



AVIATION



HIGHWAY



MARINE



RAILROAD



PIPELINE

# Aviation Investigation Final Report

<b>Location:</b>	Decatur, Texas	<b>Accident Number:</b>	CEN10LA078
<b>Date &amp; Time:</b>	December 25, 2009, 13:00 Local	<b>Registration:</b>	N600CE
<b>Aircraft:</b>	BELL HELICOPTER TEXTRON CANADA 407	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	2 Serious, 1 Minor
<b>Flight Conducted Under:</b>	Part 91: General aviation - Positioning		

## Analysis

The pilot, flight medic, and flight nurse were departing from a hospital helipad for the purpose of a cross-country positioning flight. As the helicopter ascended about 50 to 60 feet above ground level (agl), the pilot heard two warning horns sound, followed by the helicopter yawing 90 degrees to the left. The pilot lowered the collective in an effort to preserve rotor rpm and maneuvered the helicopter back over the helipad. Around 5 to 8 feet agl the pilot increased collective pitch, but the helicopter continued a quick descent until it experienced a hard landing back on the helipad.

A review of hospital video surveillance footage for the 24 hours prior to the accident revealed that the helicopter remained parked outside for approximately 5 hours in blowing snow conditions; during this time, it was not equipped with plugs or covers over the engine inlets or the exhaust. The plugs and covers were installed later and the helicopter remained outside in temperatures ranging from 16 degrees Fahrenheit (F) to 34 degrees F for the next 19 hours. The video also revealed that at no time did anybody look at the exhaust stack, right side engine intake, or open any access panels prior to the operation of the helicopter.

An examination of the recorded Engine Control Unit (ECU) data revealed that during the flight, the helicopter's engine experienced a momentary flameout followed by a successful relight. Although the engine power was increasing, due to the helicopter's close proximity to the ground, the pilot was unable to recover main rotor rpm before ground impact. As part of the postaccident examination, the engine was removed from the airframe and an engine run was performed. There were no anomalies found with the airframe or engine that would have contributed to the loss of engine power. The operator's procedure manual stated that the pilot

must ensure that all ice, snow, and frost is removed from the engine inlet area. The helicopter manufacture's flight manual stated that as part of the preflight inspection, the pilot must check that the engine inlet area is cleaned of all debris, accumulated snow and ice. The engine manufacturer's Operation and Maintenance Manual gave a precaution that the accumulation of snow or ice may result in the engine experiencing a flameout.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's inadequate preflight inspection and the momentary loss of engine power due to snow or ice ingestion.

### Findings

<b>Aircraft</b>	(general) - Inadequate inspection
<b>Environmental issues</b>	Snow - Effect on equipment

# Factual Information

## History of Flight

<b>Prior to flight</b>	Aircraft inspection event
<b>Takeoff</b>	Loss of engine power (total) (Defining event)
<b>Autorotation</b>	Loss of engine power (total)
<b>Landing</b>	Hard landing

## HISTORY OF FLIGHT

On December 25, 2009, about 1300 central standard time, a single-engine Bell 407 helicopter, N600CE, was substantially damaged during a hard landing following a loss of engine power shortly after takeoff from the Wise Regional Health System Helipad (XA57), Decatur, Texas. The commercial pilot and flight medic sustained serious injuries while the flight nurse sustained minor injuries. The helicopter was registered to and operated by Air Evac EMS Inc., of West Plains, Missouri. Visual meteorological conditions prevailed and a company flight plan was filed for the 14 Code of Federal Regulations Part 91 positioning flight. The cross-country flight was departing for Wichita Falls, Texas, to pick up a patient.

According to the pilot, on December 24th it rained until around 0900 or 1000 at which time it turned to “moderate” blowing snow with winds at 15 to 25 knots. Around 1100 to 1130 the pilot performed a ground run of the helicopter’s engine for 5 minutes. The pilot reported that everything operated “well” and that he used anti-ice due to blowing snow. That afternoon, when the snow did not let up as he expected it would, the pilot reported that he inspected the engine intake and exhaust for snow build up and found none.

The pilot then plugged the engine intakes and covered the exhaust with a plastic cover. The helicopter was not flown that night due to weather conditions; including an accumulation of snow/ice on the rotor blades and horizontal stabilizer. The pilot reported that the next morning, December 25th, the weather was clear and cold, but the helicopter had enough snow and ice to prevent the crew from taking any calls. Around 0900, the pilot did a walk around, removed the engine covers, and waited for the ice to melt off of the rotor blades and horizontal stabilizer. The pilot reported that by 1130 all of the ice was gone from the helicopter’s surfaces and the temperature was 39 degrees Fahrenheit (F).

Approximately 1249 the crew got a transfer request to fly to Wichita Falls, Texas. The pilot performed a “walk around,” climbed in the cockpit and started the engine. The medical crew came out a few minutes later and did a “walk around” before boarding the helicopter. The pilot reported that the helicopter was running 7 to 8 minutes before takeoff.

