Aviation Investigation Final Report

Location:	Childress, Texas	**Accident Number:**	CEN13FA075
Date & Time:	November 27, 2012, 15:58 Local	**Registration:**	N28MP
Aircraft:	Hughes 369	**Aircraft Damage:**	Substantial
Defining Event:	External load event (Rotorcraft)	**Injuries:**	1 Fatal, 1 Serious
Flight Conducted Under:	Part 133: Rotorcraft ext. load		

Analysis

The helicopter was in a hover about 120-150 feet above the ground while a utility worker performing a long-line operation worked on a transmission tower. After the loss of power, the helicopter spun and descended during which the worker was pulled off the tower by the attached long line. The pilot performed an autorotation that resulted in a hard landing. The pilot sustained serious injuries and the worker sustained fatal injuries.

Postaccident examination of the helicopter revealed no usable fuel on board, and fuel quantities between the fuel tank and engine were consistent with fuel exhaustion. The examination revealed that the electrical wire to the start pump was not secured, which allowed for the possibility of it interfering with the fuel quantity transmitter float mechanism, thus providing erroneous cockpit fuel quantity indications to the pilot. The examination also revealed that the low fuel quantity annunciator was inoperative due to separation of the fuel quantity transmitter's low-level fuel whisker.

Recent maintenance of the helicopter's fuel system by the operator's maintenance personnel included the replacement of the start pump and testing of the low-level fuel light by electrically grounding the top of the fuel quantity transmitter using safety wire. A vacuum check of the fuel system was not performed after the fuel system had been opened. The method for testing the low-level fuel light and the lack of a vacuum check were not in accordance with the maintenance manual and the helicopter manufacturer's service bulletin relating to the start pump installation. Postaccident examination of the helicopter also revealed a nonstandard installation of an engine mounted fuel filter petcock drain valve.

No written company procedures and/or fueling records were available that required pilots to track fuel loading and time-based fuel consumption in order to determine time remaining for flights and their termination. The pilot stated that he would have the helicopter refueled when the fuel gauge indicated about 100 lbs. However, had the operator and/or pilot calculated the flight time remaining based on known fuel quantities that were independent of fuel gauge indications, then any fuel gauge inaccuracies would be have become apparent.

Probable Cause and Findings

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

The improper maintenance of the helicopter fuel system that resulted in erroneous fuel gauge indications and the pilot's inadequate fuel management, both of which resulted in fuel exhaustion during a long-line hover. Also causal was the lack of company procedures to ensure adequate maintenance and fuel planning.

Findings

Personnel issues	Installation - Maintenance personnel
Aircraft	Fuel indication system - Incorrect service/maintenance
Aircraft	Fuel - Fluid level
Aircraft	Fuel - Fluid management
Personnel issues	Use of available resources - Pilot
Organizational issues	Availability of policy/proc - Operator
Organizational issues	(general) - FAA/Regulator

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Prior to flight	Sys/Comp malf/fail (non-power)
Maneuvering-hover	Fuel exhaustion
Maneuvering-hover	Loss of engine power (total)
Maneuvering-hover	Loss of control in flight
Autorotation	External load event (Rotorcraft) (Defining event)
Autorotation	Collision with terr/obj (non-CFIT)

On November 27, 2012, about 1558 central standard time, a MD Helicopters, Inc. MD 500D (Hughes 369D), N28MP, experienced a loss of engine power during long-line power line construction. The helicopter subsequently impacted terrain during a forced landing near the transmission tower where the work was being performed. The helicopter received substantial damage. The commercial pilot sustained serious injuries, and the long-line worker was fatally injured. The helicopter was registered to and operated by Brim Equipment Leasing Inc. (D.B.A. Brim Aviation) under the provisions of 14 Code of Federal Regulations Part 133 as an external-load operation flight. Visual meteorological conditions prevailed for the flight that originated near the accident site, which was about two miles northeast of Childress, Texas.

The long-line operation consisted of a 50 foot long-line with a web seat attached to and suspended underneath the helicopter. The long-line worker was performing work on the power line while attached to the helicopter hovering overhead.

