Aviation Investigation Final Report

Location:	Lake Ozark, Missouri	**Accident Number:**	CEN13LA396
Date & Time:	June 28, 2013, 12:20 Local	**Registration:**	N78900
Aircraft:	Bell 47D1	**Aircraft Damage:**	Substantial
Defining Event:	Fuel contamination	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Other work use		

Analysis

The pilot stated that, during the preflight inspection, he observed no contamination in the fuel sumped from the helicopter. During the helicopter's second air tour flight of the day, it experienced a total loss of engine power during cruise flight. The pilot performed an autorotation to a field, which resulted in damage to the tailboom and main rotor blade.

The helicopter had been in a previous accident and was subsequently rebuilt; it was sold to the operator about 6 months before the accident. During the rebuild, parts were sand and bead blasted. The pilot stated that, about 2 months before the accident, fuel samples from the helicopter showed contamination. He described the contaminated fuel as "discolored…from sitting." The operator drained and replaced the fuel, ran the engine on the ground, and performed numerous sumps until the fuel was "clean" and up to the operator's standards. The helicopter was then flown for about 12 hours before the accident flight occurred. During postaccident examinations, a substance consistent with silicon-glass blasting was found within the carburetor bowl, carburetor screen, and fuel sump. No other anomalies were found that would have precluded normal operation of the helicopter. It is likely that the fuel was contaminated by the blasting substance at the time of the rebuild and that the substance was not found during subsequent preflight inspections, which resulted in a total loss of engine power during cruise flight.

Probable Cause and Findings

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

The improper rebuild and maintenance of the helicopter and inadequate subsequent inspections, which resulted in undetected fuel contamination and a subsequent total loss of engine power during cruise flight.

Findings

Aircraft	(general) - Incorrect service/maintenance
Aircraft	(general) - Incorrect service/maintenance
Aircraft	Fuel - Fluid condition
Aircraft	(general) - Malfunction

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Enroute-cruise	Fuel contamination (Defining event)
Autorotation	Off-field or emergency landing
Landing-flare/touchdown	Hard landing
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

On June 28, 2013, about 1220 central daylight time, a Bell 47D1, N78900, experienced a total loss of engine power during cruise flight and impacted terrain during an autorotation near Lake Ozark, Missouri. The pilot and passenger on board were not injured. The helicopter sustained substantial damage. The helicopter was registered to and operated by Lake Ozark Helicopters Inc under 14 Code of Federal Regulation Part 91 as an air tour flight that was not operating on a flight plan. The flight departed from Lake Ozark, Missouri, about 1110.

The pilot stated that when he arrived in April 2013 to work as a pilot for the operator. The pilot said that they sumped both of the operators helicopters, N78900 and N702CC, because they had not been flown for some time. He said there was some contamination in N78900's fuel that was sumped. He said that the contamination was "discolored fuel from sitting." They drained and replaced the fuel for N78900 and ran the engine on the ground and performed "numerous sumps "until the fuel was clean and up to their standards.

The pilot stated that their standard practice was to sump fuel in the morning as part of a daily preflight from the fuel tanks that the helicopters were refueled from and from the helicopters.

The pilot stated that he arrived at work at 0930, checked weather, performed a preflight of the helicopter, and found the helicopter to be airworthy. He said that he did not witness any identifiable contamination from the fuel sumps from the helicopter, or from the operator's other helicopter (N702CC), or from the fuel tanks used to fuel the helicopter(s). About 1020, he departed on his first flight with approximately 22 gallons or 1.8 hours of fuel. He returned about 1105 and added fuel for a second flight. About 1110, he departed on a second flight with the same amount of fuel as the first flight. About 1220, the engine sputtered during the return to the operator's base. He rolled the throttle on and engine power was regained, then seconds later, the engine quit at an altitude of 1,500 feet mean sea level. He performed an autorotation to a field near Susan Road, Lake Ozark, Missouri. After landing, the pilot rechecked the fuel gauge which was "still indicating" ¼ tank. He checked the fuel tank with a yard stick kept aboard the helicopter and noted that the yard stick indicated "just below" 6 gallons or 30 minutes of fuel.

