Aviation Investigation Final Report

Location:	Port Orange, Florida	**Accident Number:**	ERA21LA388
Date & Time:	September 29, 2021, 14:06 Local	**Registration:**	N116SV
Aircraft:	Cessna 172	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General aviation - Instructional		

Analysis

After an uneventful 1-hour flight, the flight instructor and student pilot were returning to the airplane's home base. The flight instructor pointed out to the student that the airplane had descended below the assigned altitude, and the student replied, "we have no power." The flight instructor took over the flight controls and attempted to restore power. Because that effort was unsuccessful, the flight instructor pitched the airplane to achieve the best glide speed. After realizing that the airplane would not reach the nearest airport, he performed a forced landing in a field, and the airplane nosed over during the landing roll.

Postaccident examination of the engine revealed that the camshaft was not being driven by the left crankshaft idler gear assembly because it was out of position. The nut that secured the idler gear to a stud at the left crankcase was separated, and a bolt that also secured the idler gear to the left crankcase was fractured. Extensive damage was noted to the left crankcase in the area that supported the idler gear and the area into which the securing bolt was threaded, indicating movement of the crankshaft idler gear shaft for an extended period of time. The available evidence for this investigation did not allow a determination regarding the reason for the separation of the nut from the stud and the fracture of the bolt that secured the idler gear to the crankcase.

The engine was last overhauled about 11 years and 3,488 hours before the accident. The owner/operator of the airplane at the time of the accident stated that, during the time that he owned the airplane, maintenance personnel had not cut open the oil filter to inspect the filter element during each oil change. Photographic evidence showed the presence of non-ferrous particles in the oil filter element. It is likely that these particles were from the damaged left crankcase. If maintenance personnel had cut open the oil filter and inspected the filter element during each oil change (the most recent of which was during the last inspection of the engine 3

months before the accident), it is possible that they would have detected the presence of non-ferrous particles in the filter element and taken action to identify the source.

Probable Cause and Findings

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

The separation of the nut from the stud and the fracture of the bolt that secured the crankshaft idler gear to the engine crankcase, which resulted in a total loss of engine power due to the inability of the left crankshaft idler gear assembly to drive of the camshaft.

Findings

Aircraft	Recip eng rear section - Failure

Factual Information

History of Flight

Enroute-descent	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Nose over/nose down

On September 29, 2021, about 1406 eastern daylight time, a Cessna 172S, N116SV, was substantially damaged when it was involved in an accident near Port Orange, Florida. The flight instructor and the student pilot were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 instructional flight.

The flight instructor stated that, earlier that day, the student pilot flew from Massey Ranch Airpark (X50), New Smyrna Beach, Florida, to Gainesville Regional Airport (GNV), Gainesville, Florida, and made an uneventful full-stop landing. Afterward, the airplane departed GNV to return to X50 with the student pilot at the controls. The airplane had an adequate supply of fuel, and the engine fuel-to-air ratio was leaned once the airplane climbed to 3,500 ft mean sea level (msl).

The controller at Daytona Beach Approach Control cleared the flight to descend to 2,500 and then 1,600 ft msl. While the airplane descended with the power reduced to 1,900 rpm, the flight instructor informed the student pilot that the airplane was 100 ft below the assigned altitude, and the student pilot replied, “we have no power.” The flight instructor took over the flight controls and applied full throttle, but the engine rpm did not change. He confirmed that the mixture control was in the full rich position and that the fuel selector was in the “both” position. The flight instructor simultaneously pitched the airplane to achieve the best glide speed (68 knots) and told the student pilot to complete the checklist for an engine failure during flight.

As the student pilot performed the checklist, the flight instructor advised the controller that the engine had lost power, and the controller provided information about nearby airports. Due to the airplane’s altitude and distance from those airports at the time, the flight instructor realized an off-airport landing was necessary. The flight instructor located a field and performed a forced landing. After the airplane rolled on the ground for a few feet, the nose landing gear contacted “something,” and the airplane nosed over, resulting in substantial damage to the left wing, the vertical stabilizer, and the bottom and left side of the fuselage near the horizontal stabilizer.

The airplane was equipped with a Garmin G1000 multifunction display. No pertinent data from the accident flight could be recovered because the unit firmware version installed on the unit did not store data.

