



Aviation Investigation Final Report

Location:	Tyler, Texas	Accident Number:	CEN20LA020
Date & Time:	November 22, 2019, 13:38 Local	Registration:	N969JM
Aircraft:	Cirrus SR22	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	2 Serious, 1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

According to the pilot, about 2 minutes after leveling off at a cruise altitude of 3,000 ft above mean sea level (msl), the engine shook and vibrated. He switched his multifunction display (MFD) to the engine parameter page and all engine indications appeared normal. About 2 minutes later, the indication of the No. 5 engine cylinder turned from green to red. He then reported the engine problem to air traffic control and announced his intentions to divert to an alternate airport. Unable to maintain altitude he began a descent. Shortly thereafter, the engine appeared to operate normally, and he was able to climb about 200 ft per minute before the shaking returned. The airplane descended out of the clouds about 1,200 ft msl, and the pilot deployed the airplane’s parachute system. The airplane impacted the ground and was substantially damaged.

A postaccident examination of the engine revealed that the No. 5 piston head exhibited cleaning and damage consistent with detonation, while the No. 1 cylinder exhibited signatures consistent with the initial phase of detonation. The magneto timing on the engine measured at 27° before top center (BTC) rather than the factory specification of 24° BTC. According to the engine manufacturer, coupled with a rich mixture, this could result in detonation.

When asked to describe the engine leaning procedure used, the pilot stated that he would lean the mixture to the blue line on the MFD. According to the airframe manufacturer, the Lean Assist blue line does not take into account engine timing.

It is likely that the incorrect engine timing, when combined with a mixture setting that was too rich for the engine condition, resulted in detonation. Investigators did not establish the last time the engine timing was adjusted.

Probable Cause and Findings

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

A total loss of engine power as a result of detonation due to a combination of improper magneto to engine timing and a rich fuel mixture.

Findings

Aircraft	Magneto/distributor - Incorrect service/maintenance
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Factual Information

History of Flight

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

On November 22, 2019, about 1338 central standard time, a Cirrus SR-22 airplane, N969JM, was substantially damaged when it was involved in an accident near Tyler, Texas. The pilot and passenger sustained serious injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

According to the pilot, about 2 minutes after leveling off at a cruise altitude of 3,000 ft above mean sea level (MSL), the engine “shook real good” which was followed by a “big vibration.” He switched his multifunction display (MFD) to the engine parameter page and all engine indications appeared normal. About 2 minutes later, the depiction of the No. 5 engine cylinder turned from green to red. He immediately checked the manifold pressure which indicated 28.5 inches of mercury or according to the pilot, about 2/3 full power. The pilot then reported the engine problem to air traffic control (ATC) and announced his intentions to divert to an alternate airport.

Unable to maintain altitude he began a descent. Shortly thereafter, the engine appeared to smooth out and he was able to climb about 200 ft per minute before the shaking returned. Subsequently, the pilot declared an emergency with ATC and advised of his intention to deploy the Cirrus Airframe Parachute System (CAPS) when he reached 1,000 ft msl. The airplane descended out of the clouds about 1,200 ft msl and the pilot identified a field to his right. He turned toward the field and tried to utilize the high boost fuel pump to restore power, to no avail. He then lowered the nose of the airplane and deployed the CAPS when the airplane was between 550 ft and 650 ft agl.

The airplane impacted the ground underneath the CAPS canopy and came to rest upright. The passenger extricated the unconscious pilot and got away from the airplane. The parachute caught the wind and carried the airplane about 1/4 mile across the field into a stand of trees. The initial impact resulted in substantial damage to the fuselage, and the subsequent travel across the field and into the trees resulted in further damage to the fuselage and substantial damage to both wings.

A post-accident examination of the airplane’s Continental TSIO-550 series engine revealed that the No. 5 piston head exhibited cleaning and damage consistent with detonation, while the No. 1 cylinder exhibited signatures consistent with the initial phase of detonation. Also, the Nos. 5 and 6 connecting rods exhibited movement consistent with bearing liberation. The fuel manifold and fuel injection nozzles were placed on a production flow bench and flowed at production specifications. The magneto timing on the engine measured at 27° before top center (BTC) rather than the factory specification of 24° BTC. According to the engine manufacturer, coupled with a rich mixture this could result in detonation.

