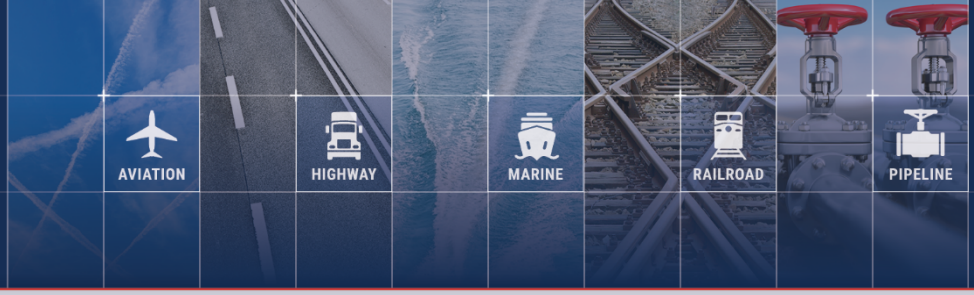

Aviation Investigation Final Report

Location:	Winston-Salem, North Carolina	**Accident Number:**	ERA13FA184
Date & Time:	March 31, 2013, 12:50 Local	**Registration:**	N6506L
Aircraft:	Lancair LC42 - 550FG	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The airplane was in cruise flight about 5,000 feet mean sea level (msl) in instrument meteorological conditions when the pilot declared an emergency and reported a loss of "fuel pressure" and engine power. The air traffic controller vectored the airplane toward the nearest airport, and, during the descent and when the airplane was about 6 miles from the airport, the pilot reported that smoke was in the cockpit and that the engine was "barely" producing power. No further transmissions were received from the pilot. The airplane collided with flat, wooded terrain and was significantly damaged by postcrash fire.

Data downloaded from the primary and multifunction cockpit displays indicate that the engine began steadily losing oil pressure during the airplane's initial climb until it leveled off at a cruise altitude of 5,000 feet msl. Data suggest that, at that time, the pilot leaned the fuel mixture for cruise flight. Although the pilot could have detected the decreasing oil pressure at that time, he did not report a loss of fuel pressure and engine power to the air traffic controller until about 6 minutes later. Data also indicate that there were multiple additional indications and cues of a loss of engine oil pressure in the cockpit but that the pilot did not respond to these in a timely manner. The operations manual indicates that the pilot should land as soon as possible if the engine oil pressure drops and then to prepare for a loss of engine power and an emergency landing. The pilot's delayed recognition of the drop in engine oil pressure was likely the result of a breakdown in her instrument scan, specifically, her systems monitoring during the climb and initial cruise phases of flight, during which time, her attention was likely directed at airplane control, power management, and navigation. The reason for the loss of engine oil pressure could not be determined during postaccident examinations due to postcrash fire damage.

Probable Cause and Findings

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

The pilot's failure to detect multiple indications and cues in the cockpit of the steady loss of engine oil pressure, which resulted in a catastrophic engine failure over terrain unsuitable for landing. Also causal was the loss of internal engine lubrication for reasons that could not be determined during postaccident examinations due to postcrash fire damage.

Findings

Aircraft	Recip eng oil sys - Failure
Not determined	(general) - Unknown/Not determined
Personnel issues	Identification/recognition - Pilot
Personnel issues	Lack of action - Pilot

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Emergency descent	Collision with terr/obj (non-CFIT)
Post-impact	Explosion (post-impact)
Post-impact	Fire/smoke (post-impact)

HISTORY OF FLIGHT

On March 31, 2013, at 1250 eastern daylight time, a Lancair LC42-550FG, N6506L, was destroyed when it collided with trees and terrain during a forced landing after a loss of engine power near Smith Reynolds Airport (INT), Winston-Salem, North Carolina. The commercial pilot and pilot-rated passenger were fatally injured. Instrument meteorological conditions prevailed, and an instrument flight rules flight plan was filed for the flight which originated from Wilkes County Airport (UKF), North Wilkesboro, North Carolina, at 1230, and was destined for Warren Field Airport (OCW), Washington, North Carolina. The personal flight was conducted under the provisions of Title 14 Code of Federal Regulations Part 91.

