Aviation Investigation Final Report

Location:	Selma, Alabama	**Accident Number:**	ERA20LA212
Date & Time:	June 10, 2020, 16:31 Local	**Registration:**	N543GS
Aircraft:	Piper PA32RT	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of engine power (total)	**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation		

Analysis

After departure, the pilot leveled the airplane at a cruise altitude of 15,000 ft mean sea level (msl). About 40 minutes into the flight, the pilot reported an engine "fluctuation" to the controller and requested to divert to a nearby airport. The controller cleared the airplane for the diversion, and the pilot indicated that the propeller was turning; however, the airplane had experienced a total loss of engine power and then an in-flight fire. When the airplane was about 3 miles from the diversion airport and about 3,100 ft msl, radar and voice communications were lost. The airplane impacted a field, and all components of the airplane were within the vicinity of the main wreckage.

Examination of the engine revealed a hole in the top of the crankcase, thermal discoloration on the aft section of the crankshaft, and detachment of the No. 6 connecting rod from the crankshaft journal. The No. 6 rod journal exhibited severe thermal discoloration. Examination of the connecting rod journal bearings revealed extensive damage to all the submitted bearings. Circumferential score marks and heavy wear were visible on the inner diameter of the bearing halves. The camshaft was fractured in torsional overstress.

The oil sump was removed from the engine and contained oil, metallic particles, small carbon chips, and organic debris. The oil filter was removed, disassembled, and a small amount of carbon chips and metallic debris was noted on the filter. The oil pump was removed from the accessory section of the engine and the pump body exhibited scoring. In addition, the oil suction screen was completely occluded by debris that filled the screen over 60% and likely starved the engine of oil. Examination of the debris in the oil suction screen revealed that approximately 75% of the debris was metallic and the remaining 25% of the debris was not metallic.

Given the significant amount of nonmetallic debris, it likely accumulated over time and resulted in the engine being starved of oil. When the engine subsequently lost total power, the crankcase was penetrated, which is likely the origin of the in-flight fire.

There was no record that the oil suction screen was cleaned during the airplane's most recent oil change about 3 months before the accident. The last documented cleaning of the oil suction screen was about 11 years before the accident and the engine had accumulated an additional 550 hours until the time of the accident.

The engine's operating manual stated that "at each fifty hours inspection," the oil suction and oil pressure screens should be removed and inspected for metal particles, cleaned and reinstalled. It also noted that, "on installations employing external oil filters," inspection of the oil suction screen "should be observed at the 100-hour inspection." Furthermore, the airframe service manual stated that the oil suction screen should be cleaned at every 50-hour interval.

When asked if the oil suction screen was cleaned during the oil change associated with the most recent annual inspection, the mechanic who performed the work stated that the oil cooler was cleaned, which likely indicates that the oil suction screen was not cleaned. A discrepancy for low oil pressure that was recorded in the engine maintenance log the day before the accident was likely due to the obstructed oil suction screen. Subsequently, the obstructed oil suction screen led to the engine being starved of oil and a total loss of engine power.

Probable Cause and Findings

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

The mechanic's failure to clean the oil suction screen during the most recent maintenance, which resulted in oil starvation and subsequent total loss of engine power.

Findings

Aircraft	Recip eng oil sys - Not serviced/maintained
Personnel issues	Scheduled/routine maintenance - Maintenance personnel
Personnel issues	Lack of action - Maintenance personnel

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Enroute-cruise	Loss of engine power (total) (Defining event)
Enroute-cruise	Fire/smoke (non-impact)
Emergency descent	Loss of control in flight

On June 10, 2020, about 1631 central daylight time, a Piper PA-32RT-300T, N543GS, was destroyed when it was involved in an accident near Selma, Alabama. The commercial pilot and pilot-rated passenger were fatally injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 business flight.

