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Engine failure involving Cirrus SR22, VH-WYH

7 km S Gilgandra (ALA), NSW, 21 November 2012

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Engine failure involving Cirrus SR22, VH-WYH

What happened

WYH at the accident site

Source: Pilot

On 21 November 2012, at about 1055 Eastern Daylight-saving Time,[1] a Cirrus SR22 aircraft, registered VH-WYH (WYH), departed Emerald, Queensland for Dubbo, New South Wales, on a private flight conducted under the instrument flight rules. The pilot and one passenger were on board.

At about 1122, the oil pressure annunciator light illuminated. The pilot observed that the engine oil pressure on the oil pressure gauge[2] had dropped from the green arc to the yellow arc and was indicating about 30 pounds per square inch (psi). He also noted that the engine oil temperature and cylinder head temperature indications remained within the normal range. The pilot pushed the oil warning annunciator light and the light extinguished. He then referred to the pilot's operating handbook[3] which contained the following instructions:

> *If low oil pressure is accompanied by normal oil temperature, it is possible that the oil pressure sensor, gage, or relief valve is malfunctioning. In any case, land as soon as practical and determine cause.*

Over the next 25 minutes, the oil pressure indication dropped a further 4 psi. At this point, the pilot contacted the maintenance organisation to advise them of the situation and the pilot indicated that as a result of the conversation he would monitor the situation.

At about 1217, the pilot elected to descend from an indicated altitude of 7,000 ft to 5,000 ft to take advantage of a tail wind at 5,000 ft.

Over the next hour and 19 minutes, the oil pressure indication dropped a further 10 psi to 17 psi. At about 1307, the pilot contacted the maintenance organisation again to discuss the situation and determine if he should land and replenish the oil system, with the 2 L of spare oil located on the aircraft. The pilot indicated that as a result of the conversation he would continue to monitor the situation.

As the oil pressure continued to slowly drop, the pilot became increasingly concerned and, at 1351, contacted air traffic control, requesting to track via Gilgandra, New South Wales and stating that the engine oil pressure was gradually decreasing.

At about 1359, WYH overflew Gilgandra and continued on towards Dubbo, at which point the oil pressure gauge indicated about 12 psi. The approximate flight time remaining to Dubbo was 11 minutes. At 1401, the engine failed and the pilot could hear something rattling around in the engine cowling. The pilot turned the aircraft towards Gilgandra aerodrome and broadcast a mayday call, indicating that the engine had failed and he intended to land at Gilgandra aerodrome. The pilot then shut down the engine. It became evident that a landing at Gilgandra aerodrome was not achievable and he looked for a suitable landing point away from roads, trees and possible power lines. The pilot broadcast a call on the Melbourne Centre frequency advising that they

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1 Eastern Daylight-saving Time (EDT) was coordinated Universal Time (UCT) + 11 hours.

2 Oil Pressure gauge instrument markings contains a red line (warning) at 10 psi, a yellow arc (caution) between 10-30 psi, a green arc (normal) between 30-60 psi, another yellow arc (caution) between 60-100 psi and a red line (warning) at 100 psi.

3 Cirrus pilot's operating handbook (POH) part number 13772-001, Section 3 *Emergency Procedures Low Oil Pressure.*

would not be able to make Gilgandra aerodrome and would deploy the ballistic parachute[4]. The pilot reported that to minimise drift under the ballistic parachute, he waited until the indicated altitude was about 2,000 ft, before deploying the parachute.

At about 1405, the pilot deployed the ballistic parachute and broadcast a call on the Melbourne Centre frequency advising that the ballistic parachute had been deployed.

The pilot secured the cabin and about 16 seconds after the parachute deployed, the aircraft impacted the ground in a slight left wing low attitude (Figure 1). The pilot and passenger seat belt air bags deployed and the pilot and passenger exited through the passenger door. The pilot received minor injuries and the passenger was uninjured.

Figure 1: Parachute inflated at accident site

Source: Pilot

Pilot comments

The pilot reported that the oil pressure indication dropped very gradually giving a false sense of security. Three or four weeks prior to the accident, the engine turbocharger intake temperature thermostat probe had failed. As the engine cylinder head temperature and oil temperature indications remained in the normal range, accompanied by the recent turbocharger probe failure the pilot thought that the low oil pressure indication may have been another faulty probe.

The day before the accident, the aircraft flew about 3.7 flight hours that was the first flight after a 100 hourly maintenance check. As part of the pre-flight inspection for that flight, the pilot checked the engine oil level which indicated about 7 quarts[5] on the dipstick.

