Aviation Investigation Final Report

Location:	Fallbrook, California	**Accident Number:**	WPR16FA091
Date & Time:	April 2, 2016, 09:15 Local	**Registration:**	N438Y
Aircraft:	NOKES MATTHEW LANCAIR IV P	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 Fatal, 5 Serious
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

About 15 minutes after departing on the cross-country flight, the experimental, amateur-built airplane experienced a loss of engine power, and the private pilot considered landing on a 550-ft-long airstrip for remote-controlled aircraft. After observing numerous people on and near the runway, he subsequently decided to land on an interstate highway. Upon touching down with the landing gear retracted, the airplane slid into a car parked on the paved shoulder of the highway, fatally injuring one of the car's occupants. Video footage captured by a cell phone inside the airplane showed normal engine indications before the accident. A video taken shortly thereafter did not capture the instrument panel or engine indications; however, the engine could be heard surging.

The airplane was equipped with fuel tanks in the left and right wings, as well as a fuselage tank. The right and left wing tanks each had a capacity of 52 gallons, and the capacity of the fuselage tank was 33 gallons. The fuel system was configured so that the left wing tank connected to the fuselage tank, and the engine would draw from the fuselage tank. The fuselage tank did not have a dedicated fuel quantity gauge; the pilot stated that he knew it was full when the wing tank gauge began to indicate above zero. The pilot stated that before departing on the accident flight, the left fuel tank quantity gauge indicated 1 gallon, which corresponded to 34 gallons available.

Postaccident examination of the airframe and engine revealed no evidence of mechanical malfunctions or failures that would have precluded normal operation. A test run of the engine at low, intermediate, and high power settings was successful.

The fuselage tank was breached during the accident, and an undetermined quantity of fuel leaked out. The gascolator did not contain any fuel, and the line from the gascolator to the engine-driven fuel pump, as well as the fuel inlet line to the fuel manifold, contained no fuel. The lack of fuel in these areas, coupled with the engine surging heard on video, may be an indication of fuel starvation; however, since the investigation was unable to determine the total quantity of fuel on board the airplane, the reason for the loss of power and engine surging could not be determined.

Probable Cause and Findings

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

A loss of engine power during cruise for reasons that could not be determined because examination of the airplane did not reveal any anomalies that would have precluded normal operation.

Findings

Not determined	(general) - Unknown/Not determined
Environmental issues	Ground vehicle - Effect on equipment

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (partial) (Defining event)
Landing	Collision with terr/obj (non-CFIT)

On April 2, 2016, about 0915 Pacific daylight time, an experimental amateur-built Nokes Matthew Lancair IV P, N438Y, made a forced landing, and collided with a parked car on the shoulder of Interstate 15 near Fallbrook, California. The pilot/owner was operating the airplane under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. The private pilot and his wife/ passenger sustained serious injuries; one occupant of the car sustained fatal injuries, and the other three occupants sustained serious injuries. The airplane sustained substantial damage. The personal flight departed Gillespie Field (SEE), San Diego, California, about 0900 en route to French Valley Airport, Murrieta/Temecula, California. Visual meteorological conditions prevailed, and no flight plan had been filed.

A private pilot witness was in the airplane pit area at the paved Palomar RC (remote control) Flyers flying strip northeast of the intersection of Interstate 15 (I-15) and Highway 76. He heard the airplane, and looked behind him toward Highway 76. He observed an airplane flying at an estimated 75 feet above ground level or a little higher as it crossed the landing field at a very low power setting. He thought that it may be at idle, but sounded to be running smoothly. The airplane seemed to be somewhat paralleling I-15, but over their field. It continued descending around the trees and toward the freeway. It went out of sight, but the landing gear and flaps were up. The airplane appeared to him to be at the perfect attitude and very under control to get the maximum glide distance. He estimated that the speed of the airplane was 60 to 75 mph. Even when the airplane descended around the trees and out of his view, it appeared to be well under control.

Another witness at the strip estimated the altitude over the strip at 100 feet with the engine at idle and the propeller turning. The landing gear and flaps were up. Just before the airplane reached large trees between the strip and the freeway, the airplane went into a right bank, and missed the trees. It continued descending to I-15 until it went out of sight. He did not hear the airplane impact the ground or any other vehicle.

