Aviation Investigation Final Report

Location:	Burns, Oregon	**Accident Number:**	WPR16LA060
Date & Time:	January 31, 2016, 14:59 Local	**Registration:**	N777PG
Aircraft:	Piper PA46	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (total)	**Injuries:**	1 None
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

The private pilot reported that, about 90 minutes after takeoff and about 19,000 ft, the engine of the high-performance pressurized airplane lost total power. Although the loss of power happened at high altitude, for the next 11 minutes, the pilot did not perform any troubleshooting steps, which were limited in scope and would not have taken long to complete, and instead diverted directly to an airport.

After arriving at the diversion airport with altitude remaining, the pilot performed a circling descent maneuver over the runway. During the landing approach, he moved the landing gear selection lever to the "down" position, but the gear did not extend, so the pilot chose to land the airplane on snow adjacent to the runway. Just before touchdown, the main landing gear extended, but the nose landing gear remained retracted. Upon touchdown, the airplane's nose dug into the snow. The airplane then abruptly stopped, sustaining substantial damage to the forward fuselage and both wings.

Examination of the engine and landing gear did not reveal any anomalies that would have precluded normal operation, and the engine performed normally during a subsequent test run. Given the engine ran normally during the test run, it is possible that, if the pilot had attempted to troubleshoot the problem, engine power could have been restored. The reason for the loss of engine power could not be determined. According to the owner, there was a previously undiagnosed landing gear problem that, on two previous occasions, had resulted in the delayed deployment of the landing gear after flying at high altitudes in cold weather. Given the airplane was flying at high altitude in cold weather when the event occurred, a reoccurrence of the landing gear anomaly could not be ruled out.

Probable Cause and Findings

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

The total loss of engine power for reasons that could not be determined because postaccident examination revealed no evidence of an anomaly that would have precluded normal operation. Contributing to the accident was a preexisting landing gear anomaly that prevented the landing gear from completely extending after flight at high altitude in cold weather during landing.

Findings

Not determined	(general) - Unknown/Not determined
Aircraft	Gear extension and retract sys - Malfunction
Aircraft	Gear extension and retract sys - Not inspected
Personnel issues	Lack of action - Pilot
Personnel issues	(general) - Pilot

Factual Information

History of Flight

Enroute-cruise	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing	Sys/Comp malf/fail (non-power)
Landing-landing roll	Landing gear collapse

On January 31, 2016, at 1459 Pacific standard time, a Piper PA46-310P, N777PG, performed a forced landing at Burns Municipal Airport, Burns, Oregon, following a total loss of engine power during cruise. The airplane was registered to and operated by the pilot as a 14 *Code of Federal Regulations* Part 91 personal flight. The private pilot, who was the sole occupant, was not injured, and the airplane sustained substantial damage during the landing roll. The cross-country flight departed Boeing Field/King County International Airport, Seattle, Washington, at 1318, with a planned destination of Scottsdale Airport, Scottsdale, Arizona. Visual meteorological conditions prevailed throughout the flight, and an instrument flight rules (IFR) flight plan had been filed.

The pilot reported that about 90 minutes after departure while cruising at 19,000 ft, the engine "tone" decreased, accompanied by a drop in manifold pressure from 29 to 15 inches. He kept the throttle in the cruise power position, and elected to divert towards Burns, after reporting to air traffic control personnel that he had an engine emergency. He stated that the engine did not regain power during the descent, and he did not perform any troubleshooting procedures. He eventually arrived over the airfield with altitude remaining, and began a circling descent. During the landing approach, he moved the gear selection lever to the DOWN position, but did not hear or feel any indication that the gear had deployed, nor did he see three green lights on the instrument panel indicating the gear was down and locked. He did not have time to perform the emergency extension procedure because the airplane was too low, and he decided to land gear-up on the snow adjacent to runway 30.

He reported that just prior to touchdown, when the airplane was about 5 ft above ground level, the landing gear began to extend, and he saw two green lights indicating the main landing gear had locked, but no green light for the nose gear. The airplane touched down, and the nose dug into the snow. The airplane abruptly stopped, sustaining substantial damage to the forward fuselage and both wings (Photo 1).

