Self-test of the temperature monitor system is normally accomplished during the preflight warning systems check by selecting the W/S TEMP position on the rotary test switch and turning the windshield bleed air switch to either the HI or LOW position. Proper system function is verified by illumination of the windshield air overheat annunciator light. Self-tests may also be accomplished in flight, if desired.

If the windshield bleed air anti-ice system fails, a backup alcohol anti-ice system is provided for the left windshield only. The system is controlled by a two-position W/S ALCOHOL switch which, when moved to the ON position, activates an electric pump which sprays alcohol on the pilot's windshield. Sufficient alcohol is provided for approximately ten minutes continuous operation with a fully serviced reservoir.

RAIN REMOVAL

This system utilizes the normal windshield bleed air anti-ice system for rain removal with augmenter doors to provide increased airflow over each windshield in heavy rain. These doors are manually operated by pulling the PULL RAIN handle located under the WINDSHIELD BLEED AIR knobs on the copilot's subpanel. For rain removal, the manual windshield bleed air controls on the copilot's subpanel should be turned to the MAX position, the PULL RAIN handle pulled out and the W/S BLEED switch positioned to LOW. Augmenter door opening will be difficult should the W/S BLEED switch be turned on first. It may also be difficult to open above 175 KIAS.

ENVIRONMENTAL

The pressurization and air conditioning systems utilize engine bleed air to pressurize and air condition the cabin and defog the cabin and cockpit windows. During normal operation, most functions are automatic. The only manual adjustments required are for individual comfort, such as cabin rate-of-climb and temperature. Ram air for cabin ventilation is available when the pressurization system is not in use.

PRESSURIZATION

Two elements are required to provide cabin pressurization. One is a constant source of air. The other is a method of controlling the flow of air into and out of the airplane to achieve the desired differential pressure and resultant cabin altitude. In the Citation V, the inflow of air to the cabin is constant (through a wide range of engine power settings) and the outflow of air is controlled by the two outflow valves located in the aft pressure bulkhead.

Outflow Valves

There are two forces at work on the outflow valves at all times. The first is a spring which is always attempting to close the respective valve, restricting the outflow of air and causing the cabin to descend. Offsetting this spring is the control air (vacuum) regulated by the cabin pressure controller and amplified by the pneumatic relay. This tends to pull the outflow valve off the seat and allow air to escape, ascending the cabin. In the event that control vacuum should exceed limits due to a malfunction, cabin altitude limit valves are provided to prevent cabin altitude from exceeding 13,000 feet, +1500 or -1500 feet. If the control vacuum exceeds the barometric reference in the cabin altitude limit valves, they will open and release cabin air into the control air line, reducing the vacuum. This will cause the outflow valves to move toward the closed position and reestablish cabin pressure. An emergency dump valve located on the vacuum line can be utilized to route vacuum directly to the outflow valves and dump cabin pressure to a cabin altitude of 13,000 feet, +1500 or -1500 feet. Unless the PRESS Source Selector is OFF the pressure will not dump completely. Refer to Pressurization Controller, below.

Bleed air from the engines is used to create a vacuum for cabin pressurization control.

When either or both engines are operating, bleed air is directed through a pressure regulator and an air ejector. Air passing through the ejector creates a vacuum at an air inlet port, which is the pickoff point for the vacuum system. A filter in the system removes foreign particles from the air. A regulator is included which regulates the vacuum pressure between 3.75 and 4.75 inches of mercury.

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PRESSURIZATION (Continued)

