C-141 ENVIRONMENTAL SYSTEMS

HOME STUDY BOOKLET

443d TECHNICAL TRAINING SQUADRON

443d MILITARY AIRLIFT WING, TNG (MAC)

ALTUS AIR FORCE BASE, OKLAHOMA

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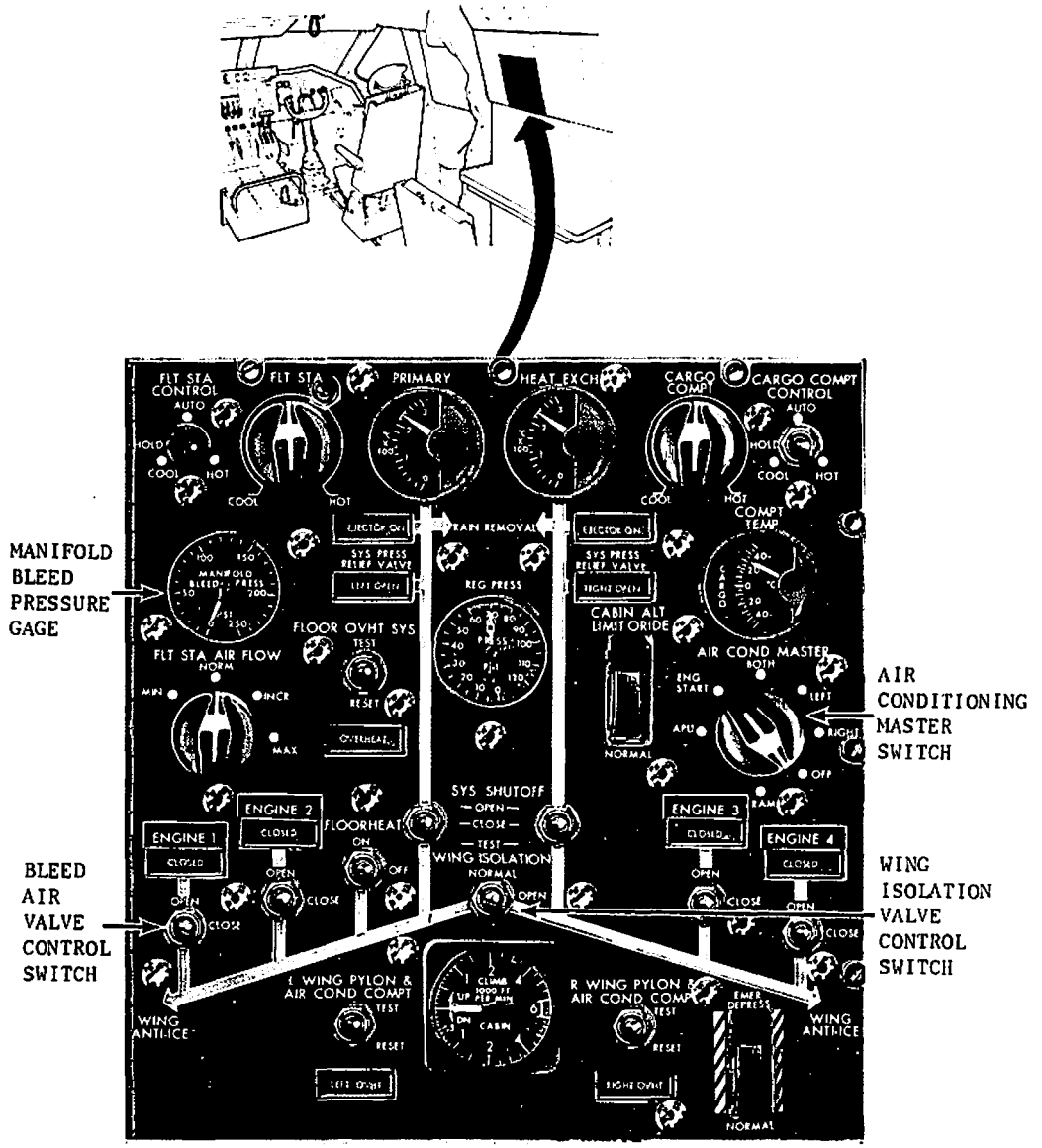
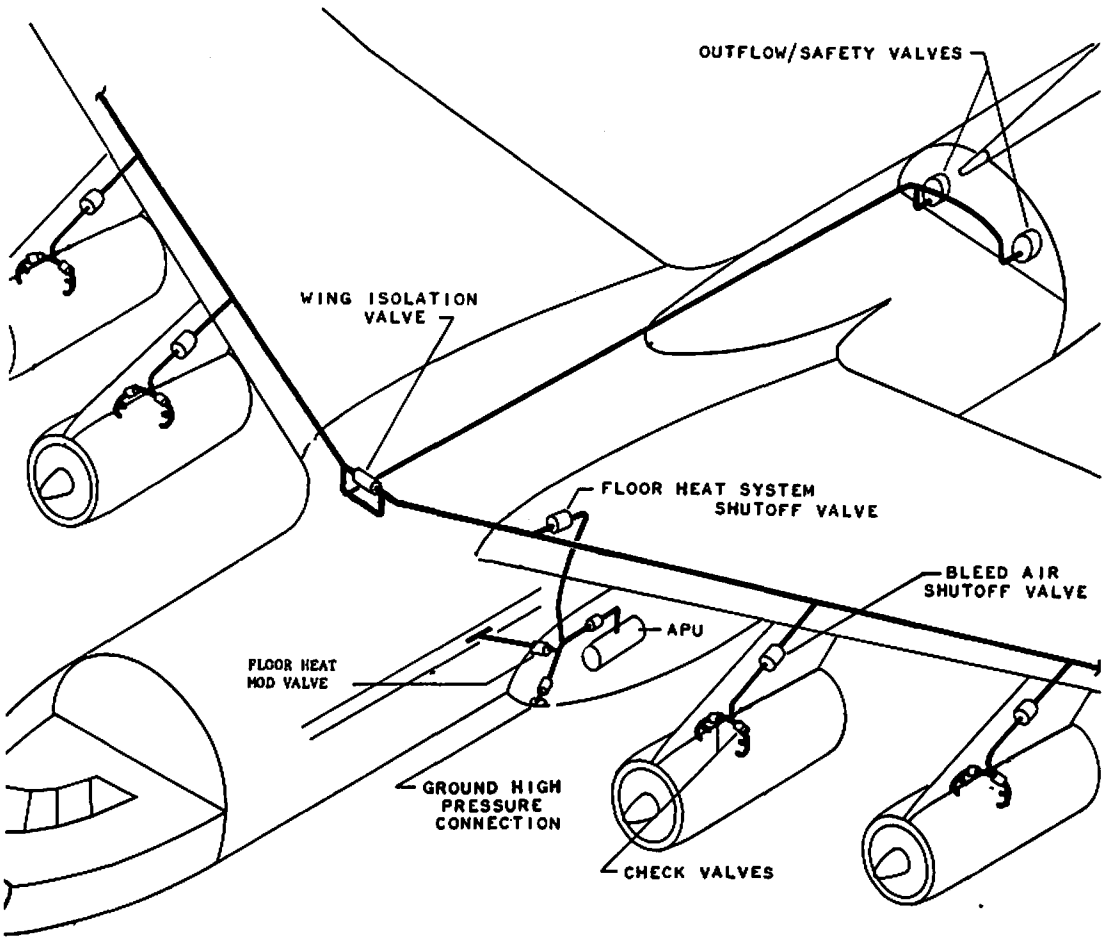


ENVIRONMENTAL CONTROL PANEL

BLEED AIR SYSTEM

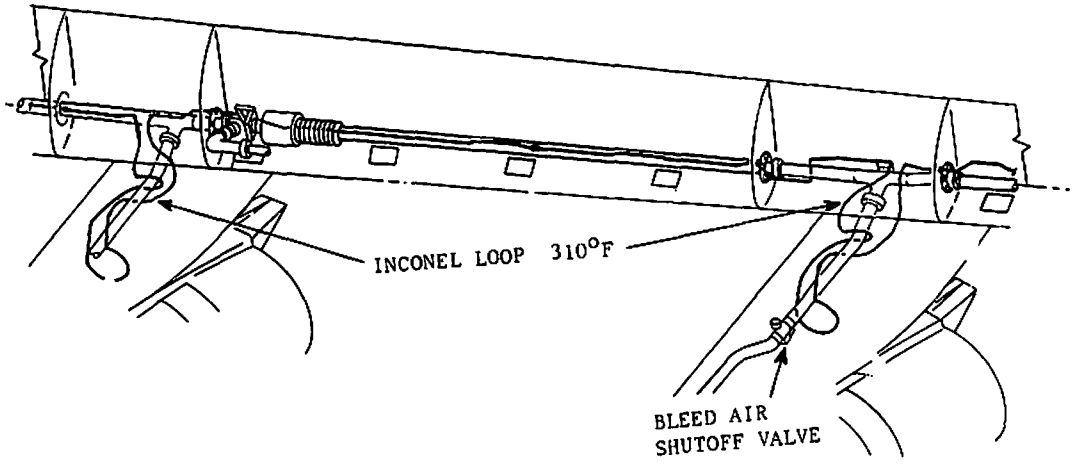
1. The high pressure bleed air manifold is a four (4) inch stainless steel line wrapped in
2. fiberglass. Air is fed into this manifold from the engines, APU or Ground Air Cart.
3. The air from the engines can be isolated from the manifold by the engine Bleed Air Shutoff
4. Valve. The Bleed Air Shutoff Valve isolates the respective engine from the manifold in case of
5. engine fire or wing overheat. These Bleed Air Shutoff Valves can be controlled individually by
6. switches on the engineer's Environmental Control Panel and the air conditioning master switch in
7. the APU position. The manifold is divided into two (2) sections, left and right, by the Wing
8. Isolation Valve located in the center wing fillet. The Wing Isolation Valve control switch is
9. located on the engineer's Environmental Control Panel. During normal operations, the Wing
10. Isolation Valve is closed. A Manifold Bleed Pressure gage is located on the engineer's
11. Environmental Control Panel. This instrument will indicate the highest pressure in either
12. manifold, left or right side, when the Wing Isolation Valve is "closed". (NOTE: Locate the
13. switches, the valves, and the gage on the panel shown on Page 1.)



