



Australian Government

Australian Transport Safety Bureau

Nose landing gear malfunction involving a Hawker Beechcraft G58, VH-OMS

Hervey Bay, Queensland, 3 April 2013

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2013-065
Final – 7 August 2013

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

© Commonwealth of Australia 2013



Ownership of intellectual property rights in this publication

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia.

Creative Commons licence

With the exception of the Coat of Arms, ATSB logo, and photos and graphics in which a third party holds copyright, this publication is licensed under a Creative Commons Attribution 3.0 Australia licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form license agreement that allows you to copy, distribute, transmit and adapt this publication provided that you attribute the work.

The ATSB's preference is that you attribute this publication (and any material sourced from it) using the following wording: *Source:* Australian Transport Safety Bureau

Copyright in material obtained from other agencies, private individuals or organisations, belongs to those agencies, individuals or organisations. Where you want to use their material you will need to contact them directly.

Addendum

Page	Change	Date

Nose landing gear malfunction involving a Hawker Beechcraft B58, VH-OMS

What happened

On 3 April 2013, a Beechcraft B58 (Baron) aircraft, registered VH-OMS (OMS), departed Hervey Bay on a business flight to Toowoomba, Queensland. On board the aircraft were the pilot in command (PIC) and a copilot.

Shortly after take-off, as the landing gear retracted, the crew heard a loud bang. The crew detected a potential issue with the aircraft's landing gear, and, once established in the cruise, began troubleshooting the problem.

The crew noted that the red landing gear transit warning light remained illuminated. They cycled the landing gear on two occasions by selecting up then down, which resulted in the green main landing gear down indicator lights illuminating, but not the nose landing gear (NLG) light. The red transit warning light also remained illuminated. The crew then completed the checklist actions contained in the Aircraft Flight Manual (AFM) in an attempt to manually extend the landing gear, but the green NLG down light did not illuminate.

The crew elected to leave the landing gear extended and continued the flight to Toowoomba, with the intention of conducting a pass over the runway to allow ground personnel to observe and report the condition and position of the NLG. The PIC advised Brisbane Centre air traffic control (ATC) of the situation and his intentions.

The aircraft arrived at Toowoomba and a pass over the runway was conducted at 500 ft. Ground personnel confirmed that the NLG had extended, but was not in the locked position.

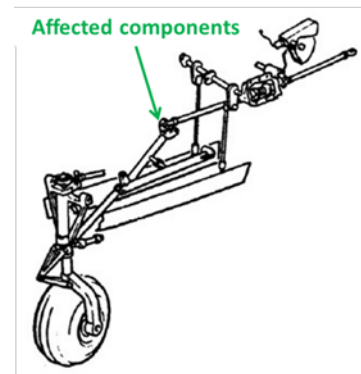
The aircraft was flown to the local training area until emergency services were in place at the airport. During this time, the PIC continued to advise ATC and other traffic within the vicinity of the situation. The crew referenced the wheels-up landing procedure in the AFM and formulated a plan, which included the responsibilities of each crew member. The crew then rehearsed the plan in preparation for landing.

After about 45 minutes, the crew were advised that emergency services were in place and the airport was closed. They returned to Toowoomba and elected to conduct a larger than normal circuit pattern. This provided the crew with additional preparation time and ensured that they did not feel rushed.

At about 500 ft above ground level, the aircraft was turned onto the final approach path. During the approach, the PIC elected to utilise engine power for as long as possible to assist with controlling the aircraft's speed and in the event a go-around manoeuvre was required.

As the aircraft's main landing gear touched down, the copilot selected the fuel and mixture controls to off, while the PIC concurrently reduced the throttle settings to idle and turned the electrical system off. The aircraft's nose then lowered and slid along the runway. The aircraft came to a stop and the crew exited. As a precaution, the aircraft was covered with fire retardant foam, but no fire resulted. A video of the landing can be viewed at:

www.youtube.com/watch?v=RfX9o6NSKzA



Source: Aircraft manufacturer

Aircraft information

The aircraft (Figure 1), serial number TH-2347, was built in the United States in 2012 and was first registered in Australia on 29 January 2013. At the time of the occurrence, the aircraft's total time in service was about 87 hours.

