



Aviation Investigation Final Report

Location:	Chauvin, Louisiana	Accident Number:	CEN17FA112
Date & Time:	February 27, 2017, 10:33 Local	Registration:	N1371
Aircraft:	Bell 407	Aircraft Damage:	Destroyed
Defining Event:	Controlled flight into terr/obj (CFIT)	Injuries:	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Positioning		

Analysis

The commercial pilot was repositioning the helicopter from an offshore oil platform to the operator's home base in visual meteorological conditions. When the helicopter did not return as expected, the operator initiated a search; the helicopter wreckage was found in a shallow marsh area just off shore. No radio distress calls were received from the pilot, and the skid-mounted emergency float system was not deployed. Onboard flight-following equipment recorded a straight flight path tracking directly to the intended destination with a gradual descent just prior to impact.

Accident flight data extracted from the helicopter's engine control unit did not show any faults with the engine. Detailed examinations of the helicopter's airframe, drive system, and flight controls did not reveal any preimpact anomalies. Examination and full teardown of the engine did not reveal any anomalies and indicated that the engine was operating at the time of impact.

Airframe deformations were consistent with a slightly nose-low and left-skid-down attitude at the time of impact; therefore, it is unlikely that the pilot experienced a loss of control. Given the absence of mechanical anomalies, the fact that the pilot did not make a distress call or activate the emergency float system, and the helicopter's relatively straight recorded flight path, it is likely that the helicopter was operating normally at the time of impact. Further, toxicology testing and autopsy findings did not indicate any evidence of pilot impairment. It could not be determined why the pilot failed to recognize the helicopter's descent and maintain a proper altitude above the water.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to maintain proper altitude resulting in a collision with water for

reasons that could not be determined based on the available information.

Findings

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

Factual Information

History of Flight

Enroute	Controlled flight into terr/obj (CFIT) (Defining event)
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On February 27, 2017, about 1033 central standard time, a Bell 407 helicopter, N1371, was destroyed when it impacted marshy water 15 miles southwest of Houma, Louisiana (HUM). The commercial pilot was fatally injured. The repositioning flight was operated by Westwind Helicopters under the provisions of Title 14 *Code of Regulations (CFR)* Part 91. Visual meteorological conditions prevailed throughout the area and a company flight plan was activated. The flight originated at 1014 from offshore oil platform South Timbalier ST37, Gulf of Mexico.

Before the accident flight, the helicopter had completed a 14 *CFR* Part 135 passenger flight from HUM to ST37, dropping off 2 passengers. The passengers reported that the flight to ST37 was normal. According to the operator, the pilot was to return the helicopter to HUM for a minor repair of an engine cowling fastener. The pilot was the only person on board for the approximate 30-minute flight to HUM.

The helicopter was equipped with an on-board flight tracking system (Sky Connect). After takeoff from ST37, six flight path data points were recorded at 2-minute intervals and showed the helicopter on a northwest heading. Sky Connect data showed the flight path of the helicopter flying direct toward HUM on a northwest heading. Sky Connect Flight Path Data Points:

- 1 Heading 207 degrees, altitude 108 feet, ground speed 8 knots (ST37 Departure)
- 2 Heading 337 degrees, altitude 728 feet, ground speed 148 knots
- 3 Heading 336 degrees, altitude 699 feet, ground speed 144 knots
- 4 Heading 336 degree, altitude 486 feet, ground speed 144 knots
- 5 Heading 336 degrees, altitude 548 feet, ground speed 150 knots
- 6 Heading 336 degrees, altitude 374 feet, ground speed 148 knots (Last Recorded Point)

