PNEUMATIC SURFACE DEICE - DESCRIPTION AND OPERATION

1. General

A. Ice protection systems are offered as independent options or as a complete package referred to as Flight Into Known Icing Conditions. These systems are provided to prevent the formation of ice and to remove ice from various areas of the airplane. The following are available options (Refer to Figure 1).

(1) Propeller anti-ice system option includes electrically heated boots bonded to the propeller blades.

(2) Windshield anti-ice system option includes an electrically heated, removable windshield panel on the pilot's side of the windshield.

(3) Electrical heaters option provides ice protection for pitot/static and stall warning systems.

(4) Flight Into Known Icing Conditions package allows flight penetration of icing conditions as defined by the FAA. The package includes all optional ice protection systems, as well as control surface mounted electrostatic discharge wicks, standby electrical system incorporating a 75-amp alternator, pneumatic deice boots on wing leading edges, wing struts, landing gear legs (optional), cargo pod nosecap (optional), horizontal and vertical stabilizers, and an ice detector light to aid in night time ice detection on the left wing inboard leading edge. An inertial separator system is built into the engine air inlet duct to prevent particles (i.e., liquid droplets, ice crystals or snow) from entering the engine inlet plenum.

2. Description and Operation

A. Pneumatic deice boots, installed on the wing leading edges, wing struts, landing gear legs, cargo pod nosecap, horizontal and vertical stabilizers, are utilized to break up ice accumulation on the leading edges during flight.

(1) System components include an engine compartment pressure line which leads from the engine bleed air system pressure regulator to three ejector flow control valves, three pressure switches, timer, located in left wing root area, three-position system activation switch, labeled BOOT PRESS and located on deice/anti-ice switch panel of lower left instrument panel, circuit breaker, labeled DEICE BOOT and located on left sidewall circuit breaker panel, deice pressure indicator light, mounted in annunciator panel, supply lines and pneumatically operated airfoil surface deice boots.

(2) An ice detector light, flush mounted near upper left corner of windshield and directed on left inboard wing leading edge, is included in deice system to aid in night time ice detection on wing leading edges. An ice detector light switch, labeled WING LIGHT, is a spring-loaded switch which must be held in the ON (upper) position to keep the ice detector light illuminating.

(a) Ice detector light components include a two- position toggle switch, labeled WING LIGHT, located on deice/anti-ice switch panel on lower left instrument panel, and a circuit breaker, labeled WING ICE DET LIGHT and located on left sidewall circuit breaker panel.

B. Pneumatic deice system utilizes bleed air from turbine power plant as air pressure source to inflate pneumatic deice boots. A pressure regulator relief valve reduces bleed air pressure of deice system to 18 PSI.

C. An electrical three-cycle timer is utilized to control three solenoid actuated ejector flow control valves. System is activated by a three-position momentary contact switch on the instrument panel. Deice cycle is initiated by pressing switch to BOOT PRESS (upper) position, then releasing switch. Each deice cycle has a duration of six seconds.

WARNING: The absence of illumination during any one of the three sequences of a cycle indicates insufficient pressure for proper boot inflation and effective deicing ability. Additionally, any deviation from the described sequence could be an indication of a malfunction in some other portion of the system and icing conditions must be avoided.

(1) The first cycle controls the vertical fin and the horizontal stabilizer deice boots inflation. The second cycle controls the inboard wing deice boots, the cargo pod, and the landing gear fairings inflation. The third cycle controls the outboard wing and wing strut deice boots inflation. The total time for one complete deice cycle is 18 seconds.

(2) When the ejector flow control valves are in their de-energized condition, the ejector section of the valve provides vacuum necessary to maintain deice boots in a deflated condition. Each time a cycle is desired, the deice activation switch must be pressed to BOOT PRESS (upper) position and released.

(a) In the event of a malfunction in the timer, which causes erratic operation of a sequence of a cycle, the switch can be held momentarily in the MANUAL (lower) position to achieve simultaneous inflation of all of the deice boots. If necessary, the system can be stopped at any point in the cycle (deflating the boots) by disengaging the circuit breaker labeled DEICE BOOT.

(b) A pressure switch is installed downstream of each ejector flow control valve. These three pressure switches activate a light in the annunciator panel, allowing the pilot to verify each cycle has pressurized. Pressure switches activate at 14 to 16 PSI.

(c) The pressure indicator annunciator, labeled DEICE PRESSURE, will illuminate initially within approximately three seconds after initiating a cycle and remain on for approximately three additional seconds to the end of the first sequence. Through each of the remaining two sequences of the cycle, the annunciator will remain off during pressure build up for about three seconds, then illuminate for about three seconds. If necessary, the system may be recycled six seconds after the completion of a cycle.

Figure 1 : Sheet 1 : Pneumatic Deice System Schematic