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March 28, 2014

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NTSB – Central Region
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Factual Observations of Helicopter Mishap
Bell 206L3; Serial Number 51546; N207DS
Owner/Operator: Delta Bravo Sierra, Inc.
Date of Accident: January 27, 2014
Location of Accident: Silt, CO

I. Introduction

On January 27, 2014, a Bell 206L3 helicopter operated by Delta Bravo Sierra Inc. was performing powerline patrol operations for Holy Cross Energy near Silt, CO. The first flight of the day was for about an hour in duration. The accident flight, the second flight of the day, departed from the operator's base at Rifle Airport (RIL) with three people onboard and reportedly 570 lbs of fuel. The helicopter was flying south approximately parallel to County Road 331 and Holy Cross Energy powerlines along slightly rising terrain. At approximately 11:18 am the helicopter struck and severed the south static wire of the crossing Excel Energy power transmission lines. The Excel lines were oriented approximately east and west and were above the Holy Cross Energy lines. The helicopter impacted the ground approximately 100 ft. east of the County Road 331 at coordinates N39°31'16.16" W107°39'38.26". All three people onboard were fatally injured. An FAA inspector viewed the accident route from a nearby hill south of the Excel Energy wires a day after the accident at about 11:15 am and noted that the sun was in a southerly position and may have obscured the Excel static wires from sight.

The helicopter was examined at the accident site on Tuesday January 28, 2014. It was then recovered on Wednesday January 29, 2014 and transported to Beegle's Aircraft Service in Greeley, CO. A layout examination of the helicopter was conducted on Thursday January 30, 2014 with NTSB, Rolls Royce, and Bell investigators present.

II. Summary

No pre-impact engine or airframe anomalies were observed. No evidence of a wirestrike was observed on either the upper or lower wirestrike cutter devices. However, evidence of wire contact was observed on the mast, leading edge of the Red grip, and Red blade leading edge. An SD memory card was recovered from an onboard DVR and sent to the NTSB Recorders Laboratory in Washington, DC for analysis.

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III. Wreckage Examination

Fuselage

No pre-impact anomalies were observed in the fuselage.

The helicopter was found resting on its left side at the accident site. The fuselage exhibited significant impact damage on the left side (See Photo 1). The forward cabin exhibited crushing on the left side. Neither the upper (See Photo 2) or the lower wirestrike cutters showed evidence of wire contact.

The tailboom was fractured consistent with overload forces in two locations (See Photo 3), just aft of the intercostal support on the tailboom's forward surface and just aft of the horizontal stabilizer. At the aft tailboom fracture near the horizontal stabilizer, evidence of main rotor strikes was observed. The aft tailboom section was found near the main wreckage. The mid-tailboom section with attached horizontal stabilizer was found approximately 50-100 feet from the main wreckage and exhibited evidence of a main rotor strike (See Photo 4). Both the left and right end plates on the horizontal stabilizer exhibited evidence of fractures from main rotor strikes (See Photo 5). The tailboom was equipped with an aftermarket strake on the left side of the tailboom.

The helicopter was equipped with high skid gear, flight steps, and bear paws on the aft skids (See Photo 6). The landing gear was located with the main wreckage. The left forward crosstube was significantly flattened and the left skid was fractured at the forward crosstube saddle location. The left skid fracture and left forward crosstube flattening were both consistent with left side ground impact. The aft crosstube was separated from both the left and right skid tubes where the rear saddles had fractured consistent with overload forces.

Flight Controls

No pre-impact anomalies were observed in the main rotor or tail rotor flight controls. All fractures observed were consistent with overload and no discontinuities were observed that would indicate a lack of control continuity at the time of the accident.

The helicopter was equipped with a single set of flight controls at the pilot right seat station. Extensive damage to the flight controls was observed and is consistent with impact forces. The cyclic stick exhibited fractures consistent with overload forces at its base and on the hand grip (See Photo 7). The left side of the cockpit exhibited significant damage to the cyclic control system (See Photo 8). The collective stick control head fractured consistent with overload forces. The collective stick remained connected to the control system. The fractured stub of the cyclic stick and the collective stick were moved by hand and corresponding movement was observed to the three main rotor servo inputs. The fixed controls from the servos to the swashplate (cyclic) and the collective lever were intact (See Photo 9).

