



NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

May 10, 2021

HELICOPTER SPECIALIST'S FACTUAL REPORT

NTSB No: ANC20LA028

A. ACCIDENT

Operator: Blue Hawaiian Helicopters LLC
Aircraft: Airbus EC-130 B4, N11QK
Location: Kalapana, HI
Date: March 5, 2020
Time: 1130 HST

B. GROUP

NTSB AS-40	Van S McKenny IV Aerospace Engineer (Helicopters) Washington, DC
Airbus	Seth Buttner Sr Manager, Accident Investigation Grand Prairie, TX
Safran Helicopter Engines	Bryan Larimore Aviation Safety Investigator Grand Prairie, TX
Blue Hawaiian Helicopters	John Chicowski Director of Maintenance Kawai, HI
FAA Honolulu FSDO	Spencer T. Leonard Aviation Safety Inspector Honolulu, HI

LIST OF ACRONYMS

ACTT	Aircraft total time
CT	computerized tomography
cw	clockwise
ccw	counterclockwise
EDX	Energy Dispersive X-ray (spectroscopy)
FAA	Federal Aviation Administration
FCU	Fuel Control Unit
FOD	Foreign object damage
ips	Inches per second
N1	Gas generator turbine speed (% rpm)
N2	Power turbine speed (% rpm)
PN	Part number
SEM	Scanning Electron Microscope
SN	Serial number
TGB	Tail Rotor Gearbox
TT	Total time (hours)

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C. SUMMARY

On March 5, 2020, about 1130 Hawaii standard time, an Airbus EC130 B4 helicopter, N11QK, was substantially damaged when it was involved in an accident about 6 miles north of Kalapana, Hawaii. Of the six occupants on board, the commercial pilot and three passengers were uninjured, and two passengers sustained minor injuries. The helicopter was operated as a Title 14 Code of Federal Regulations Part 135 flight.

According to the pilot, the accident helicopter was the second of two commercial air tour helicopters departing Hilo International Airport (PHTO). After departure, they flew in a southerly direction and remained slightly offshore for a short time before turning west along the shoreline. The two helicopters proceeded to a geographic area known as the "Old Ocean Entry." As the helicopter passed over the shoreline, the pilot noticed a significant, high frequency airframe vibration. He said that as soon as the vibration started, the tail rotor chip annunciator light briefly illuminated, and as the vibration continued, the tail rotor chip light "flickered." The vibration and noise stopped after a few seconds and the chip light extinguished. He selected a large open area as a precautionary landing site and slowed the helicopter on the approach. As the helicopter slowed, he raised the collective, and applied right tail rotor pedal, but the nose of the helicopter veered to the left. The pilot noted that he eventually applied full right tail rotor pedal, but the nose of the helicopter continued to the left. At about 200 feet above ground level, with the right tail rotor pedal fully depressed, the helicopter began to spin to the left. In an effort to stop the spin, he attempted to gain forward airspeed, but eventually closed the engine throttle and performed a hovering autorotation. He said the helicopter descended, touched down hard, and subsequently rolled on its right side, sustaining substantial damage to the fuselage, tail boom, and the main rotor drive system.

The wreckage was recovered on Sunday March 7th, 2020, and repositioned at the Blue Hawaiian hangar facility at the Hilo airport. The tail boom was disconnected from the airframe in the field to facilitate recovery transportation.

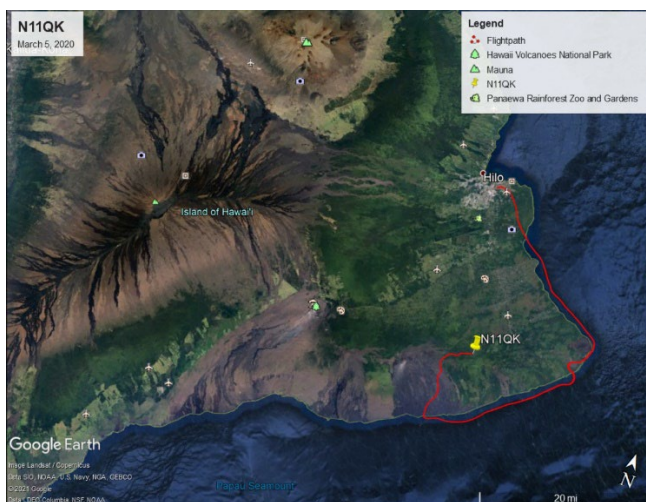


Figure 1- Accident flight path



Photo 1 - Overhead photo of accident site.

D. DETAILS OF THE INVESTIGATION

1.0 HELICOPTER INFORMATION

1.1 GENERAL DESCRIPTION

The Airbus EC-130 B4 is a light single-engine helicopter with a single main rotor and a shrouded fenestron anti-torque system. The type certificate is based on the Airbus AS350 B3 except a gross weight increase to 2,500 kg, and an enlarged fuselage structure. The helicopter is equipped with a Safran Helicopter Engines Arriel 2B1, 847 shp turboshaft engine with a dual channel FADEC¹ control system. The helicopter was configured with a single pilot seat on the left side of the cockpit and 6 passenger seats (2 forward and 4 aft seats).