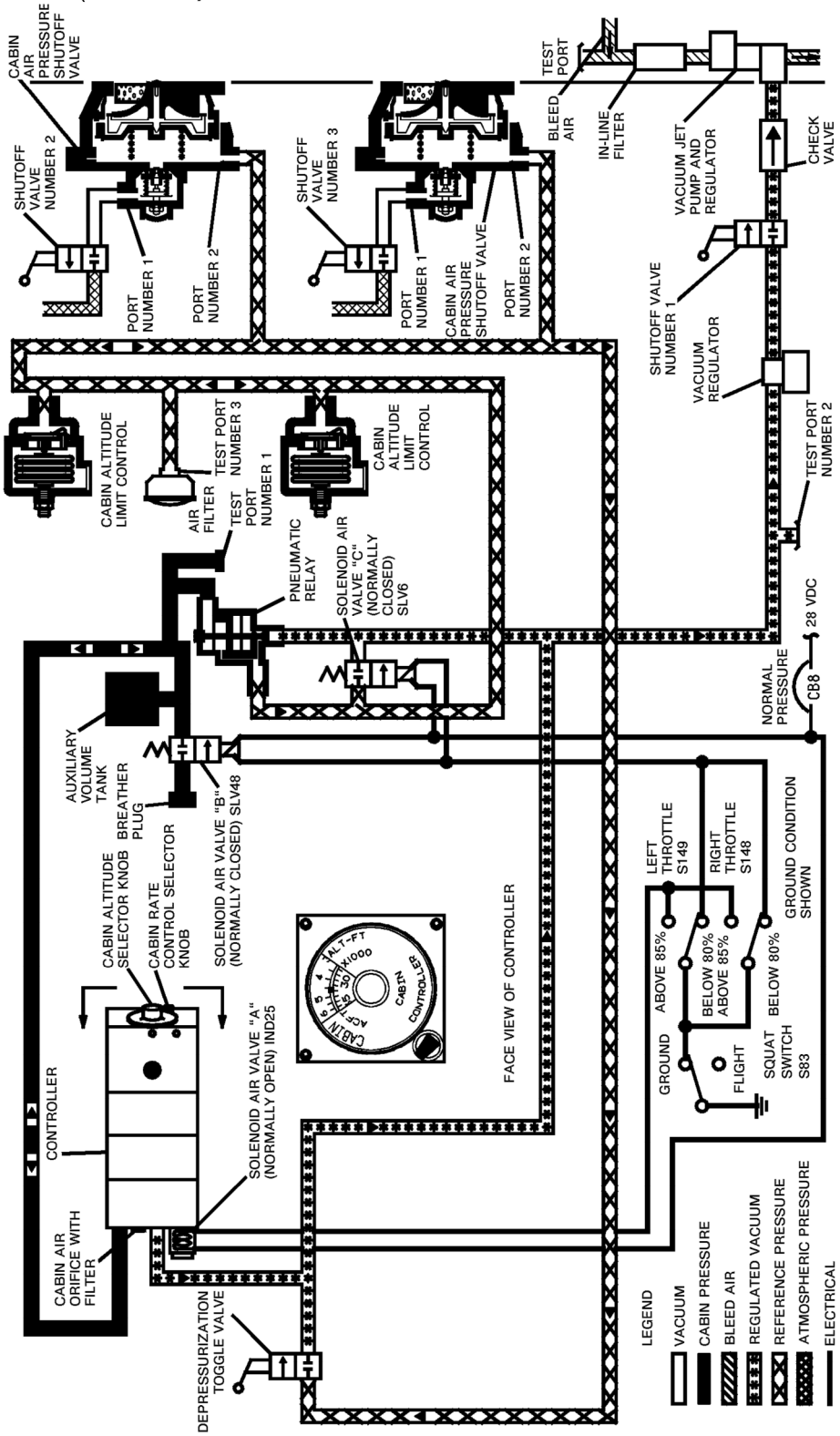

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Figure 2-25. Pressurization Control System Schematic

PRESSURIZATION

In the event of a vacuum system failure, the emergency dump valve will be inoperative and cabin pressure will go to maximum differential since control air (vacuum) is not available to the pressurization outflow valves. Select pressurization source to OFF during landing approach.

Pressurization Source

Engine bleed air is used as the source of high pressure air to provide cabin pressurization. During normal operations, some of the bleed air passes through the air cycle machine for cooling before entering the cabin.

Each engine has two ports from which compressor discharge air (bleed air) is bled off the engines. Two control valves, one mounted in each pressurization bleed air line, controls the bleed air flow from the respective engine through the air conditioning system and into the cabin. A ground shutoff and pressure regulating valve bypassing the right bleed line allows bleed air pressure to the air conditioner at a higher flow rate for ground operations.

The emergency pressurization control valve installed on the left bleed air line is used to route orifice controlled bleed air directly to the cabin for emergency pressurization. The pressurization source selector switch is a six-position switch labeled OFF, GND, LH, NORM, RH and EMER. In the OFF position, both bleed air control valves are closed allowing no bleed air to enter the cabin. In the GND position, with the right engine operating, the ground shutoff and pressure regulating valve is open, allowing up to approximately 18 pounds/minute bleed air to flow through the air cycle machine to ventilate the cabin. With this position selected, the BLEED AIR GND light on the annunciator panel will illuminate. In the LH position, the left flow control valve will open, allowing the left engine conditioned bleed air (6 pounds/minute) to enter the cabin. In the RH position, the right flow control valve will open, allowing right engine conditioned bleed air (6 pounds/minute) to enter the cabin. In the NORMAL position, the left and right flow control valves will open, allowing both left and right conditioned bleed air (12 pounds/minute) to enter the cabin. In the EMER position, the emergency pressurization valve opens in flight only, allowing hot bleed air from the left engine to enter the cabin directly and the EMER PRESS ON annunciator light will illuminate. The air cycle machine is bypassed with emergency pressurization selected, cabin temperature will rise, and AUTOMATIC or MANUAL temperature control will be disabled. Cabin temperature can be controlled to some extent with the left throttle. Retarding the left throttle will lower bleed air temperature, but excessive reduction will allow the cabin altitude to climb.

