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AEROSPACE RECOMMENDED PRACTICE

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ENVIRONMENTAL CONTROL SYSTEMS TERMINOLOGY

FOREWORD

Changes in this revision are format/editorial only.

1. SCOPE:

This SAE Aerospace Recommended Practice (ARP) provides the definition of terms commonly used in aircraft environmental control system (ECS) design and analysis. Many of the terms may be used as guidelines for establishing standard ECS nomenclature. Some general thermodynamic terms are included that are frequently used in ECS analysis, but this document is not meant to be an inclusive list of such terms.

2. APPLICABLE DOCUMENTS:

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AIR1168 SAE Aerospace Applied Thermodynamics Manual

2.2 FAR Publications:

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591.

Federal Aviation Regulation, Part 1

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2.3 Other Publications:

U.S. Standard Atmosphere National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration and United States Air Force

3. LIST OF ENVIRONMENTAL CONTROL SYSTEM TERMS:

1. **ADIABATIC:** Adiabatic describes a process in which an energy change is accomplished on or by a fluid without heat transfer to or from the surroundings.
2. **AIR, BLEED:** Air bled from the compressor of a gas turbine engine.
3. **AIR, COMPARTMENT:**
 - a. Air flowing into a compartment
 - b. Air in a compartment proper - the condition of compartment air is normally determined at a point where the air leaves the compartment. (The cabin is considered to be a compartment.)
4. **AIR, COOLING:** A stream of air used as a heat sink.
5. **AIR, RECIRCULATED:** Compartment air recirculated by fans, blowers, or ejectors into the distribution system.
6. **AIR, STANDARD SEA LEVEL:** Standard sea level air is defined as air at 59 °F and at a dry air pressure of 29.92 inches Hg absolute (288 °K at 101.35 kPa).
7. **AIR CYCLE MACHINE:** The basic component of an air cycle refrigeration system. The device consists of an air expansion turbine which is connected by a shaft to a compressor and/or a fan. The power generated in the expansion turbine is used to drive the compressor and/or the fan.
8. **ALTITUDE, EQUIVALENT OR CABIN:** The standard altitude at which atmospheric pressure is equal to the cabin pressure.
9. **ALTITUDE, PRESSURE:** The altitude corresponding to a given pressure in the standard atmosphere.
10. **ALTITUDE, STANDARD:** The altitude corresponding to the temperature and pressure tabulated in an accepted standard atmosphere table. (See Atmosphere Standard)
11. **ANTICIPATOR:** A sensitive element in a control system designed to respond to a change in pressure or temperature or rate of change and to reset on the pressure or temperature controlling instrument to counteract the tendency of the controlling system to hunt.
12. **AREA, POSITIVE PRESSURE:** Any region in which the static pressure is greater than that of the static pressure of the undisturbed air stream.

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13. **AREA, NEGATIVE PRESSURE:** Any region in which the static pressure is less than that of the static pressure of the undisturbed air stream.
14. **ATMOSPHERE, STANDARD:** The atmosphere as defined by the latest U.S. Standard Atmosphere issued by the Government Printing Office.
15. **BOILER:** That part of an air conditioning system, a heat exchanger, in which a source of heat is utilized to vaporize a liquid heat transfer medium. (See EVAPORATOR).
16. **BULB, THERMOSTATIC:** A liquid-vapor filled bulb wherein pressure changes are proportional to temperature changes. It is used as a means of control.
17. **CABIN NONPRESSURIZED:** An airplane cabin which is not designed or equipped for pressurizing.
18. **CABIN, PRESSURIZED:** An airplane cabin which is constructed, sealed, and equipped with an auxiliary system to maintain a pressure within the cabin greater than that of the surrounding atmosphere.
19. **CAPILLARY TUBE:**
 - a. A small diameter tube connecting a sensor with a bellows or diaphragm in a control device.
 - b. A small diameter tube used as an expansion orifice in small refrigeration systems.
20. **CENTRIFUGAL SEPARATOR:** A device which utilizes centrifugal force to separate materials of differing densities, such as water droplets or impurities from air.
21. **CHARGE, REFRIGERANT:** The amount and type of refrigerant contained in a system.
22. **CHARGE OIL:** The amount of refrigerant oil added to a vapor cycle system with the refrigerant to lubricate the compressor and valves.
23. **CHARGING:** The process of filling a vapor cycle system with the refrigerant and oil charge.
24. **CHILLER:** A liquid transport system whose heat sink is a vapor cycle system.
25. **COEFFICIENT OF PERFORMANCE (COP):** Pertaining to a refrigeration cycle, COP is the ratio of refrigeration produced to the work supplied, where refrigeration produced and work are expressed in consistent units.
26. **COMPRESSOR:** A device in which work is done on a fluid to raise its total pressure and temperature.
27. **COMPRESSOR, AXIAL:** A compressor which inducts and delivers a fluid axially by one or more rotating elements, compressing the fluid.