BLEED AIR SYSTEM COMPONENTS

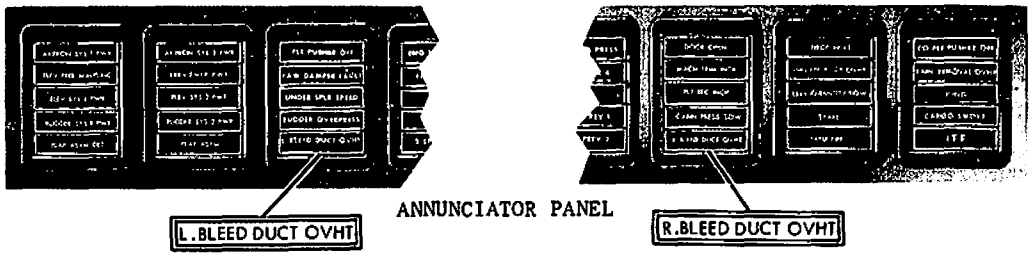
BLEED AIR MANIFOLD OVERHEAT SYSTEM

14. The Wing Manifold, Air Conditioning Packs and Pylon Lines down to the Bleed Air Shutoff Valves
15. have an overheat sensor called an Inconel Loop. One loop protects the left wing and one loop
16. protects the right wing. Should an overheat develop in either wing, it will automatically
17. close the Wing Isolation Valve, and both Bleed Air Shutoff Valves on the affected wing. Those
18. systems which require air for operation on the affected wing would now be inoperative.



19. This overheat condition will be indicated to the pilots by the two master CAUTION lights, and
20. a (L BLEED DUCT OVHT) or (R BLEED DUCT OVHT) light on the annunciator panel.

MASTER CAUTION LIGHT

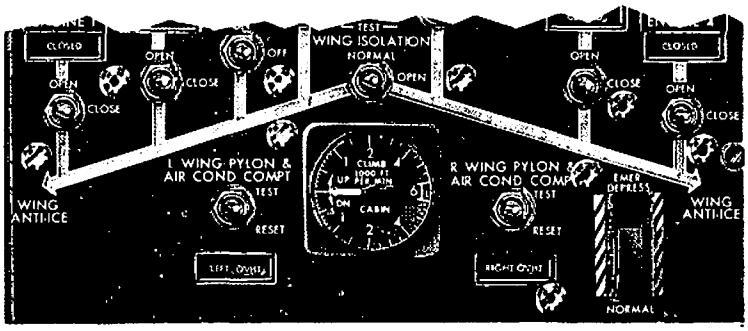


ANNUNCIATOR PANEL

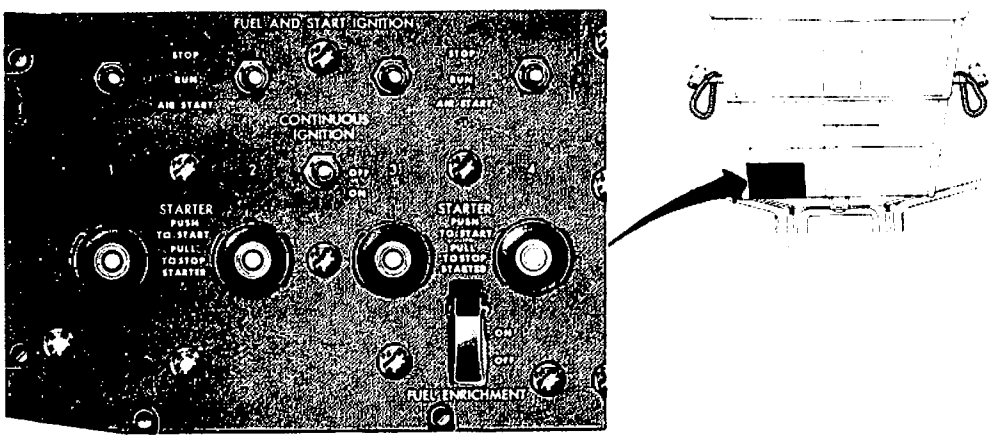
L. BLEED DUCT OVHT	Overheat condition in left wing leading edge or left air conditioning compartment.	Check with flight engineer.
R BLEED DUCT OVHT	Overheat condition in right wing leading edge or right air conditioning compartment.	Check with flight engineer.

21. The engineer's indication would be a left ovht or right ovht light on the environmental control
22. panel. When the overheat condition no longer exist the overheat lights would extinguish, but
23. the valves would remain closed until reset by the engineer.

LIGHTS



24. The overheat system is overridden if any Engine Starter Button is depressed. The Bleed Valves
25. and Wing Isolation Valve (will not close) in the system during engine start if a starter button
26. is depressed. After the starter button pops out, the valves will close.



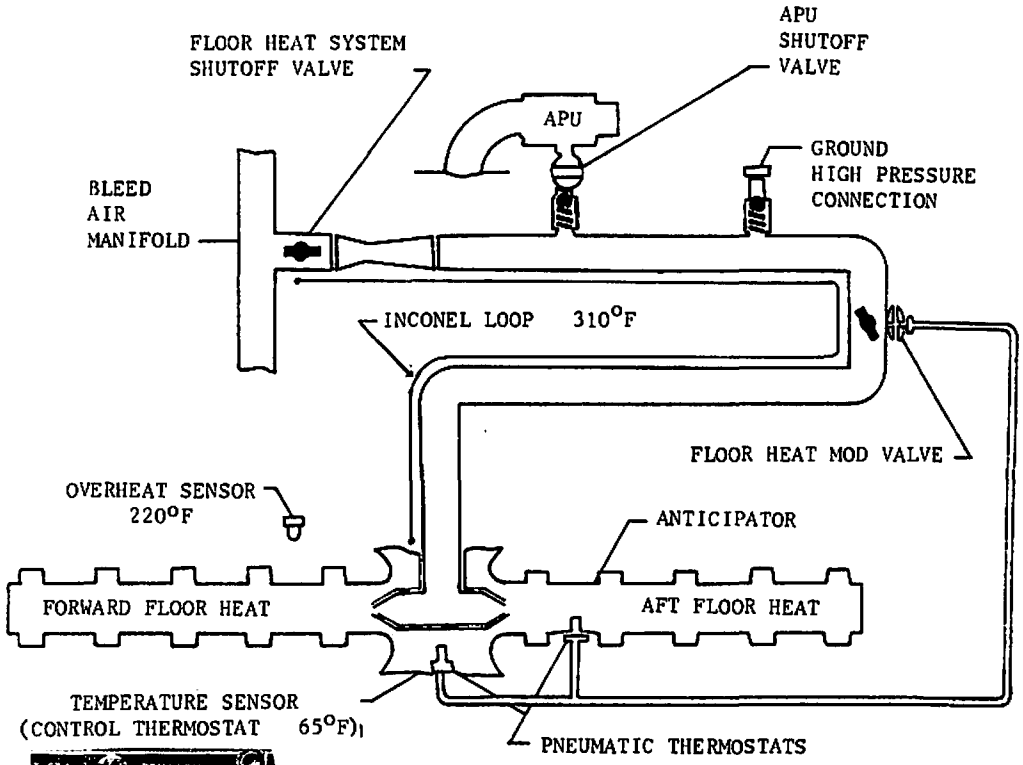
START PANEL

FLOOR HEAT SYSTEM

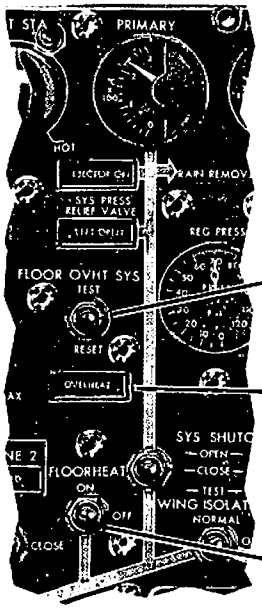
27. The APU air or external air is fed into a segment of the manifold which is located in the left
28. wheel well pod. This air line extends into the aircraft to supply air for the floor heat and
29. upward to the bleed air manifold. A valve is installed in the wheel well pod to modulate the
30. air flow to the floor heat system. The Floor Heat Modulating Valve is controlled by the floor
31. heat switch on the engineer's panel. The Floor Heat Shutoff Valve is installed in the left wing
32. leading edge; it isolates the air flow to the floor heat modulating valve or air flow from the
33. APU to the bleed air manifold. The switch which controls the Floor Heat Modulating Valve will
34. also OPEN or CLOSE the Floor Heat Shutoff Valve.

