Australian Government
Australian Transport Safety Bureau

Partial engine failure involving Cessna 210, VH-EGB

near Liveringa, Western Australia, 12 May 2017

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Addendum

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What happened

On 12 May 2017, a Cessna 210M aircraft, registered VH-EGB, departed Broome, Western Australia (WA) on a freight charter flight with the intended destination of Fitzroy Crossing, WA.

About one hour into the flight, at about 1027 Western Standard Time (WST), the pilot noticed on the engine data monitor (EDM) that the fuel flow was fluctuating between 40 and 65 litres per hour. The pilot then confirmed that the analogue fuel flow gauge was also fluctuating and enriched the fuel mixture to see if that would stabilise the fuel flow, but the fluctuations continued.

The pilot then completed the fuel vaporisation checklist and switched the selected fuel tank from the right to the left. When the pilot selected the fuel pump on, in accordance with the checklist, the fuel flow initially indicated a rise, then stabilised to normal.

About 20 seconds later, the engine surged and then stopped, but the propeller was still turning. The engine RPM and fuel flow reduced to zero. At that time, the aircraft was 25 to 30 NM beyond Liveringa, so the pilot turned towards that airfield.

The pilot then conducted the engine restart procedure, leaving the left fuel tank selected. The mixture was already fully rich, with the throttle half open. The pilot selected the fuel booster pump on low for three seconds and then increased the throttle to full.

The engine restarted, but was coughing and surging and not producing enough power to maintain level flight at 9,500 ft above mean sea level. The pilot reduced the throttle to lessen the engine surges and set the attitude to maintain an airspeed of 80 kt, which was the best glide speed for that weight. In that configuration, the aircraft was descending at about 600 ft per minute.

The pilot broadcast a Mayday call and then reduced the power to just above idle, where it was running the smoothest. The fuel boost pump was also selected off, which reduced the surging. The aircraft was then descending at about 400 ft per minute. The pilot conducted a straight-in approach to join a five-mile final approach for runway 25 at Liveringa, maintaining additional height (to a normal approach) in case the engine stopped completely, requiring a glide approach and landing.

During the approach, the pilot observed that the cylinder head temperature (CHT) had dropped from above 337º (when they had conducted a trend measurement a few minutes before the engine issues started), to below 200º. The EDM display bar graph of each CHT would normally be at 5 or 6, but were at or below 2, with one cylinder on 0.

The aircraft landed without further incident. After landing, the pilot phoned a maintenance engineer, who advised the pilot to conduct a visual inspection. The pilot observed a fuel outlet valve that had sheared off, but as it was an overflow valve, would not have caused the power loss. The pilot then performed engine run-ups with all indications normal.

Pre-flight

Prior to the flight, the pilot conducted fuel drains, with no water or other contaminants found in the fuel.

Engineering report

The aircraft had just had a 200-hourly maintenance inspection. It was the first flight after the maintenance.

The post-incident inspection found that the fuel fluctuations probably resulted from a full or partial blockage of the fuel vent system.

Rough running and engine stoppage

The operator conducted an investigation into the incident and found the following.

- Although the pilot selected the fuel pump to low, when the throttle is then moved forwards of 19 inches of manifold pressure, an actuator automatically switches the fuel pump to high flow.
- The combination of the fuel mixture in the full rich position and the fuel pump at high flow probably introduced too much fuel into the engine, extinguishing the combustion process. As the aircraft was then at about 9,000 ft, the fuel to air ratio became high enough to result in the engine stopping.
- The pilot's comment that the engine subsequently ran better at lower power setting and the low CHT, suggests that the engine mixture was overly rich.

Cessna service information letter (SIL) SE 79-25, *Fuel flow stabilization*, provided information to aid in the recognition and prevention of excessive fuel vapour accumulation in the fuel system. It stated that 'indications of fuel vapour accumulation are fuel flow gauge fluctuations greater than 5 lbs/hr. This condition with leaner mixtures or with larger fluctuations may result in power surges.'

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The fuel vent system was probably partially or fully blocked, resulting in fuel flow fluctuations.
- The engine probably stopped due to over-rich fuel mixture.

Safety action

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

Aircraft operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are taking the following safety actions:

Notice to aircrew

The company issued a notice to all flight crew and included Cessna service information letter (SIL) SE 79-25. The SIL included the fuel flow stabilisation procedure, what stated 'Reset the mixture as required'. The notice advised flight crew regarding the 'reset', to first lean the mixture to peak exhaust gas temperature (EGT), then enrich to the company standard operating procedures setting of 75º rich of peak EGT, as 'Placing the mixture to rich will most likely cause engine stoppage at altitude due to an incombustible mixture'.

Maintenance

Closer inspections of fuel tank vent systems are to be carried out during scheduled maintenance.

Daily inspection

Flight crew are to check the fuel vent as part of the daily inspection of aircraft.

Safety message

This incident highlights the importance of good decision making following an engine failure or malfunction. The pilot maintained as much altitude as was safely possible, to increase the glide distance. After turning towards the nearest airfield, the pilot also kept a lookout for suitable forced landing sites.

It further highlights the need for unambiguous actions in emergency procedure checks to prevent an event from escalating.

General details

Occurrence details

Date and time:	12 May 2017 – 1030 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Engine failure or malfunction	
Location:	near Liveringa, Western Australia	
	Latitude: 18° 03.00' S	Longitude: 124° 10.00' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210	
Registration:	VH-EGB	
Serial number:	21062858	
Type of operation:	Charter- Freight	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Nil	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an

investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.