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3. (Continued):

28. COMPRESSOR, CABIN: A compressor which compresses and delivers air to a pressurized cabin.
29. COMPRESSOR, CENTRIFUGAL: A compressor which inducts a fluid axially, delivers it radially outward relative to the rotating impeller, and compresses the fluid.
30. COMPRESSOR, LYSHOLM TYPE: A positive displacement lobe-type compressor with internal compression.
31. COMPRESSOR, POSITIVE DISPLACEMENT: A compressor which compresses the fluid by mechanical displacement.
32. COMPRESSOR, RECIPROCATING: A positive displacement piston-type compressor.
33. COMPRESSOR, ROOTS-TYPE: A positive displacement lobe-type compressor without internal compression.
34. COMPRESSOR, VANE: A positive displacement compressor of the vane type.
35. CONDENSER: A heat exchanger in which the state of a fluid is changed from a gas or vapor to a liquid.
36. CONDUCTANCE, AIR SPACE: The heat transfer coefficient of an air space which includes the combined influence of conduction, convection, and radiation for a specified air space width. Its units are usually expressed in Btu/hour·ft²·°F (W/m²·K).
37. CONDUCTIVITY, THERMAL: The physical property of a substance which denotes the unit heat transfer rate by conduction through the substance usually expressed in units of Btu/hour·ft·°F (W/m·K).
38. CONTROL, AUTOMATIC: A control device that automatically regulates some part of an air conditioning system by electrical, hydraulic, pneumatic, or mechanical means.
39. CONTROL, BAROMETRIC: A method of control which depends on the barometric pressure of the atmosphere.
40. CONTROL, DIFFERENTIAL PRESSURE: A method of control which limits the maximum pressure differential between two points. When used for cabin pressure control, the differential pressure control 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.
41. CONTROL, ISOBARIC: A method of control which maintains essentially constant air pressure.

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42. CONTROL, MANUAL: A control device regulated by hand directly or through a mechanism.
43. CONTROL, MODULATING: A continuous automatic regulating type of control.
44. CONTROL, PRESSURE RATIO:
 - a. A method of control which limits the maximum pressure ratio between cabin pressure and atmospheric pressure and maintains this ratio at all altitudes above those of the isobaric and differential controls.
 - b. A control which operates to maintain a specific pressure ratio between two points in a system.
45. 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.
46. CONDITIONING, PREFLIGHT AIR: The process of air conditioning aircraft compartment(s) while the aircraft is on the ground.
47. COOLING EFFECT DETECTOR (SENSOR): A device used to determine the cooling capability of the fluid in which it is immersed. The device consists of an integrally mounted thermistor and electrical heat source, separated by a layer of insulation. Additionally, there is a layer of insulation between the heater and the external envelope of the detector. Thus, heat developed by the electrical resistance heater raises the temperature of the entire cooling effect detector assembly, including the thermistor, until the temperature gradient between the airstream and the detector is sufficient to dissipate the developed heat into the airstream and maintain thermal equilibrium. The heated element is thus affected by air temperature, density, velocity, and the entrained moisture.
48. COOLING LOAD, CABIN: The heat transfer rate to the cabin air as measured by the difference between the total enthalpy of the air discharged from the cabin and the total enthalpy of the air entering the cabin during a specified period of time.
49. COOLING LOAD, TOTAL: The heat transfer rate from the compartment coolant supply as measured by the difference between the total enthalpy of the coolant entering the cooling device or devices and the total enthalpy of the coolant leaving the cooling devices during a specified period of time.
50. COOLING SYSTEM, BOOTSTRAP: An air cycle refrigeration system in which air from a pressure source flows successively through a compressor, a heat exchanger, and a turbine. Heat is rejected in the heat exchanger to a heat sink. The power necessary to drive the compressor is obtained from the turbine.

