DE-ICING VERSUS ANTI-ICING

Simple as it may be, some folks don't understand the fundamental difference between de-icing and anti-icing equipment. De-icing, as the name implies, removes accumulated ice from the leading edges of wings, horizontal stabilizers, vertical stabilizers, and propellers. Yes, props have de-icing, not anti-icing, equipment!

Anti-icing equipment is used where no amount of ice can be tolerated; it requires a significant current draw and, except for the relatively small pitot tube heat, is seldom found in light aircraft. A common location of anti-icing is at turbine-engine inlets, where a chunk of ice could produce disastrous results.

The first working airfoil de-icer was designed in 1929 by William C. Geer in conjunction with the Guggenheim Safety Foundation and the National Advisory Committee for Aeronautics. His design was implemented by BFGoodrich in 1932, and the first pneumatic de-icers to be installed on a commercial aircraft were on a 1930 Northrop Alpha mail plane. A close relative of those early pneumatic de-icers is still used on the leading edges of airfoils. Since then, however, electrothermal de-icers have been added to propellers.

ELECTROTHERMAL PROPELLER DE-ICING

The colder the outside air temperature, the greater the tendency for ice to adhere to a surface. Fundamentally, electrothermal propeller de-icing is a simple matter of converting electrical energy into heat and transferring the heat to the prop. That takes a fair amount of electrical power, and when you are flying IFR in icing conditions you don't have a lot of power to spare. To solve that problem, the job is broken into two elements: outboard and inboard.

In a single-engine airplane, first the outboard element will heat up, then the inboard. This cycling—outboard, inboard—continues as long as the propeller de-ice switch is on. With a 14-volt system, you can anticipate a 20 to 23-amp draw with a two-blade prop, 30 to 34 amps with three blades, as compared to 8 to 12 and 14 to 18 amps, respectively, for a 28-volt system.

When de-icing, there is more at work than just heat. Centrifugal force is pulling constantly, especially on the outboard section. Here, a little ice buildup helps by increasing the mass of the ice; the pause in outboard heating while the inboard element is activated allows some buildup. Then, as the outboard heat turns on again, the adhesion of the ice reduces, centrifugal force tugs away, and the ice flies off into the blast of air.

The dual-element system, though not the only type, still is the most common. In the single-engine airplane, regardless of the number of propeller blades, there are two independent circuits, as shown in Figure 13-1. All outboard elements simultaneously heat for 34 seconds, then all inboard elements for 34 seconds. If all outboard elements didn't heat simultaneously, there would be a strong tendency for rotational imbalance to occur as one prop outboard section shed ice and the other didn't.

BFGoodrich offers a slightly different method of handling the situation with their HOTPROP® de-icer. This single, graduated heat element solves the problem of excessive