Australian Government
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Partial power loss – Gippsland Aeronautics GA8, VH-WOV

Kununurra Airport, 28 April 2012

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Partial power loss – Gippsland Aeronautics GA8, VH-WOV

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What happened

On 28 April 2012, at about 0815 Western Standard Time[1], a Gippsland Aeronautics GA8-TC 320 aircraft, registered VH-WOV (WOV), took off from runway 12 at Kununurra airport, Western Australia, for a sightseeing flight over the Bungle Bungle ranges. On board were the pilot and six passengers.

GA8-TC 320

Source: ***GippsAERO Pty Ltd***

The flight was scheduled to depart at 0630, but was delayed after the aircraft initially assigned to the task was found to be unserviceable during engine run-up. Further delays ensued because the replacement aircraft, WOV, required additional fuel and there were complications associated with organising the refuel. The pilot sensed a growing level of passenger frustration at the delay and was also concerned that his subsequent flight would be substantially affected by the delay. These circumstances made the pilot anxious to commence the flight.

The engine operated normally during the pre-flight engine run-up, but failed to deliver full power during the takeoff roll. Gradual application of the throttle during the takeoff meant that the pilot was unaware of the of the engine problem until some time into the takeoff roll. After becoming airborne, the engine power decreased further, despite the continuing application of full throttle by the pilot. At about 30 ft above ground level (AGL), the engine power had decreased to the point that level flight could not be maintained. In response to the low and reducing power, the pilot turned toward a field in preparation for a forced landing.

At about 10 ft AGL during the forced landing, the pilot discovered that sufficient power was available to remain airborne. The pilot commented that continued flight at this point may have been aided to some extent by ground effect[2]. After assessing that the surface of the forced landing field was unsuitable, the pilot elected to remain airborne and continue the turn back toward the departure airport. The aircraft reached the airport, but continued across the runway and parallel taxiway at an angle of about 45˚, only several feet above the ground. The pilot did not land on the runway or taxiway, concerned that any attempt to significantly bank the aircraft to align with the runway or taxiway may have resulted in wing tip contact with the ground. The pilot landed the aircraft on a grassed area of the airport adjacent to the parallel taxiway (Figure 1). The aircraft was undamaged and there were no injuries.

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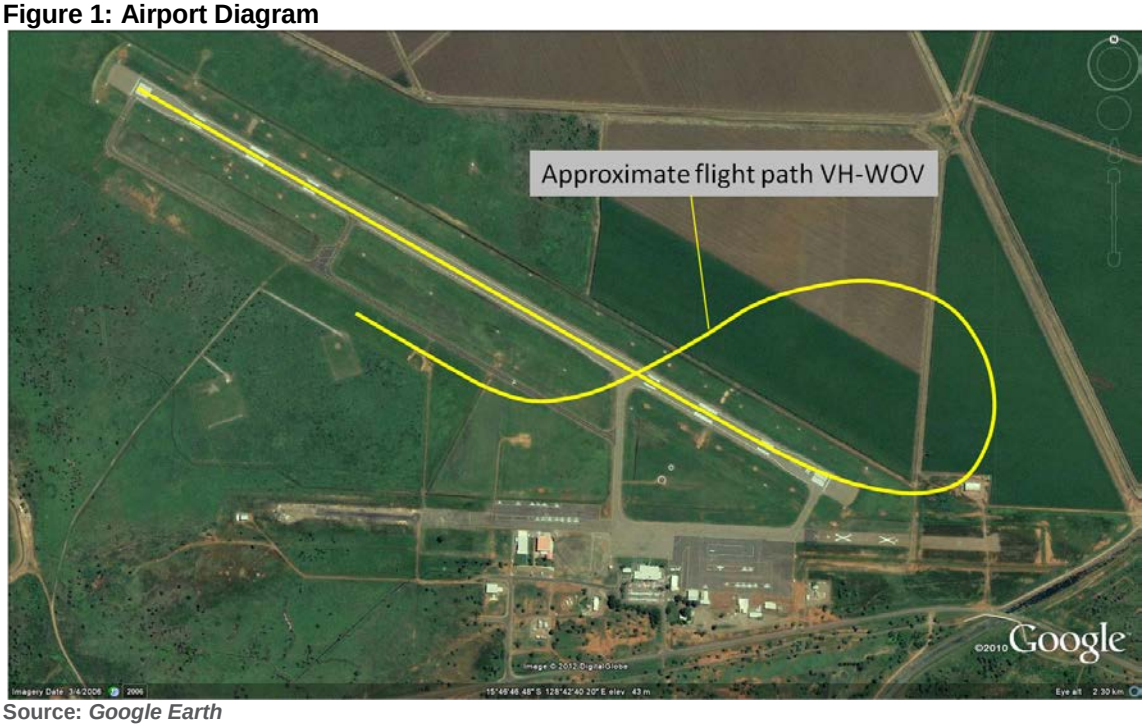
1 Western Standard Time (WST) was Coordinated Universal Time (UTC) +8 hours.