When asked to describe the engine leaning procedure used, the pilot stated that he would lean the mixture to the blue line on the MFD. According to Cirrus, the Lean Assist blue line does not take into account engine timing. According to the Cirrus Perspective cockpit reference guide, when the “ASSIST” key is selected, the system highlights the number and places a light blue box around the exhaust gas temperature (EGT) readout of the cylinder with the hottest EGT. There is a value for the deviation from peak EGT to assist the pilot in knowing the difference between the peak temperature and the current temperature for the peaked cylinder. “The system continues to detect peak EGTs for each cylinder lean of peak as the fuel flow is decreased, and the peak of each cylinder’s EGT is indicated by a light blue marker on the graph.”

The airplane was equipped with a Heads-Up Technologies recoverable data module (RDM) that recorded flight, engine, and autopilot parameters in one second intervals. A review of the data revealed that around 1314:45, the No. 5 cylinder head temperature (CHT) began to increase, the exhaust gas temperature (EGT) began to decrease, and engine oil pressure began to decrease. After a brief recovery of the CHT and EGT values, which lasted about 2 minutes, the No. 5 cylinder failed. Shortly after the No. 5 cylinder failure, the No. 1 cylinder failed.

Pilot Information

Certificate:	Airline transport; Flight instructor; Remote	Age:	52, Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	Seat Occupied:	Left
Other Aircraft Rating(s):	Unmanned (sUAS)	Restraint Used:	3-point
Instrument Rating(s):	Airplane	Second Pilot Present:	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	Toxicology Performed:	No
Medical Certification:	BasicMed Unknown	Last FAA Medical Exam:	August 31, 2018
Occupational Pilot:	No	Last Flight Review or Equivalent:	May 22, 2019
Flight Time:	25400 hours (Total, all aircraft), 3200 hours (Total, this make and model), 25250 hours (Pilot In Command, all aircraft), 330 hours (Last 90 days, all aircraft), 105 hours (Last 30 days, all aircraft), 11 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cirrus	Registration:	N969JM
Model/Series:	SR22 NO SERIES	Aircraft Category:	Airplane
Year of Manufacture:	2014	Amateur Built:	
Airworthiness Certificate:	Normal	Serial Number:	0714
Landing Gear Type:	Tricycle	Seats:	4
Date/Type of Last Inspection:	January 1, 2019 Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:		Engine Manufacturer:	Continental Motors
ELT:		Engine Model/Series:	TSIO 550
Registered Owner:	Martin Aviation Llc	Rated Power:	
Operator:	On file	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Instrument (IMC)	Condition of Light:	Day
Observation Facility, Elevation:	KTYR,551 ft msl	Distance from Accident Site:	9 Nautical Miles
Observation Time:	12:53 Local	Direction from Accident Site:	154°
Lowest Cloud Condition:		Visibility	10 miles
Lowest Ceiling:	Overcast / 600 ft AGL	Visibility (RVR):	
Wind Speed/Gusts:	12 knots /	Turbulence Type Forecast/Actual:	None / None
Wind Direction:	310°	Turbulence Severity Forecast/Actual:	N/A / N/A
Altimeter Setting:	30.03 inches Hg	Temperature/Dew Point:	11°C / 8°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Terrell, TX (TRL)	Type of Flight Plan Filed:	IFR
Destination:	Gladewater, TX (07F)	Type of Clearance:	IFR
Departure Time:	13:15 Local	Type of Airspace:	Class E

Wreckage and Impact Information

Crew Injuries:	1 Serious, 1 None	Aircraft Damage:	Substantial
Passenger Injuries:	1 Serious	Aircraft Fire:	None
Ground Injuries:		Aircraft Explosion:	None
Total Injuries:	2 Serious, 1 None	Latitude, Longitude:	32.489723,-95.481941

Administrative Information

Investigator In Charge (IIC):	Williams, David
Additional Participating Persons:	Gavin Hill; FAA; Irving, TX Brannon Meyer; Cirrus Aircraft; Duluth, MN Mike Council; Continental Motors; Mobile, AL
Original Publish Date:	April 6, 2022
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.nts.gov/Docket?ProjectID=100610

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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](#).