National Transportation Safety Board
Aviation Accident Final Report

Location:	Birmingham, AL	**Accident Number:**	ERA11LA175
Date & Time:	03/02/2011, 1756 CST	**Registration:**	N154MW
Aircraft:	BELL 206-L4	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General Aviation - Flight Test		

Analysis

The helicopter pilot reported that, following a maintenance test flight to verify that a newly installed power turbine governor was accurately set, he flew over the anticipated landing area and entered the downwind leg of the traffic pattern. While turning to the base leg of the traffic pattern, about 500 feet above ground level and at 40 to 50 knots, he reported that he heard a loud bang and that the airframe “lurched.” He entered an autorotation and located a vacant parking garage deck within gliding range. The engine-out audio warning sounded and segment lights illuminated. The pilot landed the helicopter and it skidded about 15 feet. A test run determined that the engine operated below the normal specifications for new engines. The pneumatic line from the power turbine governor was found to be leaking and was removed and sent to the NTSB's Materials Laboratory for further examination. That examination revealed superficial longitudinal tool marks that did not extend to the interior surfaces of the flared ends. The interior surface of the flared ends exhibited some localized fretting damage on one side, consistent with damage that could have been caused by inadequate torque at the connection; however, no other anomalies were noted. According to the engine manufacturer, the leak would not have caused the engine to operate below the normal specification. The postaccident examination revealed no preimpact mechanical malfunctions or failures with the helicopter or engine that would have precluded normal operation.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A total loss of engine power for undetermined reasons.

Findings

Not determined	Not determined - Unknown/Not determined (Cause)

Factual Information

HISTORY OF FLIGHT

On March 2, 2011, at 1756 central standard time, a Bell 206L4, N154MW, operated by Omniflight Helicopters Incorporated, performed a forced landing within the city limits of Birmingham, Alabama. The helicopter departed from Carraway Medical Center Heliport (AL49), Birmingham, Alabama, about 1741, for a local maintenance test flight. Day visual meteorological conditions prevailed and a company visual flight rules flight plan was filed. The certificated airline transport pilot was the sole occupant and was not injured. The helicopter sustained substantial damage to the tail boom section just aft of the cabin. The flight was operated under the provisions of 14 Code of Federal Regulations Part 91.

According to the pilot, the engine governor was replaced earlier in the day and the test flight was to confirm proper inflight settings. Prior to departure, the linear actuator was adjusted by maintenance personnel to the proper ground setting. During the flight, the pilot made several collective adjustments and noted some lag in the rpm indications on the N2, or engine core speed, gauge; however, with some collective adjustment, the rpm returned to the selected value. The pilot flew over the anticipated landing area, entered the downwind leg, and while turning to the base leg of the traffic pattern, approximately 500 feet above ground level, with an airspeed of 40 to 50 knots, and he reported hearing a "loud bang and the airframe lurched." He entered an autorotation and located a vacant parking garage deck within gliding range. The engine out audio sounded and segment lights illuminated. The pilot landed the helicopter and it skidded approximately 15 feet. He performed the emergency shutdown procedure; however, the engine had already stopped.

PERSONNEL INFORMATION

The pilot held an airline transport pilot certificate with ratings for multiengine airplane and helicopter, a commercial pilot certificate with a rating for airplane single-engine land, and a flight instructor certificate with ratings for rotorcraft helicopter and instrument helicopter. The pilot reported 10,599 total hours of flight experience, of which 1,684 hours were in the make and model of the accident helicopter and all of which were as pilot in command. He also reported 360 hours as a flight instructor in the accident helicopter make and model.

HELICOPTER INFORMATION

The helicopter's most recent inspection was conducted on February 8, 2011, as part of the operator's Approved Airworthiness Inspection Program (AAIP). At the time of the accident, the helicopter had 4,613 total hours time in service. The helicopter was equipped with an Allison 250-C30P engine which had 8,785 total hours time in service, 19,028 cycles, and had 138 hours time in service since its most recent inspection.