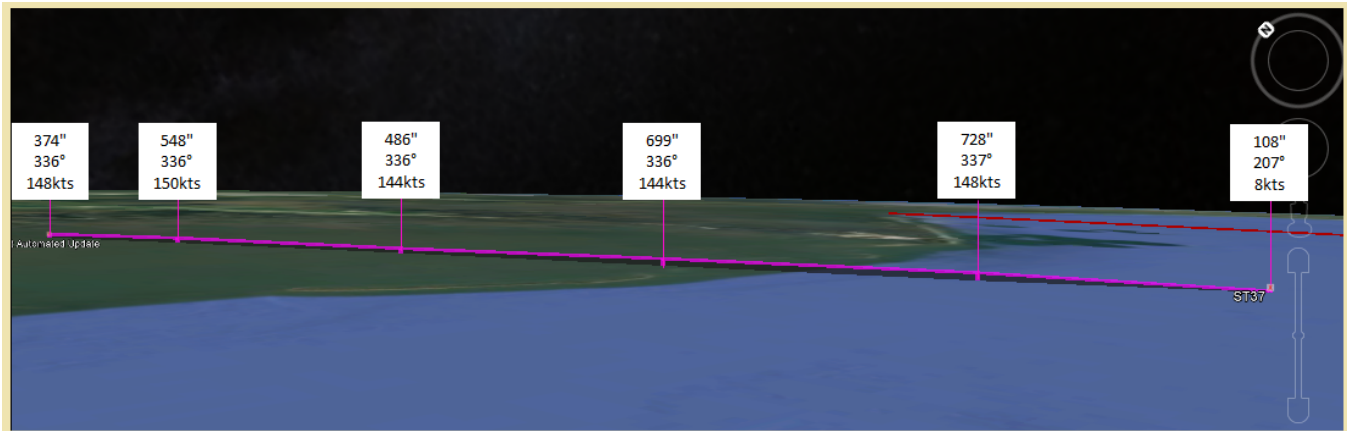


Figure. Sky Connect Flight Path

The figure shows the helicopter's altitude, heading, and ground speed; ST37 is located at the right of the figure. The last Sky Connect data point was at 1024, indicating an altitude of 374 ft and ground speed of 148 knots. Sky Connect issued an "Overdue" alarm at 1033. At 1103, company flight monitoring personnel dispatched a search helicopter, and the wreckage was found at 1135 about 15 miles south-southeast of HUM.

There were no reported witnesses to the accident. There were no radio or distress calls heard from the helicopter, and the helicopter's Sky Connect emergency button was not activated.

Pilot Information

Certificate:	Commercial; Private	Age:	28, Male
Airplane Rating(s):	Single-engine land	Seat Occupied:	Right
Other Aircraft Rating(s):	Helicopter	Restraint Used:	4-point
Instrument Rating(s):	Airplane; Helicopter	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	Yes
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	June 29, 2016
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	December 12, 2016
Flight Time:	2265 hours (Total, all aircraft), 123 hours (Total, this make and model), 2193 hours (Pilot In Command, all aircraft), 140 hours (Last 90 days, all aircraft), 51 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

The pilot held a commercial pilot certificate with rotorcraft-helicopter and instrument ratings. He was hired by Westwind Helicopters on July 17, 2016. His total flight time as of February 27, 2017 was 2,266 hours, all of which was in light helicopters. His total flight time in the accident helicopter make and model was 120 hours. He had flown 140 flight hours in single-engine helicopters in the 90 days before the accident. According to pilot training records provided by the operator, the pilot was current and qualified in offshore Part 135 flight operations. His

most recent Federal Aviation Administration (FAA) second-class medical certificate was issued in June 2016 with no limitations.

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	Registration:	N1371
Model/Series:	407 NO SERIES	Aircraft Category:	Helicopter
Year of Manufacture:	1997	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	53182
Landing Gear Type:	N/A; Emergency float; Skid	Seats:	6
Date/Type of Last Inspection:	February 16, 2017 100 hour	Certified Max Gross Wt.:	5250 lbs
Time Since Last Inspection:	680 Hrs	Engines:	1 Turbo shaft
Airframe Total Time:	9135 Hrs as of last inspection	Engine Manufacturer:	ALLISON
ELT:	C126 installed, not activated	Engine Model/Series:	250-C47
Registered Owner:	GM LEASING COMPANY LLC	Rated Power:	650 Horsepower
Operator:	Westwind Helicopters	Operating Certificate(s) Held:	On-demand air taxi (135)

Westwind Helicopters leased the helicopter, serial number (S/N) 53182, from GM Leasing in April 2015. It had a total airframe time of 9,146.8 hours at the time of the accident. The helicopter was equipped with an Allison 250C47B turbo shaft engine (S/N CAE847222) with a total time of 15,510.6 hours. According to maintenance records provided by the operator, the most recent 100-hour inspection was completed on February 16, 2017, at 9,125.5 airframe hours.