FLOOR HEAT OVERHEAT SYSTEM

35. An overheat sensor in the floor heat distribution duct or an Inconel Loop, mounted alongside
36. the plumbing will sense an overheat condition. Should an overheat develop and be sensed by
37. either system, it will close the Floor Heat Modulating Valve, Floor Heat Shutoff Valve and
38. will illuminate the Floor OVERHEAT light on the Environmental Control Panel. After the
39. temperature decreases, the overheat light will extinguish but the valves, will remain closed.
40. The system can be reset by placing the System Test Switch on the Environmental Control Panel to
41. Reset position.



FLOOR HEAT SYSTEM SCHEMATIC



FLOOR OVERHEAT SYSTEM SWITCH

CARGO COMPARTMENT FLOOR HEAT
SYSTEM OVERHEAT LIGHT

FLOOR HEAT SWITCH

BLEED AIR AND OVERHEAT QUIZ

1. List the three air sources which can be used to supply air to the Bleed Air Manifold? (Line 2)

2. The Bleed Air Shutoff Valves are located in the individual engine pylons. The purpose of the Bleed Air Shutoff Valve is to: (Line 4 & 5)

3. What is the purpose of the Wing Isolation Shutoff Valve? (Line 7-8)

4. What valve is used to isolate the floor heat system from the Bleed Air Manifold? (Line 29,30,31)

5. Should an overheat occur in the floor heat system, what valves will be driven closed? (Line 37)

   a.

   b.

6. The Bleed Air Manifold has a 310° overheat sensor. Which valves will automatically CLOSE in case of overheat in the left wing? (Line 16, 17, 18)

   a.

   b.

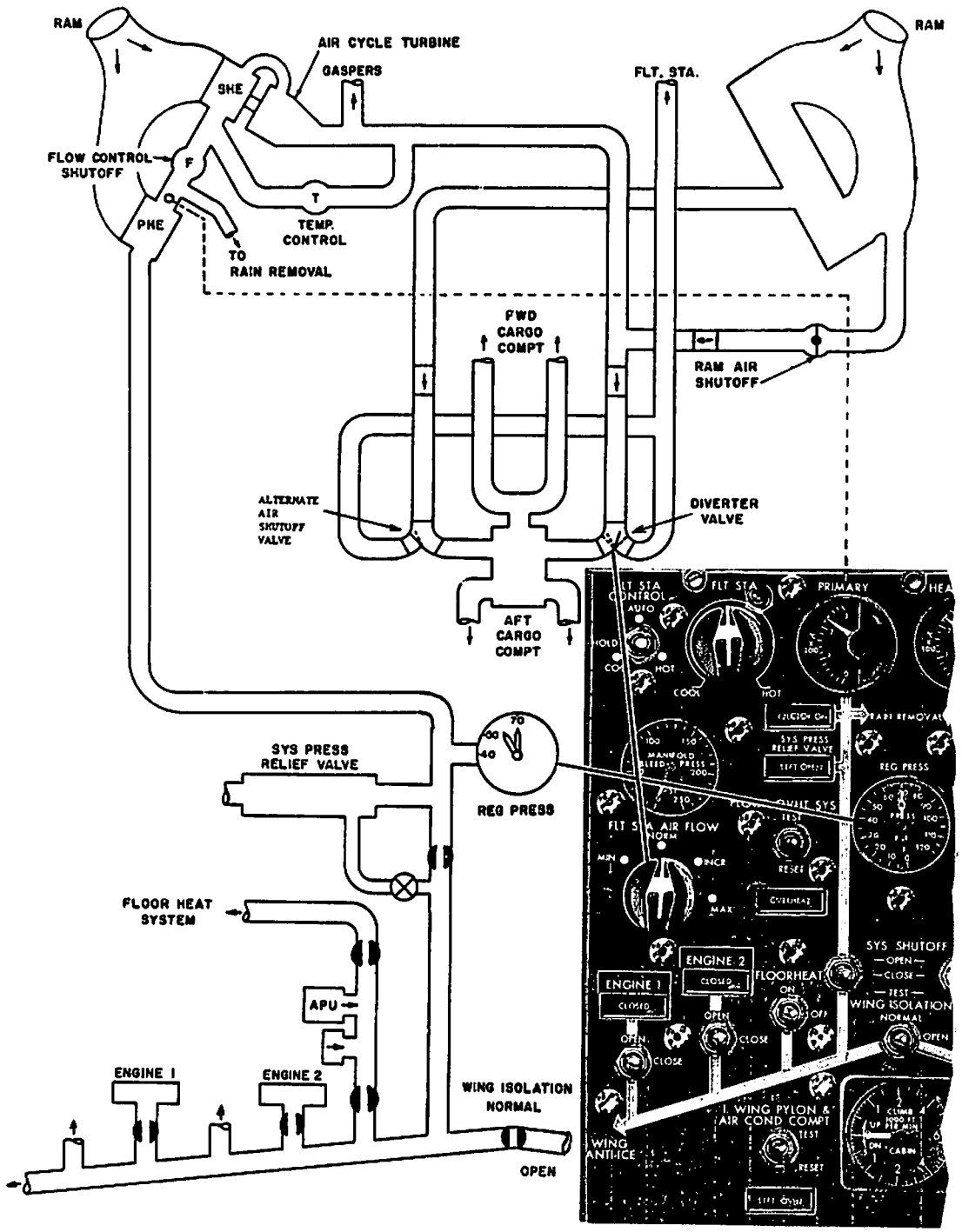
7. What warning will be indicated if an overheat should occur in either wing, pylon or air conditioning compartment? (Line 19, 20, 21)

   a.

   b.

   c.

8. If an overheat condition occurs, will the Engine Bleed Air SOV and Wing Isolation Valves close during engine start with the starter button depressed. (Line 25)

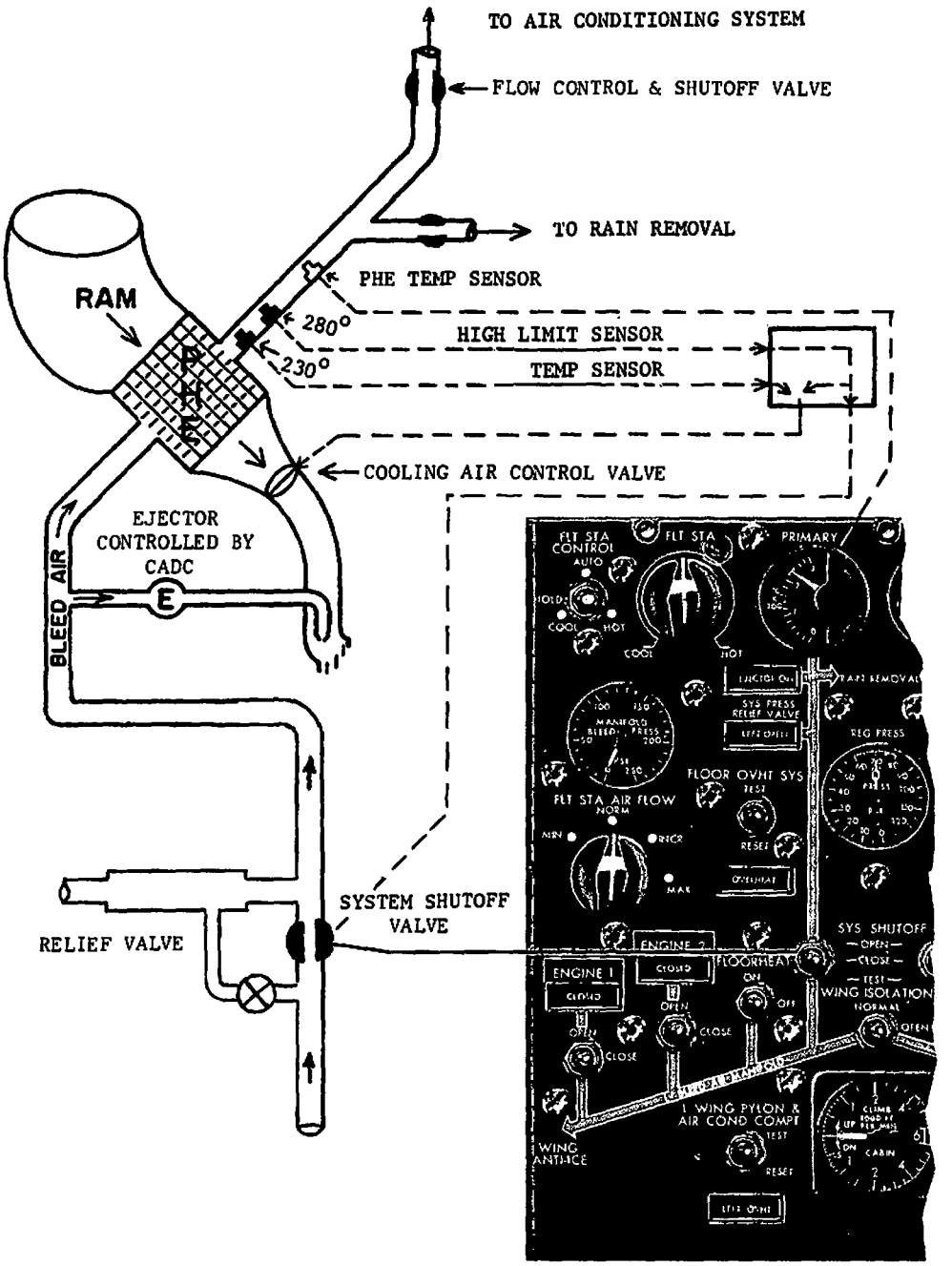


AIR CONDITIONING SYSTEM SCHEMATIC

AIR CONDITIONING SYSTEM

1. Air from the bleed air manifold is fed into the two air conditioning systems through the System
2. Air Pressure Regulating and Shutoff Valves. The left air conditioning system normally supplies
3. air to the flight station and the right system supplies air to the cargo compartment. The System
4. Air Pressure Regulating and Shutoff Valves are controlled by System Shutoff Switches on the

