Aviation Investigation Final Report

Location:	Methuen, Massachusetts	**Accident Number:**	ERA17FA117
Date & Time:	February 28, 2017, 13:02 Local	**Registration:**	N315AL
Aircraft:	LAVENDER ALAN P SONEX	**Aircraft Damage:**	Substantial
Defining Event:	Fire/smoke (non-impact)	**Injuries:**	1 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The sport pilot, who was the owner and builder of the experimental, amateur-built airplane, had not flown the airplane in over 4 months due to a fuel leak. Two days before the accident, he reported that he had corrected the leak by repairing a fuel outlet connection near the fuel shutoff valve in the cockpit. The pilot departed and remained in the airport traffic pattern with the intent of performing touch-and-go takeoffs and landings. During final approach for the first landing, several witnesses observed the airplane on fire before it suddenly entered a nose-down descent and impacted a residence.

Examination of the wreckage revealed evidence of an inflight fire in the engine compartment; the bottom oil line where it attached to the oil filter by a blue aluminum nut was not secure. In addition, the fuel regulator fuel intake line at the regulator attach point had little torque and spun freely on the threads. Both connections were inside the engine compartment and shared no commonality with the pilots previously reported fuel leak at the outlet connection in the cockpit. It is likely that, while performing engine maintenance, the pilot failed to properly torque the oil and fuel regulator fittings. Normal engine vibrations during the flight likely resulted in one of the fittings becoming loose and introducing flammable liquid into the engine compartment. Upon contact with hot engine components, the fluid ignited and resulted in an engine compartment fire. Because both the oil and fuel systems were compromised by loose connections, whether the fire was caused by fuel or oil could not be determined.

Although an autopsy of the pilot identified severe coronary artery disease, which would have placed him at high risk for an acute cardiovascular event, it is unlikely that symptoms from his heart disease contributed to his inability to manage the inflight emergency. The rapidly developing emergency caused by fire and smoke, distracted the pilot who had little recent experience in the airplane. The pilot's diverted attention likely resulted in his failure to recognized that the airplane was going to exceed its critical angle of attack and enter an aerodynamic stall.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The pilot's failure to properly secure oil and fuel line fittings during maintenance, which resulted in an inflight engine fire, and his subsequent loss of control while maneuvering for landing. Contributing to the accident was the pilot's diverted attention due to the inflight fire.

Findings

Personnel issues	Incomplete action - Pilot
Personnel issues	Scheduled/routine maintenance - Pilot
Aircraft	Hoses and tubes - Incorrect service/maintenance
Personnel issues	Attention - Pilot

Factual Information

History of Flight

Approach-VFR pattern base	Fire/smoke (non-impact) (Defining event)
Approach-VFR pattern final	Fire/smoke (non-impact)
Approach-VFR pattern final	Loss of control in flight

On February 28, 2017, about 1302 eastern standard time, an experimental, amateur-built Sonex, N315AL, was substantially damaged when it collided with a building in Methuen, Massachusetts, during final approach for landing at Lawrence Municipal Airport (LWM), Lawrence, Massachusetts. The sport pilot was fatally injured. The airplane was owned by the pilot who was operating it under the provisions of Title 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed near the accident site at the time of the accident, and no flight plan was filed for the local personal flight.

An acquaintance of the pilot reported that the pilot had experienced fuel leaks in the cockpit due to a cross-threaded connector. He stated that the pilot spent most of his time doing maintenance inside the cockpit. In an e-mail sent to his Experimental Aviation Association (EAA) chapter on February 25, the pilot reported that the last time he flew the airplane was on October 8, 2016. He had removed and reinstalled the fuel tank twice due to a cross-threaded outlet fitting that was causing a fuel leak at the fuel outlet connection near the fuel shutoff valve in the cockpit. He stated that the issue was fixed and that he would fly the following Tuesday (the day of the accident), during which he would remain in the airport traffic pattern and "do a bunch of touch-and-goes to make sure everything is working correctly."

On the day of the accident, the pilot purchased 12 gallons of fuel about 1245. The pilot then informed the tower controller that he would be remaining in the traffic pattern to practice takeoffs and landings. The controller issued a takeoff clearance and instructed the pilot to make a left closed traffic pattern and to report mid-field downwind. The pilot acknowledged and departed runway 14; he then reported mid-field at an altitude of 1,400 ft above ground level (agl). The pilot was subsequently cleared to land, but he never acknowledged the clearance.

