2.19. ENVIRONMENTAL CONTROL SYSTEM

The environmental control system utilizes engine bleed air for cabin pressurization, through the pressure control, and for cabin heating, through a Heating Unit, while a Cooling Airconditioning System provides cabin cooling.

Depending on ambient temperature, combined operation of both the Heating Unit and the Cooling Airconditioner can be required up to 20000 ft. in order to ensure comfortable cabin conditions.

2.19.1 HEATING SYSTEM

One engine is capable to sustain the operation of the pressurization control and of the heating unit.
During single engine operations, the Cooling System is automatically disengaged due to the excessive electrical load.

The air flowing from the engine first enters a precooler, which reduces the temperature to an adequate level, then through a shut-off valve, a check valve and a pressure regulator reaches the heating control system.
Temperature sensors, fitted to the air ducts, detect a possible overheat or a rupture of the line and send electrical signals to the L/R BLEED TEMP red warning light on the annunciator display.

The heating control system permits an independent temperature control of the cabin and cockpit areas, and consists, essentially, of a Heat Exchanger, two Temperature Modulating valves, two Electronic Temperature Controllers, two duct temperature sensors, two overtemperature sensors and a Heating control panel.

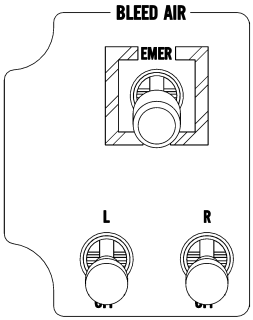

Figure 2.19-1. Engine Bleed Air Controls

The bleed air is divided into two flows; one enters the air-to-air Heat Exchanger to produce a colder flow; the other one by-passes the Heat Exchanger and it is then mixed to the colder flow through the two Temperature Modulating valves.

During flight operations the cooling air for the Heat Exchanger enters through an external air inlet placed on the right side of the rear fuselage and it is exhausted from an outlet located on the same side of the rear fuselage.

A vane axial blower, controlled by a weight switch on the left main landing gear leg, provides the airflow to the Heat Exchanger during ground operations only.

The two, cabin and cockpit, temperature modulating valves are located behind the rear pressure bulkhead, under the baggage compartment floor.
Downstream the temperature modulating valves the airflow is then ducted to the cabin and cockpit areas through suitable mufflers.
Two overtemperature sensors are fitted to the cabin and cockpit air supply ducts to switch on the DUCT TEMP red warning light if an overheat is detected.

The two, cabin and cockpit, Temperature Controllers are electronic units which, on the basis of the received inputs from the relevant area temperature sensor, duct sensor and the desired temperature from the Heating Control Panel, drive the position of the relevant temperature modulating valve, as necessary, to obtain adequate downstream temperature.

The Heating Control Panel is located in the lower left side of the instrument panel and includes three concentric type rotary switches for a fully independent control of system operation in the cabin and in the cockpit area: the external knob of each switch is for the cockpit area while the inner knob is for the cabin area heating control.

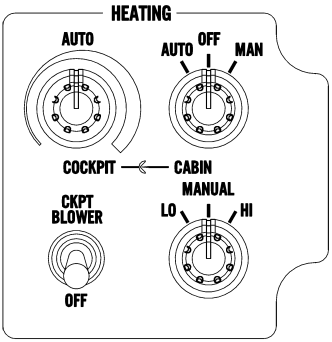

Figure 2.19-2. Heating System Controls

The AUTO potentiometer switch allows setting of the desired temperature when in the system automatic mode of operation.

The AUTO/OFF/MAN mode selector switch allows selecting the system automatic (AUTO) or manual (MAN) mode of operation through the system inoperative (OFF) mode.
When the OFF mode is selected the temperature modulating valve stops at the last operating position and allows the heating flow to continue.

The LO/MANUAL/HI manual control switch allows selecting the air inflow temperature when in manual mode of operation.

The system mode of operation, automatic or manual, can be selected independently for the cockpit and for the cabin.
After selecting the AUTO mode with the mode selector, the temperature of related area is automatically maintained to the level selected by means of the AUTO potentiometer switch.
When the MAN mode is selected on the mode selector, the temperature of the related area is controlled by discrete movings to the HI (high) or LO (low) springloaded position of the related manual control switch. Each manual control switch directly drive the corresponding temperature modulating valve: a complete and continuous motion of the valve from the full hot (HI) to the full cold (LO) position or viceversa requires about 15 seconds.

The air flow is distributed in the passenger area through overhead and floor diffusers,while in the cockpit area through adjustable outlets, lateral and floor diffusers.
A fan, operated by the CKPT BLOWER switch, allows to increase the airflow in the cockpit.

Electrical power for operating the left, the right and the emergency bleed air valves is supplied by the left and right dual feed busses through the L BLEED AIR and the R BLEED AIR 3-ampere circuit breakers respectively on the pilot and the copilot circuit breaker panels.

Electrical power for operating the pressure regulating valve is delivered from the left and right dual feed busses through the L WING ANTI-ICE and R WING ANTI-ICE 3-ampere circuit breakers on the pilot and the copilot circuit breaker panels when the main wing anti-icing system is activated.

The temperature controllers, sensors and valves are powered from the right single feed bus through the HEAT 5-ampere circuit breaker on the copilot circuit breaker panel.

