Making good sense about flying in sub-freezing clouds!

As readers of last month's OTA issue know, the FAA has finally departed from its longstanding notion (and notion held by far too many pilots) that all sub-freezing clouds produce airframe icing.

In truth, most sub-freezing clouds are produced by microscopic water droplets either too small or too cold to produce ice on the wings. But what about the remainder of these sub-freezing clouds. They produce airframe icing, right?

Answer: You bet! And the icing they produce can be sufficiently severe to turn our airplanes into ice-laden lawn darts! As illustrated above, moderate to severe icing can re-shape a wing in minutes while at the same time adding more weight than our airplanes can carry.

So what is a prudent winter-time pilot suppose to do?

The are two schools of thought about winter-time flying in non-known ice certified airplanes. One is right and prudent. The other is simply wrong.

First, the wrong school of thought. This school of thought relegates our airplanes into seasonal vehicles, constrains flight students to classroom exercises, and denies pilots the winter dispatch reliability to justify the cost of ownership. In short, it says, *"Never penetrate sub-freezing clouds in non-known ice certified airplanes, period."*

Proponents of this wrong school of thought view the meteorological world and the rules pertaining to it as *"black and white"* rather than shades of grey that typify the real world.

Now for the correct school of thought. This school assigns sub-freezing cloud risks in the same way they evaluate turbulence, ceilings, and visibility. For example, the intensity of turbulence ranges from light chop to thunderstorms. Ceilings range from 4,000' overcast to obscured. Visibility can be greater than six miles down to ground-hugging fog.

In other words, not all turbulence, ceilings, and visibility necessarily grounds airplanes. Some do, but most do not. The same is true for sub-freezing clouds.

Okay, so how do we know which sub-freezing clouds to avoid?

I recently asked my dentist if he treats HIV infected patients any differently than other patients. He said in reply, "*No, I treat all patients as if they were HIV infected!*"

My dentist's response unlocks the door of understanding about sub-freezing clouds. We pilots should treat all sub-freezing clouds as if they contained lots of ice . . . then we should act accordingly.

Acting accordingly, of course, means having an immediate, guaranteed accessible *"back door"* (VFR conditions or above freezing temperatures) to bolt to should airframe icing be experienced.

Looking first at VFR conditions, here's what we're looking for:

1. **Cloud bases higher than the minimum vectoring altitude**

2. **Cloud tops within two or three minutes climb capability.**

Looking next at above freezing temperatures, here's what we're looking for:

1. **Freezing level above the minimum vectoring altitude.**

2. **Temperature inversion with above freezing temperatures aloft.**

If either of these two desired conditions do not exist, do not penetrate sub-freezing clouds.

Additional meteorological factors to consider

Three different meteorological factors determine the overall icing risk of sub-freezing clouds. One, of course, is temperature. Another is water-droplet size. And the third is the relative stability of the atmosphere. Let's look a bit more closely at the last.

The more stable the atmosphere, the lower the risk of icing. In stable conditions, water droplets too small to adhere to the airframe seldom grow to larger ice-creating sizes.

Fronts and low pressure areas, on the other hand, create instability in the atmosphere. This instability circulates tiny water droplets to higher and lower altitudes thereby causing them to

increase in size. Eventually, they grow into super-cooled large (sub-freezing) droplets that turn an airplane into a marginally flyable popsicle in minutes.

Thus, if flying through sub-freezing clouds is contemplated, avoid any frontal passages or areas in or around low pressure areas.

Most important decision we can make regarding icing!

The most important decision we can make when encountering airframe icing is the decision to change altitudes without delay. Don't wait to see if it gets worse. Instead, anticipate that icing will ALWAYS get worse, so act immediately. Notify ATC, give them an icing PIREP, and request an immediate altitude change.

In summary, the wrong school of thought is the guaranteed *"safest"* way to operate. In fact, it's almost as safe as flying in a classroom simulator. On the other hand, the correct school of thought contains about the same element of risk as any other IMC factor, e.g., low ceiling/visability, turbulence.

You're the pilot. You make the call.