Aviation Investigation Final Report

Location:	Tuckers Crossing, Mississippi	**Accident Number:**	CEN21LA102
Date & Time:	December 29, 2020, 08:35 Local	**Registration:**	N103SU
Aircraft:	Hughes 369D	**Aircraft Damage:**	Destroyed
Defining Event:	Off-field or emergency landing	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The pilot departed for the first flight of the day to begin aerial tree trimming operations along a transmission line. The mission's ground support specialist (GSS), who was in communication with the pilot via radio, observed the helicopter approach the trimming zone from the south then fly northbound to the east of the transmission line; the helicopter was equipped with an external saw assembly that was about 120 ft in length and about 40 to 50 ft above the trees. The GSS and the pilot discussed hazards located in the trimming zone. Shortly thereafter, the pilot announced over the radio that he would be making an emergency landing. The GSS reported that he did not see any smoke or hear "odd noises" coming from the helicopter and that "the helicopter made a quick forward descent until the saw disappeared into the east tree line." The helicopter subsequently impacted trees and terrain, and a postimpact fire ensued.

A postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation, but the examination was limited due to the thermal damage to the helicopter. Annunciator light bulb filament analysis revealed that the main rotor transmission oil pressure light was likely illuminated at the time of the accident, and the emergency procedure is to land as soon as possible.

The pilot was likely performing an emergency landing due to the illumination of the transmission oil pressure warning light. The reason that the pilot did not release the external saw from the helicopter during the attempted emergency landing could not be determined based on the available evidence.

The reason that the warning light likely illuminated could also not be determined. Operator text communications showed that, about 2 weeks before the accident, another company pilot reported an issue with the accident helicopter, to which a mechanic responded, "trans oil pressure may be the cause." However, the operator stated that the main rotor transmission oil

pressure light could illuminate when ferrying the external saw at higher speeds due to the aerodynamic drag placed on the external saw in forward flight and the nose-low attitude required to pull the saw during flight. The operator also stated that slowing the airspeed or adjusting the helicopter into trim would extinguish the light and allow for normal operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The pilot's loss of helicopter control when the external saw contacted trees during an attempted emergency landing due to a main rotor transmission oil pressure warning. The reason that the pilot did not release the external saw from the helicopter during the attempted emergency landing could not be determined based on the available evidence.

Findings

Aircraft	Main rotor indicating system - Related operating info
Personnel issues	Use of equip/system - Pilot
Personnel issues	Lack of action - Pilot
Not determined	(general) - Unknown/Not determined
Aircraft	Descent rate - Attain/maintain not possible
Personnel issues	Aircraft control - Pilot

Factual Information

History of Flight

Maneuvering-low-alt flying	Off-field or emergency landing (Defining event)
Emergency descent	External load event (Rotorcraft)
Maneuvering	Unknown or undetermined
Emergency descent	Controlled flight into terr/obj (CFIT)

On December 29, 2020, about 0835 central standard time, a Hughes 369D helicopter, N103SU, was destroyed when it was involved in an accident near Tuckers Crossing, Mississippi. The pilot was fatally injured. The helicopter was operated as a Title 14 *Code of Federal Regulations* (*CFR*) Part 133 external load flight.

According to the operator, the pilot departed for the first flight of the day from a private landing zone to begin aerial tree trimming operations along a transmission line, which was about 2.7 miles from the departure location. The helicopter contained about 400 pounds of fuel and was equipped with an external saw assembly that was about 120 ft in length. The mission's ground support specialist (GSS), who was in communication with the pilot via radio, stated that the helicopter approached the trimming zone from the south and flew northbound to the east of the transmission line. He estimated that the external saw was about 40 to 50 ft above the trees. The GSS and the pilot discussed hazards located in the trimming zone. Shortly thereafter, the pilot announced over the radio that he would be making an emergency landing. The GSS reported he did not see any smoke or hear any "odd noises" coming from the helicopter and that "the helicopter made a quick forward descent until the saw disappeared into the east tree line." The helicopter subsequently impacted trees and terrain, and a postimpact fire ensued.

The accident site was located in wooded terrain to the east of the transmission line (see figure 1). The external saw assembly was found connected to the helicopter's trapeze assembly and entangled in the trees.