Pressurization Controller

It is the function of the controller to meter control air (vacuum) to the outflow valves so that desired cabin altitude and rate of climb are achieved.

The controller consists of two chambers separated by a moveable diaphragm. One chamber senses cabin pressure while the other chamber references ambient pressure trapped prior to liftoff. Pressure differences between the two chambers, resulting from an increase in cabin altitude, cause the diaphragm to move and route control air to the pneumatic relay. The pneumatic relay amplifies this signal and in turn, controls the two outflow valves. Cabin pressure is then increased or decreased until equilibrium between the two chambers is established.

Desired cabin altitude is selected by rotating the cabin altitude selector knob. This applies a spring bias to the moveable diaphragm and changes the pressure differential at which equilibrium between the two chambers is achieved.

The rate at which the cabin climbs or descends is controlled by the cabin rate knob. This valve bleeds air between the two sealed chambers and, in conjunction with an isobaric bellows, determines the rate at which the spring pressure is applied to the moveable diaphragm when a new cabin altitude is selected.

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PRESSURIZATION (Continued)

The cabin altimeter and cabin rate of change indicators are located on the center pedestal adjacent to the pressurization controller. The cabin altimeter presents existing cabin altitude on the outer scale, and pressure differential on the inner scale. The pressure differential needle will indicate a malfunction of the outflow valves whenever a pressure differential in excess of 8.9 PSI is shown on the gage; the cabin rate of change indicator shows the rate at which the cabin is ascending or descending.

The outflow valves are calibrated to regulate cabin differential pressure at 8.9 PSI, +0.1 or -0.1 PSI. During ground operation, vacuum is routed directly to both outflow valves, driving them to the full open position (or partially open during takeoff run). This assures that the airplane is depressurized during all ground operations.

A guarded emergency dump switch provides a rapid dump capability for the pilot. EMER DUMP position causes the pressurization outflow valves to open, releasing cabin pressure and allowing cabin altitude to equalize with airplane altitude up to approximately 13,000 feet, +1500 or -1500 feet. The PRESS SOURCE selector must be OFF to obtain complete depressurization of the cabin at altitudes above 13,000 feet, +1500 or -1500 feet. The cabin altitude limit controls prevent a system failure or inadvertent pilot action from depressurizing the cabin above this altitude.

During the takeoff roll, advancement of the throttles closes three solenoid valves, moving the outflow valves into the controlling range and trapping ambient pressure for reference by the cabin pressure controller.

AIR CONDITIONING

Air conditioning for the cabin is provided by routing engine bleed air through a precooler in the tailcone and in turn through the air cycle machine which conditions the air prior to distribution to the cabin. Cabin overhead and underfloor ducting is used to distribute the conditioned air. An optional freon air conditioning system is also available.

The air cycle machine located in the tailcone compartment, cools engine bleed air to approximately 2°C (35°F). Bleed air enters the air cycle machine through any of three bleed air shutoff and pressure regulating valves (LH, RH, GND) and passes over a precooler and heat exchanger. The air is then compressed by a turbine-driven compressor and passed over a second heat exchanger. Finally, the air drives a turbine which extracts energy and cools the air further. Expansion provides the final cooling. The advantages of the compression cycle are twofold: (1) the compressor section provides a load for the turbine to work against and (2) compressing and heating the air increases the efficiency of the second heat exchanger. Fresh air enters the tailcone through the flush scoops in the dorsal fin. A small fan, driven by the air cycle machine, pulls the fresh air over both heat exchangers and the precooler and dumps it overboard through a vent in the tailcone.

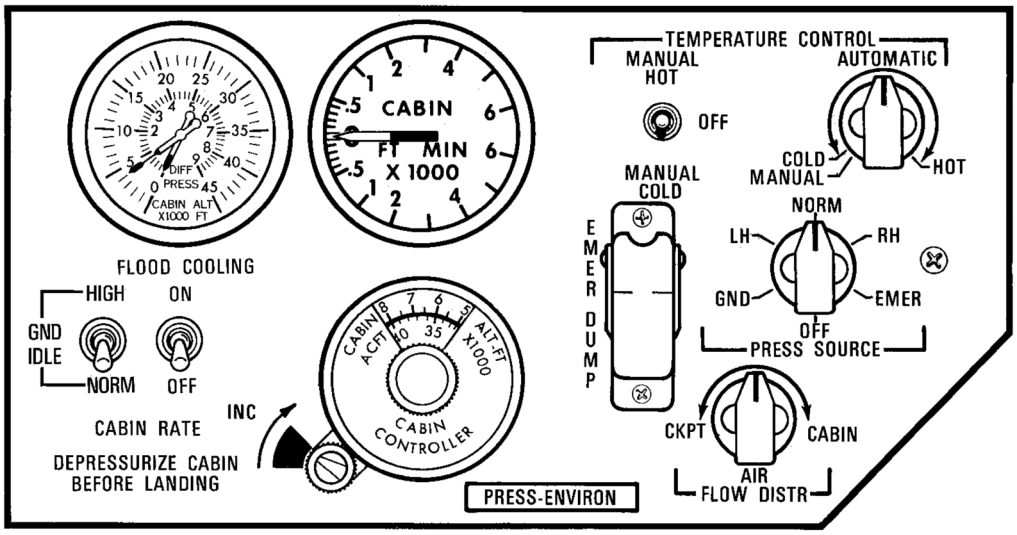

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Figure 2-26. Pressurization - Environmental Control Panel (Typical)

