National Transportation Safety Board
Aviation Accident Final Report

Location:	Taylor, AZ	**Accident Number:**	WPR17LA020
Date & Time:	11/12/2016, 1640 MST	**Registration:**	N9398W
Aircraft:	PIPER PA 28-235	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	2 None
Flight Conducted Under:	Part 91: General Aviation - Instructional		

Analysis

The flight instructor reported that, after demonstrating emergency descent procedures to the student pilot during an instructional flight, he applied engine power to recover from the simulation, but the engine had experienced a total loss of power. After performing troubleshooting steps, which did not restore full power, the instructor performed a forced landing. During the landing roll, the airplane struck a berm and sustained substantial damage.

The airplane's most recent annual inspection was completed about 14 months before the accident; however, postaccident examination did not reveal any anomalies with the airframe or engine that would have precluded normal operation, and the engine performed with no anomalies during a subsequent test run. The reason for the loss of engine power could not be determined.

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 for reasons that could not be determined because postaccident examination revealed no anomalies that would have precluded normal operation.

Findings

Not determined	Not determined - Unknown/Not determined (Cause)

Factual Information

History of Flight

Maneuvering	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-flare/touchdown	Collision with terr/obj (non-CFIT)

On November 12, 2016, about 1640 mountain standard time, a Piper PA 28-235 airplane, N9398W, struck a berm during a forced landing, following a loss of engine power near Taylor, Arizona. The certified flight instructor and student pilot were not injured, and the airplane sustained substantial damage The airplane was privately owned and operated by the pilot under the provisions of 14 *Code of Federal Regulations* Part 91 as an instructional flight. Visual meteorological conditions prevailed, and no flight plan had been filed. The local flight originated from Taylor about 1600.

The flight instructor reported that the preflight inspection was uneventful. The wing tip fuel tanks were both filled to half of their capacity, and the fuel tanks in the right and left wing contained 18 and 20 gallons of fuel respectively. About 40 minutes after takeoff, and after completing a series of training maneuvers with the student, the instructor decided to demonstrate an emergency descent. He asked the student to look for an appropriate simulated landing spot, and he pitched the nose slightly down, configuring the airplane for a best glide descent speed. They began the maneuver at an elevation of about 8,000 ft (1,700 agl), and after descending about 500 ft the instructor sensed that something was not right. He lifted off his headset, and the engine sounded quiet; he then pushed the throttle forward, but the manifold pressure gauge remained static, and the engine did not respond. He turned on the electric fuel pump, switched the fuel selector valve from the left to right tank, and set the fuel mixture to full rich, with no change. He then moved the throttle back and forth a few more times with no response. Concerned that they did not have sufficient altitude for further troubleshooting, he began to look for an emergency landing site.

On final approach he secured the airplane by shutting off the fuel selector valve, and as they got closer to the ground he could see a berm and fence obstructing the landing area. They were unable to deviate, and during the ground roll the airplane struck the berm, bounced back into the air, and landed hard. The airplane sustained substantial damage to the aft fuselage and right side of the stabilator during the impact.

Flight Instructor Information

Certificate:	Flight Instructor; Commercial	**Age:**	77, Male
Airplane Rating(s):	Single-engine Land; Single-engine Sea	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	Glider	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Single-engine; Instrument Airplane	**Toxicology Performed:**	No
Medical Certification:	Class 3 With Waivers/Limitations	**Last FAA Medical Exam:**	09/24/2015
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	02/11/2015
Flight Time:	(Estimated) 11945 hours (Total, all aircraft), 500 hours (Total, this make and model), 11945 hours (Pilot In Command, all aircraft), 23 hours (Last 90 days, all aircraft), 11.9 hours (Last 30 days, all aircraft)		

Student Pilot Information

Certificate:	Student	**Age:**	34, Male
Airplane Rating(s):		**Seat Occupied:**	Left
Other Aircraft Rating(s):		**Restraint Used:**	3-point
Instrument Rating(s):		**Second Pilot Present:**	Yes
Instructor Rating(s):		**Toxicology Performed:**	No
Medical Certification:	None	**Last FAA Medical Exam:**	
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	3.3 hours (Total, all aircraft), 3.3 hours (Total, this make and model), 3.3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	PIPER	**Registration:**	N9398W
Model/Series:	PA 28-235 235	**Aircraft Category:**	Airplane
Year of Manufacture:	1968	**Amateur Built:**	No
Airworthiness Certificate:	Normal	**Serial Number:**	28-11095
Landing Gear Type:	Tricycle	**Seats:**	
Date/Type of Last Inspection:	09/17/2015, Annual	**Certified Max Gross Wt.:**	2900 lbs
Time Since Last Inspection:	7 Hours	**Engines:**	1 Reciprocating
Airframe Total Time:	as of last inspection	**Engine Manufacturer:**	LYCOMING
ELT:	C91A installed, activated, did not aid in locating accident	**Engine Model/Series:**	O-540 SERIES
Registered Owner:	Daniel O Mills	**Rated Power:**	235 hp
Operator:	On file	**Operating Certificate(s) Held:**	None

The last maintenance event was for an annual inspection, on September 17, 2015, 7.1 flight hours before the accident.

