Australian Government
Australian Transport Safety Bureau

Propeller failure involving de Havilland DH-82, VH-ARU

near Shute Harbour ALA, Queensland, 2 July 2016

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Aviation Occurrence Investigation
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Addendum

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Propeller failure involving de Havilland DH-82, VH-ARU

What happened

On 2 July 2016, at about 1420 Eastern Standard Time (EST), a de Havilland DH-82A aircraft, registered VH-ARU, departed Shute Harbour aircraft landing area (ALA), Queensland, for an aerobatic joy flight. On board were a pilot and one passenger.

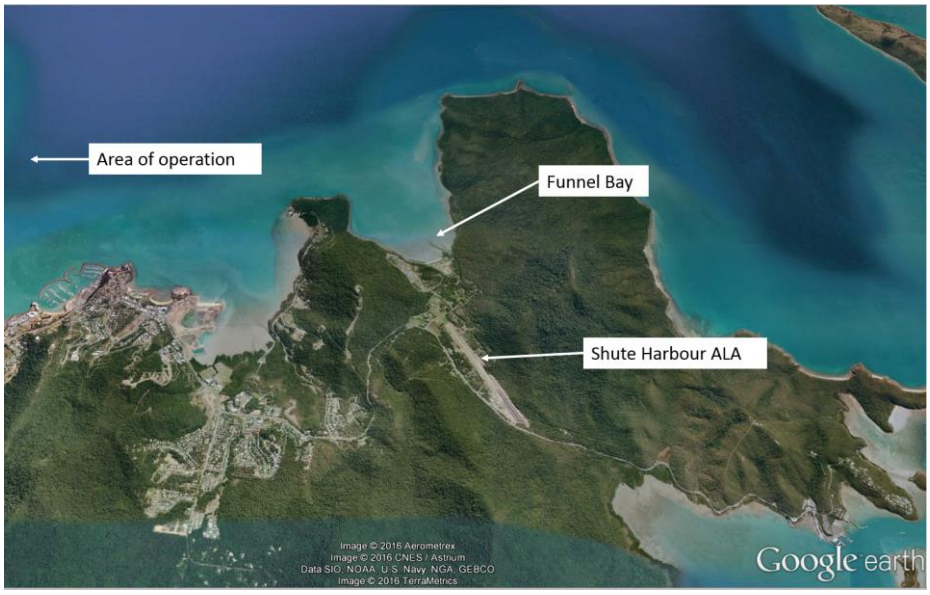
When the aircraft reached about 4,500 ft over water, the pilot advised air traffic control (ATC) that they were commencing aerobatic operations. The pilot reported that they then raised the aircraft nose and reduced the throttle to idle. The aircraft then pitched nose-down and the pilot initiated a rotation to the left. After about one and a half rotations, the pilot levelled the aircraft wings and stopped the rotation. As the airspeed was then about 110 kt, which was the entry speed for the next manoeuvre (a loop), the pilot raised the aircraft nose and applied full power as the nose passed the horizon.

The aircraft was then passing about 3,500 to 4,000 ft on climb, when the pilot and passenger heard a bang. The pilot saw a small object fly past to their left in close proximity, and the passenger saw that the on-board camera had been knocked.

The pilot discontinued the manoeuvre and stabilised the aircraft in a glide attitude. As the aircraft continued to descend, the pilot elected to return to Shute Harbour ALA. The pilot reported that the aircraft was not vibrating and the tachometer was indicating maximum RPM. The pilot also assessed that the engine was not producing any thrust, regardless of the throttle position. The pilot advised ATC that they had completed operations and were returning to Shute Harbour. At no time did the pilot inform ATC that there was an emergency.

As the aircraft passed the highest terrain en route to Shute Harbour ALA, the pilot assessed that they were not going to be able to reach the ALA (Figure 1). The pilot then turned the aircraft to land on the beach at Funnel Bay, but sighted boats moored on the beach. The pilot therefore aimed to land the aircraft at Funnel Bay on the mudflats. The pilot conducted a forced landing onto the mud and the aircraft continued onto some rocks. After landing, as the pilot inspected the aircraft, they noticed that the propeller was missing.

Figure 1: Shute Harbour ALA and Funnel Bay



Source: Google earth – annotated by ATSB

The pilot was uninjured and the passenger sustained minor injuries. The aircraft sustained substantial damage (Figure 2).

Figure 2: Accident site showing damage to VH-ARU

Source: Aircraft owner – modified by ATSB

Pilot comments

The pilot had completed a daily inspection of the aircraft earlier in the day and had subsequently flown it for about 6 minutes to assess the weather conditions. The incident flight was the first commercial flight of the day. During the pre-flight inspection, the pilot reported having made a visual check of the propeller for defects, gravel rash and any chips, but had not detected anything abnormal.

The pilot had asked the passenger their weight prior to the flight, and although they did not complete a weight and balance calculation, assessed that the aircraft was within its weight and balance limitations for aerobatic flight.

At the time of the incident, they were operating about 4 to 5 NM from the ALA, and over water. The pilot thought that the aircraft probably struck a bird resulting in the propeller failing.

When they realised that the aircraft was unable to reach the runway at Shute Harbour, the pilot had a secondary plan to land on the beach at Funnel Bay. They commented that their training helped to deal with the situation by being aware of their surroundings and having a series of plans in case of emergency.