The pilot reported that when he conducted the pre-flight inspection on the day of the accident, the engine oil level indicated below 5 quarts and 1 L of oil was added to the engine. The pilot commented that it was unusual to add 1 L oil after conducting 3.7 flight hours. The oil level was

[4] The aircraft is equipped with a Cirrus Airplane Parachute System (CAPS) designed to bring the aircraft and its occupants to the ground in the event of a life threatening emergency. The system includes a parachute, a solid propellant rocket to deploy the parachute, a rocket activation system and a harness faired into the fuselage structure.

[5] One US quart is equivalent to about 0.95 L.

checked again and the level was between 5 and 5 ½ quarts, which the pilot indicated was the oil level he normally maintained.

The pilot reported that there was no evidence of oil coming from the engine breather, including after the 7.7 flight hours on the day of the accident.

Inspection at accident site

The pilot indicated that there was no sign of an external oil leak from the engine and there was no oil on the windscreen (Figure 2).

The pilot checked the oil level at the accident site and the engine oil dipstick indicated 2 quarts.

The pilot inspected the paddock after the accident and found that it was very uneven with contour banks that were not visible from the air. The pilot believed that a safe landing on the landing gear would not have been possible.

Figure 2: WYH at the accident site

Source: NSW Police Force

Engine examination

The engine was removed and examined at an engine overhaul facility. The inspection revealed that the number two cylinder connecting rod (Figure 3) had separated from the crankshaft due to extreme heat and ruptured the crankcase. A detailed examination did not identify any external oil leaks or internal defects that were not as a result of the lack of oil. 2.1 quarts of oil was drained from the engine sump.

Figure 3: Engine number two cylinder failed parts

Source: Insurance assessor

Engine oil system

The oil for engine lubrication is drawn from an eight quart capacity sump located in the engine crankcase. The oil provides engine lubrication and cooling. A filler cap with integral dipstick is provided for determining the amount of oil in the engine crankcase. The engine oil servicing section of the POH requires that if the engine oil level is below 6 quarts then the engine filler cap should be removed and oil added through the filler as required to reach between 6 and 8 quarts.

The POH also contains the following caution:

> *The engine should not be operated with less than six quarts of oil. Seven quarts (dipstick indication) is recommended for extended flights.*

The aircraft manufacturer indicated that maintaining an oil level above the minimum allows for that extra margin of safety, reliability, and dependability.

The aircraft engine is designed[6] to have an oil sump capacity of 8 quarts with 5 quarts usable at 16 degrees nose up and 4.5 quarts usable at 10 degrees nose down.

ATSB comment

The average oil consumption for the combined accident and previous flight was about 0.5 quarts per hour which is near the upper end of the maximum oil consumption[7] for the engine.

Safety message

This accident highlights the importance of understanding the information contained in the manufacturer's publications. The Cirrus pilot's operating handbook emergency procedure for low engine oil pressure requires that the pilot land as soon as practical and determine the reason for the low oil pressure indication, even if the oil pressure sensor, oil pressure gauge, or oil relief valve is suspected as the reason for the low oil pressure indication. The pilot's operating handbook also requires that the engine should not be operated with less than six quarts of oil and seven quarts is recommended for extended flights.

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6 Engine type certificate data sheet type certificate number E3SO.

7 Engine specifications IO-550-N www.tcmlink.com/EngSpecSheetDocs/IO550N.pdf.

Aeronautical decision making is a systematic approach to the mental process used by pilots to help determine the best course of action, in response to a given set of circumstances. Aeronautical decision making can be influenced by many factors such as the gradual onset of a risk, perceived severity of the risk, incomplete or misinformation and previous experience. The FAA *Pilot's handbook of aeronautical knowledge Chapter 17 Aeronautical decision making* contains various tools to aid in decision making, such as risk matrixes. The handbook is available at www.faa.gov/library/manuals/aviation/pilot_handbook/.

General details

Manufacturer and model:	Cirrus SR22	
Registration:	VH-WYH	
Type of operation:	Private	
Occurrence category:	Accident	
Primary occurrence type:	Total power loss/engine failure	
Location:	7 km S Gilgandra (ALA), New South Wales	
	Latitude: 31° 45.75' S	Longitude: 148° 37.27' E
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 1 (Minor)	Passengers – Nil
Damage:	Substantial	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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 fare-paying passenger operations.

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.