



Carburettor Icing?

Readers are encouraged to share their aviation experiences in order to alert others to potential pitfalls. We do not accept anonymous contributions. If you tell us who you are, we will not publish your name unless we have your permission.

The following contribution comes from Kevin Langford of the Air New Zealand Flying Club, who recounts a carburettor icing experience.

On 13 April 2002 I departed Christchurch in a Cessna 150 at approximately 10:45 am, bound for Pukaki airfield. Passing Geraldine at around 5500 feet, I could see that about two thirds of the McKenzie Basin was covered in low cloud and fog. A landing at Pukaki would not be possible, so I called some friends at Wanaka on my cellphone and found that the weather there was clear and calm. No problem. I would continue to Wanaka and call in at Pukaki on my way home, by which time the fog would be gone. So I continued on my present course climbing slowly to clear the high terrain at McKenzie's Pass.

I was over McKenzie's Pass at 6000 feet at around midday when I noticed a slight vibration in the engine. At first I thought it was my imagination, but no it was definitely there. I assumed I had picked up a little carburettor ice, so applied full carburettor heat for around 10 seconds. The engine smoothed out and the carburettor heat knob was pushed back in again. The vibration returned almost immediately, accompanied with a drop of about 100 rpm. I quickly reapplied carburettor heat and checked the mixture. The engine smoothed out a bit, but with even less power this time. The mixture adjustment hadn't made any difference.

I was descending by this time and becoming fairly interested in getting full power restored. I tried returning the carburettor heat to COLD again, only to have power fade away completely and the engine start shaking. I was getting a bit worried by this time so turned the aircraft towards Tekapo, as it was the nearest airfield and only about 10 nautical miles away. I was now down to 5500 feet.

Carburettor heat was re-applied and partial power returned. I then tried various combinations of carburettor heat, throttle and mixture, but the more I did the worse it seemed to be. So, with carburettor heat full HOT and enough power to just maintain height, I decided to set the transponder to 7700 and call Christchurch Information and advise them of my predicament.

After reporting my problem, position and intentions, they acknowledged the situation and said that they would try and get me on radar. I guessed they could see me because the transponder reply lamp was flashing, but I heard nothing more from them. I thought they might have called me back to check

my progress, but after a minute or two I had heard nothing so decided to tune to Tekapo Traffic on 118.6. MHz.

I broadcast my problems and intentions and immediately received a reply from the Air Safaris people who invited me to do a straight-in approach for Runway 29. Finally, I was able to make a gentle descent on a long final for Runway 29. As I neared the airport, I found myself a bit high and was obliged to make an orbit and lose the last of my height. An easy landing was made and I taxied in, the engine still running.

After parking the aircraft, I did a quick engine run-up and was amazed to find that it was now running normally. I could hardly believe it. I shut down the engine and got out of the machine only to find all manner of emergency services waiting for me.

I arranged for the Flying Club's Chief Engineer to come and check the engine the next day. He found nothing wrong with it. Only one test left – a circuit. After receiving a very handy briefing from the Air Safaris Chief Pilot on useful places to go if the engine goes quiet, I took off and flew an uneventful circuit.

Later I flew the aircraft back to Christchurch without any trouble.

After talking about my experience with Club instructors and engineers, it is now generally agreed that the engine had suffered from a bad case of carburettor icing, which I had been unable to clear. It may be interesting to note that I have since made the same trip in the same aircraft on several occasions in similar, and different, conditions and have not had any trouble.

Vector Comment

Thank you for sharing this experience with readers, and well done for handling the situation so decisively.

We agree, it is highly likely that you experienced a severe case of carburettor icing. Your club's engineering report indicates that the ambient air temperature and dew point in the Tekapo area around the time of the incident were within 1°C of one another. This supports your conclusion of carburettor icing. Although the weather conditions might have seemed relatively benign at the time, the air temperature and moisture content were extremely conducive to carburettor refrigeration icing.

This incident certainly highlights the importance of always being alert to the possibility of carburettor icing, proactively

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checking for it at regular intervals, recognising its symptoms, and reacting promptly if it develops.

