ACCIDENT

Aircraft Type and Registration:	Piper PA-28-161 Cadet, G-BXJJ
No & Type of Engines:	1 Lycoming O-320-D3G piston engine
Year of Manufacture:	1989 (Serial no: 2841200)
Date & Time (UTC):	17 October 2014 at 0820 hrs
Location:	Near White Waltham Aerodrome, Berkshire
Type of Flight:	Training
Persons on Board:	Crew - 2 Passengers - None
Injuries:	Crew - 2 (Minor) Passengers - N/A
Nature of Damage:	Substantial, both wings detached
Commander's Licence:	Commercial Pilot's Licence
Commander's Age:	33 years
Commander's Flying Experience:	2,890 hours (of which 1,200 were on type) Last 90 days - 180 hours Last 28 days - 56 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and information from the operator

Synopsis

Whilst the aircraft was engaged in a circuit training flight, the engine suffered a loss of power on base leg. The instructor took control and carried out a forced landing. As the aircraft descended, power cables were spotted on the approach path and in avoiding them the aircraft landed short of the intended field and collided with a hedge. The aircraft was severely damaged in the collision. In the absence of any mechanical defects, carburettor icing is considered to be the most likely cause of the power loss, given the number of risk factors present on the day.

History of the flight

The purpose of the flight was for the student pilot to practise flying circuits. The daily inspection was completed normally and no defects were noted. The fuel onboard was 34 US Gal and the check of the fuel drains did not identify any water or other contamination. The start-up, taxi and pre-takeoff checks were normal. Application of carburettor heat for approximately 10 seconds produced a 50 rpm drop and the rpm returned to its original value when the control was returned to the OFF position.

The takeoff, climb out and downwind leg were normal, except that the carburettor heat was left in the ON position after the downwind checks. The instructor noticed this, but decided to not to say anything as it would be needed again for the imminent descent. The student pilot then reduced the engine power, possibly slightly more than normal, to slow the aircraft in

order to extend two stages of flap and commence the approach. The aircraft became lower than planned and when the throttle was advanced to add power, the engine did not respond. The instructor took control, declared a MAYDAY on the aerodrome frequency and then conducted emergency drills, which included changing the fuel selector to the other tank. The aircraft descended faster than anticipated and as the height reduced power cables became visible on the approach path. In order to avoid a potential stall by attempting to fly over the cables, the instructor decided to descend and fly under the cables. The aircraft landed short of the intended field (Figure 1) and it collided with a hedge and was severely damaged. The student selected the electrical master and other switches OFF.