The pilot said that they had planned to hang travelers on a section of east/west power line towers on the day of the accident. He said that on the day of the accident, a 15-gallon fuel load was "working best." His rule for refueling was that he obtained fuel when the fuel gauge indication was close to 100 pounds, which he said would almost allow a ½-hour of flight time.

A company mechanic said that the first operation of the day was to unclip the lines. A full load of fuel was loaded onto the helicopter with only the main tank fueled. He said that he remembered filling the helicopter with fuel two times and each time 15 gallons of fuel was loaded, which was the amount specified by the pilot. The mechanic did not know how much fuel was added prior to the accident. The mechanic said that the helicopter was gone for about an hour since its last refueling prior to the accident. The fuel added was not recorded in a log.

About 1400, the pilot departed on a flight to repair a section of fiber optic line that fell down before work continued on the towers. He then flew back and landed at the landing zone where the helicopter was re-rigged for crew operations and refueled. He lifted off with the long-line worker, and they worked on several towers. A traveler was hung on the tower near the accident site, and the helicopter was

positioned in a stable hover about 120-150 feet above the ground. The helicopter experienced a pronounced sharp left yaw, which the pilot thought was from a wind gust. The pilot said that it was "milliseconds" between the left yaw and the engine "winding down." The pilot did not hear any unusual noises or vibrations before the loss of engine power and the only annunciation he had time to see was the engine-out annunciation. He did not see any other red/yellow annunciators illuminate. The pilot applied right pedal input. The helicopter started to settle, and he then heard the engine out horn and saw the engine out light illuminate. The pilot's first thought was to get away from the tower because the helicopter would have hit the lower arm of the tower. As the helicopter moved away from the tower, he looked at the horizon and estimated that the helicopter was about 50 feet above the ground when he "bottomed out the collective." The helicopter settled faster and onto the ground in a right-side-low attitude.

A long-line worker on the ground said that he was about 200-300 feet away from the helicopter when he "heard all the sound go away" and "it just shut down," while the helicopter was on the north side of the tower. The helicopter then spun clockwise 180 degrees when it lost power. He said the helicopter "seemed" to spin and turn "pretty fast" and did not recall how fast it spun. He said that the long-line worker was hanging on the traveler when he was pulled off the traveler by the long-line.

The long-line worker that was on the ground and witnessed the accident stated there was no easy way for a long-line worker to release from a harness and it would take several seconds to do so. The pilot stated there was no company policy or procedure for the release of the long-line. The pilot said that he could not "specifically say" that he was trained to release the long-line. If a long-line worker wanted to get off of the long-line, he had to be "jettisoned." The pilot said that for the long-line worker to jettison themselves, they would have to use a knife to cut the long-line.

Pilot Information

Certificate:	Commercial	**Age:**	42
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 None	**Last FAA Medical Exam:**	December 19, 2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	June 14, 2012
Flight Time:	2700 hours (Total, all aircraft), 800 hours (Total, this make and model), 2500 hours (Pilot In Command, all aircraft), 60 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

The pilot held a commercial pilot certificate with a rotorcraft-helicopter rating. He reported a total aircraft flight time of 2,700 hours, of which 800 hours were in the MD 500D (Hughes 369D) helicopters.

Since 1990, he was a helicopter pilot in law enforcement and search and rescue operations. Since 2009, he was a helicopter pilot in Part 91, 133, and 135 operations. Until September 2012, he was employed as a full-time pilot flying Eurocopter helicopters for power line and freight flights, after which he was

employed on a part-time basis.

On September 16, 2012, he was hired by Brim Aviation as a helicopter pilot. On September 17 and September 18, 2012, he received pilot training at Brim Aviation that was comprised of ground and flight training. Company Pilot Training and Qualification Record showed that the pilot's ground training consisted of ground testing, and the flight training consisted of two flights. The record did not indicate total flight, ground, and testing hours received by the pilot nor flight maneuvers he performed and the results of those maneuvers. The record had only two entries by the company president, who was also the company's director of operations, which stated the pilot passed knowledge and skill requirements outlined in Part 133 and 137. There were no entries to identify who provided and the pilot's flight instruction. During the pilot's post-accident interview, he identified the company instructor/check airman as the person who provided his flight training and testing.