It is possible to pick up carburettor icing (normally refrigeration icing) even when operating well clear of cloud at cruise power settings – not just at low power settings during descent or on approach (normally throttle butterfly icing).

The following information is intended as a refresher on the basics of carburettor icing for pilots who fly aircraft with normally aspirated engines:

Carb Icing-Conducive Conditions

Both refrigeration icing and throttle butterfly icing in float-type carburettors can occur within the ambient air temperature range of -10°C to +35°C at relative humidities above 50%. A good indicator of relative humidity is the air temperature and dew point relationship. Values within a few degrees of one another indicate a high relative humidity and therefore an increased likelihood of developing carburettor icing.

Symptoms and Remedy

Carburettor icing is usually characterised by rough running and a drop or fluctuation in engine rpm for a fixed-pitch propeller, and a drop in manifold air pressure (MAP) for a constant speed unit (CSU) installation. The CSU will maintain the pre-set rpm even when the MAP is reduced by ice build-up. It should be noted, however, that if any ice is dislodged, the rpm will fluctuate slightly as the CSU 'hunts' to balance the propeller torque reaction against the fluctuating engine torque produced by the ingestion of the ice.

While rough running might be an obvious symptom, a decrease in engine rpm or drop in MAP might be more subtle and can be mistakenly attributed to factors such as a loose throttle friction nut, or turbulence and variations in airspeed in the case of a fixed-pitch propeller. Always check, however, for carburettor icing as a potential cause of any slight drop in rpm or MAP.

When icing is suspected, apply full carburettor heat until the symptoms clear or are confirmed as not being carburettor icing

(this may take quite some time). If ice is present, the selection of hot air will result in a drop in rpm followed by rough running and fluctuating rpm while the ice is cleared and the engine ingests the resulting water or chunks of ice. Smooth running at a slightly lower-than-normal rpm due to the selection of hot air will normally then follow.

Note that for CSU installations, the MAP may fluctuate before it steadies at a higher value, and the rpm may fluctuate during the clearance process before it steadies at the pre-set value.

If no ice is present, the application of carburettor heat will result in drop in rpm only for a fixed-pitch propeller and a slight drop in MAP for a CSU installation.

Partial heat should not be used, as it can actually promote the formation of carburettor icing.

If there has been a large ice build-up, the engine may run very roughly until the ice has fully melted. If ice forms again, the process must be repeated. In extreme conditions (as were probably experienced in this incident) it may be necessary to apply full heat continuously until you can fly out of the icing conditions. Refer to the aircraft Flight Manual for any limitations placed on the prolonged use of carburettor heat at high power settings.

The application of hot air will richen the mixture, and in some cases it may be necessary to lean the mixture to assist smoother running.

Engine Handling Techniques

Apply carburettor heat as part of regular cruise checks (eg, SADIE, CLEAR, etc) or whenever carburettor icing is suspected. The frequency of carburettor icing checks should be increased when operating in conditions of high relative humidity, such as when temperature and dew point are close together.

Make full use of a carburettor temperature gauge if fitted – it will provide a good indication of whether conditions are conducive to carburettor icing, particularly when in the cruise, and therefore how frequently heat should be applied. ■

AIP Supplement Cut-off Dates

Do you have a significant event or airshow coming up soon? If so, you need to have the details published in an AIP Supplement instead of relying on a NOTAM. This information must be promulgated in a timely manner, and should be submitted to the CAA with adequate notice (within 90 days of the event). Please send the relevant details to the CAA (ATS Approvals Officer or AIS Coordinator) at least one week before the cut-off date(s) indicated below. Note: If your AIP Supplement requires an illustrated graphic, allow a further five working days.

Supplement Cycle	Supplement Cut-off Date (with graphic)	Supplement Cut-off Date (text only)	Supplement Effective Date
03/01	21 Nov 02	28 Nov 02	23 Jan 03
03/02	30 Dec 02	7 Jan 03	20 Feb 03
03/03	16 Jan 03	23 Jan 03	20 Mar 03

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