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(R) Glossary of Technical and Physiological Terms Related to Aerospace Oxygen Systems

RATIONALE

This document consolidates reference definitions to many terms related to aviation oxygen systems. It was prepared as a reference to cover the multi-disciplinary aspects required to responsibly address work in the area of aviation oxygen systems. The goal is to provide a common reference and definitions that engineers, physiologists and others could use to understand concepts that are not specific to their area of expertise.

1. SCOPE

This document presents a glossary of many terms found in literature related to aviation oxygen systems and associated topics. Such a listing can never be all inclusive, but the majority of important terms are anticipated to be included for reference.

2. REFERENCES

2.1 Applicable Documents

There are no referenced publications specified herein.

2.2 Definitions

a: Arterial symbol, used to designate the source of blood gas, or other components of arterial blood, i.e., PaO_2, partial pressure of arterial oxygen tension; $PaCO_2$, arterial CO_2 tension, etc.

A: Alveolar symbol, used to designate alveolar gas tensions, i.e., $PACO_2$, alveolar CO_2 tension; PAO_2, alveolar oxygen tension, etc.

ABSOLUTE PRESSURE: See Pressure, Absolute.

ACAPNIA: The complete absence of carbon dioxide (usually in the blood); a term commonly used incorrectly for hypocapnia.

ACAPNIC: Suffering from acapnia.

ACIDOSIS, RESPIRATORY: A condition of the blood in which there is an increase of the carbonic acid of blood relative to the bicarbonate fraction with resultant decrease of pH; this occurs whenever elimination of carbon dioxide through pulmonary ventilation is impaired, as in respiratory obstruction, paralysis, pulmonary fibrosis, or other diffusion impairment.

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ADAPTER: A mechanical means for connecting parts of one or more systems or components. In this context, the various components of an oxygen system.

ADIABATIC: Describes a process in which there is no heat transfer to or from the surroundings. See Compression, Adiabatic.

AEROEMBOLISM: (Archaic) Embolism due to air; may occur in surgery of head, neck and heart, induced abortion and severe decompression sickness. Does not differentiate between trapped and evolved gas phenomenon. See Air Embolism.

AEROSOL: A fine suspension of liquid or very small solid particles (usually 0.3 to 8 μm) in an atmosphere of gas. A colloid system in which the continuous phase (dispersion medium) is a gas, e.g., fog.

AIR, CABIN: (1) Air flowing into a cabin. (2) Air in the cabin proper - condition of cabin air is normally determined at the point where the air leaves the cabin.

AIR CONTENT, ALVEOLAR, DRY: See Gases, Respiratory.

AIR CONTENT, ATMOSPHERIC, DRY: See Gases, Respiratory.

AIR CONTENT, EXPIRED, DRY: See Gases, Respiratory.

AIR, BLEED: Air bled from the compressor of a gas turbine engine.

AIR, COOLING: A stream of air used as a heat sink.

AIR EMBOLISM: Embolism due to air; most frequently induced by trans pulmonic pressure causing air insertion into one or more of the following: (1) arterial and hence cerebral gas embolism, (2)mediastinal and subcutaneous emphysema,(3) pneumopericardium, and/or (4) pneumothorax. Example: The volume of gas in the lungs expands so much that the alveolar walls tear, air escapes into the small pulmonary veins, and some of it travels to the cerebral and coronary circulations.

AIR, RECIRCULATED: Air in enclosed spaces or equipment cooling systems which is recirculated by fans or blowers.

AIR, STANDARD SEA LEVEL: Dry air at 15 °C (59 °F) and at a pressure of 101.3 kPa (29.92 in Hg) absolute.

AIR, REGENERATED: Air that has been regenerated by removing excess carbon dioxide, water vapor, odor, or other contaminants and, by adding oxygen, thereby making it suitable for respiration.

AIRWAY(1): The path which air travels from the atmosphere to the alveoli in the lung. (2) Any of several devices used in securing or maintaining an unobstructed respiratory passage. The route for passage of air into and out of the lungs. (OR) All passageways of the respiratory tract from mouth or nares down to and including respiratory bronchioles.

ALKALOSIS, RESPIRATORY: A condition of the blood in which there is a decrease of the carbonic acid fraction of blood relative to the bicarbonate fraction with resultant increase in pH; this occurs as a result of excessive elimination of carbon dioxide, as in hyperventilation. Also called Hypocapnia. Hypoventilation resulting in alkalemia (a combining form meaning a decreased hydrogen-ion concentration in the blood; as applied to arterial blood, denotes a pH > 7.45).

ALLERGIC DISEASES OF THE RESPIRATORY SYSTEM: Diseases, caused by the substances sensitizing the respiratory system, e.g., sneezing, allergic common cold, allergic asthma, and conjunctivitis.

ALLERGIC DISEASES OF THE SKIN: Eczema after sensitization by skin contact, e.g., nodules, vesicles, and pruritus of appropriate skin areas. Especially at risk is skin, that is previously damaged by wetness or irritants, rarely also contact-urticaria (wheals; pruritus, rash, hives).

ALLERGY: Specific reaction changes of the organism based on a pathological immunoreaction (sensitization) caused by an exogenous substance.

ALTITUDE, DENSITY: The altitude corresponding to a given density in a standard atmosphere.

ALTITUDE, EQUIVALENT OR CABIN: I.C.A.O. (International Civil Aviation Organization) standard altitude at which atmospheric pressure is equal to the cabin pressure.

ALTITUDE, PRESSURE: The altitude corresponding to a given pressure in I.C.A.O. standard atmosphere.

ALTITUDE, STANDARD: The altitude corresponding to temperature and pressure conditions and as tabulated in NACA-TN-3182.

ALVEOLAR AIR: Air in the terminal lung sacs or alveoli and alveolar ducts.

ALVEOLAR DUCT: A portion of the terminal air passages of the lung from which air sacs (alveoli) arise.

ALVEOLAR-CAPILLARY MEMBRANE: Thin layer of tissue which partitions the air in the alveoli from capillary blood, and through which gas exchange occurs between blood and alveolar air. The tissue that separates air from blood in the lung. Also called Alveolar Septum.

ALVEOLAR VENTILATION: That air which enters the alveoli. In principle, tidal volume minus the physiological dead space times the respiratory rate. The difference between tidal volume and anatomic dead space volume multiplied by the breathing frequency.

ALVEOLI: The small air sacs at the end of the bronchi where gas exchange with the blood occurs by diffusion.

ALVEOLUS (plural ALVEOLI): See Pulmonary Alveolus.

AMBIENT: Surrounding, or prevailing, i.e., ambient temperature. Of or pertaining to an existing or prevailing environment condition.

ANEMIA: An abnormal condition characterized by a reduction in the number of circulating red blood cells or the amount of normal hemoglobin available to carry oxygen. A quantitative or qualitative deficiency of the blood. This may be a reduction in the total number of red blood cells, hemoglobinemia, which is a reduction of the hemoglobin content within each cell, or both. The result is a decrease in the oxygen-carrying capacity of the blood. Anemia is marked by paleness of the skin and mucous membranes, loss of energy, heart palpitation and murmurs.

ANEROID: A sealed, flexible, evacuated chamber that expands when exposed to a reduced ambient pressure and contracts when subjected to increased ambient pressure. See Control, Barometric.

ANOXEMIA: A condition of absolute lack of oxygen, as opposed to hypoxemia or hypoxia which refers to deficiency or lowered oxygen content.

ANOXIA: Severe hypoxia, especially of such severity as to result in permanent damage or death.

ANTHROPOLOGY: The science of human beings.

APNEA: Cessation or absence of breathing movements, such as the transient cessation of breathing in anesthetized animals after hyperventilation. An absence of spontaneous breathing. See Respiration, Types of.

ARRHYTHMIA: Absence of rhythm applied especially to any variation from the normal rhythm of the heartbeat.

ARTERIAL BLOOD: Usually refers to oxygenated (bright red) blood in the conducting and distributing arteries of the systemic circulation. (Blood in the pulmonary artery, by contrast, is dark (purplish) because of its low oxygen content prior to oxygenation in the lung capillary vascular bed.) The pulmonary artery conducts venous blood from the superior and inferior vena cava vein through the right heart to the lung.

