Icing

Icing is a year-round threat to pilots. Whether it accumulates in your carburettor, or on your airframe, it can have a huge effect on aircraft performance.

"People often assume that icing is just a winter issue," says CAA Chief Meteorological Officer Peter Lechner. "But that's not the case at all.

"We live in a temperate maritime country so icing conditions can occur all year round both in the air and on the ground. And ice and flying really don't mix."

The spine of New Zealand's landmass lifts the warm moist air flowing off the Tasman and cools it. This high moisture-content air is perfect for producing ice on aircraft.

Accurately predicting where and how much ice you'll find is difficult, but there are general conditions that make icing more likely.

Having a good knowledge of Met, knowing the air temperature, dew point, and freezing level outside your aircraft will help you predict icing conditions.

Induction System Icing

If you have a carburettor, the two key things that affect icing are the air temperature and the relative humidity.

Basically, when liquid fuel changes to fuel vapour and mixes with the induction air it can cause a large drop in temperature. The venturi effect also cools the airflow. If the carburettor temperature then falls below 0 degrees Celcius, the water vapour condenses into ice.

The classic symptoms of carburettor icing are a reduction in power and an engine running rougher. Unless this is addressed, usually by applying carburettor heat, then the carburettor may freeze up.

When humidity is higher (with more water in the atmosphere) there's a greater risk of icing – and not just in cold conditions. Carburettor icing can be possible in a range of -10 to 30 degrees Celsius.

Knowing the dew point will help you decide if you're likely to experience carburettor icing. The dew point is the temperature where the air is saturated with water. At the dew point temperature, the relative humidity is 100 per cent and water vapour condenses out of the air and forms visible water – dew.

The closer the dew point is to the temperature, the higher the level of moisture in the air. So even if the temperature is 15 degrees Celsius, if the dew point is 14 degrees Celsius, that means there will be significant amounts of moisture in the air, and therefore a greater chance of carburettor icing.

Carburettor icing is less likely to occur during takeoff and climb when the engine is operating at higher power due to a wide throttle opening.

If you have a carburetted engine, apply full carburettor heat at regular intervals during the cruise to avoid ice accumulating. The engine may still run roughly for a short time as any ice melts and is ingested.

Removing Ice Pre-Flight

You must remove any ice, frost, or snow from your aircraft before you take off. This isn't just common sense, but is required by rule 91.315 *Operating in Snow and Ice Conditions.*