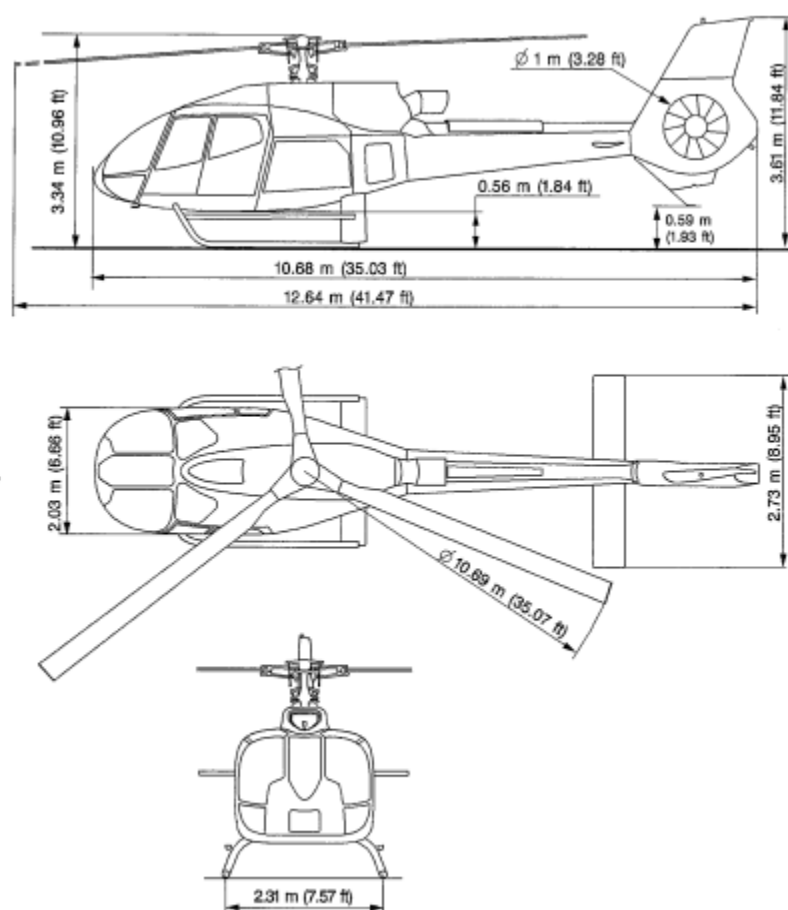


Figure 2- 3-view diagram of the EC130²

¹ FADEC – Full Authority Digital Engine Control

² 3-view drawing obtained from the Airbus EC130 B4 Flight Manual

2.0 AIRFRAME EXAMINATION

2.1 POST-ACCIDENT EXAMINATION

The helicopter was stored in a hanger on Hilo Airport. The operator had removed the tail boom from the fuselage for the purposes of recovery from the field.

The fuselage right side had impact damage, door removed (after the accident), and the right landing skid forward section fractured at the cross tube. All 3 rotor blades were separated and had sheared from the main rotor hub at the blade Starflex sleeves. The Starflex had sheared mid span on all three arms. All the forward seats had slight displacement to the right. The Hobbs meter read 21,596.0 hours.

The tail boom exhibited numerous dents but had not buckled at the transmission interface. The right horizontal stab was bent downward at mid span. Tail rotor drive shaft cover was removed by the investigators for visual inspection. The forward and the intermediate tail rotor drive shaft was generally in place, however, the polymer hanger bushings had been displaced from their brackets. The rear shaft was broken due to the rotational interference with the fenestron fairing crossing hole. The tail rotor pitch change control rod was attached to the fenestron control input lever. The pitch change arm moved smoothly with the fenestron blades moving in concert. The anti-torque pedals were moved through by hand and a smooth movement of the teleflex cable end-to-end was observed.

All 10 of the fenestron blades assemblies were in the hub. One of the blades (S/N M8916) had been liberated at the blade root, nearest the blade's drain port; the blade root end remained attached and installed to the fenestron hub. The liberated blade section was located within the fenestron outer fairing/shell. The fenestron blades were numbered 1-10 by the investigative team, with No 1 being the subject liberated blade. The fracture surface on the root end of the liberated blade had a discolored area at the trailing edge, the mid-section was flat, and the forward section exhibited shear lips. The trailing edge of the blade that was marked as Blade # 5 exhibited trailing edge damage approximately 1 cm in diameter near the root. All 10 blades were sent to the NTSB lab for further examination.