ARTERIOLIZED BLOOD: Blood that has been fully oxygenated by passage through the lungs.

ARTERY: A vessel conducting blood from the heart. Conducting and distributing arteries are those which deliver oxygenated blood to all organs. The pulmonary artery conveys venous blood from the heart to the alveolar ducts and alveoli. Bronchial and tracheal arteries supply oxygenated arterial blood to the non-respiratory conducting lung structures.

ARTICLE: A material, part, component, process, or application as defined by FAA Advisory Circular 20-62E.

ASPHYXIA: Suffocation from lack of available or usable oxygen plus retention of carbon dioxide in vital tissues. The retention of carbon dioxide distinguishes asphyxia from hypoxia which is merely a diminished amount of oxygen supply. Cardiac muscle tolerates asphyxia poorly as compared to hypoxia. Cessation of ventilation leading to acute hypoxia and hypercapnia. (OR) A condition due to lack of oxygen in respired air, resulting in impending or actual cessation of life.

ASPIRATION: (1) Removal of accumulated mucus and foreign bodies from airway by suction. (2) To draw by suction into the airway, vomitus, food, secretions or excretions. Results in aspiration pneumonitis. (3) The act of breathing or drawing in. The act of inhaling, especially in reference to the pathological aspiration of vomitus or material foreign to the respiratory tract; also, the process of withdrawing fluid by negative pressure.

ASTHMA: A respiratory disorder characterized by recurring episodes of paroxysmal dyspnea, wheezing on expiration/inspiration caused by constriction of the bronchi, coughing, and viscous mucoid bronchial secretion. The episodes may be precipitated by inhalation of allergens or pollutants, infection, cold air, vigorous exercise, or emotional stress.

ATELECTASIS: Partial or complete collapse, or imperfect expansion of the air sacs of the lungs; may include entire lobes or entire lung fields. Abnormal collapse of air spaces with elimination of the gas phase.

ATMOSPHERE: (1) A mixture of gases surrounding the earth. (2) A mixture of gases surrounding an object or a person. (3) In expressing pressure of compressed gases, one atmosphere is assumed to be 14.7 psia, the pressure of air at sea level. See Atmosphere, Standard.

ATMOSPHERE, OXYGEN ENRICHED: A localized atmosphere in which the oxygen concentration is elevated to a level that facilitates ignition of materials at lower temperatures and at greater combustion rates than occurring at sea level pressure.

ATMOSPHERE, STANDARD: The I.C.A.O accepted atmospheric model as defined in NACA-TN-3182, in which: (1) the air is a dry perfect gas; (2) the temperature at sea level is 15 °C (59 °F); (3) the pressure at sea level is 101.3 kPa (29.92 in Hg) (760 mm Hg); (4) the temperature gradient from sea level to the altitude at which the temperature is -56.5 °C (-69.7 °F) is -0.006499 °C/m (-0.003566 °F/ft) and zero above that altitude; and (5) the density at sea level under the conditions described in 1 through 4 is 1.225 kg/m^3 (0.0765 lb/ft^3).

ATMOSPHERIC PRESSURE: See Pressure, Atmospheric.

ATOMIZER: Device to reduce a liquid or solid to small droplets, in the form of a spray. A device that produces an aerosol suspension of liquid particle without using baffles to control particle size. OR An instrument used for throwing a jet of spray. See also Nebulizer.

ATOPY: Genetic disposition to develop hypersensitivity reactions (allergic rhinitis or asthma) to substances inhaled or ingested, with effects to the skin and respiratory system (e.g., pollen, molds, and house dust mites).

ATPD: Ambient Temperature and Pressure, Dry.

ATPS: Ambient Temperature and Pressure, Saturated with water vapor. These conditions exist in a water-sealed spirograph or gasometer when the water temperature equals ambient temperature.

AUTOMIX: A valve operated by barometric pressure which regulates the mixture of oxygen with ambient air to attain an enriched percentage of oxygen according to altitude.

AVERAGE LUNG VOLUME: Average volume of gas in lung during respiration (residual volume plus expiratory reserve plus 1/2 tidal volume). See Lung.

BACK-UP OXYGEN: A substitute oxygen supply located on the airframe to accommodate failure of OBOGS (on-board oxygen generation system) or other primary oxygen supply systems. The backup supply may be activated manually, or automatically.

BAG, ECONOMIZER: A bag (connected to a mask) to which oxygen is admitted continuously at a fixed rate of flow, and which during expiration, is isolated from the mask by a check valve so that oxygen delivered to the bag during expiration is available for the next inspiration, thereby reducing the peak demand on the oxygen system.

BAG, REBREATHER: A bag connected through an open passage to a mask, so that oxygen delivered to the bag at a continuous fixed rate of flow becomes mixed with a portion of the expired gas, thereby providing a large volume of oxygen-enriched gas for the next inspiration, thus reducing the peak demand on the oxygen system and reducing the oxygen consumption by rebreathing a portion of each expiration.

BAROMETRIC CONTROL: See Control, Barometric.

BENDS: A form of decompression sickness (occurring as a result of rapid reduction of ambient pressure) which is produced by evolution from solution in the blood of gaseous emboli (bubbles), primarily nitrogen, in and around the bending joints. Pain may be mild at onset, increasing in severity and may become intolerable. See Henry's Law.

BIOLOGICAL (WORKPLACE) TOLERANCE VALUE: The "biological tolerance value" is (1) that concentration of a substance or concentration of its derivative in the body, or (2) that triggered deviation of a biological indicator from its standard, at which the health of an employee isn't usually impaired.

BLACKOUT: A temporary condition in which vision is lost, due to inadequate blood flow and the associated insufficient oxygen supply to the retina of the eyes, commonly induced by positive “G” forces of moderate intensity and duration. Blood pressure at the retina of the eye is equal to or less than intraocular pressure (eye pressure). “G” induced loss of consciousness is impending. A condition characterized by failure of vision and momentary unconsciousness, due to diminished circulation to the brain. See Gray out.

BLEED AIR REGULATOR: A bleed air regulator is incorporated between the heat exchanger and the OEAS (oxygen enriched air system) concentrator in some OBOGS (on-board oxygen generation system) installations to prohibit excessive concentrator supply pressure, and to improve heat exchanger performance through flow reduction.

BLEED AIR SHUTOFF VALVE: The bleed air shutoff valve is a valve incorporated in some MSOGS (molecular sieve oxygen generation system) applications which is in the bleed air line between the aircraft engine outlet port and the concentrator. It may be automatically and/or manually activated. Its purpose is to shut off bleed air to prevent conditions that may cause concentrator damage (such as an excessive temperature condition) or malfunction.

BLINKER: A type of oxygen flow indicator having a shutter that opens and closes when flow is present.

BOTTLE, OXYGEN: See Cylinder, Gas.

BRADYCARDIA: Slowness of the heart manifested by a pulse rate usually less than 60/min. Also, slowing of the heart rate below normal.

BRADYPNEA: Decrease in normal respiratory rate, or unusually slow breathing. See also Respiration, Types of.

BREATH: The air inhaled and exhaled during respiration. The air taken in and expelled by the expansion and contraction of the thorax.

BREATHING: The cyclic inflow and exit of air from the lungs through the air conducting components of the respiratory tract. Physiologically, the rhythmic process by which the ventilatory system draws a tidal volume of ambient gas or liquid into the lungs (inspiration) and then expels it (expiration).

BRONCHI: The two primary divisions of the trachea, or windpipe (singular, bronchus). Larger branching airways dividing into the lobes and segments of the lung.

BRONCHIUM (plural BRONCHIA): One of the subdivisions of the bronchus, smaller than the bronchus and larger than the bronchioles.

BRONCHIECTASIS: Abnormal and chronic dilatation and infection of bronchial tubes and terminal air sacs and passage. Marked by fetid breath and paroxysmal coughing with the expectoration of mucopurulent matter. An abnormal condition of the bronchial tree characterized by irreversible dilatation and destruction of the bronchial walls.

BRONCHIOLE: A minute, thin walled branch of a bronchus, especially one that terminates in one or more alveoli and alveolar ducts. Branching airways beginning 5 to 14 divisions below the segmental bronchi; usually 2 mm in diameter or less.