The pilot did not have a Federal Aviation Administration (FAA) record of any previous incidents, accidents, or enforcement actions.

The pilot had been off work for several weeks prior to beginning work on November 26, 2012. The pilot said that he left his home in Chico, California, on November 24, 2012, to travel to Texas to begin work on November 26, 2012. On November 26, 2012, he slept all night and woke up once to go to the bathroom and woke up again at 0730 to start his work day. He worked until 0830-0900, returned to the hangar at 1000 after further flying was cancelled due to wind conditions, and went to bed about 2230. On the day of the accident, he left the crew quarters located in Childress, Texas, about 0700 and drove about 20-30 minutes to the hangar where the helicopter was kept near Wellington, Texas.

Part 133 did not have any crew member duty time/rest requirements. The pilot said that his work duration was dependent on a combination of daylight, time, and number of towers. In the southern areas of the country, work duration was driven by daylight.

Post-accident examination of the helicopter revealed one bottle of 5-hour ENERGY drink in the glove box between the front seats of the helicopter. The pilot said that he did not take any prescription or over-the-counter medications before the accident flight. He said that he does not consume any alcoholic beverages while on work trips and did not consume 5-hour ENERGY drinks.

The pilot stated that he did not have any safety concerns pertaining to Brim Aviation.

Aircraft and Owner/Operator Information

Aircraft Make:	Hughes	**Registration:**	N28MP
Model/Series:	369 D	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	970191D
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Turbo shaft
Airframe Total Time:		**Engine Manufacturer:**	Allison Engine Company
ELT:	Installed, not activated	**Engine Model/Series:**	250-C20B
Registered Owner:	Brim Equipment Leasing Inc	**Rated Power:**	420 Horsepower
Operator:	Brim Equipment Leasing Inc	**Operating Certificate(s) Held:**	Rotorcraft external load (133)
Operator Does Business As:	Brim Aviation	**Operator Designator Code:**	BV0L

The aircraft was a MD Helicopters, Inc. MD 500D (Hughes 369D), serial number 970191D, helicopter certified under Civil Air Regulations (CAR) Part 6. The helicopter was purchased by and registered to Brim Equipment Leasing Inc. in 2005 and was used in long-line and law enforcement operations.

The helicopter was powered by a Rolls Royce, 250-C20B, serial number CAE-836143, engine.

The helicopter was equipped with an ARS-Air Rescue Systems (ARS) belly band, part number: "ARS-3RR 10a", date of manufacture: "22389-312A-10 of 10", date-in-service: "6-3-12".

The last maintenance inspection on the helicopter was a 100-hour inspection dated November 17, 2012, at an aircraft total time of 15,301.6 hours and a Hobbs time of 5,901.4 hours. The helicopter flew about 4 or 5 times since that inspection, which was performed in a hangar at Brim Aviation's Wellington, Texas, facility.

According to the MD 500D Rotorcraft Flight Manual, section 2-11, Fuel System Limitations, Table 2-1, lists the usable fuel for standard non self-sealing fuel tanks as 1.9 gallons. Section 3-13, Fuel System Malfunctions, states that "FUEL LEVEL LOW" indicator would be "ON" when approximately 35 lbs of fuel (22.5 lbs usable) remain in the fuel tank.

Investigators examined the helicopter for the presence of a maintenance discrepancy log. The only log found aboard the helicopter that contained a section for discrepancies, titled "PILOTS REMARKS OR DISCREPENCIES," was contained in a "Brim Aviation Engineering Log Book Report." The Brim Aviation Engineering Log Book Report began with its first entry on page 2401, dated November 11, 2011, and ended with its last entry on page 2446, which was not dated. Page 2445 was dated November 16, 2012.

Only two pages within The Brim Aviation Engineering Log Book Report contained airworthiness entries within the discrepancies section, which were on pages 2409, undated, and 2410, dated February 18, 2012. The discrepancy entry on page 2409 was: "Throttle friction sticky" and "Pilot's door exterior handle non operational." The discrepancy entry on page 2410 was: "Pilot's exterior door handle – inop," "Gov. control linkage – Bolt spins – Retighten & Re cotter," "Reinstall Skid Mirror," Reinstall Steps."

