Australian Government
Australian Transport Safety Bureau

Wheels-up landing involving a Cessna 210, VH-JGA

Cairns Airport, Queensland on 11 November 2014

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2014-178
Final – 10 June 2015

Released in accordance with section 25 of the *Transport Safety Investigation Act 2003*

Publishing information

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 4150 (24 hours)
Accident and incident notification: 1800 011 034 (24 hours)
Facsimile: 02 6247 3117, from overseas +61 2 6247 3117
Email: atsbinfo@atsb.gov.au
Internet: www.atsb.gov.au

Addendum

Page	Change	Date

Wheels-up landing involving a Cessna 210, VH-JGA

What happened

VH-JGA

Source: Aircraft operator

On 11 November 2014, at about 1130 Eastern Standard Time (EST), a Cessna 210 aircraft, registered VH-JGA (JGA), departed from Cairns Airport, Queensland, for a scenic flight over Green Island and Arlington Reef with the pilot and four passengers on board.

After about half an hour of local flying, the pilot returned JGA to Cairns Airport. During the approach, at about 1,000 ft above ground level, the pilot selected the landing gear down, however, the green landing gear down indicator light did not illuminate. The pilot observed via an inspection mirror that the left main landing gear was just out of the landing gear recess and not in the down and locked position. The nose landing gear and right main landing gear appeared to be in the down position. The pilot advised the Cairns Tower air traffic controller that JGA would conduct a missed approach and requested a clearance to hold over the sea to determine the reason for the malfunction.

While holding over the sea, in the vicinity of Cairns Airport, at about 1,000 ft, the pilot conducted a landing gear emergency extension, but the left main landing gear still did not lock in the down position. The pilot contacted the operator and maintenance organisation via a mobile phone and conducted extensive troubleshooting, but was unable to get the left main landing gear to lock in the down position.

JGA was then returned to Cairns Airport and the pilot conducted a low level pass over the runway so that the landing gear could be observed. The nose landing gear and right main landing gear were observed to be in the down position, while the left main landing gear was observed to be out of the landing gear recess and only extended to about a 45 degree angle. The pilot elected to hold over the sea and reduce the amount of fuel on board, before conducting a landing. The pilot consulted with the operator and the maintenance organisation and decided to land on the grass area, abeam runway 33, with the landing gear retracted.

The pilot of JGA conducted two practice approaches to assess the aircraft configuration and landing area before beginning the approach for a wheels-up landing. The pilot extended the flaps to help slow the aircraft and, after turning onto a long final, briefed the passengers for the landing and instructed them to take up the brace position. Just prior to touchdown, the pilot turned off the master switch and moved the engine mixture control to the cut-off position. At about 1416, the aircraft landed on the fuselage underside on the grass area abeam runway 33 and came to a stop. The pilot and four passengers were uninjured and the aircraft was substantially damaged (Figure 1).

Figure 1: Damage to JGA

Source: *Aircraft operator*

Pilot comment

The pilot had flown the aircraft on a previous flight that day and had not noticed anything unusual. The pilot commented that there was sufficient fuel on board the aircraft so that there was time to investigate the malfunction and to plan and prepare for the landing.

When conducting the emergency extension, the nose and right main gear went straight to the down and locked position before the emergency extension hand pump was used. The hand pump had no effect on moving the left main landing gear.

Operator comment

The operator conducted an investigation into the accident and determined that the housing of the left main landing gear had fractured (Figure 2), resulting in the gear not extending to the down and locked position. The operator reported that they conducted a visual inspection of the left and right main landing gear actuators for cracks and checked the tightness of the actuator mounting bolts at the periodic (100 hourly or 12-month) maintenance inspections with the actuator in-situ. The last inspection was conducted about 50 hours prior to the accident, with no defects found.

JGA was manufactured in 1981 and, at the time of the accident, the aircraft had about 12,882 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*). The left main landing gear was a non-lifed component and had been on the aircraft since new. There was no record that the actuator had been overhauled.

