



Australian Government

Australian Transport Safety Bureau

Foreign object damage involving a Eurocopter AS365 N3 Dauphin, VH-WPX

Jandakot Airport, Western Australia, 3 November 2015

ATSB Transport Safety Report
Aviation Occurrence Investigation
AO-2015-127
Final – 27 May 2016

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 2016



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

Foreign object damage involving an Eurocopter AS365 N3 Dauphin, VH-WPX

What happened

On 3 November 2015, at about 1400 Western Standard Time (WST), a pilot of a Eurocopter AS365 N3 (Dauphin), registered VH-WPX, conducted a maintenance test flight at Jandakot Airport, Western Australia.

The test flight was the third that day, to conduct track and balancing of the main rotor, following reports of vibration.

During the post-flight inspection following this test flight, one of two Licenced Aircraft Maintenance Engineers (LAMEs) involved in the test flight, noticed two large gouges to the leading edge of one of the main rotor blades (Figure 1).

A spanner that had been used during the third track and balance related adjustments could not be located. It was later located on an adjacent taxiway about 43 m from the hangar. Due to the scuff marks and scratches found on the spanner, it was determined that it had been left in the rotor head area and was likely ejected during the aircraft start up.

Figure 1: Damage to leading edge of a main rotor blade on VH-WPX



Source: Aircraft operator

Events leading up to the foreign object damage

Prior to the event, the main rotor head bolts (bolts) had approached their scheduled life limit. So on 26 October the maintenance organisation replaced the bolts, in accordance with the Airbus Helicopters AS365¹ Maintenance Manual. The maintenance manual required that a main rotor blade track and balance be performed following this replacement.

Helicopter vibration was automatically monitored using the Honeywell Chadwick Helmuth Vibration Expert (VXP), which was installed in the helicopter. The VXP data generated was automatically sent to an external diagnostics organisation for trend monitoring. Additionally, LAMEs could access this data for rotor track and balancing requirements.

The operator advised that when the bolts were replaced, a work pack² was generated for the task.³ Prior to the required track and balancing flights, one of the two LAMEs tasked with the job (LAME 2), transferred the main rotor blade track and balancing procedure to the aircraft technical log⁴ and ground run/test flight sheet.⁵

However, due to non-availability of flight crew, the test flights were not conducted until 28 October. The ground run/test flight record indicated that the results of the track and balance procedure were satisfactory, and the aircraft was returned to service the same day.

The aircraft continued in service, and flew about 14 hours between 28 October and 3 November. During this period, the maintenance organisation reported that a 4P vibration⁶ (within manufacturer tolerance) was being monitored and a pilot advised of a vibration. However, this information was not formally recorded on technical documentation.

On 2 November, the external diagnostics company that monitored the aircraft VXP data, advised the operator of a rising vibration trend. This rising vibration trend was still within tolerance, and supported the pilot reported vibration that was being monitored by the maintenance engineers. At this time, the Chief Engineer advised the other LAME (LAME 1) to conduct further main rotor track and balancing during the following few days, subject to pilot availability.

Further track and balancing, and smoothing, was conducted on 3 November. The two LAMEs' recollections and observations of the task are detailed below.

LAME 1

- Reported that a work pack had not been created for the subsequent track and balancing job, however, they (LAME 1) endorsed the ground run/test flight sheet and annotated the corresponding number on the technical log prior to the test flights.
- Reported that the Chief Engineer had discussed the required maintenance with them.
- Reported that although not formally assigned the role, thought they were most likely the Job Coordinator.
- LAME 1 had tagged out a socket and a screwdriver. Prior to each test flight, LAME 1 placed the tools being used into a metal tray, and then placed the tray on top of the toolbox. As the job was ongoing, there had been no documented requirement to place the tools back into their assigned location. LAME 1 had visually checked the tools in the metal tray prior to the third test flight, but did not use the tag procedure (refer *Tool Control Procedure*).

¹ The Eurocopter Group was renamed Airbus Helicopters in January 2014.

² The operator's maintenance organisation manual required that a work pack for maintenance tasks be created by the Maintenance Controller

³ Refer to comments under LAME 1 and 2 who advise a work pack was not generated for this maintenance

⁴ The technical log provides a method of efficiently recording information, on one page, relating to the operation and maintenance status of the helicopter. It is accessible to flight crew and maintenance personnel.

⁵ The ground run/test flight sheet is used to record requirements for ground runs and check flights. The sequential number of the record is annotated in the appropriate section of the aircraft technical log.

⁶ The AS365 has a rotor system consisting of four main rotor blades. A 4P vibration is one that has a frequency of 4 per each revolution of the main rotor.

- LAME 1 had performed adjustments to the main rotor pitch links and blade weights, and had asked LAME 2 to perform an independent inspection⁷ of the work after the second test flight. LAME 1 reported that the request had been for LAME 2 to both perform the independent inspection, and to check that no tools had been left on the helicopter.
- LAME 1 was not aware that the spanner that they had been using had been left on top of the main rotor blades.

LAME 2

- Also reported that a work pack had not been created for the job.
- Stated that prior to the third test flight, they (LAME 2) had completed an independent inspection of the maintenance tasks, performed by LAME 1.
- LAME 2 did not notice that the spanner had been left on top of a main rotor blade. They noted that the blade was very flat, and that it would not be possible to see it on top of the rotor blade from the ground.
- LAME 2 had tagged the spanner and several other tools out earlier in the day. The tools had not been returned to the toolbox during the day, as it was expected that further adjustments would be required.

