



# The National Transportation Safety Board

Office of Aviation Safety  
Central Region  
Memorandum for the Record  
Airframe Examination  
Findings  
CEN19FA009  
Fulton Missouri  
October 17 2018

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## General Accident Scene

The helicopter wreckage was found in a grassy area in a slight depression in the Potowatami recreational area near Fulton, MO. Initial examination of the wreckage at the accident site showed evidence that the helicopter impacted in a nose-low, left skid down attitude. Most of the helicopter wreckage was found resting on its left side, in a 6-foot wide, 2-foot deep crater. Portions of the wreckage were partially embedded in the dirt. All components were identified at the accident site, with small pieces of debris and plexiglass from the windshield located within 30-feet of the main wreckage. The wreckage was transported to a secure facility in Fulton, Missouri, for detailed examination.

## Airframe

The airframe sustained severe impact damage. The windshield and both door windows were completely shattered. Portions of both doors were found at the accident site. The aircraft impacted in a nose low, left skid low attitude. The cabin was crushed up and towards the vertical firewall. The vertical firewall was buckled with more severe damage on the left side. The horizontal firewall was also crushed with more damage to the left side. The mast fairing was crushed on the left side and had severe damage to its forward side. The tailcone remained attached to the airframe. The tailcone skins were separated between bays X and Y. The aft bulkhead casting was fractured.

The empennage was disconnected from the tailcone but came to rest near the tailcone. The upper vertical and horizontal stabilizers were generally straight and had very little damage. The lower vertical stabilizer was bent to the left side on the trailing edge. The tail rotor skid tube was in place and undamaged.

## Landing Gear

The forward cross tube was bowed. The forward right strut was rotated aft at the elbow. The aft left cross tube was bent down on and aft on the left side. The aft right strut remained attached to the skid tube. The right skid tube was disconnected at the forward right strut. The forward right strut remained attached to the forward cross tube. The toe of the left skid tube was embedded in the dirt below the aircraft. The left skid tube was disconnected at both the forward and aft strut attachments.

## Cockpit and Cabin

The cockpit mixture control was found in the full rich position, but the knob was bent about 90°. The cyclic trim knob was on but also bent flat to the cyclic boot. The removable cyclic was installed. The cyclic stick was folded forward and to the left side and could not be used. The cross bar and cyclic grips were disconnected from the cyclic shaft and found loose in the wreckage. The collective friction bolt was 1.6 inches from the top of the slider, about ½ travel. The collective friction was off. The removable collective was installed. The pedals were positioned with the left pedal slightly forward and were also jammed in place. The removable pedals were installed.

## Cockpit Switches

The heater blower was in the ON position. The keyed ignition switch was in the BOTH position. The clutch switch was in the ENGAGED position and the switch guard was impact damaged. Most instruments were unreadable due to severe impact damage. The battery and alternator switch positions could not be determined. The carburetor heat knob was found pulled to the ON position and it was bent.

## Annunciator Lights

The annunciator lights were pulled and examined with a 10x magnifying glass. The Low Oil Pressure light filament was stretched. The Low Rotor RPM light filament was stretched, and the lens was broken. The Starter On light filament was broken but not stretched. The Low Fuel light filament was stretched. The MR Chip and TR Chip lights lenses were broken and filaments not stretched. The Governor, Rotor Brake, MR Temp, and Clutch lights were destroyed from impact damage.

## Seats/Restraints

Both pilot and copilot seat structures were completely crushed. The left-side seatbelt was found unbuckled with the latch attached to the strap. The right-side seatbelt was separated and the ends of the belt were frayed. The right-side seatbelt latch was found in the wreckage detached from the strap. Both inertial reels were locked and would not retract. A headset case, rags, and charts were found in the right side under seat baggage compartment.