Figure 2: JGA left main landing gear actuator showing the fractured housing

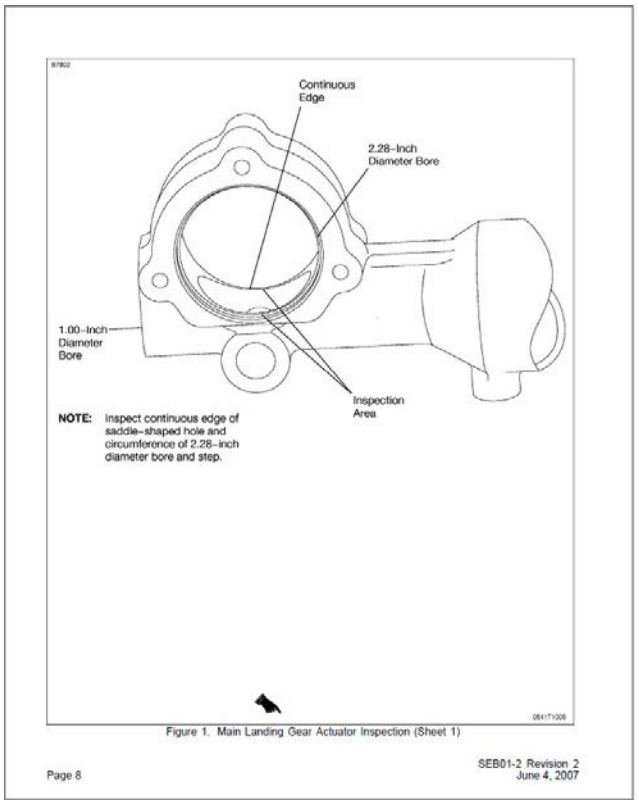
Source: *Aircraft operator*

Cessna service manual

The Cessna 210 aircraft service manual contained a Supplemental Inspection Document (SID) 32-10-01 (temporary Revision Number 10 dated 1 August 2011) with a compliance date by 31 December 2013 that directly related to the removal and detailed inspection of the main landing gear retraction system. The inspection was to be carried out initially every 3,000 hours total time in service or 10 years whichever occurred first and repeated every 500 hours or 5 years whichever occurred first (JGA was manufactured in 1981 and had about 12,882 hours total time in service). The SID also required verification that Cessna Service Bulletin SEB01-2 *Main Landing Gear Actuator Inspection* has been accomplished. The Cessna 200 series SIDs were introduced in August 2011 and the CASA current compliance dates have been extended until 30 June 2015 for aerial work and charter operations and 31 December 2015 for private operations to allow for sufficient time for full compliance.

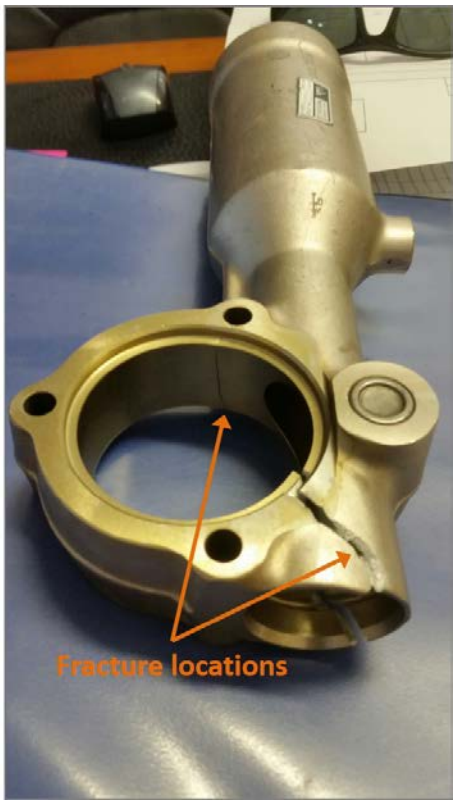
Cessna Service Bulletin SEB01-2 *Main Landing Gear Actuator Inspection* revision 2 dated 4 June 2007, required the inspection of the main landing gear actuators for the presence of cracks. Indicating that non-compliance with the service bulletin could result in failure of the main landing gear actuator. The service bulletin required the removal and disassembly of the main landing gear actuators and a fluorescent penetrant inspection of the actuator body to be carried out using black light and a magnifying glass to detect any cracks (Figure 3). The inspection was to be carried out initially every 3,000 hours total time in service within the next 100 hours operation and subsequent inspections every 500 hours total time in service thereafter.

Figure 3: Cessna Service Bulletin SEB01-2 main landing gear actuator inspection area



Source: *Cessna*

Fracture located in JGA main landing gear actuator



Aircraft operator

Aircraft maintenance

The aircraft operator reported that all Service Letters and Service Bulletins are reviewed by the maintenance organisation and implemented based on experience and at their request.

Information provided to the operator by the aircraft maintenance organisation was that the actuator fractured in what appeared to be one clean break and not a crack that slowly progressed, and that type of crack could occur in a sudden overload situation during the take-off when the landing gear is selected up and the wheels contact the ground. The maintenance organisation also recommended that the Service Bulletin requirements be carried out on aircraft that have exceeded 5,000 airframe hours.

ATSB comment

ATSB investigation AO-2011-115

The ATSB investigation AO-2011-115 *Flight control system event involving Cessna 210N, VH-JHF, 48 km West of Bourke Airport, NSW, 12 September 2011* found that reported elevator control input difficulties resulted directly 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 found at the time, that some aircraft registration holders believed that their aircraft was exempt from the manufacturer's supplemental inspections, such as the Cessna SIDs when their aircraft was maintained using the CASA maintenance schedule (*Civil Aviation Regulations 1988* (CAR) *Schedule 5*). While the CASA maintenance schedule did not make any specific reference to the incorporation of the manufacturer's supplemental inspections, it was a CAR requirement that all aircraft be maintained in accordance with approved maintenance data that, by definition, included those inspections.

The ATSB investigation report AO-2011-115 is available at www.atsb.gov.au/publications/investigation_reports/2011/aair/ao-2011-115.aspx.

