

LOSS OF PART OF TAILFIN

The purpose of the Dutch Safety Board's work is to prevent future accidents and incidents or to limit their after-effects. It is no part of the Board's remit to try to establish the blame, responsibility or liability attaching to any party. Information gathered during the course of an investigation – including statements given to the Board, information that the Board has compiled, results of technical research and analyses and drafted documents (including the published report) – cannot be used as evidence in criminal, disciplinary or civil law proceedings.

GENERAL INFORMATION

Occurrence:	2007091
Classification:	Serious incident
Date, time ¹ of occurrence:	11 September 2007, 09.17 hours
Place of occurrence:	North Sea, 30 NM north of Den Helder Airport, the Netherlands
Aircraft registration:	OY-HSL
Aircraft model:	Eurocopter EC155B1
Type of aircraft:	Helicopter
Type of flight:	Passenger flight
Phase of operation:	Cruise
Damage to aircraft:	Serious, partial loss of tailfin
Number of crew:	Two
Number of passengers:	Nine
Injuries:	None
Other damage:	None
Lighting conditions:	Daylight

SUMMARY

On the return flight from an oil platform, the heading of the helicopter changed rapidly and the autopilot disengaged automatically. The crew performed several checks and, as no anomalies could be determined, the flight continued. After landing at Den Helder Airport the air traffic control tower informed the crew that a part of the tailfin was missing.

¹ All times in this report are local times, unless otherwise specified.

FACTUAL INFORMATION

History of flight

The Eurocopter EC155B1 helicopter took off from the "Nobel George" oil platform in the North Sea towards Den Helder Airport. The flight was conducted under instrument flight rules (IFR). The helicopter climbed to 5000 feet, the autopilot was engaged and the helicopter followed its programmed flight route.

During the flight the heading of the helicopter changed rapidly and the autopilot disengaged automatically. The crew performed several checks and, as no anomalies could be determined, the flight continued. A normal landing was performed at Den Helder Airport. While the helicopter taxied to the parking stand, the crew was informed by air traffic control a part of the vertical tailfin was missing (see figure 1). Up to that point the crew was not aware of the loss of the tailfin. In their mind an in-flight autopilot failure had occurred.



Figure 1: The lower part of the tailfin (left) and the separated upper part of the tailfin (right).

The reported weather conditions at the time of the incident were: wind 340 degrees with a speed of 15 knots, visibility 300 meters and no turbulence.

Helicopter EC155B1

The EC155B1 is a twin-engine helicopter and depending on the configuration can carry up to thirteen passengers with one or two crew. The helicopter is commonly used for passenger transport and offshore support. The helicopter is equipped with a ducted fan tail rotor, a so called Fenestron. The housing of this tail rotor is an integral part of the tail. The tailfin consists of two parts, the lower and upper tailfin part. The upper tailfin part is connected by a forward and aft attachment fitting to the lower part. The attachment fittings are part of a hinge mechanism to fold the tail for storage purposes (see figure 2).

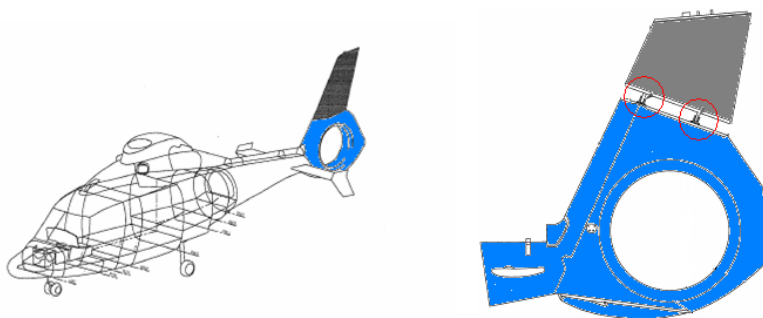


Figure 2: Schematic overview of the EC155B1 helicopter with a coloured tailfin, consisting of a lower tailfin part (light blue) and an upper tailfin part (grey). The two attachment fittings are circled in red.

