



Aviation Investigation Final Report

Location:	WINTER PARK, Florida	Accident Number:	MIA97FA172
Date & Time:	May 22, 1997, 17:10 Local	Registration:	N61PP
Aircraft:	Bell 206B	Aircraft Damage:	Destroyed
Defining Event:		Injuries:	3 Serious
Flight Conducted Under:	Part 91: General aviation		

Analysis

Witnesses observed the helicopter hovering out of ground effect with a tailwind. The nose of the helicopter pitched nose high and the helicopter started to hover backwards. The nose yawed right and back to the left, and then started spinning to the right descending with the nose pitching up and down before the helicopter disappeared from view behind a tree line. Examination of the helicopter revealed no evidence of a precrash mechanical failure or malfunction of the airframe, flight controls, engine assembly or accessories. Review of the pilots logbook revealed he had not flown the helicopter in six months. The pilot stated he had not received any instruction in the loss of tailrotor effectiveness or uncommanded left or right yaw. He was not aware of the conditions required for this phenomenon to occur or what corrective action should be taken. Review of the flight manual revealed no written procedures pertaining to loss of tailrotor effectiveness or unanticipated right yaw.

Probable Cause and Findings

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

The pilots improper in-flight planning/decision to conduct an out of ground effect hover with a tailwind resulting in an in-flight loss of directional control due to loss of tailrotor effectiveness/unanticipated right yaw, and subsequent in-flight collision with a tree and terrain. Contributing to the accident was the manufactures inadequate written procedures in the flight manual, and the pilot's inadequate training pertaining to the loss of tailrotor effectiveness/unanticipated right yaw.

Findings

Occurrence #1: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: HOVER - OUT OF GROUND EFFECT

Findings

1. WEATHER CONDITION - TAILWIND
2. (C) IN-FLIGHT PLANNING/DECISION - IMPROPER - PILOT IN COMMAND
3. (F) PROCEDURE INADEQUATE - MANUFACTURER
4. OUT OF GROUND EFFECT - PERFORMED - PILOT IN COMMAND
5. (F) INADEQUATE TRAINING(EMERGENCY PROCEDURE(S)) - PILOT IN COMMAND
6. DIRECTIONAL CONTROL - NOT MAINTAINED - PILOT IN COMMAND
7. LOSS OF TAIL ROTOR EFFECTIVENESS - ENCOUNTERED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT

Phase of Operation: DESCENT - UNCONTROLLED

Occurrence #3: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: DESCENT - UNCONTROLLED

Findings

8. (C) OBJECT - TREE(S)

Occurrence #4: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Findings

9. TERRAIN CONDITION - GROUND

Factual Information

HISTORY OF FLIGHT

On May 22, 1997, about 1710 eastern daylight time, a Bell 206B, N61PP, registered to Highlands Helicopter Service Inc., operating as a 14 CFR Part 91 photography flight, experienced an in-flight loss of control while hovering out of ground effect with a tailwind, and crashed in a residential area in Winter Park, Florida. Visual meteorological conditions prevailed and no flight plan was filed. The helicopter was destroyed. The commercial pilot and two passengers sustained serious injuries. The flight originated from Orlando Executive Airport, Orlando, Florida, about 7 minutes before the accident.

The photographer stated he was located in the right rear seat behind the pilot and the other passenger was in the left front seat. They departed Orlando Executive Airport and flew to the vicinity of the Naval Training facility to take some photos. They elected not to photograph the facility and traveled southwest bound towards the bank located at 1560 Orange Avenue. He did not know what altitude they were at, but he overheard some conversation on the aircraft radio that they would be at or below 700 feet. They came to a hover heading westbound with a wind from the east and he took several photos of the bank out of the right rear window. They started to move forward, the helicopter started pitching up and down like a boat in the water. He heard a loud noise which came from behind him. There was no conversation between anyone in the helicopter, and he did not hear any alarms over the headset. The helicopter started spinning, collided with a tree, hit the ground, and came to rest on its right side.

A witness stated he observed the helicopter traveling westbound before it stopped and came to a hover estimated between 100 feet to 500 feet east of highway 1792. The helicopter pitched slightly nose down and forward. The nose was observed to pitch nose high and the helicopter started to hover backwards. The nose yawed to the right and back to the left, and then started spinning to the right descending with the nose pitching up and down before the helicopter disappeared from view behind a tree line. Other witnesses also observed the helicopter traveling westbound in the vicinity of highway 1792. The helicopter stopped, came to a hover, hovered backwards, the nose dropped down and the helicopter began spinning to the right and disappeared from view below the tree line.