Figure 1: VH-OMS after landing



Source: Aircraft maintenance provider

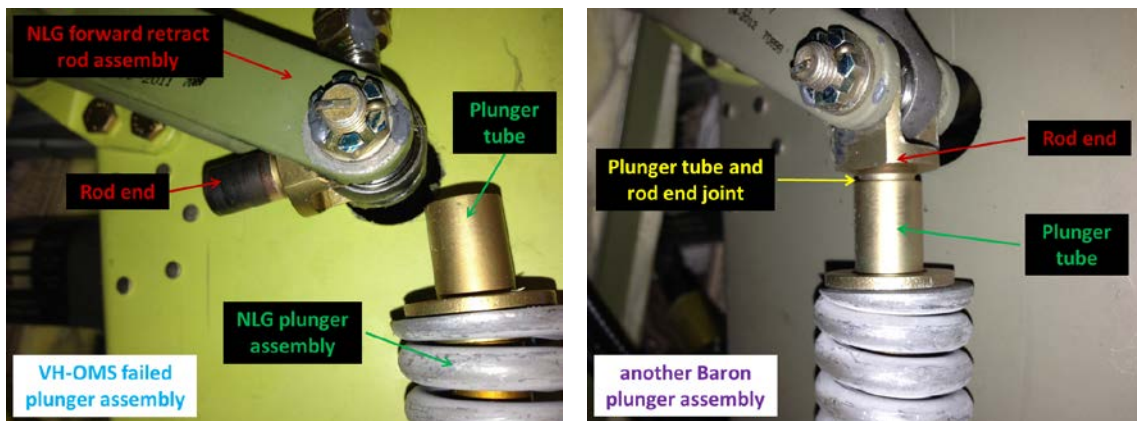
Nose landing gear (NLG) examination

The maintenance provider conducted an examination of the aircraft and determined that the rod end on the NLG forward retract rod assembly had separated from the plunger tube on the NLG plunger assembly (Figure 2). The initial examination suggested that there may have been a manufacturing issue that resulted in a defective joint between the rod end and plunger tube.

After the accident involving OMS, the NLG of a second Baron aircraft was inspected and it also showed signs of a similar defect (Figure 2). That aircraft was built in 2012 and had 127 hours total time in service.

The affected components for both aircraft were subsequently removed and sent to the aircraft manufacturer for further examination.

Figure 2: VH-OMS and another Baron rod plunger assembly in situ



Source: Aircraft maintenance provider

Aircraft manufacturer investigation

The affected components were examined by the aircraft manufacturer in the United States, who identified that there was no copper brazing visible on the lower section of the rod end (Figure 3) and inside the plunger tube.

During the manufacturing process, copper braze¹ is placed inside the plunger tube. The rod end is then inserted into the tube, and copper braze is further placed around the tube and rod end joint. The assembly is then placed in a heated chamber where the copper braze melts and 'wicks'² into the joint between the rod end and plunger tube. This provides copper penetration into the joint from the outside of the tube and from the inside at the lower end of the fitting.

It was determined that the copper braze had not been placed inside the plunger tube before the rod end had been inserted. This subsequently resulted in the rod end separating from the plunger tube.

The rod-end retract rod assemblies had been previously produced in-house by the aircraft manufacturer; however, in early 2012 this process was contracted to an external supplier. That supplier further outsourced the brazing process.

All new assemblies were required to be 'pull tested' to a 2,200 lb. test load. For the assemblies fitted to OMS, the aircraft manufacturer reported that a pull test had been conducted by the supplier; however, it could not be determined why that test did not reveal the lack of brazing. Two other assemblies manufactured by the supplier were pull tested and failed at about 6,000 lbs; the braze joint did not separate.

The aircraft manufacturer advised that eight of the supplier's retract rod assemblies had left their production quality system either installed in new aircraft or as spare parts, including that fitted to OMS and the other Baron. Seven of those assemblies had since been removed from service; the last assembly had not been located at the time of writing this report. The remaining assemblies manufactured by the supplier, still in the production quality system, had been disposed of. All of the supplier's assemblies were replaced with ones produced in-house.

Figure 3: VH-OMS rod end



Source: Aircraft manufacturer

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.

Hawker Beechcraft

As a result of this occurrence, the aircraft manufacturer has advised the ATSB that they have taken the following safety actions:

- **Mandatory Service Bulletin (MSB):** was released by the aircraft manufacturer on 6 May 2013 as a result of this accident: <http://csobeech.com/files/HBC-SB32-4125.pdf>. It was issued to inspect for, and if necessary, replace the specified nose landing gear plunger assemblies. This must be accomplished no later than 50 flight hours or 9 months from the issuance of the MSB, whichever occurs first.

¹ Brazing is the process of joining metals by filling a small space between them with molten non-ferrous metal having a melting point above a given arbitrary value.

² The ability of a liquid to flow in narrow spaced without the assistance of, and in opposition to, external forces like gravity.

The MSB further stated that:

An improperly brazed rod end might separate from the plunger assembly during landing gear operation. The plunger assembly is part of the NLG extension/retraction system and a separated push-pull retract rod assembly plunger rod end might result in a NLG disconnect from the retraction system that could allow the nose landing gear to collapse on landing.

- **Assembly manufacture:** manufacture of the plunger assembly will now be conducted in-house.
- **Braze specifications:** they are reviewing all braze process specifications and other brazed components manufactured by the supplier.

Safety message

While the crew were faced with an unfortunate situation, this accident highlighted the benefits of using time to your advantage. The crew took the time to formulate a strategy for the landing, assigned responsibilities to each crew member, and then rehearsed the plan. This ensured that they were well prepared and ended in a safe outcome.

General details

Manufacturer and model:	Hawker Beechcraft Corporation G58 (Baron)	
Registration:	VH-OMS	
Type of operation:	Business	
Occurrence category:	Accident	
Primary occurrence type:	Landing gear	
Location:	Hervey Bay, Queensland	
	Latitude: 25° 19.13' S	Longitude: 152° 52.82' E
Persons on board:	Crew – 2	Passengers – Nil
Injuries:	Crew – Nil	Passengers – Nil
Damage:	Substantial	

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau 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.