Environmental Control Panel or the air conditioning master switch. They regulate system pressure to 70 psi. Should the System Shutoff Valves be unable to regulate the desired pressure, a System Relief Valve will insure that the pressure will not exceed 90 to 115 psi by relieving excess pressure overboard. A dual indicator located in the center of the Environmental Control Panel will indicate system pressure downstream of the System Shutoff Valves. Engine bleed air could be as high as 420°C which is too hot for the various systems to be operated, so it must be cooled. The cooling is initially done in the Primary Heat Exchanger where the bleed air is cooled to a maximum temperature of 230°C. The 230°C air is now available to be used for Rain Removal and Air Conditioning. Located downstream from the Primary Heat Exchanger is a high limit temperature sensor. It will sense an overheat of 280°C and cut power to the System Shutoff Valve which will close until the temperature drops below 280°C. The next unit in the Air Conditioning System is called the Flow Control and Shutoff Valve. The Flow Control and Shutoff Valve serves as a Shutoff Valve between the Primary Heat Exchanger and the Secondary Heat Exchanger. The Flow Control and Shutoff Valve is normally controlled by the Air Conditioning Master Switch. However, the Flow Control and Shutoff Valves are also powered to the "CLOSED" position by either Emergency DE-Pressurization Switches or a Secondary Heat Exchanger overheat of 100°C.

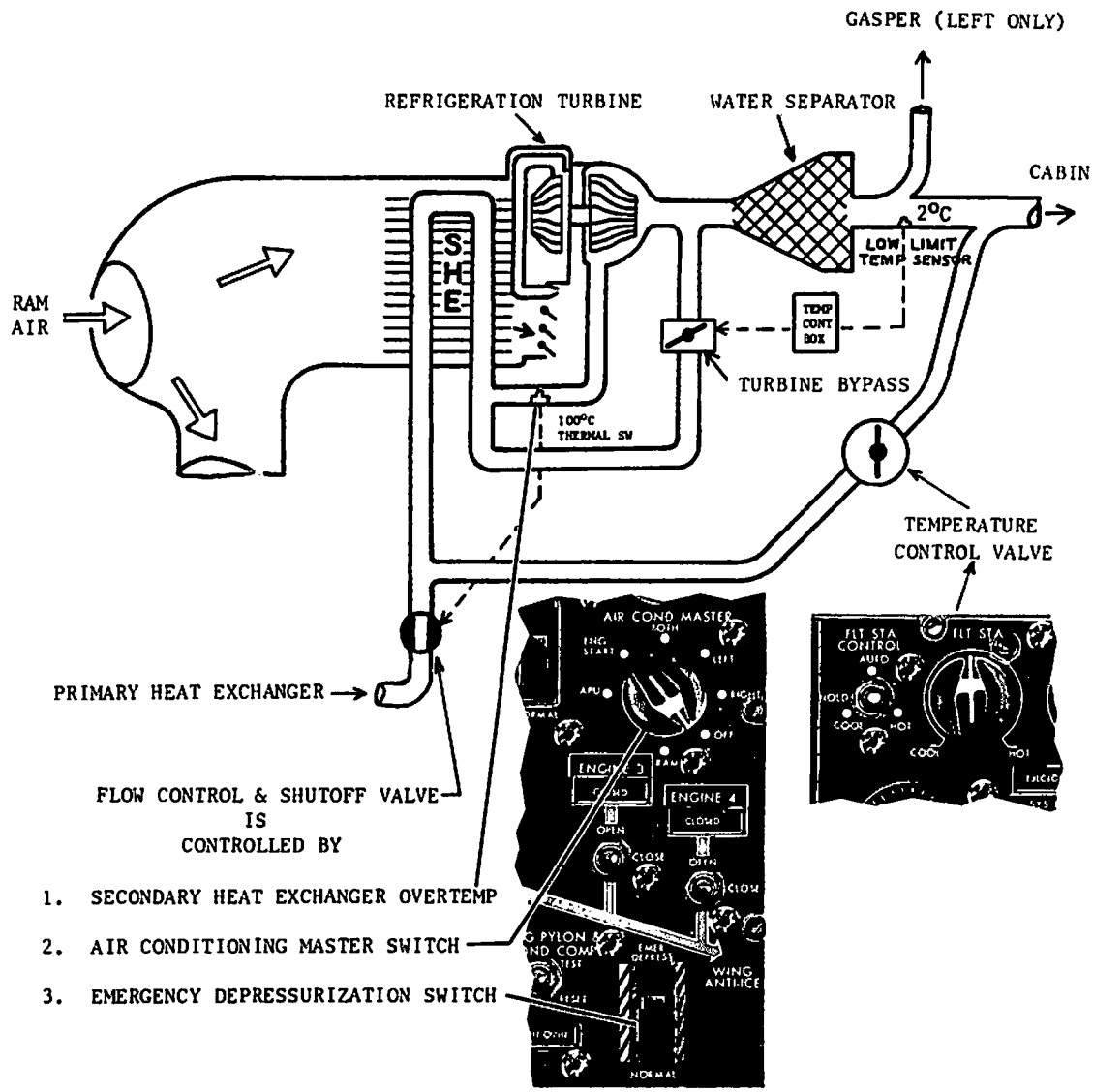


PRIMARY HEAT EXCHANGER SCHEMATIC

22. The Refrigeration System cools the air to a low temperature 2°C, then automatically mixes the

23. 2°C and the 230°C air to obtain the desired results as selected by the Temperature Control Switch.

SECONDARY HEAT EXCHANGER SCHEMATIC



AIR CONDITIONING QUIZ

1. The Air Conditioning System has two (2) System Air Pressure Regulating and Shutoff Valves. What are the two (2) functions of these valves? (Line 5 & 6)

   a.

   b.

2. The System Relief Valve is located downstream from the System Air Pressure Regulating and Shutoff Valve. What is the purpose of this System Relief Valve? (Line 7 & 8)

3. After the air leaves the Primary Heat Exchanger, it is cooled to 230°C, and used to feed what two systems? (Line 12 & 13)

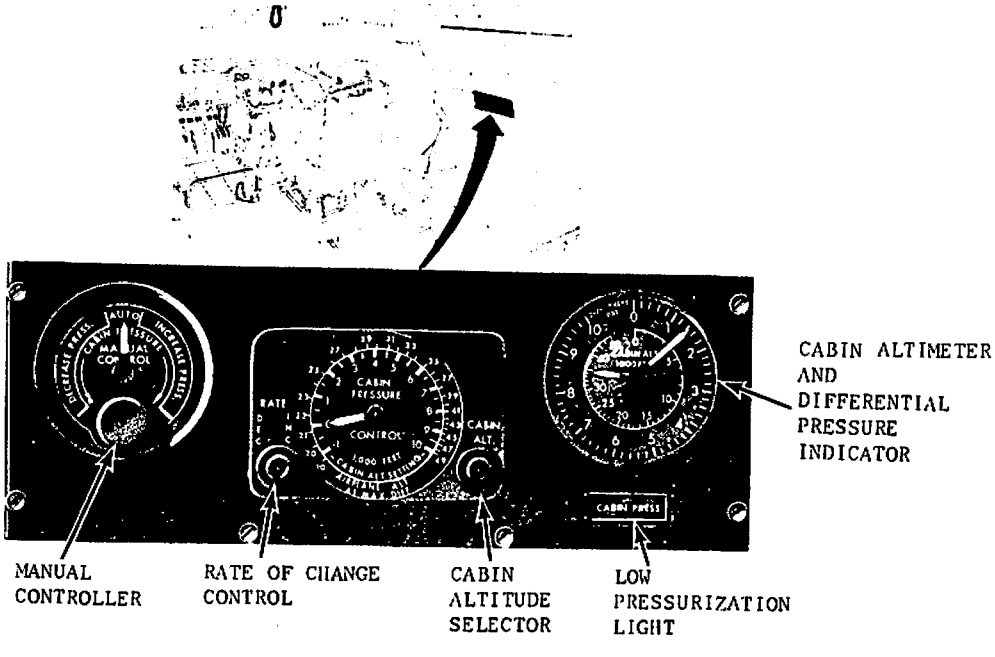
   a.

   b.