There were no entries within the "POWER CHECKS" section for any of the pages from 2401 to 2445. The pilot stated that engine trend monitoring was not performed. The PILOTS REMARKS OR DISCREPENCIES sections of the remaining pages within this log contained flight/customer information. According to page 2440 of the log, an entry dated October 17, 2012, at a Hobbs time of 5,817.3 hours, and aircraft total time of 15,217.5 hours, within the "MECHANICS: CORRECTIVE ACTION & LIST ALL MAINTENANCE PERFORMED," states in part:

"Replaced airframe anti ice filer with new part."

"Drained and wiped clean fuel cell bladders, removed, cleaned, and reinstalled fuel boost pump."

"All work done IAW csp-hmi-2 and Rolls Royce engine"

The MD Helicopters, Inc. Maintenance Manual, CSP-HMI-2, B. Start Pump Installation, page 410, revision 19, states in part:

"CAUTION"

"Ensure start pump wire lead is wrapped around or tie-wrapped to the fuel supply hose so that there is no possibility of its interfering with fuel quantity transmitter float mechanism. Ensure electrical connections will not be strained by G-induced hose movements."

The operator's mechanic who performed the maintenance listed on page 2440, stated in an interview that he held an airframe and power plant certificate issued in March 2009 and did not hold an inspection authorization rating. He was employed by the company for about two years and has been the primary mechanic since July or August 2012. He said that his position at the company is that of a field mechanic and he works on four other company aircraft. He spends half of his time in the hanger and the other half in the field. He performs maintenance, fueling, ground operations, and the rigging of equipment. He said his maintenance training was "on-the-job."

The mechanic stated that maintenance to the fuel system was performed after a pilot, who he said was probably a pilot other than the accident pilot, reported a "shudder." He said that he did not know if the

report was made on October 4, 2012, and whether there was a written record of that report. He said that when he worked on the fuel system, he drained fuel from the fuel tank under both access covers on the floor of the cabin. The pilot helped him replace the start pump and flush the fuel system. He said that he reinstalled the sump drain and boost pump. The fuel tank was partially filled with a "few gallons" of fuel and the boost pump was operated and fuel flow was noted. He said that they removed the fuel quantity transmitter. He said that the pilot only removed the floor access covers to the fuel tank and held a 5-gallon bucket when they drained the fuel. The mechanic said that he was looking at the helicopter maintenance manual while he was performing the maintenance on the fuel system. The mechanic said that he did not perform vacuum checks of the fuel system and did not know how to perform those checks without reading the maintenance manual. He did not perform a vacuum check after working on the fuel system. When asked how he checked the low fuel annunciator light, the mechanic said that he grounded the fuel quantity transmitter by contacting the top of the transmitter with a safety wire.

The MD Helicopters, Inc. Maintenance Manual, CSP-HMI-2, Fuel System Inspection/Check, page 501, revision 44, states in part, that testing of the FUEL LEVEL LOW WARNING LIGHT is performed by be refueling the helicopter with 35 lbs. of fuel remaining for commercial operations and 75 lbs. of fuel remaining for noncommercial machines. With the helicopter battery switch in the EXT PWR position and external power connected, the FUEL LEVEL LOW WARNING LIGHT must be off for these fuel remaining quantities.

The MD Helicopters, Inc. Maintenance Manual, CSP-HMI-2, Fuel System Inspection/Check, page 601, revision 19, states in part:

"WARNING"

"Air entering the airframe fuel supply lines may cause a power reduction or flameout. Fuel system vacuum and fuel air bleed procedures must be performed after opening fuel the supply system for any reason, prior to releasing the helicopter for flight."

The mechanic stated that he did not have any safety concerns pertaining to Brim Aviation.