According to the fixed-based operator, the airplane was fueled with 55 gallons of fuel prior to departure from Walker County Airport – Bevill Field (JFX), Jasper, Alabama. According to Federal Aviation Administration (FAA) air traffic control communications and radar data, the airplane departed JFX at 1543 with the intended destination of Pensacola International Airport (PNS), Pensacola, Florida. After departure, the airplane climbed and leveled off at a cruise altitude of 15,000 ft mean sea level (msl). About 40 minutes into the flight, the pilot reported an engine "fluctuation" to the controller and requested to divert to Craig Field Airport (SEM), Selma, Alabama. The controller cleared the airplane to SEM, and the pilot indicated that the propeller was turning; however, the airplane had experienced a total loss of engine power. Soon after, while in the descent to SEM, the pilot stated that there was a "fire as well." When the airplane was about 3 miles from SEM and about 3,100 ft msl, radar and voice communications were lost.

Pilot Information

Certificate:	Commercial	**Age:**	43,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 2 Without waivers/limitations	**Last FAA Medical Exam:**	March 14, 2019
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	267.5 hours (Total, all aircraft), 157.3 hours (Pilot In Command, all aircraft)		

Pilot-rated passenger Information

Certificate:	Airline transport; Flight instructor	**Age:**	51,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	Unknown
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Instrument airplane	**Toxicology Performed:**	Yes
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	February 6, 2020
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	6.4 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N543GS
Model/Series:	PA32RT 300T	**Aircraft Category:**	Airplane
Year of Manufacture:	1978	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	32R-7887124
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	March 29, 2020 Annual	**Certified Max Gross Wt.:**	3600 lbs
Time Since Last Inspection:	9.3 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	3253.8 Hrs at time of accident	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	TIO-540-S1AD
Registered Owner:	On file	**Rated Power:**	300 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The airplane was manufactured in 1978. At the time of the accident, it had a tachometer time of 732.7 hours and 1,726.9 hours time since major overhaul on the engine. The most recent annual inspection was completed on March 29, 2020, at a tachometer time of 723.4 hours. At that time, the oil was changed, and the oil filter was replaced. In addition, a discrepancy noted on the work order for the maintenance indicated that the “oil temp[erature] probe is not reading correctly.” According to the mechanic, the oil temperature probe was changed, and the oil lines were changed. When asked if the oil suction screen was cleaned during the most recent annual inspection, the mechanic stated that “oil cooler was cleaned…flushed, and reinstalled on the aircraft.”

On May 29, 2020, at a tach time of 726.0 hours, the airplane had a discrepancy that indicated the airplane was “running rough and low power.” The maintenance entry indicated that cylinder No. 4 was replaced, and the airplane was returned to service with no discrepancies.

According to a maintenance entry on June 9, 2020, at a tach time of 728.2 hours, a discrepancy was listed as “oil pressure low.” The entry indicated that the mechanic “adjusted oil pressure by turning regulator screw one turn and re-safety wired [the] nut.” The airplane was flown with no discrepancies and returned to service.

An examination of the engine maintenance logbook revealed that the most recent documented cleaning of the oil suction screen was July 17, 2009. At that time, the engine had accumulated 1178.5 hours of time since major overhaul. Concerning maintenance of the oil suction and oil pressure screens, the engine's operating manual stated, "at each fifty hours inspection, remove, inspect for metal particles, clean and reinstall." It also noted “On installations employing external oil filters” the step involving inspecting the oil suction screen “should be observed at the 100-hour inspection.” The airframe service manual listed under the “Engine Group” that the oil suction strainer should be cleaned at every 50-hour interval.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SEM,167 ft msl	**Distance from Accident Site:**	4 Nautical Miles
Observation Time:	16:35 Local	**Direction from Accident Site:**	70°
Lowest Cloud Condition:	Clear	**Visibility**	9 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	10 knots / 15 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	220°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.92 inches Hg	**Temperature/Dew Point:**	31°C / 25°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Jasper, AL (JFX)	**Type of Flight Plan Filed:**	IFR
Destination:	Selma, AL (SEM)	**Type of Clearance:**	IFR
Departure Time:	15:43 Local	**Type of Airspace:**	

Airport Information

Airport:	Craig Field SEM	**Runway Surface Type:**	Asphalt;Concrete
Airport Elevation:	166 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	33	**IFR Approach:**	None
Runway Length/Width:	8014 ft / 150 ft	**VFR Approach/Landing:**	Forced landing;Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	In-flight
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	32.326946,-87.05722(est)

The airplane impacted a field, and all components of the airplane were within the vicinity of the main wreckage. The initial impact crater was about 4.5 ft deep, and the debris field was about 225 ft long by 120 ft wide oriented on a 125° heading.