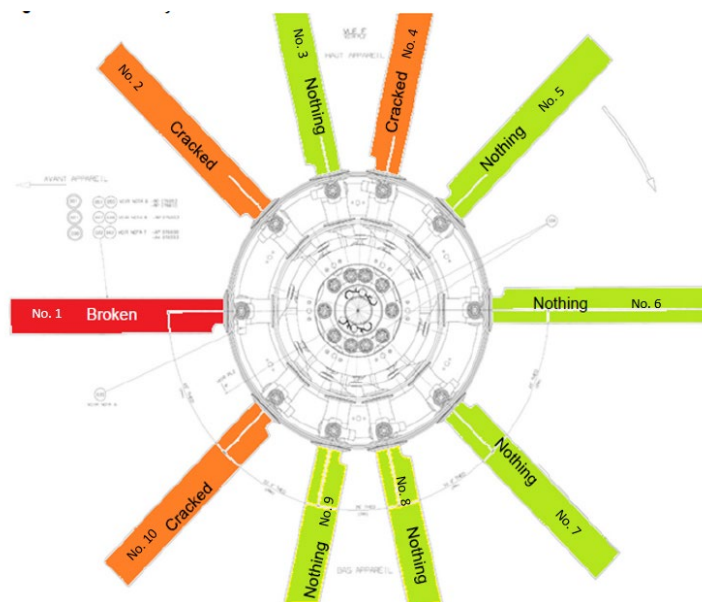


Figure 3 - Illustration identifying the location of the ruptured, cracked, and non-cracked blades.³

2.2 FENESTRON HUB EXAMINATION

The fenestron hub is able to receive up to 6 balance bolts on the inboard (right) side of the hub which are installed depending on the balancing requirements. Only 5 of the bolts were observed installed. A shadowing of soot from a balance bolt that had been installed, existed around the hole that was missing its balance bolt. The empty/missing bolt hole also happened to be the one nearest the fenestron blade that was liberated. A review of the maintenance records compared with the hour meter installed in the helicopter showed that the total hours on all the fenestron blades were 4,410.9 at the time of the accident. The fenestron fairing interior circumference had score marks aligned with the tip path of the fenestron blades. An 18-inch-long hole along the fenestron blade tip path and outboard of the fenestron drive shaft had been cut out. The leading edge of the fenestron fairing had a hole the shape of the blade end over the tail rotor drive shaft cover. The broken fenestron blade was located within the fenestron fairing.

2.3 TAIL ROTOR GEARBOX EXAMINATION

The tail rotor gear box (TGB) was turned through by hand. The gear box rotated smoothly. The gear box chip detector canon plug was connected to the chip detector and safety wired. The wire lead going into the canon plug had what appeared to be a nylon mesh sleeve around the wire. The mesh sleeve where the wire entered the canon plug was frayed and worn. The investigative team used a multimeter to identify the chip detector circuit and check circuit continuity between the detector and the electrical canon plug at the forward end of the tail boom. The chip detector magnetic contacts were bridged with an alligator clip to facilitate the circuit test. When the wire that entered the chip detector canon plug was wiggled, an intermittent signal was observed at the multimeter. The TGB was sent to the Airbus Helicopters Laboratory for further examination.

³ Illustration provided by Airbus Helicopters.

2.4 AIRBUS HELICOPTERS LABORATORY EXAMINATION OF THE TAIL ROTOR GEARBOX

The examination consisted of documenting and disassembling the gear box. The input flange rotated with some small binding points observed. The input flange was jammed in the full forward position and a press was used to remove it. Local overheating and smearing on 4 splines of the sliding input flange were identified. It was determined that the splines would still transmit torque. The damage was attributed to the high vibration level that would have been present after the loss of a fenestron blade, and likely occurred during the accident sequence.

The pinion bearing (input shaft, which exhibited slight binding at points) and the wheel bearing (output shaft, which exhibited free and smooth movement) were examined. Both bearings consisted of 2 rows of ball bearings. The pinon bearing's cages had a high level of oxidation of the silver coating and spalling. The wheel bearing's larger cage had oxidation but no spalling, and the smaller cage had evidence of oxidation and spalling.

The small sample of gearbox oil was colored dark. An analysis showed mainly metallic residue of silver, steel, copper, and sulphur in the oil and sludge. The darkness of the oil was due to the presence of the oxidized silver.

The degraded residual oil can explain the bearing cage oxidation, the spalling of the silver, and the resulting small binding point noted before disassembly. This type of degradation does not influence operation of the tail rotor gear box.

3 METALURGICAL EXAMINATION OF THE BLADES

3.1 NTSB LABORATORY EXAMINATION

The NTSB Materials Laboratory examined all 10 blades. Visual examination with a binocular optical microscope found three other blades (SN: M9186, M8882, M8979) that had cracks aligned with the blade drain hole on the suction side of the blade. The NTSB lab examined both sides of the fracture on the ruptured blade. Following visual examination and documentation of all the blades, the NTSB lab retained the ruptured blade platform and root and sent the ruptured blade plus the 9 remaining blades, including the ones with visible cracks to Airbus Helicopters for examination.