BRONCHIOLITIS: Inflammation of the bronchioles, bronchopneumonia. An acute infection of the lower respiratory tract causing expiratory wheezing, respiratory distress, inflammation, and obstruction of the bronchioles. The severe obstruction to pulmonary ventilation can cause hypoxemia, respiratory acidosis, and even death.

BRONCHITIS: Inflammation and edema of the bronchial tubes leading to airway obstruction deep in the lung. An acute or chronic inflammation of the mucous membranes of the tracheobronchial tree.

BRONCHOCONSTRICTOR: A medicament or agent that narrows the air passages of the lungs.

BRONCHOCONSTRICTION: Narrowing of the bronchi due to contraction of their smooth muscle.

BRONCHODILATOR: A medicament or agent which dilates the air passages of the lungs. A substance, especially a drug, that relaxes contractions of the smooth muscle of the bronchioles to improve ventilation to the lungs.

BRONCHOSPASM: Spasmodic narrowing of the lumen of a bronchus associated with edema of air passages and air trapping. An abnormal contraction of the smooth muscle of the bronchi, resulting in an acute narrowing and obstruction.

BTPD: An abbreviation for Body Temperature (37 °C or 98.6 °F), Ambient Pressure, Dry.

BTPS: An abbreviation for Body Temperature (37 °C or 98.6 °F), Ambient Pressure, Saturated with water vapor (pH_20 - 47 mm Hg - 6.3 kPa).

CABIN, NONPRESSURIZED: An airplane cabin that is not designed or equipped for pressurizing and which will, therefore, have a cabin pressure equal to that of the surrounding atmosphere.

CABIN PRESSURIZATION: The process of producing ambient pressures within the cabin of an aircraft that are higher than outside ambient pressures. Aircraft pressurization (cabin altitude) schedules typically do not exceed the 8000 foot range.

CABIN, PRESSURIZED: An airplane cabin that is constructed, sealed, and equipped with an auxiliary system to maintain a pressure within the cabin greater than that of the surrounding atmosphere.

CANNULA, NASAL: A tube (or pair of tubes) designed to be inserted into one or both nostrils, for the administration of oxygen or other gases, or for sampling of respiratory gases.

CAPILLARY: A minute (6 to 8 µm diameter) thin-walled blood vessel, smallest of the blood-transport system. Capillaries constitute the interchange point between the circulatory system and the tissues and connect the arterial system with the venous system. Their walls act as semi-permeable membranes for the interchange of various substances, including fluids, between the blood and tissue fluid.

CAPILLARY TUBE: (1) A small diameter tube inserted in a pneumatic or hydraulic system to produce a desired pressure drop. (2) A small diameter tube connecting a thermostatic or pilot valve with a bellows or diaphragm in a control device.

CARBON DIOXIDE (CO_2): An odorless, colorless gas which neither burns nor supports combustion. It is a primary product of oxidation/combustion of carbon-containing substances. It is an end product of the living metabolic processes in the tissues of the body and enters the blood through the capillaries. CO_2 is excreted in exhaled air after it diffuses from the blood across the alveolar membrane into the respiratory air as a result of a gradient in partial pressures.

CARBON MONOXIDE (CO): A colorless, odorless, toxic gas usually resulting from partial oxidation/combustion of carbonaceous compounds under conditions of an insufficient supply of oxygen.

CAS-NUMBER: The CAS-Number (Chemical Abstracts Registry) is the internationally used recording number for the definite identification of chemical substances. It is assigned by the Chemical Society of America, a private scientific organization.

CENTRAL NERVOUS SYSTEM (CNS) DISORDERS: Decompression sickness characterized by a gas (usually nitrogen) evolving from solution and finding its way to and causing decrement of function of the spinal cord and/or brain. See Neurological Decompression Sickness, Neurological Manifestations, and Henry's Law.

CHEMICAL OXYGEN GENERATOR: A device containing a compound with chemically bonded oxygen which, when properly activated, will produce a supply of gaseous oxygen at a purity, rate, and quantity suitable for breathing.

CHEYNE-STOKES RESPIRATION: An abnormal, repeating pattern of breathing characterized by alternating progressive hypopnea and hypoventilation, ending in a brief apnea. See also Respiration, Types of.

CHOKES (TRUE): A form of decompression sickness where a gas (usually nitrogen) evolves from solution in the lung area, causing respiratory distress, a dry non-productive cough, sharp pain in the chest, a sense of suffocation, and/or severe substernal pain.

CHOKES (FALSE): Dryness of the throat and coughing resulting from prolonged breathing of aviator's oxygen. This is not decompression sickness and is distinguished from true chokes by the lack of pain in the chest.

CLOSED CIRCUIT SYSTEM: See Rebreather System. A system of inhalation of expired gas (potentially high in carbon dioxide content); potential suffocation hazard if CO_2 and trace contaminant control means are not included.

COMPLEMENTAL AIR: See Reserve, Inspiratory. IRV (inspiratory reserve volume), the maximum volume of air that can be inhaled following a normal quiet inspiration.

COMPLIANCE: Compliance is a measure of the distensibility of the chest and/or lungs and is expressed as volume change per unit of airway pressure or applied pressure change. Compliance changes as the lung is inflated or deflated. The units are liters of lung volume/cm H_20 pressure. Volume change per unit in applied pressure.

COMPOSITION CONTROLLER: A device incorporated in some MSOGS (molecular sieve oxygen generation system) to limit the oxygen concentration in the breathing gas supply to an upper bound. It is operational at ground level and above. Its purpose is to prevent or minimize the occurrence of acceleration-induced lung collapse (atelectasis) at an aircraft pressure altitude range where high-G maneuvers are possible and routinely performed.

COMPRESSION, ADIABATIC: Rapid compression of a gas or mixture of gases without transmission of heat to or from it. This can occur when a high pressure source is rapidly connected to a lower pressure line. The heat evolved from the compression of the gas initially in the low pressure line can achieve extreme temperatures and act as an ignition mechanism. Adiabatic compression has been a common cause of oxygen system fires when sufficient precautions are not taken in the charging or transmission of oxygen in equipment and systems.

COMPRESSION, ISOTHERMAL: Compression of a gas or mixture of gases with subtraction of enough heat to maintain a constant temperature. Typical in slow compression processes where sufficient time for temperature equilibration exists.

COMPRESSOR: A device in which work is done on a fluid (liquid or gas) to raise its total pressure.

COMPRESSOR, AXIAL: A compressor which inducts and delivers a fluid (liquid or gas) axially by one or more rotating elements, compressing the fluid.

COMPRESSOR, CABIN: A compressor that compresses and delivers air to a pressurized cabin.

COMPRESSOR, CENTRIFUGAL: A compressor that inducts a fluid (liquid or gas) axially, delivers it radially outward relative to the rotating impeller, and compresses the fluid.

CONCENTRATION: The amount of a given constituent present in a unit volume. May be expressed as a ratio, as a percentage, in parts per million or in milligrams per liter (mg/dm^3).

CONCENTRATION (C): The concentration (C) of a substance or element in the air is the quantity of this substance in a specific volume of the air. It is shown in mass per volume-unit or for gases and vapors as volume per volume-unit. The units are mg/m^3 and ml/m^3 (ppm).

CONDITIONER: A device that warms, purifies, humidifies, or medicates inspired air.

CONDITIONING, AIR: The simultaneous control of all, or at least the first three, of the following factors affecting both the physical and chemical conditions of the atmosphere within a structure: temperature; humidity; motion; distribution; pressure; dust; and bacteria.

CONFORMANCE: This term is archaic. Unlike the related compliance and elastance, the term conformance is not used in most current texts on respiratory physiology.

CONTAINER: Common term for a passenger oxygen dispensing unit installed in the cabin and compartments of transport aircraft. Containers are activated and open to provide oxygen masks in the event of cabin decompression. Chemical units include a chemical generator which is activated when a mask is donned by a passenger. Gaseous containers may dispense oxygen piped to the container from a centralized source, or contain a small pressurized cylinder to supply oxygen. See also Cylinder, Gas.

CONTROL, BAROMETRIC: A method of control that depends on the barometric pressure of the atmosphere.

CONTROL, DIFFERENTIAL PRESSURE: A method of control that limits the maximum pressure differential between cabin pressure and atmospheric pressure and maintains this differential at all altitudes above those of the isobaric control. When operating, the differential control always overrides the isobaric control.