Within the two weeks prior to the accident, the maintenance logbook contained the following entries. On March 2, 2011 the power turbine governor was removed and an overhaul serviceable governor was installed; all adjustments of the rigging were checked and no leaks or defects noted. February 24, 2011, a leak was noted at the fuel control outlet line to the fuel nozzle; the leak was repaired by retorquing the outlet line nut and no other leaks or defects were noted. On February 20, 2011, the fuel control unit was replaced in accordance with the Rolls Royce maintenance manual and the helicopter was test flown with no further defects noted.

METEOROLOGICAL INFORMATION

The 1753 recorded weather observation at Birmingham Regional Airport (BHM), Birmingham, Alabama, included wind from 110 degrees at 3 knots, visibility 10 miles, clear skies, temperature 20 degrees C, dew point 3 degrees C, and barometric altimeter 30.21 inches of mercury.

WRECKAGE AND IMPACT INFORMATION

According to an FAA inspector, the helicopter came to rest on the top level of a parking garage. The tail boom separated aft of the cabin and the tail and the tail rotor impacted the right rear door prior to coming to rest. External examination of the engine did not reveal any abnormalities and the power turbine governor had been replaced prior to the accident flight. No eyewitnesses were located nor did the local authorities know about the accident until they were called to help secure the helicopter overnight.

A follow-on examination was conducted on March 29, 2011 by the NTSB. Cursory external and internal examination or the airframe and engine were conducted and no component failure was noted. The hoses, fittings, and lines were examined and revealed no damage or scrape marks; however, several lines were in contact with each other. N2 continuity was confirmed to the main rotor and tail rotor output drive shaft by hand rotation of the power turbine. N1 (low pressure) continuity was confirmed to the starter generator by hand rotation of the compressor, and both rotated smoothly. The throttle was found in the closed position and was manipulated by hand.

The airframe fuel filter bowl was removed, and with the filter still installed, the bowl was full of fuel and was free of debris. The filter was removed from the bowl and the element was separated and free of debris. The fuel nozzle line fitting at the combustor case was released and separated from the engine. A drop of fuel dripped from the line and examination of the fuel line revealed moisture, consistent with fuel, inside. Fuel was present in the fuel pump line.

Collective movement revealed the power turbine governor range was 40 to 61 units. Electrical power from the battery was applied to the helicopter and the collective was exercised revealing the range was 39 to 70 units using beeper adjustment. The droop compensator was 10.625 inches in length at the linear actuator and approximately 0.125 inches of adjustments on the rod end which correlated to a lower rpm setting.

Approximately 10 gallons of fuel were added to the main fuel tank and the fuel pump pressure was tested. The left and right fuel boost pump were tested separately and indicated approximately 8 psi on the cockpit fuel pressure gauge, which correlated to the bottom side of the green, or normal, operating range.

The Turbine Outlet Temperature gauge was checked and did not reveal an engine over temperature indication.

The freewheeling unit was removed and revealed wear step marks on the drive side splines. The coast side splines exhibited small areas of linear impact damage consistent with chatter damage. The unit operated normally when checked by hand.

The engine was removed from the helicopter and mounted in an engine test cell. A pneumatic leak check was accomplished on all pneumatic (Pc) lines and one Pc line between the Pc air filter and power turbine governor was found to have a leak at the Pc air filter aft connection B-nut, no torque stripe was observed on the B-nut fitting. The engine was started and a normal

light off occurred. The engine appeared to operate below normal specifications during the engine run. The engine appeared to operate normally during the deceleration and cool down period. During the post run engine shut down, no hydro braking was required and the N2 shut down appeared quicker than normal. The engine was restarted in order to simulate a deceleration and then a rapid acceleration. The first two attempts were unsuccessful; however, on the third attempt the engine had a normal response to the power changes. Specifications of the engine run are located in the public docket for this accident.

