



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

January 31, 2018

AIRFRAME AND ENGINE EXAMINATION

WPR18FA074

This document contains 11 embedded photos.

A. ACCIDENT

Location: Pomeroy, WA
Date: January 27, 2018
Aircraft: Hughes 369D, Registration N369TH, Serial #1000830D
NTSB IIC: Samantha Link

B. EXAMINATION PARTICIPANTS:

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C. SUMMARY

The airframe and engine examination of helicopter was conducted on January 30, 2018 at the facilities of Hillcrest Aviation, Lewiston, Idaho. No mechanical anomalies were noted that would have precluded normal operations.

D. DETAILS OF THE INVESTIGATION

1.0 Engine Examination

- The engine remained in position and was securely attached to the airframe
 - No significant impact damage was noted to the engine
 - No obvious catastrophic anomalies were noted
- Ample oil was present in the engine oil reservoir
 - Oil was clean and bright, with no abnormal odors noted
- Control continuity from the cockpit to the engine could not be established due to deformation of the fuselage and cabin area
- Exhaust ducts were removed to facilitate access to the power turbine
 - No evidence of damage
 - When rotated by hand, the power turbine rotated smoothly, and continuity was established to the main rotor and tail rotor drive shafts
- The gas generator turbine was boroscoped

- o Displayed no evidence of operational damage, thermal discoloration, or damage consistent with an abnormal combustion.
 - o Metal splatter was noted on the 1st stage turbine nozzle shield
- Inlet plenum was accessed to inspect the compressor
 - o Tail rotor drive shaft was broken within the plenum
 - o Compressor was damaged consistent with foreign debris
 - o When rotated the compressor moved freely
- The fuel supply line to the fuel spray nozzle was removed
 - o About one teaspoon of clean, clear liquid that smelled of 'Jet A' fuel was present
 - o The fuel nozzle spray face exhibited normal carbon soot.
- All pneumatic engine control lines were inspected.
 - o All lines intact and fittings were at least hand tight
 - o Engine fuel control was found at the "90" detent, which corresponds to the "fly" throttle position.
 - Bound in place due to impact damage to the fuselage
 - o The turbine governor indicator needle was at "90", corresponding to a high power setting.
 - Bound in place due to impact damage to the fuselage