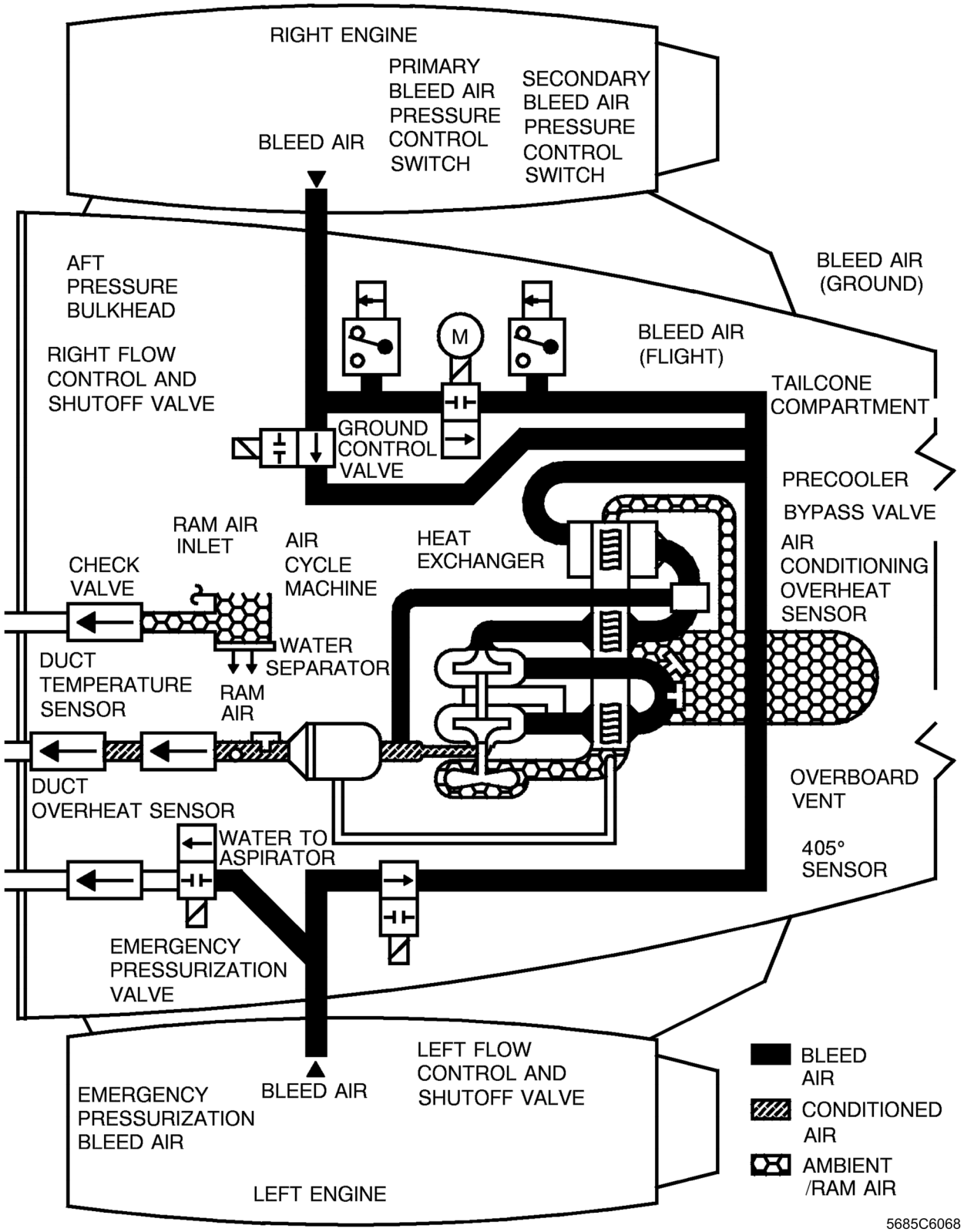

Figure 2-27. Bleed Air System Schematic

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AIR CONDITIONING (Continued)