4. An overheat condition (280°C) in the primary heat exchanger will close what valve? (Line 14 & 15)

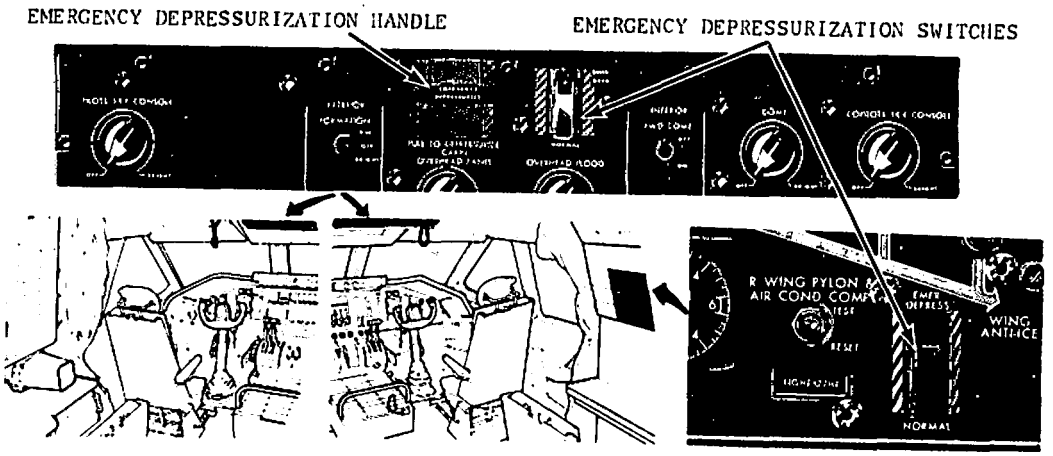
PRESSURIZATION SYSTEM

1. The pressurization system is quite simple and is controlled from the flight engineer position.
2. Pressurization is maintained by controlling the outflow of surplus cabin air. The Outflow Safety
3. Valves located in the Aft Hay Loft area will regulate the amount of outflow air. The engineer is
4. able to automatically or manually control the operation of the Outflow Safety Valves. Cabin
5. pressure is normally controlled automatically by the cabin pressure controller located on the
6. lower center portion of the Environmental Control Panel (Locate on panel). The system permits
7. the operator to select desired cabin altitude and rate it changes. A cabin altitude section knob
8. permits altitude selections of from -1000 to 10,000 feet. A pointer on the face of the automatic
9. controller display the selected cabin altitude and corresponding aircraft altitude at maximum
10. differential pressure (locate on panel). A rate adjustment knob permits a rate-of-change of 200
11. to 2000 feet per minute (locate on panel). Located to the left of the automatic controller is a
12. Manual Controller used to override the automatic controller (locate on panel). To protect the
13. aircraft structure from excessive differential pressures, a limiting device is built into the
14. controller which automatically limits differential pressure to 8.3 psi.



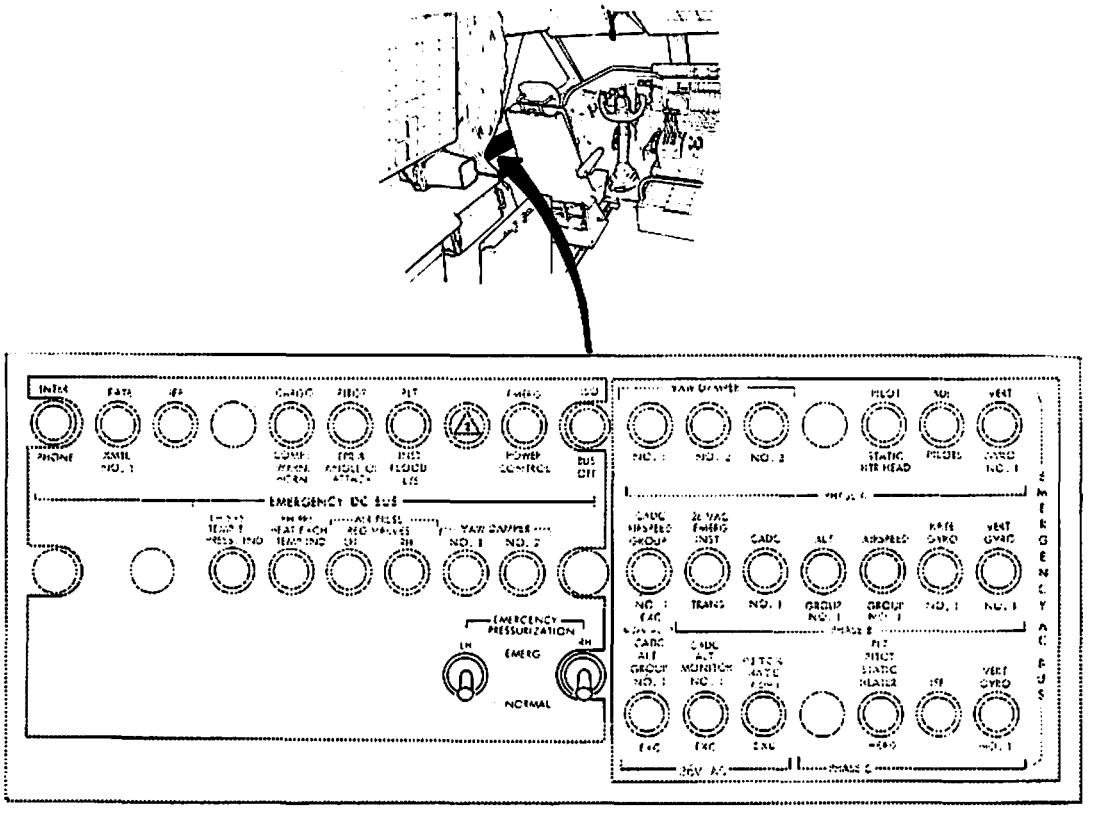
FLIGHT ENGINEER'S PRESSURIZATION SYSTEM CONTROLS

15. Two red-guarded Emerg Depress Switches are provided for use if it becomes necessary to depressur-
16. ize the aircraft rapidly. One switch is located on the pilot's overhead control panel. The other
17. switch is located on the lower right corner of the environment control panel. (Locate on panels)



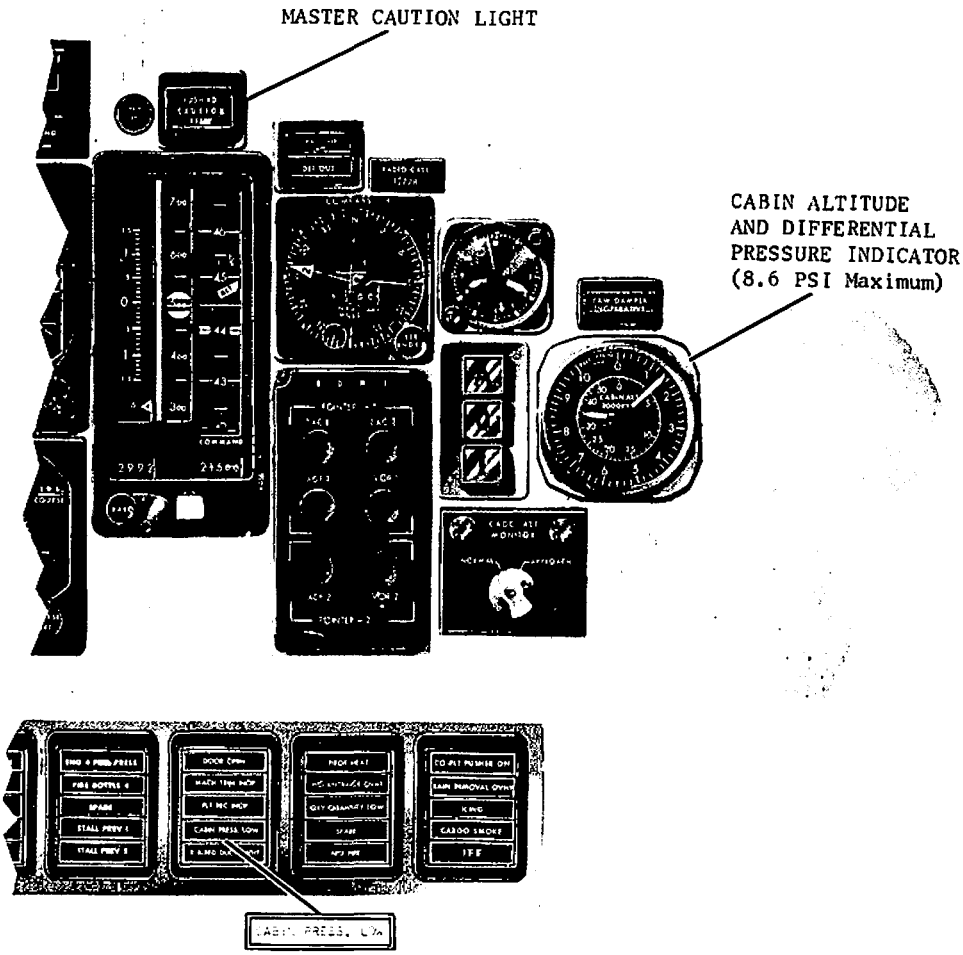
18. Both switches are wired in parallel so that emergency depressurization is accomplished if either
19. switch is actuated. Depressurization time from maximum differential pressure is about 90 seconds.
20. It is accomplished by cutting off all airflow into the aircraft by closing both the Left and
21. Right Flow Control and Shutoff Valves and Floor Heat Modulating Valve, at the same time it opens
22. both Outflow Safety Valves, and overrides the Cabin Limit feature of the Outflow Safety Valves.
23. Manual Depressurization is accomplished by pulling a Red "T" Handle located on the pilot's over-
24. head control panel. (Locate on panel). This handle through a cable linkage will unlatch the
25. Number 2 escape hatch. When the hatch is opened, the aircraft depressurizes in approximately
26. 15 seconds.