With all systems “looking good”, and the before takeoff check complete, the pilot lifted the

helicopter off of the north helipad and hovered approximately 15 feet to the south. With a slight wind from the southwest the pilot pointed the nose into the wind, pulled rotor pitch and began to climb. When approximately 50 to 60 feet above ground level the pilot heard two warning horns go off, followed by the helicopter yawing 90 degrees to the left. The pilot then reduced collective to preserve rotor rpm and maneuvered the helicopter back over to the south helipad. Around 5 to 8 feet above ground level the pilot pulled collective pitch; however, the helicopter continued a quick descent until it landed hard back on the helipad, resulting in a spread of the landing skids and a fuselage to ground impact. The helicopter came to rest in an upright position on the helipad.

In a statement submitted by the flight nurse, he reported that the pilot arrived at the helicopter first and started the helicopter. Approximately 5 minutes later he, along with the medic, arrived on the helipad and did a "walk around." The nurse stated that he did not notice any ice on the helicopter, but the helipad was covered with about 1/2 to 1 inch of ice.

The flight nurse continued that they lifted off, turned south, and began to ascend. Everything felt and sounded good until they were approximately 50 to 100 feet off of the ground, at which time he heard a sound that he recognized as "the engine flaming out." The helicopter began to fall until it experienced a hard ground impact. The flight nurse further reported that during the accident sequence it sounded like the helicopter's engine tried to re-start.

The helipad was equipped with a video surveillance monitoring system which recorded the helicopter sitting on the helipad in the hours leading up to the accident as well as the accident sequence. A review of the video recording was performed by a Federal Aviation Administration (FAA) inspector who reported the following:

Shortly before 1200 on December 24, 2009, the accident helicopter was run-up on the helipad and shut down. The helipad pad was clear of weather contamination at that time.

1200: Snow starts and gets progressively worse. Wind also picks up.

1650: Plugs are installed in the engine intake ducts of the helicopter. The helipad is completely covered by snow.

1700: A boot is installed over the engine exhaust stack of the helicopter.

1717: The wind blows the boot off of the exhaust stack.

1722: The boot is reinstalled on the exhaust stack.

There was no visible activity for the rest of the night.

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0705: Two individual walk up to the helicopter and look around before walking away.

0718: An individual walks around the helicopter then leaves.

0951: An individual removes the engine's intake plugs and exhaust boot. He then climbs up on the left side of the helicopter and appears to look at the main rotor mast. The person then walks around the helicopter and rubs his hand on different areas of the airframe before walking away.

0955: An individual walks around the helicopter before manually turning the tail rotor.

Around 1253 the pilot is seen to walk out to the helicopter and appears to be talking on a cell phone. He walks up the left side of the helicopter, stops momentarily near the left side baggage door, and then continues by walking around the helicopter's tail and up the helicopter's right side. He then boards the helicopter. From the time the pilot reaches the helicopter until he boards is approximately 33 seconds. He appears to be on a cell phone up until the time he climbs into the helicopter.

Approximately 1255 the helicopter is started and about 2 minutes later the medical crew walks out to the helicopter. Around 3 minutes and 20 seconds later the helicopter lifts off the pad and does a slight pedal turn before climbing out of view of the camera. A few seconds later a cloud of smoke appears in the upper left corner of the video followed by the helicopter in a fast descent until ground impact.

The FAA inspector further reported that during the security tape review he did not observe anyone look in the exhaust stack, right side engine intake, or open any access panels prior to the operation of the helicopter.

## METEOROLOGICAL INFORMATION

The NTSB investigator-in-charge reviewed weather data that was recorded, between 1206 on December 24th to 1246 on December 25th, by the automated weather observing system at the Decatur Municipal Airport (LUD), Decatur, Texas, located 2.5 nautical miles north from the site of the accident. The temperature during this time ranged from 16 degrees F to 34 degrees F. The wind ranged between 4 and 28 knots.

During the afternoon and evening of the 24th, the precipitation was recorded as either light snow, snow, or heavy snow from the hours of 1206 to 1906. From 1906 on the 24th until the time of the accident there was no recorded precipitation.

## TESTS AND RESEARCH

Following the accident the helicopter was recovered for further examination.

A fuel sample was taken from the helicopter and sent to a lab for testing. The test results reported no abnormalities.

An examination of the recovered Engine Control Unit (ECU) data, recorded during the accident flight, revealed that the helicopter's engine experienced a momentary flameout followed by a successful relight. Although the engine power was increasing, due to the helicopter's close proximity to the ground, the pilot was unable to recover main rotor RPM before ground impact.

