



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

Aviation Investigation Final Report

Location:	Marathon, Texas	Accident Number:	CEN20LA328
Date & Time:	August 8, 2020, 11:00 Local	Registration:	N284S
Aircraft:	Bell 206	Aircraft Damage:	Destroyed
Defining Event:	Loss of control in flight	Injuries:	3 Fatal, 1 Serious
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

During an aerial survey flight when the helicopter was about 800 ft above ground level, the pilot felt a slight vertical vibration through the collective and airframe. The vibration immediately intensified to a severe lateral vibration in the main rotor system, and the pilot could not control the helicopter. While maneuvering for an emergency landing, the helicopter lost lift and impacted terrain short of the intended landing area, and a postimpact fire ensued. The pilot stated that the engine was producing power at the time of the accident. No evidence indicated an in-flight structural breakup, and all damage to the airframe occurred during the ground impact sequence.

A fatigue crack was found on the leading-edge abrasion strip of one of the main rotor blades. Given the flat fracture features of the fatigue cracking, the fatigue crack was present before the accident flight. However, this fatigue cracking showed no evidence of propagation into the blade spar and, therefore, was likely not a factor in this accident. The main rotor blade damage was likely due to ground and tailboom impacts; the examined portions of the main rotor blades showed no evidence of an in-flight failure of the main rotor blades.

In addition, no evidence showed any flight control disconnections, and further postaccident examination to determine if the flight control system had fractured could not be performed due to the extensive thermal damage. The helicopter's hydraulic system was unable to be tested due to the damage resulting from the postcrash fire. Examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation.

The reason for the in-flight loss of control could not be determined based on the available evidence for this accident investigation. The helicopter was not equipped with, and was not required to be equipped with, crash-resistant flight recorders. The lack of flight recorder data for this accident precluded further evaluation of the accident circumstances and pilot actions.

This accident demonstrates the need for crash-resistant flight and image recorders aboard turbine-powered, nonexperimental, nonrestricted-category aircraft that are not currently required to be so equipped, as previously recommended by the National Transportation Safety Board.

Probable Cause and Findings

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

The in-flight loss of helicopter control for reasons that could not be determined based on the available evidence.

Findings

Aircraft	(general) - Not attained/maintained
Personnel issues	Aircraft control - Pilot
Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of control in flight (Defining event)
Maneuvering-low-alt flying	Collision with terr/obj (non-CFIT)
Unknown	Unknown or undetermined

On August 8, 2020, about 1100 central daylight time, a Bell 206B helicopter, N284S, was destroyed when it was involved in an accident near Marathon, Texas. The pilot was seriously injured, and the three passengers were fatally injured. The flight was operated as a Title 14 *Code of Federal Regulations* Part 91 aerial survey flight.

The flight was conducting an aerial survey in the Texas Black Gap Wildlife Management Area. The pilot reported that, about 5 minutes before the helicopter was to be refueled, he felt a “slight” vibration; at that time, the helicopter was operating at an altitude of about 800 ft above ground level and an airspeed of about 69 knots. The pilot further reported that the vibration, which lasted less than 30 seconds, started as a “slight vertical vibration” but “immediately intensified to a severe lateral vibration” that made the helicopter “impossible to control.” The pilot stated that the vibration affected the main rotor system blades and that he felt most of the vibration through the collective and airframe with no vibration in the anti-torque pedals. The pilot informed the passengers that he would be conducting an emergency landing. The pilot recalled that during the emergency landing, he observed two distinct blade paths prior to impact. The helicopter lost lift and subsequently impacted terrain short of the intended landing area. A postimpact fire ensued. The pilot stated that the engine was producing power at the time of the accident.

Pilot Information

Certificate:	Airline transport	Age:	71, Male
Airplane Rating(s):	None	Seat Occupied:	Front
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Helicopter	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	November 14, 2019
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	21000 hours (Total, all aircraft), 3000 hours (Total, this make and model), 30 hours (Last 30 days, all aircraft)		

Passenger Information

Certificate:		Age:	
Airplane Rating(s):		Seat Occupied:	Unknown
Other Aircraft Rating(s):		Restraint Used:	
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	
Airplane Rating(s):		Seat Occupied:	Unknown
Other Aircraft Rating(s):		Restraint Used:	
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	
Airplane Rating(s):		Seat Occupied:	Unknown
Other Aircraft Rating(s):		Restraint Used:	
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	No
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

The pilot reported that he had accumulated about 2,500 flight hours in Bell 206L and 206B helicopters conducting aerial surveys in Texas, Alaska, Utah, and New Mexico.

