Australian Government
Australian Transport Safety Bureau

Engine failure involving an Enstrom 280, VH-YHD

5 km north-west of Redcliffe Airport, Queensland, on 28 February 2015

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Addendum

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Engine failure involving an Enstrom 280, VH-YHD

What happened

On 28 February 2015, at about 1232 Eastern Standard Time (EST), an Enstrom 280 helicopter, registered VH-YHD (YHD), departed from Caloundra Airport, for a flight to Redcliffe Airport, Queensland, with the pilot, who was the only person on board.

After about half an hour, the pilot commenced a descent from 1,500 ft above ground level (AGL). The pilot then broadcast on the Redcliffe common traffic advisory frequency (CTAF) that YHD would join the Redcliffe circuit in about 6 minutes and navigated along the coastline toward Redcliffe.

At about 1,000 ft AGL, the pilot heard a bang and the engine stopped. This caused the helicopter to yaw to the left violently. The pilot then attempted to restart the engine but was unsuccessful. At about 800 ft AGL, the helicopter entered autorotation[1] and the pilot prepared to land on the beach. The pilot observed people swimming in the sea and manoeuvred the helicopter to an area where there were no people. The pilot arrested the descent and the skids contacted the sand. The helicopter continued to move forward along the sand, and then a few seconds later the helicopter blades impacted the sand, and the helicopter rolled over. The pilot received minor injuries and the helicopter was destroyed (Figure 1).

Figure 1: Accident site showing the damage to VH-YHD

Source: Queensland police

[1] Autorotation is a condition of descending flight where, following engine failure or deliberate disengagement, the rotor blades are driven solely by aerodynamic forces resulting from rate of descent airflow through the rotor. The rate of descent is determined mainly by airspeed.

Witness

A witness to the accident reported that the helicopter was first sighted at about 100 m above the ground, descending and approaching from the north. The only noise was from the rotor blades, with no engine sound. The witness reported that the wind was quite strong coming from the east. A stronger easterly gust came when the helicopter was close to the ground. The helicopter landed and continued to move forward, but then flipped upside down and the rotor blades contacted the sand. The helicopter came to rest about 150 m from where the witness was located. A passer-by assisted the pilot to exit the helicopter.

Pilot comment

The pilot provided the following comments:

- This was the first flight after the completion of the periodic (100 hourly or 12-month) maintenance inspection.
- The helicopter operated normally during the engine run-up checks and the flight, up to the engine failure.
- The pilot commented not to delay in lowering the collective[2] and setting the airspeed as everything happened very quickly after the engine failed and the pilot instinctively conducted an autorotation.
- The landing was smooth with no bump.
- The weather was fine with a slight breeze from the north-east and the wind speed at Caloundra was about 10 kt.
- Rather than fly direct to Redcliff airport the pilot had selected to fly along the shoreline. If YHD had flown direct to Redcliff then the engine may have failed over Deception Bay and YHD may have landed in the water.
- The pilot stated that the number of flight hours experience on the helicopter type was about 60, with about eight flight hours on the type in the 90 days prior.

Helicopter maintenance

The helicopter engine was overhauled and installed in YHD in April 2006. At the time of the accident, the engine had completed about 146 hours since overhaul. The periodic (100 hourly or 12-month) maintenance inspection included overhaul of the engine magneto.

Maintenance organisation investigation

The maintenance organisation inspected the engine externally and removed the number three cylinder. They determined that the damage found to the number three cylinder and piston (Figure 2) was consistent with detonation. Extreme heat from uncontrolled burning of the combustion gases resulted in melting of the cylinder between the spark plug hole and the exhaust valve seat. This melting damaged the piston to an extent that the combustion gases would blow past the piston rings. The maintenance organisation did not remove the other cylinders.

The maintenance organisation also removed the engine magneto and fuel control unit. Both units were examined at a component overhaul facility. The examination of the magneto found no defects. The examination of the fuel control unit found that it was functioning normally and was set to a lean position, although this position could not be validated due to disruption during the accident.

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[2] Collective is the primary helicopter flight control that simultaneously affects the pitch of all blades of the lifting rotor. Collective input is the main control for vertical velocity.

Figure 2: Damage to number three cylinder and piston

Source: Aircraft maintenance organisation

ATSB comment

In 2007, the ATSB published an aviation safety research and analysis report, *Aircraft Reciprocating-Engine Failure An Analysis of Failure in a Complex Engineered System B2007/0191*. The safety study discussed detonation in more detail including the examination of the factors that contribute to detonation free - operation (normal combustion) and the factors that contribute to detonation.

Safety message

When planning a particular flight it is important for pilots to consider options and risk. In this accident, the pilot opted to follow the coastline, allowing for the option to land on the beach. The pilot in the pre-flight planning identified the hazard (flying over water) and although the likelihood of an engine failure was low, the consequences were high and made the decision to follow the coastline to mitigate the risk. If the pilot had selected the option to fly the most direct path then the engine would have failed over the water.

The US Federal Aviation Administration (FAA) has published information on risk management in a *Risk Management Handbook (FAA-H-8083-2)*. They have also published a guide *Tips for Teaching Practical Risk Management and Practical Risk Management for local VFR Flying*. The guide contains the Perceive-Process-Perform model that offers a structured way to manage risk for local visual flight rules flying (Figure 3).

Figure 3: Risk Management Decision Path: Perceive-Process-Perform

Source: US Federal Aviation Administration

General details

Occurrence details

Date and time:	28 February 2015 – 1305 EST	
Occurrence category:	Accident	
Primary occurrence type:	Engine failure	
Location:	5 km north-west of Redcliffe Airport, Queensland	
	Latitude: 27° 10.85' S	Longitude: 153° 01.78' E

Helicopter details

Manufacturer and model:	Enstrom 280	
Registration:	VH-YHD	
Serial number:	1187	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 0
Injuries:	Crew – Minor	Passengers – Nil
Damage:	Destroyed	

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 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.