To warm the cabin to a desirable temperature, a bypass valve allows some hot engine bleed air to bypass the ACM and mix with the cold air exhausted from the air cycle machine. The bypass valve is controlled by the automatic or manual temperature control located on the pressurization environmental control panel. With the temperature control selector in the MANUAL position, the bypass valve can be controlled manually by the MANUAL HOT/MANUAL COLD switch. The switch has three positions, spring-loaded to the center (OFF) position. When the switch is deflected toward the MANUAL HOT position, the bypass valve is driven open, allowing more hot bleed air to bypass the ACM and mix with the cold air exhausted from the air cycle machine. When the switch is released, the bypass valve will remain at that position. When the switch is moved toward the MANUAL COLD position, the bypass valve is driven closed. The bypass valve, when manually controlled, will travel from full open to full closed in approximately ten seconds. When AUTOMATIC temperature control is selected, the cabin temperature will be automatically controlled, corresponding to the position of the automatic temperature selector. Response rate in automatic depends on temperature conditions. Two air duct temperature sensors are linked to the automatic temperature control selector to drive the bypass valve towards the desired position. Should the duct temperature become excessively hot, the AIR DUCT O'HEAT annunciator panel light will illuminate. This is an advisory light and corrective action, lowering the cabin temperature, should be accomplished to prevent system damage. An air conditioning overheat sensor is installed between the compressor and turbine section of the air cycle machine to prevent excessively hot air from causing damage to the air cycle machine due to overheating. If this sensor indicates that the compressor section is producing air that is too hot (approximately 435°F), it will close all shutoff valves in the bleed air ducts and open the emergency pressurization valve when airplane is in flight. This will secure the air cycle machine and pressurize the cabin by the emergency method. This condition will be indicated by the illumination of the EMERG PRESS ON annunciator light as well as the increased noise level associated with high velocity air entering the cabin. If the temperature drops below approximately 405°F within 12 seconds, the system will automatically return to normal operation. If temperature is not reduced within 12 seconds, it will be necessary to rotate the pressurization source selector knob in the cockpit to EMER position and then reselect LH, RH, or NORM to reset the system for normal operation.

During high altitude operation, particularly at low airspeed and high power settings while attempting to cool a warm cabin, it is possible for the cooling demand to exceed air cycle machine (ACM) capabilities. This would result in ACM overtemperature and shutdown and automatically trip the EMERGENCY pressurization on. To preclude this, an overtemperature protection circuit is incorporated which will bias the temperature controller when the ACM compressor discharge temperature reaches approximately 410°F. This bias causes the ACM temperature controller to respond as if a warmer cabin temperature had been selected; therefore, it switches from cooling to heating mode until the ACM overtemperature condition is corrected. Once the ACM compressor discharge temperature has cooled, the bias is automatically switched out and the ACM will return to cooling mode. This system will cycle the bias in and out until the ACM stabilizes (cabin temperature reaches selected value). The ACM overtemperature protection circuit operates only in the AUTOMATIC temperature controller mode. Therefore, operations above 31,000 feet altitude should be restricted to AUTOMATIC mode. It is possible, at high altitude, when using MANUAL mode, to select a cold enough temperature to cause ACM shutdown and to trip the emergency pressurization on.

A water separator is provided to dehumidify the conditioned air before entering the cabin. The conditioned air enters the water separator where it is filtered and the excess water is removed. The conditioned air is then ducted through a check valve into the cabin flow ducts for distribution. The condensate is injected into the air flowing over the heat exchangers to increase cooling.

The cabin air distribution system consists of an overhead air duct and outlets, and underfloor and armrest air ducts which supply conditioned air to the footwarmer manifolds, armrests, and the overhead outlets. A separate cockpit and defog air distribution system is ducted forward through the underfloor from a defog blower in the aft cabin.

When the air temperature selected is cold, a damper valve directs the air through the overhead, floor and armrest air ducts. As the temperature selected becomes warmer, the damper valve will close, recirculating underfloor airflow through the overhead air duct. When a hot temperature is selected (over 38°C (100°F), the damper valve will be closed, which directs all hot airflow through the floor and armrest air ducts.

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AIR CONDITIONING (Continued)

A flow divider is provided to allow the crew to proportion, to a certain extent, the amount of air provided to the cockpit versus the cabin. The flow divider does not affect the overhead outlet system. A five-position selector is provided on the tilt panel for control of the flow divider.

Switches labeled OVHD FAN and DEFOG FAN are located on the copilot's panel. Both have HI/OFF/LOW positions. If increased air circulation is desired, position the OVHD FAN switch to the HI or LOW position. This actuates the cabin fan, increasing airflow through the overhead ducts. The DEFOG FAN switch controls defog and ventilation airflow into the flight compartment.

