

Accident

Aircraft Type and Registration:	Piper PA-28-181, G-BVNS
No & Type of Engines:	1 Lycoming O-360-A4M piston engine
Year of Manufacture:	1976 (Serial no: 28-7690358)
Date & Time (UTC):	23 April 2024 at 1503 hrs
Location:	1.5 miles from Prestwick Airport
Type of Flight:	Currency Check flight
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - 1 (Serious) Passengers - 1 (Serious)
Nature of Damage:	Aircraft damaged beyond economic repair
Commander's Licence:	Light Aircraft Pilot's Licence
Commander's Age:	75 years
Commander's Flying Experience:	307 hours (of which 101 were on type) Last 90 days - 0 hours Last 28 days - 0 hours
Information Source:	AAIB Field Investigation

Synopsis

While the aircraft was on a right base leg for an approach to Runway 30 at Prestwick Airport, ATC lost visual and radio contact. The aircraft had suffered a power loss and established a glide descent. The aircraft hit a tree during the latter stages of the forced landing, and subsequently struck the ground vertically nose-down. Both of those on board sustained serious injuries.

The report considers carburettor icing and the use of carburettor heat, both of which are the subject of a Civil Aviation Authority (CAA) Safety Sense Leaflet. It also highlights licensing, specifically revalidation, and the CAA's General Aviation Pilot Licensing and Training Simplification work.

History of the flight

The PIC was out of currency according to the flying club's rules which require pilots to fly at least once every 62 days. He therefore scheduled a flight with the club's Chief Flying Instructor (CFI) who, though still in post, did not have a current CAA medical certificate, and could therefore only be aboard the aircraft as a passenger. The plan was to fly for around one hour, conduct some general handling exercises to the south of the airport, including stalling and practice forced landings, and then return for three circuits. Both pilots recalled using carburettor heat during these exercises.

The aircraft had been refuelled to 34 US gal, 17 per side, on 20 April 2024, so the pilot did not refuel before departure on the accident flight. The aircraft taxied out from the club's parking area and departed Runway 30 at 1401 hrs. The aircraft turned left and departed to the south where it conducted the planned general handling exercises without incident. At approximately 1440 hrs the aircraft called Prestwick ATC for rejoin. An Airbus A320 was conducting training in the left-hand circuit, but G-BVNS was cleared via the Dalrymple Visual Reporting Point (VRP) for a left base join to Runway 30 (Figure 1). The aircraft made a normal approach and stopped on the runway for approximately 90 seconds to allow for spacing with other traffic before taking off to join the right hand circuit to the north side of Prestwick Airport.



Figure 1

Prestwick Airport and Dalrymple VRP

On the downwind leg ATC asked the aircraft to enter an orbit to allow spacing for the A320 to make an approach to Runway 30; this is a common procedure at Prestwick. After three orbits the aircraft was cleared to right base by ATC and directed to report Final. The call was acknowledged by the pilot and there was no indication of stress in his voice. During

the RTF exchange the ATC controller was visual with the aircraft as it rolled out of its final orbit toward a right base track. Following the exchange the tower controller turned around to look at the A320 in the left hand circuit while passing a message to that aircraft. When they turned back the tower controller could no longer see G-BVNS.

Toward the end of the last orbit the PIC had allowed the aircraft to descend to approximately 800 ft amsl. As the aircraft rolled out on a base leg track both those on board recalled that the engine had run down. The CFI believed that the pilot in command had failed to notice the engine issue, called "I have control" and took control. He established the aircraft in the glide and looking ahead could see Runway 21 and the SAR hangar near the threshold of the disused Runway 25 at Prestwick. His initial thought was to attempt glide to that runway. However, in his own words he soon realised that the airfield "was moving up the windscreen" and that it would be out of gliding range. After taking control he directed the PIC to change the fuel tank selection, which he did. Although the CFI was on the right side of the aircraft, he did not feel there were any suitable landing options to the right but "saw a patch of open ground to the left." The CFI considered a Mayday call but decided to concentrate on the forced landing. In the latter stages he initiated a left turn to align with the longest axis of the landing area but saw trees that he considered would obstruct the aircraft's final approach. He described raising the nose to clear the trees. The aircraft reduced speed and, whilst he did not recall hearing the stall warner, he described the aircraft as being in light buffet. The aircraft struck the top of a tree in a left banked attitude, which arrested the forward speed of the aircraft, causing it to roll and yaw left, and pitch down. The aircraft struck the ground vertically nose-down.

