



Australian Government

Australian Transport Safety Bureau

Undetected engine thrust reverser deactivation involving Airbus A320, VH-VQG

Gold Coast Airport, Queensland on 18 December 2017

ATSB Transport Safety Report
Aviation Occurrence Investigation
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Published by: Australian Transport Safety Bureau
Postal address: PO Box 967, Civic Square ACT 2608
Office: 62 Northbourne Avenue Canberra, Australian Capital Territory 2601
Telephone: 1800 020 616, from overseas +61 2 6257 2463 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Email: atsbinfo@atsb.gov.au
Website: www.atsb.gov.au

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Addendum

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Safety summary

What happened

On the morning of 18 December 2017, a Jetstar Airways Airbus A320 aircraft, registered VH-VQG was on final approach for Gold Coast Airport, Queensland. The aircraft was operating as a scheduled passenger flight, from Adelaide, South Australia.

After a normal descent and touchdown, the captain selected both engine thrust reversers. The left engine thrust reverser did not activate. The aircraft decelerated using normal braking and taxied to the gate without further incident. There was no damage to the aircraft, or injuries as a result of the incident, and the captain reported the thrust reverser issue for investigation.

What the ATSB found

During overnight maintenance in Adelaide, the left engine thrust reverser lockout pin had been installed. However, the pin was not removed after the maintenance, resulting in the aircraft returning to service with the thrust reverser deactivated.

The lockout pin was located at the top of the engine and its 1 m red warning flag was difficult to see in the prevailing low-light conditions. This probably led to the engineer not seeing the flag and removing the pin.

Further, the lockout pin was not booked out of the tool store nor was its installation recorded in the technical log. As a result, the checks that these procedures provided to ensure the pin's removal were missed.

What's been done as a result

The aircraft's maintenance organisation, Qantas, advised that it is taking safety action that includes the following:

- Highlighting the importance of the aircraft maintenance manual precautions to maintenance staff at Adelaide.
- Lengthening all thrust reverser lockout pin warning flags to hang past the closed engine cowls. The pin will also have a warning notice attached for placement on the engine thrust reverser controls during maintenance.

The aircraft manufacturer, Airbus, advised that the August 2019 revision of the aircraft maintenance manual introduced an operational test of the thrust reverser system to confirm its re-activation after maintenance tasks.

Safety message

This investigation highlights the importance of considering the environmental conditions in which equipment and tools will potentially be used, as well as the importance of following procedures that in this instance should have resulted in detecting the error.

When considering the effectiveness of equipment, tooling and procedures that aim to minimise the likelihood and/or consequences of an error, an engineered solution is generally more effective than relying on procedural compliance. Further, a functional check is generally more effective within procedural compliance than a self-check of work. See the ATSB research report, [An overview of human factors in aviation maintenance](#) (AR-2008-055), available from the ATSB website.

The occurrence

What happened

On the morning of 18 December 2017, a Jetstar Airways (Jetstar) Airbus A320 aircraft, registered VH-VQG (VQG) was on final approach to Gold Coast Airport, Queensland. The aircraft was operating as a scheduled passenger flight, from Adelaide, South Australia, with two flight crew, four cabin crew, and 140 passengers.

At about 0845 Eastern Standard Time,¹ air traffic control cleared VQG to land. After a normal descent and touchdown, the captain (pilot flying) selected both engine thrust reversers.² The right engine thrust reverser activated but the left engine reverser did not, and the flight crew received a 'reverse fault' alert. They continued with the landing and the aircraft decelerated to a taxi speed using normal braking. The captain moved the thrust reverser controls to the stowed position, the aircraft was taxied to the gate without further incident and the passengers disembarked.

While taxiing, the captain cycled the thrust reverser levers and the alert extinguished. Nevertheless, the captain reported the thrust reverser issue for investigation by engineering personnel.

The subsequent engineering inspection found the left engine thrust reverser lockout pin installed, effectively deactivating the reverser. The lockout pin was removed, the thrust reverser confirmed to be operating normally and the aircraft returned to service.

There was no damage to the aircraft, or injuries as a result of the incident.

Overnight maintenance

Maintenance on the aircraft's left engine was carried out in Adelaide during the night before the incident flight. Two A320 licensed maintenance engineers had carried out that maintenance.

One of the engineers (engineer 1) began his scheduled night shift at about 1900 on 17 December, and he described the weather that evening as hot and humid. He initially thought he was the only engineer on that shift to carry out maintenance certification on four A320 aircraft, and stated that he felt 'stressed' and under pressure. The other engineer (engineer 2) had been called in to work overtime that evening. He started his shift at 1830, carrying out other tasks before being assigned to assist engineer 1 with VQG later that evening.

At about 2300, after completing their other tasks, the engineers commenced maintenance on VQG. This maintenance was unscheduled and involved investigating an engine bleed air issue. Jetstar had not provided paperwork for this task. Engineer 2 began collecting the consumables required for the task. Engineer 1 went to the tarmac tool store to get a lockout pin, required to be installed on the engine to prevent inadvertent activation of the thrust reverser.

After locating the lockout pin with some difficulty, engineer 1 hurried back to the aircraft without booking out the pin on the store's computer system. He opened the left engine cowling and, using a stand to access the top of the engine, installed the pin. Procedures required the pin's installation to be entered in the aircraft's technical log. The log was located in the line office, and the engineer decided to record it in the log later.

