ACCIDENT

Aircraft Type and Registration:	Cessna 177A Cardinal, G-BTSZ
No & Type of Engines:	1 Lycoming O-360-A2F piston engine
Year of Manufacture:	1969
Date & Time (UTC):	26 May 2010 at 1018 hrs
Location:	Tempsford Airfield (disused), Bedfordshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - 1 (Minor) Passengers - 2 (Minor)
Nature of Damage:	Landing gear collapsed and damage to the propeller
Commander's Licence:	Private Pilot's Licence
Commander's Age:	68 years
Commander's Flying Experience:	1,432 hours (of which 118 were on type) Last 90 days - 43 hours Last 28 days - 13 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and information provided by maintenance organisation

Synopsis

Approximately 15 minutes into a local area flight from Cranfield, the aircraft's engine began to misfire. The pilot applied carburettor heat, to no effect, and then observed that both fuel quantity gauges indicated that the fuel tanks were empty. The pilot carried out a forced landing, during which the nose landing gear collapsed. Subsequent investigation showed that the probable cause of the loss of power was the build up of water-contaminated fuel residue in the engine fuel strainer drain mechanism, which prevented the drain from closing fully after the pre-flight checks and resulted in the loss of fuel.

History of the flight

The pilot had arranged to take two passengers for a flight from Cranfield to the local area. On arrival at the aircraft he visually inspected the fuel tank contents and estimated that there was sufficient fuel, approximately 22 gallons, for two hours of flight. The engine fuel strainer (gascolator) drain operating handle was located on the upper right engine cowling and when opened discharged fuel through a pipe extending through the lower left engine cowling. The pilot completed the engine fuel strainer drain check, with the assistance of one of his passengers, and no abnormalities were observed during the pre-flight checks.

After engine start, the aircraft was held on the ground

for 15 minutes due to other movements in the circuit. Approximately 15 minutes after takeoff the engine began to misfire, so the pilot selected the carburettor heat to ON, which had no effect. The pilot then checked the two fuel quantity gauges which showed both fuel tanks to be empty. After establishing the aircraft in a glide, the pilot informed ATC of the problem and his intention to carry out a forced landing at a disused airfield in the vicinity. During the approach, he realised that the aircraft would not reach the remaining section of runway, so he carried out a landing on an area of ploughed ground to the north of the site. The nose landing gear failed during the ground roll and the occupants suffered minor injuries but were able to leave the aircraft unassisted.

Investigation

The pilot confirmed that his estimation of the fuel quantity prior to the flight was made by visual assessment of the depth of fuel observed through the fuel tank filler necks. The tank necks were not fitted with 'tabs' to assist with this estimation. The pilot also commented that approximately 18 months ago he had experienced a problem with the engine fuel strainer (gascolator) drain being difficult to operate and close fully, but this had been rectified. He also stated that he placed covers over the wing fuel filler caps when the aircraft was parked to help prevent water contamination of the fuel system. The maintenance organisation who later examined the aircraft confirmed that it was fitted with an early standard of fuel filler caps, which are more prone to water ingress than the 'raised umbrella' type of fuel filler cap.

Inspection of the aircraft's fuel tanks confirmed that they were empty and there was evidence of an in-flight fuel leak from the engine fuel strainer drain. In view of the previous problems with the fuel strainer, tests were carried out which confirmed that, after operation, the drain valve could stick in a partially open position producing a leak rate of between 18 and 24 gallons per hour. When the filter drain mechanism was disassembled it was found contaminated by a large deposit of waxy material, similar to that produced when fuel is contaminated with water. After cleaning and reassembly, the fuel filter drain operated normally. It is possible that the deposits in the fuel drain mechanism prevented the closure of the fuel strainer drain, which then resulted in an unobserved fuel leak.

On 30 July 2010 the Federal Aviation Administration published Special Airworthiness Information Bulletin SAIB CE-10-40R1 advising owners and operators of Cessna 100, 200 and 300 series aircraft of the hazards of water contamination of the fuel system and methods of minimising water ingress, including the use of a new 'raised umbrella' type of fuel filler cap.