Maintenance records indicated compliance with all required scheduled maintenance inspections, applicable service bulletins, and applicable airworthiness directives. A review of the maintenance logbooks by the NTSB IIC did not reveal any uncorrected scheduled or unscheduled maintenance actions.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	HUM, 15 ft msl	Distance from Accident Site:	15 Nautical Miles
Observation Time:	09:50 Local	Direction from Accident Site:	156°
Lowest Cloud Condition:	Scattered / 1000 ft AGL	Visibility	5 miles
Lowest Ceiling:	Broken / 2200 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	12 knots / 17 knots	Turbulence Type Forecast/Actual:	/ Unknown
Wind Direction:	150°	Turbulence Severity Forecast/Actual:	/ Unknown
Altimeter Setting:	30.12 inches Hg	Temperature/Dew Point:	24°C / 21°C
Precipitation and Obscuration:			
Departure Point:	GOM ST37, GM (ST37)	Type of Flight Plan Filed:	Company VFR
Destination:	Houma, LA (HUM)	Type of Clearance:	VFR flight following
Departure Time:	10:14 Local	Type of Airspace:	Class E

At 0950, the weather observation at HUM included wind from 150° at 12 knots gusting to 17 knots, visibility 5 statute miles with haze, scattered clouds at 1,000 ft and a broken ceiling at 2,200 ft, temperature 24°C, dew point 21°C, and an altimeter setting of 30.12 inches of mercury.

The search pilot reported that the conditions in the area of the accident site included 5-7 miles visibility with ceilings above 700 ft about 1130.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	29.43926,-90.590591(est)

General

The wreckage was found in shallow marsh waters south of Timbalier Bay, about 15 miles south-southeast of HUM. The wreckage was recovered and transported to a salvage facility in Baton Rouge, Louisiana. The recovered portions included the main fuselage, tailboom, the main rotor drive system, main rotor blades, engine, tail rotor blades and tail rotor gearbox, and landing gear with skid-mounted float assembly.

Detailed examinations of the recovered components were conducted under the supervision of the NTSB

investigator-in-charge. The FAA, Westwind Helicopters, Rolls Royce, and Bell Helicopter participated in the airframe examinations at Southern Aircraft Recovery on March 2-3, 2017. The Rolls-Royce engine was examined under the supervision of the FAA on March 3, 2017, at Arrow Aviation, Broussard, Louisiana. The Engine Control Unit (ECU) was transported to Triumph Engine Controls in West Hartford, Connecticut, for data extraction. The following are summaries of the examinations.

Airframe

The airframe was destroyed by impact forces upon water contact, breaking into several pieces. Airframe deformations were consistent with a slightly nose low and left skid down orientation at the time of impact. The left forward Dzus fastener on the engine cowling that was reported loose at the ST37C platform was missing, and the cowling mounting hole was found fractured. The left side of the helicopter exhibited more damage than the right side, including doors, landing gear, and cockpit and nose area. The tailboom remained connected to the aft fuselage and the aft fuselage was separated from the aft engine firewall bulkhead. The tailboom was relatively intact with two slight bends to the left. The vertical fin exhibited a tail rotor strike to its bottom surface, consistent impact forces occurring after the tail rotor gearbox departed its mounting location.

The skid-mounted float system was not deployed.

Rotors

All four main rotor blades exhibited spar and afterbody damage consistent with impact forces, but no spar fractures were observed. The top blade surface balance pocket weights located near the blade tips' leading edges were all intact, remaining firmly attached to the blade spars. The bottom blade surface balance pocket weights located near the blade tips' trailing edges had all departed from their mounting pockets in the blades afterbody surfaces.

All four main rotor yoke arms were significantly damaged from impact forces, exhibiting delamination and fractures of the composite yoke flexure structure. All hub bearings were damaged consistent with overtravel. Up-stops and down-stops were significantly damaged, consistent with impact forces.

Both tail rotor blades remained connected to their respective yoke arms. Both blades were relatively intact with one blade exhibiting trailing edge blade tip skin delamination consistent with impact forces.

