Code of Federal Regulations, control of all air traffic, within designated airspace, by air traffic control.

**Preflight.** All preparations, including gathering information, assembly, and inspection performed by the pilot before flight.

**Pressure gradient.** In weather, the difference between high and low pressure areas. Wind speed is directly proportional to the pressure gradient.

**Pressure relief valve.** A device in a propane tank designed to release excess pressure—which may be caused by overfilling, overheating, or excessive nitrogen pressurization—to prevent tank rupture.

**Preventive maintenance.** Simple or minor preservation operations and the replacement of small standard parts not involving complex assembly operations.



**Prohibited area.** According to Title 14 of the Code of Federal Regulations, designated airspace within which the flight of aircraft is prohibited.

**Propane.** A colorless and odorless gas. Ethyl mercaptan is added to propane to give it a detectable odor. Propane weighs 4.2 pounds per gallon at 60 °Fahrenheit.

**Practical Test Standard (PTS).** Book containing areas of knowledge and skill that a person must demonstrate competency in for the issuance of pilot certificates or ratings.

**Pull test.** A strength test in which a section of envelope fabric is pulled to a definite pound measurement to determine if it meets the certification requirements for airworthiness.

**Pyrometer.** An instrument used to measure air temperature inside the top of a balloon envelope.

## R

**Rapid descent.** A relatively fast loss of altitude. A subjective term, but usually meant to describe a descent of more than 500 fpm.

**Rating.** According to Title 14 of the Code of Federal Regulations, a statement that, as part of a pilot certificate, sets forth special conditions, privileges, or limitations.

**Red line.** Refers to a line which activates the deflation panel of a balloon, or the maximum envelope temperature allowed, or the maximum on a gauge.

**Repair station.** A facility where specified aircraft and their parts may be inspected, repaired, altered, modified, or maintained. FAA approval is issued to a facility upon qualifications specified by the local FSDO.

**Repairman certificate.** An FAA certificate issued to a person who is employed by a repair station or air carrier as a specialist in some form of aircraft maintenance. A repairman certificate is also issued to an eligible person who is the primary builder of an experimental aircraft, to which the privileges of the certificate are applicable.

**Required equipment.** Equipment that must be aboard an aircraft, as required either by the FAA or balloon manufacturer, to maintain airworthiness.

**Restricted area.** Airspace of defined dimensions within which the flight of aircraft is restricted in accordance with certain conditions.

**Return to service.** A certificated mechanic or authorized inspector must approve an aircraft for return to service after it has been inspected, repaired, or altered. In addition, an aircraft that has been modified must be test flown by an appropriately certificated pilot before return to service.

**Ridge.** In weather, an elongated area of high pressure with no rotative motion.

**Rip panel.** A deflation panel, usually circular or triangular, at the top of a balloon envelope, which may be opened by pulling a line in the basket to allow hot air or gas to escape, and the envelope to deflate.

**Rotator vent.** See Turning Vent.

**Rotor.** May be found embedded in mountain waves. Formation usually occurs where wind speeds change in a wave, or where friction slows the wind near the ground. See *Figure 4-22* of this handbook for a graphical representation of rotors.

## S

**Sectional chart.** Published on a routine basis, these charts are similar to automobile road maps, and provide useful information regarding airspace, reference points, tower frequencies, etc., to a balloon pilot. They are generally not very helpful for navigation, as the scale, 1:500,000, is too small to be of use to the balloon pilot.

**SIGMET.** Significant Meteorological Information.

**Single Pilot Resource Management.** A variant of the crew resource management model that is or more practical application to the balloon pilot. Defined as the “art and science of managing all resources available to the single pilot to ensure the successful outcome of the flight.”

**Skew-T plot.** In weather, a graphic depiction of the data received from a radiosonde.

**Small aircraft.** Aircraft having a maximum certificated takeoff weight of 12,500 pounds or less. All currently type-certificated balloons are small aircraft.

**Serial number (S/N).** A number, usually one of a series, assigned for identification.

**Step descent.** A method of allowing a balloon to lower toward the ground by reducing the altitude, leveling off, and repeating the step, to lower the balloon in increments rather than one continuous motion.

**Superheat.** A gas balloon term, superheat occurs when the sun heats the gas inside the envelope to a temperature exceeding that of the ambient air, resulting in expansion of the gas.

**Superpressure balloon.** (1) A type of hot air balloon which has no openings to the atmosphere—the mouth is sealed with a special skirt—and is kept pumped full of air (at a higher pressure than the atmosphere) by an on-board fan. Used on moored balloons to allow operations in relatively strong wind. (2) In gas ballooning, a sealed envelope in which the internal envelope pressure exceeds that of a non-sealed envelope.