Figure 1. Main wreckage (Source: Federal Aviation Administration).

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	40,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Unknown
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter; Instrument helicopter	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	January 14, 2020
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	April 3, 2019
Flight Time:	(Estimated) 5247 hours (Total, all aircraft), 392 hours (Total, this make and model), 3485 hours (Pilot In Command, all aircraft)		

On August 11, 2017, the pilot successfully completed the “MD520N Pilot Transition Training” course provided by MD Helicopters.

The operator provided the pilot’s two resumes, which were not dated. On one resume, the pilot reported 785 hours of flight experience with external load/long-line operations; on the other resume, the pilot reported 1,100 hours. The operator hired the pilot in April 2019, and he completed the 14 *CFR* 133.37 knowledge and skills tests on May 11, 2019.

Between June 2019 and March 2020, the pilot completed 126 flights and accumulated 119.4 total flight hours, of which 117.1 hours were for external load operations. The available information for this accident did not show the pilot’s total flight experience with the operator.

Aircraft and Owner/Operator Information

Aircraft Make:	Hughes	**Registration:**	N103SU
Model/Series:	369D	**Aircraft Category:**	Helicopter
Year of Manufacture:	1981	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	210895D
Landing Gear Type:	None; Skid	**Seats:**	4
Date/Type of Last Inspection:	December 20, 2020 100 hour	**Certified Max Gross Wt.:**	3051 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	12801.5 Hrs as of last inspection	**Engine Manufacturer:**	ALLISON
ELT:	Not installed	**Engine Model/Series:**	250-C20B
Registered Owner:	SIGNATURE PROPERTY HOLDINGS LLC	**Rated Power:**	420 Horsepower
Operator:	SIGNATURE PROPERTY HOLDINGS LLC	**Operating Certificate(s) Held:**	Rotorcraft external load (133)
Operator Does Business As:	Signature Utility Services	**Operator Designator Code:**	

A review of the airframe maintenance records revealed that, on December 20, 2020, a 100-hour helicopter inspection was completed, which included the removal of the over-running clutch and the installation of a serviceable over-running clutch. On December 21, 2020, a 300-hour airframe inspection was also completed with a total airframe time of 12,807.2 hours. The engine records revealed that 150/300/600-hour inspections were completed on December 17,

2020, with a total engine time of 3,332.3 hours, and 3,468 cycles. On December 7, 2020, the fuel control unit was replaced “due to erratic engine operation during start up sequence.”

According to company text communications regarding helicopter maintenance and flight operations information, on December 13, 2020, a pilot reported that “had the ‘warning’ tone annunciate 3 [times] in the last flight. Had no secondary indications. Early in the flight so I don’t think it was the low fuel light blinking.” A company mechanic responded, “Trans oil pressure may be the cause on [N103SU], a quick flicker will cause tone.” A company employee replied that another helicopter in the company’s fleet “does it all the time on windy days with the warning audio going off and no secondary indication. If you’re not low on fuel then it’s likely the trans pressure [gauge].” This company employee also stated that he had “caught it faintly illuminating the panel light with a good gust pushing things way out of trim for a second.” The pilot then responded that he “was figuring one or the 2” and that he “tried inducing a trans press light but couldn’t get it to do it.” The pilot further stated that he would “keep an eye on it.” No additional related communications were provided through December 23, 2020, when the text conversation ended.

According to the rotorcraft flight manual emergency and malfunction procedures, if the main rotor transmission oil pressure indicator (red warning light) illuminates, the procedure is to land as soon as possible. The main transmission oil pressure warning does not produce an audible tone; audible and visual warnings are only provided for engine-out and low-rotor conditions.

A review of the accident helicopter’s instrument panel showed a warning tone switch below the annunciator panel lights in the center of the upper instrument panel (see figure 2.). The maintenance records did not indicate an installed separate warning tone system for the helicopter.

Figure 2. Instrument panel with warning tone switch (Source: MD Helicopters).

According to the operator, previous flight experience showed that the main rotor transmission oil pressure light can illuminate when ferrying the external saw at higher speeds or turbulent conditions due to the aerodynamic drag placed on the external saw in forward flight and the nose-low attitude required to pull the external saw during flight. The operator also stated that slowing the airspeed or adjusting the helicopter into trim would extinguish the light and allow for normal operation. The operator added that “the nose-low attitude is not seen during normal flight profiles without the external load’s drag.”