Information from the Federal Aviation Administration (FAA) revealed that the flight departed UKF at 1230 and climbed to 5,000 feet. The flight was in cruise flight about 5,000 feet when at 12:46.34, the pilot declared an emergency and reported a "low fuel pressure – engine's quitting." The air traffic controller vectored the airplane toward INT, and during the descent the pilot reported smoke in the cockpit and subsequently reported that the engine was "barely" producing power. At last report, the airplane was about 6 miles from INT, and no further transmissions were received from the pilot.

In an email, one witness stated that he heard the airplane, but could not see it due to low, irregular clouds. He said the airplane was "making a slightly uneven noise – like a sputter but more like its power was changing erratically." The witness further stated that the sound of the engine didn't not fade gradually as he expected, but "went abruptly silent." He later learned that the airplane crashed about six miles from the spot where he heard the sounds overhead.

Another witness reported to police that he saw the airplane flying just above the trees. He stated that the airplane was not trailing smoke, and that the propeller was not rotating. A third witness said the airplane was flying close to the tops of the trees, and the engine was sputtering as though it "may have run out of gas." A fourth witness reported seeing a "large blue object" just above the fence in her back yard before it exploded and burst into flames. She stated she heard no noise and didn't discover the object was an airplane until later.

PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with ratings for airplane single-engine land and instrument airplane. Her most recent FAA third-class medical certificate was issued on December 2, 2011, and she reported 800 total hours of flight experience on that date. An examination of the pilot's logbook revealed about 963 total hours of flight experience, 291 hours of which were in the accident airplane make and model.

The pilot-rated passenger held a private pilot certificate with ratings for airplane single-engine land and instrument airplane. His most recent third-class medical certificate was issued on November 19, 2010 and he reported 300 total hours of flight experience on that date. Examination of the pilot-rated passenger's logbook revealed that it was severely damage by fire and water. The total hours of flight experience, and time in make and model could not be determined, however it's estimated that the total hours of flight experience were about 460 hours. The last entries in the logbook appeared to be in December 2012 based on entries in previous pages.

AIRCRAFT INFORMATION

The airplane was manufactured in 2003, and was a pre-molded, composite built, semi-monocoque, four-seat, single engine, low wing, tricycle design airplane. The airplane was certified in the utility category and was used primarily for transportation and general aviation uses. The airplane was equipped with a Continental IO-550N, 310-horsepower engine. Examination of FAA records and copies of maintenance receipts revealed its most recent annual inspection was completed July 26, 2012 at 1,088 aircraft hours.

Subsequent to the annual inspection, the airplane underwent service and maintenance on five occasions. The work included an oil change, alternator change (2), and a starter adapter change. Each time an engine run was performed and a leak check was noted. The most recent maintenance run and leak check was annotated February 11, 2013.

Engine oil history

A review of the maintenance records revealed that the previous owner of the airplane had engine oil leaks corrected during 2009 and 2010. The repairs to and replacement of pushrod tubes, rocker covers, sump gaskets, and a front crankshaft seal were noted. Further, the Nos. 1, 2, and 5 cylinders were replaced on September 28, 2010.

On July 25, 2012, during the owner's pre-purchase inspection of the airplane, the left magneto oil seal was replaced due to "leaking." No further engine oil leaks were noted in the airplane's maintenance records.

METEOROLOGICAL INFORMATION

At 1254, the weather conditions reported at INT, at 969 feet elevation and 4 miles east of the accident site, included an overcast ceiling at 800 feet, visibility 7 miles, temperature 13 degrees C, dew point 11 degrees C, and an altimeter setting of 29.89 inches of mercury. The winds were from 240 degrees at 7 knots.

WRECKAGE AND IMPACT INFORMATION

The accident site was located on flat, wooded terrain in a residential area approximately 3 miles west of INT, and all major components of the airplane were accounted for at the scene. The wreckage path was oriented approximately 078 degrees magnetic and about 400 feet in length. The initial impact point was in a tree top; about 50 feet above the ground, and fragments of the airplane were distributed along the wreckage path.