CONTROL, ISOBARIC: A method of control that maintains essentially constant cabin air pressure.

CONTROL, MANUAL: A control device regulated by hand.

COSTAL BREATHING: Respiration produced solely by the intercostal muscles. See also Respiration, Types of.

COUPLING, AUTOMATIC OUTLET: An oxygen connection which when disconnected automatically closes a valve to prevent loss of oxygen and reopens when reconnected.

CPR: Cardiopulmonary Resuscitation. Emergency procedure for reviving heart and lung function.

CREWMEMBER: A person assigned to perform duty in an aircraft during flight time. Flight deck crew designates pilots and observers normally occupying the cockpit; cabin crew refers to cabin attendants and other personnel normally not present on the flight deck.

CRITICAL POINT: That point at which liquid and vapor have identical properties; critical temperature, critical pressure, and critical volume are terms given to temperature, pressure and volume at the critical point. Above the critical temperature, gas cannot be liquefied by pressure alone. Critical pressure is the saturation pressure corresponding to critical temperature.

CYANOSIS: An abnormal bluish discoloration of mucous membranes and skin (usually first noticeable in the lips, ear lobes, and nail beds) associated with blood oxygen deficiency. Usually caused by the presence of excessive amounts (5 g or more per 100 ml blood) of reduced hemoglobin in the capillaries. Seldom recognized in subjects with less than 10 g hemoglobin per 100 ml blood.

CYANOTIC: Showing signs of cyanosis.

CYLINDER, GAS: Common configuration in aviation for a container of pressurized gas; may be portable or fixed to the aircraft, low or high pressure. Also called a bottle, vessel or container. The terms flask and tank are seldom used in reference to aircraft gaseous systems.

DALTON'S LAW: States that the pressure exerted by each gas in a gaseous mixture is independent of other gases in the mixture, and the total pressure of the mixture of gases is equal to the sum of the separate pressures which each gas would exert if it alone occupied the whole volume.

DEAD SPACE: Volume of gas in connecting passages to the lungs including throat, mouth and nasal airway in which no respiratory exchange takes place. Respired gas volume that does not participate in gas exchange; maybe anatomic, alveolar, or mechanical or a substantial volume of inspired gas that is wasted with each breath.

DEAD SPACE, ANATOMICAL: Average value - about 100 to 150 cc in the 70 kg male and 70 to 90 cc in the 55 kg female during quiet breathing. Enlarges with deep breathing. The volume of the conducting airways.

DEAD SPACE, MECHANICAL: Space in breathing apparatus, outside the body of the subject, where the expired air is trapped and then re-inhaled.

DEAD SPACE, PHYSIOLOGICAL: The anatomical dead space plus the volume of inspired gas ventilating alveoli that have no pulmonary capillary perfusion. The sum of anatomical and alveolar dead space. Alternatively, the total volume of wasted ventilation equals the sum of the conducting airways and the alveoli that are ventilated but not perfused.

DECOMPRESSION: This term commonly refers to the loss of pressurization of an aircraft cabin or cockpit. When the decompression occurs in 1 second or less, it is termed an explosive decompression.

DECOMPRESSION SICKNESS: One or more physiological and physically adverse conditions correlated with the evolution (expulsion) of gas (usually nitrogen) from tissues and fluids in the body as a direct result of a rapid drop in ambient pressure. Evidence exists that this can occur by reducing the barometric pressure by one-half of that to which a body is acclimated. See Henry's Law, Bends, Chokes (True) (False), Paresthesia, and Central Nervous System Disorders.

1. Bends: Manifestations of mild to severe pain, usually in the larger joints, due to nitrogen evolving from the blood and collecting in the joints.

2. Chokes: Deep and sharp pain centrally located under the sternum due to nitrogen evolving from the blood and locating in the smaller blood vessels of the lungs and producing a dry, nonproductive cough.

3. Neurological Manifestations: The effects of nitrogen evolving from the blood and locating in the brain or spinal cord. Symptoms may include blurred vision, blind spots, flickering lights, headaches, or unilateral numbness or tingling.

4. Skin Manifestations: The effects of nitrogen evolving from the blood and locating in the subcutaneous tissue. Symptoms may include itching, hot or cold sensations, tingling, or appearance of a mottled rash.

DEMAND SYSTEM: An oxygen system using demand regulators. See Regulator, Demand.

DENITROGENATION: The reduction of the nitrogen concentration in the body by respiring 100% oxygen over a period of time in an attempt to promote the diffusion of nitrogen from the blood to the lungs, thereby eliminating much of the nitrogen dissolved in the body tissues. Removal of the dissolved nitrogen from the body, as a preventive of caisson disease, aeroembolism.

DENSITY: The relationship between the weight of a substance and its volume.

DENSITY, MASS: The mass of any substance per unit volume. The standard mass density of dry air is 1.225 kg/m^3 (0.0765 lb/ft^3)'at 15 °C (59 °F) and 101.3 kPa (760 mm Hg) (29.92 in Hg) absolute pressure.

DERMATITIS: Inflammatory skin reaction often evoked by external impact.

DEW POINT: See Temperature, Dew Point. The temperature at which air containing water vapor becomes saturated and liquid water droplets begin to form.

DIAPHRAGM: (1) The large dome-shaped muscle which separates the thorax from the abdomen; the primary muscle of ventilation. (2) A thin membrane which, in a pressure-reducing (or demand) regulator, separates the gas being controlled from ambient atmosphere.

DIAPHRAGMATIC BREATHING: Respiration produced solely by use of the diaphragm.

DIFFUSION, LAW OF GASEOUS: The movement of gases of higher partial pressure to a volume of gases of lower partial pressure, as in the movement of gases such as oxygen and carbon dioxide through the membranes of the lung into and out of the lung. This also occurs at the tissue level, for example between the capillaries and tissues.

DIFFUSION, RANDOM GASEOUS: The spontaneous movement of molecules or other particles in solution, owing to their random thermal motion, to reach a uniform concentration throughout.

DILUTER: A device for mixing atmospheric air with oxygen. See Auto mix.

DILUTER-DEMAND: See Regulator, Diluter-Demand.

DISTAL: At the greatest distance from a central point; peripheral.

DYSBARISM: An Archaic, imprecise term replaced by the study of trapped gases affecting the Ears, Sinuses, Teeth, and Gastro-Intestinal Tract as well as the separate study of the Evolved Gas problems, i.e., Bends, Paresthesia, Chokes (true), and Central Nervous System disorders. See Henry's Law.

DYSPNEA: Consciousness of air need; shortness of breath; labored breathing; subjective difficulty in breathing. See also Respiration, Types of.

ECONOMIZER BAG: See Bag, Economizer.

EDEMA, PULMONARY: An excessive accumulation of fluid in the pulmonary alveoli, ultimately spilling into the conducting air passages and interfering with gas exchange. It is often caused by left ventricle failure and/or loss of oncotic pressure.

EG-NUMBER: The EG-Number is a systematic, substance specific, respectively, material group specific identification number, which is assigned by the ED Commission, when admitting a substance into the list of the annex of the guideline 67/548/EWG. The numbering follows a sign code of the type *ABC-RST-VW-Y* with the meaning:

1. *ABC* - Atomic number of that chemical element, which is typical for the attribute. A special scheme exists for organic carbon compounds due to its diversity.

2. *RST* - Consecutive number of the compounds of an element.

3. *VW* - Form, in which a substance is produced, results or is offered for sale, e.g., solution with a concentration of 10 to 35%: code number 02, concentration >35%: code number 01 calculation).

EINECS-NUMBER: The EINECS-Number is assigned for dangerous chemicals, when admitted into the European list of existing substances on the market (European Inventory of Existing Chemical Substances). Those numbers have seven digits, starting with 200-001-8.

ELASTANCE: Is the reciprocal of compliance and measures the increase of airway pressure for a given increase of lung volume.

EMBOLISM: See Embolus. The occlusion of a blood vessel by an embolus.

EMBOLUS: Undissolved material, such as a clot, plug, fat globule, or gas bubble, carried by the blood from one vessel and forced into a smaller one to occlude or obstruct the circulation.

