Australian Government
Australian Transport Safety Bureau

Engine fire involving a Beech A36, VH-FFY

near Caloundra (ALA), Queensland, 6 September 2013

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Aviation Occurrence Investigation
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Addendum

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Engine fire involving a Beech A36, VH-FFY

What happened

On 6 September 2013, at about 1545 Eastern Standard Time,[1] a Beech A36 aircraft, registered VH-FFY, taxied for a private flight from the Caloundra aeroplane landing area (ALA) to Archerfield, Queensland with the pilot and two passengers on board.

The pilot reported that, during the take-off run, all engine indications were normal. When 200 ft above ground level (AGL), the pilot detected a burning smell and observed smoke entering the cockpit from the pilot foot-well. The engine continued to produce power. At about 300 ft AGL, as the area was heavily forested, the pilot commenced a turn back to the runway for landing.

The pilot opened the left side storm window to draw the smoke out of the cockpit and reduced power. The engine then began to run rough. The pilot elected to conduct a forced landing and selected a suitable paddock. The pilot shut down the engine and prepared the aircraft for landing.

During the landing roll, the nose landing gear separated from the aircraft due to the uneven terrain and the propeller subsequently contacted the ground (Figure 1). One passenger sustained minor injuries.

After the accident, the exhaust tailpipe from the turbocharger assembly was found on the runway at Caloundra. An engineering inspection revealed that the tailpipe had separated at a weld joint.

Figure 1: Damage to VH-FFY

Source: Operator

Fitment of the turbo-normalizing system

In August 2013, a Tornado Alley Turbo turbo-normalizing system had been fitted to the aircraft under a Supplemental Type Certificate (STC). The ATSB was advised by the manufacturer that about 800 Beech Bonanzas, including the A36 model, were equipped with the turbo-normalizing system, without any such incident having been reported previously. The weld joint at the tailpipe/flange was tack-welded[2] when provided to the installer to allow for proper positioning, with

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1 Eastern Standard Time (EST) was Coordinated Universal Time (UTC) + 10 hours.

2 A small dab of weld metal making a local link to hold parts in the correct location while the main weld is made.

the requirement to fix that position and then perform circumferential welds.[3] This requirement was detailed in the installation instructions provided to the installer.

At the same time as the installation of the turbo-normalising system, the aircraft had undergone a routine 100 hourly maintenance inspection. The aircraft had completed 15 hours of flying since the installation and maintenance, during which time minor adjustments to the fuel flow and magneto timing had been made.

Pilot comments

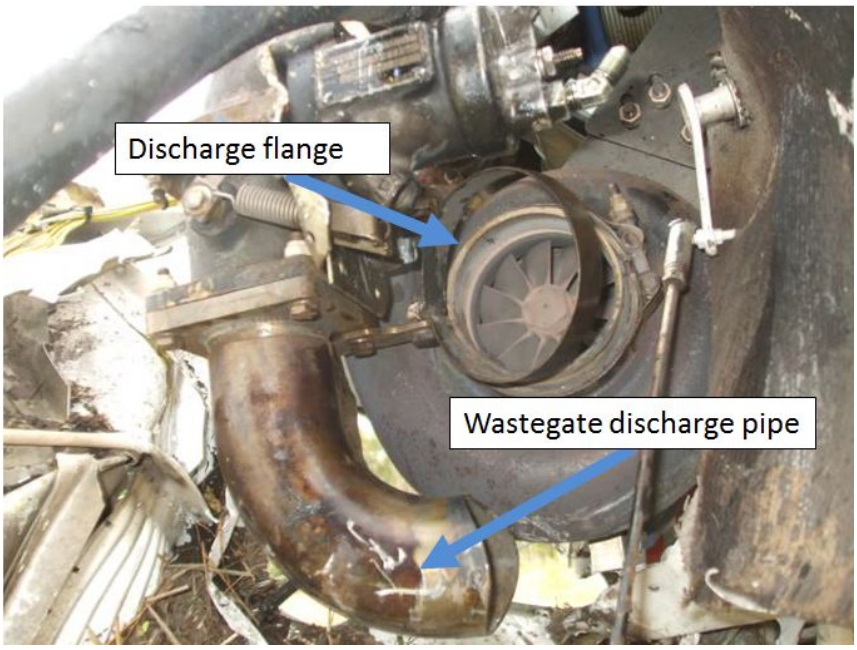
The pilot reported that, due to the turbo installation, the fuel mixture setting for take-off was higher than normal. The rough running experienced after the power reduction may have been due to the fuel mixture being too rich for the reduced power setting. However, at the time the pilot had insufficient altitude to investigate the situation.

Insurance assessment report

The insurance assessment reported the following:

- the turbo-normalizing modification required a redesign of the aircraft's exhaust system to incorporate the turbocharger
- the separated segment of the exhaust system was the tailpipe, which captured the turbocharger discharge gases and the outflow of the bypass system, and expelled them (Figure 2)
- the installation instruction, which required the installer to perform the final welding (circumferential) of the flange and pipe, had not been completed. The attachment of the tailpipe was, therefore, reliant on the manufacturer's temporary tack welds
- inspection of the recovered tailpipe, turbo flange, and wastegate discharge pipe showed that the pipe and flange tack welds had failed, allowing the tailpipe to separate from the aircraft (Figure 3)
- the hot gas from the turbo-normalizing system was discharged directly onto the wiring, hoses and firewall blanket, which subsequently resulted in the smoke and fumes.

Figure 2: Turbocharger outlet and wastegate



Source: Insurance assessor

[3] A type of weld produced around the outer surface of a cylindrical part.

Figure 3: Failed tack welds

Source: Insurance assessor

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 proactive safety action in response to this occurrence.

Tornado Alley Turbo (manufacturer)

As a result of this occurrence, the turbo-normalizing system manufacturer has advised the ATSB that the requirement to complete the circumferential weld will be highlighted in the installation instructions. The tailpipe supplied will also be clearly marked as supplied tack-welded, with additional instructions showing the requirement to perform the circumferential weld prior to flight.

Safety message

A partial engine power loss presents a more complex situation to the pilot than a complete power loss. As detailed in the *Avoidable Accidents No. 3 – Managing partial power loss after takeoff in single-engine aircraft* booklet, www.atsb.gov.au/publications/2010/avoidable-3-ar-2010-055.aspx, an ATSB study of 242 partial power loss occurrences between 2000 and 2010, revealed that there were 21 events after take-off where the pilot conducted a forced or precautionary landing beyond the aerodrome boundary.

In a partial engine power loss event, the engine may not be relied on to continue to provide any level of power. Therefore, it may be advantageous to conduct a forced or precautionary landing as if experiencing a total engine failure, as it removes the variability and unknown reliability of some engine power, particularly where there are suitable landing options available. Moreover, all pilots are specifically assessed and trained to deal with a complete engine failure after take-off.

General details

Occurrence details

Date and time:	6 September 2013 – 1600 EST	
Occurrence category:	Accident	
Primary occurrence type:	Inflight fire	
Location:	near Caloundra (ALA), Queensland	
	Latitude: 26° 48.12' S	Longitude: 153° 06.32' E

Aircraft details

Manufacturer and model:	Beech Aircraft Corporation A36	
Registration:	VH-FFY	
Serial number:	E1583	
Type of operation:	Private	
Persons on board:	Crew – 1	Passengers – 2
Injuries:	Crew – Nil	Passengers – 1 (Minor)
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 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.