



National Transportation Safety Board Aviation Accident Final Report

Location:	Tooele, UT	Accident Number:	WPR11LA151
Date & Time:	03/01/2011, 0830 MST	Registration:	N206BY
Aircraft:	BELL 206B-III	Aircraft Damage:	Substantial
Defining Event:	Loss of control in flight	Injuries:	2 None
Flight Conducted Under:	Part 91: General Aviation - Other Work Use		

Analysis

While accompanying a pilot who was developing further proficiency in helicopter long-line external load operations, the accident pilot, who had a total time of 1.5 hours in the make and model helicopter that was being flown, was offered the opportunity to fly an external load circuit. During the circuit, which was the pilot's first long-line experience in that make and model helicopter, the helicopter suddenly began to yaw to the right as it approached the point where the load was going to be placed on the ground. The pilot at the controls was unable to arrest the yaw, and during his attempt to regain control of the helicopter, it descended into the terrain. A postaccident examination of the helicopter found no evidence of any anomaly or malfunction that would have contributed to a loss of 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 did not maintain yaw control of the helicopter during a maneuvering hover. Contributing to the accident was the pilot's lack of experience in the make and model helicopter.

Findings

Aircraft	Yaw control - Not attained/maintained (Cause)
Personnel issues	Incorrect action performance - Pilot (Cause)
	Total experience w/ equipment - Pilot (Factor)
	Aircraft control - Pilot (Cause)

Factual Information

On March 1, 2011, about 0830 mountain standard time, a Bell 206B-III, N206BY, impacted the terrain near the north end of Tooele Valley Airport, Tooele, Utah. The commercial pilot, who was employed by the operator, and the Airline Transport Pilot (ATP), who had accompanied her on the flight, were not injured, but the helicopter, which was owned by N206BY LLC, and operated by Upper Limit Aviation, sustained substantial damage. The 14 Code of Federal Regulations Part 91 local area personal proficiency flight, which departed Salt Lake City International Airport about one hour prior to the accident, was being operated in visual meteorological conditions. A company visual flight rules flight plan had been filed and activated.

According to the commercial pilot, who had accumulated about 85 hours of flight time in a Bell 206, the primary purpose of the flight was for her to gain additional experience and proficiency in helicopter long-line external load operations, in preparation for participation in the operator's upcoming FAR Part 133 contract. Upon arriving at Tooele Valley Airport, the ATP exited the helicopter, inspected the long-line (which was hooked to a net with a 50 pound tire in it), connected the long-line to the helicopter, removed both forward cockpit doors, and then re-entered the helicopter. The commercial pilot then picked the helicopter and the long-line load off the ground, and established a working pattern altitude about 500 to 600 feet above ground level (agl). She then flew three separate approaches to the airport's compass rose, where she brought the helicopter to a stationary hover, and placed the external load upon the surface.

After her third approach, the commercial pilot offered the ATP the opportunity to fly an approach to place the long-line load in the same location. The ATP, who had accumulated a total of 1.5 hours of flight time in a Bell 206, none of which included long-line operations, then took control of the helicopter. He first flew a downwind leg, and then began the final approach to the compass rose. When the ATP started his final approach portion of the pattern, the commercial pilot put her head out the door in order to observe the load hanging below the helicopter. While he was on final approach, the ATP kept the helicopter about 140 to 150 feet agl, which placed the external load about 30 to 40 feet agl. As he continued to move toward the compass rose, the helicopter was flying into a headwind of about 3 knots, and was moving forward about 10 to 12 knots. Reportedly, as the load approached the compass rose, the helicopter began an uncommanded yaw to the right. The ATP put in left pedal, but he was unable to arrest the nose right yaw. At the same time that the helicopter started yawing to the right, its nose pitched up slightly, which the pilot countered with forward cyclic input, which successfully arrested the upward movement of the nose. Because the helicopter continued to yaw to the right, the ATP lowered the collective and added additional forward cyclic in an attempt to arrest the yaw and gain additional airspeed. At that point in time, without advising the ATP, the commercial pilot applied some additional downward pressure to the collective in an effort to lower it still further, and then reportedly took her hands off the collective (although the ATP reported feeling what he thought were both downward and upward collective inputs from the commercial pilot as the helicopter neared the terrain). Shortly thereafter the helicopter impacted the terrain in a slight nose low shallow right bank on a heading of about 300 degrees. Immediately after the initial ground contact, which was on the forward portion of the right skid, the helicopter rolled onto its right side, coming to rest on a heading of about 210 degrees. As the helicopter rolled onto its side, the main rotor blades came in contact with the

terrain, and the main rotor mast fractured at the location where it comes in contact with the static stops. During the accident sequence, one of the main rotor blades also contacted and severed the helicopter's tail boom. After the helicopter came to rest, the engine was still running, so the ATP shut the engine down by rolling the throttle past the detent to the full off position, while at the same time the commercial pilot moved the fuel shut-off valve toggle switch to the off position.