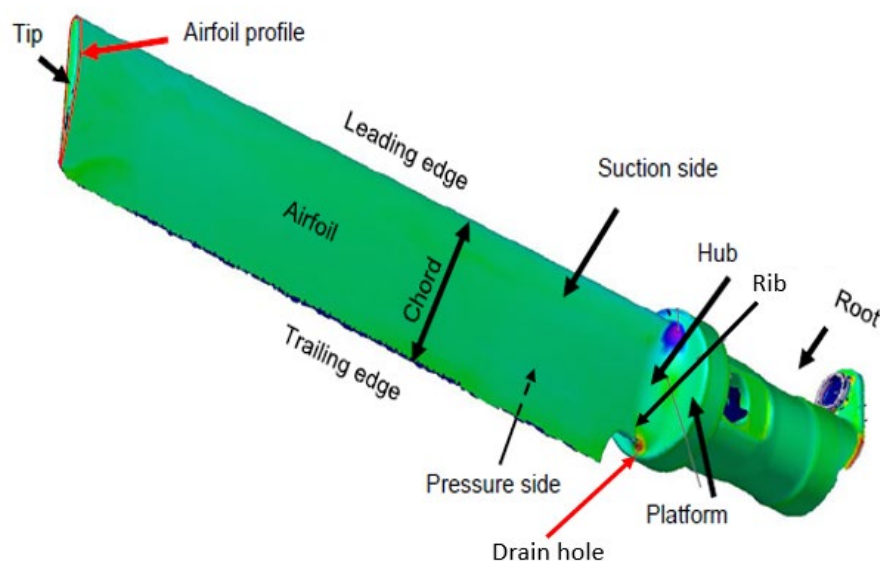


Figure 4 - Fenestron blade nomenclature⁴

The NTSB laboratory identified the ruptured blade's fracture had originated at the drain hole and grew progressively along the blade chord through approximately 60% before fracturing in overstress. The root and barrel section of the blade underwent multiple nondestructive examinations⁵. The fracture features indicated that the failure started from two separate origin areas, one on either side of the drain hole at or near its intersection with the aft rib face. The origin areas had been damaged with no identifiable features. Further from the origin, variable-spaced fatigue striations were observed, consistent with high cycle fatigue crack growth.

The offset of the drain hole centered on the rib was measured 0.23 mm. The acceptable engineering limit specified on the technical drawing was ± 0.2 mm.

Details of the entire examination are contained in the Materials Laboratory Factual Report (Report No, 20-028).

3.2 AIRBUS LABORATORY EXAMINATION RESULTS

Material examination of the blades using EDX identified the material to be consistent with aluminum alloy 2618A, which is the material identified in the engineering specifications for the blade. Hardness test values were measured between 145 HB and 155 HB. Additionally, tensile tests performed on the material batch corresponding to the blades performed before delivery exceeded the minimum specified criterion. Airbus Helicopters Laboratory considered the material findings acceptable.

Airbus Laboratory examined the ruptured (No. 1) blade fracture with optical microscope and an SEM. Crack initiation was identified on the suction side and pressure side of the blade, both locations directly opposite each other, along the chamfer of the drain hole. 71 beach marks, consistent with fatigue,

⁴ Image provided by Airbus Helicopters

⁵ See NTSB Materials Lab report 20-028

extended along 23.16 mm of the chord line, with the remaining 11.84 mm section of the fracture having characteristics of a ductile fracture.

The 9 remaining blades were examined visually, using florescent penetrant, and eddy current inspections. It was determined that blade numbers 2,4, and 10 had cracks near the drain hole. All blades were thoroughly examined and the drain hole location and size measured. The cracks were opened and examined on the 3 blades that had been identified with existing cracks. The findings are summarized in the following table⁶.