The controller reported that, as the airplane turned onto the final leg of the traffic pattern about 500 ft agl, another airplane was "over the numbers" getting ready to land. He stated that, although spacing did not appear to be an issue, he observed the accident airplane make a shallow s-turn maneuver to the left, then back to the right before it suddenly nosed over in a right turn and disappeared out of view.

Several witnesses on the nearby highway saw the airplane approach from the north, then make a sudden dive before disappearing behind trees. One witness stated that the belly of the airplane was "engulfed in flames." He described the flames as "very bright red" and stated that the airplane looked like a "meteor." He stated that flames also appeared to be behind the propeller, which was turning, and "under where the pilot would sit." Additional witnesses called 911, reporting that they saw a plane go down, that it was "on fire," and that the airplane "burst into flame."

Pilot Information

Certificate:	Sport Pilot	**Age:**	73,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	None None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	September 1, 2015
Flight Time:	128.5 hours (Total, all aircraft), 28 hours (Total, this make and model), 0 hours (Last 90 days, all aircraft), 0 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

According to Federal Aviation Administration (FAA) airman records, the pilot received his sport pilot certificate on May 21, 2014. Review of his logbook revealed 128.5 total hours of flight experience and 28 hours in the accident airplane make model as of his last logged flight about four months before the accident. The pilot did not hold an FAA medical certificate, nor was he required to as a sport pilot.

Aircraft and Owner/Operator Information

Aircraft Make:	LAVENDER ALAN P	**Registration:**	N315AL
Model/Series:	SONEX UNDESIGNAT	**Aircraft Category:**	Airplane
Year of Manufacture:	2016	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental light sport (Special)	**Serial Number:**	1589
Landing Gear Type:	Tailwheel	**Seats:**	2
Date/Type of Last Inspection:	May 4, 2016 Condition	**Certified Max Gross Wt.:**	1150 lbs
Time Since Last Inspection:	28 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	28.4 Hrs as of last inspection	**Engine Manufacturer:**	Jabiru
ELT:	C91 installed, not activated	**Engine Model/Series:**	3300L
Registered Owner:	On file	**Rated Power:**	120 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The pilot/owner purchased the airplane in January 2015 from the manufacturer in kit form. The pilot/owner completed the build and it was issued a special airworthiness certificate for experimental airplane on May 4, 2016. It was a two-seat, single-engine, low-wing, tailwheel-equipped airplane that was equipped with a Jabiru 3300L six cylinder, 120-horsepower

reciprocating engine. Airframe maintenance records indicated that the airplane had accumulated 28.4 hours total time as of the last recorded entry on October 8, 2016; on this day, the pilot flew 1.4 hours. The engine logbook had one entry dated May 1, 2016 that reported, "ground run no leaks." No additional engine maintenance was documented.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	LWM,140 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	17:54 Local	**Direction from Accident Site:**	320°
Lowest Cloud Condition:	Scattered / 9000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	4 knots /	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.35 inches Hg	**Temperature/Dew Point:**	13°C / -2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Methuen, MA (LWM)	**Type of Flight Plan Filed:**	None
Destination:	Methuen, MA (LWM)	**Type of Clearance:**	None
Departure Time:	12:55 Local	**Type of Airspace:**	Class D

The 1254 automated weather observation at LWM included variable wind at 4 knots, 10 miles visibility, scattered clouds at 9,000 ft, temperature 13°C, dew point -2°C, and an altimeter setting of 30.35 inches of mercury.

Airport Information

Airport:	Lawrence Municipal Airport LWM	**Runway Surface Type:**	Asphalt
Airport Elevation:	147 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	14	**IFR Approach:**	None
Runway Length/Width:	3900 ft / 100 ft	**VFR Approach/Landing:**	Traffic pattern

LWM was located 2 miles east of Methuen, Massachusetts, at an elevation of 147 ft mean sea level. It was equipped with two runways oriented 05/23 and 14/32. Runway 14/32 was 3,900 ft long and 100 ft wide. The surface was made of asphalt and was in good condition.

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	In-flight
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal	**Latitude, Longitude:**	42.722778,-71.135833

All components of the airplane were accounted for at the accident site and there was evidence of both pre- and postimpact fire. The airplane struck the roof of a three-story condominium building located about 1,800 ft from the approach end of runway 14. The airplane was found in the attic and upper bedrooms in a nose-low attitude on a heading about 208°. The empennage partially protruded from the roof. Both wings remained attached to the fuselage at their respective wing roots and were bent aft about 45°. The bedroom where the airplane came to rest caught fire, but was quickly extinguished by the building's fire suppression system. Fire damage was limited to the rooms in the immediate vicinity of the airplane.