1.1 Engine Photos



Figure 1: Overall View of Engine



Figure 2: Compressor

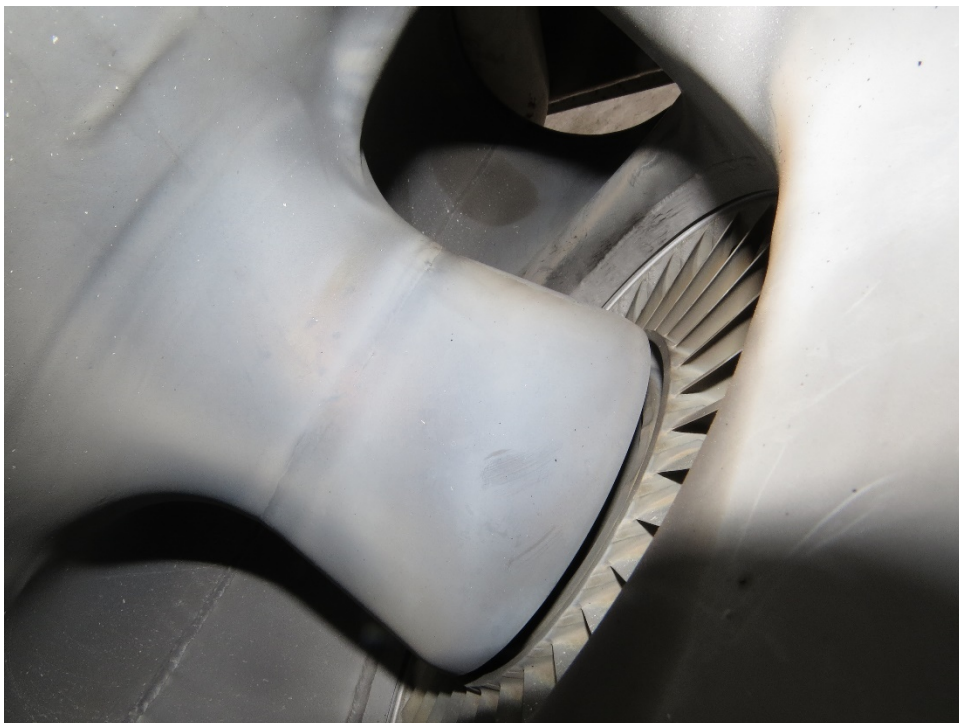


Figure 3: The Power Turbine

2.0 Airframe Examination

- The forward fuselage exhibited substantial impact damage
 - The right side was crushed inward
 - The bottom of the fuselage was bent and deformed on both the left and right sides
 - Most doors were removed prior to the accident flight.
 - The right-side passenger door was observed attached, but was crushed and damaged.
- The lower fuselage exhibited upward and inward crushing on the right side
 - The pilot floor support bulkhead and floor were bent and distorted
 - The right seat support structure exhibited downward and sideward crushing; the left seat support exhibited slight crushing of the seat pan
 - The canted frame and lower bulkhead behind the pilot/copilot seats were bent and distorted
 - The lower strike protection assembly was fracture separated, but was otherwise undamaged
- All four seatbelts were firmly attached to the airframe and functioned normally when manipulated by hand
 - It was noted, the aft right passenger seat belt was buckled across the seat and did not appear to be used at the time of the accident
- Landing Gear
 - The left skid tube, fore, and aft struts appeared undamaged
 - The right skid was found separated from the lower fuselage
 - The forward strut was fractured about mid-span and the aft strut appeared fractured near the lower fuselage
- The aft fuselage was primarily intact
 - Forward engine air inlet fairings were buckled and fractured
 - Both engine access doors were operational
- Cockpit/Instruments
 - Helicopter was set up for left-hand command
 - Right side controls had been removed prior to flight
 - Control continuity from the cyclic, collective, and anti-torque pedals could not be confirmed due to broken and jammed flight controls and control tube assemblies
 - Left anti-torque pedal was fractured from the torque tube
 - The longitudinal mix and lateral mixer control rods in the vertical tunnel appeared to be fractured at the lower bell cranks; all control tubes in the vertical tunnel were unable to be moved
 - All control connections at the main rotor assembly were fractured
 - The lateral and longitudinal trim actuators, bungee springs, and interconnect torque tubes were unremarkable
- The main rotor hub exhibited multiple fractures and deformation, as did the pitch house assemblies, swashplates, strap packs, main rotor dampers, and main rotor blades

- The main rotor blades exhibited extensive damage consistent with being driven under power
 - All five main rotor blades were fracture separated and appeared to be bent and warped in a similar manner
 - Two blades were mostly whole, however, warped
 - One blade was warped; however, the tip was fracture separated
 - One blade sustained extensive trailing edge damage, was warped, and separated into several pieces
 - One blade was wrapped around the main rotor hub right below the pitch housings
- Main transmission and drivetrain
 - Continuity was established from the engine through the main drive shaft to the main transmission. From the main transmission, continuity was established up to the main rotor hub and back to the fracture in the tail rotor drive shaft.
 - The main drive shaft and couplings were unremarkable. The main drive shaft was rotated by hand, but rotation was limited due to the damage of the main rotor hub.
 - The tail rotor drive shaft coupling at the main transmission appeared unremarkable.
 - The oil cool blower impeller rotated smoothly when it was rotated by hand
 - The oil cooler blower belt was missing, but was found fracture separated nearby. The belt was easily manipulated and did not exhibit signs of cracking.
 - The transmission fluid was visible through the site glass
 - The two main transmission chip detectors were removed, and very fine particulate matter was observed on both
 - The tail rotor drive shaft was fracture separated into three pieces and exhibited extensive rotational scoring particularly towards the aft end of the drive shaft
 - The fractures were just aft of the main transmission output pinion, at the tailboom fracture, forward of the tail rotor transmission, and at the tail rotor transmission.
- Tailboom/Empennage
 - The tailboom, tail rotor drive shaft, and tail rotor control rod were fracture separated about 2.5 feet forward of the empennage. The end of the damaged area was bent downward restricting access to the tail rotor drive shaft.
 - The tailboom was cut just forward of the tailboom fracture to remove the tail rotor drive shaft for further examination
 - The tail rotor drive shaft was fracture separated into three pieces and exhibited extensive rotational scoring particularly towards the aft end of the drive shaft.
 - The empennage was fracture separated, however, mostly intact
 - The right-side horizontal stabilizer was bent downward about 45 degrees and the skin was ruptured just outboard of the attachment to the vertical stabilizer
 - The right tip plate exhibited deformation on the aft outer surface