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N284S
Model/Series:	206 B	Aircraft Category:	Helicopter
Year of Manufacture:	1978	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	2393
Landing Gear Type:	None; Skid	Seats:	4
Date/Type of Last Inspection:	August 2, 2020 100 hour	Certified Max Gross Wt.:	3200 lbs
Time Since Last Inspection:	34 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	15164 Hrs at time of accident	Engine Manufacturer:	Allison
ELT:	C126 installed	Engine Model/Series:	250-C20B
Registered Owner:	Southwest Heliservices LLC	Rated Power:	420 Horsepower
Operator:	Southwest Heliservices LLC	Operating Certificate(s) Held:	On-demand air taxi (135)

According to the helicopter's maintenance records, in November 2019 at Van Horn Aviation, Tempe, Arizona, for main rotor blade A092, the tip abrasion strip and trim tab were removed and replaced due to a trim tab debonding. For main rotor blade A093, the trim tab was removed and replaced for inspection. Both blades had a component total time of 829 hours.

Main rotor blades serial Nos. A092 and A093 were installed on the accident helicopter on March 1, 2020, at a total helicopter time of 14,917 hours, and both blades had a component total time of 928 hours. Three 100-hour/12-month inspections were performed after installation, including an inspection performed on August 2, 2020 (6 days before the accident).

On July 1, 2020, the engine was removed and replaced due to reports of a high turbine outlet temperature and low power.

According to the helicopter's flight manual and the helicopter's most recent weight and balance records, the helicopter's maximum gross weight was 3,200 pounds, and the empty weight was 1,908 pounds. The operator estimated that the helicopter's weight at the time of the accident was 2,700 pounds.

The helicopter was not equipped with, and was not required to be equipped with, a crash-resistant flight recorder or cockpit image recorder.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KE38	Distance from Accident Site:	72 Nautical Miles
Observation Time:	11:35 Local	Direction from Accident Site:	330°
Lowest Cloud Condition:	Clear	Visibility	10 miles
Lowest Ceiling:		Visibility (RVR):	
Wind Speed/Gusts:	9 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	200°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30.26 inches Hg	Temperature/Dew Point:	30°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Alpine, TX	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	None
Departure Time:	08:00 Local	Type of Airspace:	Class G

The pilot reported the temperature about the time of the accident was "heating up pretty good pushing around 100 degrees [Fahrenheit]" and did not recall the density altitude.

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Destroyed
Passenger Injuries:	3 Fatal	Aircraft Fire:	On-ground
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	3 Fatal, 1 Serious	Latitude, Longitude:	30.191667,-103.21028(est)

The helicopter impacted hilly, rocky terrain in a remote area of west Texas at an elevation of about 5,160 ft. An on-scene examination revealed that most of the wreckage was in a compact area with the farthest piece of wreckage, a tip end section of a main rotor blade, estimated to be about 80 ft from the main wreckage. The postimpact fire consumed most of the main wreckage (the fuselage, engine, transmission, and portions of the main rotor blades). The tailboom had separated and was located near the fuselage; and the tailboom had sustained limited thermal damage.

Further examination of the tailboom showed that it was fractured in two large segments: the forward section containing the horizontal stabilizer and the aft section containing the vertical stabilizer and tail rotor. The aft end of the forward tailboom section was deformed to the right and showed evidence consistent with contact by a main rotor blade.

The forward landing gear cross-tube exhibited significant deformation; the aft cross-tube showed minor deformation. The left and right skid tubes were fractured in multiple locations.

The main rotor assembly, including the yoke, mast, and swashplate, exhibited thermal damage, and no anomalies that would have precluded normal operation were noted with the assembly. Both main rotor blades' inboard section remained attached to the yoke, displayed fractures located about 48 inches outboard of the yoke, and exhibited thermal damage. Large midspan-to-outboard end segments were found near the tail rotor and vertical stabilizer. A 20-inch section of one main rotor blade tip (referred to as blade A) was found about 80 ft from the main wreckage. Smaller sections of blade skin and foam core were distributed within the main wreckage area.

The main transmission housing was partially consumed by the postcrash fire. The engine-to-transmission driveshaft remained attached to the main transmission input quill and remnants of the freewheeling unit. Rotational scoring was noted on the driveshaft.

The tail rotor remained installed on the tail rotor gearbox output shaft, and both tail rotor blades remained installed on the tail rotor yoke. Both tail rotor blade tips displayed impact damage, and the remainder of the blades were relatively intact. No anomalies that could have precluded normal operation were noted with the tail rotor system.

The tail rotor drive train exhibited fragmentation. All drive shaft segments were located, and rotational scoring was noted at the hanger bearing locations within the tailboom sections. Continuity through the tail rotor gearbox was noted when the gearbox was manually rotated. No evidence indicated any binding or abnormal sounds.

