



Aviation Investigation Final Report

Location:	Fort Myers, Florida	Accident Number:	ERA23LA011
Date & Time:	October 8, 2022, 18:02 Local	Registration:	N5DF
Aircraft:	BELL TEXTRON CANADA LTD 505	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	4 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The pilot, who owned the helicopter, was proceeding to a landing zone to drop off passengers. As he initiated his approach, the prevailing wind was a right, quartering tailwind. His approach was near vertical, with no forward airspeed. The helicopter began to rotate to the right, then the rotation accelerated, and the pilot was unable to maintain helicopter control. The helicopter impacted the ground and came to rest on its left side, and the pilot and all three passengers were seriously injured. The main rotor struck a reinforced concrete light pole during the impact sequence, and the main rotor hub and blades separated from the main rotor mast. This resulted in an engine overspeed and blade shedding of the free turbine blades, by design, to prevent rupture of the free turbine disk.

Postaccident examination of the airframe, engine, digital engine control unit, and data from integrated avionics revealed no evidence of a preexisting mechanical malfunction or failure that would have precluded normal operation. Recorded data revealed that during the approach, engine power demand exceeded engine power available, resulting in a loss of tail rotor effectiveness (LTE), after which the pilot was unable to recover control of the helicopter.

Probable Cause and Findings

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

The pilot's execution of a landing approach with a right, quartering tailwind, low forward airspeed, and high power demand that, when combined, resulted in a loss of tail rotor effectiveness and helicopter control.

Findings

Aircraft	Directional control - Not attained/maintained
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Aircraft control - Pilot
Environmental issues	Tailwind - Effect on operation

Factual Information

History of Flight

Approach-IFR final approach	Loss of control in flight (Defining event)
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On October 8, 2022, about 1802 eastern daylight time, a Bell 505 helicopter, N5DF, was substantially damaged when it was involved in an accident at Fort Myers, Florida. The private pilot and three passengers received serious injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

The pilot, through his attorney, reported that he was approaching a landing zone (LZ) at Fire Station 75 in Fort Myers to drop off passengers. About 150 ft above the ground, he noticed flags near the LZ and elected to go around to make another approach to better align with the light wind. He added power to initiate the go around and suddenly there was a “bump and dip” in the tail which was immediately followed by severe and massive vibration and shaking of the helicopter, with an uncommanded left yaw. The helicopter then pitched up and rolled violently. The pilot was unable to regain control and the helicopter impacted the ground near the LZ, in a ditch. There was no fire.

The left, rear seat passenger video-recorded the final portion of the flight with a personal electronic device. The video was analyzed by a National Transportation Safety Board (NTSB) Onboard Image Recorder Group on November 15, 2022. About 43 seconds elapsed time (00:43) into the video, the helicopter was observed proceeding toward the accident site. The wind was generally out of the northeast, blowing toward the southwest. About 00:57, the camera panned inside the cockpit. The cockpit instruments appeared normal with no indication of an anomaly or malfunction. The accident site and LZ were visible ahead of the helicopter. The helicopter’s heading was about west-northwest. Flags on a flagpole were erect and indicated wind blowing from the north-northeast.

At 01:32 elapsed time, the video captured the pilot. He was wearing his shoulder harness and the primary flight display showed no anomalies. The helicopter began the descent to land and slowed to near zero forward airspeed as it was above the accident site (a nearly vertical approach). At 01:41, with nearly zero forward airspeed, the wind direction relative to the helicopter’s nose indicated a right, quartering tailwind. Two seconds later, at 01:43, with zero forward airspeed, the helicopter began yawing to the right, and then the right yaw accelerated. At 01:47, the helicopter had completed 1 full rotation to the right. For the next few seconds, the pilot attempted to regain control of the helicopter as it continued to rotate; however, he was unsuccessful. The helicopter crashed and eventually came to rest on its left side after

contacting trees and a reinforced concrete light pole. The engine continued to run after impact. First responders assisted the occupants out of the helicopter.