The PIC recalled completing the downwind checks, believing he used carburettor heat, and conducting the orbits downwind. As he prepared for a descent towards the airfield, he recalled the engine rpm indication reducing to around 500. He recalled that the CFI said something but could not remember what was said. Ahead he saw trees with an area of green beyond. He recalled that the CFI pumped the throttle, but that the engine did not recover. His last recollection of the flight was the nose being raised with the aircraft in a "right banked" attitude. Then the aircraft was on the ground. He believed that he had been flying the aircraft.

The ATC controller, believing that G-BVNS may have manoeuvred further downwind to position for its approach, made RTF calls to try and establish its position. The call was repeated several times, but no reply was received. The tower controller checked Runway 21 at Prestwick in case the aircraft had landed there. They also asked other personnel in the tower to look out for the missing aircraft; however, no visual contact was made with the aircraft. The tower controller then asked the A320 to move to the right hand circuit to look for the missing aircraft. At 1504 hrs an automated emergency call was received by the emergency services from the mobile phone of the pilot of G-BVNS. The emergency services informed Prestwick ATC of the accident shortly after and at the same time the crew of the A320 reported sighting the aircraft on the ground in a field to the north-east of the airport.

The coastguard SAR helicopter based at Prestwick was launched to attend the scene along with local emergency services. Both pilots had sustained serious injuries and were flown to the major trauma unit of the Queen Elizabeth Hospital in Glasgow.

Airfield information

Prestwick Airport is an international airport serving the west of Scotland, situated one nautical mile (two km) north-east of the town of Prestwick, and 32 miles (51 km) south-west of Glasgow. The airport has two long asphalt surfaced runways; the layout is shown in Figure 2.

