aibn Accident Investigation Board Norway

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REPORT SL 2011/03

REPORT CONCERNING AIR INCIDENT AT HANKØ, ØSTFOLD COUNTY, NORWAY 27 OCTOBER 2009 WITH EUROCOPTER AS 350 B3, LN-OZT

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This report has been translated into English and published by the AIBN to facilitate access by international readers.
As accurate as the translation might be, the original Norwegian text takes precedence as the report of reference.

The Accident Investigation Board has compiled this report for the sole purpose of improving flight safety. The object of any investigation is to identify faults or discrepancies which may endanger flight safety, whether or not these are causal factors in the accident, and to make safety recommendations. It is not the Board's task to apportion blame or liability. Use of this report for any other purpose than for flight safety should be avoided.

Photos: AIBN and Trond Isaksen/OSL

Accident Investigation Board Norway

REPORT

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This investigation is limited in its extent. For this reason, the AIBN has chosen to use a simplified report format. The report format indicated in the ICAO Annex 13 is only used when the scope of the investigation makes it necessary.

All times given in this report are local time (UTC + 1 hour), unless otherwise stated.

Aircraft information:	
- Type and reg.:	Eurocopter AS 350 B3, LN-OZT
- Manufacturing year:	2009
- Engine(s):	Turbomeca Arriel 2B
Operator:	European Helicopter Center
Date and time:	Tuesday 27 October 2009 at 0905 hrs
Location:	Hankø, Østfold County, (N59°13' E010°46')
Type of occurrence:	Aviation incident, tail rotor control fault discovered after landing
Type of flight:	Commercial, non scheduled
Weather conditions:	Not relevant
Light conditions:	Daylight
Flight conditions:	VMC
Flight plan:	VFR
No. of persons onboard:	1
Injuries to persons:	None
Damage to aircraft:	None
Other damage:	None
Commander:	
- Sex and age:	Male, 31 years old
- Licence:	CPL (H)
- Flying experience:	Total flight hours: 627 hours whereof 188 hours during last 90 days. Experience on relevant type 425 hours.
Information sources:	”NF-2007 Accident/Incident/Occurrence reporting in civil aviation” from the commander. Pictures and information from the technical department at European Helicopter Center, Helifly Maintenance and Eurocopter, as well as AIBN’s own investigations.

FACTUAL INFORMATION

European Helicopter Center (EHC) was going to perform a transport assignment for a private customer at Hankø in Østfold County, consisting of approximately 80 lifts of various construction materials. LN-OZT took off at 0900 hrs from Sandefjord airport Torp (ENTO) bound for Hankø. A pilot and load master was on board the helicopter. The flight to Hankø was uneventful and lasted about 10 minutes.

Before starting the planned transport assignment, the helicopter was landed at Hankø. When the commander went through the shutdown checklist after landing, he thought that the pedals seemed somewhat "strange". He completed the shutdown and decided to check the pedals further when he had spoken to the customer. When the commander returned ten minutes later, he entered the helicopter and felt that the pedals could be moved with unusually little resistance.

The commander asked the load master to check if there was any movement in the tail rotor when he pushed the pedals. The load master saw no movement in the tail rotor. In addition, the commander could hear scraping noises under the seat when pushing the pedals. During the following external inspection, the commander also noticed that the tail rotor was fully deflected to the right, as if the right pedal was pushed fully in.

The commander called the technical manager at EHC, who asked him to remove the forward cowling underneath the helicopter in order to look for faults. The commander explained that he could see two nuts which had come off the threads completely and where hanging on a rod that was part of the tail rotor controls (see figure 1).