PERSONNEL INFORMATION

Review of the pilot's logbook revealed the pilot had recorded 382.7 total rotary wing flight hours of which 286.8 hours were as pilot-in-command (PIC). He had recorded as logged 221.5 hours in the Bell 206 of which 194.5 hours were as the PIC. Review of records on file with the FAA Information Management Section, Oklahoma City, Oklahoma, revealed the pilot recorded on his application for a second class medical certificate on November 2, 1995, that

he had 1,275 total civilian flight hours. Review of an aircraft insurance quote on June 13, 1995, revealed the pilot had 1900 total flight hours with 207 hours in the Bell 206. Review of an application for aircraft insurance on September 30, 1995, indicated the pilot had accumulated 1,970 hours, 718 rotorcraft hours with 220 hours in the Bell 206. The pilot called Alexander Aviation Associates Inc, Orlando, Florida, about 2 hours before the accident requesting liability insurance coverage for N61PP. The pilot indicated he had 2,010 total flight hours with 260 hours in the Bell 206. Review of training records on file at Bell Helicopter, indicate the pilot attended off site recurrency training on January 13, 1993. The pilot indicated he had 105 helicopter hours, had flown 20 helicopter hours in the last 6 months of which 50 hours were flown in the Bell 206. The instructor indicated in the remarks, "Owns the company. Low time helicopter pilot. Stuck to the basics. Showed how to do autos to a spot. Nice technique in autos, but still a little hesitant. Needs more 206 time. No problems at his level." The pilot attended 206B refresher training at the Bell Helicopter Training Academy from November 8, 1993, through November 12, 1993. The pilot indicated on the registration form that he had 210 total helicopter flight hours with a 150 hours in the Bell 206. The pilot received 6.6 hours of dual instruction. The instructor stated in the remarks that, "Pat performs all maneuvers very well for his hour level. Commercial pilot maneuvers were weak and instruction had been sporadic but passable at this level. Recommend emergency procedures recurrency with John Ball before departure. Safe and competent." The pilot attended off site training in Orlando, Florida, from February 20, 1995, through February 21, 1995, and flew 1 hour of dual instruction. The instructor stated in the remarks, "safe in all maneuvers-weak! Recommend refresher in 12 mos."

The pilot stated in an interview that the last time he flew the helicopter before the accident was November 1, 1996, and that he could not remember any of the events after he departed on the photography flight. He further stated that he had not received any instruction in the loss of tailrotor effectiveness or uncommanded left or right yaw. He was not aware of the conditions required for this phenomenon to occur or what corrective action should be taken. When asked if he had received a copy of FAA Advisory Circular 90-95, unanticipated right yaw in helicopters, he stated no.

AIRCRAFT INFORMATION

Review of the helicopter logbook revealed the last recorded annual inspection was conducted on November 1, 1996, and the helicopter had accumulated 7219.2 hours. The hour meter was destroyed, and no additional records were located to indicate time flown since the annual inspection. Review of refueling records on file at Executive Air Center Inc., revealed that N61PP had 30 gallons of fuel added on November 1, 1996. According to the airframe inspector who signed off the last annual inspection, the 30 gallons of fuel was added to the helicopter after he tracked the main rotor blades which brought the total fuel quantity to 50 gallons. The helicopter was flown by the owner back to the east ramp of the airport. Numerous engine run-ups were conducted by the owner, but the helicopter has not been flown since the annual inspection.

METEOROLOGICAL INFORMATION

Visual meteorological conditions prevailed at the time of the accident. Review of weather information obtained from Orlando Executive Airport, for the time period of the accident, revealed the winds were 070 degree at 15 knots. A controller at Orlando Executive Control Tower stated the winds were out of the northeast between 5 to 20 knots with gusts when N61PP took off VFR northbound. A television helicopter pilot who responded to the crash site in a Bell 206 helicopter stated he hovered his helicopter east bound into the wind. The wind was described as stiff with gusts.

WRECKAGE AND IMPACT INFORMATION

The wreckage of N61PP was located in the in the backyard of a private residence located at 1451 Norfolk, Winter Park, Florida.