3. (Continued):

51. COOLING SYSTEM, REDUCED AMBIENT: An air cycle refrigeration system incorporating two turbines in which ambient air passes first through a turbine then through a heat exchanger in which it is used to cool air from a pressure source and then through a compressor which raises its pressure to ambient pressure. The air from the pressure source after passing through the heat exchanger is further cooled by the second turbine from which it passes into the compartment to be cooled. Power from both the cooling air turbine and the compartment air turbine is used to drive the compressor.
52. COOLING SYSTEM, REGENERATIVE: An air cycle refrigeration system in which air from a pressure source flows successively through a heat exchanger and a turbine. From the turbine all or a portion of the air goes to a heat load with either the remaining air from the turbine or the air discharged from the heat load used as cooling air in the heat exchanger. Power from the turbine is usually used to drive a cooling air fan or a compressor.
53. COOLING SYSTEM, SHOESTRING (Recirculating Simple System): Air from a pressure source flows successively through a heat exchanger and a turbine, or section of a turbine. Turbine work powers a compressor which draws exhaust air from the conditioned compartment, compresses it, cools it in a heat exchanger, and flows through a turbine or the section of a turbine shared with the main bleed air.
54. COOLING SYSTEM, SIMPLE: An air cycle refrigeration system composed of a heat exchanger followed by turbine in the supply air stream. The heat exchanger cooling air is provided by a fan or compressor which is driven by power from the cooling turbine.
55. COOLING SYSTEM, SIMPLE/BOOTSTRAP: This system combines both the Bootstrap Cooling System and the Simple Cooling System. Air from a pressure source flows successively through a heat exchanger, a compressor, another heat exchanger, and a turbine. The turbine drives the compressor as well as a fan. The fan which absorbs a small percentage of the shaft power is used to pull cooling air through the heat exchangers.
56. COOLING SYSTEM, THREE WHEEL BOOTSTRAP: See Cooling System, Simple/Bootstrap
57. COOLING SYSTEM, THREE WHEEL RECIRCULATING (Three Wheel Shoestring): A recirculating or shoestring cooling system which utilizes a three wheel air cycle machine. The third wheel is a fan which consumes a fraction of the shaft power and provides heat exchanger cooling air.
58. CRITICAL POINT: The critical point of a fluid is that point at which the liquid and the vapor have identical properties; critical temperature, critical pressure and critical volume are the terms given to the temperature, pressure and volume at the critical point. Above the critical temperature gas cannot be liquefied by pressure alone. Critical pressure is saturation pressure corresponding to critical temperature.

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59. CYCLE, CLOSED: A closed cycle is one where the working substance is returned regularly to a particular state or condition at each point in the cycle during steady operation.
60. DAMPER: A device for controlling air flow.
61. DECIBEL: The decibel is a logarithmic scale unit of sound and is described as: the sound intensity I_1 is N decibels higher in "intensity level" than the reference sound intensity I_0 if $N = 10 \log_{10} I_1/I_0$. The reference intensity level is usually taken as $1.0 \times 10^{-16} \text{ W/cm}^2$.
62. DENSITY, MASS: The mass of any substance per unit volume. The standard mass density of dry air is $2.378 \times 10^{-3} \text{ slugs/ft}^3$ at 59°F and 29.92 inches Hg absolute (1226 kg/m^3 at 288K and 101.35 kPa absolute).
63. DIFFUSER: A device for converting the velocity pressure of a fluid stream into pressure head, usually accomplished by efficiently reducing the velocity of air.
64. DISTRIBUTION SYSTEM: The combination of ducts, cabin inlet openings, valves and orifices to distribute fluids to satisfy cabin and equipment cooling and heating demands.
65. DRYER: A device used to remove water or water vapor from a refrigerant or other fluid.
66. EFFECTIVENESS, HEAT EXCHANGER:
 1. Hot Side: The temperature drop of the hotter fluid divided by the maximum temperature drop theoretically obtainable through the use of infinite heat transfer surface.

$$\epsilon = \frac{C_h (T_{hi} - T_{ho})}{C_{min} (T_{hi} - T_{ci})}$$

2. Cold Side: The temperature rise of the cooler fluid divided by the maximum temperature rise theoretically obtainable through the use of infinite heat transfer surface.

$$\epsilon = \frac{C_c (T_{co} - T_{ci})}{C_{min} (T_{hi} - T_{ci})}$$

where T = temperature

C = heat capacity

c = cold flow

h = hot flow

i = inlet

o = outlet

c_{min} = smaller of C_h and C_c magnitudes

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67. EFFICIENCY, ADIABATIC:

- a. Turbines: The ratio of the actual dry air enthalpy drop through a turbine to the enthalpy drop for a reversible adiabatic expansion.
- b. Compressors: The ratio of enthalpy rise of dry air in a compressor for a reversible adiabatic compression to the actual air enthalpy rise.