A couple of hours later, the engineers completed investigating the bleed air issue. By this time, it had started raining. Engineer 1 made a visual inspection around the engine in preparation to close the cowling. The available lighting had reduced as half the tarmac lights automatically turn off at midnight. Engineer 1 missed seeing the lockout pin and its 1 m long red warning flag, and closed

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

² The purpose of the engine thrust reversers is to decelerate the aircraft on the ground, either routinely or during an emergency.

the cowling (Figure 1). The flag was shorter than those on the pins in the hangar tool store at Adelaide, which had been lengthened to 4 m after a previous incident to make them more obvious. Additionally, the stand that engineer 1 had used to install the pin, and which may have reminded him about it, had been removed for another task.

The aircraft maintenance manual thrust reverser de-activation procedure also required the use of specific warning labels in the cockpit, stating that ‘thrust reverser HCU [hydraulic control unit] is de-activated’. This procedure was not used during this maintenance task.

Figure 1: Photograph of a thrust reverser lockout pin and warning flag (non-reflective)



Source: Operator, annotated by the ATSB

Shortly after 0230 on 18 December, the engineers completed the maintenance on VQG, and went to the line office to complete the paperwork. The engineers recorded different parts of the completed maintenance, but neither entered the installation of the lockout pin in the technical log.

At the release to service of VQG, a tooling inventory check was conducted. As the pin was not booked out on the store’s computer, it did not show up during the check.

The aircraft was released to service with the lockout pin installed.

Similar occurrences

AO-2018-064³

In September 2018, the engine thrust reversers on a Jetstar A320 aircraft did not activate when landing at Sydney Airport, New South Wales. The ATSB investigation into that occurrence found that the thrust reverser lockout pins on both engines were not removed after maintenance at the Brisbane Airport, Queensland facility before the flight.

In that case, the aircraft maintenance lockout pins (fitted with warning flags) were substituted with in-service pins without flags. Further, the functional check of the thrust reversers following reactivation as per the operator’s task card for that planned maintenance was not carried out. The investigation also found that operational pressure to expedite the maintenance probably influenced the deviation from procedures.

January 2017

In January 2017, the right engine thrust reverser on a Jetstar A320 aircraft did not activate when landing at Melbourne Airport, Victoria. The operator’s investigation found that the thrust reverser lockout pin was not removed after maintenance at Adelaide before the flight.

In that case, the aircraft maintenance lockout pin also had a 1 m red warning flag and was not booked out on the store’s computer system.

³ Available at www.atsb.gov.au

Safety analysis

The left engine thrust reverser did not activate when VH-VQG landed at the Gold Coast Airport because its lockout pin was installed. Engineers had installed the pin during maintenance in Adelaide before the flight, but missed removing it due to a number of reasons.

The maintenance in Adelaide was carried out in the night under artificial lighting on the tarmac. The lighting significantly reduced at midnight when the tarmac lights automatically dimmed (half extinguished). In addition, it was raining when engineer 1 carried out a visual inspection before closing the engine cowling. These conditions made it difficult to see the lockout pin's red warning flag.

The red colour of the flag was also harder to see in the artificial lighting,⁴ and the flag was not fitted with reflective material. The lockout pin was located at the top of the engine, where its 1 m flag was not as conspicuous as other longer flags, which would have hung below the engine to the tarmac. Further, the stand used to install the pin, which might have served as a reminder, had been removed. The combination of these factors probably led to the pin not being removed.

Procedures aimed at ensuring the lockout pin's removal were not followed. These procedures included booking items out on the tool store's computer system. As the pin was not booked out, its return to the store could not be checked. Further, the pin's installation was not recorded in the technical log, which meant its removal went unnoticed and unrecorded.

Finally, the required cockpit warnings associated with thrust reverser deactivation were not used, thereby removing an opportunity to identify that the pin had not been removed before the aircraft was returned to service.

Findings

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The lockout pin on the left engine thrust reverser was not removed after maintenance, resulting in the aircraft returning to service with the thrust reverser deactivated.
- The location of the thrust reverser lockout pin at the top of the engine meant that its 1 m red warning flag was difficult to see in the prevailing low-light conditions. This probably led to the engineer not seeing the flag and removing the pin.
- The lockout pin was not booked out of the tool store nor was its installation recorded in the technical log. As a result, the checks that these procedures provided to ensure the pin's removal were missed. Additionally, the required cockpit warnings associated with thrust reverser deactivation were not used, removing an opportunity to identify that the thrust reverser was disabled.

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.

Qantas

The aircraft maintenance organisation, Qantas, has advised the ATSB that it is taking the following safety actions:

- Highlighting the importance of the aircraft maintenance manual precautions, and the limitations of human performance on the stages of maintenance, to maintenance staff at Adelaide.

⁴ An effect known as the [Purkinje shift](#), red will appear darker relative to other colours as light levels decrease.

- Lengthening all thrust reverser lockout pin flags to hang past the closed cowls. The pin will also have a warning notice attached for placement on the engine thrust reverser controls during maintenance.
- Focused audits on work practices for tooling and documenting maintenance activities.
- Reiterating the responsibilities of engineers to those involved in this incident.

Airbus

The aircraft manufacturer, Airbus, advised that the August 2019 revision of the aircraft maintenance manual introduced an operational test of the thrust reverser system to confirm its re-activation after maintenance tasks.

General details

Occurrence details

Date and time:	18 December 2017 – 0847 EST	
Occurrence category:	Incident	
Primary occurrence type:	Operational / Miscellaneous / Warning Devices	
Location:	Gold Coast Airport, Queensland	
	Latitude: 28° 9.87' S	Longitude: 153° 30.28' E

VH-VQG

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VQG	
Operator:	Jetstar Airways	
Serial number:	2787	
Type of operation:	Air Transport High Capacity - Passenger	
Departure:	Adelaide Airport, South Australia	
Destination:	Gold Coast Airport, Queensland	
Persons on board:	Crew – 6	Passengers – 140
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	None	

About the ATSB

The 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; 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.

Purpose of safety investigations

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the 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.