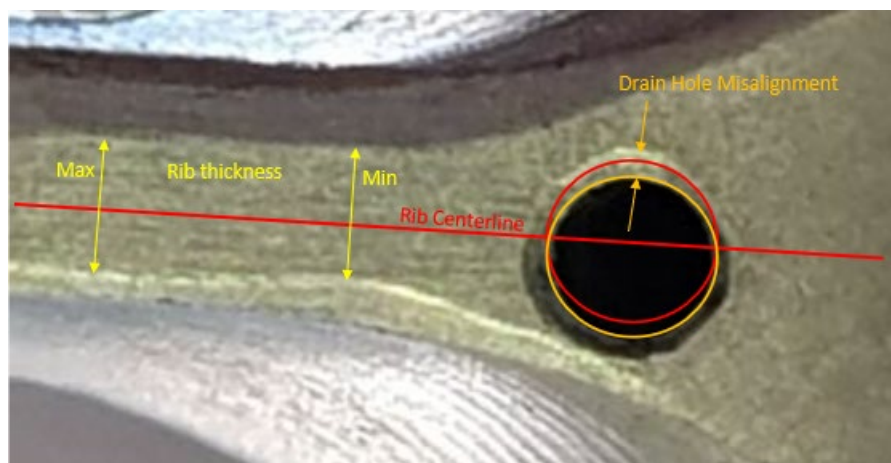


Figure 5 - Measurement location illustration

Blade No.	Rib thickness 2.3±0.3mm	Hole diameter 1.5 ± 0.1 mm	Misalignment ± 0.2 mm	Crack	Crack length after opening	Crack features
1	1.21-1.70 mm	--	--	Ruptured	23.16 mm	Fatigue
2	1.67-2.02 mm	1.45mm	0.03 mm	Yes	3.29 mm	Fatigue
3	2.22-2.29 mm	1.56 mm	0.16 mm	No	N/A	N/A
4	2.21-2.24 mm	1.50 mm	0.13 mm	Yes	2.7 mm	Fatigue
5	1.8-1.9 mm	1.46 mm	0.02 mm	No	N/A	N/a
6	1.9-1.92 mm	1.48 mm	0.00 mm	No	N/A	N/A
7	1.86-2.17 mm	1.44 mm	0.27 mm	No	N/A	N/A
8	2.322-3.3 mm	1.51 mm	0.18 mm	N	N/A	N/a
9	1.67-2.04 mm	1.41 mm	0.11 mm	No	N/A	N/A
10	1.56-2.1 mm	1.47 mm	0.14 mm	Yes	2.44 mm	Fatigue

The Airbus Laboratory concluded that blade 1 failed in the drain hole area from fatigue crack propagation. Blades 2, 4, and 10 are cracked on the suction side of the blade in the drain hole area, and crack features were consistent with fatigue. The crack initiation location for blades 2, 4, and 10 were characterized by burrs. Additionally, it was noted that the rib thickness on blade 1 was irregular and showed evidence of rework⁷. Blades 2, 5, 6, 7, 9, and 10 also showed evidence of rework.

⁶ Tolerance criteria included in the column heading.

⁷ Airbus defined “rework” as an area where some surface material has been removed or modified from the original manufactured condition.

4.0 TAILBOOM ALIGNMENT CHECK

In order to determine if tail boom alignment could have contributed to the accident sequence, the operator agreed to perform an alignment check on the helicopter. To complete this task the helicopter had to be positioned so it was level and the tail boom reattached to the fuselage. Airbus Helicopters loaned the alignment tools to the operator to enable them to perform the check. The mechanic for the operator reported back the following:

The check was performed accordance to section 65-11-00, 6-8, in the maintenance manual.

“-Para (2) requirement (central shaft alignment): The axis does go through the 1.4 mm diameter and therefore passes this check.

- Para (3) requirement (engine alignment): The axis is out of the 4mm diameter by about 2mm and therefore does not pass. It is out towards the upper left quadrant. With the hard landing on the side of the aircraft, it could explain the engine being out of alignment.

- Para (4) requirement (central shaft reverse alignment): The axis is within the 1.4mm diameter and therefore passes this check.

- Para (5) requirement (TGB alignment): The axis is within the 10 mm diameter and therefore passes this check. The axis point is towards the upper right quadrant right at the 10 mm diameter.

- Para (6) requirement (TGB reverse alignment): The axis is within the 10 mm diameter and therefore passes this check. The axis point is right at the 10 mm diameter at the lower right quadrant.

The damage found earlier on the tailboom area seems to have damaged only the channel next to the mount but did not damage the mount itself which explains why the central shaft and TGB shaft alignment checks all passed.”

5.0 AIRBUS SERVICE BULITIN

Airbus Helicopters issued an Alert Service Bulletin (ASBNo. EC130-05A033) on August 10, 2020, and re-issued on February 09, 2021, instructing mechanics and operators to perform a crack inspection and dimensional check for each tail rotor blade. Compliance was considered mandatory. The ASB guides mechanics through a multistep process of checking for cracks around the drain holes of the tail rotor blades and document the drain hole location on the blade rib. The ASB also provided criteria for blade replacement. Operators were instructed to record all measurements and return that information to Airbus.

This ASB required a crack inspection and dimensional check on all the tail rotor blades be performed within a period of time which depends on the accumulated flight hours of each individual blades without exceeding 12 months and to send the results to Airbus Helicopters.

Airbus Helicopters reported that as of July 29, 2021, that they had received the results of 2,230 blade inspections in compliance with the ASB, with no blade cracks identified.

6.0 MAINTENANCE RECORDS REVIEW

Date	ACTT	Action
5.20.2014	15,344.2	Replaced tail boom with SN 7306 (TSN 5879.9). Fenestron balance performed
8.1.2016	18,112.0	Tail boom vertical fan duct repair. Air Repair LLC, WO: 7818, RDAS AHI 130 53 003 16.
5.24.2018	N/A	N11QC - 1000-hour fenestron inspection, including balancing (recorded 0.2 ips)
7.12.2018	~20,870.5 ⁸	Fenestron from N11QC installed on N11QK
10.26.2019	22,646.1	100/150-hour inspection
12.3.2019	2278.7	100/150-hour inspection
1.8.2020	22,913.2	100/150-hour inspection
2.6.2020	22,969.5	25-hour tail boom/fenestron junction inspection
2.15.2020	22,986.0	25-hour tail boom/fenestron junction inspection
2.17.2020	2,2992.8	100-hour airframe inspection
2.23.2020	23,004.1	25-hour tail boom/fenestron junction inspection
2.27.2020	23,025.9	25-hour tail boom/fenestron junction inspection
3.4.2020	23,034.5	100/150/600-hour inspection. Includes visual inspection of the tail boom, tail rotor drive shaft, tail rotor gear box, rotor hub, blade assemblies, duct area, etc. Tail rotor blade & bearing check. Balance fenestron (0.085 ips). Balance #1 tail rotor drive shaft (0.133 ips) Balance TR drive shaft assembly (0.072 ips)