Pilot Information

Certificate:	Commercial	**Age:**	34
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	3-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	Helicopter	**Toxicology Performed:**	No
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	June 17, 2013
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	December 5, 2012
Flight Time:	638 hours (Total, all aircraft), 19 hours (Total, this make and model), 581 hours (Pilot In Command, all aircraft), 212 hours (Last 90 days, all aircraft), 108 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N78900
Model/Series:	47D1	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	480
Landing Gear Type:	Skid	**Seats:**	2
Date/Type of Last Inspection:	March 1, 2013 100 hour	**Certified Max Gross Wt.:**	2350 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	7653 Hrs at time of accident	**Engine Manufacturer:**	Franklin
ELT:	Installed, not activated	**Engine Model/Series:**	6V4
Registered Owner:	Lake Ozark Helicopters Inc	**Rated Power:**	
Operator:	Lake Ozark Helicopters Inc	**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	LOHJ

N78900 was a 1952 Bell 47D1, serial number 480, helicopter was purchased by and registered to Lake Ozark Helicopters Inc in December 2012 and February 2013, respectively. The helicopter was authorized for commercial air tour operations under Part 91.147 under a Letter of Authorization (LOA) issued by the Federal Aviation Administration (FAA) Kansas City (MKC) Flight Standards District Office (FSDO). The LOA inclusion of an aircraft operated under Part 91.147 is not subject to airworthiness/conformity/maintenance records inspection by the FAA. The helicopter was flown by the pilot for about 12 hours prior to the accident.

The helicopter was involved in an accident on November 12, 1995, which was investigated by the

National Transportation Safety Board (NTSB) under identification number: LAX96FA045. The NTSB Factual Report stated that the helicopter was destroyed by impact and the resulting postimpact fire. FAA records did not list the helicopter as destroyed.

A maintenance logbook entry dated October 26, 1995, with a total aircraft time of 7,640.2 hours, preceded the next entry: "A/C damaged in accident." The subsequent entry stated that the helicopter was sold to the individual that sold the helicopter to Lake Ozark Helicopters Inc. and "rebuilt after the accident, in D-1 configuration," which had an entry for a 1,200-hour inspection dated October 12, 2009, with an aircraft total time of 7,640.2 hours. There was also an entry for the installation of a Franklin engine, serial number AF33-600-32030, with a total time of 900 hours and 0 hours since major overhaul. The repairs were not conducted by a repair station, but performed by an airframe and power plant (A&P) mechanic with inspection authorization.

Maintenance logbook entries dated March 1, 2013, indicated that a 100-hour and an annual inspection of the helicopter were performed. A 100-hour inspection of the engine was also performed. At the time of these inspections, the aircraft total time was 7640.7 hours and the engine time since overhaul was 0.5 hours. According to the A&P mechanic, these inspections were also the prebuy inspection of the helicopter, which was performed with the former and current owners present.

The total aircraft time at the time of the accident was 7,653 hours.

A postaccident review of aircraft maintenance records provided to a FAA inspector from the MKC FSDO revealed that the maintenance records did not contain component records, Airworthiness Approval Tags or Yellow Tags (FAA Form 8130–3), work orders, or Major Repair and Alteration forms (FAA Form 337). FAA Aircraft Registry records did not contain FAA Form 337s for the repair. There was no logbook entry stating that the helicopter had been repainted.

There were two aircraft data plates for the helicopter, one of which was not attached to the helicopter. Both data plates had the same aircraft make, model, and serial number, but the data plate that was not attached was consistent with the original aircraft data plate.