The engine was removed from the helicopter and shipped to Rolls-Royce Corporation, located in Indianapolis, Indiana. With oversight provided by an FAA inspector, an engine exam and test run was performed. The engine was tested to Rolls-Royce production test standards, PTS898, Rev D. The engine run resulted in satisfactory start, run, and shut down tests.

The engine examination, ECU data, and test cell engine runs revealed no evidence of an engine condition which would prevent the engine from operating normally. In addition, there were no anomalies found with the airframe that would have contributed to the loss of engine power.

#### ADDITIONAL INFORMATION

The following was located in Air Evac EMS's Flight-Standard and Emergency Operating Procedures Manual; Rev 32, Chapter 5, Section 5.32, dated May 5, 2009.

#### COLD WEATHER OPERATIONS:

B. The duty pilot will ensure, if possible, that the aircraft is secured in a heated hangar anytime the temperature is equal to or less than 40 degrees F.

C. If a heated hangar is not available; the aircraft will be run at operating RPM for 20 minutes every 6 hours that the temperature is 40 degrees F and below.

D. When temperature is 40 degrees F or less and freezing precipitation, ice, or frost is forecast, the aircraft will be placed in a hangar regardless if the hangar is heated or not.

E. Pilot's will review the manufacture's Approved Flight Manual before flying in cold weather.

I. Ensure that all ice, snow, and frost is removed from the engine inlet area, flight controls, stabilizing or control surfaces, airfoils, windscreen.

The following is from the Bell 407 Rotorcraft Flight Manual BHT-407-FM-1, Rev 7, Section 2-3-B-2, dated September 4, 1998.

#### PREFLIGHT CHECKLIST:

#### FUSELAGE – CENTER – RIGHT SIDE

2. Cabin roof, transmission cowling, and engine inlet area – Cleaned of all debris, accumulated snow and ice; cowling secured.

In addition, the following is from Rolls-Royce 250-C47 Operation and Maintenance Manual, Section 72-00-00, Page 27.

#### OPERATING PRECAUTIONS:

WARNING: SNOW OR ICE SLUGS CAN CAUSE THE ENGINE TO FLAME OUT...

#### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	47,Male
<b>Airplane Rating(s):</b>		<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	Helicopter	<b>Restraint Used:</b>	
<b>Instrument Rating(s):</b>	Helicopter	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	April 20, 2009
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	February 5, 2009
<b>Flight Time:</b>	3191 hours (Total, all aircraft), 997 hours (Total, this make and model), 3044 hours (Pilot In Command, all aircraft), 21 hours (Last 90 days, all aircraft), 4 hours (Last 30 days, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	BELL HELICOPTER TEXTRON CANADA	<b>Registration:</b>	N600CE
<b>Model/Series:</b>	407	<b>Aircraft Category:</b>	Helicopter
<b>Year of Manufacture:</b>		<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	53347
<b>Landing Gear Type:</b>	Skid	<b>Seats:</b>	5
<b>Date/Type of Last Inspection:</b>	December 17, 2009 AAIP	<b>Certified Max Gross Wt.:</b>	5250 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo shaft
<b>Airframe Total Time:</b>	4500 Hrs as of last inspection	<b>Engine Manufacturer:</b>	ALLISON
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	250-C47B
<b>Registered Owner:</b>	AIR EVAC EMS INC	<b>Rated Power:</b>	650 Horsepower
<b>Operator:</b>	AIR EVAC EMS INC	<b>Operating Certificate(s) Held:</b>	On-demand air taxi (135)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	LUD,1047 ft msl	<b>Distance from Accident Site:</b>	2 Nautical Miles
<b>Observation Time:</b>	12:46 Local	<b>Direction from Accident Site:</b>	16°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	6 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	250°	<b>Turbulence Severity Forecast/Actual:</b>	/
<b>Altimeter Setting:</b>	30.02 inches Hg	<b>Temperature/Dew Point:</b>	1°C / 0°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Decatur, TX (XA57)	<b>Type of Flight Plan Filed:</b>	Company VFR
<b>Destination:</b>	Wichita Falls, TX	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	12:58 Local	<b>Type of Airspace:</b>	

## Airport Information

<b>Airport:</b>	Wise Regional Health System XA57	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>	957 ft msl	<b>Runway Surface Condition:</b>	
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	Forced landing

## Wreckage and Impact Information

<b>Crew Injuries:</b>	2 Serious, 1 Minor	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 Serious, 1 Minor	<b>Latitude, Longitude:</b>	33.20972,-97.589447(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	LeBaron, Timothy
<b>Additional Participating Persons:</b>	Willis H Power; Federal Aviation Administration; Fort Worth, TX Jack Johnson; Rolls-Royce; Indianapolis, IN Harold R Barrentine; Bell Helicopter; Fort Worth, TX Dave Hardin; Air Evac EMS Inc; West Plains, MO
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<b>Note:</b>	
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=75198">https://data.nts.gov/Docket?ProjectID=75198</a>

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).