No pre-impact anomalies were found in the main or tail rotor systems and the damages found were consistent with rotation at impact.

Flight Controls and Hydraulics

The cockpit area was destroyed by impact forces. The helicopter was equipped with single controls at the pilot's station. The vertical tunnel where four vertical flight control tubes transit was found fractured consistent with impact at top and bottom surfaces. All four control tubes exhibited overload fractures at the top of the vertical tunnel and the right cyclic pitch control tube was found fractured in overload about 1 ft from the bottom of the tube. The cyclic was intact and remained connected to the control system. Cyclic movement revealed corresponding movement of the vertical control tubes. The collective

was fractured at its cast base, consistent with impact forces. The collective jackshaft was intact but displaced due to extensive cockpit damage. Control linkages to the main rotor servos were found intact. All three main rotor servos and mounting support structures were intact, including intact nut and locking tabs at the spool valve wire drive to spool control lever connections.

Tail rotor control system fractures were found at various locations due to airframe impact damage. The tail rotor pitch control was found intact.

The hydraulic manifold was found intact and the hydraulic reservoir was full of hydraulic fluid. Both the pressure line to the manifold and the rotor brake hydraulic line were found fractured, consistent with overload forces. The bypass pop-out buttons for both the pressure and return lines were not extended. The hydraulic pump remained attached to the main transmission, but the elbow pressure fitting was found fractured consistent with impact forces.

No pre-impact anomalies were found in the flight control or hydraulic systems.

Drive System

The mast was intact and the chip detectors were clean. The main KaFlex driveshaft exhibited flexure fractures at both forward and aft locations consistent with overload at impact. The KaFlex outer diameter exhibited minimal rotational signatures. The transmission end KaFlex coupling could not be rotated by hand. The top case of the transmission was removed, revealing significant magnesium corrosion from the transmission case between the planetary and ring gear teeth, preventing rotation of transmission gearing. All observed gears were intact. Transmission mounting to the airframe was secure. The fore/aft pylon elastomeric restraints were both damaged. The left restraint was found fractured consistent with overload impact forces and the right restraint was bent.

The forward steel short shaft under the engine remained connected to the engine end, but the aft spline coupling separated from the oil cooler shaft due to airframe impact deformations just forward of the oil cooler. The tail rotor driveshaft was found intact from the oil cooler to the most aft tail rotor driveshaft segment. Rotation of the driveshaft was inhibited due to crushing of the oil cooler fan shroud against the oil cooler fan. The last tail rotor driveshaft segment exhibited a fractured coupling attachment ear, consistent with overload impact forces on the tail rotor gearbox. Three of the four gearbox studs were found fractured. The right forward stud was found intact and a small piece of tail rotor gearbox casting material was found fractured, consistent with overload forces. The mounting spot faces on the gearbox support casting did not exhibit fretting, consistent with instantaneous fracture of the three studs. The tail rotor gearbox rotated by hand with moderate resistance.

No pre-impact anomalies were found with the drive system.

Fuel System

The airframe fuel filter canister contained water and fuel with a heavy fuel smell, consistent with water immersion. The paper filter was relatively clean with water droplets in the paper element folds. The main fuel cell exhibited breaches consistent with airframe impact damage. Several fuel line breaks were observed, consistent with impact damage. The fuel valve was found in the closed position.

Engine

The helicopter had been submerged in salt water for about 3 days before examination and was torn away from the airframe during the impact sequence. Both engine mounts had torn away at the airframe end and remained attached to the engine case. A section of airframe material remained attached to the engine by interface fuel and oil lines. Overall, the engine exhibited minimal impact damage with all modules and engine accessories in their normal respective positions. The fuel filter bypass button was found extended. Beginning corrosion was noted to the accessory gear box, consistent with salt water submersion. The exhaust stack remained attached to the engine and displayed minor impact damage. The stack was impacted with extending down and into the fourth stage turbine wheel area. The mud was removed from the stack. A small bag containing chip detector removal tools was found in the mud. Following a visual examination, the engine was given a fresh water rinse to remove the mud.