27. If at any time, electrical power is lost to the System Air Pressure Regulating and Shutoff
28. Valves, they will "Close" which will affect pressurization. Pressurization can be restored by
29. two Emergency Pressurization switches located on the emergency circuit breaker panel. (Locate
30. on panel). Positioning these two switches to the emergency position will insure pressurization
31. by providing emergency electrical power to open the System Air Pressure Regulating and Shutoff
32. Valve.



EMERGENCY POWER CIRCUIT BREAKER PANEL

33. Two Cabin Altitude and Differential Pressure Indicators are provided to indicate the respective
34. cabin altitude and differential pressure. One is located on the copilot's instrument panel and
35. the other on the lower right side of the environmental control panel. (Locate the one indicato
36. on panel below).



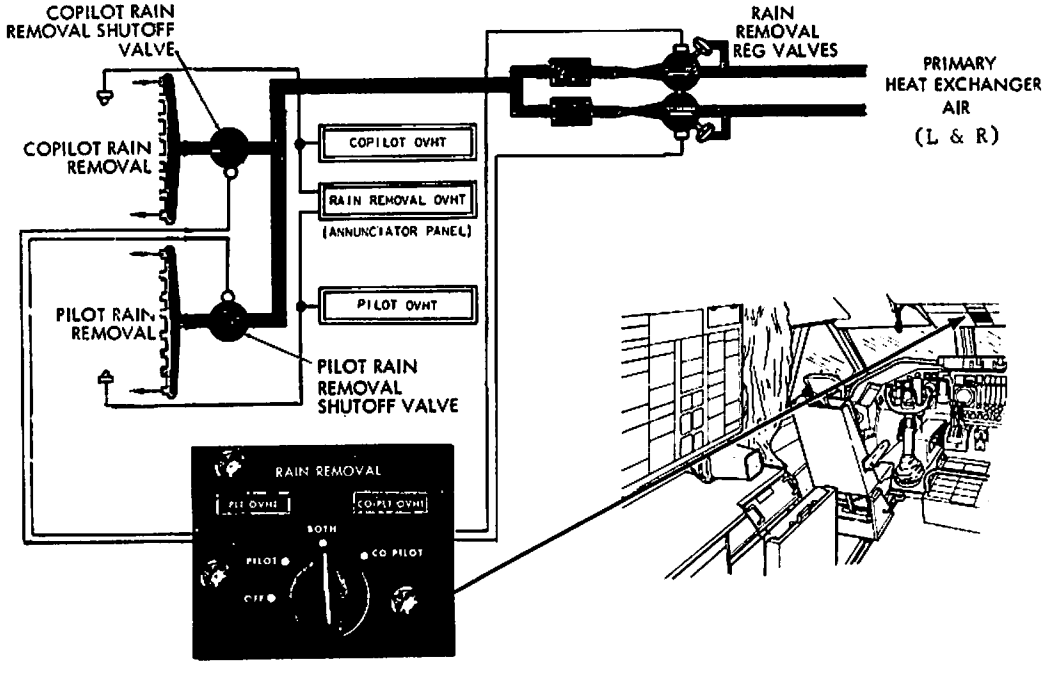
CABIN PRESS LOW	Cabin press above 10,000 ft. ±1000 equiv.	Decrease altitude or prepare to use oxygen mask.

37. Two Cabin Pressure Low warning lights are provided to warn the crew whenever cabin altitude
38. exceeds 10,000 feet. One light is located next to the automatic pressure controller. The
39. other light is included on the pilot's annunciator panel. (Locate on panel above).

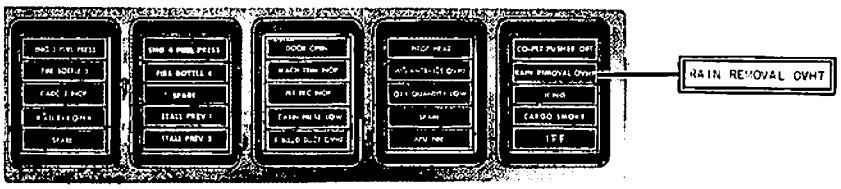
RAIN REMOVAL SYSTEM

40. The aircraft is equipped with a jet blast rain removal system. The pilot's and copilot's
41. windshields are cleared by high-temperature, high velocity air supplied through slot-type
42. nozzles at the base of the windshields. Bleed air is supplied from the output of the primary
43. heat exchangers, which would be at a temperature of approximately 230°C and a pressure of 70
44. psi. Pressure is further regulated by the Rain Removal Pressure Regulator and Shutoff Valves.
45. These valves will regulate the pressure for the rain removal system to 15 PSIG. From the
46. regulating valves a single line runs forward to the flight station where the line separates to
47. two Rain Removal Shutoff Valves. These valves provide rain removal for the pilot's and copilot's.
48. windshields separately or together. The system is controlled by a Rain Removal Selector
49. Switch located on the pilot's overhead control panel.

(NOTE: When rain removal is selected, windshield heat is removed from that windshield).



50. Should an overheat occur on either windshield during rain removal operation, it will illuminate
51. both master caution lights and a Rain Removal Ovht light on the annunciator panel. The system
52. will not automatically shut itself down, so the pilot must take corrective action. (See below)



RAIN REMOVAL OVHT	Windshield temperature has reached 71°C.	Turn system off or manually cycle the system.

CAUTION

The windshield rain removal system should be operated only momentarily on a dry windshield. Failure to observe this can result in overheat damage.

RAIN REMOVAL SYSTEMS QUIZ

1. What are the 4 positions of the Rain Removal Selector Switch? (Line 47 & 48)

   a.

   b.

   c.

   d.

2. What valves must be open to obtain Rain Removal? (Line 43, 44, 45 & 46)

   a.

   b.

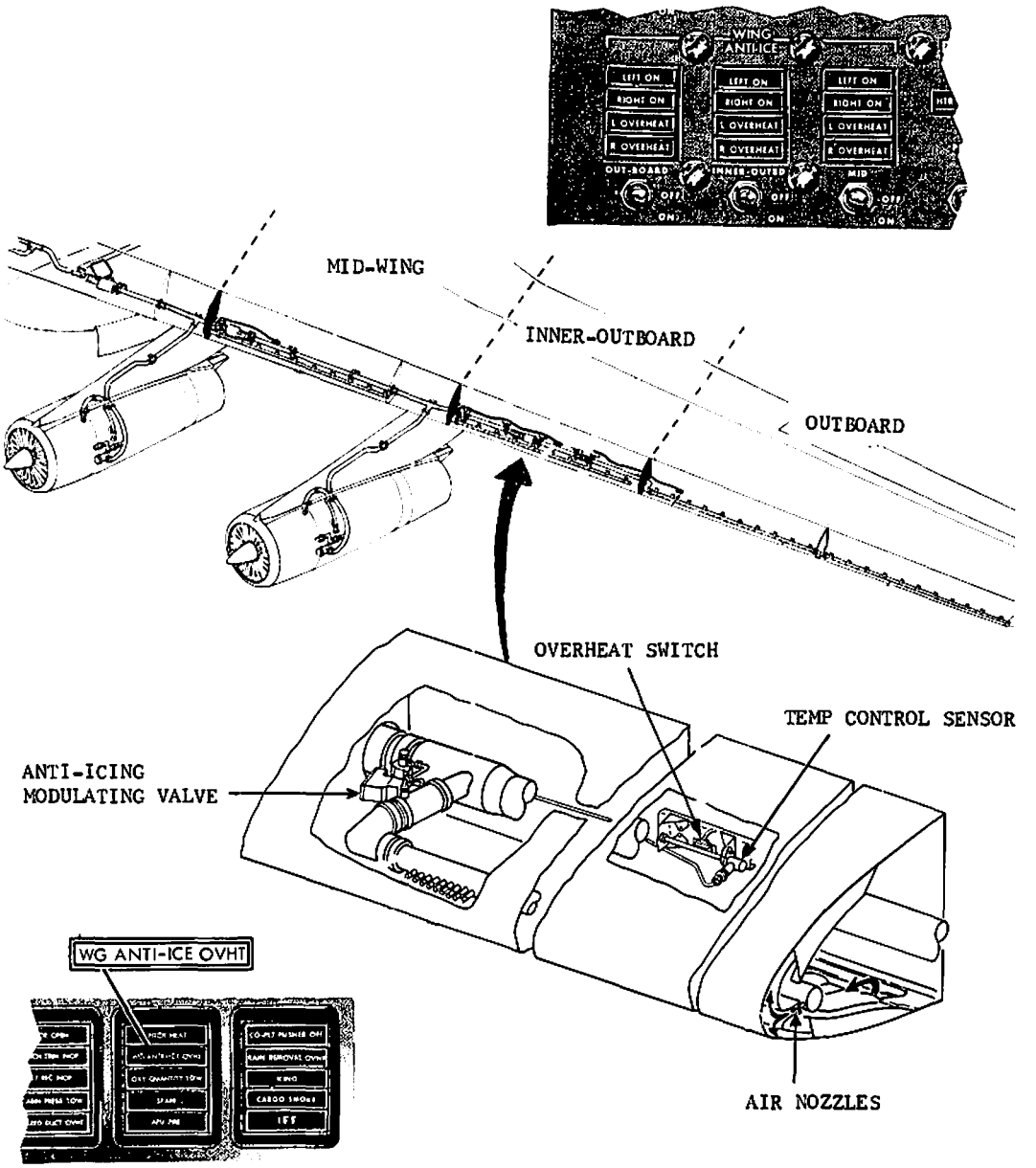
3. What warnings will be indicated should an overheat condition occur? (Line 49 & 50)

   a.

   b.

   c.

