ACCIDENT

Aircraft Type and Registration:	Reims Cessna F172N Skyhawk, G-DENR
No & type of Engines:	1 Lycoming O-320-H2AD piston engine
Year of Manufacture:	1979
Date & Time (UTC):	20 August 2006 at 1140 hrs
Location:	Lower Widdon Farm, near Ashburton, Devon
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 2
Injuries:	Crew - None Passengers - None
Nature of Damage:	Engine cowling, firewall, wheel struts, left wing tip, wing skins, tailplanes, elevators and cabin interior
Commander's Licence:	Private Pilot's Licence
Commander's Age:	45 years
Commander's Flying Experience:	107 hours (of which 31 were on type) Last 90 days - 12 hours Last 28 days - 0.5 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further enquiries by the AAIB

Synopsis

The aircraft was on a VFR flight from Bournemouth, Dorset, to Truro, Cornwall. When it was approximately 15 nm south-west of Exmouth, Devon, and at 2,800 ft altitude, the engine began to run roughly before stopping. The pilot completed engine failure checks without success and subsequently flew a forced landing into a field. The aircraft landed heavily and suffered severe damage. The occupants vacated the aircraft uninjured.

Cessna 172 fuel system

The engine fuel selector is located on the floor below the instrument panel and is easily accessible to both pilots. The selector can be used to feed the engine from the left or right tank or both tanks. To turn the fuel OFF the pointer is turned to face directly aft. There is no safeguard on the OFF position, so care is required when changing the selection. For all normal operations the fuel selector should be placed in the BOTH position. If the tank levels become uneven it is possible to select the higher quantity tank in cruising flight to balance the tank levels.

When refuelling, the fuel selector should be placed in the LEFT or RIGHT position to minimise cross-feeding between tanks. After refuelling the tanks to full, fuel from the left tank can vent overboard from the air vent pipe on the underside of the left wing. This can be

avoided by under-filling the left tank by two gallons or the left tank can be selected initially after start. Once a small amount of fuel has been used the selector can then be returned to BOTH. The selector should be selected to BOTH for takeoff, climb and landing; this requirement was placarded on the fuel selector in G-DENR as shown in Figure 1 below.

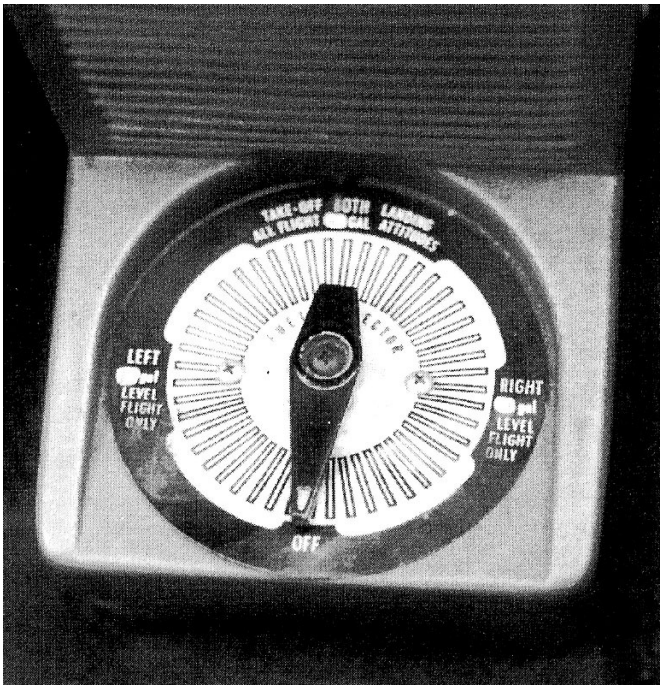

Figure 1
Fuel Selector

In addition to the fuel tanks and tank selector, the Cessna 172 fuel system consists of a fuel strainer, a strainer bowl and the carburettor downstream of the fuel selector. The strainer bowl has a volume of 0.196 litre. If the fuel supply to the fuel strainer is shut off, its design prevents fuel in the bowl portion being drawn into the carburettor and so the engine will not be able to draw fuel from the fuel strainer. Consequently, the engine will run until the fuel contained in the carburetor float bowl is exhausted; this is predicted to be for no longer than 20 seconds at cruise power.