No.	SN	Date installed on N11QK	Blade TT (hrs)
1	M8916	6.13.2018	2245.5
2	M9186	6.13.2018	2245.5
3	M9169	6.13.2018	2245.5
4	M8882	6.13.2018	2245.5
5	M9170	6.13.2018	2245.5
6	M9072	6.13.2018	2245.5
7	M9179	6.13.2018	2245.5
8	M8453	6.13.2018	2245.5
9	M9195	6.13.2018	2245.5
10	M8979	6.13.2018	2245.5

⁸ Approximate airframe total time when the fenestron was replaced based on existing records. The actual maintenance record entry for this action could not be located.

7.0 BLUE HAWIIAN SAFETY EVENTS REVIEW

Blue Hawaiian Helicopters provided reports from their internal safety reporting system. Twenty-four reports directly relating to N11QK were identified, with the earliest dated from September 2016. None of the 24 reports identified an issue or event relating to the tail rotor.

8.0 LIST OF ATTACHEMENTS

- 8.1 FENESTRON HUB EXAMINATION**
- 8.2 INTERVIEW SUMMARY - PILOT**

Van S. McKenny IV
Aerospace Engineer – Helicopters



ATTACHMENT 1

HELICOPTER SPECIALIST FACTUAL REPORT

NTSB No. ANC20LA028

**Fenestron Hub Examination
(7 Pages)**

NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Aerospace Engineering Division
Washington, DC 20594



April 6, 2020

HELICOPTER SPECIALIST FACTAL REPORT

A. ACCIDENT INFORMATION

Place : Kalapana, HI
Date : March 5, 2020
Vehicle : EC130 B4 / N11QK
NTSB No. : ANC20LA028
Investigator: Van McKenny

B. COMPONENTS EXAMINED

1. Fenestron Hub

C. DETAILS OF THE EXAMINATION

The purpose of this examination was to document the components and condition of the fenestron hub. The fenestron blades had been removed during the on-scene phase of the investigation. Blue Hawaiian Helicopters shipped the fenestron hub to the NTSB engineering investigator in Los Angeles. The examination was completed at the Los Angeles Field Office and was witnessed via video connection by the Airbus party representative. All aspects of the examination were coordinated through continuous video interaction.

Visual examination of the hub revealed that the interior had been partially disassembled. The 10 blades had been removed from the hub. The pitch-change spider assembly attach bolts had been removed. The laminated torsion straps, splined flanged, and swelling-resistant plates remained bolted together. Dark soot like deposits had accumulated around the exterior of each inner and outer bearings. The exterior of the hub was covered in a thin layer of a soot like film. One balance bolt was not present on the exterior of the hub. Soot shadowing around the hole was observed. The presence or not of all these bolts is associated with the balancing requirements.



Photo 1 - Fenestron hub as received



Photo 2 - Fenestron hub as received

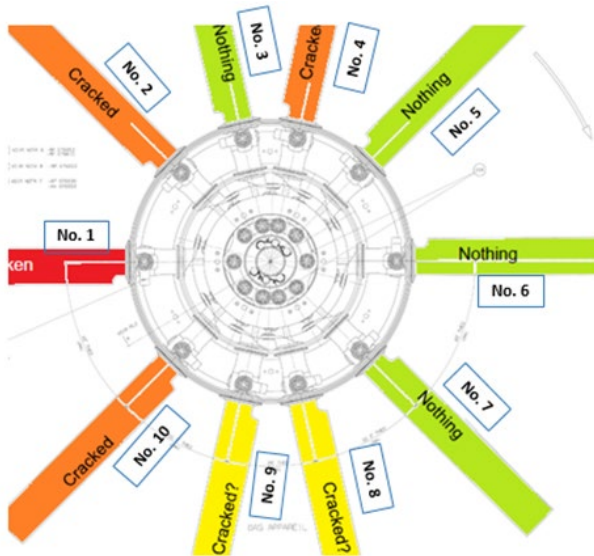


Figure 1 - Blade position numbering sequence



Photo 3 - Closeup of missing balance weight location.

1. Outer bearing measurement:

Each outer bearing was photographed in place and the diameter measured twice with a digital micrometer.

The bearing was removed from the hub and the 2 wear indicators were measured with a digital micrometer. Each bearing was firmly secured in the hub with PRC (Pro-Seal) adhesive.