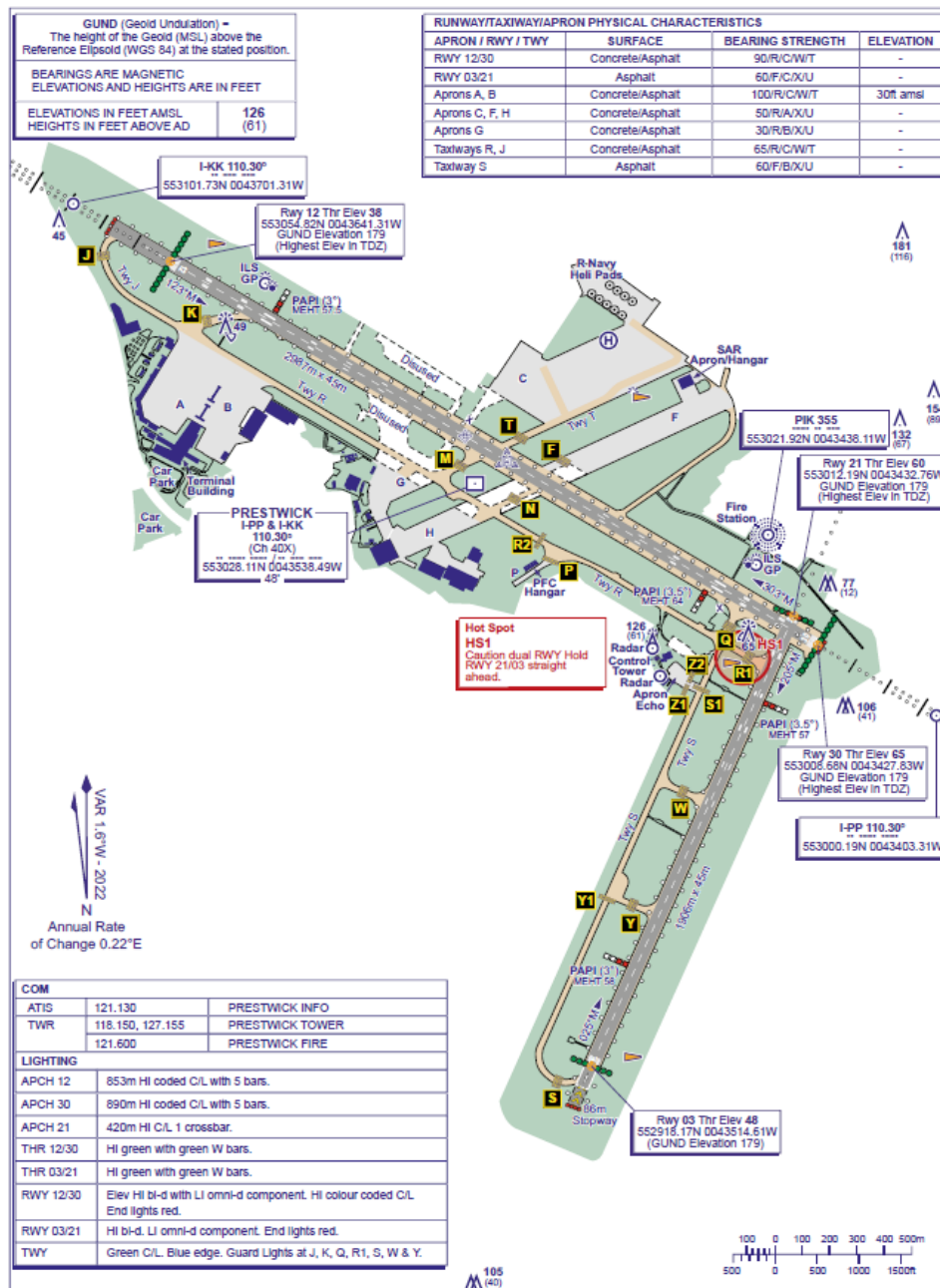


Figure 2

Prestwick Airport chart

Recorded information

The CFI was using a flight-planning and navigation app on his mobile phone which recorded the aircraft’s GPS flight path (Figure 3). The figure highlights the three orbits flown at the end of the downwind leg of the circuit and the proximity of the crash site from the airport.

The orbits were flown over a period of 3.5 minutes during which the aircraft climbed and descended about 300 ft. The airspeed varied between about 83 and 110 kt (Figure 4).

