

WRECKAGE EXAMINATION
NTSB Accident Number
ERA22FA160

ACCIDENT

Location: Loxahatchee, FL
Date: March 18, 2022
Time: 1632 EDT
Aircraft: MD Helicopter
Registration: N650AG

PARTICIPANTS

Daniel Boggs
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HISTORY OF FLIGHT

On March 18, 2022, at 1632 eastern daylight time, an MD Helicopters 369HM, N650AG, was destroyed after it impacted power lines near Loxahatchee, Florida. The commercial pilot and pilot-rated passenger were fatally injured. The helicopter was operated by the commercial pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight.

According to Automatic Dependent Surveillance-Broadcast (ADS-B) data obtained from the FAA, the helicopter departed Antiquers Aerodrome (FD08), Delray Beach, Florida, about 1358 and flew north over swampy, state land. The data further showed the helicopter flying at altitudes from 25 to 75 ft above ground level, and at speeds between 83 to 100 knots, before colliding with high-voltage power lines. The power lines were measured at 80 ft. The data ended at 1432.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for airplane single-engine land, airplane single engine sea, and instrument airplane. He did not possess a helicopter rating at the time of the accident, he

WRECKAGE EXAMINATION
NTSB Accident Number
ERA22FA160

had a logbook endorsement for solo student flight with the prohibition of carrying passengers. The commercial pilot was issued a Federal Aviation Administration (FAA) second-class medical certificate on October 28, 2021. He reported 1,200 hours of total flight experience at that time.

The pilot-rated passenger held a private pilot certificate with a rating for airplane single-engine land and an instrument rating. The pilot-rated passenger did not have any helicopter experience.

AIRCRAFT INFORMATION

MD Helicopter, 369HM, N650AG, SPAS pending,

METEOROLOGICAL INFORMATION

No weather concerns

COMMUNICATIONS

None...

FLIGHT RECORDERS

N/A

WRECKAGE AND IMPACT INFORMATION

The wreckage was located in a swampy field. Power lines were observed on the ground near the wreckage. The wreckage path began where the power lines were located and continued for about 250 ft on a 270° magnetic course. The wreckage was laying on its right side and oriented about a 320° heading. The skids were separated from the helicopter, and all four main rotor blades were fractured off the hub. One main rotor blade could not be located in the swamp. Power line impression marks were found on the landing light housing and the skid brackets. The tail rotor was located about 30 ft from the main wreckage. Parts from the engine cowling, tail section and engine were found scattered in the wreckage path. The instrument panel was intact.

All three engine mounts were broken from impact forces and the engine was connected to the airframe by several flexible lines. Mud and weeds were present on the engine and throughout the compressor. The Fuel Control Unit (FCU) and Power Turbine Governor (PTG) throttle and input linkages were fractured and continuity could not be verified to the cockpit. The FCU throttle input lever was in the fly position. All of the external air, oil, and fuel line connectors were secure when checked by hand. Due to the extensive impact damage, neither the pneumatic air leak check nor the fuel system vacuum check could be performed. The aircraft mounted fuel and oil components were not accessible or identified during the inspection

The N2 and N1 rotors were locked and the aircraft transmission input shaft was fractured in two places. The overrunning clutch functioned normally. Once the turbine module was removed from the engine, the gearbox N1 and N2 systems turned freely and were continuous

WRECKAGE EXAMINATION
NTSB Accident Number
ERA22FA160

to their respective output drive gears. The gas producer rotor (N1) rotated freely within the turbine as well. Neither the upper nor lower magnetic chip detectors retained ferromagnetic debris.

The fuel nozzle was removed and carbon was present on the air shroud, primary fuel orifice, and secondary fuel orifice. The nozzle did not appear to be blocked. The input drive shafts for the PTG and FCU turned freely with no free play noted on the shafts. The FCU throttle input lever rotated normally with appropriate spring force resistance from min to max fuel settings. The PTG input lever rotated smoothly throughout the operating range. The fuel pump driveshaft was intact and turned with medium resistance, which is typical. The fuel pump filter was clean and free of contaminants. Fuel was present in the fuel pump output and bypass return lines and in the FCU to fuel nozzle line.

The Outer Combustion Case and left compressor discharge air tube displayed heavy battering from impact, most severely on the left side. When viewed through a borescope, the first stage turbine nozzle and nozzle shield appeared normal with no obvious hot streaks and the first stage turbine wheel blades were intact with no impact damage noted. Some silver debris appeared on the first stage nozzle shield, consistent with liberated coating from the compressor impeller shroud. The turbine to compressor coupling (N1 shaft) was intact while the power N650AG, M250-C20B, S/N CAE 800311, 23 March 2022 turbine to pinion gear coupling (N2 shaft) was fractured just forward of the aft Teflon seal land. The shaft was necked down just forward of the fracture with bulging noted between the land and aft splines.

All of the compressor vanes and blades were intact. Hard body impact was noted on the outermost section of the first stage compressor blades. Vane tip rub was noted on the first stage compressor wheel consistent with contact from the first stage vanes during impact.

Engine Information:

A Rolls-Royce M250-C20B gas turbine engine, S/N CAE 800311, powered the helicopter.

