



# Aviation Investigation Final Report

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<b>Location:</b>	Hauppauge, New York	<b>Accident Number:</b>	ERA16LA124
<b>Date &amp; Time:</b>	March 5, 2016, 15:08 Local	<b>Registration:</b>	N295AR
<b>Aircraft:</b>	CIRRUS DESIGN CORP SR22	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

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## Analysis

The commercial pilot was conducting a personal cross-country flight. The pilot reported that, during cruise flight, the engine "sputtered" twice and then lost total power. He switched the fuel selector from the left tank to the right tank, but the engine would not restart, so he chose to activate the airframe parachute system. The parachute deployed normally, and the airplane touched down in a lawn adjacent to an industrial complex.

An examination of the engine revealed that the camshaft gear had numerous missing or smeared teeth, and metal particles were found inside the oil filter element and oil sump. Additional metallurgical examination revealed that the first fractured tooth, located about 180° from the timing mark, failed due to fatigue. Most of the remaining broken or missing teeth exhibited overload signatures. Camshaft gear hardness was measured, and it met the manufacturer's specifications.

In August 2005, the engine manufacturer issued a service bulletin (SB), which called for the replacement of the camshaft gear with an improved, wider gear design "at next engine overhaul or at camshaft gear replacement." The recommended overhaul time for this engine was 2,000 hours or 12 years, whichever occurred first. At the time of the accident, the engine was 15 years old, had accumulated 1,544 hours in service, and had never been overhauled. At the time of the accident, the SB had not been complied with and the improved camshaft gear had not been installed in the engine.

## Probable Cause and Findings

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

The total loss of engine power, which resulted from the failure of the camshaft gear due to fatigue. Contributing to the accident was the owner/operator's failure to comply with the engine manufacturer's recommended overhaul interval.

## Findings

<b>Aircraft</b>	Recip engine power section - Fatigue/wear/corrosion
<b>Aircraft</b>	Recip engine power section - Failure
<b>Personnel issues</b>	Scheduled/routine maintenance - Owner/builder
<b>Personnel issues</b>	Use of policy/procedure - Owner/builder

## Factual Information

### History of Flight

<b>Enroute-cruise</b>	Loss of engine power (total) (Defining event)
<b>Emergency descent</b>	Off-field or emergency landing

On March 5, 2016, about 1508 eastern standard time, a Cirrus Design Corporation SR22, N295AR, was substantially damaged following a total loss of engine power and forced landing at Hauppauge, New York. The pilot and one passenger were not injured. The airplane was registered to Advance Wellness and was operated by the pilot under the provisions of Title 14 *Code of Federal Regulations* Part 91 as a personal flight. Day, visual meteorological conditions prevailed, and no flight plan was filed. The flight from Groton, Connecticut (GON) to Farmingdale, New York (FRG) originated about 1430.

According to the pilot, during cruise flight, at 2,200 feet mean sea level, the engine "sputtered" twice, then lost all power. The fuel selector was on the left tank, so he switched to the right tank and attempted a restart. The engine would not restart, so he elected to activate the Cirrus Airframe Parachute System (CAPS). The CAPS deployed normally and the airplane touched down in a lawn adjacent to an industrial complex near Hauppauge. The pilot and passenger exited the cockpit and first responders arrived to assist.

An inspector with the Federal Aviation Administration responded to the accident site and examined the wreckage. Structural damage to fuselage was evident. The wing fuel tanks contained fuel. An initial inspection of the engine with a borescope revealed physical evidence of valve strikes to the top surfaces of all six pistons.

The engine was removed from the airframe and sent to the manufacturer's facility for further examination. During the disassembly of the engine, the starter adapter was removed, and damage to the camshaft gear teeth was noted. The oil filter was removed and opened; metal particles were found inside the filter element. Several metal particles were found in the oil sump after removal. The cylinders were removed; each piston head exhibited valve strike signatures. The camshaft was removed from the engine case. The camshaft was intact; however, about 50% of the camshaft gear teeth were smeared or missing.

Metallurgical examination of the failed camshaft gear teeth revealed that the first fractured tooth, located about 180° from the timing mark, failed from fatigue. The fracture surface exhibited beach marks and multiple initiation areas at the surface of the tooth. From the direction of the crack growth indicated by the arrest lines, the tooth separated in the direction of loading from engine operation by the mating crankshaft gear. Most of the remaining broken or missing teeth exhibited overload signatures. Camshaft gear hardness was measured with a diamond slim profile penetrator and met the manufacturer's specifications.

The engine, model number IO-550-NB7, was built on February 25, 2001, and had accumulated 1,543.7 hours at the time of the accident. On August 9, 2005, Continental Motors Inc. issued Service Bulletin SB05-08, which called for the replacement of the camshaft gear with an improved gear, nominally

0.060" wider. The bulletin compliance time was, "At next engine overhaul or at camshaft gear replacement." The recommended overhaul time for this engine was 2,000 hours or 12 years, whichever occurred first. At the time of the accident, the service bulletin had not been complied with and the accident airplane's engine did not have the improved camshaft gear installed.

## Pilot Information

<b>Certificate:</b>	Commercial; Private	<b>Age:</b>	50, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	January 15, 2014
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	
<b>Flight Time:</b>	1703 hours (Total, all aircraft), 1500 hours (Total, this make and model), 1512 hours (Pilot In Command, all aircraft)		

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	CIRRUS DESIGN CORP	<b>Registration:</b>	N295AR
<b>Model/Series:</b>	SR22 NO SERIES	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	2001	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	0028
<b>Landing Gear Type:</b>	Tricycle	<b>Seats:</b>	4
<b>Date/Type of Last Inspection:</b>	July 13, 2015 Annual	<b>Certified Max Gross Wt.:</b>	3400 lbs
<b>Time Since Last Inspection:</b>	58 Hrs	<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	1543 Hrs at time of accident	<b>Engine Manufacturer:</b>	CONT MOTOR
<b>ELT:</b>	Installed, not activated	<b>Engine Model/Series:</b>	IO-550 SERIES
<b>Registered Owner:</b>	On file	<b>Rated Power:</b>	310 Horsepower
<b>Operator:</b>	On file	<b>Operating Certificate(s) Held:</b>	None

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	FRG,80 ft msl	<b>Distance from Accident Site:</b>	9 Nautical Miles
<b>Observation Time:</b>	14:53 Local	<b>Direction from Accident Site:</b>	235°
<b>Lowest Cloud Condition:</b>		<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 11000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	4 knots /	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	230°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.15 inches Hg	<b>Temperature/Dew Point:</b>	3°C / -13°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	GROTON, CT (GON )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	FARMINGDALE, NY (FRG )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	14:30 Local	<b>Type of Airspace:</b>	Class C

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 None	<b>Latitude, Longitude:</b>	40.816665,-73.246391(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Hicks, Ralph
<b>Additional Participating Persons:</b>	Stephen R Ferrara; FAA/FSDO; Farmingdale, NM Brannon Mayer; Cirrus Aircraft; Duluth, MN Chris Lang; Continental Motors; Mobile, AL
<b>Original Publish Date:</b>	December 14, 2017
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=92811">https://data.nts.gov/Docket?ProjectID=92811</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).