## Fuel System

Both fuel caps remained secured in place. The main tank was severely impact damaged and the bladder was ruptured. The main fuel tank strainer was clear. The auxiliary fuel tank was damaged, but the fuel bladder remained intact. There was a small amount of fuel present in the auxiliary tank. The fuel smelled like avgas. The auxiliary fuel tank strainer was clear. The gascolator bowl contained no fuel. The gascolator screen had a small amount of debris on it but was not obstructed. The fuel shutoff valve was in the on position. The fuel vent tubes were disconnected from the roll over vent valves but were clear. The carburetor fuel screen was clear. The carburetor was disassembled. The float bowls were wet but contained no fuel. There was severe damage to fuel lines and hoses, however, the fuel hoses remained attached to the fuel tanks. The air box was damaged. The air filter was present, but damaged and had some debris from the impact.

## Driveline

Both drive belts were broken but were in place on the groove of the upper sheave. The clutch actuator was fractured near the upper bearing. The surface of the disconnect was angular and jagged. Both upper and lower bearings rotated freely. The intermediate and flex coupling were bent and pulled apart. The clutch locked normally but was very rough and ratcheted in the freewheeling direction. The clutch assembly was retained by the NTSB for further examination.

The main rotor gearbox was intact. No oil was visible in the sight gage, however blue oil was present on the mast tube and with the wreckage at the recovery facility. The mast tube was bent slightly. The drop stop tusks were separated from both blade spindles. The droop stops on both blades were pushed upwards. The spindle bearing ratcheted when they were turned indicating there was some brinelling in the bearings. There was a defined crush mark across the elastomeric teeter stops on both blades.

## Main Rotor

The blue blade was bent slightly upwards near the hub and then bowed upwards midspan. The blade was resting on the tailcone and there was a small dent and scuff mark on the tailcone where it was resting.

The red blade was bent towards the leading edge at approximately 1/3<sup>rd</sup> span and then downwards at approximately 2/3<sup>rd</sup> span.

The main rotor gear box was rotated through approximately 170 degrees from the main rotor blades. Rotation was limited by the damage to the mast tube.

## Tail Rotor

The tail rotor driveshaft was disconnected aft of the intermediate flexplate and at the weld to the aft flange of the driveshaft at the tailrotor gearbox. Both fracture surfaces were angular and jagged. The tail rotor drive shaft damper bearing rotated freely. The tail rotor gearbox was intact but the aft tailcone casting was fractured. Blue oil was present in the tail rotor gearbox. There was continuity and freedom of rotation in the tail rotor gearbox from the gearbox input to the tail rotor blades. One tail rotor blade was bent inboard near the hub. Both tail rotor blades remained intact and attached to the tail rotor hub.

## Flight Controls

The flight controls were severely impact damaged. There were several disconnects in both the main and tail rotor controls. All fracture surfaces were rough and angular consistent with overload. All rod ends and hardware in the main rotor flight controls were located, with the exception of the pitch control link upper rod ends. The upper rod ends were not located. The fracture surface was angular and jagged. The upper pitch control link rod end hardware was fractured but partially remained in the pitch change horn of one of the rotor blades. The pitch change horn was separated from the other blade.

All portions of the tail rotor controls were recovered. The pitch change shaft was free to slide on the pitch change shaft. The controls at the tail rotor were still intact and actuation of the pitch change shaft still changed pitch on the blades.

#### Powerplant Controls

The carburetor heat control in the cockpit was unlocked and bent flush with the console but appeared to be up (on) approximately 1 inch. The carburetor heat slider valve was 1.4 inches open at the carburetor. The governor control switch was broken away from the collective and the position of the switch could not be determined. The throttle twist grip moved freely on the collective and no longer actuated the throttle controls. The throttle valve in the carburetor was in the full open position and throttle stop screw was broken away from the carburetor. The throttle control rod was separated near the rod end, but the rod end remained attached to the carburetor. The mixture arm was in the full rich position, however, the mixture cable was only extended .75 inch from the cable sheath. The mixture spring was deformed. The mixture cable clamps were not in place on the mixture cable, however the support bracket for the clamps was damaged.

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