CASA Airworthiness Bulletin (AWB) 02-048

CASA issued Airworthiness Bulletin (AWB) 02-048 *Compliance with Cessna Supplemental Inspection Documents (SIDs)* on 7 April 2014 to clarify the requirement to comply with Cessna SIDs. The AWB comprised Aviation Ruling 01/2014, which stated that compliance with the Cessna SIDs was mandatory, irrespective of the category of operation or the elected maintenance schedule for the aircraft, be it:

- CAR 42A Manufacturer's Maintenance Schedule,
- CAR 42B CASA Maintenance Schedule (Schedule 5), or
- CAR 42C Approved System of Maintenance.

The AWB also stated that:

> Significantly, the SIDs were developed on the assumption that the aircraft had been maintained using the Manufacturer's Maintenance Schedule, or equivalent (including the incorporation of all applicable Service Bulletins), and do not necessarily take into account modifications or repairs made to the aircraft since manufacture. Therefore, all relevant Service Bulletins need to be incorporated to be in compliance with the SIDs inspections.

Since the accident involving JGA, CASA released Issue 2 to AWB 02-048, dated 10 April 2015, to clarify that those service bulletins listed in the SIDs are required to be incorporated and confirmed that, where specified in the SIDs, on-going inspections are also required to be complied with.

The AWB further stated that:

> Therefore, all Service Bulletins that directly relate to the structural integrity of the aircraft need to be incorporated to be in compliance with the SIDs inspections. Please note that some Service Letters and other information referred to in the SIDs requirements were originally discretionary in nature. These documents are now considered mandatory if referred to as part of the SIDs inspections requirements in relation to [principal structural elements (PSEs)] PSEs.

Further information can be found in AWB 02-048, which is available at: www.casa.gov.au/wcmswr/_assets/main/airworth/awb/02/048.pdf

US Federal Aviation Administration (FAA) Service Difficulty Reporting (SDR) database

A search of the US Federal Aviation Administration (FAA) Service Difficulty Reporting (SDR) database found about 65 entries dated from 1995 to 2014 of reported crack or cracks in the main landing gear actuator/s, in the same crack location as specified in the service bulletin or in that area and with the same part number as JGA's actuator or one of the actuator part numbers listed in the service bulletin. Five entries had originated from Australia. About 20 reports resulted in an inflight incident and eight mentioned landing with the landing gear in the up position or without both main landing gear in the down position.

Although most reports indicated that the crack or cracks were located in the same area specified in the service bulletin, about 15 indicted they originated from one or more of the actuator attachment bolt holes. About 13 cracks had been located while carrying out the requirements of the service bulletin and the same number again were located while conducting a fleet inspection of the actuator. Several mentioned that this is an ongoing issue and suggested that the actuator be redesigned. One report mentioned a loose actuator attachment bolt, while two mentioned that the bolts were correctly torqued.

Although some entries lacked details, about seven specifically mentioned they were found during a scheduled inspection. One mentioned that the actuator had failed 25 hours after a 100 hourly

inspection, which specifically checked the actuators externally for cracks. About three entries reported that the actuator had failed subsequently from conducting the requirements of the service bulletin. One reporter indicated that an inspection should be conducted on the actuator any time that the landing gear contacts the ground in other than the fully extended or fully retracted position.

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.

Operator

As a result of this occurrence, the aircraft operator has advised the ATSB that they are taking the following safety actions:

Maintenance action

The operator's Cessna 210 aircraft fleet will undergo further examination to see if there is any evidence of other potential failures within the fleet.

Safety message

This accident highlights the importance of comprehensive, periodic maintenance inspections and the role of supplemental inspections in maintaining ageing aircraft. As aircraft age, the original maintenance schedules may not be sufficient to ensure the aircraft's ongoing safety. It is important to review the aircraft's maintenance schedule to ensure it is appropriate for the aircraft and 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,* www.atsb.gov.au/publications/2007/b20050205.aspx. 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 and have developed supplementary inspection programs (such as the Cessna SIDs); other aircraft do not have the same level of airworthiness support. 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 addition, further information is detailed in CASA's Ageing Aircraft Management Plan (AAMP) that is available at www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_100381.
CASA Flight safety Australia June 2014 Doing it right is available at:
www.flightsafetyaustralia.com/2014/06/

CASA Flight Safety Australia December 2014 SIDS program finds dangerous defects is available at: www.flightsafetyaustralia.com/2014/12/ .

General details

Occurrence details

Date and time:	11 November 2014 – 1416 EST	
Occurrence category:	Accident	
Primary occurrence type:	Technical – Airframe – Landing gear	
Location:	Cairns Airport, Queensland	
	Latitude: 16° 53.15'S	Longitude: 145° 45.32' E

Aircraft details

Manufacturer and model:	Cessna Aircraft Company 210N	
Registration:	VH-JGA	
Serial number:	21064222	
Type of operation:	Charter - Passenger	
Persons on board:	Crew – 1	Passengers – 4
Injuries:	Crew – 0	Passengers – 0
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.