Sources of Operating Air

The source of operating air for deice boot systems varies with the type of powerplant installed on the aircraft. Reciprocating engine aircraft typically use a dedicated engine-driven air pump mounted on the accessory drive gear box of the engine. The suction side of the pump is used to operate the gyroscopic instruments installed on the aircraft. It is also used to hold the deice boots tight to the aircraft when they are not inflated. The pressure side of the pump supplies air to inflate the deice boots, which breaks up ice that has formed on the wing and stabilizer leading edges. The pump operates continuously. Valves, regulators, and switches in the cockpit are used to control the flow of source air to the system.

Turbine Engine Bleed Air

The source of deice boot operating air on turbine engine aircraft is typically bleed air from the engine compressor(s). A relatively low volume of air on an intermittent basis is required to operate the boots. This has little effect on engine power enabling use of bleed air instead of adding a separate engine-driven air pump. Valves controlled by switches in the cockpit deliver air to the boots when requested.

Pneumatic Deice Boot System for GA Aircraft

GA aircraft, especially twin-engine models, are commonly equipped with pneumatic deicer systems. Rubber boots are attached with glue to the leading edges of the wings and stabilizers. These boots have a series of inflatable tubes. During operation, the tubes are inflated and deflated in an alternating cycle. *[Figure 15-17]* This inflation and deflation causes the ice to crack and break off. The ice is then carried away by the airstream. Boots used in GA aircraft typically inflate and deflate along the length of the wing. In larger turbo prop aircraft, the boots are installed in sections along the wing with the different sections operating alternately and symmetrically about the fuselage. This is done so that any disturbance to airflow caused by an inflated tube is kept to a minimum by inflating only short sections on each wing at a time.

GA System Operation

Figure 15-18 shows a deice system used on a GA twin-engine aircraft with reciprocating engines. In normal flight, all of the components in the deice system are de-energized. Discharge air from the dry air pumps is dumped overboard through the deice control valves. The deflate valve is open connecting the deice boots to the suction side of the pump through the check valve manifold and the vacuum regulator. The gyroscopic instruments are also connected to the vacuum side of the dry air pump. The vacuum regulator is set to supply the optimum suction for the gyros, which is sufficient to hold the boots tightly against the airfoil surfaces.

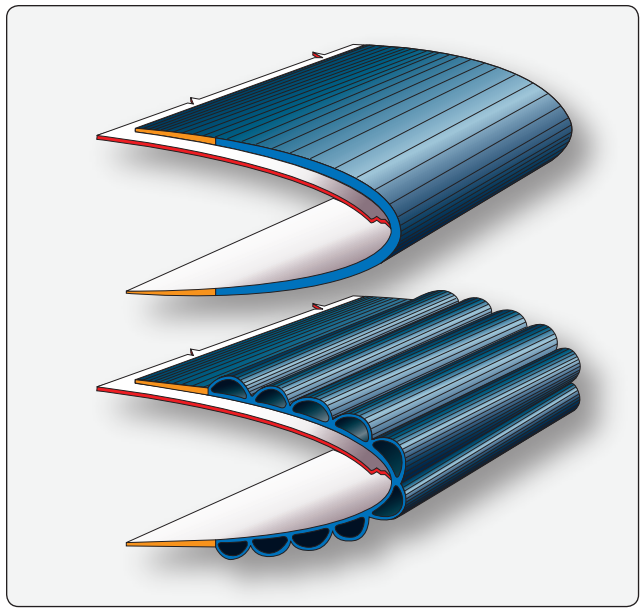

Figure 15-17. *Cross-section of a pneumatic deicing boot uninflated (top) and inflated (bottom).*

When the switch shown in *Figure 15-19* is pushed ON, the solenoid-operated deice control valves in each nacelle open and the deflate valve energizes and closes. Pressurized air from the discharge side of the pumps is routed through the control valves to the deice boot. When the system reaches 17 psi, pressure switches located on the deflate valve de-energize the deice control valve solenoids. The valves close and route pump air output overboard. The deflate valve opens and the boots are again connected to vacuum.

On this simple system, the pilot must manually start this inflation/deflation cycle by pushing the switch each time deice is required. Larger aircraft with more complex systems may include a timer, which will cycle the system automatically until turned OFF. The use of distributor valves is also common. A distributor valve is a multi-position control valve controlled by the timer. It routes air to different deice boots in a sequence that minimizes aerodynamic disturbances as the ice breaks of the aircraft. Boots are inflated symmetrically on each side of the fuselage to maintain control in flight while deicing occurs. Distributor valves are solenoid operated and incorporate the deflate valve function to reconnect the deice boots with the vacuum side of the pump after all have been inflated.

Combining functional components of a deice system into a single unit is fairly common. *Figure 15-20* illustrates the right side of a large aircraft deice boot system. The left side is the same. In addition to the distributor valves, which combine functions of a control valve and deflate valve, the