



Australian Government

Australian Transport Safety Bureau

Engine failure involving Piper PA-28, VH-IPO

Mangalore Airport, Victoria, 16 June 2016

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Addendum

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Engine failure involving Piper PA-28, VH-IPO

What happened

On the morning of 16 June 2016, a student and instructor planned to conduct a training flight in a Piper PA-28-161 aircraft, registered VH-IPO (IPO), from Mangalore Airport, Victoria.

The planned flight included time in the Mangalore training area before returning to the airport for circuit training. The aircraft departed Mangalore at about 0940 Eastern Standard Time (EST).

After completing the planned training area manoeuvres, the instructor conducted an orbit and asked the student to identify significant geographical points within the training area. At this time, the instructor noticed the tachometer indicated a slightly lower engine power output than expected for the selected throttle position. The instructor suspected carburettor icing¹ and applied carburettor heat.² This resulted in an immediate further drop in power and the instructor also reported the engine running slightly rough. After 10–15 seconds the power level returned to normal. After a further 10–15 seconds, the instructor selected the carburettor heat off and instructed the student to return to Mangalore. During the return flight, the instructor periodically applied carburettor heat without further indications of carburettor icing.

As the aircraft descended to Mangalore, the student selected carburettor heat on and joined the circuit for runway 36. Due to traffic in the circuit, the student conducted two go-arounds.³ After the second go-around, the aircraft re-joined the circuit and the student prepared the aircraft for another approach. As the student prepared to turn onto the base leg, they applied the carburettor heat. At that time, the instructor observed a large drop in RPM. The instructor then took control of the aircraft and immediately turned onto the base leg. During the turn, the engine failed and the instructor continued the turn to track directly to runway 36. The instructor carried out the engine failure checklist, but was unable to restart the engine. The instructor then broadcast MAYDAY⁴ on the Mangalore common traffic advisory frequency.

As the aircraft descended toward runway 36, the instructor assessed that they did not have sufficient altitude to glide to the runway. The instructor identified a field to the south of runway 36 and outside of the airport perimeter as suitable for a forced landing. As the aircraft descended through about 200 ft above ground level, the instructor conducted the shutdown checklist and landed the aircraft in the selected field.

The instructor and student were not injured in the incident and the aircraft was not damaged.

VH-IPO



Aircraft operator

¹ Carburettor ice is formed when the normal process of vaporising fuel in a carburettor cools the carburettor throat so much that ice forms from the moisture in the airflow which can restrict the airflow and interfere with the operation of the engine.

² Carburettor heat is a system within the aircraft engine, selectable by the pilot, which draws heated air into the carburettor to prevent or attempt to remove ice.

³ Go-around, the procedure for discontinuing an approach to land, is a standard manoeuvre performed when a pilot is not completely satisfied that the requirements for a safe landing have been met. This involves the pilot discontinuing the approach to land and may involve gaining altitude before conducting another approach to land.

⁴ MAYDAY is an internationally recognised radio broadcast for urgent assistance.

Operator comment

The operator of IPO provided the following comment:

An engineer inspected the aircraft after the incident. The exhaust system, engine controls, fuel system and ignition system were inspected. Engine tests and a flight test were also performed. All checks indicated no faults with the aircraft or contaminants in the fuel system.

Carburettor icing

Induction icing, often referred to as carburettor icing, is the accumulation of ice within the induction system of an engine fitted with a carburettor. This ice forms as the decreasing air pressure and introduction of fuel reduces the temperature within the induction system. The temperature may reduce sufficiently for moisture within the air to freeze and accumulate. This build-up of ice restricts airflow to the engine, leading to a reduction in engine performance.

Environmental conditions influence the likelihood of carburettor ice forming, as shown by the Civil Aviation Safety Authority (CASA): [Carburettor icing probability](#) chart.