68. ENTHALPY: Property of substance in an energy term defined as follows:

$$h = u + PV \text{ Btu per lb (J/kg).}$$

where: u = internal energy

P = pressure

V = volume

If the fluid can be regarded as a perfect gas, its enthalpy can alternately be expressed as the product of its constant pressure specific heat and its absolute temperature.

- 69. EVAPORATOR: As pertains to a refrigeration system, that part of the system in which heat is transferred to the refrigerant resulting in its change of phase from a liquid to a gas. (See BOILER).
- 70. EXHAUST SYSTEM (VENTILATING): As relates to compartment ventilation, that combination of air discharge ducts, vents and outlet grills utilized for the discharge of air from the compartment to the outside.
- 71. FAN: A device used to circulate air at relatively low pressures and high volume flows. It is driven by a shaft connected to a power source.
- 72. FILTER, AIR: A device for removing and entrapping dust or other foreign particles from air.
- 73. FLAME-RESISTANT MATERIALS: To be obtained from latest revision of FAR 1 - Definitions and abbreviations.
- 74. FLASH-RESISTANT MATERIALS: To be obtained from latest revision of FAR 1 - Definitions and abbreviations.
- 75. FIREPROOF MATERIALS: To be obtained from latest revision of FAR 1 - Definitions and abbreviations.
- 76. FIRE-RESISTANT MATERIALS: To be obtained from latest revision of FAR 1 - Definitions and abbreviations.
- 77. FLOW, VOLUMETRIC: The volume rate of fluid flow at a specified temperature and pressure, usually expressed in units of ft^3/min (m^3/s).

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78. **FLOW, WEIGHT:** The weight rate of fluid flow, usually expressed in units of pounds/min (kg/s).
79. **GASPER AIR OUTLET:** Also known as velocity outlet. This is a supplementary conditioned air outlet, adjustable in flow quantity and direction, which is usually provided at each passenger seat and crew station to create additional air motion as required by the individual. It seems to have a therapeutic value, tending to alleviate motion sickness by providing a refreshing draft over the face and body.
80. **HEAT EXCHANGER:** An apparatus in which the transfer of heat from one medium to another is accomplished without mixing of the media.
81. **HEAT EXCHANGER, CABIN PRESSURIZING PRIMARY (AFTERCooler):** A heat exchanger designed to reduce the temperature of air discharged by a cabin air compressor.
82. **HEAT EXCHANGER, PRECOOLER:** A heat exchanger which is used to cool engine bleed air before it enters the air conditioning compartment or unit. It usually serves the function of a primary heat exchanger in a bootstrap cooling system.
83. **HEAT EXCHANGER, PRIMARY:** The heat exchanger in a bootstrap cooling system which is used to cool the air from the pressure source before it enters the compressor. Ram air is usually used as the cooling medium in the heat exchanger.
84. **HEAT EXCHANGER, REGENERATIVE:** A heat exchanger used to recover energy from a fluid whose cooling (or heating) potential was developed in another part of the system. Often it is used to recover cooling (or heating) potential of a fluid that would normally be wasted. (See Cooling System, Regenerative).
85. **HEAT EXCHANGER, ROTATING:** A heat exchanger in which one fluid is passed inside hollow blades of a blower, while the other fluid is drawn through the heat exchanger and over the exterior of the blades.
86. **HEAT EXCHANGER, SECONDARY:** The heat exchanger in a bootstrap cooling system which is used to cool the air which passes from the compressor to the cooling turbine. Ram air is usually used as the cooling medium in the heat exchanger.
87. **HEAT LOAD:** A source of heat generation in an aircraft compartment or a source of heat transfer into an aircraft compartment.
88. **HEAT LOAD, EQUIPMENT:** Heat load associated with the heat generation of equipment within an aircraft compartment, usually results from the conversion of electrical energy into heat.
89. **HEAT LOAD, INFILTRATION:** Heat load associated with a fluid which infiltrates into an aircraft compartment at a different temperature than the compartment.

