

Investigation Report

Identification

Type of Occurrence:	Accident
Date:	9 February 2010
Location:	Porta Westfalica Airfield
Aircraft:	Helicopter
Manufacturer / Model:	Agusta / A109A
Injuries to Persons:	None
Damage:	Aircraft severely damaged
Other Damage:	None
Information Source:	Investigation by BFU
State File Number:	BFU 3X008-10

Factual Information

History of the Flight

On the day of the accident the crew of the Agusta A109A transported a passenger to the cardiac centre in Bad Oeynhausen. Afterwards the crew flew to the special airfield in Porta Westfalica to refuel for the flight back to Rostock.

After refuelling the pilot started the engines at about 1500 hrs¹ and intended to taxi to the left of the gas station towards the runway. According to his own statements, the

¹ All times local, unless otherwise stated

moment he slightly pulled the pitch lever for taxiing a strong surge went through the entire helicopter. The pilot viewed his surroundings and saw parts of the tail rotor and the tail rotor gear box lying 5 m behind the helicopter on the ground.

The pilot stated that during the previous flights and the pre-flight check the tail rotor did not show abnormal vibrations or irregularities.

Personnel Information

The 50-year old pilot held a Commercial Helicopter Pilot's License (CPL(H)) issued according to JAR-FCL German and valid until 12 October 2010. He had a total flying experience of about 6,146 hours; 3,046 of which were on the type in question.

A formal clearance and practical training which was required according to Part 145.A.30 j) 3 Personnel Requirements for daily checks according to LTA No.: D-1987-017R3 could not be provided.

Aircraft Information

The helicopter Agusta A109A, year of manufacture 1981, had the manufacturer's serial number 7217. It was equipped with two Allison-250-C20B engines. Maximum take-off weight was 2,600 kg; the basic weight was 1,792 kg. Total operating hours were 5,623 hours. The last annual check was conducted on 12 January 2010. Since then the helicopter had been operated for 17 hours.

The tail rotor consisted of two blades with the P/N 109-0132-02-121. One blade with the S/N A5-0092, year of manufacture 1998, had a total of 1,215 operating hours. The second blade with the S/N A5-0253, year of manufacture 2000, had a total of 885 operating hours. Since 25 November 2005 both blades were operated together as one tail rotor. In the past four years this tail rotor was installed on three different helicopters. On 12 January 2010 the tail rotor was installed on the helicopter in question.

For the tail rotor blades the AD LBA No.: D-1987-017R3 respectively EASA IT-2006-001 existed according to which crack formation can occur on the blade roots. These ADs referred to the Agusta Bollettino Tecnico (BT) 109-5 and after 1999 to the BT 109-110. The actions described in the AD stipulated a threepart check.

First, all tail rotor blades with more than 400 operating hours had to be checked for cracks using dye penetrant examination.

Second, every time before the first flight of the day the pilot was to clean the tail rotor blades with a rag and solvent and check them for cracks if necessary with a magnifying glass.

Third, after every 100 operating hours the tail rotor blades were to be checked using dye penetrant examination.

The content of the ADs was included into the Agusta A109A/A109All Maintenance-Manual, Section 05-20-00 Standard Inspection Program (100 Hour / Annual inspection), Section 05-30-00 Extended Inspection Program (150 Hour / Annual Inspection) and Section 05-50-00 Unscheduled Maintenance Checks. Chapter 65 described the tail rotor check.

According to the dye penetrant examination report the last tail rotor check was conducted on 6 January 2010 without result.

Meteorological Information

According to the records of the Deutscher Wetterdienst (DWD, German Meteorological Service) for the day of the accident and the area of Porta Westphalica at 1520 hrs the weather was as follows: ground visibility was 6,000 m, light snow fall, clouds in 1,000 ft and 2,700 ft, wind 100° with gusts up to 7 kt and QNH 1,007 hPa. The temperature was -4 °C and the dewpoint was -9 °C.

Communications

The pilot of the helicopter had radio contact with the aeronautical station „Porta Info“. Radio communications were not recorded.