The cockpit, cabin area, and engine compartment were consumed by postcrash fire. The main wreckage rested on its left side, and had been cut and displaced by first responders. Control continuity could not be determined due to significant fire damage, but flight control components that were examined exhibited fractures consistent with overload failure.

The engine remained in its mounts, attached to the fuselage, and each of the three propeller blades exhibited aft bending and spanwise scratching. The engine was severely damaged by fire and impact. The engine oil sump was completely burned away, and the engine case exhibited holes from both internal and external impact. Due to the extent of the damage, and the hazard of burned composite materials, no examination of the engine was conducted on site. The engine was retained for a detailed examination at a later date.

No evidence of oil streaking or staining of the airframe could be identified, as the airframe surrounding and aft of the engine compartment was completely destroyed by fire. The tail section was separated from the airplane, and displayed impact and postcrash fire damage. The exterior surfaces were stained from soot consistent with the postcrash fire.

MEDICAL AND PATHOLOGICAL INFORMATION

The Wake Forest University School of Medicine, Department of Pathology performed the autopsies on the pilot and the pilot-rated passenger. The autopsy report indicated that each died as a result of "multiple injuries."

The FAA's Bioaeronautical Sciences Research Laboratory, Oklahoma City, Oklahoma, performed toxicological testing of the pilot. The testing was negative for drugs, alcohol, and carbon monoxide.

TESTS AND RESEARCH

The engine was examined in Mobile, Alabama at the manufacturer's facility under the supervision of an NTSB senior air safety investigator. The engine exhibited significant impact and thermal damage, and the crankcase was breached above the Nos. 4, 5, and 6 cylinders. Disassembly revealed connecting rod, bearing cap, piston skirt, and hardware fragments in the oil sump. These fragments could not be matched with their associated engine components.

The Nos. 1 and 2 connecting rod assemblies were intact, but displayed thermal discoloration. Their respective connecting rod bearings exhibited lubrication distress and thermal smearing of the surface babbit, exposing the copper layer.

The Nos. 3, 4, 5 and 6 connecting rods were separated from the crankshaft. The No. 6 connecting rod separated from the crankcase and was not recovered.

The airplane was equipped with Avidyne Multi-Function Display (MFD) and Primary Flight Display (PFD), as well as analog engine instruments on the left side of the instrument panel, and analog flight instruments between the PFD and MFD in the center of the panel.

The MFD unit displayed the pilot checklist, terrain/map information, approach chart information and other aircraft/operational information depending on the specific configuration and options installed. One of the options available was comprehensive engine monitoring and performance data.

The PFD unit included a solid state Air Data and Attitude Heading Reference System (ADAHRS) and displayed aircraft flight data including altitude, airspeed, attitude, vertical speed, and heading. The PFD unit had external pitot and static port inputs for altitude, airspeed, and vertical speed information. Each PFD contained two TSOP2 Flash memory devices mounted on a riser card. The flash memory stored information the PFD unit used to generate the various PFD displays. Additionally, the PFD had a data logging function which is used by the manufacturer for maintenance and diagnostics.

The MFD and PFD were examined in the NTSB Vehicle Recorders Laboratory on November 1, 2013. Both displays exhibited major fire damage, and disassembly revealed major fire damage to the compact flash (CF) cards as well. The memory flash chips were removed, re-soldered to their respective CF cards, and placed in an Avidyne test bench equipped with a surrogate MFD and PFD.

The data was downloaded from each CF card, both engine and flight parameters were graphed, and a Google Earth overlay of the flight path was plotted. Engine parameters graphed included engine rpm, exhaust gas temperature, cylinder head temperature, fuel flow, and engine oil pressure. Airplane flight parameters such as auto pilot states, aircraft attitudes, accelerations, Flight Director, and Auto Pilot modes were also plotted.

The data showed the airplane departed UKF around 12:30:00, and the last valid GPS point was recorded at 12:49:14. About 12:38:40, during the initial climb, the oil pressure began a steady decline. About 12:40:00, while pressure altitude leveled around 5,000 feet, a decline in fuel flow and simultaneous increase in exhaust gas temperature, consistent with leaning of the fuel mixture for cruise flight, was noted. At 12:40:12, while in straight and level flight, the engine oil pressure dropped below 30 psi, and out of the normal operating range of 30 – 60 psi. At 12:42:28, the engine oil pressure dropped below the minimum pressure of 10 psi, and at 12:46:00, the exhaust gas temperatures and engine RPM dropped to zero.