The engine separated from the firewall and came to rest upright against a wall about 5 ft forward of the fuselage. The engine exhibited fire damage on the left side. The two-blade fixed P-Tip propeller blades separated about 12 inches from the propeller hub. The 17-gallon polymer fuel tank remained intact and secured behind the firewall and directly forward of the instrument panel. It contained about 7 gallons of 100 low lead aviation fuel. Fuel lines leading from the fuel tank were severed during impact and were leaking when the fire department arrived on scene. The fuel shutoff valve, which was installed at the lower side of the tank above the pilot's feet, was separated and found loose in the wreckage and was heavily fire damaged; its preimpact position could not be determined. The aluminum plumbing between the valve and the gascolator was consumed by fire; however, the fittings remained intact. The firewall-mounted gascolator contained residual fuel that resembled 100 low lead aviation fuel. The filter contained no contaminants and was not damaged.

The throttle body separated from the engine but remained attached by the control cable and was slightly damaged by impact forces. It displayed exterior discoloration and sooting, but no evidence of internal damage. The fuel regulator component remained attached to the throttle body; however, the fuel line into the regulator from the fuel supply had no torque and was easily spun by hand where it was threaded into the regulator. The throttle body was opened and displayed some discoloration that appeared like soot inside the air intake. The fuel regulator showed some soot deposits. Both intake and outflow lines and their respective connection nuts and couplers were undamaged at the unit and did not show any signs of heat damage, but areas under and to the left of the unit showed evidence of fire.

The spark plugs were removed; the electrodes exhibited normal wear and color when compared to a Champion inspection chart. Examination of the magnetos revealed no anomalies. The engine crankshaft was turned manually; internal engine continuity was confirmed. Compression and suction were observed on all cylinders and valve action was correct.

Flight control continuity was confirmed by operating the push/pull rods to their respective locations on each flight control surface. All connections remained intact. The aileron connections were traced

visually to the dual stick flight controls but could not be operated due to impact damage. Rudder control continuity was visually confirmed, but the controls could not be operated due to impact damage.

The engine sustained fire and heat damage, with the heaviest concentration of heat damage to the lower left side of the engine. Thermal damage propagated aft past the intake and exhaust manifolds through the rear of the engine. The oil filter was fused to the engine and could not be removed. The lower oil line that connected to the oil filter was not secured. The blue aluminum connection nut was loose. There was oil spray on the lower left side of the engine. The leading edge of the intact manifold expansion gaskets were heavily damaged by fire. All intake and exhaust manifolds on the left side of the engine showed evidence of external heat signatures. There was no evidence of heat damage to the right side of the engine. The engine cowl showed interior heat damage to the bottom side with the heaviest concentrations on the bottom left and aft.

Soot, discoloration, and heat signatures were on the bottom of the fuselage and on the leading edge of the radio antennae, which exhibited blistering. Soot was also on the inboard portion of the right wing, and a soot pattern was along the right side of the fuselage that originated from an area near the front of the airplane and extended out under the right wing toward the tail.

The instrument panel was impact- and heat-damaged. It contained an Xtreme-EFIS that can display primary flight display information, navigation information, and, optionally, engine information. The unit could not be separated from the instrument panel in the field, so the entire instrument panel was removed from the wreckage and sent to the NTSB Vehicle Recorder Division for additional examination and download. The SD card was successfully read using the manufacturer's software. Only one file, from February 5, 2016, was recovered, and this file was consistent with ground-only operation. No data pertinent to the investigation was recovered.

Medical and Pathological Information

The Commonwealth of Massachusetts Office of the Chief Medical Examiner, Boston, Massachusetts, performed an autopsy of the pilot. The cause of death was multiple blunt force and thermal injuries.

Severe coronary artery disease with a previously placed stent was found in the left anterior descending coronary artery. In the area of the stent, there was 90% stenosis, and in the more distal portion of the artery, there was 80% stenosis. In the circumflex artery, there was 80% stenosis in the area of a previous stent and 40% focal narrowing elsewhere. The right coronary artery had up to 40% stenosis from atherosclerosis. There was no gross evidence of a previous heart attack, but microscopy demonstrated interstitial fibrosis, hypertrophic cardiomyocytes, and hypertensive changes of the vasculature.

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicology testing on specimens of the pilot. Testing identified rosuvastatin in blood and urine. Rosuvastatin is a cholesterol lowering medication often marketed with the name Crestor and is not considered impairing.

Administrative Information

Investigator In Charge (IIC):	Mccarter, Lawrence
Additional Participating Persons:	David Cardullo; FAA/FSDO; Boston, MA
Original Publish Date:	March 18, 2019
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=94786