

## CIRCUIT BREAKERS

Push-to-reset, pull-off type circuit breakers, with the amperage rating marked on each breaker, are installed in panels located on both sides of the cockpit. The panels are readily accessible to the flight crew during flight. The panels shown are typical installations for the Excel.

Additional circuit breakers to which flight crew access is not essential, are located in the tailcone junction boxes.

## ANTI-ICE/DEICE SYSTEMS

The airplane utilizes a combination of engine bleed air, electrical heating elements and pneumatic boots to accomplish anti-ice/deice functions. The anti-ice system consists of bleed air heated engine inlets, wing leading edges, and fan spinner and stators. Electric heating elements are used for pitot tubes, static ports, a true airspeed (TAS) probe and an angle-of-attack probe. The horizontal stabilizer is deiced by pneumatic boots. Windshield anti-ice is provided by electrical heating.

All anti-ice systems should be turned on when operating in visible moisture and the indicated RAT is  $+10^{\circ}\text{C}$  or below.

### NOTE

- Icing conditions exist when the indicated RAT on the ground and for takeoff is  $+10^{\circ}\text{C}$  or below; the indicated RAT in flight is  $+10^{\circ}\text{C}$  or below; and visible moisture in any form is present (such as clouds, fog with visibility of one mile or less, rain, snow, sleet or ice crystals.)
- Icing conditions also exist when the indicated RAT on the ground and for takeoff is  $+10^{\circ}\text{C}$  or below when operating on ramps, taxiways or runways where snow, ice, standing water, or slush may be ingested by the engines or freeze on engine nacelles or engine sensor probes.

## ENGINE AND WING ANTI-ICE SYSTEM

Bleed air flows continuously through the fan spinner whether the anti-ice system is activated or not. When the wing/engine anti-ice switches (one for each engine) are positioned to ENGINE ON, bleed air flows through the applicable engine inlet and engine stators. If sufficient bleed air flow is not available to maintain the proper wing temperature, the wing anti-ice annunciator will illuminate. The light may be extinguished by increasing engine RPM. Operation of the system may be checked by observing engine ITT rise when the engine anti-ice is turned on. If the check is made on the ground, it may require up to two minutes to extinguish the wing anti-ice light with  $N_1$  set at approximately 70%. Maximum engine power setting values are reduced when using anti-ice, as shown in Section IV. Loss of electrical power to the valve supplying flow to the inlets results in the valve opening; thus, assuring anti-ice capability. The WING XFLOW switch is designed to provide wing anti-ice protection to both wings in the event of an inoperative engine. WING XFLOW position disables the selected engine inlet temperature and stator valve inputs to the anti-ice failure annunciators.