The airplane maintained its heading, airspeed, and altitude for about 6 minutes with the engine oil pressure below the normal operating range, and for about 3.5 minutes with the oil pressure below the minimum allowable pressure at idle.

According to the Continental Installation and Operation Manual for the IO-550 series engines:

4-4.7. Low Oil Pressure

WARNING

If oil pressure drops below 30 psi, an engine failure is imminent. Follow AFM/POH emergency procedures.

If the oil pressure drops suddenly from a normal indication of 30-60 psi, monitor temperature closely and LAND AS SOON AS POSSIBLE.

Troubleshoot and correct the cause of the low oil pressure indication prior to further flight.

According to the Lancair Pilot's Operating Handbook, the engine oil pressure indication displayed red on both the map and engine pages when oil pressure decayed below 10 psi. An oil pressure annunciator also illuminated below 5psi.

The published emergency procedure for LOSS OF OIL PRESSURE:

1. Oil Temperature – CHECK WITHIN PROPER RANGES FROM 170 TO 220 [degrees]

1.1 If oil temperature is within operating range – LAND AS SOON AS POSSIBLE
1.2 If oil temperature is above operating range
1.2.1. Throttle –REDUCE to the minimum required power
1.2.2. LAND AS SOON AS POSSIBLE
1.2.3. BE PREPARED FOR LOSS OF ENGINE POWER AND PREPARE FOR AN EMERGENCY LANDING.

At the time the engine oil pressure decayed below 30 psi, the airplane was approximately 16 miles east of the departure airport, and about 2 miles south of Elkin Municipal Airport (ZEF), where the GPS RWY 25 instrument approach procedure was available.

Pilot Information

Certificate:	Commercial	**Age:**	56
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	December 2, 2011
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 963.7 hours (Total, all aircraft), 291.5 hours (Total, this make and model), 801 hours (Pilot In Command, all aircraft), 7.5 hours (Last 90 days, all aircraft)		

Pilot-rated passenger Information

Certificate:	Private	**Age:**	58
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	November 19, 2010
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 300 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Lancair	**Registration:**	N6506L
Model/Series:	LC42 - 550FG	**Aircraft Category:**	Airplane
Year of Manufacture:	2003	**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	42003
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	July 26, 2012 Annual	**Certified Max Gross Wt.:**	3400 lbs
Time Since Last Inspection:	66 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1088 Hrs as of last inspection	**Engine Manufacturer:**	Continental Motors
ELT:	Installed, not activated	**Engine Model/Series:**	IO-550N
Registered Owner:	Dennis O'Neal	**Rated Power:**	310 Horsepower
Operator:	Dennis O'Neal	**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	INT,969 ft msl	**Distance from Accident Site:**	4 Nautical Miles
Observation Time:	12:54 Local	**Direction from Accident Site:**	78°
Lowest Cloud Condition:		**Visibility**	7 miles
Lowest Ceiling:	Overcast / 800 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	240°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	29.88 inches Hg	**Temperature/Dew Point:**	13°C / 11°C
Precipitation and Obscuration:	Light - Low drifting - Mist		
Departure Point:	Wilkes County, NC (UKF)	**Type of Flight Plan Filed:**	IFR
Destination:	Warren Field, NC (OCW)	**Type of Clearance:**	IFR
Departure Time:	12:30 Local	**Type of Airspace:**	

Airport Information

Airport:	SMITH REYNOLDS INT	**Runway Surface Type:**	
Airport Elevation:	969 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 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	On-ground
Total Injuries:	2 Fatal	**Latitude, Longitude:**	36.116664,-80.286109

Administrative Information

Investigator In Charge (IIC):	Rayner, Brian
Additional Participating Persons:	Jerry L Toms; FAA/FSDO; Greensboro, NC Jan Smith; Cessna Aircraft Company; Wichita, KS Chris Lang; Continental Motors, Inc.; Mexico, MO
Original Publish Date:	October 30, 2014
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=86551