Examination of the crashsite revealed the helicopter collided with a tree about 60 feet above the base of the tree while rotating around its vertical axis to the right in a nose-down attitude. The tailboom separated about 6 inches forward of the leading edge of the right horizontal stabilizer, in a downward direction. There was no evidence of either a main rotor or tail rotor impact with the tailboom, and the 90-degree gearbox was in place. The right horizontal stabilizer was not damaged. The left horizontal stabilizer sustained extensive impact damage and tree bark was imbedded in the outboard end of the stabilizer. The vertical stabilizer sustained minor damage. The helicopter collided with the ground in a nose-down attitude, and came to rest on its right side on a heading of 135 degrees magnetic. The high skid landing gear remained attached to the airframe, and was removed by crash rescue personnel. The cross tubes remained in position and there was no evidence of lateral shift. The right flight step was bent up and out, and the aft cross tube mount was separated. The right skid tube tip separated forward of the forward cross tube ankle. The center section of the right skid tube between the ankles was broken in two pieces, and the skid heel remained attached to the rear ankle. The left flight step separated, but the remainder of the step remained attached to the cross tubes. The left skid tow, forward of the ankle separated with the remainder of the skid tube attached to the aft ankle. The fuel system was not ruptured, however fuel exited the fuel system through the fuel vent. Browning of vegetation was present in the vicinity of the fuel vent. The crash debris line extended 40 feet from the main wreckage on a heading of 240 degrees magnetic.

Examination of the main rotor system and tailrotor system revealed no evidence to indicate a precrash mechanical failure or malfunction. The main rotor blades and tail rotor blades were not marked in accordance with the Bell Helicopter Maintenance Manual. For identification purposes all blades were marked "WHITE" or "RED" followed by the appropriate serial number. The "WHITE" main rotor blade spar (SN: T-21215), separated in two sections. The blade tip failed downward 4 feet 8 inches inboard from the blade tip, and was located 40 feet from the main wreckage. The second spar separation occurred outboard of the doubler stack in an upward direction. The intermediate section of the blade remained attached to the

root end by the trailing edge spline. Chordwise scarring was present on the bottom of the rotor blade, and no leading edge damage was noted. The "RED" main rotor blade spar (SN: T-20275), separated at the outboard end of the doubler stack in an upward direction. The remainder of the rotor blade remained attached to the root end by the trailing edge spline. Chordwise scarring was located on the bottom of the rotor blade, and no leading edge damage was noted. The outboard 3 feet of the trailing edge was crushed inward toward the leading edge. The "WHITE" tail rotor blade (SN: TAC-3679), had a dent about 1 inch in length on the leading edge inboard surface. The tail rotor blade was buckled about 1 foot from the blade tip, with the leading edge bent aft. The "RED" tail rotor blade (SN: CS-665) was not damaged.

Examination of the airframe and flight control assembly revealed no evidence of a precrash mechanical failure or malfunction. All components necessary for flight were present at the crash site. Continuity of the flight control system was confirmed for pitch, roll, and yaw.

Examination of the main transmission, engine to transmission driveshaft, overrunning clutch, tailrotor transmission, and chip detectors revealed no evidence of any precrash mechanical failure or malfunction.

The engine assembly and accessories were removed and transported to an authorized repair facility in Miami, Florida, for further analysis. Disassembly of the engine and accessories revealed no evidence of a precrash mechanical failure or malfunction. No engine data plate was installed on the engine.

MEDICAL AND PATHOLOGICAL INFORMATION

The pilot sustained a closed head injury with right frontal contusion, subarachnoid hemorrhage, pneumocephalus, left optical contusion, left traumatic optic neuropathy, respiratory failure, and multiple facial fractures. Toxicology studies of specimens from the pilot were performed by the Orlando Regional Healthcare System, Orlando, Florida. These studies were negative for drugs and alcohol.

