

ACCIDENT

Aircraft Type and Registration:	Piper PA-28-151 Cherokee Warrior, G-BOTF	
No & Type of Engines:	1 Lycoming O-320-E3D piston engine	
Year of Manufacture:	1975 (Serial no: 28-7515436)	
Date & Time (UTC):	9 September 2012 at 0818 hrs	
Location:	Southend Airport, Essex	
Type of Flight:	Private	
Persons on Board:	Crew - 1	Passengers - 2
Injuries:	Crew - None	Passengers - None
Nature of Damage:	Fire damage to engine and cowling	
Commander's Licence:	Private Pilot's Licence	
Commander's Age:	24 years	
Commander's Flying Experience:	130 hours (of which 3 were on type) Last 90 days - 5 hours Last 28 days - 4 hours	
Information Source:	Aircraft Accident Report Form submitted by the pilot	

Synopsis

The aircraft's engine caught fire during an attempt to start the engine whilst it was hot from having recently run. In the absence of evidence of a pre-existing defect in the fuel system within the engine bay, it is likely that the engine fire was caused by over-priming the hot engine.

History of the flight

The pilot taxied the aircraft from its parking position to the fuel pumps with the intention of refuelling the aircraft prior to conducting a local flight. He reported that the aircraft started at the first attempt and remarked that he had experienced difficulty in starting the engine on the same aircraft the previous week and he had been told by an instructor to continue cranking the engine until it eventually started.

After refuelling the aircraft, and with his two passengers onboard, the pilot attempted to start the engine but it did not start, so he continued to crank the engine by using the starter motor whilst advancing and retarding the throttle. He could not recall how many times the throttle control was advanced, nor if the engine was cranked continuously throughout the start attempt. The engine still did not start and the pilot noticed that smoke was issuing from the engine bay, followed by flames. He set the fuel cock to OFF and supervised the successful evacuation of his passengers, shortly after which the airfield fire service arrived and extinguished the fire.

Aircraft examination

The forward lower section of the engine cowling and the inside of the engine bay were extensively fire damaged, Figure 1, with the seat of the fire appearing to have been located at the bottom of the engine, close to the carburettor. An engineering inspection of the fuel system within the engine bay did not reveal loose fittings, split fuel hoses or other pre-existing defects.

Previous similar occurrences

A search of AAIB records for engine fires following engine starting attempts on Piper PA-28 series aircraft revealed seven similar incidents over the period 2000-2012. Three of these incidents were reported in the AAIB Bulletin and in all three cases, over-priming of a hot engine was identified as the likely cause of the engine bay fire.

Discussion

The source of fuel for the fire was likely to have been fuel pumped into the carburettor venturi by the carburettor accelerator pump, which operates when the throttle lever is advanced swiftly forwards. The induction of the fuel into the engine relies on airflow to move the fuel upwards into the engine inlet manifold. However, if the engine is stopped when the throttle lever is advanced, excess fuel will drip downwards from the carburettor and pool in the carburettor heat box. The heat radiated by the hot exhaust system can then cause the pooled fuel to vaporise and can also act as an ignition source for the fuel vapour.



Figure 1

Fire damage to the forward lower section of the engine bay

The PA-28-151 owner's manual contains the following advice:

'If the engine fails to start at the first attempt, another attempt should be made without priming. If this fails, it is possible that the engine is over-primed. Turn the magneto switch to OFF, open the throttle slowly, and rotate the engine approximately ten revolutions with the starter. Re-prime the engine with one half the amount used in the initial attempt, turn the magneto switch to "Left", and repeat the starting procedure.'