Both outer ring rotating swashplate attachment ears for the Red and White pitch change links were fractured consistent with overload forces (See Photo 10). The White pitch change link was fractured consistent with overload forces near the bottom of the link (See Photo 13). The location of the White pitch change link tube fracture was in a vertical plane similar to the wirestrike marks on the mast. The bottom of the White pitch change link (approximately 6 inches long) was found on the helicopter roof attached to a swashplate ear and monoball bearing (See Photo 11). Only the top of the Red pitch change link and attached clevis remained attached to the Red pitch horn (See Photo 12).

The Red pitch change link fractured near the end of the threaded insert consistent with overload forces. The remainder of the Red pitch change link was not observed.

The tail rotor control system exhibited several fractures consistent with overload in areas of airframe damage in the main fuselage and tailboom.

Main and Tail Rotor

Wirestrike evidence was observed on the Red main rotor blade and grip. All observed fractures in the main and tail rotor systems were consistent with overload and no pre-impact anomalies were observed in either rotor system.

The main rotor hub assembly was intact, although both of the main rotor grips were observed to be over-rotated on the yoke from impact (See Photo 13). The inboard end of each main rotor blade remained attached to the hub. Each blade exhibited chordwise scoring marks on outboard leading edge surfaces consistent with striking the tailboom during the impact sequence (See Photo 14).

The Red main rotor blade was found with the main wreckage. The inboard blade area exhibited scoring marks on leading edge surfaces consistent with wirestrike marks (See Photo 15). The leading edge of the Red grip also exhibited abrasions consistent with wirestrike damage (See Photo 16). The blade spar fractured at the outboard doubler, but the aluminum trailing edge strip was bent but not fractured.

The White main rotor blade was fractured at the outboard doubler and the trailing edge strip separated from the blade (See Photo 17). The White blade was found approximately 50 feet from the main wreckage (See Photo 18).

The tail rotor hub assembly remained connected to the tail rotor gearbox output shaft (See Photo 19). Free pitch change movement was demonstrated through the slider rod mechanism to the tail rotor blades. Near the tip of one tail rotor blade, a chordwise fracture was observed, consistent with overload forces. The tail rotor blades were aftermarket blades.

Drive System

No pre-impact anomalies were observed in the main or tail rotor drive systems. Wirestrike marks were observed on the mast. All observed fractures and damage were consistent with occurring during the impact sequence.

The mast exhibited spiral scoring marks from approximately 8-10 inches above the outer ring swashplate to just below the main rotor hub (See Photos 20 & 21). The scoring marks were consistent with wirestrike marks. The input drive attaching flange on the main transmission was rotated by hand and corresponding rotation of the mast through the main transmission was observed (See Photo 22). The driveshaft rear outer coupling (engine end) was intact and all over-temperature indicating dots were white in color, indicating that the coupling had not overheated (See Photo 23). The driveshaft forward outer coupling (transmission end) was found with axial fractures consistent with overload forces from misalignment at impact (See Photo 24). The outer coupling teeth were intact and covered with typical black-colored Bell specified driveshaft coupling grease. The inner coupling teeth exhibited fractures and smearing (See Photo 25) consistent with rotating contact on the right side transmission restraint assembly fitting after fracture of the forward outer coupling (See Photo 26). The left front transmission mount leg was fractured consistent with overload during impact.

The tail rotor gearbox was located with the aft tailboom section; all four attachment studs were fractured consistent with overload forces at impact. The tail rotor gearbox rotated freely by hand. The tail rotor driveshafts on the tailboom exhibited several areas of main rotor strike damage. The #2 (See Photo 27) and #4 (2nd to last tail rotor driveshaft) tail rotor driveshaft sections on the tailboom both exhibited main rotor strike damage. The #4 shaft (See Photo 28) was found approximately 100 feet from the main wreckage. The #3 shaft, located near the tailboom aft fracture, was not recovered from the accident scene. The #2 shaft on the tailboom, the #1 shaft on the tailboom, and the short shaft from the aft fuselage remained connected together (See Photo 29), but had separated from their hanger bearing mounts and were found near the aft tailboom fractured section. The steel oil cooler tail rotor driveshaft could not be rotated by hand because of deformation to the oil cooler shroud consistent with impact forces. The steel tail rotor driveshaft located under the engine exhibited bending overload at mid-span (See Photo 30).

Fuel System

No pre-impact anomalies were observed with the fuel system.

The helicopter tookoff for the accident flight with approximately 570 pounds of fuel and reportedly flew for about 30-45 minutes before the accident. A significant amount of fuel leaked onto the ground at the accident site from a breach in the fuel cell. The airframe fuel filter was intact and fuel drained from the filter when the drain valve knob was turned. The filter canister exhibited a dent consistent with contact with a fuel line elbow fitting during impact.