The pilot stated that the engine lost power, and he considered landing on a short 550-foot remote controlled aircraft strip. He intended to land with the landing gear in the up position to shorten the landing distance; however, he was concerned about flipping over when running off the end of the runway. He observed numerous people on and near the runway, and decided to land on the freeway.

Witnesses on I-15 observed the airplane land, and contact the car. One noted that the landing gear was up. The pilot's wife/passenger stated that one person was trying to help her out, and told her that there was a lot of gasoline, and she had to move. Some witnesses helped the pilot and his passenger out of the airplane; they did not report a strong odor of fuel, or observe a large pool of liquid. One witness, who arrived before the fire department, smelled fuel, and estimated that 10 gallons of liquid was on the

pavement. The pilot provided a photo that showed two streams of fluid on the highway, but the quantity and type of fluid could not be determined. One witness stated that he did not fear for his safety. The first arriving Fire Chief Officer on scene reported that he observed a small spot of unknown fluid coming from the fuselage area by the wing that expanded out about 5 feet by 5 feet. Another fire department person noted enough liquid to dampen the soil near the cockpit, however he couldn't tell if this was fuel or water from a fire hose that was nearby.

Pilot Information

Certificate:	Private	**Age:**	62,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:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	August 18, 2015
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	November 11, 2015
Flight Time:	4750 hours (Total, all aircraft), 1200 hours (Total, this make and model), 10 hours (Last 90 days, all aircraft)		

The 62-year-old pilot reported that he held a private pilot certificate with a rating for airplane single-engine land. The pilot held a third-class medical certificate issued on August 18, 2015. It had the limitation that the pilot must wear corrective lenses. He had a Statement of Demonstrated Disability (SODA) 30D09235 dated October 9, 1992, for no useful vision in the left eye. The SODA was issued on October 21, 1992, after the pilot successfully completed a medical flight test.

The pilot held a Repairman Experimental Aircraft Builder certificate.

The pilot reported that he had a total flight time of 4,750 hours, and had logged 0 hours in the previous 90 days. He reported 1,200 hours in this make and model. He completed a flight review on November 11, 2015.

Aircraft and Owner/Operator Information

Aircraft Make:	NOKES MATTHEW	**Registration:**	N438Y
Model/Series:	LANCAIR IV P	**Aircraft Category:**	Airplane
Year of Manufacture:	2000	**Amateur Built:**	Yes
Airworthiness Certificate:	Experimental (Special)	**Serial Number:**	LIV-298
Landing Gear Type:	Retractable - Tricycle	**Seats:**	
Date/Type of Last Inspection:	November 30, 2015 Condition	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	350 Hrs as of last inspection	**Engine Manufacturer:**	CONT MOTOR
ELT:	Not installed	**Engine Model/Series:**	TSIO-550-E
Registered Owner:	On file	**Rated Power:**	350 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The four-seat low-wing retractable-gear airplane, serial number LIV-298, had an original special airworthiness certificate issued on January 29, 2000. A special airworthiness certificate was issued to the pilot/current owner on February 2, 2010. Federal Aviation Administration (FAA) records indicated that the registration on the airplane was issued on February 2, 2010, with an expiration date of December 31, 2013. The registration and airworthiness certificate were not identified in the wreckage. Maintenance logbooks were not located.

The pilot reported that the airplane had a total airframe time of 350 hours at the most recent condition inspection in November 2015.

The engine was a Continental Motors Inc. (CMI) TSIO-550E, serial number 803031. The pilot reported that the total time recorded on the engine at the most recent condition inspection was 350 hours.

The pilot stated that there were no unresolved maintenance issues prior to the flight, and no issues were detected during start, taxi, run-up, or takeoff.

Fueling records at Jet Air Systems, El Cajon, California, established that the airplane was fueled on April 1, 2016, with the addition of 5.0 gallons of 100LL aviation fuel. The pilot stated that the previous flight was in March 2016, and was a 1.25 hour round robin. He explained that the airplane had an auxiliary fuel tank on the belly that he had installed after purchasing the airplane; it was plumbed in with the left wing tank. The left wing tank had a placard on the filler cap indicating 75 US gallons; the right wing tank had a placard on the filler cap indicating 52 US gallons. The filler ports were near the outboard end of each wing. The pilot stated that the 75 gallons meant that he had a 10 gallon reserve when the left tank and the belly tank were full. As fuel was added, he knew that the center tank was full (33 gallons) when the left fuel gauge began to indicate. He confirmed that he had 5 gallons of fuel added to the left wing tank on April 1, and he observed 1 gallon on the left fuel tank gauge. He stated that there was still an indication of 1 gallon when he started the engine for the accident flight, and that there were 34 gallons of fuel on board. There was no fuel quantity gauge for the belly tank, and one was not