CABIN AIR CONDITIONING (OPTIONAL)

An optional vapor cycle air conditioner discharges conditioned air from floor mounted evaporator/blowers in the forward and aft ends of the dropped isle, to provide rapid cabin cooling. The air conditioner is controlled by a switch panel on the copilot's instrument panel, and can be used on the ground or in flight up to 18,000 feet. The MODE, AC/BLO/OFF switch controls primary power to the system. The AC position turns on the compressor and the forward blower. The FWD BLOWER HI/LO switch controls the forward blower speed when the MODE switch is in AC or BLO. A COMP ON twist-dimmable light illuminates when the compressor is powered. The system may not be operated in the AC mode above 18,000 feet. A ground unit, or at least one generator, must be on line to run the compressor.

FLOOD COOLING SYSTEM (OPTIONAL)

The Flood Cooling System provides an air outlet grill on the upper aft pressure bulkhead to supply a high-volume flow of conditioned bleed air to flood the cabin, for faster and more efficient cooling. The system is controlled by an ON-OFF switch on the environmental control panel. When the switch is in the ON position, conditioned bleed air is diverted through a line in the tailcone to an axial flow blower on the top of the aft pressure bulkhead, then to the air outlet grill. The system can be used during ground operation and in flight below 10,000 feet. Use of the system above 10,000 feet pressure altitude and/or use for cabin heating are both prohibited due to temperature and pressure limitations of the tailcone duct. Dual check valves in the duct ensures against reverse flow when the system is not in use.

OXYGEN

GENERAL

The oxygen system provides supplementary oxygen for the cockpit sweep-on type masks and the passengers' continuous flow masks. It is not normally used since a cabin altitude of 8000 feet can be maintained at the maximum certified airplane altitude with normal pressurization system operation.

OXYGEN BOTTLE

In the unlikely event supplementary oxygen is required, a fully charged 76.0 cubic foot bottle, located in the left side of the tailcone compartment provides approximately one hour of oxygen for crew and six passengers. Duration for actual personnel aboard can be computed by assuming consumption at a rate of 4.3 liters per minute per occupant, and a usable full bottle output of 1750 liters. Normal pressure for the system is 1600 to 1800 PSI.

The bottle assembly contains a pressure reducing valve, shutoff valve and provisions for external servicing. A green disc is installed in the end of the bottle overpressure vent line which is flush mounted on the lower left side of the aft fuselage approximately four feet aft of the tailcone access door. This disc, when ruptured, indicates bottle pressure has exceeded 2500 PSI and is empty. This overpressure system will actuate under only the most adverse circumstances; therefore, if the disc is ruptured, determine the cause of the overpressure before flight. The oxygen bottle pressure is displayed on the right instrument panel. A locking connector has been provided on the right and left flight deck consoles to supply the flight compartment occupants with 70 PSI oxygen for diluter demand mask use. The diluter demand masks have an integrally mounted microphone and oxygen regulator. Each oxygen regulator has a lever allowing manual selection of diluter demand (normal) or demand (100% oxygen) flows. The lever is normally placed in the 100% position so it is ready for emergency use at high altitudes. If oxygen is used below 20,000 feet, the lever can be repositioned to normal to conserve oxygen.

