Aviation Investigation Final Report

Location:	Intracoastal City, Louisiana	**Accident Number:**	CEN13FA003
Date & Time:	October 5, 2012, 07:58 Local	**Registration:**	N406AL
Aircraft:	Bell 407	**Aircraft Damage:**	Substantial
Defining Event:	VFR encounter with IMC	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

According to the operator, the pilot was performing a local postmaintenance flight following a routine phase check that had been completed the previous evening. Several witnesses reported seeing the helicopter start up and enter a low altitude hover before it hover-taxied toward the runway. One witness reported that she saw the helicopter depart on the runway heading and disappear into fog or a low cloud ceiling. Another witness, who also was a pilot employed by the operator, reported that there was mist, fog, and a low cloud ceiling when the helicopter departed.

Recovered flight data indicated that, about 20 seconds after takeoff, the helicopter reached a maximum altitude of 255 feet and ground speed of 51 knots while still on the runway heading. The helicopter then entered a left descending turn, during which, it reached a maximum bank angle of 38 degrees to the left and a 20-degree nose-down pitch angle. The helicopter also achieved a 1,600 ft per minute descent during the turn. After turning about 200 degrees from the original departure heading, the helicopter descended into trees and terrain in a nose-low, left-skid-low attitude.

The postaccident examination of the helicopter revealed no evidence of a preimpact failure or malfunction that would have precluded normal operation. Additionally, the engine exhibited damage consistent with it operating at the time of impact. The witness accounts of the helicopter climbing into a low cloud ceiling during initial climb and the subsequent descending left turn shown by the recovered flight data were consistent with the pilot inadvertently encountering instrument meteorological conditions and then attempting a course reversal. Additionally, the helicopter's descent rate and pitch and bank angles during the course reversal were consistent with the pilot lacking a discernible horizon or ground reference to maintain control of the helicopter. Although the helicopter was equipped with basic attitude instrumentation and avionics, it was not certified for flight under instrument flight rules (IFR). Additionally, although he held an instrument rating for helicopters, the pilot was not current for IFR operations nor was it required for his employment as a pilot of helicopters limited to visual flight rules operations.

Probable Cause and Findings

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

The pilot's decision to attempt a local flight in marginal visual meteorological conditions and his subsequent loss of control following an inadvertent encounter with instrument metrological conditions shortly after takeoff.

Findings

Environmental issues	Low ceiling - Decision related to condition
Environmental issues	Fog - Decision related to condition
Personnel issues	Decision making/judgment - Pilot
Personnel issues	Aircraft control - Pilot
Personnel issues	Spatial disorientation - Pilot
Aircraft	(general) - Not attained/maintained

Factual Information

History of Flight

Initial climb	VFR encounter with IMC (Defining event)
Initial climb	Loss of visual reference
Maneuvering-low-alt flying	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On October 5, 2012, about 0758 central daylight time, a Bell 407 helicopter, N406AL, was substantially damaged when it collided with terrain shortly after takeoff from Central Industries Airport (2LA0), near Intracoastal City, Louisiana. The commercial pilot, who was the sole occupant, was fatally injured. The helicopter was registered to and operated by Bristow US LLC, under the provisions of 14 Code of Federal Regulations Part 91 while on a company flight plan. Day instrument meteorological conditions (IMC) prevailed for the postmaintenance flight that was originating at the time of the accident.

According to the operator, the pilot was performing the postmaintenance flight to identify if there was any residual oil left behind during a routine phase check that had been completed the previous evening. At 0756, the pilot sent an electronic message to the company's flight-following center located in New Iberia, Louisiana, to activate his local flight plan and to report having 1 hour of fuel on-board.

Several witnesses reported seeing the helicopter startup and enter a low altitude hover over the landing pad before it hover-taxied toward runway 24. One witness reported that she saw the helicopter depart on the runway heading and disappear into fog or a low cloud ceiling. Several witnesses reported hearing a sound consistent with a ground impact shortly after the helicopter had departed toward the southwest.

Pilot Information

Certificate:	Commercial	**Age:**	62
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	April 18, 2012
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 8, 2012
Flight Time:	11386 hours (Total, all aircraft), 619 hours (Total, this make and model), 11262 hours (Pilot In Command, all aircraft), 118 hours (Last 90 days, all aircraft), 43 hours (Last 30 days, all aircraft), 7 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) records, the pilot, age 62, held a commercial pilot certificate with helicopter and instrument helicopter ratings. His last aviation medical examination was

completed on April 18, 2012, when he was issued a second-class medical certificate with a limitation for corrective lenses.