INVESTIGATION AND ANALYSIS

The data from the flight data recorder (FDR) and cockpit voice recorder (CVR) was provided by the operator to the Dutch Safety Board for investigative purposes. The flight data was analyzed using conversion information provided by the aircraft manufacturer.

Investigation of recorded digital information

The analysis of the flight data showed that at approximately 08.54 hours the helicopter took off from the "Nobel George" oil platform in the North Sea. The helicopter made a climbing right turn to 5000 feet to a magnetic heading of 343 degrees. At 5000 feet the autopilot was engaged and the helicopter followed its programmed flight route.

At 09.16 hours a descent from 5000 feet to 3000 feet was initiated. At 09.17 hours, at an altitude of 4096 feet with a heading of 335 degrees, a rapid heading change occurred of approximately 20 degrees to the left. Two seconds later a master warning was recorded, the autopilot disengaged and the discrete autopilot 1 (A/P-1) and autopilot 2 (A/P-2) failures were recorded for a period of five seconds. At the same time Red Roll, Pitch, Yaw and collective alarms² were recorded for a period of five seconds. Next the heading changed to 355 degrees and a climb was started. The helicopter gained altitude to 5000 feet and a magnetic heading of 305 degrees was flown. At this time the crew flew manually and attempted to find the cause of the autopilot disconnect and heading change.

At approximately 09.20 hours at 5000 feet a second descent was started towards 1500 feet. Seven minutes later the autopilot was switched on for a second time and an approach to Den Helder Airport was initiated. The helicopter landed at 09.41 hours at Den Helder Airport. During this flight no other faults were recorded on the FDR.

A few days after the event the upper part of the tailfin washed ashore at the island of Terschelling and was recovered. The lower part of the tailfin was inspected and a fatigue crack was found on the forward fitting. Inspection of the aft fitting showed a failure which was indicative of overload. Analyses of the fractures make it probable the forward fitting failed first whereby the upper part of the tailfin ripped, overloading the aft fitting. In day to day operations, the hinge system was not used for parking the helicopter in the hangar.

Similar occurrences

Before this event, during a regular inspection of a similar helicopter (EC155B), cracks were found on the forward fitting. Metallurgical investigation of these attachment fittings showed the material was according to manufacturer specifications. Despite the material complied with manufacturer specifications, fatigue cracks were found.

Follow-up and design changes

Eurocopter published a safety bulletin on 28 September 2007 asking for a repetitive inspection on all EC155 helicopters every 55 flight hours. For the Eurocopter models AS365N1, N2, N3 and AS 366G1 this was for every 110 flight hours³. This Safety Bulletin was endorsed by an EASA Emergency Airworthiness Directive (AD) 2007-0259-E published on 2 October 2007.

² These warnings are displayed in red on the primary flight display.

³ For fittings which had accumulated more than 5000 flight hours.

During application of the required repetitive inspections two other cases of cracks, in the forward lower fitting were discovered. As a result of further investigations, EASA issued AD 2007-0259-R1 in February 2010 superseding AD 2007-0259-E. This latest AD removed the repetitive inspection for the SA365, AS365 and SA366 helicopters, modified the time requirement for initial inspection, and specified the inspection area. The manufacturer developed a Design Change⁴ of the forward fitting, increasing the resistance of the attachment fittings (hinges) between the fairing and the vertical fin. This Design Change was approved by EASA in July 2010. The Design Change is implemented in helicopters delivered since July 2010. At time of publication of this report (May 2011) a proposed AD is under publication for retrofitting the whole EC155 fleet with the new fitting design. The introduction of this new design will remove the 55 hour inspection interval.

CONCLUSION

The investigation can be summarized with the following conclusions:

- The loss of the upper tailfin part was probably caused by a fatigue crack on the forward attachment fitting of the lower part of the tailfin.
- Due to the failure of the forward attachment fitting, the separation of the upper part of the tailfin caused an overload of the aft attachment fitting.

⁴ Reference to modification 07-54B40.