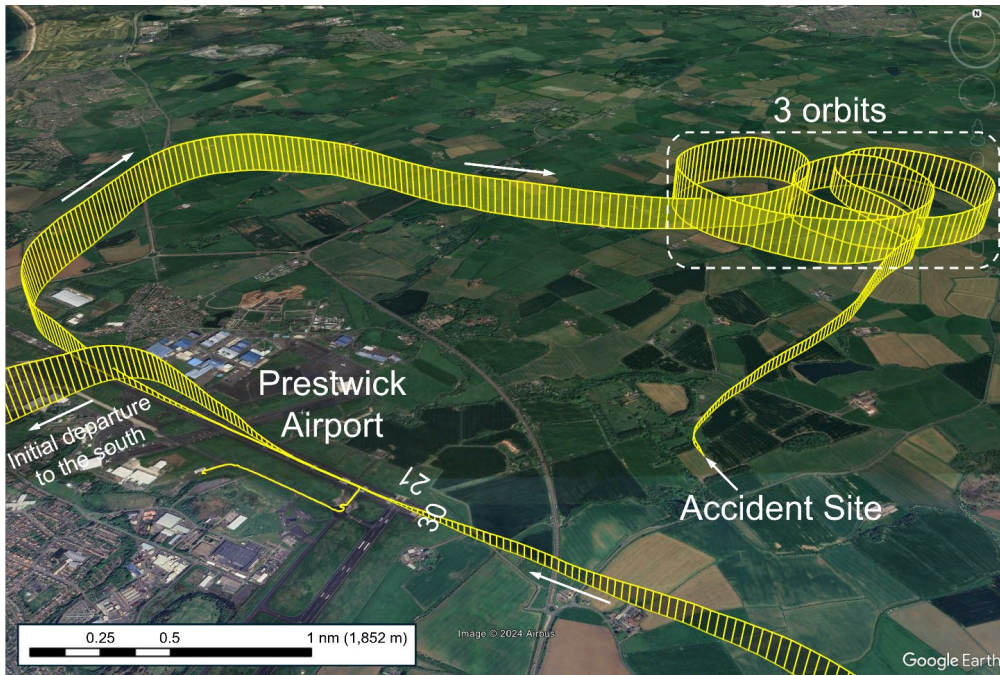


Figure 3

Flight path of right hand circuit with downwind orbits highlighted

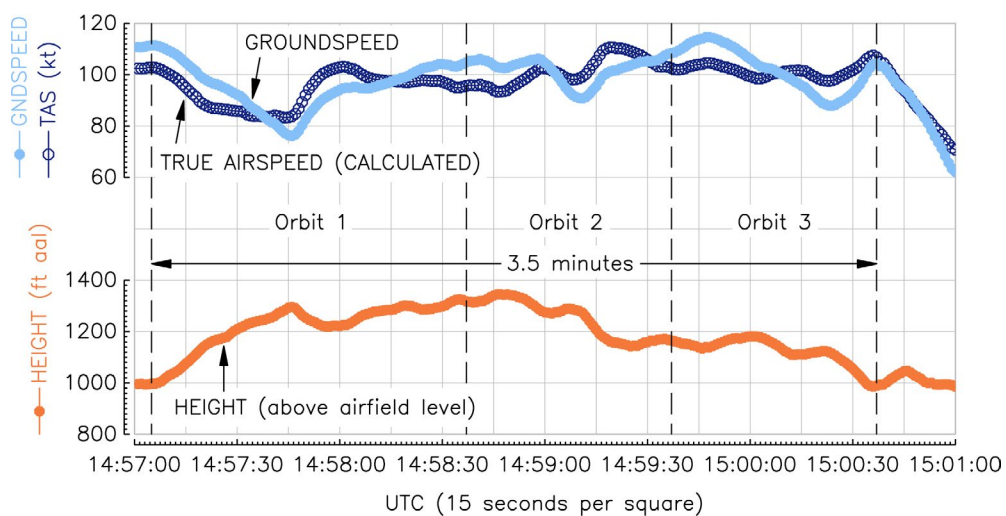


Figure 4

GPS derived data for the three orbits

Figure 5 plots data for the descent starting with the aircraft descending through 1,000 ft amsl (980 ft aal and about 600 ft agl) on base, at about 800 ft/min, just under 2 nm from the threshold of Runways 21 and 30. The descent rate reduced to about 460 ft/min for the remaining 60 seconds of the descent, during which the airspeed reduced from 85 to below 60 kt. The aircraft then struck the tree, after which it descended towards the ground at about 4,250 ft/min (equivalent to 48 mph).

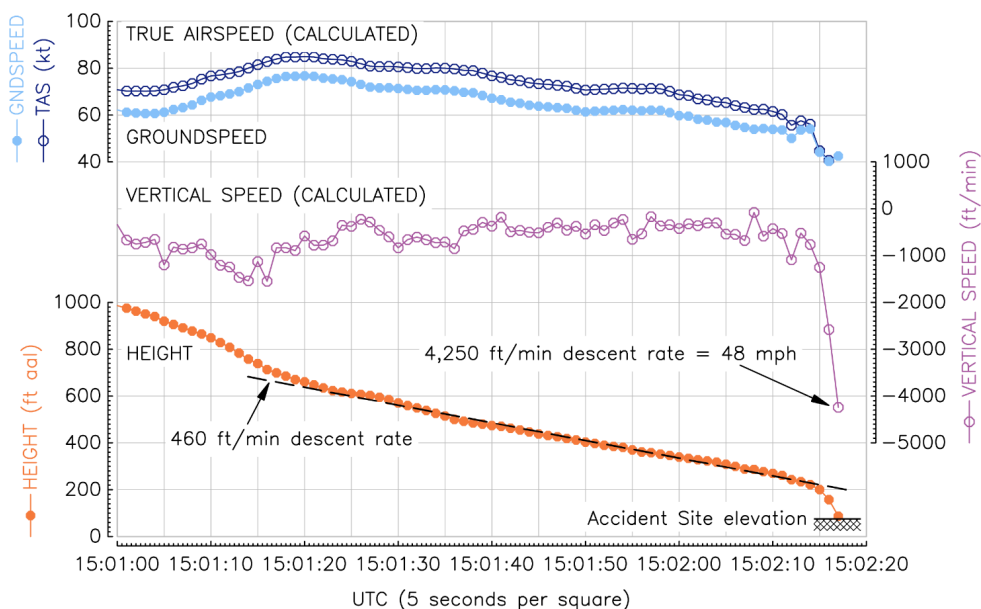


Figure 5
GPS derived data for the descent

Accident site

The accident site was approximately 1.5 miles from Prestwick Airport.

The leading edge of the left wing had struck a tree that was approximately 15 m tall which caused the aircraft to roll and yaw to the left. Indentations in the ground approximately 45 m from the tree indicated that the aircraft had been in a steep nose-down attitude. The right wingtip hit the top of a wooden fence post and the wing separated from the aircraft causing a substantial fuel leak; a small amount of residual fuel was found in the right wing.

The aircraft bounced and fell backwards such that the tail and horizontal tailplane became entangled in a barbed-wire fence that ran along the boundary between two fields. The left wing was still partially attached to the fuselage, but the angle at which the aircraft came to rest meant that the fuel drained out of the wing through a broken pipe.

The propeller sustained minimal damage and there were no propeller slash marks in the ground. This indicates that the engine was either stopped, or not producing any significant power.

Aircraft information

G-BVNS was manufactured in 1976, and the Airworthiness Review Certificate was valid until March 2025. It was equipped with a Lycoming O-360 engine and a two-blade, fixed-pitch, metal propeller. The engine was overhauled in January 2023, and it had accrued approximately 150 operating hours since. There were no reports of any engine related issues in the days preceding the accident.