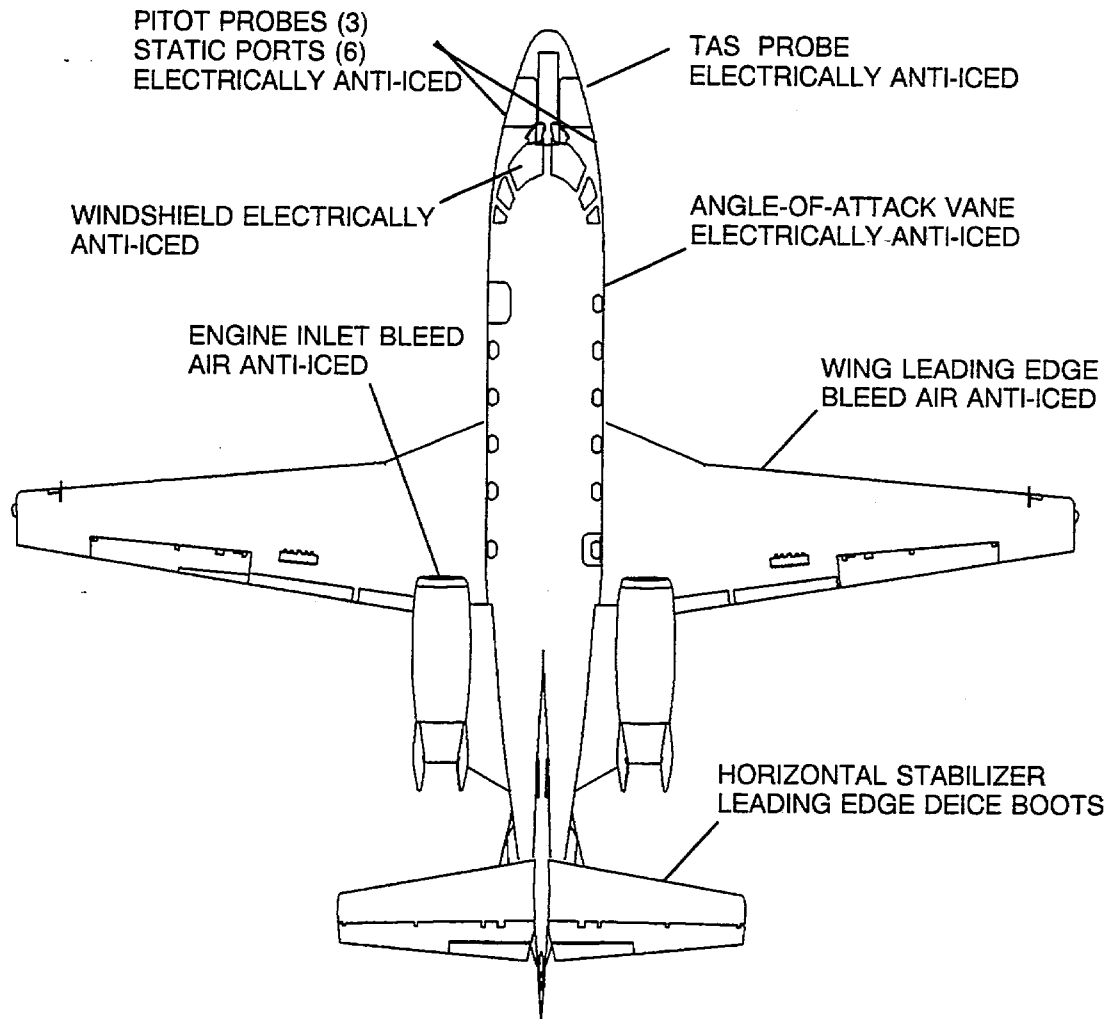
**AIRPLANE ANTI-ICE / DEICE SYSTEMS**

Figure 2-15

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**TAIL DEICE**

The horizontal tail is deiced by pneumatic boots controlled by the tail deice AUTO/OFF MANUAL switch. Selecting the switch to AUTO will activate a controller which will inflate the boots one side at a time and then repeat this cycle after 3 minutes, continuously, providing automatic deice of the stabilizer. Selecting the momentary MANUAL position will inflate both boots as long as the pilot holds the switch in the MANUAL position. Vacuum is supplied to deflate the boots after each cycle and keep them deflated between cycles and when OFF.

Proper activation of the deice boots is annunciated by a white TL DEICE PRESS L or R advisory light on the annunciator panel which illuminates when proper inflation pressure is reached in each deice boot.

**CAUTION**

THE TAIL DEICE BOOTS SHOULD NOT BE ACTIVATED AT INDICATED RAT BELOW  $-40^{\circ}\text{C}$  ( $-40^{\circ}\text{F}$ ). BOOT CRACKING MAY RESULT.

