Aviation Investigation Final Report

Location:	Naples, Florida	**Accident Number:**	ERA09FA355
Date & Time:	June 18, 2009, 10:30 Local	**Registration:**	N9421K
Aircraft:	Schweizer 269C-1	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Serious
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

The 19-hour helicopter student pilot departed on a cross county flight and shortly after takeoff the helicopter experienced a loss of engine power. While attempting to return, the pilot allowed the main rotor rpm to decay and while descending, the helicopter contacted a building, trellis, and then the ground. Inspection of the helicopter revealed no evidence of preimpact failure or malfunction of the flight controls, main rotor or tail rotor drive systems. The engine was removed from the helicopter and test run after proper timing of the right magneto; no discrepancies were noted. The engine had been overhauled approximately 124 hours earlier; overhauled magnetos were installed at that time. The engine had been inspected three times since the overhauled engine was installed; the last 100-Hour inspection was approximately 29 hours earlier. The mechanic who performed the last 100-Hour inspection reported using the engine manufacturer's inspection guide and 14 CFR Part 43 Appendix D as references. He did not check the magneto breaker points for pitting and minimum gap as specified in the engine manufacturer's 100-Hour inspection guide. Appendix D specified that the engine accessories are to be checked for apparent defects in security of mounting. There was no record that the magnetos had been removed since the overhauled engine was installed. The cause of the loss of engine power was determined to be caused by rotation (advance) of the right magneto which was due to an incorrect gasket and also by undetected fracture of the clamping flange. While there was no discrepancy with the left magneto, it also had an incorrect gasket installed.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: A loss of engine power due to the improper installation of the right magneto by maintenance personnel resulting in subsequent loss of engine power. Contributing to the accident was the inadequate 100-Hour inspection by the mechanic when he failed to note that improper

hardware were installed at both magnetos, and his failure to detect fracture of the clamping flange of the right magneto.

Findings

Aircraft	Magneto/distributor - Incorrect service/maintenance
Personnel issues	Scheduled/routine inspection - Maintenance personnel

Factual Information

History of Flight

Initial climb	Loss of engine power (partial) (Defining event)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)

On June 18, 2009, about 1030 eastern daylight time, a Schweizer 269C-1, N9421K, registered to North Bay Enterprises, Inc., operated by Ocean Helicopters, Inc., was substantially damaged during a forced landing near Naples Municipal Airport (APF), Naples, Florida. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 Code of Federal Regulations (CFR) Part 91 instructional flight from APF to Immokalee Regional Airport (IMM), Immokalee, Florida. The certificated commercial pilot, the sole occupant, was seriously injured. The flight from APF originated about 1 minute earlier.

The pilot stated that he planned on performing a solo cross-country flight. Prior to departure he performed a preflight inspection with no reported discrepancies. Using the checklist he performed an "internal preflight" with nothing unusual noted. He started the engine and checked the magnetos noting both were within the 125 rpm maximum drop. He did not recall or report anything unusual about the rest of the pre-departure process.

According to a transcription of communications with Naples Air Traffic Control Tower, at 1028:31, the pilot advised he was at Euro American ready to depart with automated terminal information service B. The tower controller cleared the flight for takeoff and to proceed southeast bound.

The pilot further stated that after receiving the departure clearance, he initiated a hover of approximately 5 to 7 feet above ground level (agl). He then began the takeoff while paralleling runway 14 and began to climb at 55 and 60 knots indicated airspeed with almost 29 inches of manifold pressure. At the same time the engine rpm was near the bottom of the green arc. He lowered the collective down slightly to correct the high manifold pressure reading and also to increase engine rpm, and although the manifold pressure decreased, the engine rpm did not increase. He increased the throttle but there was very little response. About this time he began hearing an intermittent beeping from the low-rotor-rpm warning horn, and also reported that the sound from the engine was not typical, which felt sluggish. He turned to the left to return and the transcription of communications indicates that at 1030:09, the pilot advised the controller, "helicopter two one kilo has gotta return to the field." He kept the collective in the previously placed position and as he came out of the turn in a direction that he thought was towards the airport, he applied full or nearly full throttle. At the end of the turn, he heard the low-rotor-rpm warning horn go to a steady tone. The helicopter began descending at a rapid rate and he immediately started looking for a neutral landing spot. He aimed for an unoccupied

pool and closed the throttle and lowered the collective. He recognized that he was unable to land in the pool and just prior to contact with a wood trellis and small building near the pool, he pulled collective. His injury precluded him from evacuating the wreckage; he was rescued by local fire rescue. He estimated the time from the perceived loss of engine power to landing was approximately 10 to 20 seconds.