TEST AND RESEARCH

Advisory Circular 90-95 states, "LTE is a critical, low-speed aerodynamic flight characteristic which can result in an uncommanded rapid yaw rate which does not subside of its own accord and, if not corrected, can result in the loss of aircraft control. LTE is not related to a maintenance malfunction and may occur in varying degrees in all single main rotor helicopters at airspeeds less than 30 knots. LTE is not necessarily the result of a control margin deficiency....Any maneuver which requires the pilot to operate in a high-power, low airspeed environment with a left crosswind or tailwind creates an environment where unanticipated right yaw may occur....The aircraft characteristics and relative wind azimuth regions are:... Weathercock stability (120 degrees to 240 degrees). (See figure 2.) Tailwinds from 120 degrees to 240 degrees, like left crosswinds, will cause a high pilot workload. The most significant characteristic of tailwinds is that they are a yaw rate accelerator. Winds within

this region will attempt to weathervane the nose of the aircraft into the relative wind. This characteristic comes from the fuselage and vertical fin. The helicopter will make a slow uncommanded turn either to the right or left depending upon the exact wind direction unless a resisting pedal input is made. If a yaw rate has been established in either direction, it will be accelerated in the same direction when the relative winds enter the 120 to 240-degree area unless corrective pedal action is made. If the pilot allows a right yaw rate to develop and the tail of the helicopter moves into this region, the yaw can accelerate rapidly. It is imperative that the pilot maintain positive control of the yaw rate and devote full attention to flying the aircraft when operating in a downwind condition.

Review of the Bell Jet Ranger II, model 206B flight manual revealed no written procedures pertaining to loss of tail rotor effectiveness or unanticipated right yaw phenomenon.

ADDITIONAL INFORMATION

The certified flight instructor (CFI) who administered the pilot's last biennial flight review on January 31, 1996, stated in an interview, that he discussed LTE/unanticipated right yaw and critical wind azimuth utilizing AVN-460 U.S. Department of Transportation, FAA handout with the pilot, however Appendix 1. Sample Flight Review Plan And Checklist signed and dated by the CFI and the pilot does not support the CFI's statement.

The wreckage of N61PP was released to Mr. Mark J. Fry, Links Automotive Inc., Orlando, Florida, on May 24, 1997. The engine assembly and accessories was released to Mr. Steven E. Milburn, Airwork Miami, on May 27, 1997. The helicopter logbooks were released to Mr. James P. Perrott, son of the injured pilot, on May 29, 1997. The pilot's logbooks were released to Mr. Patrick E. Perrott, on August 26, 1997.

Pilot Information

Certificate:	Commercial; Private	Age:	66, Male
Airplane Rating(s):	Single-engine land; Multi-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	Last FAA Medical Exam:	November 2, 1995
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	1275 hours (Total, all aircraft), 222 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N61PP
Model/Series:	206B 206B	Aircraft Category:	Helicopter
Year of Manufacture:		Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	1369
Landing Gear Type:	High skid	Seats:	5
Date/Type of Last Inspection:	November 1, 1996 Annual	Certified Max Gross Wt.:	3200 lbs
Time Since Last Inspection:		Engines:	1 Turbo shaft
Airframe Total Time:		Engine Manufacturer:	Allison
ELT:	Not installed	Engine Model/Series:	250-C20
Registered Owner:	HIGHLANDS HELICOPTER SERVICE I	Rated Power:	400 Horsepower
Operator:	PATRICK E. PERROTT	Operating Certificate(s) Held:	None
Operator Does Business As:		Operator Designator Code:	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	ORL ,113 ft msl	Distance from Accident Site:	3 Nautical Miles
Observation Time:	16:50 Local	Direction from Accident Site:	330°
Lowest Cloud Condition:	Scattered / 5500 ft AGL	Visibility	7 miles
Lowest Ceiling:	Broken / 8500 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	15 knots / None	Turbulence Type Forecast/Actual:	/
Wind Direction:	70°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	30 inches Hg	Temperature/Dew Point:	28°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	ORLANDO (ORL)	Type of Flight Plan Filed:	None
Destination:		Type of Clearance:	None
Departure Time:	17:03 Local	Type of Airspace:	Class D

Airport Information

Airport:		Runway Surface Type:	
Airport Elevation:		Runway Surface Condition:	
Runway Used:	0	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	None

Wreckage and Impact Information

Crew Injuries:	1 Serious	Aircraft Damage:	Destroyed
Passenger Injuries:	2 Serious	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	3 Serious	Latitude, Longitude:	28.590147,-81.340766(est)

Administrative Information

Investigator In Charge (IIC):	Smith, Carrol
Additional Participating Persons:	BEN R COLEMAN; ORLANDO , FL JOSEPH A SYSLO JR.; FORT WORTH , TX SCOTT S SCHEURICH; INDIANAPOLIS , IN
Original Publish Date:	February 2, 1998
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=38141

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