Pilot Information

Certificate:	Private	Age:	50, Male
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	
Medical Certification:	Class 2 With waivers/limitations	Last FAA Medical Exam:	November 16, 2021
Occupational Pilot:	UNK	Last Flight Review or Equivalent:	May 17, 2022
Flight Time:	917 hours (Total, all aircraft), 455 hours (Total, this make and model), 63 hours (Last 90 days, all aircraft)		

Passenger Information

Certificate:		Age:	52, Male
Airplane Rating(s):		Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	4-point
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:		Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	36, Male
Airplane Rating(s):		Seat Occupied:	Left
Other Aircraft Rating(s):		Restraint Used:	4-point
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

Passenger Information

Certificate:		Age:	36, Male
Airplane Rating(s):		Seat Occupied:	Right
Other Aircraft Rating(s):		Restraint Used:	4-point
Instrument Rating(s):		Second Pilot Present:	No
Instructor Rating(s):		Toxicology Performed:	
Medical Certification:		Last FAA Medical Exam:	
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:			

The pilot, who owned the helicopter, completed the Bell Training Academy 505 Ground and Flight Refresher on May 16 and 17, 2022 at Hurst, Texas. On May 18, he completed the 505 Inadvertent IMC and Helicopter Upset Recovery Course, also at the Bell Training Academy.

Aircraft and Owner/Operator Information

Aircraft Make:	BELL TEXTRON CANADA LTD	Registration:	N5DF
Model/Series:	505	Aircraft Category:	Helicopter
Year of Manufacture:	2021	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	65340
Landing Gear Type:	Skid	Seats:	5
Date/Type of Last Inspection:	July 27, 2022 Continuous airworthiness	Certified Max Gross Wt.:	3680 lbs
Time Since Last Inspection:	39 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	221 Hrs at time of accident	Engine Manufacturer:	Safran Helicopter Engines
ELT:	C126 installed	Engine Model/Series:	Arrius 2R
Registered Owner:	On file	Rated Power:	492 Horsepower
Operator:	On file	Operating Certificate(s) Held:	None

The helicopter was manufactured in 2021. The last maintenance entry in the helicopter's records was a lubrication service on July 7, 2022, at a total aircraft time of 182 hours.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	KFMY, 12 ft msl	Distance from Accident Site:	6 Nautical Miles
Observation Time:	17:53 Local	Direction from Accident Site:	43°
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:	Broken / 4000 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	11 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	60°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.01 inches Hg	Temperature/Dew Point:	29°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Bokeelia, FL (NA)	Type of Flight Plan Filed:	None
Destination:	Fort Myers, FL	Type of Clearance:	None
Departure Time:	17:43 Local	Type of Airspace:	Class G

Reported surface wind at 1753 at Page Field Airport (FMY), Fort Myers, Florida, located about 6 nautical miles (nm) northeast of the accident site, was from 060° at 11 knots. Concurrently, Southwest Florida International Airport (RSW), Fort Myers, Florida, located about 10 nm east-northeast of the accident site, reported wind from 050° at 10 knots.

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Substantial
Passenger Injuries:	3 Serious	Aircraft Fire:	On-ground
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	4 Serious	Latitude, Longitude:	26.51269,-81.9371

An inspector with the Federal Aviation Administration responded to the accident site and examined the wreckage. The helicopter sustained substantial damage to the main rotor, with the outboard sections of the blades separating during impact. The main rotor hub and blade assembly separated from the main rotor mast. The tail boom broke free of the fuselage and the tail rotor separated from the tail boom. There were several trees and a reinforced concrete

light pole that were struck during the impact sequence. Damage to the main rotor blades showed signatures consistent with contact with the light pole.

