National Transportation Safety Board
Aviation Incident Final Report

Location:	Gulf Of Mexico, GM	**Incident Number:**	CEN12IA096
Date & Time:	12/01/2011, 1005 CST	**Registration:**	N435PH
Aircraft:	BELL HELICOPTER TEXTRON CANADA 407	**Aircraft Damage:**	None
Defining Event:	Loss of engine power (total)	**Injuries:**	2 None
Flight Conducted Under:	Part 135: Air Taxi & Commuter - Non-scheduled		

Analysis

While maneuvering for a precautionary landing to an oil rig platform because of a chip light indication, the helicopter's engine lost power. The pilot entered an autorotation, called mayday, inflated the helicopter's floats, and performed a successful water landing. The pilot and passenger were able to exit the helicopter unassisted into a life raft and were picked up within 10 minutes. Examination and disassembly of the engine revealed the No. 2 bearing had failed. Metallurgical examination of the bearing showed the No. 2 bearing outer ring cracked in fatigue due to false brinnelling, which occurs in cases where the bearing is stationary but is subjected to ambient vibration or shock during transport. A spalling area was severe enough to propagate mechanical stress in the outer ring causing the ring to fracture. The engine compressor section was overhauled 2.7 hours before the failure.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The failure of the compressor section No. 2 bearing due to false brinnelling and fatigue.

Findings

Aircraft	Compressor section - Failure (Cause)

Factual Information

On December 1, 2011, about 1005 central standard time, a Bell 407 helicopter, N435PH, was successfully autorotated to the water following a loss of engine power while maneuvering near a platform in the Gulf of Mexico. The helicopter was not damaged during the on water landing. The commercial pilot, and sole passenger, were not injured. The helicopter was registered to and operated by PHI, Inc., under the provisions of 14 Code of Federal Regulations Part 135 as a non-scheduled air-taxi flight. Visual meteorological conditions prevailed and a company flight plan had been filed. The flight originated from platform EC278-C, and was en route to platform EC261, both in the Gulf Of Mexico.

According to the pilot, while en route to EC261 the engine chip light illuminated. The flight was abeam platform EC278-B at the time, and the pilot elected to divert for a precautionary landing. While on the base leg to EC278-B, the pilot heard a loud whining noise, followed by a loud popping noise, and the helicopter began to yaw. The pilot entered an autorotation, called mayday, inflated the floats, and performed a successful water landing. The pilot and passenger were able to exit the helicopter unassisted into a life raft and were picked up within 10 minutes. The helicopter remained upright for approximately 20 minutes before overturning.

The engine was removed from the helicopter and examined at the PHI facility in Lafayette, Louisiana, under the supervision of a Federal Aviation Administration inspector. Examination and disassembly of the engine revealed the No. 2 bearing was fractured. The bearing components were located throughout the engine and retained for metallurgical examination.

According to the operator's maintenance records, the Rolls-Royce Model 250-C74B gas turbine engine, serial number CAE 847428, underwent a 150/300 hour inspection, and an overhaul to the compressor section, at a total time of 7,475.6 hours. The engine was installed on the helicopter 2.7 hours prior to the accident.

Metallurgical examination of the bearing and other components was completed by Rolls-Royce Corporation, Indianapolis, Indiana. According to Rolls-Royce, the No. 2 bearing outer ring cracked in fatigue, initiating from a spalled area on the raceway surface. The microstructure, hardness, and chemistry of the outer ring conformed to the engineering drawing requirements. The damage associated with the other compressor and turbine components examined was consistent with damage that would occur after the No. 2 bearing failure.

The failed bearing was then sent to FAG Aerospace, Inc, Stratford, Ontario, Canada, for evaluation. Results of the evaluation showed the failure occurred due to false brinnelling, where the bearing is stationary, but subjected to ambient vibration or shock during transport. The bearing balls were free to vibrate within the bearing. During the vibration period, the bearing experienced relative microscopic motion. The spacing between each set of brinnelling marks was equal to the ball spacing within the bearing. False brinnelling increased sufficient load during bearing operation which caused premature spalling. One spalling area was severe enough to propagate mechanical stress in the outer ring causing the ring to fracture.

History of Flight

Enroute	Loss of engine power (total) (Defining event)

Pilot Information

Certificate:	Commercial	**Age:**	32, Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 1 Without Waivers/Limitations	**Last Medical Exam:**	11/15/2011
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	03/27/2011
Flight Time:	3848 hours (Total, all aircraft), 849 hours (Total, this make and model), 3834 hours (Pilot In Command, all aircraft), 238 hours (Last 90 days, all aircraft), 52 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BELL HELICOPTER TEXTRON CANADA	**Registration:**	N435PH
Model/Series:	407	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	53891
Landing Gear Type:	Emergency Float; High Skid	**Seats:**	7
Date/Type of Last Inspection:	11/29/2011, AAIP	**Certified Max Gross Wt.:**	5250 lbs
Time Since Last Inspection:	2.7 Hours	**Engines:**	1 Turbo Shaft
Airframe Total Time:	4769 Hours	**Engine Manufacturer:**	ROLLS-ROYC
ELT:	Installed, activated, did not aid in locating accident	**Engine Model/Series:**	250-C47B
Registered Owner:	PHI INC	**Rated Power:**	813 hp
Operator:	PHI INC	**Air Carrier Operating Certificate:**	On-demand Air Taxi (135)

Meteorological Information and Flight Plan

Observation Facility, Elevation:		**Observation Time:**	
Distance from Accident Site:		**Condition of Light:**	Day
Direction from Accident Site:		**Conditions at Accident Site:**	Visual Conditions
Lowest Cloud Condition:	Clear	**Temperature/Dew Point:**	21°C / 11°C
Lowest Ceiling:	None	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	6 knots, 130°	**Visibility (RVR):**	
Altimeter Setting:	30.22 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	EC-278C, GM	**Type of Flight Plan Filed:**	Company VFR
Destination:	EC-261, GM	**Type of Clearance:**	None
Departure Time:	1035 CST	**Type of Airspace:**	

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	None
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None		

Administrative Information

Investigator In Charge (IIC):	Timothy LeBaron	**Adopted Date:**	04/10/2013
Additional Participating Persons:	Jason B Adame; Federal Aviation Administration; Baton Rouge, LA Mike Weber; Rolls Royce; Indianapolis, IN Tom Yakubovich; PHI, Inc.; Lafayette, LA		
Publish Date:	04/10/2013		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=82447		