



National Transportation Safety Board Aviation Accident Final Report

Location:	Granbury, TX	Accident Number:	CEN14LA334
Date & Time:	07/02/2014, 0842 CDT	Registration:	N9898W
Aircraft:	PIPER PA-28-140	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (partial)	Injuries:	2 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The flight instructor reported that, after takeoff, when the airplane was about 500 ft above ground level, the engine started to run roughly and lose power. The engine rpm decreased to about 1,100 rpm as the flight instructor attempted to turn the airplane 180 degrees back toward the airport. However, he was unable to land at the airport, so he made a forced landing to a field short of the runway.

During a postaccident engine test run, the engine initially ran roughly, and black smoke was observed coming from the exhaust. After a brief warmup, the engine could only produce about 1,600 rpm at full throttle, and the engine test run was stopped. The examination of the No. 3 cylinder revealed that the exhaust valve was broken in several pieces and that some fragments remained in the cylinder, which produced gouging and scraping to the piston and cylinder head. The broken exhaust valve, spring, exhaust valve keepers, and rotating cap exhibited carbon buildup. Examination revealed a wear pattern on the top of the No. 3 cylinder exhaust valve rotator cap consistent with rocker arm wear. No rotational signatures were observed along the edge of the cap near the heavy carbon buildup, indicating that the rotator cap had stopped rotating, which subsequently led to a hot spot on the exhaust valve and caused the valve to fail.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The partial loss of engine power due to the failure of the exhaust valve.

Findings

Aircraft	Recip eng cyl section - Failure (Cause)
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Factual Information

On July 2, 2014, about 0842 central daylight time, a Piper PA-28-140, N9898W, sustained substantial damage during a forced landing after a loss of engine power during takeoff at the Granbury Regional Airport (GDJ), Granbury, Texas. The flight instructor and passenger were not injured. The airplane was registered to Thunderbolt Aviation LLC and operated by Iron Compass Aviation under the provisions of the 14 Code of Federal Regulations Part 91 as an instructional flight. Visual meteorological conditions prevailed at the time of the accident, and a visual flight rules flight plan was filed. The airplane was departing GDJ and was en route to the Waco Regional Airport (ACT), Waco, Texas.

The flight instructor reported that the airplane was about 500 feet above ground level when the engine started to run rough along with a loss of engine power. The engine rpm decreased to about 1,100 rpm as the flight instructor attempted to complete a 180-degree turn back to the airport. However, he was unable to land on the airport, so he completed a forced landing to a field short of the runway. The airplane's right wing hit a tree during the landing roll, which resulted in substantial damage to the wing.

The on-site examination of the airplane by Federal Aviation Administration inspectors revealed that there appeared to be no damage to the engine and no apparent reason for the loss of engine power. The airplane wreckage was transported to an aircraft storage facility for further examination and an engine run.

An engine run was conducted using an external fuel supply. After priming the fuel system with the electric fuel pump, the engine was started. The engine sounded like it was running rough, and some black smoke could be seen from the exhaust. After a brief warm up, the engine would not operate more than about 1,600 rpm at full throttle. The engine run was stopped and a compression check was performed. The No. 3 cylinder did not have any compression. The examination of the No. 3 cylinder revealed that the exhaust valve was broken in several pieces and some fragments remained in the cylinder. The broken exhaust valve, spring, exhaust valve keepers, and rotator cap all exhibited carbon build-up. The piston and cylinder head exhibited gouging and scraping consistent with secondary damage from the fragments. The examination of the No. 3 cylinder exhaust valve rotator cap revealed that it had a wear pattern on the top of the cap that was consistent with rocker arm wear, and no rotational signatures along the edge of the cap where there was heavy carbon build-up.

The engine was a 150-horsepower Lycoming O-320-E2A. The last annual maintenance inspection was conducted on June 2, 2014, with a total aircraft time of 3,464 hours. At the time of the accident, the engine had about 2,040 hours since the last overhaul. The airplane had flown about 46 hours since the annual/100-hour maintenance inspection. The recommended time between overhauls (TBO) is 2,000 hours, but it is not a mandatory requirement under Part 91 regulations.

History of Flight

Takeoff	Loss of engine power (partial) (Defining event) Collision with terr/obj (non-CFIT)
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Pilot Information

Certificate:	Airline Transport; Flight Instructor	Age:	71
Airplane Rating(s):	Multi-engine Land; Single-engine Land	Seat Occupied:	Right
Other Aircraft Rating(s):	Glider	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine; Glider; Instrument Airplane	Toxicology Performed:	No
Medical Certification:	Class 3 With Waivers/Limitations	Last Medical Exam:	01/09/2013
Occupational Pilot:	No	Last Flight Review or Equivalent:	06/12/2014
Flight Time:	10341 hours (Total, all aircraft), 250 hours (Total, this make and model), 111 hours (Last 90 days, all aircraft), 43 hours (Last 30 days, all aircraft)		

Student Pilot Information

Certificate:	None	Age:	51
Airplane Rating(s):	None	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 3 With Waivers/Limitations	Last Medical Exam:	04/05/2014
Occupational Pilot:	No	Last Flight Review or Equivalent:	
Flight Time:	43 hours (Total, all aircraft), 43 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Manufacturer:	PIPER	Registration:	N9898W
Model/Series:	PA-28-140	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	28-23418
Landing Gear Type:	Tricycle	Seats:	
Date/Type of Last Inspection:	06/02/2014, Annual	Certified Max Gross Wt.:	
Time Since Last Inspection:		Engines:	1 Reciprocating
Airframe Total Time:	3464 Hours	Engine Manufacturer:	LYCOMING
ELT:	Installed, not activated	Engine Model/Series:	0-320-E2A
Registered Owner:	THUNDERBOLT AVIATION LLC	Rated Power:	150 hp
Operator:	Iron Compass Aviation	Air Carrier Operating Certificate:	None

Meteorological Information and Flight Plan

Observation Facility, Elevation:	GDJ, 778 ft msl	Observation Time:	0835 CDT
Distance from Accident Site:	0 Nautical Miles	Condition of Light:	Day
Direction from Accident Site:	0°	Conditions at Accident Site:	Visual Conditions
Lowest Cloud Condition:	Clear	Temperature/Dew Point:	27° C / 21° C
Lowest Ceiling:		Visibility	10 Miles
Wind Speed/Gusts, Direction:	Light and Variable, Variable	Visibility (RVR):	
Altimeter Setting:	30.07 inches Hg	Visibility (RVV):	
Precipitation and Obscuration:	No Precipitation		
Departure Point:	Granbury, TX (GDJ)	Type of Flight Plan Filed:	VFR
Destination:	Waco, TX (ACT)	Type of Clearance:	None
Departure Time:	0840 CDT	Type of Airspace:	

Airport Information

Airport:	Granbury Regional Airport (GDJ)	Runway Surface Type:	Asphalt
Airport Elevation:	777 ft	Runway Surface Condition:	Dry
Runway Used:	14	IFR Approach:	None
Runway Length/Width:	3603 ft / 60 ft	VFR Approach/Landing:	Forced Landing

Wreckage and Impact Information

Crew Injuries:	2 None	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	2 None		

Administrative Information

Investigator In Charge (IIC):	James P Silliman	Adopted Date:	01/14/2015
Additional Participating Persons:	Stewart Dietrick; FAA North Texas FSDO; Irving, TX Mike McClure; Piper Aircraft; McKinney, TX		
Publish Date:	01/14/2015		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=89589		

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