Background information

The pilot stated that he was fully conversant with the operation of the fuel selector and he had recently demonstrated this to an examiner during his 'Single Engine Piston' aircraft skills test.

History of the flight

The pilot reported that before departure from Bournemouth, the owner (not the pilot) filled the right tank to FULL and the left tank to two gallons short of FULL. The owner checked these quantities visually. The owner advised the pilot to take off with the selector on LEFT and to select BOTH after takeoff during his first routine in-flight check. The aircraft subsequently took off at approximately 1000 hrs with the LEFT tank selected.

The flight progressed uneventfully with the pilot performing a routine in-flight check over Dorchester, 23 track miles from Bournemouth, where he selected the fuel selector to BOTH and applied precautionary carburettor heat. As he approached Lyme Regis he contacted Exeter radar and requested a Flight Information Service. They requested that he report overhead Exmouth, which he complied with; at this point the aircraft was at 2,000 ft amsl and had flown a further 38 track miles. The pilot then carried out another routine in-flight check, including the use of carburettor heat, before commencing a cruise climb to 3,300 ft amsl at 95 kt and 2,300 rpm.

As the aircraft climbed through 2,800 ft amsl the engine began to run roughly and the rpm reduced slightly. The pilot selected the carburettor heat ON, with no initial change in the engine's rpm. He then reduced the IAS to the aircraft's best glide speed of 65 kt but the engine rpm then started to fluctuate slightly before it stopped; at this point the aircraft was 15 nm south-west

of Exmouth. The pilot carried out the Engine Failure checklist from memory and declared an emergency to Exeter ATC. Having appreciated that the engine was not going to restart, the pilot then concentrated on flying a forced landing into a field. At that time the aircraft was on the eastern edge of Dartmoor where the height of the predominantly undulating ground was approximately 500 to 1,000 ft amsl. This situation left the pilot with a limited choice of fields and a restricted amount of time before landing.

For the forced landing the pilot selected the fuel selector to OFF in order to reduce the risk of fire after landing. Having selected a field, the pilot positioned the aircraft downwind before turning on to a base leg. Realising that he had turned too early, he elected to cross this field and a tree line and land in the next field. On crossing the tree line the aircraft's elevator clipped the top of the trees; the left wing tip subsequently contacted the ground just before the aircraft landed heavily on a down slope in the field. Upon coming to a stop, the pilot made the aircraft safe and the occupants vacated the aircraft uninjured.

The pilot added that his recollections of his actions before and during the engine failure are imprecise and as such he is not sure what cockpit selections he might have made. He feels that one possibility could be that he misidentified the fuel selector position and turned it from BOTH to OFF. While he does not recall doing this, he accepts it as a possibility.

Weather

The Met Office provided an aftercast for the time of the accident. There was a weak decaying frontal system over the British Isles and a relatively moist westerly flow covering south-west England.

The METAR for Exeter issued 10 minutes before the accident showed that the surface wind was from 260º at 12 kt with visibility in excess of 10 km, scattered cloud at 1,400 ft above airfield level and broken cloud at 4,000 ft aal. At the surface the temperature was 18ºC and the dew point was 13ºC.

Carburettor icing

When the ground level temperature and dew point for Exeter are plotted on the Carburettor Icing chart in Safety Sense Leaflet 14 found in LASORS they fall in the *Moderate Icing – cruise power* area close to the 80% humidity line. Given that the aircraft was within a few hundred feet of the cloud base when the engine lost power, the relative humidity was likely to have been closer to 100% increasing the risk of carburettor icing.

While there is a possibility that carburettor icing might have caused the initial rough running of the engine, the aircraft owner stated that he felt this was unlikely based on his previous experience of flying the aircraft. Additionally, the pilot's routine in-flight checks should have cleared any light icing that might have formed; therefore it was unlikely that carburettor icing caused the engine failure.

Damage assessment

As a result of the heavy landing the aircraft suffered severe damage and was beyond economic repair. Consequently the engine was not inspected to establish whether there had been any mechanical failure.

Discussion

Given the circumstances, the design of the fuel selector and the pilot's statement, it is conceivable that an inexperienced pilot lacking in currency could make an incorrect selection. As a result, it is possible that the engine failure could be attributed to a selection error,

although, it could also be attributable to carburettor icing. Moreover, the possibility that some other unidentified problem caused the engine failure cannot be excluded.