Aerodrome Information

Porta Westphalica Airfield (EDVY) has one 860 m asphalt runway oriented 05/23. North of the main runway the grass strip for gliders is located. South of the runway in front of the buildings which house the "Flugleitung" (required by German regulation at uncontrolled aerodromes to provide aerodrome information service to pilots) and the airport restaurant a parking area for aircraft is located. The gas station is located north of the "Flugleitung". Aerodrome elevation is 148 ft AMSL.

Flight Recorders

The helicopter was not equipped with a Flight Data Recorder (FDR) or a Cockpit Voice Recorder (CVR). These recording devices were not mandatory.

Wreckage and Impact Information

During the accident the helicopter stood at Porta Westphalica Airfield north of the gas station with its nose pointing south. When the BFU staff arrived at the accident site it had already been cleared. The helicopter stood in the hangar of a local maintenance organisation and the wreckage pieces had been collected.

The tail rotor gear box including the bulkhead had been torn out of the helicopter's tail. The push rod of the tail rotor pitch control was severed at the area of the missing bulkhead. At the tail rotor one blade (S/N A5-0092) was bent at the tip and the other blade (S/N A5-0253) was torn at the end of the blade re-enforcement in the area of the colour change from red to transparent lacquer. The sheeting of the vertical fin was torn open and the tail cone was bent to the right. The torn-off tail rotor blade piece was found in the area of the left main landing gear.

Aboard the helicopter there was neither a magnifying glass nor solvent to check the tail rotor during pre-flight check.

Fire

There was no fire.

Tests and Research

The BFU commissioned an expert of the Technische Universität Braunschweig, Institut für Werkstoffe (IfW) to determine the cause for the fracture. In summary, the expert came to the following conclusion:

- The tail rotor blade was destroyed by a fatigue fracture. All macroscopical characteristics pointed emphatically to a fatigue fracture (fatigue failure).
- Beginning at the end of one of the re-enforcement sheets for the blade grip two fatigue cracks running in opposite directions had formed. One was 97 mm long and the other 37 mm.

- Their common point of origin marked a weak point in the design. In this area a change in stiffness occurred. The local stress peak at the end of the enforcement sheet overlapped with a high side load and a high centrifugal force and aided the development of a fatigue crack.

The broken tail rotor blade was handed over to the manufacturer so he could conduct his own investigation.

In summary, the expert opinion of the manufacturer came to the following conclusion:

- The fracture surfaces show signs of a fatigue fracture.
- At the end of the affixed enforcement sheet two separate starting points of a shared fatigue fracture were found.
- On the surface of the aluminium sheeting scrape marks were found on both starting points.
- After the coat of lacquer had been removed, the opposite upper surface of the tail rotor blade showed similar scrape marks.

The BFU has the investigation report and the expert opinion of two past accidents from Great Britain and the USA, respectively. This documentation basically corresponded with the expert opinion in the case.

The Air Accidents Investigation Branch UK (AAIB) had commissioned a study concerning possible crack propagation during a standard conduct of flight of 30 minutes based on the manufacturer's data. This study was based on a 5 mm initial crack length. It would grow to a length of 55 mm during 94 flights / 47 operating hours.

Organisations and their Procedures

Operator

The owner of the aircraft was an operator certified by the Luftfahrt-Bundesamt (LBA) according to JAR-OPS 3 and Part 145 Certified Maintenance Organisations. The maintenance organisation was an Agusta-Service-Center approved by the manufacturer of the helicopter.

The operator operated two more Agusta A109 helicopter besides the one in question. The tail rotors of the three helicopters were exchanged between them according to need. Of the three tail rotors only the one with blades of the P/N 109-0132-02-121 was affected by the AD No.: D-1987-017R3 respectively EASA IT-2006-001. The two

others with blades of the P/N 109-0132-02-125 were not affected by the ADs or the check for cracks.

The helicopter in question was stationed in Rostock a satellite station of the operator. Together with partners the operator had been offering ambulance flights from Rostock for years. The plan was to station a new helicopter in Rostock at the beginning of 2010 which, however, got delayed. It would have complied with flight performance class one. In Rostock, the pilots performed the daily checks on the helicopter. In general there was no technician available in Rostock. According to a statement of the company there was a magnifying glass for the check for cracks available at the station if necessary.

