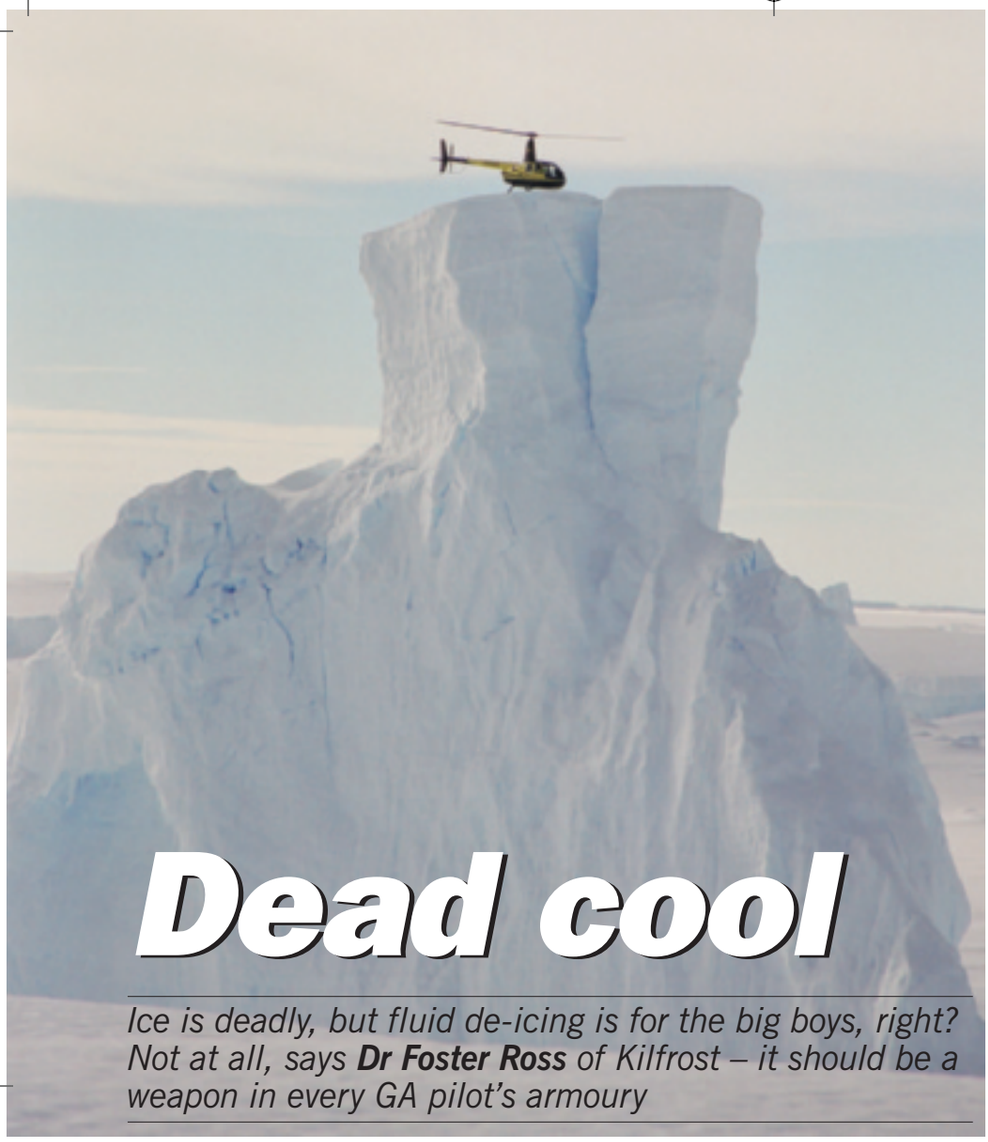


Dead cool

*Ice is deadly, but fluid de-icing is for the big boys, right? Not at all, says **Dr Foster Ross** of Kilfrost – it should be a weapon in every GA pilot's armoury*

When we learn to fly we're all warned about the dangers of ice, but how many general aviation pilots give it much thought afterwards? Surprisingly few – and the consensus appears to be that because we aren't usually cleared for flight into known icing, it isn't an issue. But it is, and increasingly so.

The primary danger point for ice accumulation is when aircraft are on the ground, and every year we see several accidents caused by pilots failing to appreciate that even a small amount of ice or frost on a wing will substantially degrade aircraft performance. Experience shows that the majority of these accidents occur close to 0˚C, the highest freezing temperature where water is at its most soluble in air and most likely to produce icing related problems. Yet I've lost count of the times I've heard 'it's not cold enough yet to worry'. In fact this is exactly the time to worry. As the temperature falls further, the air becomes increasingly dry, producing less ice and meaning it's certainly less likely that general aviators will be flying. Zero degrees centigrade is the real danger zone.

Another form of ice many general aviators will have experienced is hoar frost which, while certainly much easier to spot, is all too often underestimated. It commonly accumulates on aircraft overnight, particularly when the sky is clear, and forms because the aircraft's body becomes cooler than the outside air. This process is known as radiant cooling, and while only a few degrees difference is needed, it's not uncommon for the aircraft skin to actually be as much as 5˚C or, in very severe conditions, 10˚C cooler than the outside air temperature.

