Australian Government
Australian Transport Safety Bureau

Landing gear malfunction involving a Cessna 210, VH-SMP

Kununurra Airport, Western Australia, 1 February 2015

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Aviation Occurrence Investigation
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Addendum

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Landing gear malfunction involving a Cessna 210, VH-SMP

What happened

VH-SMP

Source: Keith Anderson, modified by the ATSB

On 1 February 2015, at about 0800 Western Standard Time (WST), a Cessna 210 aircraft, registered VH-SMP (SMP), departed from Kununurra Airport, Western Australia, for a scenic flight over King George falls with the pilot and five passengers on board.

The pilot returned to Kununurra after about 2 hours. During the approach, the pilot selected the landing gear selector to the down position. However, the green landing gear down indicator light did not illuminate. In addition, the landing gear pump continued to operate until the landing gear pump circuit breaker popped. The pilot observed that the right and left main landing gear appeared to be in the down and locked position. However, the pilot was unable to observe the nose landing gear.

As he was unable to verify the position of the nose landing gear, the pilot conducted a missed approach and held at about 1,500 ft above the ground level to investigate the reason for the malfunction. The pilot also broadcast on the common traffic advisory frequency (CTAF) his intentions and briefed the passengers.

The pilot selected the landing gear down and up another two times. However, in the down selection, there was no green landing gear down light and the landing gear pump continued to operate until the circuit breaker popped. The pilot inspected the landing gear down light globe and determined it was operational.

The pilot then used the 'landing gear fails to extend' and 'manual gear extension' checklists, and conducted a manual gear extension. The main landing gear was observed to be in the down position, but there was still no landing gear down green light.

The pilot contacted the operator first via a text message using a mobile phone, and then on the company radio frequency. After consulting with the operator, the pilot conducted a low-level pass over the runway to enable the operator to observe the landing gear position from the ground.

During the low-level pass, the operator observed the landing gear and reported to the pilot that the landing gear appeared to be in the down position. The operator told the pilot that it was likely to be an indication problem. The pilot returned SMP for a landing on runway 12 and briefed the passengers for the landing.

At about 1020, SMP landed, with the main landing gear wheels touching down first. The pilot held full back pressure on the elevator controls to hold the nose wheel off the runway for as long as possible. After about 100 m, the nose of the aircraft sank on to the runway. At this point, the nose wheel collapsed, the propeller struck the runway, and the aircraft came to a stop. Once the aircraft was stationary, the pilot completed the shutdown checks. The pilot and passengers then exited the aircraft through the two front doors.

The pilot and five passengers were uninjured. The aircraft sustained minor damage, including damage to the propeller, nose wheel, and engine cowling.

Pilot comment

The pilot reported that when the manual gear extension hand pump was used to pump the gear down, and was pumped until it could not be pumped further, it felt just like when the gear is in the down and locked position.

The pilot indicated that SMP last flew on 12 January 2015, about 3 weeks before the incident flight, and that there was no outstanding maintenance.