Photo 1 - Airplane at the Accident Site

Pilot Information

Certificate:	Private	**Age:**	63,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	3-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 3 With waivers/limitations	**Last FAA Medical Exam:**	January 19, 2016
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	(Estimated) 1000 hours (Total, all aircraft), 500 hours (Total, this make and model)		

Aircraft and Owner/Operator Information

Aircraft Make:	Piper	**Registration:**	N777PG
Model/Series:	PA46 310P	**Aircraft Category:**	Airplane
Year of Manufacture:	1987	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	46-08063
Landing Gear Type:	Retractable - Tricycle	**Seats:**	6
Date/Type of Last Inspection:	January 13, 2016 Annual	**Certified Max Gross Wt.:**	4101 lbs
Time Since Last Inspection:	10 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	431.8 Hrs as of last inspection	**Engine Manufacturer:**	Teledyne Continental
ELT:	C91 installed, not activated	**Engine Model/Series:**	TSIO-550-C14B
Registered Owner:	On file	**Rated Power:**	310 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	None

The low-wing, high-performance, pressurized airplane was manufactured in 1987. It was equipped with a twin-turbocharged six-cylinder Continental TSIO-550-C14B engine, manufactured in November 2011. The engine had accrued 431.8 flight hours at the time of the last annual inspection, which was completed 18 days and 9.7 flight hours before the accident.

The aircraft was equipped with hydraulically operated, retractable, tricycle landing gear, with hydraulic pressure provided by an electrically driven hydraulic pump. Gear operation was controlled by a conventional two-position selector switch. Three green lights, which are individually activated as each gear mechanically locks into the down position are located above the landing gear selector.

The landing gear is held in the up position by hydraulic pressure which is trapped in the system lines by a check valve in the pump assembly.

The emergency gear extension system is activated by manually pulling a control on the instrument panel. The control activates a valve which relieves the pressure in the up side of the circuit, and bypasses fluid to the down side of the system. The additional fluid required for down operation comes directly from the reservoir. The landing gear is held in the down position by spring-loaded mechanical locking mechanisms built into the actuating cylinders of each landing gear leg.

The Pilot's Operating Handbook includes three initial steps for emergency procedures for an engine power loss in flight. The steps call for the pilot to switch fuel tanks, set the auxiliary fuel pump to LOW, and set induction air to ALTERNATE. If power is not restored, the axillary fuel pump should then be set to HIGH, fuel mixture FULL RICH, and the throttle to approximately 75 % power.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KBNO,4170 ft msl	**Distance from Accident Site:**	0 Nautical Miles
Observation Time:	22:53 Local	**Direction from Accident Site:**	354°
Lowest Cloud Condition:	Few / 5500 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.86 inches Hg	**Temperature/Dew Point:**	0°C / 5°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	SEATTLE, WA (BFI)	**Type of Flight Plan Filed:**	IFR
Destination:	SCOTTSDALE, AZ (SDL)	**Type of Clearance:**	IFR
Departure Time:	13:18 Local	**Type of Airspace:**	Class A;Class E

Airport Information

Airport:	BURNS MUNI BNO	**Runway Surface Type:**	Concrete
Airport Elevation:	4158 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	30	**IFR Approach:**	None
Runway Length/Width:	5100 ft / 75 ft	**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	43.591945,-118.955558(est)

Tests and Research

Engine Monitor

The airplane was equipped with a JPI EDM-700 Engine Monitor. The unit was sent to the NTSB Office of Research and Engineering for data extraction. The EDM-700 recorded exhaust gas temperatures (EGT), cylinder head temperatures (CHT), turbine inlet temperature (TIT), and battery voltage from the time between engine start and the accident.

The extracted data revealed that the EGT and CHT values varied in concert with one another throughout the initial portions of the flight over a period which correlated to the takeoff and climb. At 1347, about 29 minutes after takeoff, the EGTs for all six cylinders reached about 1,500 degrees F, the CHT's about 290 degrees F, and TIT about 1,650 degrees F. The values remained closely matched and consistent for the next hour, until at 1448 an abrupt drop in EGT for all six cylinders to 150 degrees F, along with a similar drop in TIT was recorded. At the same time, CHT for all cylinders began gradually falling, reaching 80 degrees F, about 5 minutes later. At 1459, 11 minutes after the initial anomaly, the EGT displayed a momentary, 30-second increase from 150 to 300 degrees F along with a similar spike in TIT, the values then all dropped, and at 1501 the data ended. Battery voltage throughout the flight remained at 28 volts.