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KLUL,238 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	08:55 Local	**Direction from Accident Site:**	310°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	80°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.36 inches Hg	**Temperature/Dew Point:**	13°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tuckers Crossing, MS	**Type of Flight Plan Filed:**	None
Destination:	Tuckers Crossing, MS	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:		**Aircraft Explosion:**	Unknown
Total Injuries:	1 Fatal	**Latitude, Longitude:**	31.611861,-89.086611

The main wreckage, which consisted of the fuselage, engine, main transmission, and rotor assembly, was consumed by the postimpact fire. The tail rotor assembly had separated from the tailboom near the tail rotor gearbox and was found adjacent to the main wreckage.

Postaccident examination of the helicopter found that the airframe fuselage, cockpit structure, and helicopter instruments and avionics exhibited extensive thermal damage. The tailboom had separated from the aft fuselage boom fairing tail cone. Damage consistent with three main rotor blade strikes was observed on the tailboom. The cargo hook system, which consisted of a primary (electrical) and secondary (hydraulic) release system, was intact, and no anomalies were noted with the system. The cargo hook remained attached to the external saw.

Due to thermal damage, flight control continuity could not be established to the cyclic, collective, and anti-torque controls. A damaged section of the anti-torque control tube located in the aft tailboom section moved appropriately when the tail rotor blades were manipulated by hand.

The overrunning clutch and main transmission driveshaft exhibited extensive thermal damage. The coupling between the overrunning clutch and main transmission driveshaft was partially separated. The main rotor transmission was thermally damaged except for some internal gears. The main rotor driveshaft was observed inside the static mast. The lower end of the main rotor driveshaft remained splined to the output gear of the main transmission and the upper end was bolted to the main rotor hub. Thermal damage was observed on the static mast and visible portions of the main rotor driveshaft.

The main rotor system exhibited extensive thermal damage. The main rotor hub, including the main rotor blades and pitch housing, remained attached to the main rotor driveshaft. The five main rotor blades exhibited varying degrees of deformation, which included warping, bending, trailing-edge separation, chordwise scratching, and thermal damage. Four main rotor blade pitch links remained attached and intact; one was bent and fractured about midspan. Three main rotor blade pitch horns were intact; two were fractured. The main rotor hub rotated when the main rotor driveshaft was rotated by hand using the main transmission output gear.

The tail rotor driveshaft was fractured into several segments. One segment exhibited damage consistent with a main rotor blade strike. The tail rotor transmission rotated when the tail rotor assembly was rotated by hand; no unusual sounds were heard during rotation. The tail rotor transmission chip detector was removed and found to be free of visible particulate matter.

No fuel system components were identified in the wreckage due to the postimpact fire.

The engine exhibited extensive thermal damage. The engine was disassembled, and seven airfoils, comprising a single packet of third-stage turbine wheel airfoils between the shroud slots, were fractured in overload near the shroud. No evidence indicated progressive fracture on any of the third-stage turbine blades. The intact portion of the shroud on the third-stage turbine wheel exhibited asymmetric rub damage, with the most severe rub damage located about 90° in the direction of engine rotation from the center of the packet of missing airfoils. The first- and second-stage turbine airfoils exhibited tip rub. All other damage was consistent with impact or thermal damage.

Examination of the available airframe and engine components revealed no anomalies that would have precluded operation.

The cockpit warning and caution indicators, which were located at the top of the instrument panel, were submitted to the National Transportation Safety Board’s Materials Laboratory for examination. The individual annunciators, each of which had four bulbs, were removed and x-rayed to determine the status of the bulb filaments. The XMSN (transmission) OIL PRESSURE annunciator exhibited hot filament stretching, consistent with the warning light being illuminated at the time of the impact.

Administrative Information

Investigator In Charge (IIC):	Sauer, Aaron
Additional Participating Persons:	Brian Young; FAA; Jackson, MS Joan Gregoire; MD Helicopters; Mesa, AZ Dave Riser; Rolls Royce; Indianapolis, IN Robby Lane; Signature Utility Services; Mountain Brook, AL
Original Publish Date:	December 7, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=102472