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90. HEAT LOAD, LATENT: Heat load associated with the complete change of state of a substance at a constant temperature. Usually refers to evaporative moisture (perspiration) produced by occupants.
91. HEAT LOAD, SENSIBLE: Heat load associated with the change in temperature of a substance. Usually refers to the heat produced by occupants.
92. HEAT LOAD, SOLAR: Heat load associated with solar radiation through transparent areas directly upon flight personnel and equipment and upon the cabin interior surfaces.
93. HEAT SINK: Any medium which is the ultimate receiver of energy being transferred as heat.
94. HEAT TRANSFER COEFFICIENT, OVERALL: The single coefficient which describes the heat transfer rate through the section under consideration. It is the combination of all the individual heat transfer paths through the section and is usually expressed in units of Btu/hour·ft²·°F (W/m²·K).
95. HEAT TRANSFER COEFFICIENT, SURFACE OR FILM: The conductance of the thin layer of fluid immediately adjacent to the surface and is usually expressed in units of Btu/hour·ft²·°F (W/m²·K).
96. HEATER, CABIN/COMPARTMENT: A heat exchanger, usually employing combustion gases, compressed air, or electrical energy, from which heat is transferred to the cabin/compartment air supply.
97. HEATER, EXHAUST HOT AIR TYPE: An exhaust hot air type heater, as used for airplane heating, is one that utilizes, by means of a heat exchanger, the heat of the exhaust gases from the engine for the purpose of directly heating the air supplied to the airplane.
98. HEATER, INTERNAL COMBUSTION TYPE: An internal combustion type heater is one that utilizes the heat produced by combustion of a fuel within the heater itself.
99. HEATER, MUFF TYPE: A heater designed to surround the duct or pipe carrying hot gases. Heat will, in this way, be transferred to air passed through the annular space between the hot pipe and the muff.
100. HEATER, RADIANT: A device which accomplishes heating by means of direct radiation.
101. HEATER, SHROUD: Synonymous with MUFF HEATER.
102. HEATING LOAD, CABIN: The rate of heat transfer to the cabin as measured by the difference between the total enthalpy of air entering the cabin and the total enthalpy of the air leaving the cabin during a specified period of time.

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103. HEATING LOAD, TOTAL: The rate of heat transfer as measured by the difference between the total enthalpy of the fluid leaving the heating system and the total enthalpy of the fluid entering the heating system during a specified period of time.

104. HUMIDITY, RELATIVE: The ratio of the partial pressure of water vapor in the air to the partial pressure which saturated water vapor exerts at the same air temperature.

105. HUMIDITY, SPECIFIC (HUMIDITY RATIO): The weight of water vapor in air expressed in pounds or grains of water vapor per pound of dry air (g of water vapor per kg of dry air).

106. HUNTING: A term applied to the undesirable oscillation of a control device resulting in a poor degree of control.

107. INDUCTION SYSTEM (VENTILATING): That combination of scoops and ducts which introduce outside air to the air distribution equipment of the airplane.

108. INLET, AIR: Inlets through which air is supplied to the space to be conditioned.

109. INTENSIFIER TUBE: An intensifier tube, as commonly applied to heating, refers to a tube which passes within the ducts or pipes carrying engine exhaust gases. Such a tube is designed to transfer heat from the exhaust gas to the air flowing within the tube.

110. INTERCOOLER, CABIN PRESSURIZING: A heat exchanger designed to reduce the temperature between two stages of air compression.

111. ISOTHERMAL REGION: A region of constant temperature.

112. LIQUID RECEIVER, VAPOR CYCLE: A vessel permanently connected to a system used for the storage of liquid refrigerant.

113. LIQUID TRANSPORT SYSTEM: A system for extracting heat at one location and rejecting it at another location. Such a system usually consists of a coolant, a coolant reservoir, a recirculation pump, and heat exchangers.

114. NOZZLE AREA, EFFECTIVE: A theoretical area of a nozzle throat which is the product of its geometric area and a dimensionless nozzle discharge coefficient.