2 Ground effect is a term used to describe improvements in aerodynamic lift and drag generated when an aircraft flies close to the ground.

Figure 1: Airport Diagram



Source: ***Google Earth***

Engine malfunction

WOV was fitted with a six cylinder, horizontally opposed, air cooled, turbocharged, fuel injected Lycoming TIO-540-AH1A engine. This engine had a maximum continuous power rating of 300 brake horsepower at 38 inches Hg[3] manifold pressure and 2,500 RPM. Published aircraft takeoff performance data was based upon a power setting of 40 inches Hg manifold pressure and 2,500 RPM. During the incident flight, the takeoff manifold pressure reached only 29 inches Hg, and decreased further after the aircraft became airborne, despite the continued application of full throttle.

Engine run-up procedures did not require the pilot to check that the engine was capable of delivering full power, or to check operation of the engine turbocharger system. The GA8-TC 320 Pilot's Operating Handbook (POH) did however state the importance of checking full throttle engine performance early in the takeoff run. The POH also stated that "... sluggish acceleration is good cause for discontinuing the takeoff ...".

The engine turbocharger system fitted to WOV had undergone maintenance during the day prior to the incident flight. This maintenance included adjustment to correct play in the waste gate[4] linkage and adjustment to correct the maximum manifold pressure. Following the incident flight, further maintenance was carried out on the turbocharger system in an attempt to rectify the low manifold pressure problem. During the subsequent flight, flown by another pilot to check engine performance, manifold pressure problems were still apparent. The turbocharger system waste gate was then replaced.

Pilot's decision to continue the takeoff with low engine power

When the pilot noticed the low manifold pressure during takeoff, he suspected a turbocharger system malfunction. At that point however, the aircraft was close to takeoff speed and the pilot had very little time to analyse the circumstances and effectively assess the situation. The pilot's

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[3] Inches Hg (Mercury) is the unit measure of manifold pressure used in piston engine aircraft and is indicative of the engine power being produced.

[4] The waste gate mechanism is an integral part of the turbocharger system. It varies the amount of exhaust air delivered to the turbocharger turbine, which in turn varies the turbine speed, turbocharger system output and available manifold pressure.

decision to continue with the takeoff was influenced by an expectation that the engine would still deliver adequate power for the planned flight, despite the apparent turbocharger system malfunction. The pilot did not anticipate the subsequent uncommanded decrease in manifold pressure once airborne. At worst, he expected that the engine would behave like a normally aspirated engine. The pilot's expectations were based upon his understanding of earlier discussions with engineering staff.

Safety message

Abnormal manifold pressure - turbocharged engines

Abnormal manifold pressure indications involving turbocharged engines can be symptomatic of a number of engine malfunctions, some of which may not be immediately apparent to the pilot. It may be associated with a malfunction within the turbocharger system itself, as in this incident, but it can also be symptomatic of other serious engine problems, such as an induction or exhaust system leak or an engine oil system problem.

Pilots are reminded that abnormal manifold pressure indications involving turbocharged engines can be symptomatic of a very serious engine malfunction. Even if abnormal manifold pressure is the result of a turbocharger system problem, engine operation and aircraft performance are unpredictable.

Pilots are encouraged to carefully review POH emergency procedures with respect to abnormal manifold pressure indications and turbocharger malfunctions. The US Federal Aviation Administration (FAA) Special Airworthiness Information Bulletin CE-09-11 provides some further operational information to pilots regarding engine turbocharger system management.

www.rgl.faa.gov/Regulatory_and_Guidance_Library/rgSAIB.nsf/(LookupSAIBs)/CE-09-11?OpenDocument

Takeoff decision making

Aircraft performance data published in the POH always specifies the conditions under which that performance can be expected. Where the manifold pressure is less than that specified, then aircraft takeoff and climb performance are unpredictable.

Pilots are encouraged to carefully consider their response to any aircraft abnormality that might become apparent during takeoff, as part of their pre-flight preparation. Self-briefing may help pilots respond to abnormal takeoff indications more effectively, and help manage the influence of perceived pressure when confronted with a time-critical decision.

The ATSB report AR-2010-055 *Managing partial power loss after takeoff in single-engine aircraft* provides some key messages regarding pilot response to partial power loss. A copy of the report is available on the ATSB website here:

www.atsb.gov.au/publications/2010/ar2010055.aspx

Aircraft details

Occurrence category:	Serious incident	
Occurrence type:	Partial power loss	
Registration:	VH-WOV	
Manufacturer and model:	Gippsland Aeronautics GA8-TC 320	
Type of operation:	Charter	
Persons on board:	Crew – 1	Passengers – 6
Injuries:	Crew – Nil	Passengers – Nil
Damage:	None	

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.