Fuel uplift

The flying club guidance indicated that at the end of a day's flying, the expectation was that the aircraft would be refuelled to tabs, which is approximately 34 US gal. Fuel bowser records showed that 50 litres (approximately 13.2 US gal) of fuel were uploaded to G-BVNS on 20 April 2024 after the last flight before the accident. The pilots from the accident flight said that they checked the contents of the fuel tanks prior to the flight, and confirmed the aircraft was fuelled to tabs.

Aircraft glide performance

The aircraft POH gives a speed for the best glide range as 76 kt. At this speed with zero flap set, in still air the aircraft should be able to glide approximately 1.6 nm for each 1,000 ft of altitude. This equates to a descent rate of about 800 ft/min.

Aircraft examination

The aircraft was taken to the AAIB facilities at Farnborough for examination.

Flying controls

There was no evidence of a pre-existing flying control failure, and the flaps were retracted.

Fuel

The fuel tank selector valve was found in the LEFT position and the pipework was free of obstruction.

The electric fuel pump switch was found in the ON position and the fuse was undamaged. The pump and its associated fuel pipes contained residual fuel. The pump worked when tested and the filter was free of debris.

The gascolator contained fuel and was free of debris or water.

Engine

The ignition key was found in the BOTH position, which is the normal position for flight. The throttle, mixture, and carburettor heat controls in the cockpit had been disrupted so it was not possible to establish their relative positions at the time of the accident. The air inlet valve in the carburettor airbox was found in the full cold position, and the air intake filter was not blocked. The oil filter was free of debris and the visual appearance of the oil was normal.

The engine showed no signs of a pre-existing fault but sustained relatively minor, localised, impact damage in the accident. This consisted of:

- One broken high-tension lead.
- A broken oil filter casting.
- One dented pushrod tube and a bend in the associated pushrod.

Engine test

Replacement parts were installed, and the engine, magnetos and carburettor were tested as an assembly at an independent repair and overhaul facility with AAIB representatives in attendance. The engine started normally and ran without anomaly for about one hour, at which point the test was terminated. It developed 187 HP at its maximum operating speed of 2,700 rpm – the specification requirement is 180 HP \pm 10%.

Meteorology

The weather was generally fine at Prestwick on the day of the accident. The airfield weather report at 1550 hrs gave the conditions as follows: wind 250° at 10 kt, visibility greater than 10 km, cloud base 3,000 ft amsl, QHN 1024 hPa, temperature 11°C and dewpoint 5°C.

The temperature and dewpoint combination plotted on a CAA carburettor icing risk chart (Figure 6) from the CAA's Safety Sense Leaflet (SSL) 14 – *Piston Engine Icing*¹ indicates the conditions of the day would have created a serious risk of carburettor icing at any power.

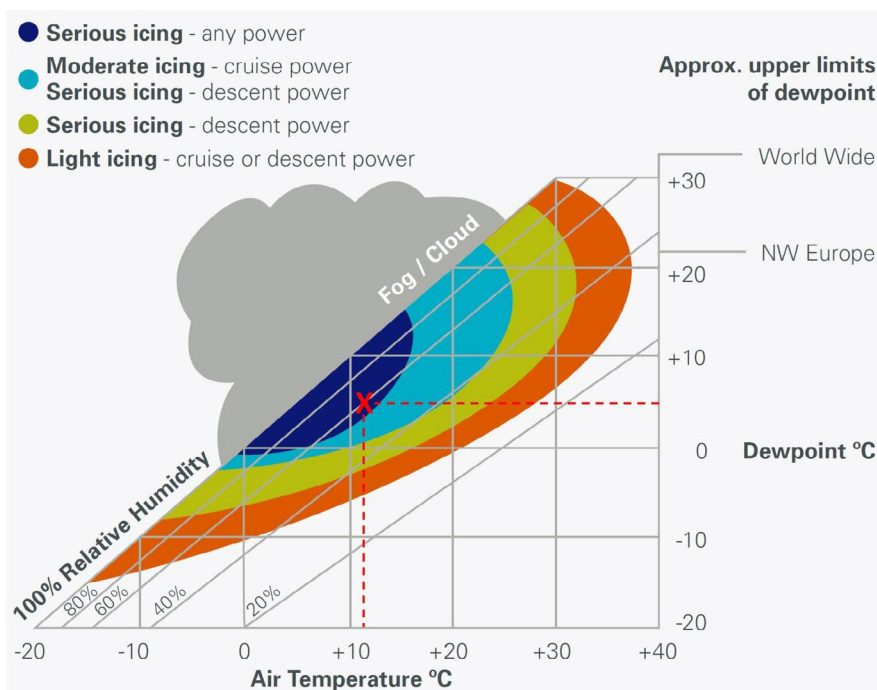


Figure 6

CAA icing risk chart from SSL 14

Footnote

¹ [CAA Safety Sense Leaflets](#) [accessed September 2024].