EMERGENCY OXYGEN: Oxygen supplied for physiological needs beyond what is provided by the normal operational atmosphere. Generic description covers many different scenarios including loss of cabin pressure, contaminant protection, and medical or perceived medical emergency. Military scenarios might include that provided upon ejection from the aircraft or failure of the bleed air supply and/or OBOGS.

EMPHYSEMA: A pathological condition of the lung characterized by reduction or loss of elastic fibers, ruptured alveolar walls and decrease in the pulmonary bed, regardless of cause.

ENDOTHERMIC: A chemical reaction in which heat is absorbed (as opposed to exothermic).

EQUILIBRIUM, MASS: A state of balance; a condition in which the materials taken into a body or system are balanced by corresponding materials given off.

ERGONOMICS: Human Factors engineering which deals with machine design and workspace environments to make them compatible with human capacities and limitations.

ESOPHAGUS: The portion of the digestive conducting canal between the hypopharynx and the stomach.

EUPNEA: Normal breathing. See also Respiration, Types of.

EXHALATION: See Expiration.

EXOTHERMIC: A chemical reaction in which heat is released (as opposed to endothermic).

EXPIRATION: The expulsion of air from the lungs ordinarily due to relaxation of the diaphragm and thoracic muscles. However, expiration can also be forced with active muscular effort, and this is in fact used in pressure breathing when the expiration is the more active phase of respiration.

EXPIRATORY RESERVE: See Reserve, Expiratory.

EXPIRATORY RESISTANCE: The dynamic pressure differential related to a unit expiratory flow change. Also see Inspiratory Resistance.

EXPLOSIVE DECOMPRESSION: A very rapid reduction of pressure inside the pressurized aircraft cabin, coming to a new static condition of balance with the external pressure. Generally, any decompression which occurs in less than 1.0 second. If severe, an explosive decompression may result in large-scale bursting of lung alveoli, which is generally fatal.

EXPOSITION EQUIVALENT FOR CARCINOGENIC SUBSTANCES: For those substance/materials, which may cause malignant tumors (according to experience) or where a reasonable suspicion to cause cancer exists, no biological (workplace) tolerance value exists, because currently no value/limit can be fixed, which is known as harmless.

EXTERNAL RESPIRATION: The interchange of gases between the blood and the atmosphere. See also Respiration, Types of.

FIBRILLATION, VENTRICULAR: Heart condition in which the ventricular beat is rapid, irregular, and ineffective. The spontaneous contraction of individual muscle fibers (fibrils) leads to irregular and ineffective beats. Fibrillary twitching without propulsion of blood. If persistent, this is rapidly fatal.

FILTER: A device serving to remove solid particles or chemical agents (i.e., charcoal filter).

FILTER, AIR: A device for removing dust or other foreign particles from air.

FILTER, SINTERED: A filter made by sintering together minute globules of metal (or ceramic) forming tortuous passages through which gas can flow, but particulates cannot.

FIRE, OXYGEN ASSESSMENT: Hazard analysis to identify and correct, if applicable, the system installation and design features that may cause or aggravate the potentially hazardous combination of oxygen presence, fuel (flammable material or contamination) and external or internal ignition mechanisms.

FIRE-RESISTANT: (1) With respect to sheet or structural members, the capacity to withstand heat at least as well as aluminum alloy in dimensions appropriate for the purpose for which they are used; not readily ignited, requiring considerable heat input for ignition and flame formation. (2) With respect to fluid-carrying lines, other flammable fluid system parts, wiring, air-ducts, fittings and powerplant controls, the capacity to withstand heat at least as well as aluminum alloy, in dimensions appropriate for the purpose for which they are used, under the heat and other conditions likely to occur at the place concerned.

FITTING, TUBE: A self-contained detachable device including a fluid passage for attaching or connecting fluid-carrying lines.

FLAME-RESISTANT: Not susceptible to combustion to the point of propagating a flame, beyond safe limits, after the ignition source is removed.

FLAMMABLE: With respect to a fluid or gas, susceptible to igniting readily or to exploding.

FLASH-RESISTANT: Not susceptible to burning violently nor rapidly when ignited.

FLIGHT LEVEL: Aircraft altitude designation stated as FLxxx, where xxx is equal to the aircraft altitude in feet divided by 100.

Example: FL400 = 40000 feet.

FLOW INDICATOR: A device for indicating that oxygen is flowing through a regulator, or to a mask. May be a float-type (piston or ball), a vane which is deflected by the flow of gas, a rotating vane-wheel type, a blinker, or a gauge showing pressure drop across an orifice.

FLOW, LAMINAR: Non-turbulent flow of a fluid in which all the particles making up the fluid move along lines parallel to the walls of the flow passage.

FLOW, MASS: The mass of a fluid that flows through a passage of any given section during a unit of time.

FLOW, STEADY: A continuous flow of constant quantity under the prevailing condition.

FLOW, TURBULENT: Irregular and disorderly flow of a fluid, in which the particles making up the fluid do not move along lines parallel to the walls of the tube. As flow rate increases, laminar flow transitions to turbulent flow at Reynold's numbers above approximately 2000.

FLOW, VOLUMETRIC: The volume rate of fluid flow at a specified temperature and pressure expressed in volume units per unit of time, i.e., m^3/min, ft^3/min, L/min.

FUNCTIONAL RESIDUAL CAPACITY: See Lung Capacities.

GAGE, PRESSURE: An instrument that shows (typically by means of a pointer and dial) the pressure at a given point in a system. May be calibrated to display either gage pressure or absolute pressure. May be calibrated in megaPascal (MPa), bar (1 Bar = 14.5 psi), kiloPascal (kPa), pounds per square inch (psi), or in atmospheres (1 atm = 101.3 kPa = 14.7 psia). Very low pressures are typically read in Pascals (Pa), millimeters of mercury (mm Hg) or inches of water (in H_20).

GAGE, QUANTITY: An instrument like a pressure gage, except that it is calibrated to read the quantity of gas or liquid remaining in a storage container.

GAS: A substance possessing molecular mobility and the property of indefinite expansion as opposed to a solid or liquid.

GAS LAWS: Mathematical relationships applicable to gases, including:

1. Boyle's Law: At a constant temperature, the volume of a gas is inversely proportional to the pressure to which it is subjected, P1 x V1 = P2 x V2.

2. Gay-Lussac's or Charles' Law: With constant pressure, the volume of a gas will vary directly with the temperature. T1/V1 = T2/V2

   Combined these two relationships can be expressed as (P1 x V1)/T1 = (P2 x V2)/T2 as consistent with the ideal gas equation PV=nRT.

3. Dalton's Law: The pressure exerted by each gas in a gaseous mixture is independent of other gases in the mixture, and the total pressure of the mixture of gases is equal to the sum of the separate pressures which each gas would exert if it alone occupied the whole volume, $P_{Total} = P_1 + P_2 + \ldots P_n$.

4. Henry's Law: The weight of a gas absorbed by a given volume or mass of liquid (with which it does not combine chemically) is directly proportional to the pressure of the gas on the liquid.

5. Graham's Law: The rate of diffusion of a gas is directly proportional to the pressure and temperature and inversely proportional to the square root of the density or molecular weight of the gas.

GASES, RESPIRATORY, COMPOSITION OF: See Table 1. (These are average values.)

Table 1 - Composition of respiratory gases

	INSPIRED		ALVEOLAR mm Hg (kPa)		EXPIRED mm Hg (kPa)	
	Vol % Dry Gas	Saturated 37 °C	Vol % Dry Gas	Saturated 37 °C	Vol % Dry Gas	mm Hg (kPa) Variable
H_2O	---	5.7 (ñ)(0.8)	---	47 (6.3)	---	47 (6.3)
N_2 & Ar	79.02	596 (79.4)	80.4	573 (76.4)	79.2	565 (75.3)
O_2	20.95	158 (21.1)	14.0	100 (13.3)	16.3	116 (15.4)
CO_2	0.03	0.3 (.04)	5.6	40 (5.3)	4.5	32 (4.3)
TOTAL	100.00	760.0 (101.3)	100.00	760 (101.3)	100.00	760 (101.3)

GASKET: The flexible sealing element in a stationary or static fluid seal.

GENE TOXICITY: Damage of the genes/genetic material.