Pre-flight inspection

The daily inspection had been certified in the aircraft technical log by an engineer prior to the first flight. Additionally, the pilot reported conducting a 'walk-around inspection' in accordance with the flight manual procedures. The pilot was aware that flight control maintenance had been conducted by the engineering group. The pilot signed the aircraft technical log and 'accepted' the aircraft prior to each of the three test flights.

The pilot reported that the aircraft handled normally throughout the three test flights.

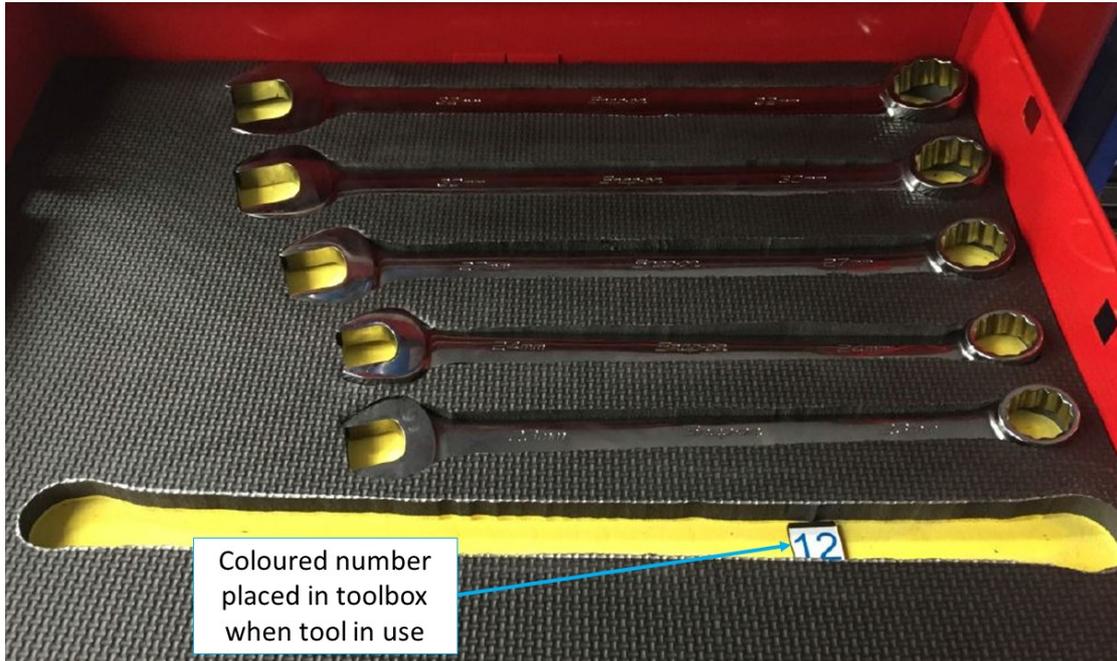
Tool control procedure

While there was a practice of tool control in place prior to the incident, formal procedures had not been documented and incorporated in the maintenance organisation manual (MOM).

The tool control practice in place, prior to this incident, required that that each tool removed from the toolbox be tagged out by the person removing the tool. Each engineer was assigned a series of numbered tags of a certain colour, and the tag was placed into the 'empty' location (cut out) of the tool being used (Figure 2). A review of both the toolbox and the engineer's assigned tags would quickly identify if any tools were still in use.

⁷ Civil Aviation Regulation CAR 42G required an independent inspection be conducted if any part of the flight control system has been disturbed

Figure 2: Tool control procedure showing coloured number replacing tool in use by the engineer assigned the blue coloured tags



Source: Operator

Operator procedures

The MOM stated that induction training of all staff shall be carried out on all new maintenance staff. This training was to provide staff with sufficient information to enable them to integrate into the company and to ensure compliance with the policies and procedures of the organisation. However, there was no written record of any such induction training having taken place.

ATSB comment

The organisation involved conducted a thorough internal investigation after this occurrence. There were a range of other issues identified in regard to training and documentation procedures, and the company have initiated remedial action in all these areas. These other issues do not fall within the scope of this investigation.

Safety actions

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.

The operator

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

Tool control procedure

A tool control procedure was in place at the time of the incident, however, the procedure had not been documented in the MOM. Additionally, there was no documented procedure requiring the tools to be returned to the toolbox prior to the aircraft being started.

The operator will incorporate the tool control procedure into the MOM. This procedure requires that all tools used during any aircraft maintenance are returned to the tool storage location prior to any of the company aircraft being started.

A tool control procedure will be implemented for any maintenance that occurs away from the main base. Additionally, a tool control procedure will be implemented to ensure external maintenance providers (for example avionics specialists) adopt the company tool control procedure.

Training for maintenance personnel

All maintenance personnel be provided with sufficient training and information to enable them to understand the workings of the organisation, its policies, manuals, procedures and their individual responsibilities.

General details

Occurrence details

Date and time:	3 November 2015 – 1400 WST	
Occurrence category:	Accident	
Primary occurrence type:	Foreign object damage	
Location:	Jandakot Airport, Western Australia	
	Latitude: 32° 05.85' S	Longitude: 115° 52.87' E

Aircraft details

Manufacturer and model:	Eurocopter AS365 N3	
Registration:	VH-WPX	
Serial number:	6936	
Type of operation:	Private – Test & ferry	
Persons on board:	Crew – 3	Passengers - 0
Injuries:	Crew - 0	Passengers - 0
Damage to aircraft:	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 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.

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.