The operator issued a flight operational directive on 16 January 2006 in which all pilots with Agusta-109 type rating were alerted to the daily visual inspection of the tail rotor blades in regard to possible crack development. From then on, by signing the aircraft log book the pilots not only signed the pre-flight inspection but also the visual inspection of the tail rotor blades. The pre-flight inspection on the day of the accident was signed in the Journey Logbook.

Maintenance

Airworthiness and maintenance of commercial aircraft was to be maintained and conducted according to EU Regulation (EC) No 2042-2003 Annex I (Part M) and Annex II (Part 145). An individual maintenance program had to be established according to the regulations and had to be approved by the responsible regulatory authority.

All maintenance actions were carried out in the operator's maintenance organisation and all corresponding documentation was stored there as well. The operator's maintenance program (Edition 33 of 9 July 2008) for their helicopters of the type A109 had been presented to the branch office of the Luftfahrt-Bundesamt in Frankfurt. The maintenance program consisted of a 14-page document. In regard to the checks for the type Agusta A109A/All it generally referred to the Maintenance Manual, Chapter 05. There were neither detailed descriptions of the checks, nor was there a specification in regard to the respective subdivisions of Chapter 05. In regard to the airworthiness directives it referred to the reference list in the maintenance records of the aircraft. There was no list of relevant airworthiness directives in the maintenance program.

The operator issued procedure instruction VA No 26 on 21 April 2008 which described the documentation of all implemented ADs and TMs. It regulated how actions

were entered and documented. Among other things, it required that an AD and TM reference list for the respective aircraft was to be established in which all regulations and actions were to be entered.

For the helicopter in question a reference list for operating hours, the necessary inspections and the respective Bolletino Tecnico of the manufacturer and ADs was created with the help of a maintenance software. With the software all maintenance tasks were controlled and ordered. Bolletino Tecnico BT 109-110 and AD No.: D-1987-017R3 respectively IT-2006-001 for inspections of the tail rotor blades were missing from the reference list. According a statement of the company it was overlooked to enter these in the list. For years, up until the tail rotor in question was mounted to the helicopter, another tail rotor with blades not affected by any ADs or BTs was used on the helicopter.

The procedural instruction VA No 10 of 21 April 2008 of the maintenance organisation showed under Item 4.5.1 the following:

[...] parts or components which can be repaired or refinished within the maintenance organisation have to undergo the testing required by the manufacturer of the respective products before they can be returned to service.

If the part or component is not used immediately after the maintenance action but will go into storage the part/product has to receive a Serviceable Tag and a yellow goods tag.

Issuance of an EASA Form One is only permissible if our company has a permission for the maintenance of the respective component.

The in-house use of an EASA Form One is not intended [...].

Documentation of the tail rotor blade inspections

For each tail rotor blade an Assembly Historical Record was kept. These showed as to when the respective blade with how many total operating hours was mounted to or removed from an aircraft. There was no reference list for the crack inspections after every 100 operating hours which was required according to AD No D-1987-017R3 or IT-2006-001. The field "retirement life" was not filled in. Dependent on the use of the helicopter the manufacturer required different maximum operating hours for tail rotor blades.

After the accident the BFU retraced the documentation and inspections of the tail rotor and torn-off blades. The tail rotor should have been inspected during every 100-hour check of the aircraft. Inspection of the blades for cracks was a definite part of the

working instruction whenever a tail rotor blades with an affected P/N was mounted. For each inspection a working order, a findings and working report and the Maintenance Check List 5-50-00 and a crack inspection protocol were made.

During the investigation it was determined that since 2000 the tail rotor had been operated on four different helicopters. The recurring crack inspections of the blades were traced back to 31 July 2008. There were no EASA Form One forms in regard to the exchange of tail rotors between helicopters. On 18 February 2009 the tail rotor was mounted to a helicopter which had not had a tail rotor affected by an AD. Until the changeover on 12 January 2010 to the helicopter later involved in the accident, the tail rotor blades and crack inspection protocols showed gaps in the verification (Refer to Appendix 1: Reference list inspections) over a period of 210 operating hours.