According to FAA Order 8900.1, volume 6, chapter 5, paragraph 6-1378, (B), (1), (a), a current copy of the operator's operating certificate and current authorizations must be onboard each rotorcraft during Part 133 operations. The "Brim Aviation Rotorcraft-Load Combination Flight Manual" (RLCFM) and "Operations Specifications" that were onboard the accident helicopter at the time the accident were not current and had been amended. The 12-page RLCFM and 17-page Operations Specifications onboard

the accident helicopter were approved by the FAA's Portland Flight Standards District Office (FSDO). According to the onboard Operations Specifications, section A001. Issuance and Applicability, only showed approval for the operator to conduct class A, B, and C external load operations. Section A003. Aircraft Authorization listed the accident helicopter with only applicable load classes A, B, and C. FAA records showed that the operator was approved for class D operations. The operator was requested and provided a current copy of their operations specifications following the accident, which listed under section A001, class D external load operations. Section A003 applicable load classes was blank for all of the listed aircraft.

The only airworthiness requirements cited in the onboard and current operations specifications were in section A447, Emergency Airworthiness Directive (EAD) Notification, which stated that the owner or operator of aircraft identified in the certificate holder or operator's aircraft listing is primarily responsible for maintaining the aircraft in an airworthy condition as required under Parts 91.403a and 39. This section also section designated the certificate holder's EAD notification representative. There were no requirements within the operations specifications for compliance with service bulletins (SBs).

A SB relating to start pump wire routing was issued by MD Helicopters on September 15, 1987, that was to be accomplished within 25 hours of helicopter operation or at the next removal of the fuel start pump or fuel quantity sender unit, whichever occurred first and at each subsequent removal of the start pump from the fuel cell. The SB further stated there have been incidents where the fuel tank start pump wiring interfered with the fuel float after the start pump had been replaced in the field. The interference can result in erroneous fuel quantity indications.

Maintenance requirements for Part 133 Rotorcraft-External Load Operations are covered in Subpart D, which cites the following areas:

133.41 Flight characteristics requirements.

133.43 Structures and design.

133.45 Operating limitations.

133.47 Rotorcraft-load combination flight manual.

133.49 Markings and placards.

133.51 Airworthiness certification

Requirements for Part 135 Operating Requirements: Commuter and On-Demand Operations and Rules Governing Persons On Board Such Aircraft are covered in Subpart C for aircraft and equipment. Additionally, Subpart J: Maintenance, Preventive Maintenance, and Alterations cite the following areas:

135.411 Applicability.

135.413 Responsibility for airworthiness.

135.415 Service difficulty reports.

135.417 Mechanical interruption summary report.

135.419 Approved aircraft inspection program.

135.421 Additional maintenance requirements.

135.422 Aging airplane inspections and records reviews for multiengine airplanes certificated with nine or fewer passenger seats.

135.423 Maintenance, preventive maintenance, and alteration organization.

135.425 Maintenance, preventive maintenance, and alteration programs.

135.427 Manual requirements.

135.429 Required inspection personnel.

135.431 Continuing analysis and surveillance.

135.433 Maintenance and preventive maintenance training program.

135.435 Certificate requirements.

135.437 Authority to perform and approve maintenance, preventive maintenance, and alterations.

135.439 Maintenance recording requirements.

135.441 Transfer of maintenance records.

135.443 Airworthiness release or aircraft maintenance log entry.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	CDS,1954 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	270°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.28 inches Hg	**Temperature/Dew Point:**	12°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Childress, TX	**Type of Flight Plan Filed:**	None
Destination:	Childress, TX	**Type of Clearance:**	None
Departure Time:		**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 Fatal, 1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 1 Serious	**Latitude, Longitude:**	34.420276,-100.240997(est)

The helicopter was located about 850 feet south of the intersection of County road U and 15 at an elevation of 1.848 feet mean sea level in a field near the tower, which had been worked on prior to the accident.

The helicopter was oriented in about a 30 degree right bank and about a 5 degree nose down attitude. The tail-to-nose heading was about 170 degrees. The tail boom was partially separated near fuselage station 209. All of the helicopter pieces/components were located near the main wreckage. Two of the five main rotor blades were separated and located about 50 feet from the helicopter. The long-line was wrapped around the main rotor mast several times. Both helicopter skids were deformed outwards in an approximate lateral direction. The right skid was fractured at the center beam. Both helicopter skids were deformed outwards in an approximate lateral direction. The right skid was fractured at the center beam.