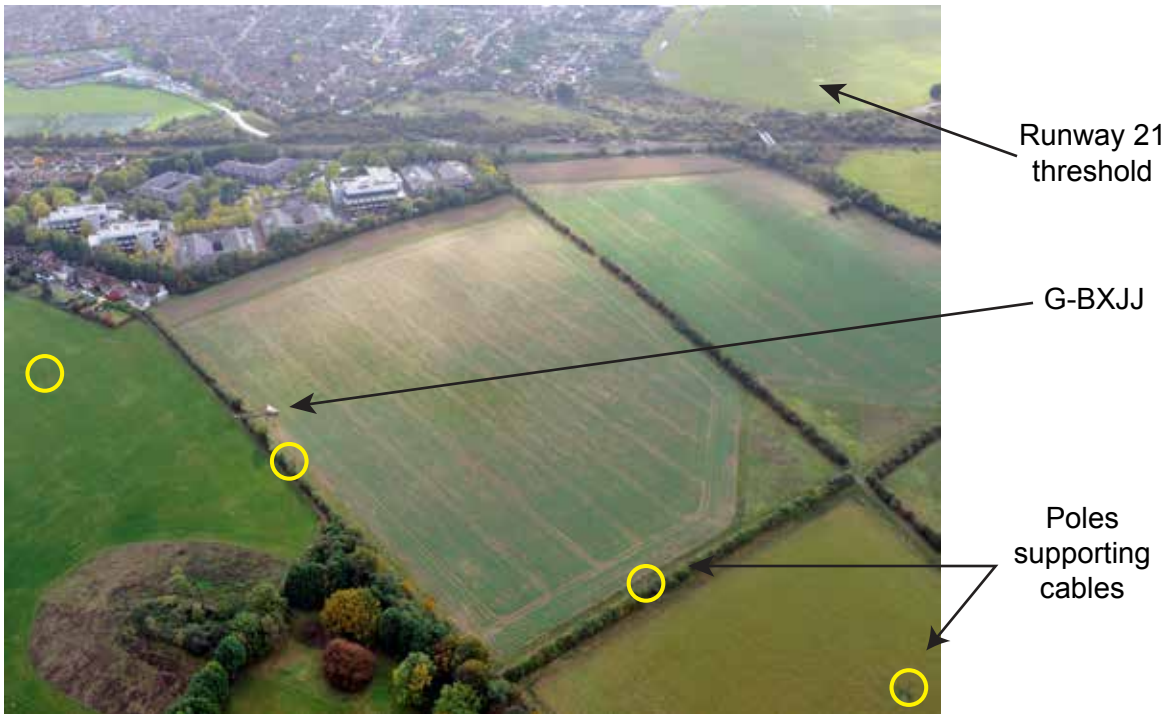

Figure 1

Aerial view of the accident site
(courtesy National Police Air Service)

Evacuation

The fuselage came to rest on its right side and the occupants were therefore unable to open the cabin door. They could smell fuel and saw it leaking from the detached wings. They were unable to dislodge the windscreens, but were able to make their escape through the left side window. They used the fire extinguisher to break the window using the direct vision window cut-out as a weak point. There was no fire.

The aerodrome called the emergency services and dispatched their own rescue and fire fighting services to the off-aerodrome location. After vacating the aircraft the instructor was able to use his mobile telephone to call the aerodrome operations to pass them his location. Assistance arrived a few minutes later.

Engineering examination

The aircraft was recovered to the operator's maintenance facility where it was examined by their engineers. The throttle and mixture controls were found connected and they operated normally through their whole range. The carburettor heat control was connected but unable to move over its full range due to distortion to the air box caused by the accident. The primer was found in and locked. The fuel system was checked and no defects were identified; the gascolator filter was clean. The engine was removed from the airframe and taken to a test facility, where it ran normally.

Weather conditions

At the time of the accident the METAR for London Heathrow Airport, 10 nm to the east, reported the wind from 190° at 6 kt, scattered cloud at 1,200 ft with temporary broken cloud at 1,200 ft, temperature 15°C and the dew point 14°C.

Carburettor icing

The CAA Safety Sense Leaflet No14, '*Piston Engine Icing*' (http://www.caa.co.uk/docs/33/20130121SSL14.pdf) gives advice and guidance on how to recognise and avoid carburettor icing. It notes:

> *'The most common, earliest to show, and the most serious, is carburettor (carb) icing caused by a combination of the sudden temperature drop due to fuel vaporisation and pressure reduction as the mixture passes through the carburettor venturi and past the throttle valve.*
>
> *If the temperature drop brings the air below its dew point, condensation results, and if the drop brings the mixture temperature below freezing, the condensed water will form ice on the surfaces of the carburettor. This ice gradually blocks the venturi, which upsets the fuel/air ratio causing a progressive, smooth loss of power and slowly 'strangles' the engine.'*

The leaflet also includes a chart, Figure 2, to show the atmospheric conditions most likely to cause carburettor icing. Plotting the temperature and dew point reported on the day of the accident onto this chart indicates that serious carburettor icing was likely to be present at any power setting.

A number of risk factors are also indentified in the leaflet, including:

> *'when:*
> - *just below cloud base*
> - *the ground is wet (even with dew) and the wind is light'*

The summary section of the leaflet includes the advice:

> *'Icing may occur in warm humid conditions and is a possibility at any time of the year in the UK.*

Low power settings, such as in a descent or in the circuit, are more likely to produce carburettor icing.

Warming up the engine before take-off improves the effectiveness of any carburettor body heat.'