Maintenance regulations

According to EU Regulation (EC) No 2042-2003 Annex I (Part M) M.A. 305 e) and d) the documentation concerning continued airworthiness of components must contain the current state of ADs, among other things.

According to Annex I AMC M.A. 302 1.1.9 the maintenance program requires to describe daily checks in detail, among other things.

According to M.A. 501 Assembly, components can only be installed into an aircraft if they are in satisfactory condition and were approved for service according to EASA Form One or another equal document.

According to M.A. 502 Maintenance of Components, no EASA Form One is required if components are maintained in assembled condition. Temporary removal and re-assembly is allowed to make accessibility easier.

According to AMC M.A. 501, 4 the purpose of EASA Form One is to allow the changeover of components from one aircraft to the next, among other things.

Additional Information

In the past there were two accidents with this helicopter type caused by torn-off tail rotor blades:

NTSB NYC87LA058: 13 January 1987, S. Boston:

“The tail rotor blade, S/N 124 failed. The tail rotor assembly and gearbox separated from the helicopter.”

AAIB EW/C1999/03/02: 27 March 1999, Hurstpierpoint:

“During final approach to land one tail rotor blade, S/N A3 685 failed. The tail rotor assembly, complete with the 90° gearbox but with the outer part of one tail rotor blade missing, was found approximately 12 m back along the approach path, and had separated from the helicopter whilst it was still airborne.”

During both investigations fatigue fractures were found at the end of the tail rotor's blade enforcement. Therefore, BT 109-5 was issued on 27 January 1987 and BT 109-110 was issued on 28 July 1999. The above-mentioned ADs were also issued and maintenance procedures changed. The manufacturer was aware of one case in which cracks were found in a tail rotor blade by the liquid penetrant inspection.

According to statements of the manufacturer the design of the tail rotor blades was changed after the two accidents had occurred. The inside of the blade was re-enforced with carbon fibre paste application. The now renewed and outward identical tail rotor blade with the P/N 109-0132-02-125 has been in exclusive production since 2006 and is intended to supplement all tail rotor blades affected by ADs.

Analysis

Flight Operations

The pilot held the required licenses and ratings. Based on his long-term professional experience, his total flying experience as well as his type experience he was very experienced and qualified for the flight. He did not have a formal clearance and a verified training for the required pre-flight check in regard to the tail rotor.

A respective training in regard to flight operations instruction the operator had issued for all A109 type-rated pilots would have pointed out the importance of the required inspection and had exposed the fact that the magnifying glass which might have become necessary was not aboard the helicopter. The BFU is of the opinion that the implementation of the requirements of Part 145 are necessary to ensure that new pilots on this aircraft type within the company are also made familiar with the flight operations instruction and the inspection.

The prevailing weather allowed flights according to visual flight rules to a limited extent. The day of the accident was a grey and misty winter day with snow showers and partially low clouds.

The helicopter had a valid certificate of registration. According to the protocol, the last annual inspection of the helicopter and the last crack inspection of the tail rotor blades had been conducted one month prior to the accident. Since then the helicopter had only been operated for 17 hours.

Maintenance

The verification of the tail rotor blade inspection, however, shows gaps for the last 210 operating hours. For the last tail rotor blade inspection a crack inspection protocol existed, the respective reference card and the signed working order were missing, however.

The Historical Cards of the tail rotor blades showed their total operating hours as soon as they were used on another helicopter. However, the continued operating hours of the blades in regard to the required 100-hour check according to AD No.: D-1987-017R3, EASA IT-2006-001 and BT 109-110 were not kept.

These inspections were not incorporated into the used maintenance software respectively into the reference list for total operating hours of the helicopter. In the reference list for the necessary inspections and the respective Bolletino Tecnico of the manufacturer and ADs the corresponding AD to be carried out was missing. Given the fact that tail rotors were exchanged several times and because of the different models present in the company, it is probable that this was overlooked.

The maintenance program for the A109 helicopters operated by the operator was superficial. Essentially it just repeated the wording of the law. Part M partially requires explicit descriptions of checks and maintenance actions.