A pilot-rated witness reported that the takeoff and departure appeared normal to him with no observed unusual movements.

PERSONNEL INFORMATION

The pilot, age 56, holds a commercial pilot certificate with rating(s) airplane single engine land, airplane multi-engine land, instrument airplane, and holds a second class medical certificate with a limitation to have available glasses for near vision issued May 19, 2009.

The National Transportation Safety Board (NTSB) Pilot/Operator Aircraft Accident/Incident Report submitted by the pilot indicated his total time in all aircraft and in make and model are 1,423 and 19 hours, respectively. He listed having 7 hours as pilot-in-command in the accident make and model helicopter.

AIRCRAFT INFORMATION

The helicopter was manufactured in July 2003, by Schweizer Aircraft Corporation as model 269C-1, and was designated serial number 0153. It was powered by a 180 horsepower Lycoming HIO-360-G1A engine, which was equipped with Slick Model 4347 and 4370 magnetos for the left and right positions, respectively.

Review of the maintenance records revealed the engine was removed for major overhaul on October 1, 2008; the major overhaul was signed off as being completed on November 11, 2008. The overhaul logbook entry indicates the magnetos were overhauled. The engine was reinstalled into the helicopter on February 25, 2009; the helicopter total time at that time was recorded to be 2,200.5 hours. Following engine installation after overhaul, the engine was inspected on February 26, 2009, April 2, 2009, and again on June 2, 2009. The engine had accumulated approximately 124 hours since overhaul at the time of the accident, and approximately 29 hours since the last 100-Hour inspection. There was no entry in the last annual or 100-Hour inspection entries indicating either magneto was removed and reinstalled, or removed and replaced.

The mechanic who performed the last 100-Hour and annual inspections reported he inspected the engine using the engine manufacturer's guide as a reference, but also used the scope and detail specified in 14 CFR Part 43 Appendix D.

While the engine manufacturer's 100-Hour inspection guide indicates to inspect the magneto breaker points for pitting and minimum gap, the mechanic who performed the last 100-Hour

inspection stated he did not comply with this item. He further stated that he did not remove either magneto during either inspection, and if he had to adjust the magnetos during either inspection, he would have billed the customer an additional 30 minutes, which the invoices did not reflect.

Review of 14 CFR Part 43 Appendix D revealed a mention to inspect the engine accessories for apparent defects in security of mounting.

The pilot who flew the helicopter earlier that day for approximately 1.1 hours reported it performed normally throughout all phases of flight "…without anything remarkable." The hour meter used for billing indicated 2,800.3 hours at the end of his flight, and the same hour meter indicated 2,800.4 hours at the time of the accident, or an elapsed time of 6 minutes.

METEOROLOGICAL INFORMATION

A surface observation weather report taken at Naples Municipal Airport at 0953, or approximately 37 minutes before the accident indicated the wind was from 060 degrees at 5 knots, the visibility was 10 statute miles, and few clouds existed at 5,000 feet. The temperature and dew point were 32 and 23 degrees Celsius, respectively, and the altimeter setting was 29.97 inches of mercury.

COMMUNICATIONS

The pilot was in contact with the Naples Municipal Airport Air Traffic Control Tower. There were no reported communication difficulties.

WRECKAGE AND IMPACT INFORMATION

The helicopter crashed in a residential area; the accident site was located at 26 degrees 08 minutes 46.86 seconds North latitude and 081 degrees 45 minutes 53.69 seconds West longitude, or approximately 0.79 statute mile and 121 degrees from the center of the departure airport. The accident site was also located approximately 0.38 statute mile and 118 degrees from the approach end of runway 32.

Examination of the accident site revealed the helicopter contacted a building and a trellis located adjacent to a community pool. The helicopter came to rest upright next to the building. No pre or postcrash fire was noted.

Inspection of the helicopter before recovery revealed the fuel tank was nearly full with no fuel contaminants noted. The throttle was in the idle position, and the clutch actuator was in the normal position for full engaged. Inspection of the flight controls, tail rotor drive, and main rotor drive revealed no evidence of preimpact failure or malfunction.
Following recovery of the helicopter, the engine was removed and inspected which revealed the right magneto remained installed in the accessory case but was against the counter

clockwise (CCW) stop and the flange adjacent to the lower clamp was fractured. The as-found position of the right magneto was timed approximately 50 degrees before top dead center (specification is 25 degrees before top dead center). The right magneto was then properly timed to the engine which revealed one edge of the lower clamp was over the fracture. The left magneto was determined to be properly timed to the engine.