The wreckage was recovered to an aircraft salvage facility where a follow-up examination was performed. No preimpact anomalies were found with the fuel system, hydraulic system, main rotor and drive, tail rotor and drive, and flight controls. The transmission chip detectors and tail rotor gearbox chip detector were normal in appearance.

The engine was shipped to the manufacturer's facility for examination. The examination revealed no preimpact anomalies. Continuity was confirmed through the entire gear train of the module 1 (MO1). The module 2 (gas generator) was disassembled down to the high pressure turbine. The free turbine blades had shed during overspeed protection and were contained by the shroud and protection ring. This blade shedding is by engine design to prevent the free turbine disk from bursting in the event of an overspeed, as was the case in this event when the main rotor separated from the mast during impact. The free turbine nozzle guide vane sustained damage during the blade shedding. The disk could still be rotated by hand. The rotating assembly of the gas generator could not be rotated by hand. The thermocouples were removed and all exhibited thermal damage. The high pressure turbine blades all exhibited extreme thermal damage and were partially consumed.

The digital engine control unit (DECU) was examined at the manufacturer's facility, and the Garmin G1000 integrated flight deck was examined at the NTSB Vehicle Recorders Laboratory. Both units revealed the helicopter's components operated as designed during the flight and accident sequence. During the rapid, uncontrolled descent, the data showed the collective position was raised and corresponding parameters, such as torque and Nr (main rotor rpm) changed correspondingly in an expected response.

The DECU dump file captured the accident flight. The data showed that engine operation was nominal until about 30 seconds prior to the end of the recording. During the approach to landing, about 7 seconds prior to initial ground impact, collective was added and the gas generator reached the DECU TOP (take off power) embedded limit of 101.29%. The collective continued to hold the high pitch demand and the N2/Nr (power turbine speed/main rotor speed) began to droop, reaching 93.7513% about 3 seconds prior to initial impact. The collective was then lowered and the Nr began to recover at 96.68102%; however, in the next second, the collective was raised again and the Nr drooped to 87.8914% about 1 second prior to initial ground impact. At about initial ground impact, the collective was completely lowered and Nr was at 89.64968%. Nominal Nr was 104%.

After initial ground impact, Nr increased to 102.5405% and collective was raised again. About 2 seconds after initial ground impact, Nr abruptly went to zero, consistent with Nr sensor impact damage. Several faults began to appear on the DECU as the unit switched to degraded mode.

About 6 seconds after initial ground impact, N2 was at 124.2205%, consistent with the physical evidence of the rotor mast shearing during the impact sequence followed by the power turbine overspeed protection blade shedding.

Survival Aspects

An examination of the fuselage, doors, interior, seats, and restraints, and emergency equipment revealed no evidence of preaccident anomalies or malfunctions.

Additional Information

The NTSB published a Safety Alert in March, 2017, on the hazards related to loss of tail rotor effectiveness. The alert included the following information:

“In helicopters, loss of tail rotor effectiveness (LTE), or unanticipated yaw, is an uncommanded rapid yaw that does not subside on its own accord. LTE can occur in all single-engine, tail rotor-equipped helicopters at airspeeds lower than 30 knots and, if uncorrected, can cause the pilot to lose helicopter control, potentially resulting in serious injuries or death.

Various factors can contribute to LTE, including varying airflow from the main rotor blades (particularly at high power settings) or from the environment, which can affect the airflow entering the tail rotor; operating at airspeeds below translational lift; operating at high altitudes and high gross weights; operating near large buildings or ridgelines, which can cause turbulence; and the relative wind direction.”

Administrative Information

Investigator In Charge (IIC):	Hicks, Ralph
Additional Participating Persons:	Marquin Israel; FAA/FSDO; Tampa, FL Gary Howe; Bell ; Fort Worth, TX Bryan Larimore; Safran Helicopter Engines; Grand Prairie, TX Beverly Harvey; TSB Bernard Boudaille; BEA
Original Publish Date:	April 25, 2024
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=106087

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