Top: ice is nice, in the right place
Top right: one ice particle the size of a grain of salt per sq cm can be enough to prevent take-off
Right: Kilfrost RDF being applied to the wing of a Commander using a backpack sprayer

Safety checks

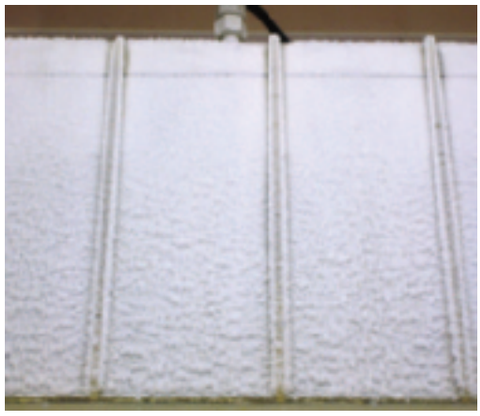
So how do you go about checking for ice on aircraft? Well, initial safety checks are imperative, and particular attention should be given to critical surfaces such as the flying wing, especially its leading edge. Visually check for ice deposits, but also run a finger over to feel for any change to the smoothness of the wing edge. Even the Civil Aviation Authority advises that your eyes and your hands are the best tools for checking for ice and frost.

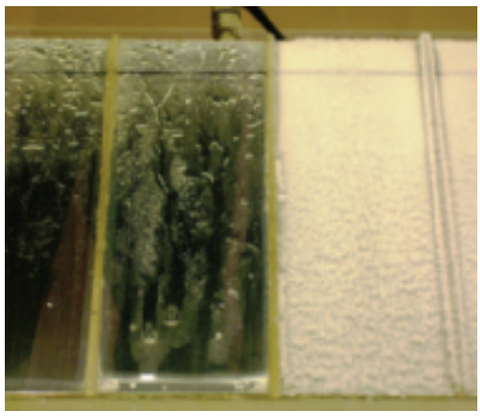
Dangers of ice

If the leading edge becomes contaminated with ice, this has been shown to reduce the effectiveness of lift substantially. Contrary to some thought, it isn't the weight of the ice which causes the problems, but rather the surface roughness – even something that's only as rough as the finest emery paper would be enough to cause a distortion of the aircraft's aerodynamic properties.

After an accident in Colorado during the winter of 2004/2005, the National Transportation Safety Board in Washington again studied the effect of ice build up and found that while most pilots understand that visible ice contamination on a wing can result in severe aerodynamic and control penalties, many don't realise that even minute particles can result in similar penalties.

Their research showed that particles of frost or ice as fine as a grain of table salt and distributed as sparsely as one per cm2 over an aircraft wing's upper surface can destroy enough lift to actually prevent it taking off. And according to their wind tunnel data, this level of frost and ice accumulation can cause lift losses of between 22% and 33% both on the ground and in the air. Combine this loss of lift with other factors such as an aircraft's load





Dennis Baldry

Above left: before – a test of de-icing fluid on a panel of snow generated at minus five degrees Left: after – the de-iced panel is clear after 30 seconds, and the fluid will run off the wing on take-off Above: zero degrees is the zone of maximum danger

and the length of a runway, and it becomes much clearer why we see so many avoidable accidents every year.

De-icing

To de-ice an aircraft we need to remove the rough surface and leave the wings – particularly the leading edges – as clean as possible. There are various methods of de-icing and a number of products available. If you're at a larger airport then you can make arrangements for your aircraft to be sprayed using the available heated and pre-diluted Type I fluid, but many general aviation pilots operate from small airfields in remote locations. In these cases it's not viable to heat de-icing fluid, nor is significant investment in application equipment likely – but this doesn't mean that de-icing shouldn't occur.

At Kilfrost we manufacture Kilfrost RDF (Rapid De-icing Fluid) which is ideal in these situations – it's a general purpose ground de-icier which reacts quickly and is used in cold concentrate form so doesn't require any preparation. In terms of applying it, the back pack sprayers you can buy at most good garden centres will do a perfectly adequate job, and they're extremely cost-effective to buy. The concentrated fluid has a low viscosity so it sprays easily, and when applied to frozen deposits they melt and dissolve the ice, which then drains away. A small amount of fluid does remain on the wings; however as the aircraft takes off this shears completely away to leave the wing clean and smooth.

This product can be accessed online at www.kilfrost.com/online-shop, as can our range of TKS fluids which are designed for use with in-flight de-icing systems. We have a choice of fluids available, all have dual de and anti-icing capabilities, are fully biodegradable and easy to use – and look out early in 2009 for the launch of the world's first truly green TKS fluid, based on glycol from a sustainable source.

De-icing is safety critical and for a general aviation aircraft the process is so simple it can be completed on the end of a runway immediately prior to take-off and is unlikely to take any longer than five minutes to complete. There really is no excuse, and it's not worth the gamble. ■

Below: how the big boys do it; a C17 Globemaster is de-iced at Elmendorf Air Force base in Alaska, where they take their icing seriously

(U.S. Air Force photo/Master Sgt. Keith Brown)