Flight control continuity could not be established due to thermal and impact damage. Various pieces of connection hardware and bellcranks for the flight control system did not exhibit evidence of separation at their respective fasteners.

The engine was located within the main wreckage on its left side at its normally installed location. The engine did not exhibit signatures of uncontainment or separation between its modules. Disassembly of the engine revealed no anomalies that would have precluded normal operation. The engine fuel system and components were unable to be tested due to thermal and impact damage.

The cockpit instruments, including the caution and warning panel, exhibited significant damage due to impact and thermal damage.

Materials Laboratory Examination

Portions of the main rotor blades were sent to the National Transportation Safety Board's Materials Laboratory for further examination. Because the data plates for the main rotor blades had separated from their blades due to exposure to the postcrash fire, the main rotor blades were identified as "blade A" and "blade B" for this work.

Blade A Examination

Six primary pieces of the main rotor blade were recovered; the largest portion of the blade was about 9 ft long and consisted of part of the constant chord section, which was fractured at both ends. The trailing edge was separated along the entire length, and the interior of the blade was exposed.

The lower skin fracture surfaces on the outboard section were predominantly translaminar and slanted inboard about 45° relative to the chord direction, consistent with bending loading.

Two impact marks were observed on the leading-edge abrasion strip, and both corresponded to locations of chordwise fractures through the blade skins. One impact mark, located about 18 inches inboard of the outboard end of the abrasion strip, showed areas of dark gray and blue material transfer. The other impact mark was located at the outboard end of the abrasion strip. The upper surface of the abrasion strip was deformed inward and aft with spanwise scratches and periodic streaks of a light silver appearance. X-ray fluorescence spectroscopy indicated that the composition of the streaks was mostly aluminum.

The leading-edge abrasion strip on the tapered tip section was fractured chordwise about 19 inches inboard from the blade tip. The fracture surface was relatively flat and featureless for about 2.4 inches from the lower aft edge except for a spanwise secondary crack that

intersected the primary fracture at the origin, which was about 1.5 inches forward of the lower aft edge. Areas of blue, white, and gray material transfer were observed near the crack. Visible curved crack arrest marks on multiple offset planes were observed propagating for about 0.4 inches, consistent with progressive fracture under dynamic loading conditions (as evidenced by fluctuations in stress amplitude and load path).

The terminus of the crack arrest marks was located about 2 inches forward of the upper aft edge of the abrasion strip. The fracture surface from the crack terminus to the upper aft edge of the strip exhibited a slanted fracture surface and dull appearance, consistent with a shear lip as a result of final separation due to overstress. The flat/progressive fracture was observed over about 58% of the leading-edge abrasion strip fracture surface at that location. Striations observed on the fracture surface were consistent with fatigue.

Scratches and witness marks were observed along the abrasion strip outboard of the tip piece. The witness marks appeared gray, blue, white, and silver, and gold/brown in color. X-ray fluorescence spectroscopy identified elevated amounts of aluminum at the lighter gray/silver marks, consistent with material transfer. Circular marks, with elongated streaks emanating from them, were observed about 14.5 inches inboard from the blade tip and were equally spaced within 1 inch, consistent with a structure rivet pattern.

Refer to the NTSB Materials laboratory Factual Report located in the public docket for additional materials laboratory examination details for Blade A.

Blade B Examination

The recovered blade was about 11 ft long, and evidence of thermal damage was observed over most of the blade. The inboard end was fractured and exhibited a 45° slanted fracture relative to the span. Visible buckling deformation and tearing separation was observed in the leading-edge abrasion strip about mid-span. The trailing edge strip was fractured chordwise with a predominantly flat, translaminar fracture surface with inter- and intralaminar separation extending away from the chordwise fracture. The fracture features were consistent with aft bending loading before fracture. Blade tip fragments that were recovered did not exhibit visible thermal damage, consistent with tip fragmentation before the postcrash fire. A witness mark, consistent with impact damage, was observed on the upper surface of the leading-edge abrasion strip about 6 inches inboard of the outboard end of the constant chord section abrasion strip.

Administrative Information

Investigator In Charge (IIC):	Hatch, Craig
Additional Participating Persons:	Nick Shepler; Rolls-Royce Engines; Indianapolis , IN Corey Wehmeyer; FAA FSDO; Lubbock, TX Mark Stuntzner; Bell Helicopters; Hurst, TX James Van Horn; Van Horn Aviation; Tempe, AZ Matt Rigsby; FAA Gary Howe; Bell Helicopters; Hurst, TX
Original Publish Date:	June 14, 2023
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=101760

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