According to flight time records provided by the operator, the pilot had accumulated 11,386 hours of flight experience, of which 11,262 hours were logged as pilot-in-command. All of the pilot's accumulated flight experience had been completed in helicopters. He had accumulated 619 hours in a Bell model 407 helicopter. He had logged 455 hours at night, 279 hours in instrument meteorological conditions, and 155 hours in simulated instrument conditions. The operator reported that since being hired, in November 2000, the pilot had accumulated 5.0 hours of simulated instrument time. Additionally, the operator reported that the pilot had accumulated 0.5 hours of simulated instrument time in the 12 months preceding the accident. According to the operator, the pilot was qualified and approved to fly Bell models 206 and 407 helicopters; however, neither helicopter model was certified for instrument flight rules (IFR) operations. The pilot's most recent FAA Part 135 Proficiency/Qualification Check for the Bell model 407 helicopter was satisfactorily completed on February 8, 2012. Additionally, on August 15, 2012, the pilot received a separate FAA Part 135 Proficiency/Qualification Check in a Bell model 206 helicopter.

The pilot had logged 446 hours during the past year, 222 hours during the prior 6 months, 118 hours during previous 90 days, and 43 hours in the last 30 days. The operator reported that the pilot had flown 7 hours within the 24 hour period before the accident flight.

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N406AL
Model/Series:	407	**Aircraft Category:**	Helicopter
Year of Manufacture:	2001	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	53481
Landing Gear Type:	High skid	**Seats:**	7
Date/Type of Last Inspection:	October 4, 2012 AAIP	**Certified Max Gross Wt.:**	5250 lbs
Time Since Last Inspection:	0 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	11466 Hrs at time of accident	**Engine Manufacturer:**	Rolls-Royce
ELT:	C126 installed, activated, did not aid in locating accident	**Engine Model/Series:**	250-C47B
Registered Owner:	Bristow US, LLC.	**Rated Power:**	650 Horsepower
Operator:	Bristow US, LLC.	**Operating Certificate(s) Held:**	On-demand air taxi (135)

The accident aircraft was a Bell Helicopter model 407, serial number 53481. The helicopter was configured to transport personnel to/from off-shore platforms. The FAA type certificate required one flight crew member (pilot) and permitted operations under day or night visual flight rules (VFR). Although the cockpit was equipped with flight attitude instrumentation and avionics, the accident helicopter was not certified for flight under IFR. The helicopter was powered by a Rolls-Royce model

250-C47B turboshaft engine, serial number CAE-847752, with maximum takeoff and maximum continuous power ratings of 650 and 600 shaft horsepower, respectively.

The helicopter was issued a normal category standard airworthiness certificate in June 2001. The helicopter was maintained under an approved aircraft inspection program. The most recent inspection, a routine phase inspection, was completed on October 4, 2012, at 11,465.5 hours total airframe time. The engine had accumulated 7,530.7 hours total time. A review of the available maintenance records did not reveal a history of outstanding maintenance discrepancies.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	IYA,16 ft msl	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	07:55 Local	**Direction from Accident Site:**	19°
Lowest Cloud Condition:		**Visibility**	0.25 miles
Lowest Ceiling:	Overcast / 200 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.13 inches Hg	**Temperature/Dew Point:**	20°C / 20°C
Precipitation and Obscuration:	In the vicinity - None - Fog		
Departure Point:	Intracoastal City, LA (2LA0)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Intracoastal City, LA (2LA0)	**Type of Clearance:**	None
Departure Time:	07:56 Local	**Type of Airspace:**	Class G

The closest weather observing station to the accident site was located at the Abbeville Chris Crusta Memorial Airport (IYA), about 13.6 miles north-northeast of the departure airstrip. At 0755, the IYA automated surface observing system reported: calm wind, visibility 1/4 mile with fog, an overcast ceiling 200 feet above ground level, temperature 20 degrees Celsius, dew point 20 degrees Celsius, and an altimeter setting of 30.14 inches of mercury.

A witness to the accident flight, who also was a pilot employed by the operator, reported that on the morning of the accident, before sunrise, instrument meteorological conditions prevailed at 2LA0 with a low cloud ceiling and ground fog. He reported that after sunrise, the weather conditions improved for a brief time, which allowed two helicopters to depart the airport under VFR conditions; however, shortly following the two departures, instrument meteorological conditions resumed at the airport. The witness reported that when the accident helicopter departed there was a low cloud ceiling, with mist and fog.