# WING ANTI-ICE FLOW DIAGRAM

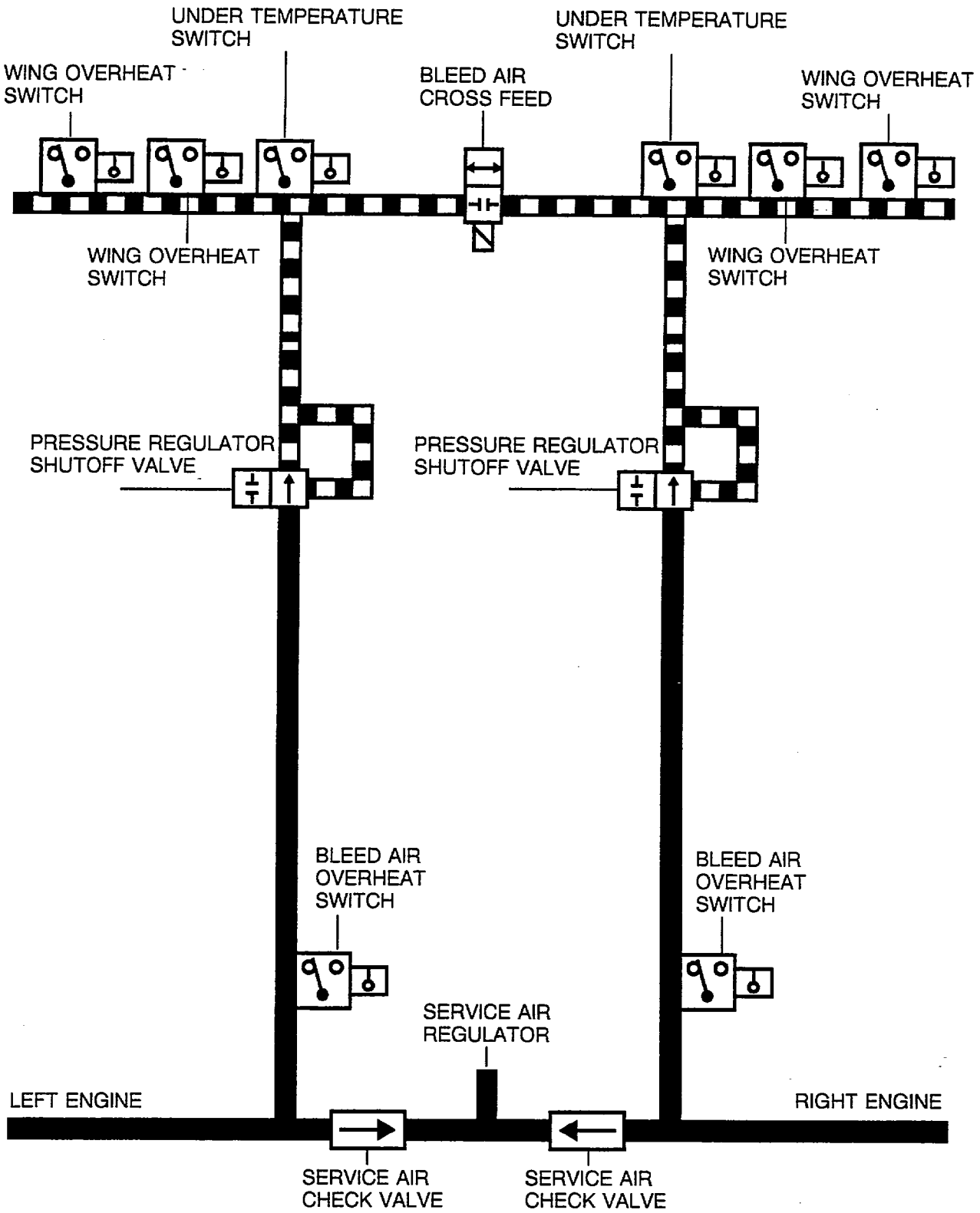


Figure 2-16

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Failure of the deice boots to activate properly when in the AUTO mode is annunciated by an amber TL DEICE FAIL L or R advisory light on the annunciator panel which illuminates when tail deice pressure is not sequenced correctly to either deice boot.

If the switch is placed in MANUAL during a cycle of automatic operation, MANUAL will override the AUTO function and all the tubes will simultaneously inflate.

#### **NOTE**

Airflow perturbations during manual boot cycle or during AUTO boot cycle with significant ice on the stabilizer may cause a minor pitch upset.

If icing conditions are anticipated after takeoff, operation of the tail deice system should be functionally checked prior to takeoff. The pilot should also check the system for proper operation prior to entering areas in which icing may be encountered.

### **WINDSHIELD ANTI-ICE**

The left and right windshields and the left and right forward cockpit side windows are AC electrically heated. Windshield anti-ice is controlled by the WINDSHIELD L and R O'RIDE/ON/OFF switches on the anti-ice switch panel. Windshield anti-ice must be turned on anytime icing is detected. It may be operated full time from engine start to shutdown and will improve cockpit comfort at high altitude, particularly at night. It is also required for windshield defog.

The windshield anti-ice system may be operated in the ON position throughout the flight. This position gradually ramps power to warm the windshield slowly. If icing is encountered with the windshield OFF, an O'RIDE switch position will override this ramp to warm the windshield more quickly.

The left and right windshields each have three heating element areas. Power from the left engine driven alternator is supplied to the left windshield outboard and center section, the right windshield inboard section and the right side window. Power from the right alternator is identically supplied to the opposite sections.