Component Serial Number Part Number

Engine CAE 800311 6853341

Gearbox CAG 31352 6877180

Compressor CAC 36197 6890550

Turbine N/A N/A

FCU 323148 23070606

PTG 84100036 23057870

Fuel Pump T105623 6899253

Fuel Nozzle VN1ATA2115 5233333

Bleed Valve FF31884 23053176

Summary of Findings:

No evidence of pre-impact mechanical damage was noted within the engine. Evidence of rotation at impact was noted within the compressor first stage (vane tip rub and impact damage on blades) as well as the fractured N2 coupling. Also, airframe powertrain shafting displayed torsional fractures consistent with power application during impact.

WRECKAGE EXAMINATION
NTSB Accident Number
ERA22FA160

Airframe

Fuselage. The fuselage was destroyed by impact forces.

Tailboom. The tailboom was fracture-separated from the fuselage and exhibited significant damage and deformation consistent with a main rotor blade strike.

Empennage. The empennage was fracture-separated from the tailboom. Both the upper and lower vertical stabilizers exhibited a gash on the outboard side consistent with a tail rotor blade strike. The inboard side of both the upper and lower vertical stabilizers were unremarkable. Trailing edge deformation was observed on the lower portion of the upper vertical stabilizer. The horizontal stabilizer exhibited minimal damage and the strut remained in place.

Landing gear. The skid-type landing gear were observed separated from the fuselage due to impact forces. One skid tube was fractured aft of the forward shoe. The struts were fracture-separated from the skid tubes. Three of the struts remained with the fuselage and exhibited significant damaged.

Cockpit. The cockpit was configured for right-hand command. The cockpit was significantly damaged and deformed due to impact forces. Survivable space was compromised. Both left and right side seat support structures were crushed and deformed.

Cabin. The cabin was significantly damaged and deformed due to impact damage.

Electrical System. Power was not applied to the aircraft and examination of the electrical system was not conducted.

Instruments and Avionics. Power was not applied to the aircraft and examination of the instruments and avionics was not conducted.

Although movement of the cyclic and collective control sticks was difficult, their movement resulted in slight movement of the main rotor assembly. The control support bracket assembly was fracture-separated just right of the aft end of the lateral trim actuator. The tail rotor control tube was fracture-separated, bent, and deformed in multiple locations, and the bellcrank was separated from the tail rotor transmission and pitch control assembly; the attach point on the tail rotor transmission was fracture-separated and remained attached to the bellcrank. The upper main rotor flight controls exhibited significant impact damage. All four pitch control links were fracture-separated near their lower end.

Overrunning Clutch. The overrunning clutch was removed, actioned by hand, and functioned appropriately.

Main Transmission Drive Shaft. The Extex main transmission drive shaft (PMA part) was fractured at both ends; the flex couplings between the main transmission and upper end of the drive shaft were fractured, and the lower end of the drive shaft was fractured just above the engine coupling.

Oil Cooler Blower. The oil cooler blower housing was fractured and the oil cooler belt was broken.

Main Transmission. The main transmission remained attached to the aircraft. Fluid was observed in the sight glass. The two magnetic chip detectors were removed; no ferrous particulate matter was observed

Main Rotor Drive Shaft. The main rotor drive shaft remained inside the static mast, and was not removed.

WRECKAGE EXAMINATION
NTSB Accident Number
ERA22FA160

Tail Rotor Drive Shaft. The tail rotor drive shaft was fracture-separated, bent, and deformed in multiple locations. The drive shaft was separated from the main transmission at the coupling. The aft end of that segment exhibited a torsional fracture separation. The aft end of the drive shaft remained connected to the tail rotor transmission.

Tail Rotor Transmission. The tail rotor transmission remained attached to the empennage. When the tail rotor blades were rotated by hand, corresponding movement of the tail rotor drive shaft at the input to the tail rotor transmission was observed. Fluid was visible through the sight glass. The tail rotor transmission magnetic chip detector was removed; no ferrous particulate matter was observed.

The main rotor hub assembly remained attached to the main rotor drive shaft; however, it exhibited substantial impact damage. Three of the four main rotor blades were recovered – the blue, yellow, and red blades. All three blades had separated from the hub at their related strap packs and exhibited varying degrees of impact damage, including downward bending, deformation, chordwise scratches and gouging, and trailing edge separation.

Both tail rotor blades remained attached to the tail rotor hub. The blue blade was fracture-separated at the doublers. The red blade was warped and deformed. The drive fork bolt appeared fractured at the blue-blade side of the drive fork. The elastomeric bearing on the red-blade side of the drive fork was no longer seated in the drive fork arm. The drive fork exhibited contact marks. The pitch links were intact but appeared slightly bent; both exhibited contact marks.

Both fuel cells appeared ruptured, and no fuel was observed in either fuel cell. The start pump was observed mounted on the bottom of the LH fuel cell. The fuel float arm in the LH fuel cell moved freely when manipulated by hand. The electrical wiring inside the LH fuel cell was secure and did not appear to interfere with the movement of the fuel float arm. The fuel shutoff valve was observed in the full open position and the red fuel shutoff control knob in the cockpit was observed in the open (in) position. The operation of the fuel shutoff valve was confirmed by actioning (pushing in and pulling out) the red fuel shutoff control knob.

It was reported that there was a strong odor consistent with that of fuel at the accident site

MEDICAL AND PATHOLOGICAL INFORMATION

Toxicology testing performed by the FAA's Forensic Services Laboratory did not reveal any evidence of drugs or alcohol.

An autopsy was performed on the pilot by the Office of the Medical Examiner, District 15, West Palm Beach, Florida. The report listed the cause of death as multiple blunt force injuries.

WITNESS STATEMENTS AND CONTACT INFORMATION

None...

ADDITIONAL INFORMATION