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Air Safety Investigator
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Photo 1
Crushing on left side of fuselage



Photo 2
Upper wirestrike cutter showed no evidence of wire contact

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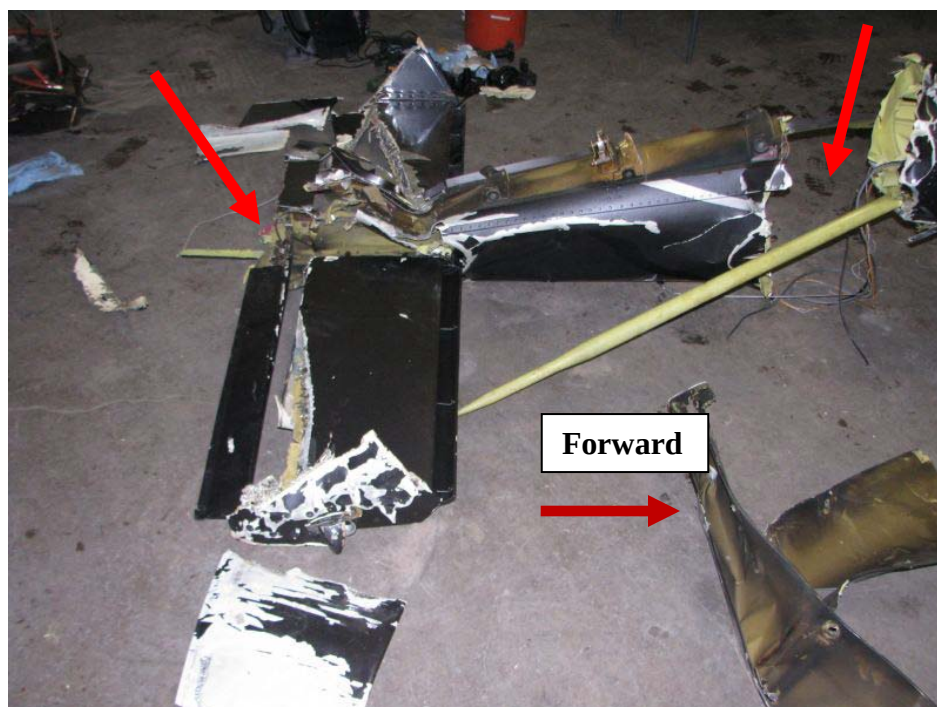


Photo 3
Arrows note two locations of tailboom fracture

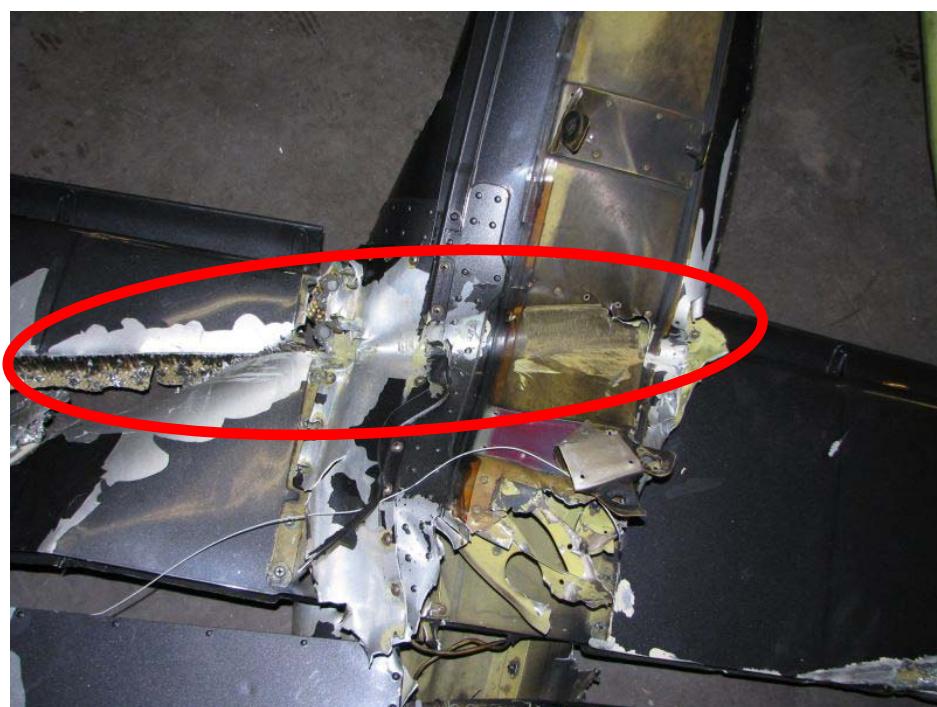


Photo 4
Main rotor strike to mid-tailboom section

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Photo 5
End plate with main rotor blade strike



