Aviation Investigation Final Report

Location:	Guernsey, California	**Accident Number:**	WPR23LA313
Date & Time:	August 9, 2023, 12:30 Local	**Registration:**	N861CC
Aircraft:	Bell OH-58A	**Aircraft Damage:**	Substantial
Defining Event:	Mast bumping	**Injuries:**	1 Minor
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The pilot was conducting an aerial application flight and initiated a climbing left turn to return to the field. The helicopter's low rotor rpm warning light illuminated, and the pilot heard the low rotor audio tone in his headset. The pilot lowered the collective to attempt to regain engine and rotor speed while maneuvering to avoid a drainage culvert. The right skid contacted the culvert, and the helicopter rolled over onto its right side; the helicopter sustained substantial damage to the fuselage and the tail rotor had separated from the tailboom.

Examination of the helicopter, including the transmission and hydraulic systems, revealed no preaccident mechanical malfunctions or failures that would have precluded normal operation. The tailboom was completely separated just aft of the horizontal stabilizers, severing the tail rotor and gear box. Witness marks from the main rotor blades were observed on the tail rotor driveshaft cover, aft of the horizontal stabilizers. A test run of the engine revealed no anomalies.

The helicopter was loaded about 21 pounds below its maximum gross weight and operated in a high-temperature environment. Performance calculations based on the pilot's estimates of environmental conditions and the helicopter's weight revealed 5-minute maximum power availability of about 92% torque. It is likely that while trying to maintain the climbing left turn, which required increased lift due to the increased load factor, the pilot demanded more power than the engine could produce and overpitched the main rotor blades. The resulting low rotor speed led to a reduction of lift and stiffness and lag in the flight control response, which the pilot interpreted as a hydraulics failure.

It is likely that while the pilot maneuvered to avoid the culvert, the low rotor speed allowed the main rotor blades to flap down and sever the tailboom. At the same time, the main rotor hub

teetered downward and fractured the mast, which separated the main rotor system from the transmission.

Probable Cause and Findings

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

The pilot's overpitching of the main rotor blades while maneuvering at low altitude in a high-temperature environment at high gross weight, which resulted in a reduction of engine and rotor speed, excessive main rotor blade flapping, mast bumping, and impact with terrain.

Findings

Personnel issues	Use of equip/system - Pilot
Personnel issues	Aircraft control - Pilot
Personnel issues	Incorrect action performance - Pilot
Aircraft	Powerplant parameters - Capability exceeded
Aircraft	Main rotor blade system - Capability exceeded

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of control in flight
Maneuvering-low-alt flying	Attempted remediation/recovery
Maneuvering-low-alt flying	Mast bumping (Defining event)
Maneuvering-low-alt flying	Collision with terr/obj (non-CFIT)

On August 9, 2023, about 1230 Pacific daylight time, a Bell OH-58A helicopter, N861CC, sustained substantial damage when it was involved in an accident near Guernsey, California. The pilot sustained minor injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 137 aerial application flight.

The pilot reported that before conducting his third aerial application flight of the day, he had reloaded the hopper and refueled the helicopter. He departed the staging area, then conducted "a complete scan of all temperatures and pressures of vital helicopter systems, all of which were within normal operating limits." After completing his first pass from north to south about 65 mph and 25 ft above ground level (agl), he initiated a 180° climbing left turn. Halfway through the turn, when the helicopter was on an easterly heading, about 100 ft agl and with an airspeed about 35 kts, the helicopter's low rotor rpm warning light illuminated and the pilot heard the low rotor audio tone in his headset.

The helicopter was banked about 30° left when the pilot lowered the collective to regain main rotor rpm within normal operating limits; he immediately noticed a "stiffness and lag" in the flight controls, which he associated with a loss of hydraulic pressure. He continued the descending left turn and was able to return the helicopter to a level attitude and touch down upright on both skids; however, the right skid contacted a drainage culvert and the helicopter rolled over onto its right side.

The field elevation at the accident site was 194 ft, and the pilot estimated the temperature was 90°F, with variable winds at 2–7 kts and 5-kt gusts. Using these estimates, the density altitude was about 2,387 ft. Automated weather reporting, located at Hanford Municipal Airport (HJO), Hanford, California, about 12 nautical miles northeast of the accident site at an elevation of 249 ft mean sea level, reported the temperature was 88°F, with wind from 190° at 4 kts.

Postaccident examination of the helicopter revealed impact damage to the right side of the fuselage, and the upper-right fuselage airframe was fracture separated at the front door post and windscreen. The tailboom revealed a concave depression about mid-span on the left side and downward flexing of the tail rotor driveshaft. The tailboom was completely separated just

aft of the horizontal stabilizers, severing the tail rotor and gear box. Witness marks from the main rotor blades were observed on the tail rotor driveshaft cover, aft of the horizontal stabilizers. The tail rotor assembly remained attached to the gearbox and the vertical stabilizers sustained minor impact damage. The main rotor hub was separated from the mast. Both main rotor blade leading edges revealed yellow paint transfer on the outboard third of each blade. The outboard third of one of the main rotor blades was completely severed.

Examination of the transmission revealed no deformations to the gear teeth on the drive or vertical shaft. The rotor tachometer generator was intact. The oil pump and variable delivery hydraulic pump were removed from the transmission and damage to the rotational shaft was observed. The hydraulic fluid reservoir contained ample hydraulic fluid, with the suction and return lines tight to touch. The servo actuators and valve circuits were secure. The hydraulic boost solenoid circuit breaker and force trim circuit breakers were not popped.