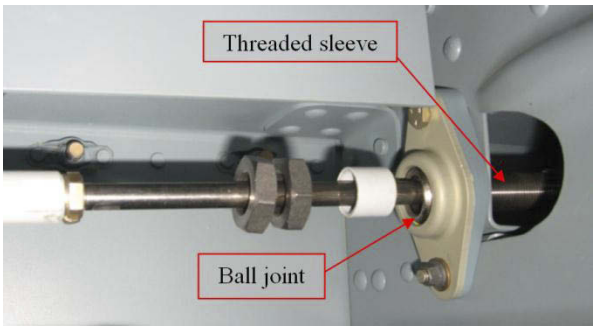

Figure 1: Loose nuts. (Photo: Helifly Maintenance)

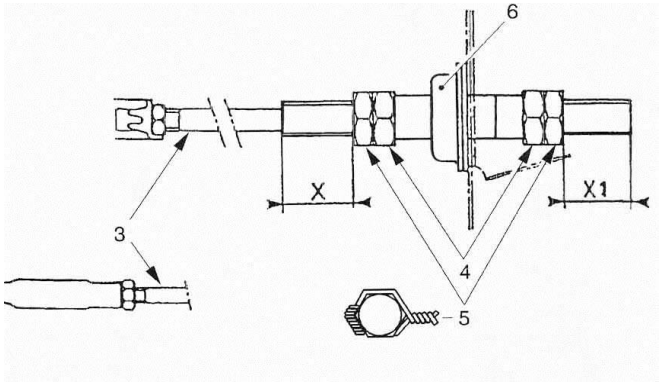

Figure 2: Flexball control connection (area A in figure 3).

EHC had an agreement with the Part 145 organization Helifly Maintenance for technical maintenance of LN-OZT. A licensed technician from Helifly Maintenance established that the forward attachment of the tail rotor's flexball control was completely loose. The two forward nuts had come loose and were hanging on the rod, and the threaded sleeve had displaced backwards and out of the ball joint. The two rear nuts could be turned by hand.

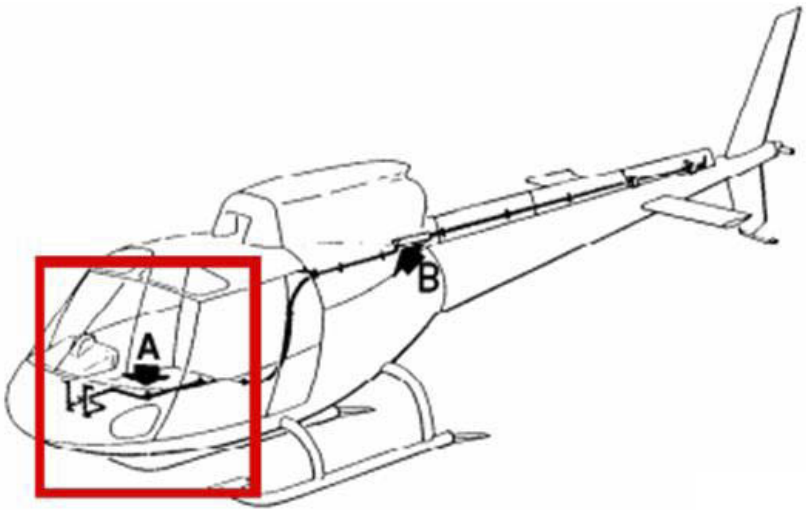

Figure 3: Loose nuts discovered in point A of the flexball control installation.

The entire tail rotor and tail rotor control were then inspected, but no more faults were found. Pictures were taken of the rod and nuts before the flexball control was installed in accordance with the maintenance manual. After start-up, a functional test was performed on the ground and in low hover before the helicopter was flown back to Torp for further examination. The flight from Hankø to Torp was uneventful.

LN-OZT had flown 425 hours since delivery from Eurocopter in April 2009. No work or inspection had been performed in the area (tail rotor controls) during this period. According to the maintenance program, this area was due for inspection at 600 hours.

The installation of the forward end of the flexball control must take place in accordance with Chapter 67.20.00.405, Item 4.1 of the Maintenance Manual. The text describes how the parts should be installed with the clause *"Do not tighten and do not safety."* With regards to adjustment and tightening/securing, reference is made to Chapter 67.20.00.501 of the Maintenance Manual.

Chapter 67.20.00.501 of the Maintenance Manual refers to "Tail rotor controls, Rigging: Version without auto-pilot". The text in Item 3.2 g) states: *"Tighten locknuts (5). Safety locknuts (5) on Teleflex[1] control supports (intermediate lever side and rear servo-control side)".* See also the drawing (figure 2) where it is indicated that locking wire must be used. None of the mentioned four nuts which were discovered to be loose, had holes for locking wire.