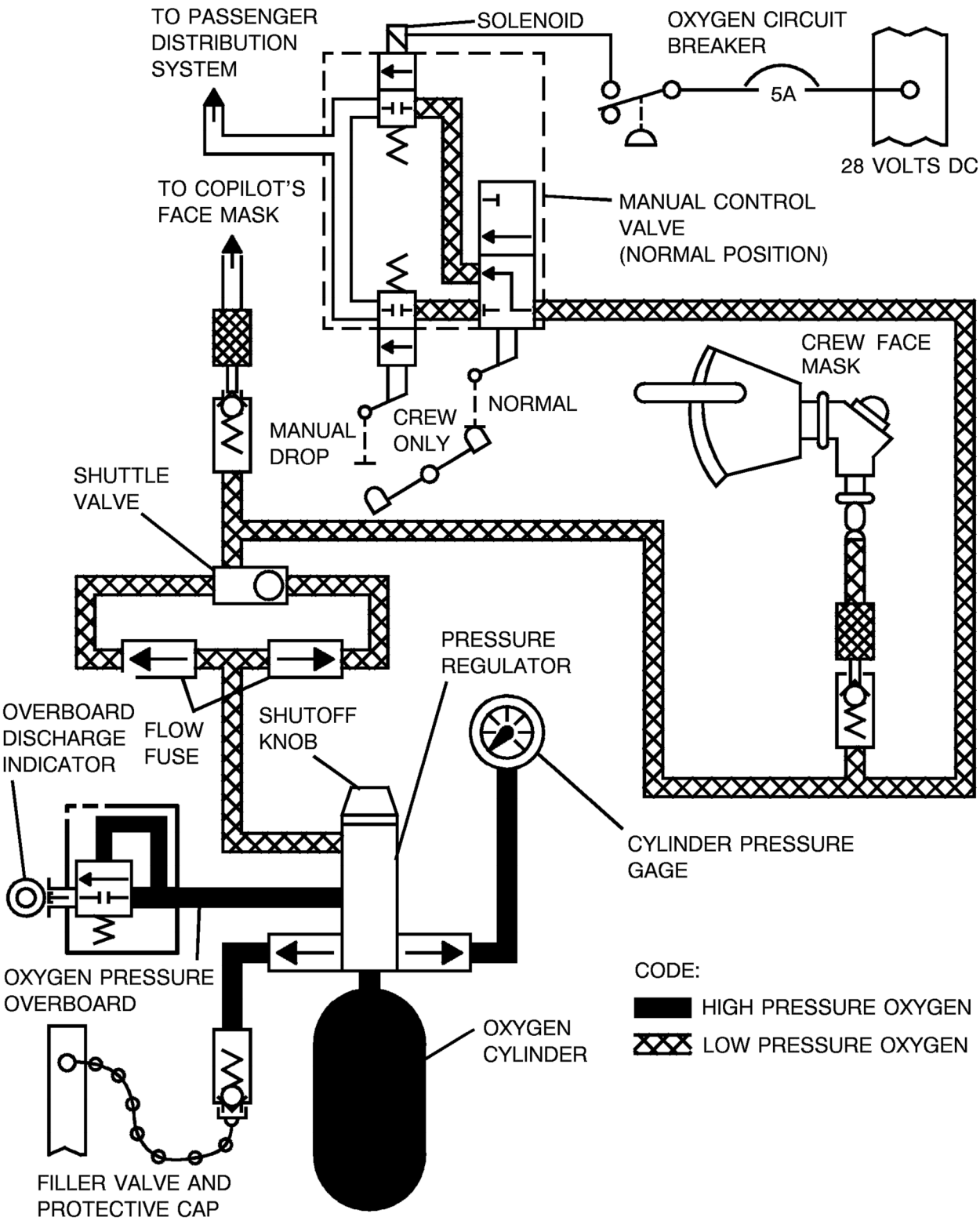

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Figure 2-28. Oxygen System Schematic

OXYGEN CONTROL PANEL

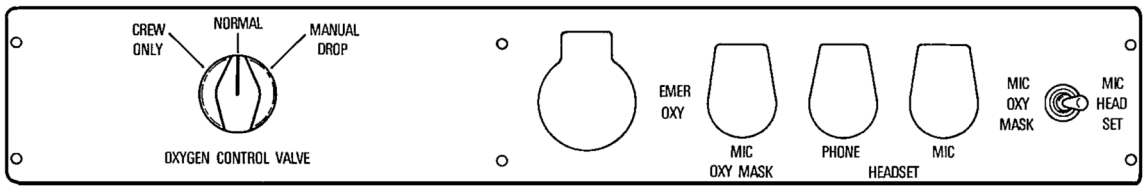

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Figure 2-29. Pilot's Side Console Oxygen Control and Outlets

The left console contains the oxygen controls regulating flow to the passenger compartment. An oxygen control valve labeled CREW ONLY, NORMAL and MANUAL DROP allows the pilot to select oxygen flow to the flight deck only (CREW ONLY position), or flow to both the passenger compartment and flight deck (NORMAL position). The MANUAL DROP position will allow the passenger oxygen masks to be manually deployed in the event of an emergency and the masks fail to automatically deploy. A switch on both the pilot's and copilot's control panels, labeled MIC OXY MASK/MIC HEADSET, selects which microphone will be used. Refer to Figure 2-29 for the pilot's side console.

WARNING

- **NO SMOKING WHEN OXYGEN IS BEING USED OR FOLLOWING USE OF PASSENGER OXYGEN UNTIL LANYARDS HAVE BEEN REINSTALLED.**
- **DUE TO HUMAN PHYSIOLOGICAL LIMITATIONS, THE PASSENGER OXYGEN SYSTEM IS NOT SATISFACTORY FOR CONTINUOUS OPERATION ABOVE 25,000 FEET CABIN ALTITUDE AND THE CREW OXYGEN SYSTEM IS NOT SATISFACTORY FOR CONTINUOUS OPERATION ABOVE 37,000 FEET CABIN ALTITUDE. INDIVIDUAL PHYSIOLOGICAL LIMITATIONS MAY VARY. IF CREW OR PASSENGERS EXPERIENCE HYPOXIC SYMPTOMS, DESCEND TO A LOWER CABIN ALTITUDE.**

Should cabin altitude exceed 13,500 feet, +600 or -600 feet, an altitude sensing switch will electrically actuate the passenger solenoid valve, supplying 70 PSI oxygen pressure to the passenger manifold. This pressure is sufficient to operate the passenger mask actuators, deploy the doors and drop the continuous flow masks at each passenger seat. Oxygen will not flow from these masks until the lanyard on the respective mask has been pulled, removing the pintle pin. This conserves oxygen in the event all masks are not to be used. When the cabin altitude has reached approximately 8000 feet with electrical power available, the passenger solenoid valve will close, allowing passenger manifold oxygen pressure to bleed off. If electrical power is not available, the passenger manifold pressure can be shut off by closing the OXYGEN CONTROL VALVE by selecting CREW ONLY position. As the oxygen pressure dissipates, the door actuators will retract, allowing mask stowage to be accomplished. Reinstall all removed pintle pins before stowing masks.

