



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

October 3, 2019

AIRFRAME EXAMINATION

WPR19LA205

This document contains 13 embedded photos.

A. ACCIDENT

Location: Eugene, Oregon
Date: July 27, 2019
Aircraft: MD 369E, Registration N438RC, Serial #0245E
NTSB IIC: Samantha Link

B. EXAMINATION PARTICIPANTS:

Samantha Link	Joan Gregoire
Aviation Accident Investigator	Chief Air Safety Investigator
National Transportation Safety Board	MD Helicopters
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C. SUMMARY

Examination of the airframe was conducted on October 3, 2019 at the Mahlon Sweet Field Airport, Eugene, Oregon. Fracture surfaces from the tail rotor driveshaft and transmission driveshaft were removed for metallurgy examination, otherwise, no anomalies were noted during the examination.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

- The helicopter was recovered to a hangar and it was overall intact.
- The forward fuselage was primarily intact
 - The lower left canopy windshield was missing, and the lower right canopy windshield was fractured.
- The lower fuselage was wrinkled, and the skids were spread.
 - The right side exhibited more crush damage than the left side.
 - The right skid was cut from the airframe for recovery purposes and the left skid remained attached.
- The tailboom remained attached at the fuselage and was bent downward slightly aft of the tailboom attachment point.
 - The vertical and horizontal stabilizers were intact and exhibited minimal crush damage.
 - The tail skid was bent upward about 90-degrees.
- The cabin area was intact and exhibited limited damage.
 - The flight controls were manipulated from the cabin and control continuity was established to their respective flight controls.

- The panels were removed from inside the aft cabin area and the main driveshaft was exposed. The driveshaft was fractured at the flexible joint that coupled with the overrunning clutch.
 - The main rotor assembly was rotated by hand and corresponding motion was observed on the driveshaft.
 - The driveshaft was removed from the helicopter and shipped to the NTSB Metallurgy laboratory.
- The main rotor assembly remained intact and exhibited minimal damage.
 - The five main rotor blades remained secured to the main rotor hub.
 - No visible damage was noted to the blades, dampers, blade pins, and pitch housings.
 - All blade tip caps and balance weights were present.
 - The hub moved freely when rotated by hand. Corresponding motion was observed on the main driveshaft and tail rotor driveshaft.
 - Flight control continuity was established from the cabin controls to the main rotor hub.
- The visible face of the engine's particle separator exhibited some grass on the intake side of the filter and the output side of the filter was clear of debris.
- The engine mounts were examined and the lower leg on the right engine mount was fractured just aft of the jam nut. The right strut damper was disconnected at the bottom end.
- No particulate matter was observed on either transmission chip detector.
- The tail rotor transmission was intact and did not exhibit any damage.
 - The chip detector was removed from the tail rotor transmission and it was clear of debris.
- The tail rotor was a four-blade system.
 - All four blades remained secured to the assembly.
 - The two outer blades exhibited inboard crush damage, and the two inner blades exhibited some scratching along the edges.
- Control continuity was established between the anti-torque pedals and the tail rotor assembly.
 - When the anti-torque pedals were manipulated by hand, the tail rotor blades moved accordingly.
- The tail rotor assembly was removed from the tailboom
 - The aft portion of the tail rotor driveshaft remained attached to the tail rotor transmission.
- The tail rotor driveshaft was fractured about midspan. The aft portion of the driveshaft was removed from the tailboom.

- The fracture surface was jagged with some rotational scoring. In addition, it was compressed inwards (it appeared flat). The drive shaft tube was more round than oblong.
 - The fracture surface was cut from the remaining portion of the tailboom and shipped to the NTSB Metallurgy laboratory.
- The tailboom was removed to examine the forward portion of the tail rotor driveshaft.
 - The internal structure of the tailboom was damaged about 1 foot 9 inches aft of the tailboom attachment point, consistent with the fractured tail rotor driveshaft.
 - Some rotational scoring (about 4-5 passes) was noted above the internal structure.
 - The fracture surface on the forward portion of the driveshaft was also jagged with rotational scoring, but not as flat. The drive shaft tube was more round than oblong.
 - The fracture surface was cut from the remaining portion of the tail rotor driveshaft and shipped to the NTSB Metallurgy laboratory.
 - Minor rotational scoring was noted on the inboard tail rotor driveshaft and the surrounding structure.
- The tail rotor control rod remained intact secured at both ends.
 - The control rod was removed from the tailboom; it was slightly bowed consistent with the damage to the tailboom.

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1.1 Airframe photos



Figure 1: Helicopter from the front



Figure 2: Left Side of Helicopter



Figure 3: Tailboom and Empennage



Figure 4: Main Rotor Assembly



Figure 5: Cabin



Figure 6: Main Driveshaft

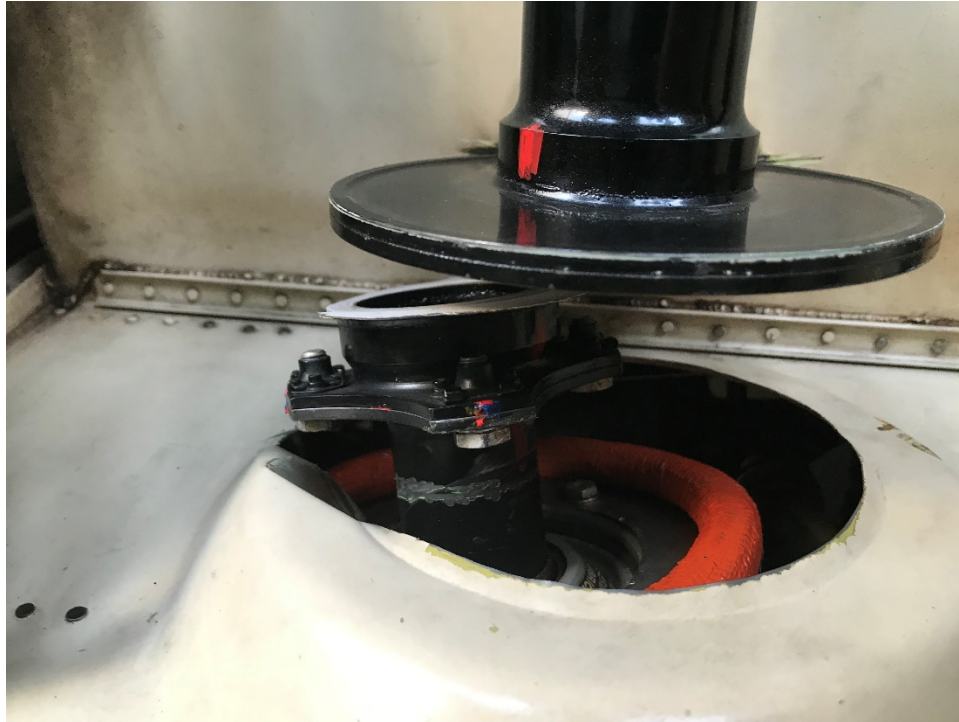


Figure 7: Main driveshaft fracture



Figure 8: Engine Compartment



Figure 9: Tail Rotor Assembly and Aft Tailboom Driveshaft



Figure 10: Fracture Surface on Aft Tailboom Driveshaft



Figure 11: Inside of Tailboom



Figure 12: Fracture Surface on Forward Portion of the Tailboom Driveshaft



Figure 13: Tailboom Driveshaft Fractures Next to Each Other

END.

Submitted by: Samantha Link