Encountering Icing Conditions

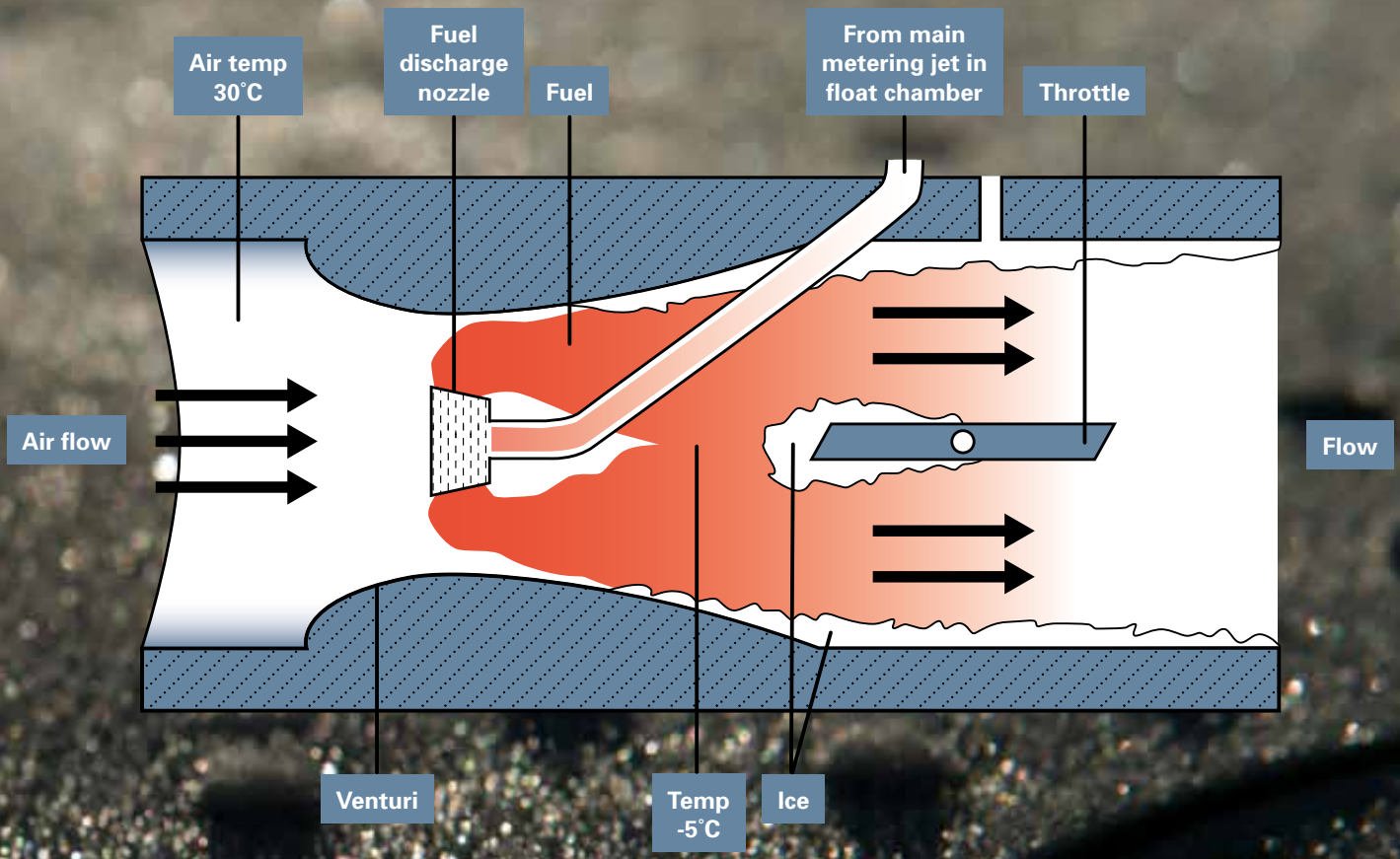
The effects of icing during a flight can be, and have been, lethal. These effects include:

- increased aircraft weight
- increased drag
- loss of lift
- loss of thrust/engine power
- erroneous instrument readings
- loss of control.

Ice build-up on the leading edge can change the actual wing profile leading to reduced lift. It may also increase the speed at which the aircraft will stall.

Usually, general aviation aeroplanes won't be equipped with de-icing technologies. Therefore the pilot must manage any icing risks during flight.

If your aircraft isn't certified for flight in icing conditions, then you must stay clear. Rule 91.421 *Operating in icing*



conditions is very clear about this. Log on to Metflight GA for the latest Met updates so you know where icing conditions are forecast.

Be cautious when flying IFR through a front that may contain freezing rain, freezing drizzle, or other hazardous weather conditions. Even though you may be flying at 5000 ft with icing forecast at 6000 ft, if the icing level descends, then you will need to take action to avoid the icing conditions.

Be aware how quickly icing conditions can affect your aircraft's performance. So if you encounter icing conditions, don't dither, you need to get into clear air as soon as possible.

Helicopter Icing in Flight

For the vast majority of helicopters in New Zealand, there's very little available in the way of ice-protection technology.

"The primary effect of ice on the rotor system is increased drag, followed by a loss of lift due to the change in aerodynamic efficiency of the blade," says Jason Frost-Evans, CAA Flight Operations Inspector – Helicopters.

"The most effective option if you notice icing is to vacate the area, but depending on the rate of accretion you may need to consider landing immediately. Helicopter icing may be evident through deteriorating performance and vibration, as well as visible accretion on the aircraft structure.

"Also, remember that most helicopter types aren't certified for flight in icing conditions and so you may now be operating outside of the flight manual limitations."

Further Information

Icing is a large and complex issue and this article is just an introduction to the basics. For more comprehensive information see the CAA's *Aircraft Icing Handbook* on the CAA web site, www.caa.govt.nz, "Publications – Good Aviation Practice".

You can also get a free copy of the *Winter Flying* GAP booklet by emailing info@caa.govt.nz. ■