

Aircraft Icing

As New Zealand heads into the cold weather, it's worth looking at how ice affects aircraft before they even leave the ground.

Ice can render an aircraft unflyable.

For that reason, rule 91.315 prohibits taking off if the aircraft has snow, ice, or frost sticking to the wings, stabilisers, or control surfaces.

CAA Aviation Examiner John Parker says the belief that propeller slipstream or air flow over the wings will blow the surfaces clean during flight is incorrect.

"You *must* remove all ice, snow, and frost from the aircraft before flying. Even a thin layer of ice can have a huge effect on the aircraft's performance.

"For instance, snow or ice on the upper wing surface substantially reduces lift and increases weight. The shape of the aerofoil is altered, and it becomes much less efficient.

"Frost and ice will also dramatically increase the stall speed."

During autumn and winter, aircraft are obviously best hangered to protect them from the elements. Aircraft left in the open should have their wings and engines covered.

If any snow, ice or frost does accumulate on the aircraft, push it into the sun and rub a cloth over it to make sure the critical surfaces are clear and dry.

Carlton Campbell, CAA Aviation Safety Adviser, says that inexperienced pilots may pour jugs of hot water over the canopy or windshield.

"But that will contribute to the ageing of the canopy or windshield, and increase the likelihood of it becoming cloudy or speckled, like ice under pressure.

"In temperatures lower than zero, don't use hot water on the aircraft wings either, as it will likely freeze instantly, making the job of de-icing much harder."

Helicopters and cold weather

Even small amounts of ice on rotor blades can set up vibrations which could lead to loss of control.

Any snow ingested into a helicopter turbine may cause a flameout. Particle separators can prevent that, but they in turn can become blocked with snow and ice.

Grant Twaddle, CAA team leader of heli ops, says that in icy conditions, helicopter pilots might find one skid is more attached to the ground than the other.

"You need to be careful that the difference in adhesion doesn't roll the helicopter over, when you take off."

When water becomes ice

Expansion of water as it becomes ice can damage the internal structure of wings, control surfaces, and fuselage bulkheads.

As Carlton Campbell explains, "Torrential overnight rain will get into all sorts of places, and if the rain is followed by a hard frost – causing the rainwater to freeze around the control linkages of the aircraft – it can cause breakages or control issues.

"If the preflight omits a trim check, it might be only after becoming airborne that the pilot discovers the trim hinges are jammed with ice."

The air inside fuel tanks of aircraft left outside on a clear night may condense and freeze. If, at the time of fuel drain testing, the ambient air temperature is still below freezing, drains may well be frozen solid.

Again, push the aircraft into the sun and wait for the ice to melt, before testing.

John Parker says keeping fuel tanks full reduces the chance of condensation forming.

"But it's essential that even full fuel tanks be checked for water by draining some fuel into a tester."

More reading

The *Aircraft Icing Handbook* is free to download from the CAA website, www.caa.govt.nz, "Quick Links > Publications > Good Aviation Practice booklets". ■