The airplane was powered by a normally aspirated, O-540-B4B5 engine. It was originally manufactured by Lycoming and overhauled in 2002 with components manufactured by Superior Air Parts, after which it was branded as a "Millennium Engine". At the time of the accident, the engine had accrued 1,135.6 flight hours since overhaul.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	KSOW, 6411 ft msl	**Distance from Accident Site:**	12 Nautical Miles
Observation Time:	2355 UTC	**Direction from Accident Site:**	168°
Lowest Cloud Condition:	Clear	**Visibility**	10 Miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	340°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.29 inches Hg	**Temperature/Dew Point:**	12°C / -4°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	TAYLOR, AZ (TYL)	**Type of Flight Plan Filed:**	None
Destination:	TAYLOR, AZ (TYL)	**Type of Clearance:**	None
Departure Time:	1600 MST	**Type of Airspace:**	Class G

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	**Latitude, Longitude:**	34.454722, -110.057500 (est)

Tests And Research

Engine Monitor

The airplane was equipped with a JP Instruments EDM-700 series engine monitor. The unit was configured to record the engine performance parameters including exhaust gas temperature (EGT), cylinder head temperature (CHT), and oil temperature.

The recorded data was 34 minutes long, and initially revealed variations and rises in EGT and CHT consistent with taxi and takeoff. The EGT and CHT values then averaged about 1,275°F, and 325°F respectively, until 29 minutes after the recording began, when the EGT and CHT

temperatures began to simultaneously drop. By the time the recording had stopped, the average CHT had reached about 225°F. During that period, the EGT dropped to 1,000°F, and then began an intermittent increase to about 1,225° lasting about 20 seconds, after which it dropped to the last recorded temperature of 200°F. The oil temperature remained at about 200°F throughout the flight.

Engine Examination

The airplane was recovered from the accident site and examined by the NTSB investigator-in-charge. A complete examination report is contained within the public docket, the following is a summary of the findings.

The combination belly-mounted fuel selector/strainer was full of fuel; the fuel was tested with water-detecting paste, and no water was present. The fuel selector valve moved freely through all its positions, and the detents were well defined. A peripheral examination of the engine and fuel supply system did not reveal any anomalies.

The engine sustained minimal damage during the accident sequence, most of the damage being sustained by the propeller, each blade of which was bent aft about midspan. All engine controls were continuous from their respective control arms through to the cabin controls and could be moved smoothly through their full range of travel. The inlet air filter and associated induction air lines, although damaged during impact, were free of obstruction, and the oil sump contained about 9 quarts of oil.

The top spark plugs were removed and examined. They were massive-electrode types manufactured by Tempest, and their electrodes were mechanically intact, coated in black soot, and displayed normal wear signatures when compared with the Champion Spark Plugs AV-27 Check-A-Plug chart.

The crankshaft turned freely when rotated by hand utilizing the propeller, and "thumb" compression was present on all cylinders.

The propeller was removed and replaced with an undamaged unit, and an engine test run was performed utilizing fuel recovered from the airplane's fuel tanks after the accident.

The engine started on the fourth cranking attempt and maintained a smooth idle of about 750 rpm. As the engine warmed up, the fuel and oil pressures remained within the green arcs of their respective gauges. Having reached operating temperature, a magneto check was performed, with a 75 rpm drop observed on each side. A propeller check was performed, and the engine speed dropped appropriately.

The engine was then operated throughout its full speed range for an additional 10 minutes. Multiple throttle "chops", followed by rapid accelerations were initiated to simulate the accident scenario. The engine responded appropriately each time, with no hesitation or speed fluctuations.

After engine shutdown, the top spark plugs were removed, and their electrodes now exhibited a grey coloration. The carburetor and engine driven fuel pump were then removed and examined. No anomalies were noted.

Additional Information

The temperature and dew point values in the area at the time of the accident were not conducive to the formation of carburetor ice.

Administrative Information

Investigator In Charge (IIC):	Eliott Simpson	**Report Date:**	09/10/2018
Additional Participating Persons:	Johnny C Portillo; Federal Aviation Administration FSDO; Scottsdale, AZ		
Publish Date:	09/10/2018		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.ntsb.gov/pubdms/search/dockList.cfm?mKey=94368		