Iced up and fast

Contaminated wing equals fast approach

BY NEIL SINGER

Winter operations in light jets present a series of problems not encountered during fair weather. Most are related to the chance of encountering in-flight icing, and the associated risks of operating a contaminated aircraft. Even the systems that are designed to protect the pilot from icing hazards can present their own complications to flight planning; the stall protection system can be one such example.

Both the Embraer Phenom 100 and Cessna Citation Mustang use inflatable deicing boots on the leading edge of the wing and tail to remove ice; both also lower the angle of attack at which the stall warning system will activate. This means the aural stall warning will activate at a higher speed than usual.

In the case of the Phenom, the higher stall speeds are kept for only as long as the boots are actively running. Because of this, the pilot is not to turn off the boots until all ice is off the aircraft, even if the boots are no longer needed. For the Mustang, the stall protection remains in "ice mode" even after the boots are deactivated, and the pilot must use another switch to disable the higher stall speed warnings. This also is only allowed when the aircraft is clear of ice.

This early stall warning has an effect on landing performance. Approach speeds in jets are flown at or above V_{REF}, which is calculated based on the actual aircraft landing weight so as to provide a 30-percent margin over stall speed. As the presumed stall speed has been increased by the presence of residual ice, so must V_{REF} be increased. A higher approach speed logically means more runway will be needed to stop the aircraft.

Making matters worse, in some cases a reduced flap setting is mandated when landing with airframe ice, causing a further increase in V_{REF}. This partial-flaps setting is used to protect against the possibility of a tailplane stall; higher flap extensions increase the work the horizontal stabilizer must do, as well as increase the angle of attack encountered by the tail. Both increase the risk of a tailplane stall, so the increased landing speed of a partial-flap landing is sometimes deemed an acceptable tradeoff.

Looking at some examples of the effect of "ice speeds" on performance calculations, a Mustang landing at a sea-level airport at 0 degrees Celsius and max landing weight will see the approach speed rise from 94 KIAS to 112 KIAS, and the runway required increases from 2,290 feet to 2,780 feet. A Phenom 100 in the same situation will have V_{REF} increase from 101 KIAS to 124 KIAS, and minimum runway increase from 2,699 feet to 4,408 feet. These increased runway numbers are only an effect of the higher approach speed; they still are predicated on a dry runway surface.

Of course, if the aircraft has ice on it during approach and landing, there is a chance the runway could be contaminated. If this is the case, things get much worse very quickly. Runway required for a light jet can increase to more than 8,000 feet with the combination of higher approach speed and the reduced braking of a quarter-inch of snow on the runway—making most GA airports unsuitable for landing, and requiring careful preflight planning. AOPA

Neil Singer is a Master CFI and a mentor pilot in Cessna and Embraer light jets.