CREW OXYGEN MASKS

The oxygen mask is a quick-donning sweep-on mask with a microphone and regulator attachment. The mask is a diluter demand type with pressure breathing available by selecting the EMER position. The crew member is assured that oxygen is being received when no restriction to breathing is present with the mask donned and in the 100 percent position. Selection of the EMER position will provide a steady flow of pressurized oxygen in the face cone. Oxygen pressure to the mask may be verified by checking the transparent cylinder in the supply line for a green band. If no oxygen pressure is present the band will indicate red. To qualify as a quick-donning mask, the mask must be properly stowed in the retainer located just below each crew member's side window. (Refer to placard adjacent to retainer for proper stowage position.) To conserve oxygen when using the mask, the regulator may be set to normal if the cabin altitude is below 20,000 feet.

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CREW OXYGEN MASKS (Continued)

100 percent position should be selected when using an oxygen mask for smoke protection. The emergency position on the mask may be used if increased oxygen flow is desired. Use of the emergency position will result in diminished duration of oxygen supply.

A two-position toggle switch is provided on the pilot's and copilot's side consoles. The switch is marked MIC OXY MASK and MIC HEAD SET. Depressing the microphone button on the appropriate control wheel allows a crewmember to transmit through the headset microphone or oxygen mask microphone, whichever is selected.

AVAILABLE TIME IN HOURS:MINUTES							
CABIN ALTITUDE	1 COCKPIT	2 COCKPIT	2 COCKPIT 2 CABIN	2 COCKPIT 4 CABIN	2 COCKPIT 6 CABIN	2 COCKPIT 8 CABIN	2 COCKPIT 10 CABIN
8,000	17:20	8:40	2:47	1:39	1:11	0:55	0:45
10,000	18:18	9:09	2:50	1:40	1:11	0:55	0:45
15,000	20:35	10:17	2:56	1:42	1:12	0:56	0:45
20,000	23:32	11:46	3:03	1:45	1:13	0:56	0:46
25,000	10:59	5:44	2:21	1:29	1:05	0:52	0:42
30,000	14:19	7:09					
35,000	19:22	9:41					
37,000	23:32	11:46					

NOTE

Cockpit masks are assumed to be at the normal setting at 20,000 feet with a respiratory rate of 10 liters per minute - body temperature pressure saturated and at 100% setting at and above 25,000 feet.

LIGHTING

INTERIOR LIGHTING

Interior lighting is provided for the flight compartment, cabin and tailcone area. Electroluminescent panels, instrument floodlights and white background lighting illuminate all cockpit instruments and switches. Two overhead floodlights, controlled by a single rheostat switch, are available for additional cockpit lighting. The overhead floodlights operate off the emergency bus in the event of a double generator failure. The following instrument panel lights can be operated from the standby gyro battery in case of electrical system failure: standby gyro indicator; copilot's attitude indicator; dual fan tachometer; copilot's vertical speed, copilot's airspeed indicator; and copilot's altimeter. All lights except the overhead and instrument floodlights are controlled by a PANEL LIGHT CONTROL master switch and then adjusted by rheostats. When the instrument panel lights are on, a dimmer is activated in the annunciator panel to provide for lower warning light intensity during night flying. The starter disengage switch is also illuminated when the panel lights are on. A floodlight in the glareshield comes on to illuminate the fan tachometers when a starter switch is pressed. It goes out when the starter/generator reverts to generator operation.

Two individually controlled map lights are located in the overhead panel above the pilot and copilot. Intensity controls are located at the forward end of each side console.

Cabin lighting includes overhead fluorescent lighting, individually controlled overhead reading lights, two aft baggage compartment lights and a refreshment center light. An illuminated switch on the forward door post turns on exit lights over the main and emergency doors and one aft baggage compartment light. These lights are powered by the hot battery bus and are available any time the battery is installed and serviceable. A footwell light located forward side of the toilet area is powered by 28 volts direct current.

A three-position passenger advisory switch in the cockpit is also tied to the hot battery bus. In the SEAT BELT position, only the FASTEN SEAT BELT sign is illuminated in the cabin. In the PASS SAFETY position, the NO SMOKING, FASTEN SEAT BELT sign and EMERGENCY EXIT lights are illuminated. When the switch is OFF, all advisory and emergency lighting is extinguished.

A third provision for emergency exit lighting is through a small battery in the cabin headliner which will power the emergency exit lights any time a sensor is exposed to a force of 5 Gs or more.