Photo 6
Landing gear

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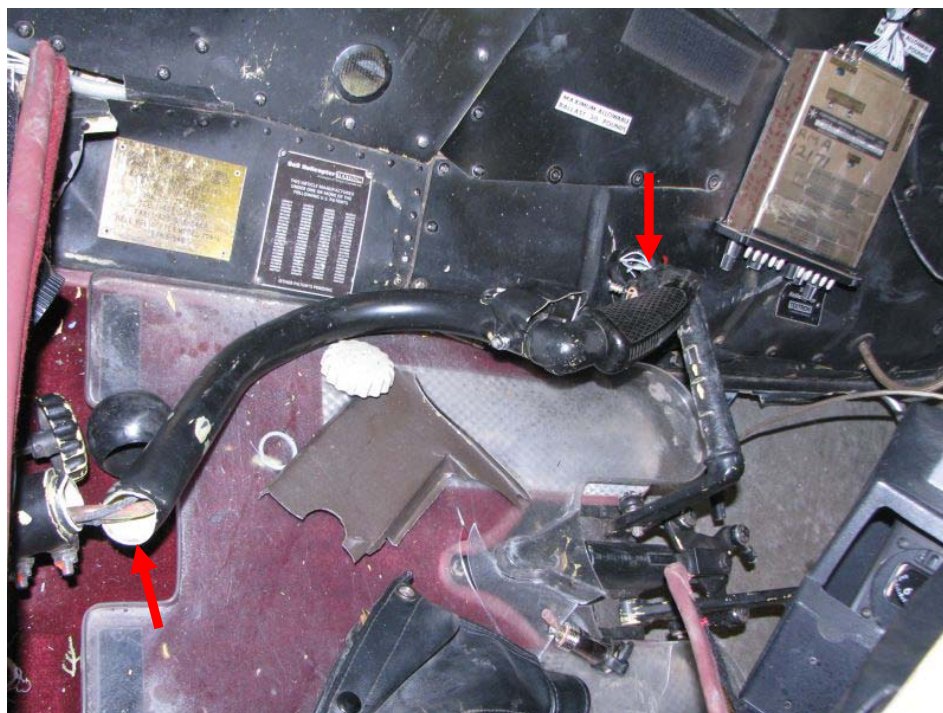


Photo 7
Cyclic stick fractured at base and on hand grip

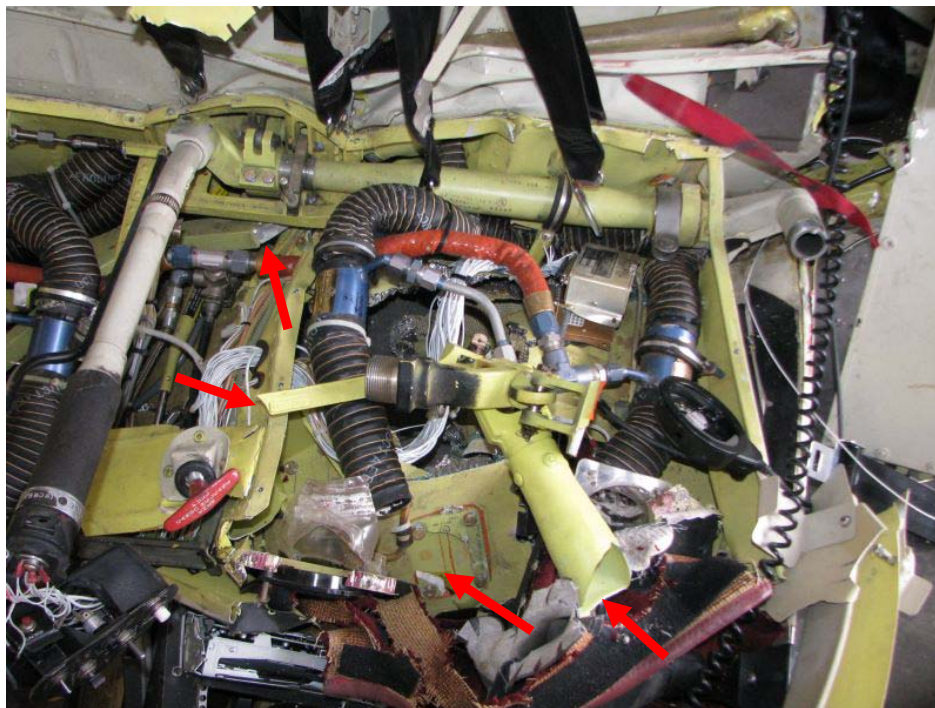


Photo 8
Extensive damage to cyclic flight controls on left side; overload fractures at arrows