Engine Disassembly

Before disassembly, neither the N1 nor N2 drive trains could be rotated by hand. The compressor module was externally normal in appearance. One impeller blade leading edge exhibited foreign object debris impact damage, with a tear about 1/4-inch inboard from the tip and deflection of the blade tip in the direction opposite rotation. Multiple impeller blades displayed deflection and slight bending of the blades in the direction opposite of rotation. The impeller shroud displayed areas of rotational scoring from contact with the impeller, with corresponding rub damage noted to the impeller blades near the knee area. The diffuser vanes were in position and undamaged. The scroll was undamaged. The bleed valve remained in position but displayed a fracture in the center port of the bypass line, consistent with impact forces near the port.

The accessory gearbox displayed corrosion; however, no visible impact damage was noted. Separation of the gearbox case and cover revealed heavy internal corrosion of both the case and the cover. All internal gearing was in position and other than corrosion coating, the gearing was all visually normal and undamaged. The oil pump and piccolo tube were both in position and visually undamaged.

The turbine module remained in normal position and exhibited no visible damage. The thermocouple harness was in position and all probe tips were normal with no evidence of excessive temperatures. Removal and separation of the turbine module revealed water and mud throughout the gas path. Separation of the gas producer rotor showed that the stage one and stage two nozzles and wheels were visually normal and undamaged. Disassembly of the power turbine rotor revealed that the stage three wheel and nozzle were visually normal and undamaged. The stage four nozzle exhibited rotational scoring in the blade track of the stage four wheel with corresponding rub damage noted to the wheel's outer rim knife seals. The exhaust collector support was in proper position displaying no evidence of damage.

The outer combustion case remained in position and displayed minor impact denting on the right shoulder area. Both left and right compressor air discharge tubes remained in position and were properly seated on both the forward and aft ends. Removal of the outer combustion case and the combustor liner revealed no evidence of excessive streaking or temperature.

N1 shafting, to include the spur adapter gear shaft and the turbine to compressor coupling, were visually normal and undamaged. Both the turbine splined adapter and compressor splined adapter were in position and visually normal. N2 shafting, consisting of the power turbine inner shaft, power turbine outer shaft and power turbine to pinion gear coupling, were normal in appearance.

The CEFA filter was removed and examined. Removal of the oil filter bowl revealed evidence of an oil/water mix. The filter was visually normal and free of debris. Removal of the fuel filter bowl revealed clear, clean liquid with the odor of jet fuel. The fuel filter and bowl were clean and free of debris.

All engine main bearings were visually normal. All balls and/or rollers were visually normal and exhibited no damage. The hydromechanical unit (HMU) remained in position and displayed no external damage. The main drive shaft was in position and visually normal. The fuel nozzle was visually normal and the nozzle screen free of debris. The engine control unit (ECU) was placed into a fresh water rinse at recovery. Visual examination of the ECU revealed no evidence of case damage or water intrusion.

Medical and Pathological Information

The Terrebonne Medical Examiner's Office, Houma, Louisiana, performed an autopsy of the pilot on February 28, 2017. The cause of death was blunt trauma.

The FAA Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology testing of the pilot. No drugs, ethanol, or carbon monoxide were detected.

Tests and Research

The ECU was transported to Triumph Engine Controls in West Hartford, Connecticut, for data extraction. The accident flight data did not show any faults with the engine. The operator reported that the normal airspeed for a return flight from offshore is typically about 120 knots. The Sky Connect data showed ground speeds between 144 and 148 knots.

Additional Information

After the accident, the operator implemented a Flight Operational Quality Assurance (FOQA) program to install Flight Data Management (FDM) equipment in all company aircraft to capture flight data,

cockpit audio, and imagery on all flights.

Administrative Information

Investigator In Charge (IIC):	Lemishko, Alexander
Additional Participating Persons:	Lisa Cotham; FAA FSDO; Baton Rouge, LA David Gutowski; FAA FSDO; Baton Rouge, LA John Ickles; FAA FSDO; Baton Rouge, LA Myron Hillers; Westwind Helicopters; Santa Fe, TX Neil Collins; Westwind Helicopters; Santa Fe, TX Dave Riser; Rolls Royce; Indianapolis, IN
Original Publish Date:	February 22, 2018
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=94783

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