Engineering report

The aircraft maintenance engineer assessed the aircraft after the incident and sent the remnants of the (timber) propeller that had remained attached to the aircraft to the ATSB. The engineer also spoke to the manufacturer of the propeller and was able to trace its history. The manufacturer suggested the propeller failure was indicative of a propeller overspeed, although they did not inspect the propeller remnants. The propeller was not retrieved as it failed when the aircraft was over water.

ATSB analysis

Video footage

The ATSB analysed the data card from the on-board camera. The camera was facing rearwards and no evidence of a birdstrike was visible on the footage when viewed frame-by-frame. Analysis

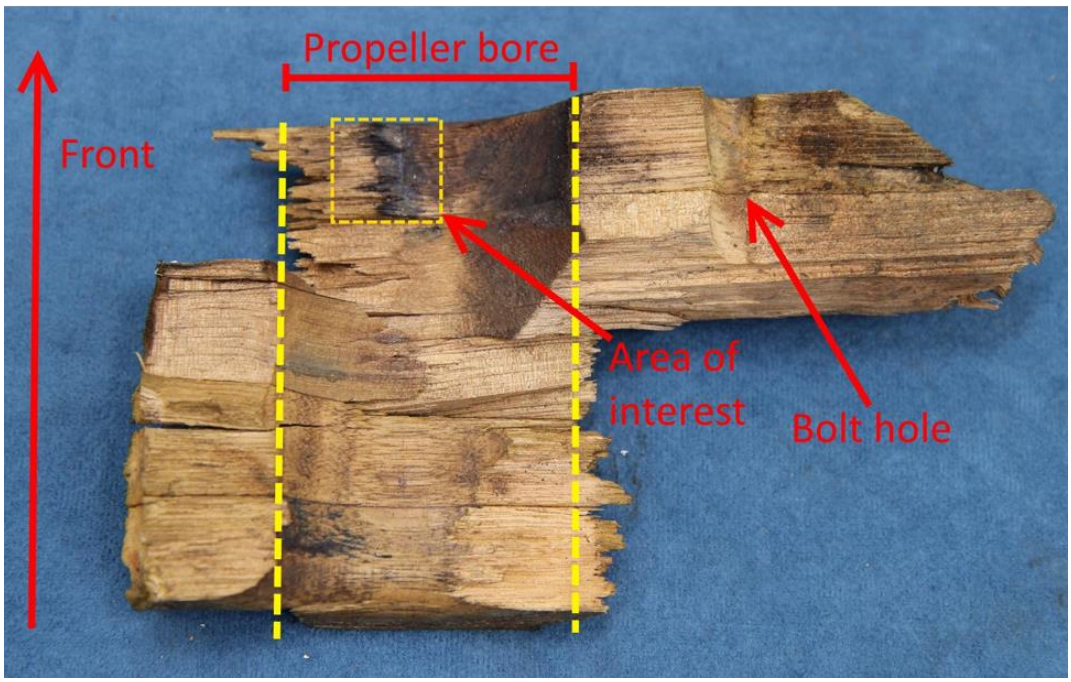
of the sound component of the recording was conducted to determine the engine frequency at the time of the propeller failure, but the results were inconclusive due to background noise including a radio transmission.

From the video footage, it was evident that the aircraft entered a spiral manoeuvre that involved substantial rudder and aileron input such that the aircraft was in balance (not skidding or slipping sideways). The wings were then levelled and the aircraft pulled out of the dive. The propeller failed just as the aircraft nose passed back up through the horizon at the start of the next manoeuvre and power was applied. The propeller was under substantial load at this stage.

Propeller remnants

The ATSB examined two fragments of the propeller that were identified as parts of the hub section. An area of interest, depicted in Figure 3, showed evidence of bending consistent with the blade breaking away from the hub while under load. No bird remains were found on the fragments. The factors contributing to the propeller failure could not be determined from the timber fragments.

Figure 3: Propeller remnants



Source: ATSB analysis

ATSB comment

One of the findings of ATSB investigation AO-2013-226, *In-flight break-up involving de Havilland DH82A Tiger Moth, VH-TSG, 300 m E of South Stradbroke Island, Queensland, 16 December 2013*, was that 'publicly-available video recordings showed that some Australian commercial Tiger Moth operators conducted aerobatic flick (otherwise known as 'snap') rolls and tailslide manoeuvres, which were prohibited by the Type Design Organisation'. However, the on-board video recording showed that the types of aerobatic manoeuvres conducted during the accident flight were all permitted for the aircraft type.

The ATSB cautions commercial vintage aircraft operators about the risks associated with aircraft age and the importance of understanding the originally-intended use of the design before commencing their operations.

Safety message

This incident highlights the value of always having a consideration of landing areas available in case a forced landing is required. Alerting air traffic control as emergencies arise enables them to provide the necessary and appropriate assistance.

General details

Occurrence details

Date and time:	2 July 2016 – 1430 EST	
Occurrence category:	Accident	
Primary occurrence type:	Propellers/Rotor malfunction	
Location:	near Shute Harbour ALA (Funnel Bay), Queensland	
	Latitude: 20° 16.70' S	Longitude: 148° 45.33' E

Aircraft details

Manufacturer and model:	de Havilland Aircraft DH-82	
Registration:	VH-ARU	
Serial number:	AM237	
Type of operation:	Charter – Aerobatics joy flight	
Persons on board:	Crew – 1	Passengers – 1
Injuries:	Crew – 0	Passengers – 1 Minor
Aircraft damage:	Substantial	

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.