115. NOZZLE AREA, GEOMETRIC: The flow area in the throat of a nozzle determined by its physical measurements.

116. OUTLET, AIR: Openings through which air is removed from the space being conditioned.

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

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118. PRESSURE, PARTIAL: That portion of the static absolute pressure of a mixture of gases, attributable to one gaseous component.
119. PRESSURE, (DIFFERENTIAL) RAM AIR STATIC (INLET): The differential between the static pressure within the inlet and the static pressure of the undisturbed air stream.
120. PRESSURE, (DIFFERENTIAL) RAM AIR TOTAL (INLET): The maximum differential between the total pressure within the inlet and the static pressure of the undisturbed air stream (ambient atmosphere).
121. PRESSURE, STATIC: The pressure that would be measured by a probe having zero velocity relative to the fluid. Pressure measurement taken by the probe normal to the direction of motion of the fluid closely approximates this pressure.
122. PRESSURE, TOTAL: The sum of the static pressure and the dynamic pressure at a given point in a fluid stream.
123. PRESSURE DIFFERENTIAL, STATIC: The difference between the static pressures at two points in a fluid system.
124. PRESSURE DIFFERENTIAL, TOTAL: The difference between the total pressures at two points in a fluid stream.
125. PRESSURE DROP, TOTAL NONRECOVERABLE: The loss of total pressure between two points in a fluid stream. (Equal to the total pressure differential).
126. PRESSURE RATIO: The ratio of the absolute pressures of a fluid entering and leaving a device. The order of the pressures is customarily chosen so that the value of the pressure ratio is greater than one. For turbines, inlet total to outlet static pressure is commonly used. For compressors outlet total to inlet total pressure is commonly used.
127. PRESSURE RECOVERY: The percentage of dynamic pressure available within the throat of a scoop for promoting flow through the scoop.
128. PRESSURIZING, CABIN: Increasing the pressure in a compartment above that of ambient pressure and controlling the pressure in said compartment.
129. PUMP, JET (EJECTOR): A device which raises the pressure of a substance by entraining it with a high velocity jet of the same or a different substance and giving the resultant mixture a relatively high velocity. The static pressure of the mixture is then raised by a deceleration process in combination with, in most cases, a pressure shock.
130. REFRIGERANT: The medium of heat transfer in a refrigerating system which picks up heat by evaporating at a low temperature and pressure and gives up heat by condensing at a higher temperature and pressure.

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131. **REFRIGERATION CYCLE:** The complete course of operation of a refrigerant back to a starting point, evidenced by: a repeated series of thermodynamic processes, or flow through a series of apparatus, or a repeated series of mechanical operations.
132. **REFRIGERATION SYSTEM, AIR CYCLE:** A refrigeration cycle which uses air as a refrigerant in an air cycle machine.
133. **REFRIGERATION SYSTEM, VAPOR CYCLE:** An assembly of connected components usually consisting of an evaporator, expansion valve, compressor, condenser, and control elements through which a refrigerant is circulated for the purpose of extracting heat at a low temperature level and rejecting it at a high temperature level.
134. **REFRIGERATION SYSTEM, COMPOUND:** A vapor refrigeration cycle using two or more stages of compression.
135. **REFRIGERATION SYSTEM, CASCADE:** A vapor cycle refrigeration system having two or more refrigerant circuits, each containing a compressor, condenser, and evaporator. The evaporator of one circuit cools the condenser of the other circuit.
136. **REGULATOR, CABIN PRESSURE:**
 - a. A pressure regulator valve from a pressurized cabin which regulates the pressure in that cabin by controlling the outflow of air from the cabin.
 - b. A valve at the air supply to the cabin regulating flow to the cabin in order to maintain prescribed pressure.
137. **REGULATOR, CABIN PRESSURE AUXILIARY UNIT:** A unit containing all the parts of a cabin pressure regulator but the control elements and operated in parallel with and by cabin pressure from the control head of the master regulator.
138. **REGULATOR, MASTER CABIN PRESSURE:** A cabin pressure regulator containing all the necessary control elements.
139. **REGULATOR, TEMPERATURE:** A device which automatically controls the temperature of an air stream in a given region.
140. **SCOOP:** An air inlet designed and located to deliver atmospheric air to an internal system by decelerating the air, thereby increasing the static pressure and producing flow.
141. **SEPARATOR, WATER:** A device for removing free moisture from the air stream.
142. **SEPARATOR, WATER, LOW PRESSURE:** A water separator located in the downstream low pressure ducting of a refrigeration system. It agglomerates the water particles and separates them from evaporator exhaust air or air cycle machine turbine exhaust air.