GOS or GOX (GASEOUS OXYGEN) SYSTEMS: Provide facilities to store gaseous oxygen in cylinders at either high or low pressure and to deliver it to the aircrewman at a reduced pressure for breathing. Used primarily in multi-seat aircraft where space and weight considerations are less important items. Basically, consists of the following: cylinder(s), regulators, gauge(s), distribution tubing, direction valve(s), and end user mask(s).

GRADUAL DECOMPRESSION: The term used for slow cabin decompression events, which may be slow enough to go unnoticed by aircraft occupants. If undetected, this type of failure may lead to grave hypoxic effects on aircraft personnel with subsequent catastrophic risk.

GRAHAM'S LAW: The rate of diffusion of a gas is directly proportional to the pressure and temperature and inversely proportional to the square root of the density or molecular weight of the gas.

GRAYOUT: A temporary condition in which vision is hazy, restricted, or otherwise impaired, due to an inadequate or insufficient blood flow and the associated insufficient oxygen supply to the retina of the eyes, commonly induced by positive “G” forces of moderate intensity and duration. See Blackout.

HAZARDOUS SUBSTANCES: Dangerous substances, preparations or materials, which have one or more of the following properties: explosion risk, explosiveness, fire propagating, high flammability, high toxicity, health damaging, caustic, irritating, sensitizing, carcinogenic, mutagenic, risk to reproduction, teratogenic, environmentally poisonous, or other chronic damaging effects.

HEAT EXCHANGER, MSOGS: Located between the pressurized air source and the OEAS (oxygen enriched air system) oxygen concentrator, the heat exchanger conditions the air supplied to the concentrator. Typically, an air-to-air heat exchanger is used to limit air temperatures that would be too high for a breathing gas or which would be detrimental to molecular sieve performance.

HEMOGLOBIN: The iron-containing chemical compound in red blood cells that combines with oxygen, transporting it and releasing it as needed by body tissues.

HEMOGLOBIN, REDUCED: Hemoglobin from which oxygen has been removed.

HENRY'S LAW: The amount of gas dissolved in a solution is directly proportional to the pressure of the gas on the solution.

HERING-BREUER REFLEX: Pulmonary nerve impulses that help to regulate the depth and rate of respiration. Also called pulmonary stretch reflex.

HOMEOSTASIS: The state of the body in equilibrium. The complex interaction of all systemic mechanisms whereby the body is kept in overall balance so that normal body function is carried out.

HUMIDITY, RELATIVE: The ratio of the mass of water vapor in air at a given temperature to the maximum amount (i.e., saturation condition) that the air could hold at that temperature; expressed as a percentage.

HUMIDITY, SPECIFIC: (Humidity Ratio) The weight of water vapor in air expressed in pounds or grains of water vapor per pound of dry air.

HUMAN FACTORS: The study of the physical, physiological, psychological, psychosocial, and pathological variables which affect human performance.

HUNTING: A term applied to the undesirable oscillation of a control device resulting in a poor degree of control. For example, a pressure reducing regulator which, instead of maintaining a constant output pressure, fluctuates cyclically from above to below the desired pressure.

HYPERCAPNIA: Excess carbon dioxide in the blood and body fluids, usually causing increased respiration. Also called hypercarbia.

HYPERPNEA: Increased ventilation, regardless of cause. See also Respiration, Types of.

HYPERTENSION: High arterial blood pressure.

HYPERVENTILATION: An abnormal increase in the breathing rate or ventilatory rate, with the resultant lower than normal $PaCO_2$. This can occur subconsciously when a stressful situation is encountered in flight. As an individual excessively ventilates or “blows off” carbon dioxide from his/her body, symptoms of lightheadedness, suffocation, drowsiness, tingling of the extremities, and coolness may occur. Continued hyperventilation may result in incoordination, disorientation, painful muscle spasms, and finally, unconsciousness. The resulting condition, known as respiratory alkalosis, causes the symptoms. See Respiration, Types of.

HYPOCAPNIA: Subnormal concentration of carbon dioxide in the blood, usually the result of hyperventilation. Also called hypocarbia; often incorrectly called acapnia.

HYPOPNEA: Decreased ventilation, regardless of cause. See also Respiration, Types of.

HYPOTENSION: Low arterial blood pressure.

HYPOVENTILATION: Air exchange less than that required by metabolic needs manifested by decreased rate and/or depth of breathing. See also Respiration, Types of.

HYPOXEMIA: Oxygen deficiency in the blood. Seldom used; superseded by Hypoxia.

HYPOXIA: Oxygen want or deficiency; any state wherein a physiologically inadequate amount of oxygen is available to, or utilized by, tissue, without respect to cause or degree. See also Anoxia.

INDICATOR, OXYGEN FLOW: A device that gives a visual signal when oxygen flows. See Flow Indicator.

INHALATOR OR INHALER: A device from which air or gaseous oxygen is inhaled, with or without medicaments, for therapeutic purposes.

INLET, AIR: Openings or valves through which air is admitted diluting the oxygen (as in a diluter-demand regulator or constant-flow mask).

INSPIRATION: Inhalation; the drawing-in of a breath by the expansion of the chest cavity, caused by contraction of the diaphragm and thoracic muscles.

INSPIRATORY RESERVE: See Reserve, Inspiratory.

INSPIRATORY RESISTANCE: The dynamic pressure differential related to a unit inspiratory flow change. Also see Expiratory Resistance.

INTERNAL RESPIRATION: The interchange of gases between body tissue cells and the blood. See also Respiration, Types of.

INTERSTITIAL: Situated between the cellular components of an organ or structure.

INTRAPLEURAL PRESSURE: See Pressure, Intrapleural.

INTRAPULMONARY PRESSURE: See Pressure, Intrapulmonary.

ISCHEMIA: Decreased blood flow through an area of tissue, body part, or organ.

ISCHEMIC HYPOXIA: Tissue hypoxia as a result of inadequate blood flow; such as in the brain. This can occur even in the presence of adequate ventilation and alveolar oxygen tension.

LAMINAR FLOW: See Flow, Laminar.

LARYNX: Upper part of the trachea, containing the vocal cords.

LD50: Lethal dose for 50% of the afflicted persons.

LIQUID OXYGEN: Liquid oxygen is a light blue, magnetic, transparent and water-like fluid that is produced by the fractional distillation of purified liquid air. When cooled to -183 °C (at 14.7 psia) oxygen passes from the gaseous to the liquid state. Standards documents MIL-0-27210 and AS8010 specify purity requirements for aviators' breathing oxygen.

LIQUID OXYGEN CONVERTER ASSEMBLY: A self-contained system for the storage of liquid oxygen and for its conversion to gaseous oxygen when required. Refer to AIR825/5 for liquid oxygen system details.

LOBECTOMY: Removal of a lobe of an organ or gland (usually refers to the removal of a lobe of the lung).

LOX (LIQUID OXYGEN) SYSTEMS: Provide equipment to store and convert liquid oxygen to gaseous oxygen at a breathable temperature and pressure for the aircrew or medical applications. Generally used in aircraft where space, weight and mission considerations are paramount. Basically, it consists of the following: converter(s), filler valve, heat exchanger, control valve, relief valve, distribution tubing, regulator(s), quantity indicator(s), shutoff valve(s), and other essential cockpit (or cabin) equipment.

LUMEN: The space in the interior of a tubular structure. Physiologically most normally referenced as the interior of a blood vessel.

LUNG: The organ of respiration in which the venous blood receives oxygen from, and gives off carbon dioxide to, the air drawn through the trachea and bronchi into the alveoli.

LUNG CAPACITIES: Lung volumes that consist of two or more of the four primary non-overlapping volumes. Functional residual capacity is the sum of residual volume and expiratory reserve volume. Inspiratory capacity is the sum of tidal volume and inspiratory reserve volume. Total lung capacity, the lung volume at the end of maximal inspiration, is the sum of two capacities: functional residual capacity and inspiratory capacity. Total lung capacity is thus also the sum of inspiratory reserve volume, tidal volume, expiratory reserve volume and residual volume.

1. FRC - Functional Residual Capacity: The volume of gas remaining in the lungs following a normal expiration, average normal value of 2400 ml; often increases with age.