Waiving the issuance of an EASA Form One when tail rotors were changed from one helicopter to the next within the company, as was approved by the Luftfahrt-Bundesamt with the procedural instruction VA No 10, did not correspond with the requirements of M.A.501. The necessary procedures and tests for the issuance of an EASA Form One during the changeover of a tail rotor would possibly have uncovered the existing defect on the tail rotor blade in time. The BFU is of the opinion that waiving the issuance of an EASA Form One is a safety defect. It is therefore not understandable that the procedural instruction was approved since waiving the issuance of the EASA Form One is according to M.A.502 only permissible during the temporary disassembly to make accessibility easier.

Design of the tail rotor blade

Fracture analysis showed fatigue fracture as cause for the torn-off tail rotor blade. The length of the fatigue fracture finally causing the malfunction of the blade was 134 mm. The crack started in the area of the colour change from red to transparent lacquer. This made an early crack finding more difficult. Based on the UK Study concerning crack propagation it must be assumed that the crack has been in existence for quite some time, i.e. at the time of the last documented crack inspection 17 operating hours ago and during the daily pre-flight checks.

The BFU is of the opinion that neither the last crack inspection nor the required pre-flight checks were conducted according to the ADs. In the end this aided the failure of the tail rotor blade during flight operations.

The accidents in the past have shown that the design of the tail rotor blade in question made inspections necessary because its endurance strength was not sufficient to guarantee safe operation during the entire service life. The analyses conducted during the investigation have shown that in general there is enough time between the beginning of a crack and the failure of a tail rotor blade to detect a crack. Errors during checks can occur at any time and therefore the same amount of operational safety cannot be achieved as with a design which has sufficient endurance strength. The BFU is therefore of the opinion that all tail rotor blades affected by ADs should be put out of service as soon as possible especially because since 2005 another design has been available.

Conclusions

The accident was caused by an undetected fatigue fracture which resulted in the failure of the tail rotor blade during taxi for take off.

On the manufacturer's side the following causes contributed to the accident:

- the design of the tail rotor blade was marginal
- an AD which was not practicable in the long run to check the tail rotor blades
- different designs of tail rotor blades which outwardly look the same

On the operator's side the following causes contributed to the accident:

- a superficial individual maintenance program

- waiving of the issuance of an EASA Form One when components were used in house.
- the 100-hour crack inspection was not documented in the Historical Cards of the tail rotor blades
- operation of several helicopters of the same type but with different tail rotor blades and the changeover of those between helicopters.
- the missing practical training of the pilots concerning the necessary daily checks of the tail rotor blades
- an erroneous pre-flight check in regard to the tail rotor inspection over a longer period of time

Safety Recommendations

Actions by the manufacturer

The manufacturer of the tail rotor blades published an information letter (A109-10-024) on 27 October 2010 that tail rotor blades P/N 109-0132-02-11, -15, -121 affected by ADs are no longer produced and repaired.

Agusta also offered all customers to exchange old AD-affected tail rotor blades with a discount of 20% with new ones. This offer was valid until 31 March 2011.

Furthermore, customers could exchange their old tail rotor blades with new ones with a discount under consideration of the remaining operating hours.

Based on these actions of the manufacturer, the BFU has abstained from issuing a safety recommendation concerning this matter.

Safety Recommendation 06/2012

The Luftfahrt-Bundesamt (LBA) should ensure that the maintenance of aircraft and their documentation, approved maintenance handbooks and procedural instructions correspond with the statutory provisions.

Safety Recommendation 07/2012

The operator of the helicopter which is also the maintenance organisation should ensure that the maintenance of their aircraft and the respective documentation, approved maintenance handbooks and procedural instructions correspond with the statutory provisions.