The area under and surrounding the helicopter did not contain smell, spill or blight consistent with a fuel spill.

The left side pilot door was not in place for the flight. The remaining three doors were in place and locked. A belly band that attached to the worker's long line was routed through the rear cabin and beneath both rear doors. The external worker's long-line was attached to the belly band and was not attached to the cargo hook, which was in the closed position.

Examination of the cockpit instrument panel revealed that the Master switch was in the off position. The Master switch was placed into the on position and the following were noted:

The Main Trans Oil annunciator illuminated, the Engine Out annunciator illuminated, the Engine Out annunciator illuminated, the Generator annunciator illumined, a sound consistent with engine out/low rotor tone sounded, fuel gauge indicated empty, Fuel quantity low annunciator did not illuminate, sound consistent with an operating start pump and igniter sounded. The cockpit switch for the igniter was in the armed position.

The fuel quantity float/transmitter had all of its retaining bolts with safety wire in place. During removal of the fuel quantity float/transmitter, three of the top retaining bolts, all adjacent to each other, exhibited a lack of torque. The fuel low level spring wire was not attached and not found. The master switch was placed into the on position and the float arm was moved from the bottom mechanical stop to its upper limit of travel. The cockpit fuel gauge indicated empty when the float arm was at the bottom mechanical stop and full when the float arm was at the upper limit of travel.

A fuel system vacuum check was performed by using a hand vacuum pump to apply 8 inches psiv to the upper port of the fuel filter bowl. The system held 8 inches of pressure for two minutes and the check was ended. The check was repeated with the same result.

The drain line connecting the engine mounted fuel filter had a petcock valve installed, which was a nonstandard installation. The petcock was wetted with a fluid consistent with Jet A fuel. The petcock contained the following: "Auto-Valve", "Dayton, Ohio", "Assy Date" (no date was present), "475C 61NSXBU", "206-041-634-3" (which is a Bell Helicopter part number). The petcock was opened and approximately 40 mL of a liquid consistent with Jet A drained. The fuel line from the nozzle was removed and about a ½ teaspoon of a liquid consistent with Jet A drained.

The helicopter was recovered from the accident site and placed in a hangar for further examination. During this examination, the helicopter was placed in an approximately level pitch attitude with a right bank attitude that did not exceed an estimated 5 degrees. The Master switch was placed into the on position and the cockpit fuel gauge indicated about 150 lbs of fuel.

Examination of the fuel system revealed that fuel vents were unobstructed. A liquid consistent with Jet A was present in the following quantities and their locations: about 16 ounces from the fuel tank, about 8 ounces from the anti-ice filter, and about 2 ounces from the engine-mounted fuel filter and nozzle line. There were no ruptures in the fuel tank bladder. Access to the fuel bladder was obtained by opening both cabin floor access covers. About 16 ounces of a liquid consistent with Jet A was drawn out from the fuel bladder using a suction hose.

Examination of the start pump, part number 164A134-3, serial number 5685, "FAA PMA" revealed that the electrical wire to the start pump was not secured to the start pump fuel line as called for in the

aircraft maintenance manual.

The airframe fuel filter was removed and the filter bowl contained a brown substance. The Master switch was placed in the on position, the filter bypass caution button was depressed, and the filter bypass annunciator illuminated.

Examination of the engine revealed no evidence of engine failure or malfunction.

The helicopter was not equipped with energy absorbing seats nor was it required to under CAR 6. The pilot's seat pan was deformed downwards about one inch. The left rear leg of the aft seat was not attached to the floor structure by an attachment pin. The pin was missing.

The Hobbs meter indicated 5,905.6 hours and was labeled with "ADD 9400.2."

Tests and Research

The start pump wire was placed in various positions over the fuel quantity float/transmitter float in which the wire was resting on the wire and in position that entangled the wire with the float and the corresponding cockpit fuel gauge indication was recorded. With the float resting on the wire, the gauge indication was about 125 lbs. With the wire on a notch that was on the left side of the float, the gauge indication was about 90-100 lbs. With the wire entangled and to the left, the gauge indication was about 140 lbs. With the wire on the upper (outboard) side of the float are near its pivot, the gauge indication was about 100 lbs.

