



**Australian Government**

**Australian Transport Safety Bureau**

# Landing gear damage involving Airbus A320, VH-VFL

Near Sydney, New South Wales, on 5 March 2020

**ATSB Transport Safety Report**

Aviation Occurrence Investigation (Short)

AO-2020-018

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#### Addendum

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# Safety summary

## What happened

On the afternoon of 5 March 2020, an Airbus A320, registered VH-VFL and operated by Jetstar Airways landed at Proserpine, Queensland, on a scheduled passenger service from Sydney, New South Wales. On the walk around after landing, damage was found to the nose gear landing light and the left main landing gear, including a pierced hydraulic brake line.

Fluid was subsequently found in the landing gear wheel well. No evidence of a strike or foreign object debris was found on the runway at Proserpine or Sydney. There was no indication that the aircraft had been struck by ground support equipment prior to departure from Sydney, and no recent maintenance had been performed on the left main landing gear.

## What the ATSB found

The ATSB determined that the nose gear landing light was probably struck and damaged during departure from Sydney. However, the source of the damage could not be determined. The glass lens from the nose gear landing light most likely struck the main landing gear, resulting in the pierced hydraulic brake line.

## Safety message

Visual inspections play an important role in maintaining the safety of an aircraft. In this case, a vigilant flight crew identified damage that could have otherwise impacted on the safety of future flights. Flight crew are encouraged to be attentive in their post-flight inspections, even when the flight has been completed without incident.

# The investigation

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 investigation was conducted in order to produce a short investigation report, and allow for greater industry awareness of findings that affect safety and potential learning opportunities.

## The occurrence

At 1308 Eastern Standard Time<sup>1</sup> on 5 March 2020, a Jetstar Airways (Jetstar) Airbus A320-232 registered VH-VFL, completed a scheduled passenger flight from Sydney, New South Wales to Proserpine, Queensland. During the subsequent walk around the flight crew noticed damage to the aircraft's undercarriage, specifically:

- the nose gear landing light was damaged
- the left main landing gear (MLG) brake hydraulics were pierced, with fluid visible on the apron, tyres and gear assembly
- a metal conduit carrying wiring for the left MLG was deformed.

After the damage was found, a member of the cabin crew recalled hearing a 'deflation noise' while on descent into Proserpine. There was no visible biological evidence that might indicate a wildlife strike. Therefore, given the extent and nature of the damage, Jetstar reported that a remotely piloted aircraft (RPA) may have collided with the aircraft.

Runway inspections were subsequently conducted at Sydney and Proserpine, however no debris or any evidence of an impact could be found at either location. Jetstar reviewed the flight data but could not identify anything that might indicate a strike had occurred. The flight data did not record the condition of the landing light or the level of hydraulic fluid in the MLG brake line.