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Assistance: Thomas Kostrzewa, Dietmar Nehmsch
Field Investigation: Thomas Kostrzewa, Axel Rokohl
Braunschweig: 2 February 2012

Appendices

Appendix 1: Reference List Tail Rotor Blade Checks
Appendix 2: Damage to the helicopter's tail and tail rotor blades
Appendix 3: Detail of Fracture Surface

Date	TR hrs	Task	A/C Reg.	A/C SN	A/C hrs	hrs between inspection	Doc #	Documentation	Comment
24.03.2000	278.45	Installation	D-HXX	7310	2107.05		1	Assembly Historical Record SIN A5-0253	
01.11.2005	278.45	2400 h insp.	D-HXX	7310	2398.80		2	Work Order dated 27. Jul 2005	
		LTA 87-17/2 PartIII					3	MM checklist 5-50-00, p 2, chapter 4A	no signature of report included, no date, no SIN reference
21.11.2005	278.45	removed from A/C		7310	2398.80		4	Crack Inspection Report dated 1. Nov 2005, BT 109-110	
26.11.2005	278.45	Installation A/C	D-HXX	7317	4735.84		1	Assembly Historical Record SIN A5-0253	
13.02.2006	331.82	2400 h insp.	D-HXX	7317	4735.84	55.07	5	Work Order dated 13. Feb. 2006	
		LTA 87-17/3 PartIII			4735.01		6	Findings and Work Report dated 22. Jun 2006	no signature of report included
							7	Taskcard dated 15. Feb 2006	
							8	Crack Inspection Report	MISNG
17.10.2006	441.97	100 h insp., LTA 87-07/3 PartIII			4898.43	106.48	9	MM Checklist 5-50-00, p 1 and 2, chapter 4A, dated 8. Jun 2006	marked as not performed
							10	Work Order dated 17. Oct 2010	
							11	Findings and Work Report dated 25. Oct 2006	no signature of report included 18. Oct 2008
							12	Taskcard dated 17. Oct 2006	
							13	MM Checklist 5-50-00, p 1 and 2, chapter 4A	included, no date
							14	Crack Inspection report dated 20. Oct 2006	referred to test procedure mis/no
08.02.2007	517.00	removed from A/C	D-HXX	7217	4874.00		1	Assembly Historical Record SIN A5-0253	
		Beachtung der TR Blöcke					14	Work Order dated 8. Feb 2007 (Tail Rotor Blade Damage)	
							15	Incident report	
							16	Taskcard dated 5. Feb 2007	included, no date, no SIN reference
							17	Findings and Work Report dated 6. Feb 2007	included, no date, no SIN reference
							18	MM Checklist 5-50-00, p 11 and 12, chapter 3	MISNG
							19	Work Order	MISNG
							20	Findings and Work report / Taskcard	MISNG
							21	Crack Inspection Report dated 21. Feb 2007, BT 109-110	Refers to different WO #
13.04.2007	517.00	Installed on A/C	D-HXX	7310	2532.53	732.23	1	Assembly Historical Record SIN A5-0253	
08.06.2007	598.87	100 h insp.			2598.80	66.87	20	Work Order dated 6. Sep 2007	
							21	Findings and Work report / Taskcard	MISNG
							22	MM Checklist 5-50-00, p 2, Chapter 4A	included, no date, no SIN reference
							23	Crack Inspection Report dated 12. Sep 2007	referred to test procedure mis/no
28.07.2006	575.03	300 h insp.			2597.93	108.03	24	Work Order dated 28. Jul 2008	
							25	Taskcard dated 28. Jul 2008	documents wrong AD # but reference # does not exist
							26	MPM Checklist 05-50-00 100 h chapter 7	included, no date, no SIN reference
21.01.2009	718.45	removed from A/C	D-HXX	7310	2732.38		26	Crack Inspection Report dated 31. Jul 2008, BT109-110	
18.02.2008	718.45	Installation A/C	D-HXX	7307	4822.51		1	Assembly Historical Record SIN A5-0253	
14.08.2009	749.08	100 h insp.			4827.12	32.21	27	Work Order dated 14. Mai 2009	
							28	Findings and Work report / Taskcard	MISNG
							29	MPM Checklist 05-50-00 100 h chapter 7, WO# 90152	included, no date
							30	Crack Inspection Record	MISNG
14.06.2009	842.23	100 h insp.			5087.29	66.17	29	Work Order dated 14 Sep 2009	
							30	Findings and Work report / Taskcard	MISNG
							31	MPM Checklist 05-50-00 100 h chapter 7, WO# 90276	included, no date
							32	Crack Inspection Record	MISNG
08.01.2010	895.00	removed from A/C	D-HXX	7307	5073.03	26.37	1	Assembly Historical Record SIN A5-0253	
08.01.2010	895.00	2400 h insp.	D-HXX	7307			31	Work Order dated 20. Nov 2009	WO still open
							32	Findings and Work report / Taskcard	MISNG
							33	Crack Inspection Report dated 6. Jan 2010	reference to test procedure mis/no not included, no date
12.01.2010	895.00	Installed on A/C	D-HXX	7217	5908.00		1	MPM Checklist 05-50-00 100 h chapter 7	
							1	Assembly Historical Record SIN A5-0253	
08.02.2010	895.20	accident	D-HXX	7217	5928.21	17.20			