The N1 Pc line was removed and sent to the NTSB's Materials Laboratory for further examination. That examination revealed longitudinal tool marks which were superficial and did not extend to the interior surfaces of the flared ends. The interior surface of the flared ends on one side exhibited some localized fretting damage. A Zyglo dye penetrate test was performed on the line and no cracks were observed.

The power turbine governor was sent to the manufacturer for testing. External inspection revealed soot/carbon at the air regulator outlet. Drive shaft movement was normal and the drive shaft was supported by the drive bearings. The Pg orifice was removed and was found clear of any obstructions and the Pr diaphragm and spring appeared normal. Teflon shavings were observed at the bottom of the post in the inner diameter of the bushing. The Teflon sleeve, located on the drive shaft within the drive body assembly, had a longitudinal split along its total length. The Teflon sleeve was replaced and the power turbine governor was installed in a test cell that allowed dynamic testing under elevated temperatures. The unit was operated and no condition was found that would prevent normal operation. Results of the power turbine governor test may be found in the public docket for this accident.

History of Flight

Approach-VFR pattern base	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Autorotation	Hard landing

Pilot Information

Certificate:	Airline Transport; Flight Instructor; Commercial	**Age:**	43, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane; Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter; Instrument Helicopter	**Toxicology Performed:**	
Medical Certification:	Class 2 Without Waivers/Limitations	**Last Medical Exam:**	07/06/2010
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	08/23/2010
Flight Time:	10599 hours (Total, all aircraft), 1884 hours (Total, this make and model), 10484 hours (Pilot In Command, all aircraft), 51 hours (Last 90 days, all aircraft), 20 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	BELL	**Registration:**	N154MW
Model/Series:	206-L4	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	52154
Landing Gear Type:	Skid	**Seats:**	5
Date/Type of Last Inspection:	02/08/2011, AAIP	**Certified Max Gross Wt.:**	4450 lbs
Time Since Last Inspection:	138 Hours	**Engines:**	1 Turbo Shaft
Airframe Total Time:	4613 Hours	**Engine Manufacturer:**	ALLISON
ELT:	Installed, not activated	**Engine Model/Series:**	250-C30-P
Registered Owner:	CHASE EQUIPMENT FINANCE INC	**Rated Power:**	650 hp
Operator:	OMNIFLIGHT HELICOPTERS INC	**Air Carrier Operating Certificate:**	On-demand Air Taxi (135)
Operator Does Business As:		**Operator Designator Code:**	RMXA

Meteorological Information and Flight Plan

Observation Facility, Elevation:	BHM, 650 ft msl	**Observation Time:**	1753 CST
Distance from Accident Site:	4 Nautical Miles	**Condition of Light:**	Day
Direction from Accident Site:	240°	**Conditions at Accident Site:**	Visual Conditions
Lowest Cloud Condition:	Clear	**Temperature/Dew Point:**	19°C / 4°C
Lowest Ceiling:	None	**Visibility**	10 Miles
Wind Speed/Gusts, Direction:	Calm	**Visibility (RVR):**	
Altimeter Setting:	30.21 inches Hg	**Visibility (RVV):**	
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Birmingham, AL (AL49)	**Type of Flight Plan Filed:**	Company VFR
Destination:	Birmingham, AL (AL49)	**Type of Clearance:**	VFR
Departure Time:	1741 CST	**Type of Airspace:**	

Airport Information

Airport:	Carraway Medical Ctr Heliport (AL49)	**Runway Surface Type:**	
Airport Elevation:	672 ft	**Runway Surface Condition:**	
Runway Used:	N/A	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced Landing

Wreckage and Impact Information

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

Administrative Information

Investigator In Charge (IIC):	Shawn Etcher	**Adopted Date:**	02/23/2012
Additional Participating Persons:	Charlie Carlisle; FAA/FSDO; Birmingham, AL		
Publish Date:	02/23/2012		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=78486		

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