According to documentation provided by the operator, at 0634, the base manager issued a weather alert for ground fog and a zero surface visibility at 2LA0, and as such, all VFR helicopter operations were placed on a ground-hold. At 0713, the base manager upgraded the weather conditions to scattered ground fog. The improved weather conditions allowed VFR helicopter operations to proceed under "caution" without a requirement to consult the base manager. At 0722, a Bell model 407 (N687AL), departed 2LA0 under VFR conditions and the pilot issued a pilot report (PIREP) for scattered ground

fog, but clear weather conditions above the fog layer. Following the accident, at 0802, the base manager issued a weather alert for ground fog and reinstated the requirement that pilots consult with him before a planned VFR departure. At 0827, the base manager issued a weather alert for ground fog and a zero surface visibility. All helicopter operations were ceased following the 0827 weather alert.

Another operator based at 2LA0 reported that one of their helicopters had departed about 16 minutes before the time of the accident. The pilot of that helicopter reported that during departure he was able to see down the entire length of the airstrip (3,100 feet by 75 feet). However, after climbing above the surrounding tree line he observed ground fog, approximately 75-100 feet thick, immediately adjacent to the east side of the airbase near the Bristow facility. He reported that as he continued toward his planned destination, toward the west, there were no visibility restrictions.

Airport Information

Airport:	Central Industries Airport 2LA0	**Runway Surface Type:**	Grass/turf
Airport Elevation:	2 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	24	**IFR Approach:**	None
Runway Length/Width:	3100 ft / 75 ft	**VFR Approach/Landing:**	None

The Central Industries Airport (2LA0) was located about 1 mile north of Intracoastal City, Louisiana, and was used primarily for off-shore helicopter operations. The private-use airport was served by a single runway: 6/24 (3,100 feet by 75 feet, grass/turf). The airport elevation was 2 feet msl.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	29.787221,-92.158332

A postaccident investigation confirmed that all airframe structural components were located at the accident site. The initial point-of-impact was within a small grouping of trees located about 132 feet south-southwest of the main wreckage. At the initial point-of-impact, there were two small trees that exhibited limb and trunk damage about 20 feet above the ground. A third tree, located about 32 feet into the debris path, exhibited limb and trunk damage about 15 feet above the ground. The magnetic heading between the initial point-of-impact and the main wreckage was about 035 degrees. A depression that was attributed to the left toe skid appeared to be the first ground impact. The left float blow-down bottles were found within the initial ground impact depression. The remaining landing gear components were located between the initial ground impact depression and the main wreckage. The main wreckage

consisted of the entire fuselage and tailboom. The fuselage was found resting on its right side against trees and overgrowth. Flight control continuity could not be established due to multiple separations; however, all observed separations were consistent with overstress fractures. All four hydraulic control servos moved freely when manipulated by hand. The transmission, mast, and main rotor hub assembly had separated from the fuselage transmission mounts as a single unit. The main rotor and tail rotor drive systems exhibited impact damage and overstress separations. The main rotor blades remained attached to the hub; however, each blade exhibited bending and delamination consistent with ground impact. The tailboom had separated at the fuselage attach point and exhibited a second fracture immediately forward of the tail rotor gearbox. The tailrotor gear box output shaft rotated freely when moved by hand. One tail rotor blade was found fractured about midspan and the other blade appeared relatively undamaged. The airframe examination did not reveal any evidence of a preimpact failure or malfunction of the helicopter structure, drive train, flight controls, hydraulic system, and main and tail rotor systems that would have precluded normal operation. All observed airframe fractures were consistent with overload forces that were encountered during the impact sequence.

The engine remained attached to the fuselage by oil supply lines. The engine was found in a vertical position with the compressor section partially buried in dirt and mud. The N1 drive train did not rotate freely because of impacted dirt and vegetation found within the compressor inlet. After the debris was removed, the N1 drive train rotated freely between the starter generator and the compressor. Inspection of the compressor impeller revealed several blade tips that were bent in the opposite direction of rotation. The N2 drive train rotated freely between the No. 4 power turbine wheel and the power takeoff gear. About 1-tablespoon of fuel was collected from the supply line connected to the fuel nozzle. The fuel nozzle appeared undamaged. Other than the presence of dirt and debris, the combustion liner appeared undamaged and normal burn signatures were observed. Examination of the upper and lower magnetic chip detectors established that they were oil-covered and free of foreign material. The engine and its electronic control unit (ECU) were retained for additional examinations.