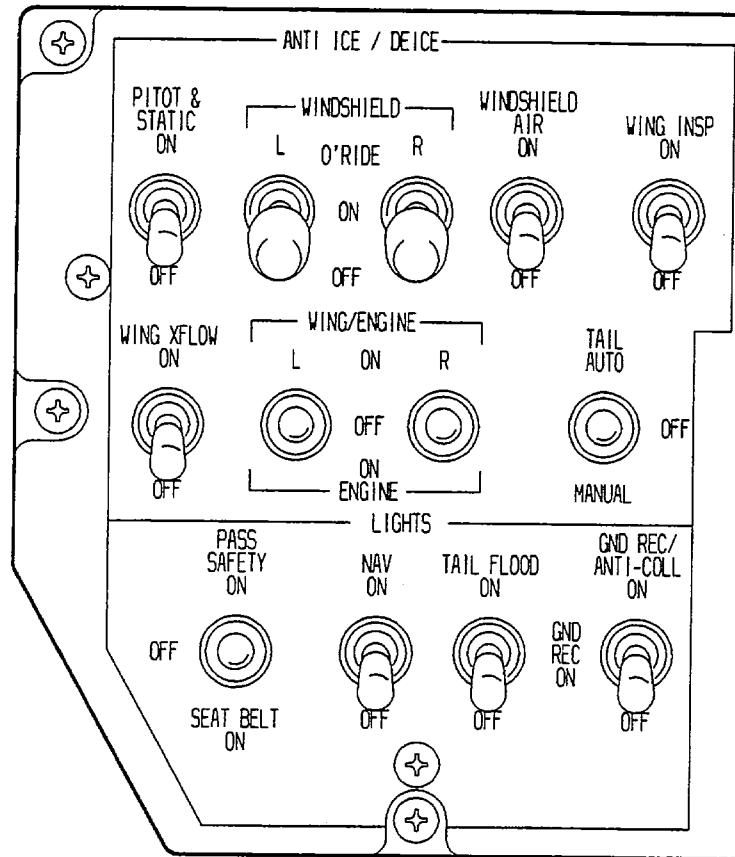
The windshield anti-ice is monitored by W/S FAULT L or R and W/S O'HEAT L or R annunciators. The W/S FAULT annunciator indicates a fault or failure of the controller to supply power to the windshield. The W/S O'HEAT annunciator indicates that the controller has detected an overheat condition which automatically shuts the affected windshield off until the overheat condition clears.

Self-test of the temperature monitor system is normally accomplished after engine start by turning the windshield heat switches ON and selecting the W/S TEMP position on the rotary test switch.

### **PITOT-STATIC , TAS AND ANGLE-OF-ATTACK ANTI-ICE**

Electric heating elements are provided in the pilot's, copilot's and standby pitot tubes; pilot's, copilot's and standby static ports, TAS probe, and the angle-of-attack probe. The pitot static anti-ice switch actuates all of these elements, with the exception of the TAS probe, which is activated via the landing gear squat switch.