## Context

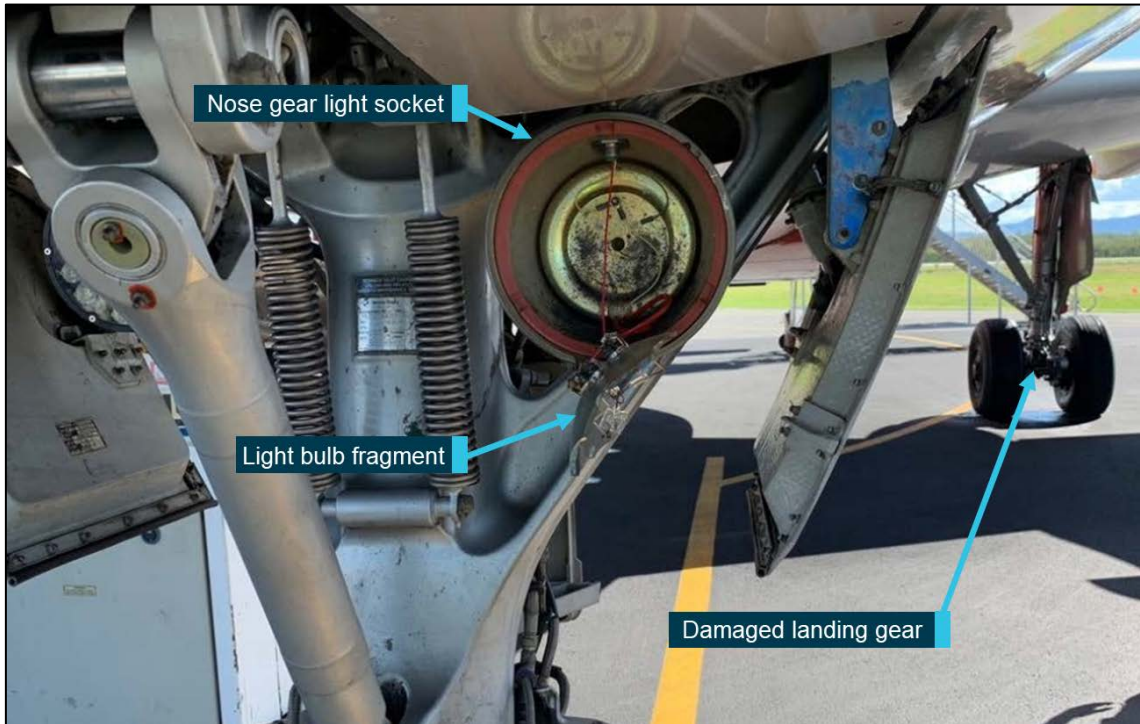
### ***Aircraft damage description***

Figure 1 shows the damage to the nose gear landing light at the time of the post-flight walk around. Most of the lamp was missing, with a small fragment still attached to the socket. In the background of the image, the damaged left MLG can be seen. The broken nose gear landing light was inspected by the manufacturer, but there was no comment made regarding possible reasons for the damage.

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<sup>1</sup> Eastern Standard Time (EST): Coordinated Universal Time (UTC) +10 hours

**Figure 1: Damaged nose gear landing light**



Source: Jetstar Airways, annotated by the ATSB

Figure 2 shows the damage found on the left-hand MLG wiring conduit and the adjacent brake hydraulic line. Fluid can be seen on the apron as well as the tyres. A subsequent inspection of the aircraft found more fluid in the wheel well of the left main landing gear.

**Figure 2: Main landing gear damage**



Source: Jetstar Airways, modified by the ATSB

***Ground handling and maintenance***

The maintenance history of VH-VFL was reviewed to determine if some or all of the landing gear damage could have been due to some earlier maintenance activity, or if tooling might have been left in the wheel well, resulting in the damage to the MLG observed. However, prior to the occurrence, the aircraft had completed 35 scheduled flights since any maintenance was performed on the landing gear.

There were no reported incidents of damage from ground support equipment prior to departure from Sydney, but there was no CCTV footage available to confirm this.

### ***Landing gear design and operation***

The nose gear landing light used a halogen lamp. The lens was made of glass, but it included a polycarbonate lens cover described by the manufacturer as very resistant to thermal shocks and mechanical impacts. An undamaged halogen lamp, installed on an A320, is shown in Figure 3.

**Figure 3: Undamaged nose gear landing light with polycarbonate cover**



Source: Jetstar Airways

The damaged main landing gear hydraulic line was responsible for actuating the wheel brakes. The line would pressurise when the brakes were applied via pilot input or the automatic brake system. One function of the automatic brake system was to apply the brakes during landing gear retraction, to prevent wheel rotation.