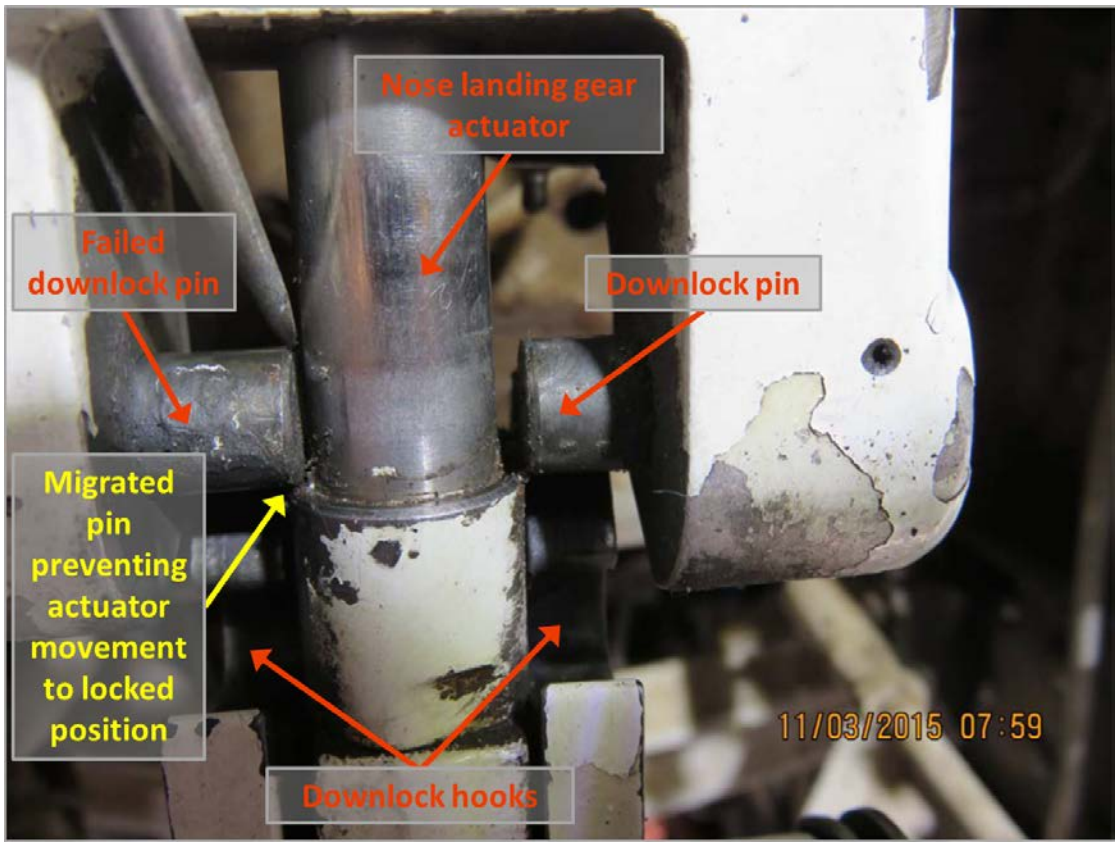
Owner investigation

The owner of the aircraft conducted an investigation into the incident. As part of their investigation, they determined that one of the nose landing gear down lock pins had failed. The pin had failed in the area of the machined groove for the pin retention roll pin (Figure 1). The failed down lock pin migrated out and interfered with the nose landing gear actuator. This movement prevented the nose landing gear down lock mechanism from engaging in the down and locked position (Figure 2). The other down lock pin was serviceable.

Figure 1: Failed nose landing gear downlock pin

Source: Aircraft owner

Figure 2: SMP nose landing gear downlock assembly, showing the failed downlock pin preventing actuator movement to the locked position



Source: Aircraft owner, modified by the ATSB

Cessna Service Bulletin

Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Inspection* dated 29 December 1995, recommended the inspection of the nose landing gear downlock actuator pins to determine the security of the pins.

Cessna had introduced the service bulletin as they had received reports that the nose landing gear actuator downlock pins had cracked and failed. It was found that the pins had failed at a circumferential groove that was used to secure the pin in the actuator bearing end. The service bulletin indicated that non-compliance could result in failure of the nose landing gear to lock in the down position and possibly collapse.

The recommended inspection was to be carried out initially within the next 200 hours operation or 12 months, whichever occurred first. Subsequent inspections at each landing gear retraction check were not to exceed 200 hours of operation thereafter. After the installation of the downlock actuator pin replacement, the repetitive inspection was not required.

Aircraft maintenance

SMP was manufactured in 1976 and, at the time of the incident, the aircraft had 9,965 hours total time in service. The aircraft was maintained under the Civil Aviation Safety Authority (CASA) maintenance schedule (*Civil Aviation Regulations 1988* (CAR) *Schedule 5*). As the nose landing gear was inspected in accordance with *Schedule 5*, the operator reported that they did not need to comply with Cessna *SEB95-20*.

The periodic (100 hourly or 12-month) maintenance inspections were carried out in August 2014 at 9,871 hours total time in service (94 hours prior to the accident). This maintenance was conducted in accordance with the CASA maintenance schedule (*Schedule 5*). *Schedule 5* did not include a specific inspection requirement to determine the security of the down lock pins.

NTSB investigation into similar failures

The US National Transport Safety Board (NTSB) investigated an accident involving a Cessna R182 aircraft, registered N6149S at Allegheny County Airport, West Mifflin, Pennsylvania on 18 May 2005 where the nose landing gear collapse during the landing.[1]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. The NTSB examined the downlock pin and found that it had failed due to a fatigue crack. The investigation also found that the Cessna Service Bulletin *SEB95-20 Nose Landing Gear Actuator Downlock Pin Inspection* had not been carried out. The investigation found over 30 other nose landing gear collapses that were attributed to the actuator down lock pins on similarly equipped Cessna aircraft.