A metallurgical examination of fuel low level spring wire's mating surface was performed by the National Transportation Safety Board's Materials Laboratory. A report of the examination stated that the based on the flat fracture appearance, the presence of ratchet marks, and crack arrest features, a fatigue crack initiated in the whisker. Due to the stepped structure associated with the fracture surface and oxidation on the surface, a demarcation for the fatigue terminus could not be reliably established. However, the presence of microvoid coalescence fracture features in the approximate center of the whisker indicate that final fracture of the whisker was due to overstress.

The fuel truck from which the helicopter was last refueled from had been moved from the accident site to outside a residence in Childress, Texas, by the time investigators arrived on-scene. Investigators examined the truck at that residence the day after the accident. The truck was labeled Brim Aviation truck number 66 and was equipped with a tank labeled Jet A. The truck odometer was 93,275 miles. There were two bottles of 5-Hour Energy in a black colored metal wire-mesh basket located on the floor in the front seat area of the truck.

The tank on the truck had a meter that indicated a total of 49,498.9 gallons and about 375.07 gallons of fuel pumped. A filter housing, installed between the fuel tank pump output and fueling hose, did not have a filter change date and did not have identifying information on the external housing. The housing was not removed to examine the presence of a filter element nor the condition of the filter element.

A binder aboard the truck had paperwork that stated that the fuel filter was changed "DEC 2010", and the last date that the fuel nozzle, tank, and filter were checked for contaminants and water was October 4, 2012. The following page in the binder had a blank entry next to the truck number and the page had its last entry dated "11/30". The "From ODO Reading" on the page was "63770" and the "To ODO Reading" was blank. Three entries for "11/30" stated:

Meter Start - 19415; Meter Stop - 19544; Total - 530; Jet A Loaded - Full

Meter Start - 19726; Meter Stop - 19822; Total - 600; Jet A Loaded – blank with "-96" next to the column

Meter Start - 19822; Meter Stop - 20*103*; Total - 500; Jet A Loaded – 220 with "-281" next to the column

Additional Information

The FAA allowed the carriage of persons under Part 133.35 when the human external-load is "necessary to accomplish the work activity directly associated with the external-load operation." Part 1 defined four distinct rotorcraft-load combinations (RLC). Class B RLC was defined as one in which "the external load is jettisonable and is lifted free of land or water during the rotorcraft operation." Part 133.1(d) stated that persons "other than a crewmember or a person who is essential and directly connected with the external-load operation may only be carried in approved Class D RLC." Brim Aviation provided rotorcraft external-load services for Great Southwest, carrying Great Southwest utility workers via long-line under the provisions of Part 133 Class B external-load operations.

According to the company Operations Specifications, Brim Aviation's principal base of operations was located at Ashland, Oregon, and no other bases were listed. The Lubbock FSDO did not know Brim Aviation was operating within their geographic service, which included Childress, Texas, and were not required to be notified by the operator or by the Portland FSDO of these operations. The Portland FSDO had oversight responsibility of Brim Aviation and did not know of Brim Aviation's operations in the Childress and Wellington, Texas areas.

The long-line worker, who was on the ground and witness to the accident, was requested during his interview by the National Transportation Safety Board Investigator-In-Charge (IIC) to provide the training materials he received during his training at ARS. These materials were not received by the IIC.

FAA Aviation Safety Program publication, FAA-P-8740-03, Time In Your Tanks, states in part:

"…the amount of useable fuel in your aircraft equates directly to how long your aircraft will fly. The longer you can fly, the more choices you have for ensuring a safe flight, consequently you can say flight time equates directly flight safety. …"

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	Paul Arrambide; Federal Aviation Administration; Lubbock FSSO; Lubbock, TX Michael Hemann; Federal Aviation Adminstration; Rotorcraft Directo; Fort Worth, TX John Hobby; MD Helicopters Inc; Mesa, AZ Jack Johnson; Rolls Royce; Indianapolis, IN
Original Publish Date:	January 27, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=85681