2. IC - Inspiratory Capacity: The maximal volume of gas that can be inspired following a normal expiration.

3. TLC - Total Lung Capacity: The volume of gas contained in the lung at the end of a maximal inspiration.

4. TVC - Timed Vital Capacity: A measure of the rate of emptying the lungs by forceful exhalation.

5. VC - Vital Capacity: The maximal volume of gas that can be expired from the lungs following a maximal inspiration.

LUNG VOLUME:

1. ERV - Expiratory Reserve Volume: The maximal volume of gas that can be expired following a normal expiration (end-expiratory position).

2. IRV - Inspiratory Reserve Volume: The maximal volume that can be inspired following a normal inspiration (end-inspiratory position).

3. RV - Residual Volume: The volume of gas remaining in the lungs at the end of a maximal expiration. (Also see Reserve and Residual items.)

4. TV - Tidal Volume: The depth of breathing; the volume of gas inspired or expired during each respiratory cycle.

MANOMETER: An instrument for measuring the pressure of liquids and gases by the height to which pressure raises a fluid.

MASK: A protective covering applied over the face to provide adequate respiratory gas to the wearer and, in some cases, to prevent inhalation of the gases in the atmosphere surrounding the wearer. Mask types include:

1. Full-face: Covers not only nose and mouth, but entire face including forehead, eyes, chin, and cheeks.

2. Oronasal: Covers nose and mouth; some types also cover chin.

3. Nasal: Covers nose only.

MAXIMUM ALLOWABLE WORKPLACE CONCENTRATION (MAC - Value): Value of the maximum concentration of a substance (as gas, vapor, or suspended particle/aerosol) in the air at the workplace, which is considered harmless to workers health at present physiological understanding. The basis is repeated, long-term, 8-hours daily exposure, not exceeding a maximum of 40 hours working time a week.

METABOLITE: Biological transformation product.

MINUTE VOLUME OF RESPIRATION: The volume of air inspired and then expired over one minute.

MOLECULAR SIEVE:

1. A gas separation concept used in MSOGS (molecular sieve oxygen generation system). The sieve utilizes a preferential adsorption medium that retains nitrogen molecules and allows molecules of oxygen and argon to pass through thus providing oxygen enriched breathing gas.

2. Materials that are crystalline zeolites that are used as sorbents for gases and liquids.

3. A specific zeolite of sodium calcium aluminosilicate modified for nitrogen-oxygen separation in the MSOGS.

MOL MASS (MOLAR MASS): The molar mass of any substance is the quotient of its mass and quantity. This results in the unit kg/mol; the numerical value is the same as the relative atomic mass/atomic mass 1. Example: the molar mass of water is 0.018 kg/mol.

MOL VOLUME (MOLAR VOLUME): The molar volume of any substance is the quotient of its molar mass and mass density. At normal conditions the molar volume of all ideal gases is V_m = 22.414 (l/mol) at 0 °C.

MOUTHBIT: See Mouthpiece.

MOUTHPIECE: A device designed to be held in the mouth by the teeth and/or lips through which gases may be respired.

MOLECULAR SIEVE OXYGEN CONCENTRATOR (MSOC): A type of oxygen concentrator that processes air through molecular sieve beds to provide an oxygen enriched breathing gas via a process of pressure swing adsorption.

MOLECULAR SIEVE OXYGEN GENERATION SYSTEM (MSOGS): An OBOGS (on-board oxygen generation system) that uses a pressure swing molecular sieve oxygen concentrator as the source of oxygen enriched breathing gas. Pressurized air may be obtained from engine bleed air or other compressed air sources.

MTBF: Mean Time Between Failures; See Probability of Failure.

MTBUR: Mean Time between Unscheduled Removals; See Probability of Failure.

MYCOTOXIN: Toxic metabolic products from fungi or molds.

NEBULIZER: Type of atomizer that produces a uniform fine mist of medicament for inhalation, removing the larger droplets, usually by baffling, permitting only a mist of uniform droplet size (usually 3 to 5 µm) to emerge. See Atomizer.

NEGATIVE MASK PRESSURE: See Pressure.

NEPHROTOXICITY: Toxicity affecting the kidneys. A damaging effect of some medications or chemical species on kidney function.

NEUROLOGICAL DECOMPRESSION SICKNESS: See Central Nervous System Disorders.

NITROGEN: A colorless. odorless gas that does not sustain higher forms of life or combustion. A nonmetallic element existing free in the atmosphere of which it constitutes about 78.1% by weight. Liquid nitrogen exists at -196 °C (-320 °F) under normal atmospheric pressure and vaporizes into gaseous nitrogen.

NTPD: Normal Temperature (21 °C, 70 °F) and Pressure (760 mm Hg, 14.7 psia, 101.3 kPa), Dry.

ON-BOARD OXYGEN GENERATION SYSTEM (OBOGS): Provides facilities for generation and delivery of breathable oxygen to the aircrew on board the aircraft through utilization of aircraft resources of bleed air and electrical power. Generally used in aircraft where elimination of oxygen system replenishment requirements is paramount. Examples include: MSOGS, permeable membrane, electrochemical and super-oxide systems.

OEAS (OXYGEN ENRICHED AIR SYSTEM): Equipment that is common to all MSOGS (molecular sieve oxygen generation system) equipped aircraft. Consists of the molecular sieve oxygen concentrator, breathing regulator, composition controller (if required) and oxygen monitor (if required).

OFF GASSING: The release of organic or and inorganic materials from solids or liquids into the ambient atmosphere.

ONCOGENIC: Creating tumors; biological, chemical, or physical factors which induce transformation from normal cells into malignant cells.

ONCOTIC PRESSURE: The osmotic pressure of the blood proteins, notably albumin, or the lymph colloids and electrolytes in the vascular system that usually tends to pull water into the circulatory system.

ORIFICE: An opening, intended for the passage of a fluid, having a fixed diameter and flow coefficient and which may be calibrated to pass a desired volumetric flow at an anticipated pressure differential.

OVERTEMPERATURE SENSOR: In an MSOGS, the sensor located in the pressurized supply air line between the heat exchanger and the OEAS (oxygen enriched air system) oxygen concentrator. When used, the sensor will activate a warning signal in the cockpit if the temperature of the air supplied to the concentrator exceeds a preset level and may activate the OBOGS (on-board oxygen generation system) bleed air shutoff valve.

OXIMETER: A device for electrochemically measuring the oxygen saturation by determining the ratio of reduced hemoglobin to oxyhemoglobin in the arterial or venous blood.

OXYGEN: A colorless, tasteless, odorless gas, constituting 21% of the atmosphere by weight; it supports combustion and is essential to life. It combines with most elements chemically. Oxygen is carried in solution in arterial blood by hemoglobin from the lungs to the tissues. Liquid oxygen exists at -183 °C (-297 °F) under normal atmospheric pressure and vaporizes into gaseous oxygen.

OXYGEN CONCENTRATOR: The component of the OBOGS (on-board oxygen generation system) that processes air to provide an oxygen-enriched breathing gas.

OXYGEN DISSOCIATION CURVE: A graph that indicates the amount of oxygen which will be given up by the hemoglobin at different oxygen tensions. This varies with pH, carbon dioxide tension, and body temperature.

OXYGEN METER: A device for measuring either the fraction of oxygen or the partial pressure of oxygen in air or in a mixture of oxygen with other gases.

OXYGEN MONITOR: The component of the OBOGS (on-board oxygen generation system) which monitors the partial pressure of oxygen in the breathing gas delivered to the aircrew. May be used to warn the aircrew when the partial pressure of oxygen is below prescribed levels.

OXYGEN SATURATION OF THE BLOOD: The fraction of total hemoglobin in the form of oxyhemoglobin (equal to the amount of bound oxygen divided by the maximum amount of oxygen which can be bound by the hemoglobin). Defined as a percentage. Currently abbreviated as S_pO_2, but the designation S_aO_2 was widely used in the past.

OXYGEN SYSTEM, HIGH PRESSURE: A system for delivering oxygen where the supply contained in one or more bottles or cylinders. Through the years the upper limit has continued to increase. Often considered in the range of 1800 to 3000 psi (12.4 to 20.7 MPa).

OXYGEN SYSTEM, LOW PRESSURE: A system for delivering oxygen where the supply is contained in one or more bottles or cylinders at 400 to 450 psi (2.8 to 3.1 MPa).

OXYGENATION: The saturation of a substance with oxygen, either by chemical combination, chelation, or by mixture.