### ***Hydraulic line examination***

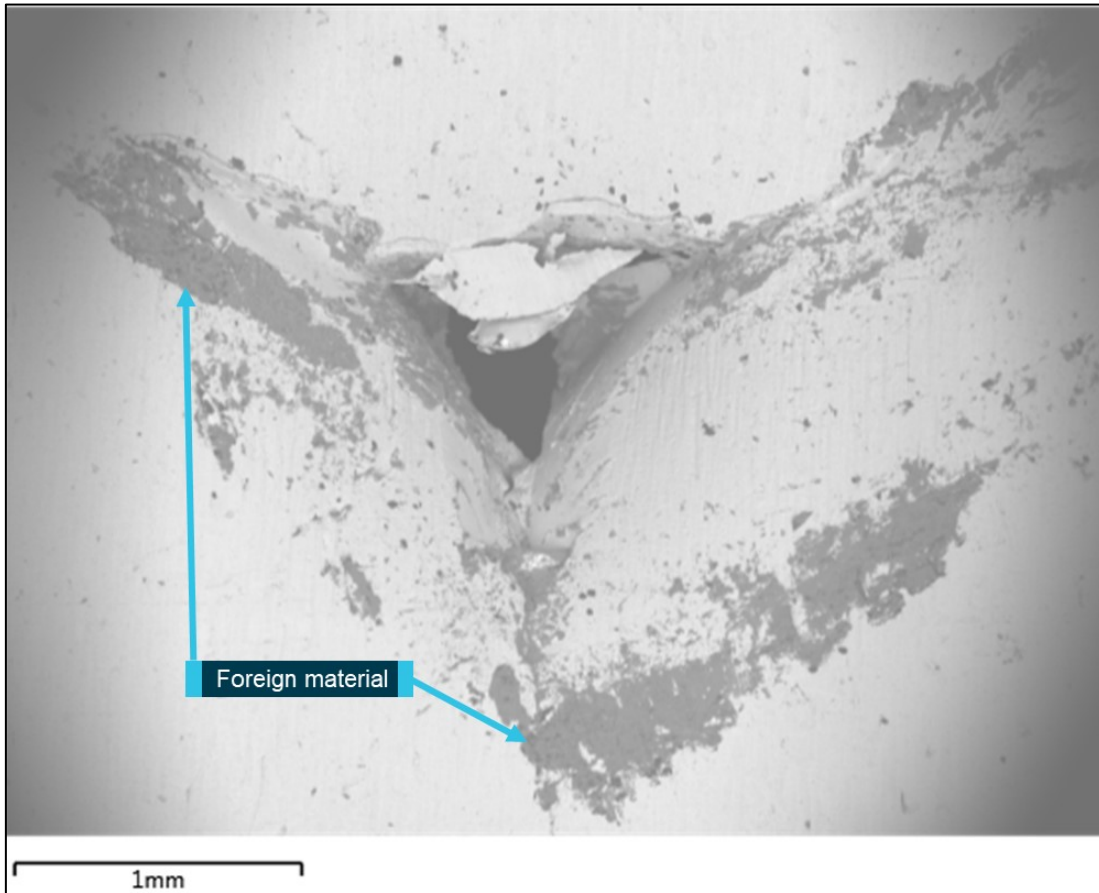
The pierced hydraulic line was sent to the ATSB for examination. The line was confirmed to be a titanium-aluminium alloy, per the manufacturer's specifications. The damage observed was consistent with a concentrated external force resulting in the puncture.

Scanning electron microscopy, including backscattered electron imagery<sup>2</sup> and energy-dispersive X-ray spectroscopy<sup>3</sup> was conducted on the damaged section of line. Figure 4 shows a foreign material identified around the damaged area.

<sup>2</sup> Backscattered electron imagery involves firing an electron gun at a subject and detecting electrons that scatter off its surface. Heavy elements scatter more electrons than light ones, so appear brighter.

<sup>3</sup> Energy-dispersive X-ray spectroscopy identifies the chemical elements within a sample by measuring how the elements interact with X-rays.

**Figure 4: Backscattered electron image of the hydraulic line damage**



*The darker regions indicate a foreign material is present, consisting of lighter elements than the titanium-aluminium line.*  
 Source: ATSB

Energy dispersive X-ray spectroscopy identified the foreign material as a combination of silicon and oxygen. At higher magnifications, the foreign material appeared to have a granular, crystalline structure. The structure and composition of the foreign material indicated that it was most likely silica, otherwise known as silicon dioxide. Silica is the primary ingredient in most forms of glass.