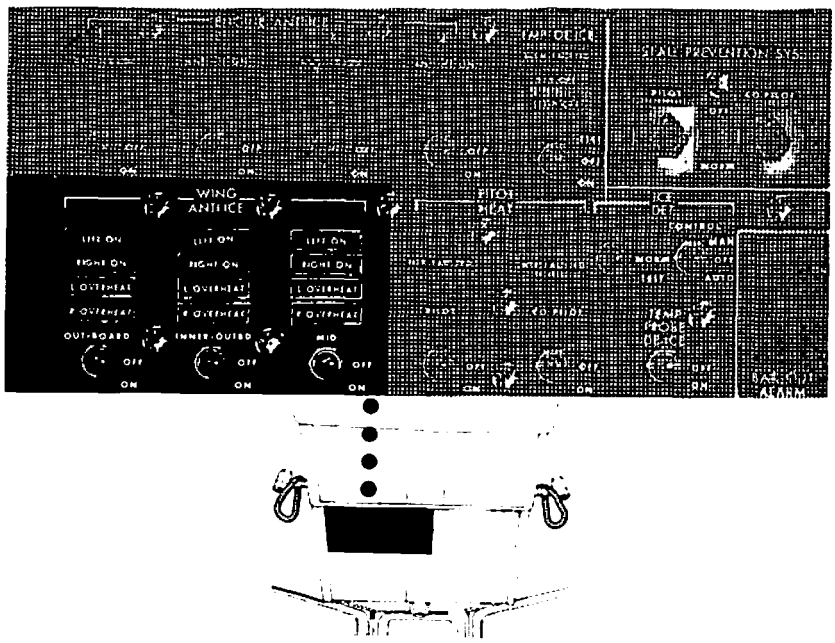
4. What is the corrective action for a rain removal overheat indication. (Line 50 & 51)



WG ANTI-ICE OVHT	Overheat condition in either wing leading edge.	Shut down wing anti-ice. If icing becomes heavy, turn on WING ANTI-ICE or change altitude to avoid ice.

WING ANTI-ICE SYSTEM

1. The wings are protected by a evaporative anti-icing system which uses CROSS WING MANIFOLD bleed
2. air as the primary heat source. Basically the system heats by circulating a mixture of bleed air
3. and leading edge plenum air through the double-skin area of the wing leading edge. The system is
4. divided into three (3) sections on each wing. These sections are called Mid, Inner Outboard and
5. Outboard. The Mid section is located between the engine pylons; the Inner Outboard section is
6. immediately outboard of the outboard pylon; and the Outboard section is nearest the wing tip.
7. (Locate on drawing). Air is controlled by three Wing Anti-Icing Modulating Valves in each wing.
8. The controls for the Wing Anti-Ice System are located on the pilot's overhead control panel.
9. There is one switch which controls the Mid Wing Modulating Valve on both the right and left wing,
10. one switch for both Inner Outboard Sections and one switch for both Outboard Section. There are
11. four lights just above each switch. When the valves are open, two (2) green lights will come ON
12. above each switch. In case of an overheat, in any wing section both master caution lights and a
13. Wing Anti-Ice Ovht annunciator light will illuminate. Plus an overheat light on the overhead
14. panel for the respective section. This system does not have an automatic shutdown feature,
15. therefore, the section must be shut down by the pilot with the respective switch.
16. RESTRICTIONS: Do not use in dry air. If a valve fails to OPEN, turn the switch OFF to keep
17. symmetrical anti-icing on the wings. Ground Testing is limited to 30 seconds.



WING ANTI-ICE SYSTEM QUIZ

1. What is the air source for the Wing Anti-Ice System? (Line 2)

2. List the 3 areas which are anti-iced on the wing. (Line 3, 4, 5)

   a.

   b.

   c.

3. What valves are armed to open, when the mid wing selection switch is placed to the ON position? (Line 9)

   a.

   b.

4. How can you tell if one valve on the wing does not open? (Line 11 & 12)

5. What would be the indications if a wing section overheats? (Line 12, 13 & 14)

   a.

   b.

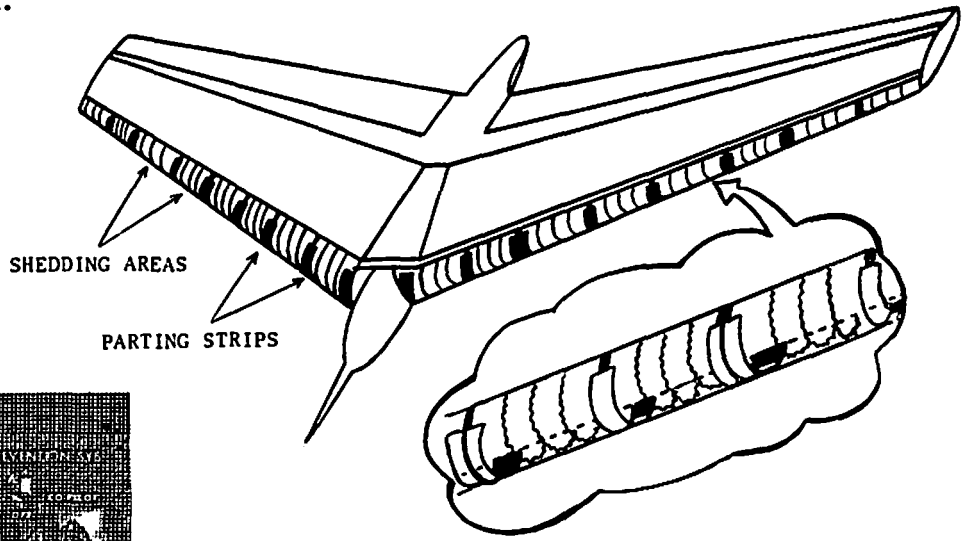
   c.

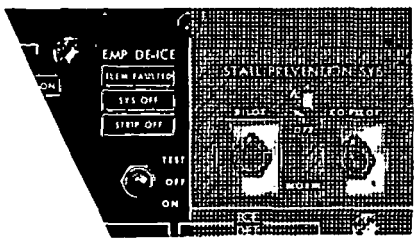
6. What is the corrective action in case of overheat in a wing area? (Line 14)

7. What action is required if the mid wing valve on the right wing fails to open? (Line 16 & 17)

EMPENNAGE DEICING

1. Empennage deicing is accomplished by electrical heating elements embedded in the fiberglass lead-
2. ing edge of the horizontal stabilizer. The leading edge is divided into 8 sections. Each section
3. has 2 Shedding Areas and 3 Parting Strips. Each shedding area is separated by parting strip
4. heaters. The system is controlled by the Empennage Deice Control Switch located on the pilot's
5. overhead control panel.





6. Deicing is accomplished by applying continuous power to the parting strip heaters or until a
7. temperature of 32°C is reached. The shedding areas are heated individually in symmetrical
8. sequence. The cycle begins with the No. 1 shedding area with each area heated for a maximum of
9. 15 seconds or until a temperature of 32°C is reached. The controller which automatically
10. controls and monitors the system is mounted about half-way up inside the vertical stabilizer.
11. When the Empennage Deice Control Switch is placed to ON with the aircraft in the air and an air
12. temperature between -29°C to +32°C the controller closes the circuit to continuously heat the
13. parting strips and applies power in the proper sequence to each of the 16 shedding areas. If
14. the entire deicing cycle is completed in less than three (3) minutes, a built-in delay prevents
15. the next cycle from starting until a three (3) minute interval has elapsed.
16. You should remember the switch positions and the normal indications of the lights during ground
17. operation, flight oeprations, system malfunctions, and flight test operations. When the switch
18. is placed in the TEST position on the ground, you should have 16 flashes of the SYSTEM OFF light,
19. and the STRIP OFF light should be illuminated steadily. In flight, during normal operation, all
20. lights should be extinguished. The SYSTEM OFF light will illuminate if the System Controller is

inoperative with the control switch ON. The ELEM FAULTED light will illuminate to indicate an overload or open circuit in a shedding area as that area is heated. The STRIP OFF light will be illuminated at any time the parting strip is overheated, power has failed, or a circuit breaker on the controller is opened.