The NTSB also investigated another similar accident involving a Cessna R182 aircraft, registered N5274S, at Ames Municipal Airport, Ames, Iowa, on 22 October 2006 where the nose landing gear collapse during the landing.[2]

The NTSB determined that one of the downlock actuator pins (the same part number as SMP) on the nose landing gear actuator assembly bearing end had failed and migrated out. The pin contacted the actuator arm piston, and prevented the full travel of the nose landing gear to the down and locked position. Both downlock pins were found to have fatigue cracks. Again, there was no evidence that Cessna Service Bulletin *SEB95-20* had been complied with.

ATSB comment

On 12 September 2011, a flight control system event occurred involving Cessna 210N, VH-JHF, 48 km West of Bourke Airport, NSW. The ATSB investigation (AO-2011-115) found that reported elevator control input difficulties resulted from the fracture of the aircraft's two horizontal stabiliser rear attachment brackets. The nature of the failures was typical of the damage sustained by aircraft as they age and move beyond the manufacturer's originally intended design life.

The investigation identified that maintaining class B aircraft in accordance with the Civil Aviation Safety Authority (CASA) maintenance schedule, without due regard to the manufacturer's or other approved data, does not adequately provide for the continuing airworthiness of those aircraft.

As a result of the investigation the ATSB issued CASA a Safety Recommendation *AO-2011-115-SR-050*:

> The Australian Transport Safety Bureau recommends that CASA proceed with its program of regulatory reform to ensure that all aircraft involved in general aviation operations are maintained using the most appropriate maintenance schedule for the aircraft type.

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.

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1 The NTSB aviation accident report *IAD05IA066*, is available from the NTSB website.

2 The NTSB aviation accident report *CHI07LA011*, is available from the NTSB website.

Aircraft owner

As a result of this occurrence, the aircraft operator has advised the ATSB that the aircraft owner has taken the following safety actions:

Aircraft maintenance

Subsequent to the incident, the aircraft owner replaced the landing gear down lock pins with updated pins on two other aircraft that the owner is responsible for, and found no abnormalities with the removed pins or the nose landing gear actuator bearing ends.

Safety message

This accident highlights the importance of comprehensive, periodic maintenance inspections and the role manufactures continuing airworthiness instructions in maintaining ageing aircraft. As aircraft age, the original maintenance schedules may not be sufficient to ensure the aircraft's ongoing safety. As a result of investigation report AO-2011-115 the ATSB encourages registration holders of class B aircraft to review their aircraft's maintenance schedule to determine if it is the most appropriate for their aircraft and to ensure that it adequately provides for the continuing airworthiness of the aircraft.

In 2007, the ATSB released research report B20050205 - *How Old is Too Old? The impact of ageing aircraft on aviation safety* and is available from the ATSB website. The report found that some aircraft manufacturers have recognised that the original maintenance schedules may not be sufficient to ensure the aircraft's (ongoing) safety. Those manufacturers have developed additional continuing airworthiness information. The report concluded that adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

In 2012, in recognition of the Australian general aviation aging aircraft fleet, CASA released a discussion paper *Ageing Aircraft Management Plan (AAMP)*. The discussion paper makes the following relevant points:

- As an aircraft ages up to and beyond its original design assumptions, the nominated maintenance program needs to be modified to take into account ageing issues. In particular, inspections of key areas or components not usually accessed.
- CASA and Authorised Persons are obliged to take into account all relevant maintenance data or information pertinent to a particular aircraft type. This includes manufacturer's data, Airworthiness Directives, Service Bulletins and other continuing airworthiness information.
- CASA Maintenance *Schedule 5* was originally conceived as a minimum schedule of maintenance activities, to be undertaken on a very limited range of relatively simple, 'orphan' aircraft
- CASA Maintenance *Schedule 5* was not originally intended to address ageing aircraft related issues. The literal application of this schedule on its own was not intended to replace the manufacturer's instructions for continued airworthiness, where available.

The adequate maintenance of ageing aircraft requires the participation and ongoing cooperation of aircraft manufacturers, regulatory authorities, owners, operators, and maintainers.

General details

Occurrence details

Date and time:	1 February 2015 – 1020 WST	
Occurrence category:	Serious incident	
Primary occurrence type:	Landing gear malfunction	
Location:	Kununurra Airport, Western Australia	
	Latitude: 15° 46.68' S	Longitude: 128° 42.45' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210L	
Registration:	VH-SMP	
Serial number:	21061544	
Type of operation:	Charter - passenger	
Persons on board:	Crew – 1	Passengers – 5
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Minor	

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.