### Safety analysis

The polycarbonate cover on the nose gear landing light would likely have prevented it from disintegrating due to thermal stress, such as from a blown bulb. Therefore, the damage to the light indicated by the recovered bulb fragments was probably the result of an impact. The bulb fragmented despite the presence of the polycarbonate cover, indicating that the light was struck with considerable force. Given their proximity to each other and the nature of the damage, the punctured hydraulic line and deformed metal wiring conduit were also considered to be the result of an impact.

Examination of the damaged hydraulic line identified traces of what was most likely glass. The most probable source of the damage to the hydraulic line and wiring conduit was the glass lens of the nose gear landing light. Other potential sources of damage, such as ground support equipment or foreign object debris could not be ruled out, however there was no evidence found to support these.

Both impacts most likely occurred during the flight between Sydney and Proserpine, since no damage was reported following the previous flight, or during pre-flight inspections in Sydney. Fluid found in the main landing gear (MLG) wheel well likely came from the punctured hydraulic line. The fluid was probably discharged into the well when the crew raised the landing gear during departure from Sydney, as the line would have been pressurised, and the gear was not retracted



again prior to the damage being found. It is therefore likely that the MLG damage occurred during departure from Sydney, rather than via a remotely piloted aircraft (RPA) while on descent into Proserpine, since damage on descent would not explain the fluid found in the wheel well. As such, the noise heard by the cabin crew member was probably unrelated to the occurrence.

The source of the impact to the nose gear landing light could not be determined. It is possible the aircraft struck a bird or an RPA during departure from Sydney, or foreign object debris during its take-off roll. It should be noted, however, that no debris was found during runway inspections at Sydney Airport and there was no visible biological evidence of a wildlife strike.

## Findings

ATSB investigation report findings focus on safety factors (that is, events and conditions that increase risk). Safety factors include 'contributing factors' and 'other factors that increased risk' (that is, factors that did not meet the definition of a contributing factor for this occurrence but were still considered important to include in the report for the purpose of increasing awareness and enhancing safety). In addition, 'other findings' may be included to provide important information about topics other than safety factors.

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

From the evidence available, the following findings are made with respect to the landing gear damage involving Airbus A320 VH-VHL, on 5 March 2020.

### **Contributing factors**

- On departure from Sydney, the nose gear landing light was probably struck and damaged by an unknown object. Consequently, part of the nose gear landing light lens likely impacted and damaged the main landing gear.

## Sources and submissions

### **Sources of information**

The sources of information during the investigation included:

- Jetstar Airways
- the nose gear landing light manufacturer.

### **Submissions**

Under section 26 of the *Transport Safety Investigation Act 2003*, the ATSB may provide a draft report, on a confidential basis, to any person whom the ATSB considers appropriate. That section allows a person receiving a draft report to make submissions to the ATSB about the draft report.

A draft of this report was provided to the following directly involved parties:

- Jetstar Airways
- Airbus
- the nose gear landing light manufacturer
- French Bureau of Enquiry and Analysis for Civil Aviation Safety (BEA).

A submission was received from:

- Jetstar Airways.

The submission was reviewed and, where considered appropriate, the text of the report was amended accordingly.

# General details

## Occurrence details

Date and time:	5 March 2020 – 1203 EST	
Occurrence category:	Incident	
Primary occurrence type:	Hydraulic	
Location:	Near Sydney Airport, New South Wales	
	Latitude: 33° 56.77' S	Longitude: 151° 10.63' E

## Aircraft details

Manufacturer and model:	Airbus A320-232	
Registration:	VH-VFL	
Operator:	Jetstar Airways Pty Ltd	
Serial number:	5489	
Type of operation:	Air Transport High Capacity	
Activity:	Commercial air transport - Scheduled - Domestic	
Departure:	Sydney, New South Wales	
Destination:	Proserpine, Queensland	
Persons on board:	Crew – 6	Passengers – 164
Injuries:	Crew – Nil	Passengers – Nil
Aircraft damage:	Minor	