Postaccident examination of the engine revealed that rotation of the crankshaft did not result in rotation of the camshaft. After removal of the accessory case, the left crankshaft idler gear assembly, which was driven by the crankshaft gear and drove the camshaft, was found out of position. Extensive damage was noted in the area of the left crankcase (which supported and secured the crankshaft idler gear shaft). The left crankcase (which received the securing bolt on the lower portion of the crankshaft idler gear shaft) exhibited extensive damage. A castellated nut (which secured the upper portion of the crankshaft idler gear shaft to a stud in the left crankcase) was separated, and a bolt (which secured the lower portion of the crankshaft idler gear shaft to the left crankcase) was fractured. The right crankshaft idler gear shaft remained secured to the crankcase by two bolts that were safety wired.

A photograph of the oil filter element showed non-ferrous particles. The owner/operator of the airplane reported that maintenance personnel had not cut open the oil filter (to inspect the filter element) during each engine inspection performed while he owned the airplane.

The engine had been overhauled by a repair station in December 2010 and was installed in the airplane several days later. The engine was removed from the airplane in July 2011 for a disassembly inspection due to a stuck valve and bent pushrods. The engine was reinstalled in the airplane on July 20, 2011, where it remained through the time of the accident. The engine accrued about 3,488 hours since June 25, 2021, which was the date of the engine's last inspection and oil change. No evidence for this investigation allowed a determination regarding the engine time accrued between the last inspection and the accident.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	22,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane single-engine; Instrument airplane	**Toxicology Performed:**	
Medical Certification:	Class 1 With waivers/limitations	**Last FAA Medical Exam:**	May 24, 2017
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 24, 2021
Flight Time:	320 hours (Total, all aircraft), 290 hours (Total, this make and model), 170 hours (Pilot In Command, all aircraft), 38 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Student pilot Information

Certificate:	Student	**Age:**	21,Male
Airplane Rating(s):	None	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	None	**Toxicology Performed:**	
Medical Certification:	Class 1 Without waivers/limitations	**Last FAA Medical Exam:**	July 27, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	83 hours (Total, all aircraft), 83 hours (Total, this make and model), 2 hours (Pilot In Command, all aircraft), 30 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Cessna	**Registration:**	N116SV
Model/Series:	172 S	**Aircraft Category:**	Airplane
Year of Manufacture:	2005	**Amateur Built:**	
Airworthiness Certificate:	Normal; Utility	**Serial Number:**	172S9815
Landing Gear Type:	Tricycle	**Seats:**	4
Date/Type of Last Inspection:	June 25, 2021 Annual	**Certified Max Gross Wt.:**	2550 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	6219 Hrs as of last inspection	**Engine Manufacturer:**	Lycoming
ELT:	Installed	**Engine Model/Series:**	IO-360-L2A
Registered Owner:	TRNS SOLUTIONS LLC	**Rated Power:**	180 Horsepower
Operator:	Aviation Pacific Flight Training School	**Operating Certificate(s) Held:**	Pilot school (141)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KDAB,41 ft msl	**Distance from Accident Site:**	6 Nautical Miles
Observation Time:	13:53 Local	**Direction from Accident Site:**	9°
Lowest Cloud Condition:	Few / 4200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	3 knots / None	**Turbulence Type Forecast/Actual:**	None / None
Wind Direction:	140°	**Turbulence Severity Forecast/Actual:**	N/A / N/A
Altimeter Setting:	30.02 inches Hg	**Temperature/Dew Point:**	29°C / 18°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Gainesville, FL (GNV)	**Type of Flight Plan Filed:**	VFR
Destination:	New Smyrna Beach, FL (X50)	**Type of Clearance:**	Traffic advisory
Departure Time:	13:30 Local	**Type of Airspace:**	Class C

Wreckage and Impact Information

Crew Injuries:	2 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	2 None	**Latitude, Longitude:**	29.090806,-81.064167

Administrative Information

Investigator In Charge (IIC):	Monville, Timothy
Additional Participating Persons:	Donald R. Andrews; FAA/FSDO; Orlando, FL
Original Publish Date:	August 15, 2023
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=103998

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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.