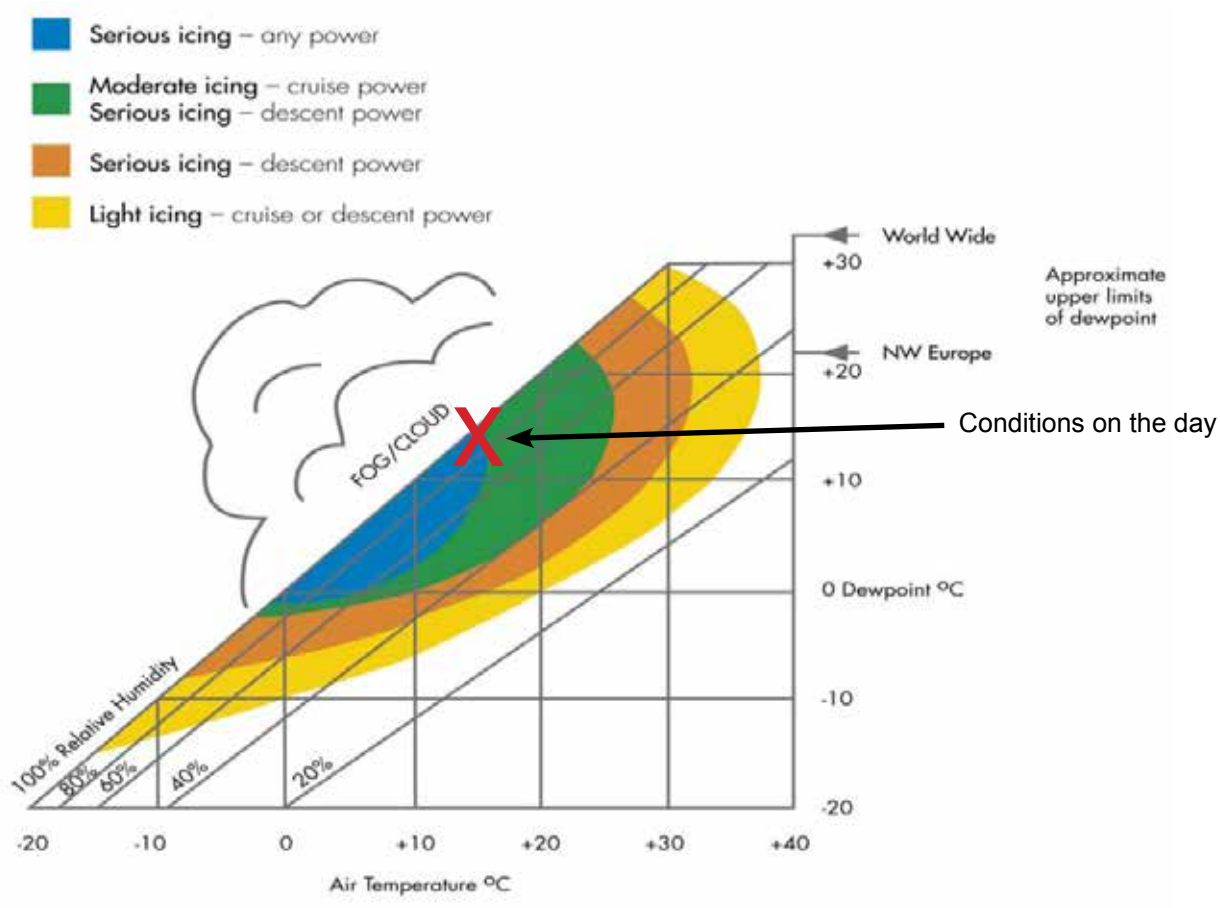

Figure 2

Carburettor icing chart from CAA Safety Sense Leaflet 14, *Piston Engine Icing*

The operator's Operations Manual V2.0 also notes:

'Carburettor icing is not restricted to cold weather and can occur on warm humid days, especially at low throttle settings (for example when descending or on approach to land).'

Discussion

In the absence of any mechanical defects, it seems that carburettor icing is a likely cause of the power loss, given the number of risk factors present on the day. These included: high humidity, a low power setting and the engine was probably not up to full operating temperature. The CAA Safety Sense Leaflet No14, '*Piston Engine Icing*' discusses carburettor icing and its avoidance in more detail.

The student pilot commented that he had not been shown how to remove the fire extinguisher from its stowage and he feels if he had been, he would have been quicker to exit the aircraft. He also noted that it would have been useful to know the left side window offered an alternative means of escape and the DV window cut-out provided a useful weak point to assist in breaking the window.

Safety action

The operator has highlighted the CAA Safety Sense Leaflet 14, '*Piston Engine Icing*' to its members. It has also placed a laminated copy of the leaflet in their flight planning room for easy reference and included a link to the leaflet in the Pilot Information section of their website.