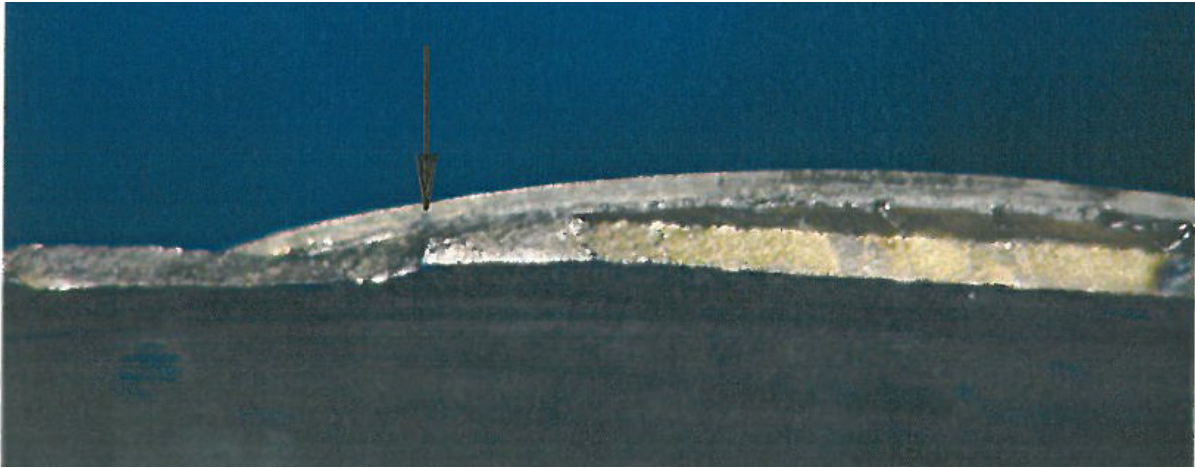
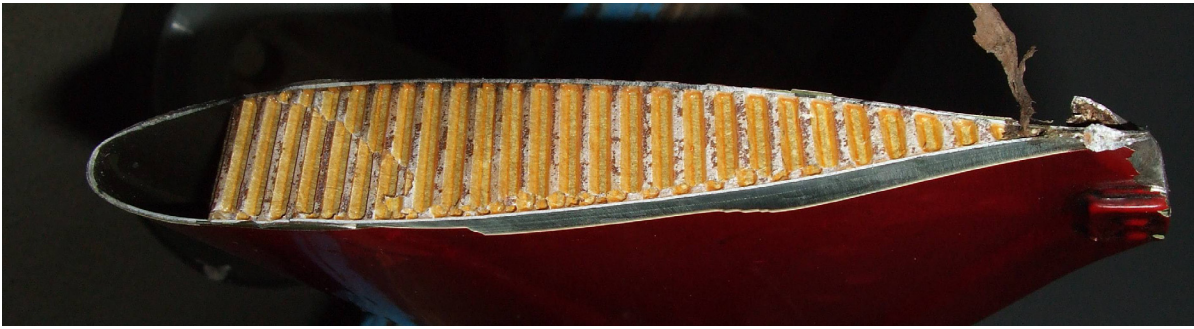
Appendix 1: Reference List Tail Rotor Blade Checks

Source: BFU



Appendix 2: Damage to the helicopter's tail and tail rotor blades

Photos (2) BFU



Appendix 3: Detail of Fracture Surface

Source: BFU

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FIUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

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