OXYHEMOGLOBIN: A hemoglobin molecule to which oxygen is attached or chelated.

P: Symbol for physiological partial pressure. PaO_2, $PaCO_2$, etc. - partial pressure of arterial oxygen, carbon dioxide, etc. Usually expressed in mm Hg.

PARASTHESIA: A form of decompression sickness where gas (usually nitrogen) evolves, forming bubbles under the skin and producing symptoms such as an itchy, gritty sensation frequently exhibiting a mottled red rash. Frequently associated with adipose tissue. Also known as skin symptom decompression sickness (D.C.S.). See Decompression Sickness.

PARTIAL PRESSURE: See Pressure, Partial.

PEEP: Positive End Expiratory Pressure. A method of control mode ventilation in which a positive pressure is maintained during expiration, thereby increasing the volume of gas left in the lungs at the end of expiration. Can improve PaO_2 levels by preventing alveolar collapse during expiration in subjects with compromised residual capacity.

PERFUSION: The act of pouring over or through, especially the passage of a fluid through the vessels of a specific organ or body part.

PERICARDIUM: The membranous sac covering the heart.

PERMEABILITY: The property of a material that allows the passage or flow of other materials through it; the passage, spread, penetration, or diffusion of one material through another, especially a membranous substance.

pH: Symbol denoting the negative logarithm of hydrogen ion concentration in solution, ranging from 0 -14. A solution with a pH of 7.00 is neutral, one with a pH greater than 7.00 is alkaline, and one with a pH below 7.00 is acidic. Normal bodily fluid (e.g., blood) pH is 7.35 to 7.44. Mean value is 7.38 at 37 °C (98.6 °F). Values of pH below 6.8 or above 7.8 are usually fatal.

PHARYNX: The area between the cavities of the mouth and nose and the larynx and esophagus. The upper portion is usually termed the nasopharynx; the lower portion, the oropharynx or the hypopharynx.

PHYSIOLOGY: The branch of science that examines the functions of living organisms and their parts.

PIPESTEM: A type of mouthpiece. See Mouthpiece.

PLENUM: An accumulation device which may be either an integral part of the concentrator or mounted on the airframe. It provides reserve breathing gas for periods when breathing rates exceed the MSOGS (molecular sieve oxygen generation system) breathing gas production rate. It also may provide breathing gas heat exchange with the cockpit to deliver a breathing gas at cockpit temperature.

PLEURA: A membrane enveloping the lungs and covering the inside of the thorax. There is a pleura for each lung.

PLEURAL CAVITY: The potential space included between the parietal and visceral layers of the pleura; it is not an actual space unless opened.

PNEUMONECTOMY: Operative removal of an entire lung from either the right or left thorax.

PNEUMONIA: Inflammation of the lung.

PNEUMOTHORAX: Abnormal presence of air or other gas in the pleural cavity sometimes leading to rapid death if unrecognized. The gas may be introduced in an "artificial pneumothorax" to collapse a lung to promote healing of tubercular lesions (obsolete), or the gas may enter through an external wound penetrating the thoracic wall, or through rupture of an alveolus or cavity of the lung or of an air sac or bronchiole.

PORTABLE DISPENSING EQUIPMENT: Light weight portable equipment made up of a cylinder, chemical generator, container, or other means as an oxygen source and other required components to provide oxygen to the user for various reasons as described below.

Usage designations:

1. Supplemental: An oxygen supply primarily for use when cabin altitude exceeds 10000 feet (3048 m) and the cabin ambient air requires oxygen enrichment for physiological reasons during emergency cabin decompressions.

2. Protective Breathing Equipment (PBE): An oxygen or air supply used for protection against harmful gases; typically used during smoke, fire, or other emergency situations in flight. A PBE provides protection for the eyes, mouth, and nose against the effects of smoke, carbon dioxide or other harmful gases. Protection is required for both sedentary and active crewmembers. Some equipment in this classification is suitable only for sedentary crew members or low altitude non-decompression threat environments.

3. First Aid: An oxygen supply used for any medical emergency but also used for physiological treatment following cabin decompression and for the entire time that cabin pressure altitude exceeds 10000 feet.

4. Medical (Therapeutic): An oxygen supply, often with up to 5% carbon dioxide added to enhance a breathing reflex, made available prior to flight, specifically for a passenger needing an enriched oxygen supply during the entire routine flight. Typically, airline and FAA approval are required. Caution: Medical Oxygen may not meet aviation purity standards. Oxygen quantity and usage or flow is specified by the passenger's physician.

POSITIVE MASK PRESSURE: See Pressure.

PRESSURE: Pressure is the force applied on a surface area, such as that of a gas or liquid on a unit of area, and is expressed as force per area. Common units include pounds per square inch (psi), millimeters of mercury (mm Hg), bar or Pascals (Pa). See also Atmospheric Pressure.

The term pressure is generally considered to mean gage pressure, as defined below, except where otherwise specified. Typical pressures referenced in aerospace systems include:

Pressure, Absolute: The total pressure above a vacuum of true zero pressure. Absolute pressure is ambient pressure plus the gage pressure. Absolute pressure units are often sufficed with the letter a, as psia or bara.

Pressure, Altitude: The absolute pressure existing at a specific altitude as defined by the I.C.A.O. standard atmosphere. Example: FL140 altitude pressure = 8.64 psia.

Pressure, Burst: The test pressure that a component or system must withstand without rupture. Normally specified as a multiplier value times the maximum operating pressure.

Pressure, Cabin Altitude: The aircraft cabin absolute pressure level expressed as an altitude as defined by the I.C.A.O. standard atmosphere.

Pressure Drop: The reduction in fluid pressure due to flow in a pipe, equipment, or system. Often specified as a value at a rated flow rate.

Pressure, Gage: Pressure which is referenced to ambient pressure. Gage pressure units are often sufficed with the letter g, as psig or barg.

Pressure, Minimum Operation: That pressure below which a mechanism may not operate (as in a pilot-operated valve which requires a certain minimum pressure for operation).

Pressure, Negative: Pressure lower than ambient atmospheric pressure.

Pressure, Output: In a pressure control device, such as a pressure reducer, the pressure that will be supplied at the outlet port.

Pressure, Positive: Pressure greater than ambient atmospheric pressure.

Pressure, Proof: The pressure that a component must withstand as a production inspection test without damage, Normally specified as a multiplier value times the maximum operating pressure.

Pressure, Rated: The nominal maximum operating pressure.

Pressure, Reseat: In a valve that closes itself against pressure, as in a check valve or relief valve, that pressure at which the valve will close itself so that flow rate decreases to a specified leakage value.

Pressure, Service: Same as Pressure, Rated.

Pressure, Surge: The maximum magnitude of a transient pressure rise.

PRESSURE, ATMOSPHERICReference pressure value equal to the absolute atmospheric pressure normally existing at sea level, equal to760 mm Hg, 14.7 psia, 1 atmosphere, or 101.3 kPa. May also refer to the local ambient pressure.

PRESSURE CONTROLLED RESPIRATOR: A respirator in which defined pressure level limits control the cycling rate.

PRESSURE-DEMAND OXYGEN SYSTEM: A demand oxygen system that furnishes 100% oxygen at higher than ambient pressure above a specified altitude (Safety pressure usually initiates between 28000 to 32000 feet).

PRESSURE DIFFERENTIAL, STATIC: The difference between the static pressures at two points in a fluid system.

PRESSURE DIFFERENTIAL, TOTAL: The difference between the total pressures at two points ina fluid streams.

PRESSURE DROP, TOTAL NONRECOVERABLE: The loss of total pressure between two points in a fluid stream (equal to the total pressure differential).

PRESSURE, INTRAPLEURAL: Pressure between the layers of the pleura, normally below atmospheric.

PRESSURE, INTRAPULMONARY: Pressure of the air within the lungs, normally below atmospheric on inspiration, above atmospheric on expiration.

PRESSURE, PARTIAL: The absolute pressure exerted by one gas species in a mixture of gases; equal to the fraction or percentage of the gas species times the total absolute pressure.

PRESSURE REDUCER: See Regulator, Oxygen Pressure.

PRESSURE RISE, DYNAMIC: The maximum static pressure increase developed by the momentum of a fluid stream when its velocity is reduced to zero.