**Suspension lines.** Lines descending from the mouth of a balloon envelope from which the basket and heater are suspended.

**Syllabus.** An abstract or digest of training. It is intended to be a summary of a course of training, and should be brief, yet comprehensive enough to cover essential information.

## T

**Telling and Doing Technique.** A four-step process teaching process particularly well suited to teaching physical skills.

**Terminal Aerodrome Forecast (TAF).** TAFs are valid for a 24-hour time period, and are updated four times daily. The TAF reporting system uses the same abbreviations as used in METAR reports.

**Temperature gauge.** The thermometer system, required in all type-certificated hot air balloons, that gives a constant reading of the inside air temperature at the top of the envelope. May be direct reading or remote, using a thermocouple or thermistor connected to a gauge in the basket or reading signals sent by a transmitter.

**Temperature recorder.** A small plastic laminate with temperature-sensitive paint dots that turn from white or silver to black, to record permanently the maximum temperature reached.

**Tensile strength.** The strength of a material that resists the stresses of trying to stretch or lengthen it.

**Terminal velocity descent.** A term used by balloonists for the speed obtained when the balloon is allowed to fall until it apparently stops accelerating, at which point the envelope acts as a parachute and its vertical speed is no longer affected by its lifting gas, but only by its shape (which is caused by design), load, and other factors.

**Tethering.** Operation of a manned balloon secured to the ground by a series of lines.

**Thermal.** A column of rising air associated with adjacent areas of differing temperature. Thermal activity caused by the sun's heating usually starts 2 to 3 hours after sunrise.

**Time in service.** According to Title 14 of the Code of Federal Regulations, with respect to maintenance time records, means the time from the moment an aircraft leaves the surface of the earth until it touches it at the next point of landing.

**Touch-and-go landing.** An operation by an aircraft that lands and takes off without stopping.

**Topographic map.** A map depicting area information on a smaller scale than an aviation sectional chart, and of much more value to the balloon pilot. Most topographic charts show areas of vegetation, roads, built-up areas, and the general topography (or terrain) of a given area.

**Trough.** In weather, an elongated area of low pressure with no rotative motion.

**Turning vent.** A vent on the side of a hot air balloon envelope which, when opened, allows escaping air to exit in a manner causing the balloon to rotate on its axis.

**Type certification.** Official recognition that the design and operating limitations of an aircraft, engine, or propeller meet the airworthiness standards prescribed by the Code of Federal Regulations for that particular category or type of aircraft, engine, or propeller.

## U

**Uncontrolled lift.** Lift that occurs without specific action by the pilot. Often referred to as false lift.

**Useful lift (load).** The potential weight of the pilot, passengers, equipment and fuel. It is the basic empty weight of the aircraft subtracted from the maximum allowable gross weight.

## V

**VAD winds.** In weather; velocity azimuth display winds are derived from the output of the 160 or more WRS-88 radar sites located throughout the United States. The WRS-88 is configured to produce radar returns off of dust and other particulate matter in the air, and in turn, those returns can be used to indicate wind direction and speed at different altitudes. Generally reported in 1000 foot increments.

**Variometer.** See Vertical Speed Indicator.

**Vent.** (1) The action of opening the vent to cool the air in the envelope. (2) An envelope opening that will automatically close.

**Vertical Speed Indicator (VSI).** An instrument that continuously records the rate at which an aircraft climbs or descends. Usually measured in FPM. A required instrument in a balloon.

**Vent line.** The line that activates the cooling vent.

**Visual Flight Rules (VFR).** Flight rules governing aircraft flight when the pilot has visual reference to the ground at all times.

**Virga.** Precipitation that falls from a cloud and evaporates before reaching the ground.

**Volume.** The total amount of air or gas (expressed in cubic feet) contained in a balloon envelope.

## W

**Warm front.** In weather, the leading edge of a warm air mass displacing a colder air mass.

**Warp.** The threads in a piece of fabric that run the length of the fabric.

**Weigh-off.** Determine neutral buoyancy of a gas balloon or airship by taking weight off at launch.

**Wind direction.** The direction the wind is coming from.

**Wind shear.** A strong and sudden shift in wind speed or direction, which may be either vertical or horizontal. Wind shear should not be confused with normal wind change, which is gentler. Wind shear is often associated with the passage of a weather front, or a strong temperature inversion.

**WINGS Program.** A program that encourages general aviation pilots to continue training and provides an opportunity to practice selected maneuvers in a minimum of instruction time. Participation in the WINGS program relieves a pilot from compliance with flight review requirements, provided all WINGS requirements are met. Previously governed by Advisory Circular 61-91, the WINGS program is available as an online education program at [www.faa.gov](http://www.faa.gov), effective mid-2007.