## AIRPLANE ANTI-ICE SWITCH PANEL



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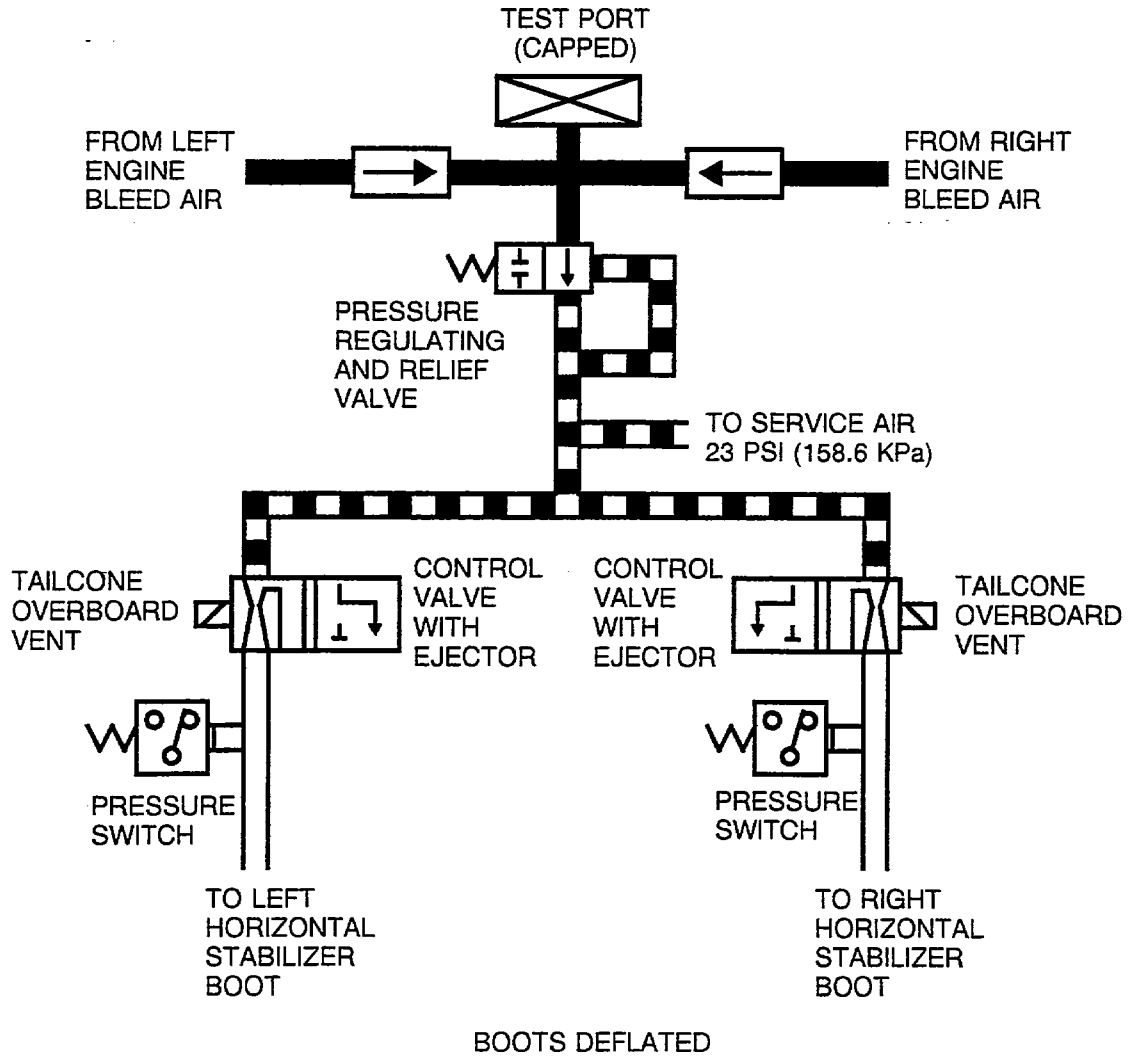
Figure 2-17.

Operation may be checked on preflight by turning the switch ON for approximately 30 seconds, then OFF; then feel each element during the external inspection. Ground operation of the pitot-static heat should be limited to less than two minutes to avoid damage to the pitot tubes and angle-of-attack vane, except as required during icing conditions. Failures of pitot and static heating elements and of the angle-of-attack vane element are annunciated by P/S HTR L or R, STBY P/S HTR and AOA HTR FAIL lights, respectively, in the annunciator panel.

### NOTE

Although the nose-mounted TAS probe measures outside ram air temperature, this measurement is fed only to the Air Data Computers (ADCs). The Ram Air Temperature display, located above the secondary flight display, receives its input from the right engine  $T_{TO}$  probe. Ram air temperature is accurate only after the right engine has been started. This probe also provides temperature data to the right engine EEC, and is electrically anti-iced anytime the engine anti-ice is turned on. The left engine  $T_{TO}$  probe provides temperature only to the left engine EEC. In the event of RAT failure, the EEC's will revert to the Air Data Computers for temperature data.