Following an inquiry to the manufacturer (Eurocopter), AIBN received the following comments regarding the incident:

Almost 20 million hours have been flown globally with helicopters with this type of yaw control installed. It is only recently that cases with loose nuts have been recorded. In addition to the incident with LN-OZT, two other cases with loose nuts in the flexball control have been reported. One of the incidents (France) was discovered a few weeks before the incident with LN-OZT, and the other (USA) took place in January 2010.

[1] The helicopter's Maintenance Manual uses the term Teleflex Control for the yaw control system. Eurocopter specifies that the correct term for the system is Flexball Control and that this system is designed and produced by Constructions Brevetees d'Alfortville (C.B.A.).

Eurocopter stated that this design is safe and robust, but that the nuts were probably not fastened correctly and that this was not discovered during the quality inspection before delivering the new helicopters to the customers.

Shortly after the incident, Eurocopter issued a service bulletin where they instructed the operators of the helicopter type to check the system every 100 flying hours versus previously every 600 flying hours. This arrangement was temporary and would apply until a supplementary service bulletin was issued. This was issued on 9 June 2010 (Service Bulletin no. 67.00.50) and operators of the helicopter type can resume normal service intervals following implementation of this bulletin.

Eurocopter stated that they would continue to use the same design, but that they had changed the installation procedures. Since the beginning of December 2009, the helicopters have been produced with new procedures where the nuts must be tightened with a torque of 5 to 7 Nm while the flexrod is held in place with a specially designed tool so that it is not twisted during the tightening (ref. Service Bulletin 67.00.50).

The nuts shall not be locked with locking wire as shown in figure 2. The symbol for use of locking wire has by error been introduced on the figures showing the flexball control. This will be corrected by Eurocopter.

Furthermore, Eurocopter makes the following comments:

According to the checklist, the pedals must be checked during the preflight test before starting the engine. If the nuts are loose and this introduces a slack on pedals of more than 10 mm, the pilot should be able to discover this.

If the test does not uncover that the nuts are loose, the vibrations during flight can cause the nuts to loosen completely. With hydraulic pressure, there will be little load on the flexball. The flexball control is relatively stiff and the external jacket is fastened to the rear end in the same way that it is fastened to the front end (see item B on figure 3). Eurocopter therefore believes that the forward end of the flexball control will remain in place during normal operations as long as the hydraulic system is activated and the transferred loads are small. Eurocopter also believes that the threaded sleeve was displaced backwards and out of the ball joint because the pedals were moved on the ground with the hydraulic system off.

COMMENTS FROM THE ACCIDENT INVESTIGATION BOARD

Early on in the investigation, the AIBN assumed that this aircraft incident had air accident potential. It was assumed that if the nuts had come completely loose while airborne, the result could have been control problems potentially causing a crash. The nuts coming loose completely as the helicopter landed at Hankø, would be completely down to chance. The AIBN therefore believes that the nuts most likely came loose and twisted off the threads over time. Following closer investigation and supplementary statements from Eurocopter, the AIBN believes that the system design would not result in the flexball being locked behind the ball joint with normal control input as long as hydraulic pressure is available and activated. It is, however, probable that the tail rotor control can become imprecise. Based on these considerations, the AIBN reclassified the incident from being a "serious incident" to an "incident".

The helicopter type has been in production since 1977. Recently, loose nuts in the flexball control have been discovered in three cases. The AIBN has not looked closer at why these incidents

suddenly took place after almost 20 million flying hours without similar problems. However, Eurocopter has changed the procedures for installation and inspection. The changes have been published through a service bulletin distributed to operators of the helicopter type.

In spite of the fact that the locking method for the flexball control, according to Eurocopter, has functioned satisfactorily for almost 20 million flying hours, the AIBN believes that the locking of the flexball control can be improved by using self-locking nuts or locking wire.

Accident Investigation Board/Norway

Lillestrøm, 1 February 2011