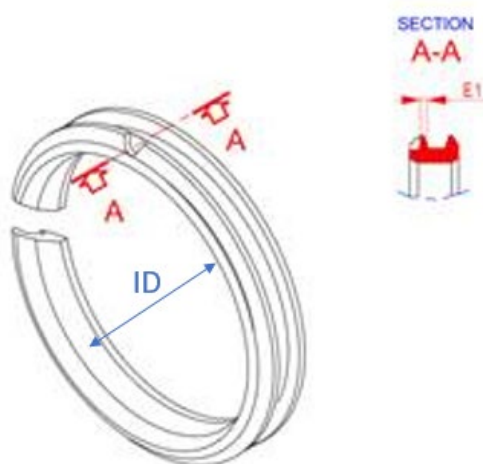


Figure 2 - Outer bearing schematic

Bearing No.	ID (mm)†	Wear Indicator A-A (mm)*
1	47.80, 47.88	1.30 & 1.35
2	47.79, 47.81	1.34 & 1.39
3	47.74, 47.88	1.42 & 1.41
4	47.84, 47.87	1.38 & 1.55
5	47.87, 47.88	1.36 & 1.38
6	47.77, 47.88	1.37 & 1.42
7	47.78, 47.81	1.41 & 1.55
8	47.68, 47.86	1.46 & 1.46
9	47.80, 47.86	1.30 & 1.34
10	47.76, 47.84	1.38 & 1.33

* 2 wear indicators on each bearing ring.

† 2 measurements made per bearing ring

The number 1 bearing exhibited a 15.6 mm abrasion on the outboard face.



Photo 4 - No. 1 outer bearing showing abrasion mark on the outer face.

2. Inner bearing measurement

Each outer bearing was photographed in place and the diameter measured twice with a digital micrometer. Each bearing was firmly secured in the hub with PRC (Pro-Seal) adhesive.

No.	ID (mm)†	Notes
1	34.97, 34.97	Bearing outer edge broke off during extraction
2	34.81, 34.85	
3	34.94, 34.91	
4	34.64, 34.77	
5	34.68, 34.62	
6	35.08, 35.03	Bearing tip broke off during extraction
7	35.08, 34.61	
8	34.82, 34.86	
9	34.64, 34.72	
10	35.02, 34.94	

† 2 measurements made per bearing ring.

3. Laminated torsion bars.

The laminated torsion bars were numbered while still attached to the hub. All torsion bar / blade bolts required a breaking torque to loosen the bolt. Torsion bars were removed and inner radius to inner radius of mounting holes were measured.

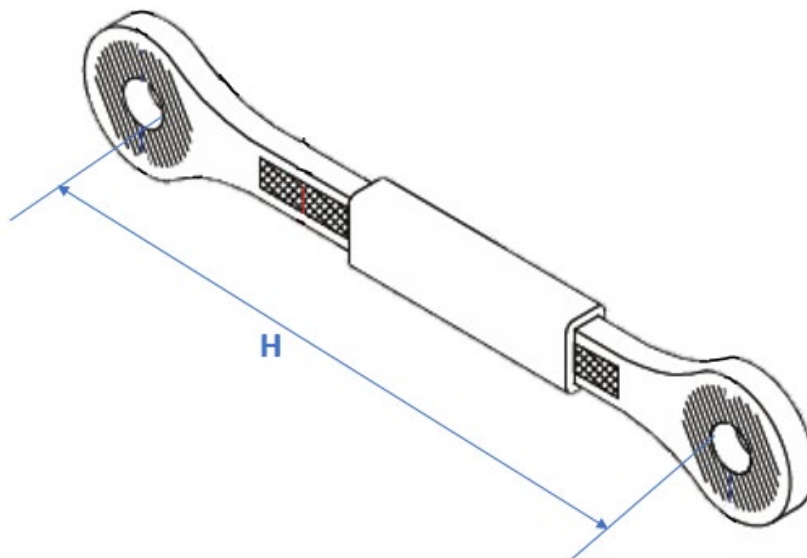


Figure 3 - Torsion bar measurement schematic

No.	Measurement H (mm)*†
1	110.05, 110.03
2	110.03, 110.04
3	110.03, 110.03
4	110.05, 110.04
5	110.06, 110.06
6	110.06, 110.03
7	110.04, 110.06
8	110.04, 110.05
9	110.04, 110.05
10	110.06, 110.07

* H = distance between the inner radius of each hole.

† 2 measurements made per laminated torsion strap.



Photo 5 - Torsion bars, front sides



Photo 6 - Torsion bars, back sides

Van S. McKenny IV
Aerospace Engineer (Helicopters)



ATTACHMENT 2

HELICOPTER SPECIALIST FACTUAL REPORT

NTSB No. ANC20LA028

**Record of Conversation – Wesley Wells (pilot)
(4 Pages)**

Record of Conversation

Friday, March 13, 2020
10:30 AM

Interview:	Wesley Wells
Phone:	Not provided
Location:	Telephone Conversation

Narrative:

The following is a summary of conversation with Mr Wesley Wells, pilot of N11QK, the accident helicopter. The following people were present during the conversation; Van McKenny (NTSB), Spencer Leonard (FAA), Seth Buttner (Airbus), Bryan Larimore (Safran), Eric Hamp (Blue Hawaiian), John Chicosky (Blue Hawaiian), and Corey Wright (Wilson Elser Law Firm, present by request of the pilot).