LIMITATIONS: If the STRIP OFF light fails to illuminate on the ground, it will indicate that heat is being applied to the parting strip, due to a possible failure of the touchdown relay. If this should happen, PULL the Empennage De-ice Power Circuit breakers on the #1 C/B Panel.

Do not operate the Empennage Deice System in dry air during flight for more than one test cycle.

EMPENNAGE DEICE SYSTEM QUIZ

1. List the two (2) types of heating elements which are used to deice the empennage. (line 2 & 3)

   a.

   b.

2. System control switch and lights are located on the: (Line 4 & 5)

3. Should the ELEM FAULTED light illuminate in flight, list the malfunctions which could cause this to happen. (Line 20 & 21)

   a.

   b.

4. In case of a system overheat or malfunction, the annunciator and master CAUTION lights will illuminate.

   a. True

   b. False

REVIEW NOTES TO AID YOU IN CLASSROOM NOTETAKING

Bleed Air System

- Three air sources
    - APU
    - External air
    - Engines
- Components
    - APU bleed load and flow control valve
        - Purpose: To control air from APU
        - Type: Solenoid operated energized open
    - Floor heat shutoff valve
        - Controls air to and from left bleed air manifold
        - Motor operated normally controlled by floor heat switch
        - Overridden open
            - Air Conditioning Master Switch in APU or ENG START
            - Manually
        - Overridden closed
            - Floor overheat
            - Manually
    - Cross-wing manifold
        - Supplies air to operate environmental systems
    - Wing Isolation Valve
        - Separates left and right bleed air manifolds
        - Motor operated normally controlled by wing isolation switch
        - Overridden open
            - Air Conditioning Master Switch in APU or ENG START
            - Manually
        - Overridden closed
            - Respective wing pylon and air conditioning compartment overheat (except with a starter button depressed)
            - Manually

- Manifold Bleed Air Pressure Indicator
    - Indicates highest pressure in either manifold
- Engine Bleed Air Shutoff Valves
    - Isolates engine from manifold
    - Motor operated normally controlled by Bleed Air Shutoff Switches
    - Overridden closed
        - Air Conditioning Master Switch in APU
        - Respective wing pylon and air conditioning compartment overheat (except with a starter button depressed)
        - Engine Fire Emergency Control Handle
- Overheat Detection Loop
    - Provides a warning and automatically isolates entire area where the overheat condition occurs
    - 310°F
    - Automatically closes wing isolation valve and both bleed valves for respective side

Air Conditioning System

- System Air Pressure Regulator and Shutoff Valve
    - Regulate bleed air to approximately 70 PSI
    - Solenoid controlled pneumatically operated (de-energized closed) normally controlled by system shutoff switches
    - Overridden closed
        - Air Conditioning Master Switch in ENG START or OFF
        - Primary heat exchanger overheat
    - Overridden open
        - Emergency Pressurization Switches
- System Pressure Relief Valve
    - Relieves pressure if regulator vlave fails
    - 90 - 115 PSI
- Primary Heat Exchanger
    - Cool bleed air to 230°C
- Cooling Air Control Valve
    - Regulate cooling ram air across primary heat exchanger
- Ejector assembly and shutoff valve
    - Used to induce cooling air flow across primary heat exchanger
    - Controlled by CADC .3 MACH

- Overridden closed
    - Air Conditioning Master Switch in APU
- Flow Control and Shutoff Valve
    - Provide a constant flow of air to secondary heat exchanger and serves as an air conditioning system shutoff valve
    - Solenoid controlled pneumatically operated (de-energized open) normally controlled by Air Conditioning Master Switch
    - Overridden closed
        - Emergency Depressurization Switches
        - Secondary heat exchanger overheat of 100°C
- Secondary Heat Exchanger
    - Cools air to 65°C
- Turbine
    - Cools air to below freezing
- Water Separator
    - Removes 55% of moisture
- Turbine By-Pass Valve
    - Prevents water separator from freezing
    - Controlled by 2°C low limit sensor
- Gasper Air
    - Provides cool air from left system to flight station
- Temperature Control System
    - Controls temperature inside the aircraft
    - Flight station and cargo compartment controls separate
- Distribution System
    - Left air conditioning unit for flight station
    - Right air conditioning unit for cargo compartment
    - 150° H limit sensors
        - Protect the distribution ducts from excessively high temperature during automatic or manual temperature control
    - Air Conditioning Diverter Valve
        - Diverts a portion of air from left pack to cargo compartment
        - Controlled by Flight Station Air Flow Selector Switch
    - Flight Station Alternate Air Shutoff Valve
        - Diverts 38% of air from right pack to flight station
        - Controlled by air conditioning master switch in RIGHT

Pressurization

- Normal 8.3 PSID
- Max 8.6 PSID

- Cabin Altitude and Differential Pressure Indicator
  - Indicates cabin altitude and differential pressure
  - Environmental control panel and copilot instrument panel
- Cabin Press Low Lights
  - Illuminates if cabin altitude exceeds 10,000 feet ± 1000 feet
  - Warning Lights
- Cabin Rate of Climb Indicator
  - Measures in feet per minute pressure changes in the cabin
  - Environmental control panel
- Manual Controller
  - Provides manual control of pressurization or selection of auto controller
  - Environmental control panel
  - Positions
    1. Decrease Pressure
    2. Auto
    3. Increase Pressure
- Automatic Controller
  - Provides automatic control from -1000 to 10,000 feet cabin altitude
  - Provides rate changes of 200 to 2000 FPM
  - Limits differential pressure to 8.3 PSID
  - Environmental Control Panel
- Outflow Safety Valves
  - Controls outflow of cabin air
  - Limits cabin pressure to 8.6 PSID
  - Limits cabin altitude to approximately 13,000 ± 1500 feet.
  - Limits negative pressure to .4 PSID
- Cabin Altitude Limit Override SW
  - Provides a means of overriding the cabin altitude limit feature
  - Environmental control panel
- Emergency Depressurization Switches
  - Depressurize aircraft in approx 90 sec.
  - Pilots overhead control panel and environmental control panel

- Switches will
    1. Close both flow control & shutoff valves
    2. Close floorheat modulating valve
    3. Energizes both emergency depressurization solenoids

- Emergency Depressurization "T" handle
    - Manually depressurize aircraft in approx 15 sec by opening no. #2 hatch
    - Pilots overhead control panel

- Cabin Pressure Control Fan and Ventura
    - Prevents cabin from pressurizing by opening outflow safety valves
    - Aft pressure bulkhead

Floorheat System

- Provides an even temperature for the cargo compartment
- Floorheat shutoff valve
    1. In-flight isolates floor heat system from the left manifold
    2. Controlled by floorheat switch
- Floorheat modulating valve
    1. Controls the temperature in the floorheat system to 65°F
    2. Controlled by floorheat switch
- Distribution Ducting and ejector assy
    1. Mixes and distributes hot bleed air with under floor air
- Floor Overheat system
    1. Inconnel loop 310°F
    2. 220°F sensor
    3. Closes the floorheat shutoff and floorheat modulating valves

Rain Removal System

- Provides pilots with better visibility
- 230°C air
- Rain removal selector SW
    1. Controls rain removal regulator valves and rain removal shutoff valves
    2. Pilots overhead control panel
- Rain removal regulator valves
    1. Regulate 230°C air to 15 PSIG
- Rain removal shutoff valves
    1. Direct air to selected wind shield
- Rain removal overheat system

1. 71°C sensor
2. Warning lights
3. Will not automatically shut system down

- Testing System
  1. Momentarily on a dry windshield

Wing Anti-Icing System

- Anti-Ice three sections on each wing
  1. Mid
  2. Inner outbd
  3. Outbd
- Manifold bleed air
- Wing Anti-Ice Control Switches
  1. Turns system on or off
  2. Pilots overhead control panel
  3. Each switch controls two modulating valves
- Wing Anti-Ice Modulating and Shutoff Valves
  1. Controls temperature to heated sections
- Wing Anti-Ice Overheat System
  1. Sensors
  2. Warning lights
  3. Will not automatically shutdown system
- Ground Testing
  1. 30 seconds

Empennage De-Ice System

- Electrically De-Ices the leading edge of the Horizontal stabilizer
- Eight sections
  1. Sixteen shedding areas
  2. Twenty-four parting strips

- Control Switch
  - Pilots overhead control panel
- Operation
  - In-flight only (touchdown relay)
  - After entering icing conditions
  - Temperature controlled (-29°C to +32°C)

- Empennage De-Ice controller
    - Provides heat to shredding areas and parting strips
- Warning lights
    - Element fault
        1. Bad shredding area (Test Syst)
    - System OFF
        1. Bad system, controller has stopped
    - Strip off
        1. One or more faulted parting strips
        2. Parting strip C/B open
        3. Overheat of one or more parting strips
- Preflight System
    - Strip OFF light
    - 16 flashes of system off
    - Procedure if strip off light does not illuminate
- Dry Air Operation

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