The airplane was recovered to a salvage facility for further examination. Examination of the airframe revealed that the fuselage was largely fragmented. Flight control continuity was established from the flight controls to their respective flight control surfaces through multiple overload breaks. The left wing was separated at the root and was mostly fragmented. The wing's aft attach point remained attached to the fuselage and was pulled from the wing structure. The right wing was separated at the wing root and was largely fragmented.

The fuel tanks were destroyed from impact forces. The vertical stabilizer was impact damaged but remained attached to its mounts. The stabilator attach point to the vertical stabilizer was separated. The left and right stabilator sections were fragmented and deformed aft. The rudder remained attached to its hinges and was separated into two sections.

The engine was separated from the airframe and located in the crater on the initial impact. The Nos. 1-4 cylinders were removed from the engine and examined. Corrosion was noted on the interior of cylinder No. 1; otherwise, there were no anomalies noted. Cylinders Nos. 5 and 6 were removed and the pistons could not be removed from the cylinders. The crankcase was examined, and a hole was in the top of the case in the vicinity of the No. 6 cylinder. The forward section of the 2-4-6 section side of the crankcase was impact damaged. The 1-3-5 side exhibited impact damage on the interior.

The top spark plugs were removed and examined. The Nos. 3, 4, 5, and 6 top spark plugs exhibited dark gray, worn, normal electrodes when compared to the Champion Check-A-Plug Chart. The remaining spark plugs were impact damaged. The fuel pump and fuel servo were disassembled with no anomalies noted. The fuel screen was free of debris. The camshaft was fractured into two sections above the No. 6 crankshaft journal. The section of the camshaft near the aft portion of the engine exhibited thermal discoloration. The camshaft lobes exhibited normal wear.

The crankshaft was removed from the crankcase and examined. It remained in one piece but exhibited thermal discoloration on the aft section of the crankshaft. The Nos. 1 through 4 connecting rods remained attached to the crankshaft and the crankshaft bearing exhibited scoring and smearing. Nos. 5 and 6 connecting rods remained attached to the piston, which were lodged inside the cylinder. The No. 5 connecting rod was detached from the crankshaft journal. In addition, the journal exhibited extensive thermal discoloration and rotational scoring. The No. 6 connecting rod was detached from the crankshaft journal and small pieces of the No. 6 connecting rod and bearing were located. The rest of the connecting rod was not located. The No. 6 rod journal exhibited severe thermal discoloration.

The oil sump was removed from the engine and contained oil, metallic particles, small carbon chips, and organic debris. The oil suction screen was examined, and it was obstructed by debris that filled about 2/3-5/8 of the oil suction screen. The debris was retained for further examination. The oil filter was removed from the engine. It had a date of March 27, 2020, written on it. It was opened and a small amount of carbon chips and metallic debris was noted on the filter. The oil pump was removed from the accessory section of the engine and examined. The pump body exhibited scoring.

Examination of the connecting rod journal bearings revealed extensive damage to all the submitted bearings. Circumferential score marks and heavy wear were visible on the inner

diameter of the bearing halves. Galling and displaced material were observed on most of the inner diameters, with the worst galling damage on the inner diameter of bearing No. 3. Discoloration due to overheating was also present on the journal inner diameters.

The camshaft was examined by the NTSB Materials Laboratory. The fracture surface spiraled circumferentially around the shaft diameter and had shear lips present around half of the circumference. The separation of the camshaft was consistent with torsional overstress.

The oil suction screen and debris were submitted to the NTSB Materials Laboratory for further examination. The debris was sorted using a magnet and the magnetic debris weighed 9.8 grams, while the non-magnetic debris weighed 3.1 grams. Thus, approximately 75% of the debris was metallic and the remaining 25% of the debris was not metallic.

Administrative Information

Investigator In Charge (IIC):	Kemner, Heidi
Additional Participating Persons:	Kyle Cook; FAA/FSDO; Birmingham, AL Mike Childers; Lycoming Engines; Atlanta, GA Damian Galbraith; Piper Aircraft; Vero Beach, FL
Original Publish Date:	August 24, 2021
Last Revision Date:	
Investigation Class:	Class 3
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=101427