# TAIL DEICE FLOW DIAGRAM



LEGEND




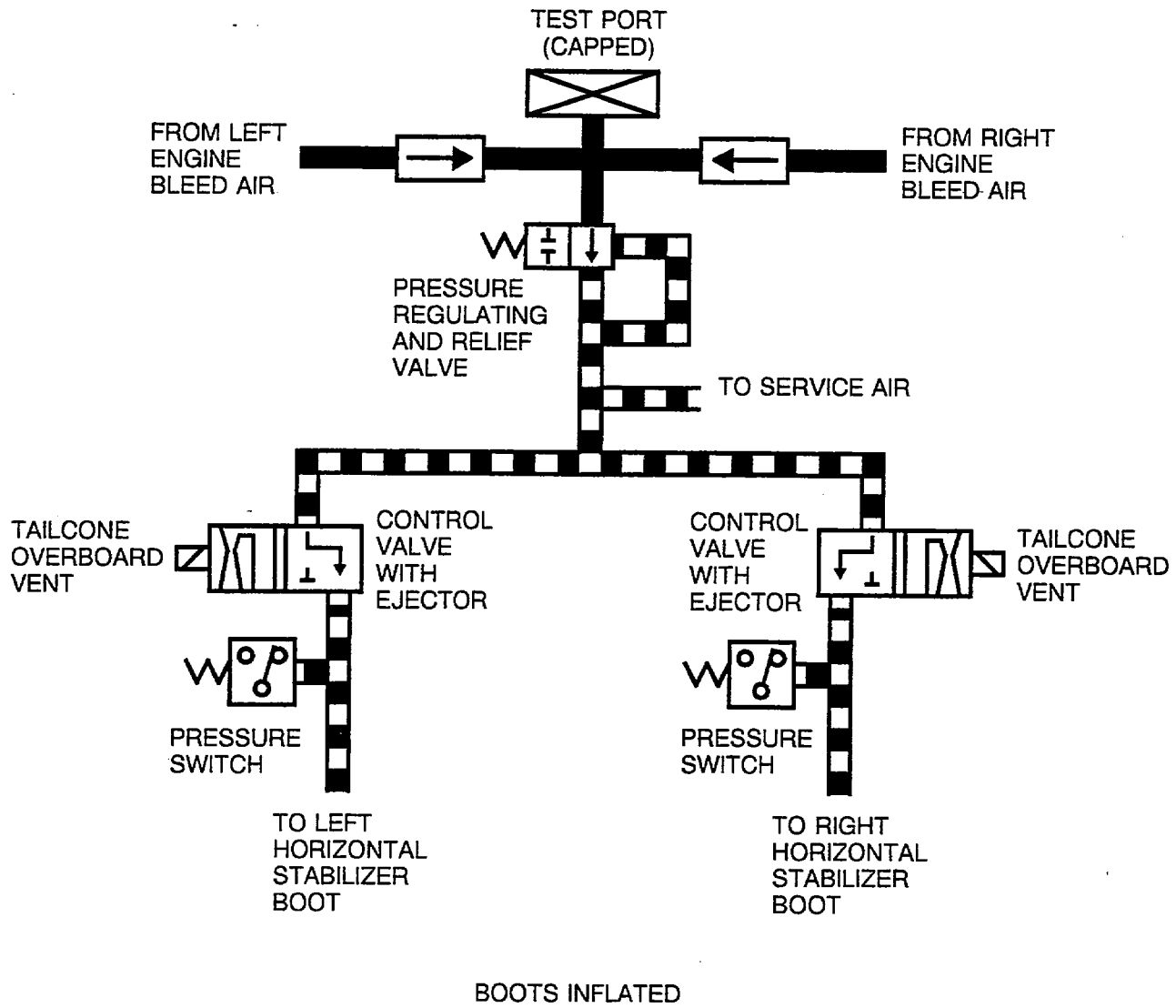
-  UNREGULATED BLEED AIR
-  REGULATED AIR PRESSURE
-  VACUUM

Figure 2-18 (Sheet 1 of 2)

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# TAIL DEICE FLOW DIAGRAM



LEGEND

- UNREGULATED BLEED AIR
- REGULATED AIR PRESSURE

Figure 2-18 (Sheet 2)

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**WINDSHIELD RAIN REMOVAL**

The windshield rain removal system utilizes a two speed blower fan located in the nose avionics compartment that is routed to the windshield through a dual duct. Placing the WINDSHIELD AIR switch in the ON position will operate the fan at high speed. With the windshield air ON, the blower will direct high velocity air onto the windshield to assist in clearing rain. The system is primarily for ground use, but does provide some benefit in flight. The primary rain removal in flight is provide by airflow in conjunction with a windshield treatment. In the OFF position, a nose avionics bay temperature of more than 95°F will automatically switch the blower fan to low speed to assist in cooling of the nose avionics compartment.