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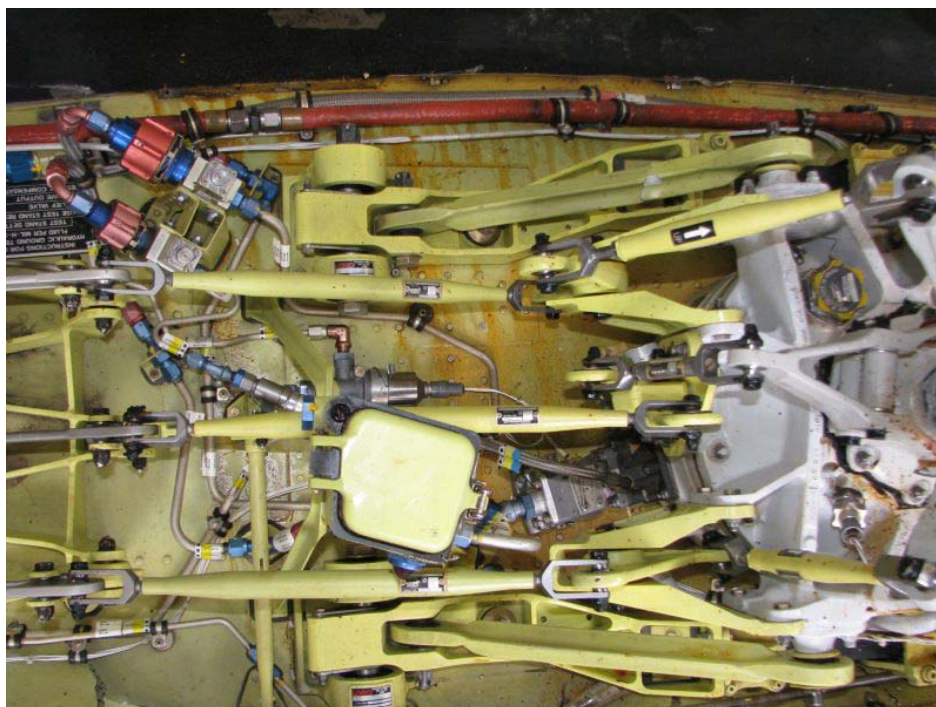


Photo 9
Intact fixed controls between servos and swashplate/collective lever



Photo 10
Both outer ring swashplate ears fractured consistent with overload forces

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Photo 11
Bottom fractured section of White pitch change link with attached swashplate ear



Photo 12
Top of Red pitch change link fractured consistent with overload near insert

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Photo 13

Intact main rotor hub assembly with top portion of fractured White pitch change link



Photo 14

Chordwise scoring marks on outboard blade surfaces from tailboom strikes by main rotor

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Photo 15
Scoring marks on inboard Red blade consistent with wirestrike



Photo 16
Red grip leading edge abrasions consistent with wire contact

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Photo 17

White main rotor blade inboard section with fracture at outboard doubler

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Photo 18
White main rotor blade outboard fractured section

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Photo 19

Tail rotor hub attached to tail rotor gearbox output shaft & chordwise T/R blade fracture



Photo 20

Wirestrike spiral scoring marks on mast commence about 8-10 inches above swashplate

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Photo 21
Wirestrike scoring marks on mast terminate at bottom of main rotor hub

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Photo 22
Input flange to main transmission