Flight recorders

The helicopter was equipped with an Appareo Flight Data Monitoring (FDM) system, which included a crash-hardened self-contained flight parameter data recorder. The FDM system consisted of a detached SD memory card storage unit, an internal GPS receiver, and an internal attitude reference unit. The system generated a new data file for each power-up cycle and could store approximately 200 hours of accumulated flight data. The recorded data was used by the operator for their Flight Operations Quality Assurance (FOQA) program. The system recorded 3-axis accelerometer data in addition to GPS positional data. The system, as configured on the accident helicopter, did not record indicated airspeed or any engine parameters. The system was designed to record data on two devices; a data collection device with non-removable memory and a separate removable SD memory card device that was used for normal data retrieval.

The recovered SD memory card contained records from the accident flight and the previous 98 power cycles. The accident flight data file was approximately 6 minutes in duration; however, there was only about 2 minutes of data associated with significant movement of the helicopter over the ground. The data for the accident flight began at 0752:43 (HHMM:SS). The helicopter maneuvered in a low-altitude

hover, at a nearly static location over the ground, until about 0756:50, when it began a hover taxi to the northeast. The helicopter turned northwest before it turned to a west-southwest course and began increasing altitude at 0757:55. The plotted position data established that the helicopter performed a takeoff using runway 24. About 20 seconds later, the helicopter reached a maximum altitude of 255 feet and ground speed of 51 knots while still on the departure runway heading. At this time the helicopter entered a left descending turn. During the descending turn, the helicopter reached a maximum bank angle of 38 degrees to the left and a 20 degree nose down pitch angle. The helicopter also achieved a 1,600 feet per minute descent during the turn. The final data point was recorded at 0758:30 with the helicopter at 37 feet altitude, rolled about 20 degrees to the left, and pitched 17 degrees nose down. The last recorded data point was located approximately 113 feet from the initial ground impact point and 255 feet from the final location of the main wreckage. As of the final recorded data point, the helicopter had turned about 200 degrees from the original runway heading. Download of the separate data collection device did not yield additional flight data beyond 0758:30.

Medical and Pathological Information

On October 8, 2012, an autopsy was performed on the pilot at the Louisiana Forensic Center, located in Youngsville, Louisiana. The cause of death for the pilot was attributed to multiple blunt-force injuries sustained during the accident.

The FAA's Civil Aerospace Medical Institute (CAMI) in Oklahoma City, Oklahoma, performed toxicology tests on samples obtained during the pilot's autopsy. Carbon monoxide, cyanide, and ethanol were not detected. Pioglitazone and Rosuvastatin were detected in blood and liver samples. Pioglitazone, brand name Actos, is a prescription oral antidiabetic agent used in the management of type 2 diabetes mellitus. Rosuvastatin, brand name Crestor, is a prescription medication used to treat elevated cholesterol.

According to FAA medical documentation, dating back to May 1980, the pilot never disclosed having been diagnosed with diabetes or elevated blood cholesterol levels. Additionally, the pilot did not report the use of any prescription or non-prescription medication on his most recent medical certificate application.

Tests and Research

On November 14, 2012, the engine electronic control unit (ECU) was examined at the Triumph Engine Control Systems factory located in West Hartford, Connecticut. An analysis of the nonvolatile data recovered from the ECU revealed that there were no malfunctions in the full authority digital engine control (FADEC) at the time of the accident. There were no unexpected records recorded in the engine history data. Additionally, no incident recorder information was stored on the device, indicating that no event triggers had been detected during the accident flight. The manufacturer attributed the lack of recorded faults during the accident flight to a sudden loss of FADEC system power at the time of

impact.

On February 19, 2013, an engine teardown inspection was completed at the Rolls-Royce factory located in Indianapolis, Indiana. The teardown inspection revealed damage to the compressor impeller blades, scoring of the aft impeller face, scoring of impeller inducer shroud, and scoring within the blade tracks of the gas producer and power turbine wheels. The observed damage was consistent with engine operation at the time of impact. Additionally, there was ingested dirt found throughout the engine air flow path. The engine teardown inspection did not reveal any mechanical anomalies that could be associated with a preexisting condition or failure that would have precluded normal engine operation.

Administrative Information

Investigator In Charge (IIC):	Fox, Andrew
Additional Participating Persons:	Albert Terry; Federal Aviation Administration; Baton Rouge, LA William Sarles; Bell Helicopter Textron, Inc.; Hurst, TX David Riser; Rolls-Royce Corporation; Indianapolis, IN Glen Girard; Bristow Group Inc.; New Iberia, LA
Original Publish Date:	March 10, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=85252