Carburettor icing

CAA carburettor icing information

SSL 14 provides extensive information for GA pilots on the risks of icing in piston engine aircraft. The leaflet considers the types of icing, atmospheric conditions which contribute to the risk, prevention, and recommended procedures. With regard to atmospheric conditions for carburettor icing it states:

'Piston engine icing is not restricted to cold weather. Particularly carburettor icing may occur on warm days if the humidity is high enough, especially at low power settings. For example, cold and clear winter conditions with low humidity may be less of a hazard than warm and humid days in the summer.'

Carburettor icing becomes more of a risk in the range between 0°C and 10°C and with high relative humidity. However, tests have produced serious icing at descent power with the outside air temperature above 25°C and with relative humidity as low as 30%. In the United Kingdom and Northern Europe where high humidity is common, you must be constantly on the alert.'

Pilots Operating Handbook

The manufacturer's Pilots Operating Handbook (POH) for the aircraft contained information on carburettor icing which is shown at Figure 7.

3.29 CARBURETOR ICING

Under certain moist atmospheric conditions at temperatures of -5°C to 20°C, it is possible for ice to form in the induction system, even in summer weather. This is due to the high air velocity through the carburetor venturi and the absorption of heat from this air by vaporization of the fuel.

To avoid this, carburetor preheat is provided to replace the heat lost by vaporization. Carburetor heat should be full on when carburetor ice is encountered. Adjust mixture for maximum smoothness.

Figure 7

Piper PA-28-181 POH extract – Carburettor Icing information

A carburettor ice detector is available as an optional fit for the aircraft, but G-BVNS was not fitted with it. The POH gives further guidance regarding carburettor icing under a section entitled engine roughness and states that such roughness is usually caused by carburettor ice. In this event the crew did not report any symptoms of rough running before the engine failed.

The Engine Power Loss in Flight checklist from the POH is shown at Figure 8. The fourth item in this checklist requires the carburettor heat to be selected on. When the engine lost power and the CFI took control, he directed the PIC to change the fuel tank selection,

which he did. The CFI said “I pumped the throttle” in an effort to recover power. While this produced two or three short bursts of apparent power it did not restore the engine. The fuel pump had already been selected on in the downwind checks and the mixture had been left fully rich for the whole flight.

<u>SECTION 3</u>	<u>PIPER AIRCRAFT CORPORATION</u>
<u>EMERGENCY PROCEDURES</u>	<u>PA-28-181, ARCHER II</u>
ENGINE POWER LOSS IN FLIGHT	
Fuel selector.....	switch to tank containing fuel
Electric fuel pump.....	ON
Mixture.....	RICH
Carburetor heat.....	ON
Engine gauges.....	check for indication of cause of power loss
Primer.....	check locked
If no fuel pressure is indicated, check tank selector position to be sure it is on a tank containing fuel.	
When power is restored:	
Carburetor heat.....	OFF
Electric fuel pump.....	OFF
If power is not restored prepare for power off landing.	
Trim for 76 KIAS.	

Figure 8

PA-28-181POH extract – Engine Power Loss in Flight checklist

Personnel

Club CFI

The flying club is a Declared Training Organisation (DTO). The CFI, who was also the Head of Training for the DTO, had first noticed symptoms of a medical condition in September 2022. He consulted a doctor but was told the symptoms could be sunstroke and he chose not to discuss the issue with an Aeromedical Examiner (AME). In December 2022 he had another episode and decided to stop flying solo or with anyone who had not gone solo. In early 2023, he consulted a different doctor but was not given any diagnosis. In June 2023 he did not renew his Class 1 medical certificate believing he would have another year’s validity with a Class 2 Medical. However, his medical certificate had only been endorsed at Class 2, so from June 2023 only his LAPL (Light Aircraft Pilot’s Licence) was valid. In October 2023 he was contacted by the CAA and told that his medical was suspended.

After further exploration his condition was correctly diagnosed and he began a course of treatment. Since beginning the treatment, he has had no further episodes of the condition. An episode of the condition in flight would not have left him in a situation where he would be liable to collapse and impede the controls of an aircraft. He stated that the Pilot in Command was aware of his medical situation before the flight.