- The left side of the horizontal stabilizer was dented and deformed about mid-span
 - The entire trailing edge of the left horizontal was bent downward
- The stinger appeared more oval than round on the bottom, and it was packed with dirt.
- Light colored diagonal marks were observed on the side of the tailboom immediately adjacent to the tail rotor.
- The tail rotor assembly and transmission were mostly intact and fracture separated from the end of the tailboom
 - Flex couplings on the tail rotor transmission coupling were fractured
 - The four bolts that connect the tail rotor transmission to the tailboom sustained damage
 - One bolt hole was fractured and two appeared to be elongated
 - The top right and bottom left bolts appeared sheared, the top left bolt was missing and the threads appeared stripped, and the bottom left bolt appeared bent down to the right.
 - The tail rotor transmission rotated freely when manipulated by hand
 - The chip detector was removed and very fine particulate matter was observed
 - Oil was observed through the site glass.
 - The tail rotor was rotated by hand and operated normally.
 - The tail rotor hub and pitch control assembly were unremarkable
 - Tail rotor stop and tail rotor hub exhibited contact marks and dents consistent with excessive tail rotor blade flapping
 - The tail rotor blades remained attached to the hub
 - One blade appeared undamaged
 - The second blade sustained damage to the outboard most two inches
 - One side of the tail rotor skin was fracture separated.
 - The weight and blade endcap were fracture separated and unable to be located
 - The damaged section of the blade was bent and curled

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2.1 Photos



Figure 4: Fuselage



Figure 5: Four of the Five Main Rotor Blades



Figure 6: Tail Rotor Drive Shaft and Tail Rotor Assembly

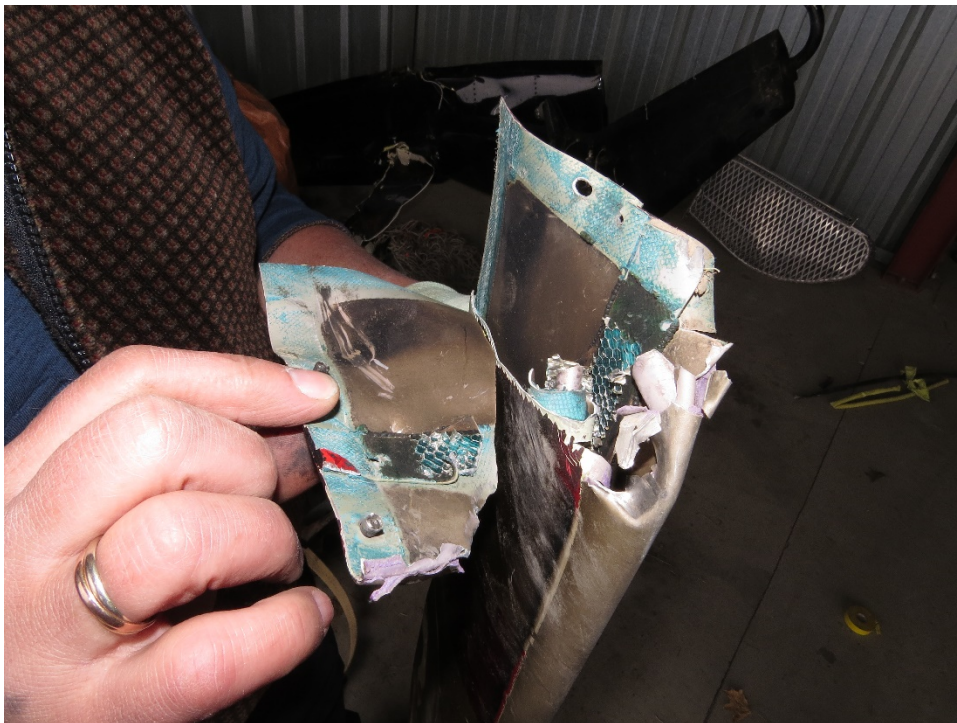


Figure 7: Outboard End of Tail Rotor Blade



Figure 8: Leading Edge of Outboard Tail Rotor Blade

3.0 Net Examination

- The two nets found on scene were located just north of the main wreckage. One net was mostly closed just north of the main wreckage. A second, half opened, net was found further north and slightly up the western ravine wall.
 - The northern most net, which was found about half open, was laid out
 - No damage was present to the netting
 - The four corner weights were present and undamaged
 - The net found just north of the main wreckage, which was found mostly closed except for one weight extended outward, was laid out and examined
 - The netting was undamaged.
 - Three of the weights appeared to be undamaged
 - The fourth weight (which was the one found extended from the rest of the net) exhibited heavy scratch marks, and the rubber ring was missing.

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3.1 Photos



Figure 9: Northern Most Net



Figure 10: Net Closest to Main Wreckage



Figure 11: The Damaged Weight

END.

Submitted by: Samantha Link