The vane axial blower is powered from the left generator bus through the HTR FAN 25-ampere circuit breaker in the main junction box.

The cockpit blower is powered from the left single feed bus through CKPT BLOWER 5-ampere circuit breaker on the pilot circuit breaker panel.

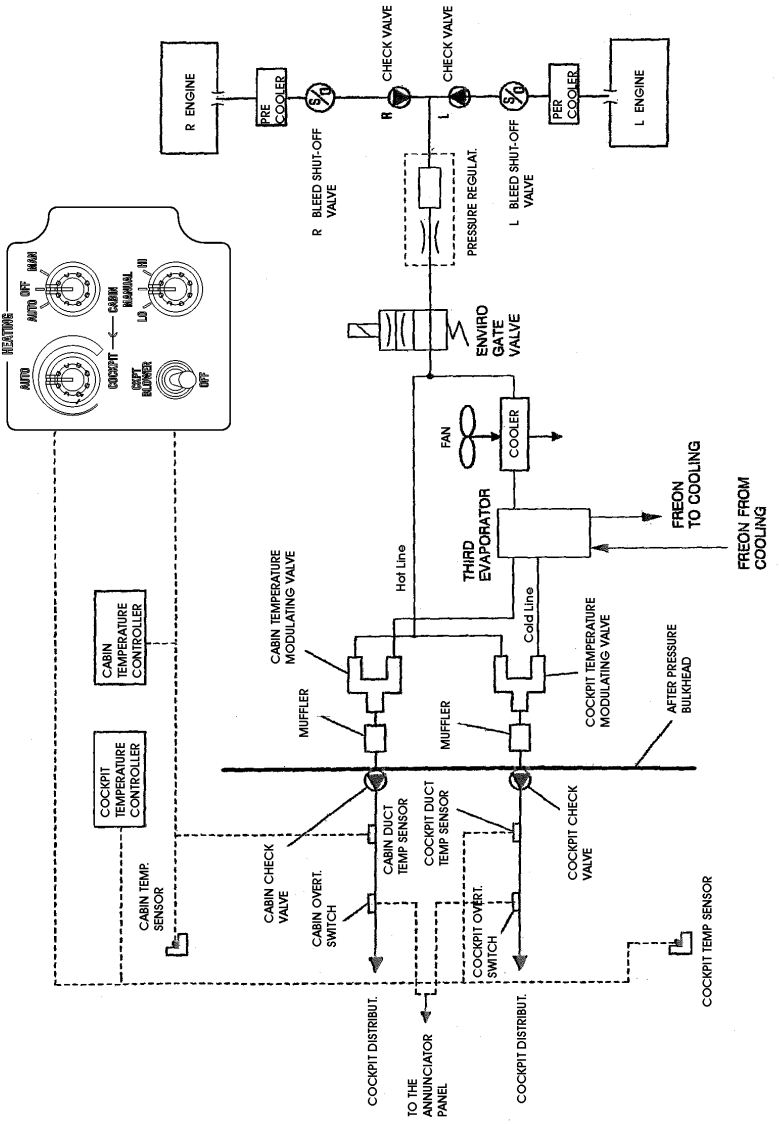

Figure 2.19-3. Heating System

2.19.2 COOLING SYSTEM

The Cooling Airconditioner System consists of a compressor/condenser/dryer/ receiver unit located in the rear baggage compartment and two evaporators, one installed behind the pilot instrument panel and the other one in the rear side of the passenger cabin. Two blowers, one for the pilot compartment and one for the passenger cabin, provide the air supply at low or high speed.

Due to the possible installation of other optional equipment, the arrangement of the airconditioner system compressor/condenser unit in the baggage compartment can assume two different configurations: a foreward or a rearward location as necessary.

One cold air outlet is located on each rudder pedal cover for the pilot and copilot use and another one is located in the rear cabin compartment.

The COOLING panel with the system controls is located on the lower left side of the instrument panel:

– the three position (OFF/FAN/COOL) main switch controls the operation of the system. When moved from OFF to the FAN position the switch controls the operation of both the blowers only. When moved to the COOL position the switch allows the operation of the blowers and of the compressor.

– the FAN CKPT and the FAN CABIN two position (HIGH/LOW) switches allow setting of the corresponding blower operating mode to HIGH speed or LOW speed when the main control switch is in either COOL or FAN position.

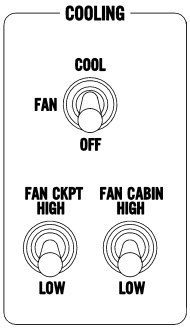

Figure 2.19-4. Cooling System Controls

The Cooling System can be switched to COOL or OFF at crew convenience.

Each time the main control switch is set to COOL the two blowers will be actuated while the compressor/condenser unit requires that a GPU or both generators are operating. In the event of generator failure the compressor/ condenser unit automatically stops operating.

The compressor/condenser unit is powered from the right generator bus through a 130-ampere fuse.

The blowers are powered from the right single feed bus through the AIR COND-PWR 20-ampere circuit breaker. The power for the system control is supplied by from the right single feed bus through the AIR COND-CONT 3-ampere circuit breaker. Both the breakers are located on the copilot circuit breaker panel.