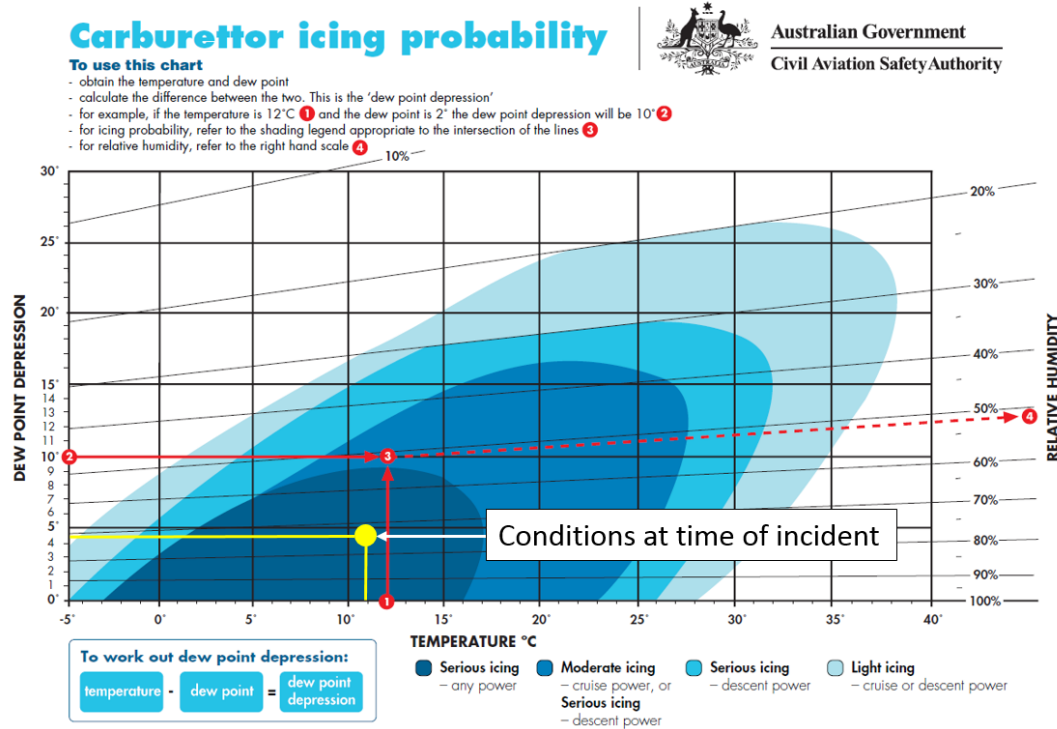
On the morning of the engine failure, the Mangalore aerodrome weather information service reported the following weather conditions.

Table 1: Weather conditions at Mangalore Airport on 16 June

Time	Temperature	Dew point
1000	8.6 °C	8.6 °C
1015	9.4 °C	9.1 °C
1030	9.6 °C	7.5 °C
1045	10.1 °C	7.3 °C
1100	10.6 °C	6.9 °C
1115	10.9 °C	6.5 °C

The carburettor icing probability chart shows the conditions at Mangalore Airport placed IPO in the serious icing zone for carburettor icing at the time of the incident (Figure 1). Carburettor icing could be expected at any power setting.

Figure 1: Carburettor icing probability chart showing prevalent conditions in yellow



Source: CASA modified by ATSB

The first indication of carburettor icing is normally a reduction in power produced by the engine. If not corrected by the pilot this may lead to rough running of the engine and engine failure.

When operating in conditions conducive to carburettor icing, pilots should use carburettor heat to prevent and remove ice build-up. After selecting carburettor heat, engine performance may deteriorate further as the ice is melted before engine performance returns to normal. This may take up to 30 seconds.

Instructor comment

The instructor of IPO provided the following comments:

On the two circuits prior to the engine failure, the student selected carburettor heat on prior to turning onto the base leg of the circuit with no indications of carburettor icing.

After the second go-around, the student joined a shortened downwind. The time period when the carburettor heat was selected off, where the carburettor ice appeared to form was very short and occurred at a very high power setting.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following proactive safety action in response to this occurrence.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are taking the following safety actions:

- The operator has increased instructor and student awareness of carburettor icing probability and symptoms for early detection. The operator has issued all instructors and students with a copy of the CASA article [Ice kills](#).

- The operator will review relevant company briefs to include carburettor ice probability and prevention.
- The operator has recommended the company operations manual be reviewed to mitigate against flying outside of gliding distance to the runway during circuit training.

Safety message

This incident highlights the insidious nature of carburettor icing and the speed with which carburettor icing can occur in favourable environmental conditions. The incident also reinforces the need for pilots to be aware of the risk of carburettor icing at all times during the operation of aircraft fitted with a carburettor.

- The ATSB article [Melting moments: Understanding carburettor icing](#) provides valuable information to assist pilots in understanding and preventing carburettor icing.
- The article [Piston engine icing](#) produced by the European Strategic Safety Initiative provides in-depth information to assist pilots in identifying and managing carburettor icing.

General details

Occurrence details

Date and time:	16 June 2016 – 1114 EST	
Occurrence category:	Serious incident	
Primary occurrence type:	Engine failure or malfunction	
Location:	Mangalore Airport, Victoria	
	Latitude: 36° 53.30' S	Longitude: 145° 11.05' E

Aircraft details

Manufacturer and model:	Piper Aircraft Corporation PA-28	
Registration:	VH-IPO	
Serial number:	28-7816627	
Type of operation:	Flying training - Training Dual	
Persons on board:	Crew – 2	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.