required; there was no provision to visually or manually quantify the amount of fuel in the tank.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KNFG,78 ft msl	**Distance from Accident Site:**	10 Nautical Miles
Observation Time:	08:54 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Clear	**Visibility**	5 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.18 inches Hg	**Temperature/Dew Point:**	13°C / 9°C
Precipitation and Obscuration:	Moderate - None - Haze		
Departure Point:	San Diego, CA (SEE)	**Type of Flight Plan Filed:**	None
Destination:	Murrieta, CA (F70)	**Type of Clearance:**	None
Departure Time:	09:00 Local	**Type of Airspace:**	

An automated surface weather observation at Camp Pendleton Marine Corps Air Station (KNFG), Oceanside, California (elevation 78 feet msl, 10 miles southwest of the accident site) was issued at 0854 PDT. It indicated wind from 180 degrees at 3 knots, 5 miles visibility with haze, sky clear, temperature 13 degrees C, dew point 09 degrees C, and an altimeter setting at 30.18 inches of mercury.

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Substantial
Passenger Injuries:	1 Serious	**Aircraft Fire:**	None
Ground Injuries:	1 Fatal, 3 Serious	**Aircraft Explosion:**	None
Total Injuries:	1 Fatal, 5 Serious	**Latitude, Longitude:**	33.338611,-117.158607(est)

Refer to the on-site examination report included in the public docket for further details.

The National Transportation Safety Board (NTSB) investigator-in-charge (IIC) and inspectors from the FAA examined the wreckage on site.

The first identified point of contact (FIPC) was a ground scar with blue paint transfer marks from the

belly of the airplane. After the ground scar was a series of propeller strike marks perpendicular to the flight path.

The nose of the airplane collided with the left rear portion of the trunk at an angle from the left to right, and intruded into the right back seat area of the parked car. The airplane pushed the car off the freeway shoulder into the adjacent dirt area. The airplane's three-bladed propeller and engine remained enmeshed with the car.

The California Highway Patrol utilized a GPS 900 RTK Rover to map the accident site, and a complete diagram is part of the public docket for this accident. The airplane slid for 272 feet, and there were no scars for another 308 feet until the airplane impacted the car. The two vehicles then moved another 100 feet together as a merged unit.

Investigators established control continuity for the ailerons, elevators, and rudder.

The airplane was oriented with the left wing a few degrees low, and the fuel caps were near the outboard edge of each wing. In this left wing low position, investigators measured about 1 inch of fluid in the left wing; they observed no fluid in the right wing. Moving the right wing to a low position still did not reveal evidence of fluid. While preparing the airplane to move it to a safer location than the side of the freeway, a small amount of fluid was observed dripping from the right wing root. After moving the airplane to a safer location, the IIC was not able to drain any fluid from the gascolator. Prior to wing removal, the IIC drained approximately 1 quart of a clear blue fluid that smelled like aviation gasoline from each wing sump. A water paste test did not change color indicating there was no water contamination in either sample.

Medical and Pathological Information

The pilot stated that he had adequate sleep, had not consumed alcoholic beverages, and was not taking any medications or supplements.

Tests and Research

The IIC and an investigator from CMI examined the wreckage at Air Transport, Phoenix, Arizona, on April 26, 2016. A full report is contained within the public docket for this accident.

The wreckage examination revealed no anomalies that would have precluded normal operation of the airframe or engine.

Airframe

The airplane was equipped with a belly tank, but it was ground down and breached. The belly drain was scraped.

The fuel selector valve (FSV) was labeled L, R, and OFF/OFF. The fuel line from the left wing fuel tank was connected to the belly tank, which in turn was connected by a separate line to the FSV. The right wing tank fuel line connected directly to the FSV. The outlet from the FSV connected to an electric fuel pump located on the right side wall of the cabin. A line went through the firewall to connect the electric fuel pump to the gascolator, which had a line connecting it to the engine. The return line from the engine was connected directly to the FSV, which had a separate line going directly to each (left and right) wing fuel tank.