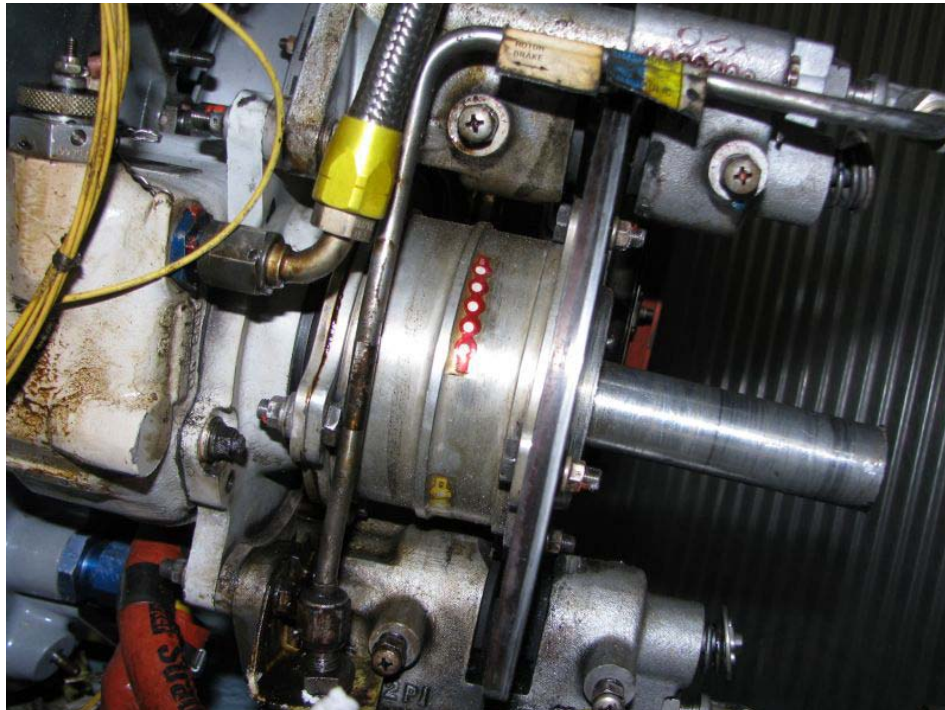


Photo 23
Engine end outer coupling for main driveshaft with White colored temperature dots

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Photo 24

Transmission end main driveshaft outer coupling with axial fractures and intact teeth



Photo 25

Fractured and smeared inner coupling teeth from rotating contact with restraint assembly

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Photo 26

Right side restraint assy with damage from contact with rotating inner coupling teeth



Photo 27

#2 tail rotor driveshaft on tailboom with main rotor strike

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Photo 28

#4 tail rotor driveshaft on tailboom and driveshaft cover with main rotor strike evidence

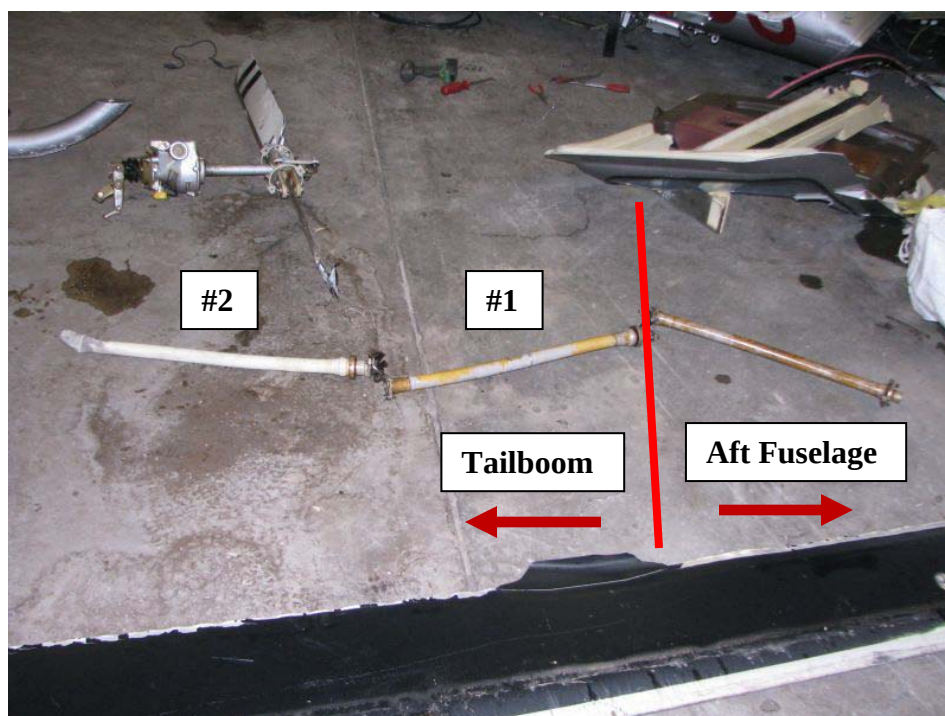


Photo 29

Tail rotor driveshaft segments: From left to right—#2, #1, aft fuselage shafts

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Photo 30

Bending overload fracture of steel tail rotor driveshaft located under the engine

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