In a phone interview with the NTSB Investigator-In-charge (IIC) about 30 minutes after the accident, both pilots said that they were not sure what had initiated the accident sequence. Both pilots stated that the onset of the yaw was without warning, and that there was no audible or visual indication of a loss of engine power or main rotor rpm. The commercial pilot said that at the time of the initiation of the yaw, her vision was focused entirely outside, and therefore she did not know what the engine or rotor instruments were indicating at that time.

The helicopter was recovered to the facilities of the operator, where it underwent an inspection by a team made up of the NTSB IIC, an FAA Inspector from the Salt Lake City Flight Standards District Office, and an accident investigator from Bell Helicopter Company. That inspection determined that the main rotor mast had fractured in a manner consistent with overload, as a result of the over-travel of the hub assembly, and forces generated when the mast made contact with the static stops. It could not be determined whether the static stop contact occurred as a result of a main rotor blade impacting the ground, or as a result of a main rotor blade hitting the tailboom. It was also determined that the freewheeling unit had fractured adjacent to the drive-spline, in a manner consistent with forces generated upon impact. Due to the direction of the impact and the helicopter's attitude at the time of impact, those forces would have resulted in the front of the engine being displaced downward, while the transmission was being displaced both down and aft as a result of the combination of the downward impact forces and the aft forces generated by a main rotor blade impacting the ground at the right front of the helicopter. The main driveshaft was inspected, and it revealed that there was rotational scoring displayed on the spike plate, and the flexures at the transmission end of the drive shaft were fractured in a manner consistent with the transmission being displaced to a degree that the main driveshaft made contact with the spike plate while still being driven. Preimpact control continuity was confirmed, with all control tube fractures displaying 45 degree shear-lips consistent with overload. All attachment hardware was either in place, or was confirmed to have been removed by the FAA prior to the beginning of the inspection process. Rotational scoring and torsional twisting of the components throughout the drive system was consistent with the presence of energy at the time of impact, and evidence of preimpact drive continuity was displayed by damage and scarring to the rotor blades, main driveshaft, spike plate, and the tail rotor driveshaft. At the conclusion of the inspection process no evidence had been found of any preimpact anomaly or malfunction associated with the helicopter's airframe or flight control system.

History of Flight

Maneuvering-hover

Loss of control in flight (Defining event)

Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	43, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Left
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane Single-engine; Helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last Medical Exam:	08/09/2010
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	12/28/2010
Flight Time:	7760 hours (Total, all aircraft), 2 hours (Total, this make and model), 6831 hours (Pilot In Command, all aircraft), 75 hours (Last 90 days, all aircraft), 6 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Pilot Information

Certificate:	Flight Instructor; Commercial	Age:	23, Female
Airplane Rating(s):	None	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	Seatbelt, Shoulder harness
Instrument Rating(s):	Helicopter	Second Pilot Present:	Yes
Instructor Rating(s):	Helicopter	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last Medical Exam:	01/14/2011
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	02/28/2011
Flight Time:	1779 hours (Total, all aircraft), 85 hours (Total, this make and model), 1688 hours (Pilot In Command, all aircraft), 135 hours (Last 90 days, all aircraft), 105 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BELL	Registration:	N206BY
Model/Series:	206B-III	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Restricted	Serial Number:	2871
Landing Gear Type:	Skid	Seats:	5
Date/Type of Last Inspection:	02/17/2011, 100 Hour	Certified Max Gross Wt.:	3350 lbs
Time Since Last Inspection:		Engines:	1 Turbo Shaft
Airframe Total Time:	11939 Hours	Engine Manufacturer:	ALLISON
ELT:	C126 installed, activated, did not aid in locating accident	Engine Model/Series:	250-C20 SER
Registered Owner:	N206BY LLC	Rated Power:	420 hp
Operator:	Upper Limit Aviation	Air Carrier Operating Certificate:	

Meteorological Information and Flight Plan

Observation Facility, Elevation:		Observation Time:	
Distance from Accident Site:		Condition of Light:	Day
Direction from Accident Site:		Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear / 20000 ft agl	Temperature/Dew Point:	-3° C
Lowest Ceiling:	None	Visibility	10 Miles
Wind Speed/Gusts, Direction:	3 knots, 170°	Visibility (RVR):	
Altimeter Setting:	30.2 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Salt Lake City, VI (KSLC)	Type of Flight Plan Filed:	Company VFR
Destination:	Tooele, UT (KTVY)	Type of Clearance:	None
Departure Time:	0733 MST	Type of Airspace:	

Airport Information

Airport:	Tooele Valley (KTVY)	Runway Surface Type:	
Airport Elevation:	4321 ft	Runway Surface Condition:	
Runway Used:	N/A	IFR Approach:	
Runway Length/Width:		VFR Approach/Landing:	

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None		

Administrative Information

Investigator In Charge (IIC):	Orrin K Anderson	Adopted Date:	04/24/2012
Additional Participating Persons:	Lyndsay Carlson; Salt Lake FSDO; Salt Lake City, UT Harold Barrentine; Bell Helicopter; Keller, TX		
Publish Date:	04/24/2012		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=78476		

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