The pilot was asked to describe what happened starting from the brief through to the accident. The pilot stated that the date was March 5 and he was doing the 1100 o'clock tour in N11QK out of Hilo. He followed Ethan along the coast to Cape Kumukahi, and proceeded along the shore to Kalapana, and then to 2016-2017 ocean entry. Then to the Old Royal Gardens subdivision. The Pu'u O'o vent was in the clouds so he continued to Pahoa along the 2014 lava flow. Wind was off his nose at 11 knots according to his instruments. A strong vibration with a noise began, he checked his instruments and saw that the tail gear box chip light was ON and flickering. The noise and vibration stopped after a few seconds, the tail rotor gearbox chip light stopped flickering and remained OFF. He made a radio call to Ethan advising him of the situation, and that he was going to make a precautionary landing at the Forest GEO which was right in front of him, only a few moments away. He told the passengers that they were going to make a precautionary landing. As he approached the landing area and slowed the airspeed the helicopter began slowly rotating to the left. His right pedal had no effect in counteracting the torque. He attempted to gain forward airspeed with forward cyclic but he continued to rotate above the trees. He chopped the throttle and lowered the collective to stop the rotation and to give them the best chance of a survivable landing. As he approached the ground he raised the collective. Once the helicopter came to rest he shut down the engine, asked if everyone was ok. He radioed Ethan that they were ok but did not get a response. He carefully exited the helicopter, and escorted everyone away from the helicopter. Once away he called Noah, and let him know they were all ok.

He was asked how the rescue went. He said he was coordinating with Noah, and Noah notified the fire department. The fire department helicopter came and took 2 passengers to Pahoa, and they came back for him and one passenger. Before he left, another Blue Hawaiian helicopter

came and landed to be with the remaining 2 passengers. He left the scene of the accident to Pahoa (police station) where he transported by ambulance to the hospital. He was asked to describe his injuries, he stated that he had abrasions on his right chin, his right knee banged against the console, and he had lower back pain. They did look at his back at the ER and there were no reported fractures in his back. He was asked to describe the extent of the injuries of his passengers, he said that the two front passengers had a few cuts on their hands, and the female had cut on her leg. He doesn't know if the rear passengers were hurt, there was a bit of a language barrier, but he did not notice that they were hurt at all. Mr Wells stated that the passengers were seated according to the manifest.

Mr Wells was asked to provide more detail regarding the tail rotor chip light. He said the vibration alerted him, the noise and vibration happened at the same time. When he looked at the instruments, he noticed that the tail rotor gear box chip light was on and off and flickering. The noise and vibration stopped after a few seconds and at that point the chip light stopped flickering and remained off. He was asked if he noticed any change in aircraft performance after the chip light went out, such as yaw. He said that there was no problem until he was coming in for landing. He said he was at cruise airspeed, approximately 100 kts, when he got the vibration. He was asked if he recalled at what airspeed he was at when he started getting the yaw, to which he stated "no" but the yaw was to the left. He said that the yaw occurred as he was slowing for landing, and the helicopter started to slowly yaw to the left. He realized his right pedal had no effect, so he applied forward cyclic in an attempt to gain forward airspeed. He said that there was no vibration during this part of the flight.

Mr Wells was asked to describe how the passenger seat belts were positioned on their bodies. He stated that during flight he doesn't check their seat belts. He said the ground crew helps the passengers aboard the helicopter and attach their seat belts. Before he takes off one of the last things he checks are the passenger's seat belts. The seat belts are usually positioned around their waist, low and tight around their waist. He uses the words "low and tight around the waist" with the passengers.

Mr Wells was asked if he recalled the altitude he was at when he first felt the vibration, he responded that he was approximately 600 ft agl. He said the time between when he first got the vibration and executed the landing was less than 2 minutes.

He was asked if the passengers felt the vibration and where did he feel it, in the seat or pedals? Mr Wells said that he did not know if the passengers felt it or not. He was not aware if the passengers communicated with him, but he communicated with them and told them that they were making a precautionary landing. He was not aware if the passengers responded in anyway.

He was asked if he had done the preflight and if he recalled anything notable about the preflight. Mr Wells stated that as indicated in the engineering logbook, that he did a thorough preflight in accordance with the flight manual. There was nothing notable about the preflight. When asked if there was anything different about this aircraft compared to others that he flew,

he said there was nothing different or unusual about this aircraft. Additionally, he stated one did not have a "pet name." When asked about his airspeed when the vibration stopped, he said that the vibration lasted only a few seconds, he didn't look at the clock to see how long it lasted.

He was asked if he felt the vibration in the pedals or his seat, to which he replied that the vibration was through the whole aircraft.

Mr Wells was asked how he secured the engine, and he replied that he used the ON-OFF switch to secure the engine. When asked about the throttle manipulation during the autorotation he stated that he was in a slow rotation to the left, he moved the twist grip all the way to IDLE and left it there after landing.

He was asked if there was anything he would like to provide to the investigation that had not been yet discussed, to which he stated that he did not have anything additional that he thought could benefit the investigation.

An additional question was asked, if the vibration stopped at the same time the noise stopped, he stated "yes." When asked to describe the noise, he said that he had never heard any sound like it before and could not provide any additional details regarding the actual sound.

The telephone conversation was concluded at 1110.

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