Pilot in Command (PIC)

The PIC presented to the investigation a UK Part Flight Crew Licensing (FCL) Private Pilot's Licence (Aeroplanes) (PPL(A)), with a Single Engine Piston (SEP) rating which lapsed in July 2023 and a UK Part FCL LAPL(A). His intention was to operate under the privileges of his LAPL. The LAPL does not require a rating to be endorsed upon it but does require that the pilot fulfils the requirements below on each day that they fly.

The requirements are²:

'(a) Holders of a LAPL(A) shall exercise the privileges of their licence only if in the last 2 years they have met any of the following conditions as pilots of aeroplanes or TMGs:

(1) they have completed at least 12 hours of flight time as PIC or flying dual or solo under the supervision of an instructor, including:

— 12 take-offs and landings;

— refresher training of at least 1 hour of total flight time with an instructor;

(2) they have passed a LAPL(A) proficiency check with an examiner. The proficiency check programme shall be based on the skill test for the LAPL(A).'

The PIC had not flown since November 2023 and believed that he was taking appropriate action to recover his currency by flying with the CFI, and that the CFI was acting as an instructor during the accident flight. The CFI stated that he took notes of the PIC's performance to facilitate a post-flight debrief.

The PIC did not recall the CFI taking control when the engine failed and considered that he was trying to fly the forced landing. His recollection of events was, however, incomplete.

CAA General Aviation Pilot Licensing and Training Simplification Project

The regulations for revalidation of ratings are complex and there are a number of licence categories. The CAA is engaged in a General Aviation Pilot Licensing and Simplification Project³. In October 2022 the CAA published CAP2335 (General Aviation Pilot Licensing & Training Simplification – Phase 1: Strategic Direction) as part of a 3-phase program to simplify training and licensing for the UK's General Aviation (GA) Sector. The subsequent GA community response (CAP2532) showed strong support in several key areas for updating the current legislation with regards to licensing and training.

The Phase 2 consultation, which closed on 22 May 2024 explored these key areas in more detail, to ensure that the CAA works towards the goals of the community whilst maintaining legislative compliance within these areas. Phase 3 will be the rulemaking phase.

Footnote

² [UK Aircrew Regulation | UK Regulation \(EU\) No. 1178/2011 | FCL.140.A LAPL\(A\) – Recency requirements](#) [accessed July 2024].

³ [Licensing & Training Simplification | Civil Aviation Authority \(caa.co.uk\)](#) [accessed July 2024].

Recency requirements

CAA 90-day currency rule

For the carriage of passengers, UK Part FCL⁴ states:

'A pilot shall not operate an aircraft in commercial air transport or to carry passengers:

(1) as PIC or co-pilot unless he/she has carried out, in the preceding 90 days, at least 3 take-offs, approaches and landings...'

To accompany a pilot who is outside the 90-day rule, the accompanying pilot must be in a position to exercise the privileges of their licence. As the CFI's medical was suspended at the time of the accident he was not able to do so and so it is likely the flight did not comply with the 90-day rule.

Flying Club

The syndicate which owned the aircraft had agreed to abide by the published operating principles of the Flying Club and all syndicate members were also flying club members. In its operating principles document the club published the information regarding pilot flying currency (Figure 9).

Currency

- Club currency is 3 landings in 62 days for nosewheel, 31 days for tailwheel
- Cross wind (actual and forecast) meets aircraft and personal capability
- Type flown in previous 90 days
- Student authorised by an instructor.
- PPL members are self authorising
- Aerobatics and formation flying shall be individually approved by club instructors
 - Formation aerobatics is not covered by PFC club governance – pilots own risk.

Figure 9

Flying club currency requirements

The CFI had signed the operating principles document. While the currency periods were clearly defined, due to the wide range of experience amongst club members it was club policy to not specify the requirements for regaining currency.

Footnote

⁴ [UK Aircrew Regulation | UK Regulation \(EU\) No. 1178/2011 | FCL.060 Recent experience](#) [accessed July 2024].

Aircraft Syndicate

The syndicate's Standard Operating Procedures (SOPs) contained a slightly amplified set of currency rules (Figure 10).

ADHERENCE TO '62-DAY' & '90-DAY' RULES

The 90 day rule is a requirement under the Air Navigation Order for the carriage of passengers - 3 take offs / landings required within preceding 90 days - includes other pilots non-flying as 'passengers' if single pilot aircraft / operations. This a LEGAL REQUIREMENT and failure to comply would render our insurance cover invalid, leaving YOU liable for any costs / damages should an accident occur. DO NOT BREACH THE 90-DAY RULE!