The fuel quantity gauge had two indicators ranging from E to F on the left and right sides of the gauge.

The air filter was clean.

Engine

There were no holes in the crankcase or cylinders that indicated a catastrophic failure of the engine.

Investigators left the engine in place on the airframe. They manually rotated the crankshaft with the propeller. The crankshaft rotated freely; the valves moved approximately the same amount of lift in firing order, and the gears in the accessory case turned freely.

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder head.

The inlet for each turbocharger compressor was clear, and the rotors for each one turned freely.

Investigators disconnected the fuel line from the gascolator to the engine driven fuel pump, and nothing drained from the line. They then disconnected the fuel inlet line to the fuel manifold valve on top of the engine, and nothing drained from the line.

Recovery personnel installed a two-bladed propeller on the engine, and made other modifications to facilitate an attempt to run the engine (see the follow-up exam notes in the public docket).

The engine was started and run at low, intermediate, and finally at a high power setting. The engine was run a total of several minutes with no anomalies noted.

Propeller

All three propeller blades remained attached at the hub, but were loose, and rotated in the hub. They were all bent aft, and all three tips curled aft.

Fuel System

A detailed examination of the fuel system was completed on June 28, and the examination report is in the public docket; no anomalies were noted. The aft portion of the belly tank had a vent line going to a solenoid valve, which in turn was connected to a line exiting the belly skin of the airplane aft of the belly tank. Blowing into the vent with electrical power off, air could be heard going into the belly tank.

Additional Information

Video Study

A cell phone in the airplane contained media recordings of portions of the flight. An NTSB recorder's specialist in the Office of Research and Engineering viewed the images, and provided a written report, which is in the public docket for this accident. Pertinent parts of the report follow.

The phone captured 42 relevant media files, 23 still images and 16 video files. In some media files, the entire instrument panel was captured; in others, only portions of the instrument panel were captured. Only events pertinent to the accident were summarized.

The video files included start, taxi, takeoff, and cruise. Videos showed the airplane at different altitudes increasing from 1,500 feet up to 3,500 feet.

A still file showed the airplane in nearly level flight about 3,000 feet msl. Airspeed was 175 knots, heading was 315 degrees, manifold pressure was 26.8 psi, rpm was 2,480, fuel pressure 11 psi, oil pressure 55 psi, fuel flow 18.1 gph, and oil temperature was 178° F. The cylinder head temperature (CHT) was within that particular instrument's green limits. A clock showed a time of 19 minutes and 35 seconds. Another still taken several minutes later showed the airplane at 3,500 feet, on a direct route GPS track to French Valley Airport, which was 27.4 nm away.

A video began 28 minutes after startup; 3 seconds into that recording, the engine was heard making a surging noise. The pilot's hand was on the throttle then moved away as if to manipulate something on the instrument panel. No engine instruments were captured in the recording, and the GPS showed that the airplane was no longer on a direct track to the programmed waypoint. Eight seconds into the recording, the passenger appeared to put the phone down. No other useful visual information was captured; the recording ended 4 seconds later, and the engine was still surging.

Radar Study

Recorded radar data tracked the flight from about 1 minute after departure until the airplane approached the accident site. The airplane turned to the north, and remained to the east of Interstate 15. About 5 minutes prior to the accident, the airplane was nearly abeam the accident site at a mode C reported altitude of 3,700 feet msl. About 1 minute later, the target began a left 100-degree turn at 3,900 feet. About 1 minute later, it was descending to the west as it crossed Interstate 15 below 3,600 feet, and continued a descending turn to the south to parallel the freeway. It continued descending on a straight

southerly course for about 1 minute; it then began a left turn, crossing the freeway at 1,700 feet. The turn was over 180 degrees, and the last data point was near the accident site with the target at 600 feet.

Amateur Built

According to FAA Advisory Circular AC 20-27F, Certification and Operation of Amateur-Built Aircraft, "Amateur builders are free to develop their own designs or build from existing designs. We do not approve these designs and it would be impractical to develop design standards for the wide variety of design configurations, created by designers, kit manufacturers, and amateur builders."

Administrative Information

Investigator In Charge (IIC):	Plagens, Howard
Additional Participating Persons:	Greg Nolting; FAA FSDO; San diego, CA Chris Lang; Continental Motors Inc; Mobile, AL
Original Publish Date:	March 15, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92940