During an initial telephone conversation with the A&P mechanic, the mechanic stated that all of the FAA Form 337s and FAA Form 8130–3s were with the aircraft records, and he did not know if all the records got transferred from the previous owner to the current owner. He said there were FAA Form 8130–3s for the carburetor that was overhauled, the magnetos that were purchased, and the engine that was overhauled. There were FAA Form 337s for "quite a few things." He said he "had no idea" if all those records were transferred to the current owner. The A&P mechanic said that he sent Form 337s to the FAA in Oklahoma City and had some Form 337s at home and he probably has all of the Form 337s at work. During a second telephone conversation with the A&P mechanic, the A&P mechanic stated that the only Form 337 that he has was one pertaining to a supplemental type certificate for a cyclic control grip.

The A&P mechanic said the he and the previous owner painted the helicopter. The A&P mechanic said there may have been some things that were sand blasted, and there was some bead blasting. The bead blasting was not done with the engine installed but only for small parts.

The A&P mechanic said that most of the helicopter was original, and the original data plate was with the records that got transferred to the current owner. The data plate, because of the era of the helicopter, was a "replaceable part" and they had a blank data plate. The A&P mechanic said that it seemed like a good idea to put a new data plate on the helicopter.

The A&P mechanic stated that he started working on the helicopter after it had just been purchased by the previous owner. The previous owner was cleaning up and sanding some things down. The A&P mechanic did not think that prior work in rebuilding the helicopter was performed by a mechanic. The A&P mechanic said that when he started working on the helicopter about 60 percent of the helicopter was present in the form of pieces, none of which had been put together. The A&P mechanic said that work on the helicopter had been in progress when he arrived and that it was "pretty much a complete" helicopter, which already had a tail boom and center frame. They "made a few new cabin pieces," They bought a new bubble and all the normal things that need overhaul. The A&P mechanic said all the main pieces for the helicopter were present, and he assumed they were from the original helicopter.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	AIZ,869 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	14:55 Local	**Direction from Accident Site:**	90°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.86 inches Hg	**Temperature/Dew Point:**	29°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Lake Ozark, MO	**Type of Flight Plan Filed:**	None
Destination:	Lake Ozark, MO	**Type of Clearance:**	None
Departure Time:	11:10 Local	**Type of Airspace:**	Unknown

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 None	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	38.180973,-92.620956(est)

According to the MKC FSDO inspector, the operator used a fuel storage tank that was located in the bed

of the operator's pickup truck to refuel its helicopters. The tank was a rectangular metal tank that was painted black. The tank was oriented so that it sloped downwards toward the forward portion of the tank, which faced the passenger compartment of the truck. The forward portion of the tank contained the fuel pump, fuel hose, and a fuel pump fuel filter (Great Plains Industries, Inc., model number 129340-02), which did not have differential pressure gauge to indicate flow restriction. The pump filter was a 10 micron particulate filter, which was not rated for water filtration that had a rated flow of 18 gallons per minute. The pump filter "DATE INSTALLED" and "METER READING" fields were blank. The aft top portion of the tank contained a pipe with a filler cap that was not equipped with a security lock. During the MKC FSDO inspector's inspection of the fuel tank, there were no records available that would indicate when the fuel filter was changed, when fuel tank inspections/samples were performed, results of the inspections/samples, and identification of the person who performed the inspections/samples.

The helicopter sustained structural damage that included damage to the tailboom and a main rotor blade.

The helicopter was recovered by the operator and later examined. The engine was run for approximately one minute only at idle power due to damage to the helicopter. The examination revealed a granular substance in the carburetor bowl, carburetor screen, and fuel sump. No other anomalies that would have precluded normal operation of the helicopter were noted.

Tests and Research

A National Transportation Safety Board Materials Laboratory examination of the granular substance found in the carburetor, carburetor screen, and sump screen was performed. Examination of the substance revealed morphology consistent with used silicon glass blasting media. Due to the condition of the particles, grit size could not be determined.

Administrative Information

Investigator In Charge (IIC):	Gallo, Mitchell
Additional Participating Persons:	Val Ziedins; Federal Aviation Administration; Kansas City, MO
Original Publish Date:	March 24, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=87401