Prestwick Flying Club operates a '62-day currency' rule - this is not an insurance requirement but SAF has agreed to abide by it. Basically, if you haven't flown within the preceding 62 days, you should contact the CFI (or another instructor) before flying. If you're only out by a couple of days, they might be happy to authorise your flight. If it's a couple of weeks / months, you will most likely be required to undergo a currency check with one of the instructors. It's a common sense approach - based on your flying experience, confidence and skill level - with safety being the primary concern.

If your 62 day currency is on another type of aircraft you must either fly the group aircraft or similar model within a 90 day period of your last flight on that type. If outwith this period then the above procedure re currency must be applied.

Figure 10

Syndicate SOP extract

The SOPs suggest that if a pilot has not flown for a protracted period, it is likely that a check with an instructor would be required and that pilots should contact the CFI or another instructor before flying.

Analysis

Engine and fuel system

There was no evidence of pre-existing faults with the engine and fuel system which would have caused the engine to stop in flight. The engine, carburettor and magnetos were tested as an assembly and found to operate normally. Evidence of leaked fuel at the accident site indicated that there was fuel on board the aircraft. Each fuel tank was selected during the descent, and this had no effect on engine performance.

Carburettor heating and its use during the flight

The weather conditions at the time of the flight were such that there was a serious risk of carburettor icing at any power. The carburettor air inlet valve was found in the full cold position, indicating that carburettor heat was not selected. The valve installation is such that the valve could not have changed position when the aircraft struck the ground.

The general handling portion of the flight was carried out without incident and neither pilot recalled any precursor symptoms that would have suggested any issues with the engine. During this phase of the flight they conducted several PFLs that involved sustained descents at idle power. The use of carburettor heat in these descents would have been appropriate and is suggested in the aircraft check list. Both pilots were sure it was used during these exercises.

On returning to the right hand circuit the aircraft made a successful stop and go. Subsequently, both pilots believed that the downwind checks had been completed and that a carburettor heat check was carried out as a part of those. Neither was absolutely certain about the carburettor heat setting during the orbits made from downwind. At this point the aircraft would have been at a power setting where the risk for carburettor icing was severe. While orbits on the downwind leg are relatively common at Prestwick it is possible that the presence of the A320 was a distraction and disrupted the checks. Approximately four minutes elapsed from the downwind leg till the aircraft was cleared to base leg.

Events after the engine power was lost

The CFI took control of the aircraft from the PIC, believing that the PIC was not aware of the engine losing power. He established the aircraft in the glide and asked the PIC to change the fuel tank selection. The aircraft was less than 2 nm from the Prestwick runways and below 1,000 ft aal. Viable areas for a field landing were available to the right, but ahead, Runway 21 was in view and may have captured the CFIs attention initially. He did not consider a right turn into wind in the period immediately following the power loss. As the aircraft descended in the direction of Runway 21 the CFI realised that there was insufficient height to glide to the airfield and that a field landing was inevitable.

Now lower, the choices were reduced and he felt that all options to the right were impeded by trees. He saw a field ahead to the left and decided to attempt a landing there. As the aircraft approached the chosen field the CFI recognised that the trees were moving up in his sightline and that in his estimation the aircraft was going to hit the trees. He raised the nose in an attempt to get the aircraft over the trees, reducing the airspeed below the aircraft's ideal glide speed. Raising the nose created an illusion that the aircraft would clear the trees.

Licensing

The PIC was aware that he was out of currency to fly at the club and had contacted the CFI to arrange for a currency check. His understanding was the role of the CFI was to "check him out" and to act as an instructor providing appropriate guidance. He was unclear about the 90-day rule but considered that as he was flying with an instructor it was not relevant to this flight. As the CFI's medical was suspended he was not in a position to exercise the privileges of his licence and, therefore, could not act as an instructor or as accompanying pilot in accordance with the 90-day rule. The existence of an LAPL and a PPL confused the situation with regards to the validity of ratings.

Whilst the statuses of the pilots' licences are unlikely to have contributed to the accident, this event highlights the potential for pilots to be confused regarding current licensing regulations. The CAA's General Aviation Pilot Licensing and Training Simplification project seeks to address these issues.

Conclusion

The engine most likely stopped because of carburettor icing and a forced landing ensued. The aircraft struck trees during the latter stages of the approach to the forced landing and control was lost. Both occupants survived but sustained severe injuries.

Published: 3 October 2024.