Postaccident examination of the engine revealed no preaccident mechanical malfunctions or failures that would have precluded normal operation. The engine performed within manufacturer specifications during a test run at various power settings.

The manufacturer's technical manual stated that "hydraulic power failure will be evident when the force required for control movement increases; a moderate feedback in the cyclic and collective controls is felt and the HYD PRESS caution light illuminates. Control movements will result in normal aircraft response in every respect." According to the FAA Helicopter Flying Handbook (FAA-H-8083-21B), an impending hydraulic failure can be recognized by a "grinding or howling noise from the pump or actuators, increased control forces and feedback, and limited control movement." The pilot reported that he did not know if the hydraulic pressure caution light illuminated because he was tending to the low rotor rpm.

The pilot estimated that the weight of the helicopter at the time of the accident was 3,179 lbs, about 21 lbs less than its maximum gross weight. The manufacturer's technical manual stated that rotor rpm limitations were 93% minimum and 110% maximum. Furthermore, the manual stated that the low rotor warning system is activated when rotor rpm drops below 95 ± 1.4%; the rotor rpm is governed by the engine rpm during powered flight.

According to the performance section of the manufacturer's technical manual, when operating in the environmental conditions estimated by the pilot, the torque required for the helicopter to conduct an out-of-ground effect hover was a minimum of 86%. The 5-minute continuous power limitation was 85–100% torque. Additionally, the manual cautioned that low-altitude maneuvering below 35 kts is not recommended in conditions where the power required to hover out of ground effect exceeds maximum continuous power. The maximum continuous power in the environmental conditions estimated by the pilot was about 92% torque.

The pilot reported that the helicopter was in a 30° left bank during the onset of the lower rotor rpm condition. The FAA Helicopter Flying Handbook states, "When you bank a helicopter while maintaining a constant altitude, the 'G' load or load factor increases…To overcome this

additional load factor, the helicopter must be able to produce more lift." The Handbook further states that at 30° of bank or pitch, the load factor, and thus the lift required to maintain altitude, is increased by 16% of the helicopter's gross weight.

According to the FAA Helicopter Flying Handbook, good practices to follow during maneuvering flight include understanding the following flight characteristics:

> Left turns, torque increases (more antitorque).
> Application of forward cyclic (especially when immediately following aft cyclic application), torque increases and rotor speed decreases.
> Know where the winds are.
> In steep turns, the nose drops. In most cases, energy (airspeed) must be traded to maintain altitude as the required excess engine power may not be available (to maintain airspeed in a 2G/60° turn, rotor thrust/engine power must increase by 100%). Failure to anticipate this at low altitude endangers the crew and passengers. The rate of pitch change is proportional to gross weight and density altitude.

The FAA Helicopter Flying Handbook also states that low rotor rpm can lead to a power-on rotor stall:

> Known as "overpitching," this can easily occur at higher density altitudes where the engine is already producing its maximum horsepower and the pilot raises the collective. The corresponding increased angle of attack of the blades requires more engine horsepower to maintain the speed of the blades; however, the engine cannot produce any additional horsepower, so the speed of the blades decreases.

According to the manufacturer's technical manual, "Droop is defined as the speed change in N2 rpm as power is increased from a no-load condition." Additionally, the manual stated, "If N2 power is allowed to droop, other than momentarily, the reduction in rotor speed could become critical. If N2 droop occurs, but low rpm warning is not activated and N2 recovers to 100% within 5 seconds, and further droop is not experienced, this is considered a normal flight characteristic."

Pilot Information

Certificate:	Commercial	**Age:**	41,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 None	**Last FAA Medical Exam:**	May 5, 2023
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 26, 2023
Flight Time:	8842 hours (Total, all aircraft), 7000 hours (Total, this make and model), 8819 hours (Pilot In Command, all aircraft), 314 hours (Last 90 days, all aircraft), 153 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N861CC
Model/Series:	OH-58A	**Aircraft Category:**	Helicopter
Year of Manufacture:	2013	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	71-20861
Landing Gear Type:	None; Skid	**Seats:**	2
Date/Type of Last Inspection:	March 20, 2023 Annual	**Certified Max Gross Wt.:**	3200 lbs
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:	6168.7 Hrs as of last inspection	**Engine Manufacturer:**	Rolls Royce
ELT:	Not installed	**Engine Model/Series:**	250-C20C (T63-A720)
Registered Owner:	BLAIR HELICOPTER SERVICE	**Rated Power:**	420 Horsepower
Operator:	BLAIR HELICOPTER SERVICE	**Operating Certificate(s) Held:**	Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KHJO,249 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	11:53 Local	**Direction from Accident Site:**	52°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	190°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.91 inches Hg	**Temperature/Dew Point:**	31°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Stratford, CA	**Type of Flight Plan Filed:**	None
Destination:	Guernsey, CA	**Type of Clearance:**	None
Departure Time:	12:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Minor	**Aircraft Damage:**	Substantial
Passenger Injuries:	N/A	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	1 Minor	**Latitude, Longitude:**	36.189063,-119.617(est)

Administrative Information

Investigator In Charge (IIC):	Hicks, Michael
Additional Participating Persons:	Jeremy Alexander; FAA; Fresno, CA
Original Publish Date:	August 27, 2025
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=192867