The engine was then placed on a test stand with a test club propeller installed. The engine was started and operated for approximately 5 minutes. At the completion of the engine run, the exhaust gas temperatures of each cylinder were checked and the reading for the No. 2 cylinder was lower than the other cylinders. The issue was attributed to damage to the bottom spark plug lead for that cylinder caused during securing of the oil cooler. The damaged ignition lead was temporarily repaired and the engine was started and operated to 2,000 rpm and approximately 29 inches of manifold pressure. The magneto drops were each approximately 100 rpm. Differential compression testing of each cylinder after the engine run using 80 pounds-per-square inch (psi) revealed all cylinders were indicating greater than 74 psi.

Following the engine run, each magneto was further inspected revealing an incorrect gasket between each magneto drive adapter assembly and magneto flange. The specified correct gasket between each magneto drive adapter assembly and magneto flange is part number (P/N) LW-12681, but the installed gasket was P/N 62224. Further inspection of the right magneto revealed the magneto drive coupling exhibited damage to both tips with shear lips noted. On one end of the drive coupling the shear lip was inwards, and the shear lip on the opposite end of the drive coupling was outwards. Further inspection of the left magneto was performed to determine the tightening torque of the securing nuts. The tightening torque was checked with a calibrated wrench revealing the upper nut was 122 inch pounds and the lower nut was 95 inch pounds (specification is 204 inch pounds). The upper and lower nuts were tightened to the specified torque value and each nut moved approximately ½ flat. The right magneto was retained for further examination.

TESTS AND RESEARCH

Examination of the right magneto was performed by the Safety Board's Materials Laboratory located in Washington, D.C. The results of the examination revealed the fracture surfaces of the clamping flange revealed matte gray roughly textured surfaces consistent with an overstress separation. Fracture traces indicated that the fracture initiated in the radius between the flange and the body on the outboard (away from the engine) surface and progressed inboard through the flange in a manner consistent with bending loads applied to the flange towards the engine case by the clamp. Inspections of the clamping surfaces of both the fractured flange and the intact opposite flange revealed marking in both the paint surface and the underlying metal surface indicating rotation of the installed magneto against the clamp blocks. The marking did not indicate a clear direction of motion; however, an impact dent in the body on the intact side established that the magneto had turned forcefully in the counterclockwise direction. Further examinations uncovered a curvilinear dent and partial shearing fracture that produced an attached sliver on the pilot diameter of the magneto. The

curvilinear feature was diametrically opposed to the fractured flange and directly under the marks on the intact flange. The orientation of the feature and direction of shearing was consistent with the magneto being axially misaligned (cocked) in the pilot diameter of the engine accessory crankcase and then shifting to proper alignment.

Student pilot Information

Certificate:	Commercial	**Age:**	56,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	May 19, 2009
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	June 9, 2009
Flight Time:	1423 hours (Total, all aircraft), 19 hours (Total, this make and model), 1225 hours (Pilot In Command, all aircraft), 29 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Schweizer	**Registration:**	N9421K
Model/Series:	269C-1	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	0153
Landing Gear Type:	Skid	**Seats:**	3
Date/Type of Last Inspection:	June 2, 2009 100 hour	**Certified Max Gross Wt.:**	1750 lbs
Time Since Last Inspection:	29 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	2296 Hrs as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	Not installed	**Engine Model/Series:**	HIO-360-G1A
Registered Owner:	NORTH BAY ENTERPRISES INC	**Rated Power:**	180 Horsepower
Operator:	Ocean Helicopters, Inc.	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	APF,8 ft msl	**Distance from Accident Site:**	
Observation Time:	10:53 Local	**Direction from Accident Site:**	301°
Lowest Cloud Condition:	Few / 4000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.97 inches Hg	**Temperature/Dew Point:**	33°C / 22°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Naples, FL (APF)	**Type of Flight Plan Filed:**	None
Destination:	Immokalee, FL (IMM)	**Type of Clearance:**	None
Departure Time:	10:29 Local	**Type of Airspace:**	

Airport Information

Airport:	Naples Municipal Airport APF	**Runway Surface Type:**	
Airport Elevation:	8 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	26.14611,-81.764724

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Dave Avery; FAA FSDO; Miami, FL Ed Rogalski; Textron Lycoming; Williamsport, PA
Original Publish Date:	October 21, 2010
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=74075