Airframe

The airframe sustained wrinkles aft of the firewall, with crush damage to the underside of the engine. Within the cabin, the fuel mixture control was found in the full-forward (RICH) position, the propeller was in the full-forward (INCR) position, and the throttle in the full-aft position (CLSD).

The auxiliary fuel pump switch was OFF, the fuel selector valve was in the LEFT position, both magneto switches were ON, and all circuit breakers appeared closed.

Both wings were removed from the airframe during recovery, and significant quantities of fuel were recovered from both fuel tanks at that time. During the examination, both the left and right collector/sump tanks were drained at their respective drain ports, and contained about 25 fluid ounces of clear blue-colored fuel each. Each tank also contained about 1 tablespoon of clear fluid, which was confirmed to be water when tested with water detecting paste.

The fuel filter bowl under the baggage compartment door was removed and contained about 5 fluid ounces of blue-colored fuel. The filter element was clear and free of debris, and no water was present.

The fuel line fittings from wing roots through to the engine driven fuel pump inlet were secure, and there were no indications of a leak. All fuel and vent lines were tested for blockage, and all were clear. The fuel selector valve was found in the left tank detent, and the valve could be moved freely between all positions.

Control continuity was established for the throttle, mixture, and propeller controls through to their respective control arms on the engine. All controls moved freely and in the correct direction.

Landing Gear

The nose landing gear remained stowed within the wheel well and appeared undamaged. Both main landing gear struts were in the fully extended and locked position; each wheel strut had bent aft and separated from the trunnion assembly.

The hydraulic system was intact, and no fluid leaks were observed. Power was applied to the airplane's electrical bus, and the hydraulic pump engaged and operated immediately. The landing gear system was examined, and no anomalies were noted which would have precluded normal operation.

During the last annual inspection, the landing gear emergency down spring, up-pressure switch, and sequence valve were replaced. The mechanic who performed the maintenance stated that the spring was an item that he typically replaces at every annual inspection, and that the sequencing valve was replaced because it was leaking hydraulic fluid at its actuating shaft. The pressure switch was operating intermittently, such that during the inspection the landing gear would not retract when commanded, unless the switch was tapped.

Engine

All fuel, oil, and induction lines appeared secure, and except for an indentation to the oil sump and right intercooler inlet manifold, no engine damage was observed beyond. The crankcase was intact, and there were no indications of catastrophic engine failure. The left and right magnetos remained firmly attached, and their engine timing was measured at 24 degrees, which corresponded to the specifications on the engine data tag.

The engine could be rotated by hand at the propeller flange, and cylinder compression was present when checked at the top spark plug bores of each cylinder.

The compressor impellers for both turbochargers could be rotated smoothly within their housings, and the inlet area of each compressor housing was undamaged.

The engine was removed from the airframe and shipped to the facilities of Continental Motors for testing. Once correctly configured within a test cell, the engine started on the first attempt, and was run at idle until operating temperatures were reached. The engine responded appropriately to a magneto check, and ran smoothly through speeds ranging from idle to 2,600 rpm and up to manifold pressures of 35.59 inHg.

Additional Information

The pilot made himself available for interview, but despite multiple requests, did not submit a Pilot/Operator Aircraft Accident Report (NTSB Form 6120.1/2).

The pilot reported that during a flight in the accident airplane about 6 to 7 years prior, he had experienced a drop in manifold pressure during cruise, but on that occasion, had decided to continue the

flight. After landing he discovered that the turbocharger crossover pipe had detached, and that this could have caused an in-flight fire. It was that prior experience that prompted him to initiate a rapid descent to land during the accident flight, rather than attempt to troubleshoot the loss of power.

The pilot further reported that a few years before the accident he had experienced two separate instances when the landing gear failed to extend after flying at high altitudes (FL22), in cold temperatures. On those occasions, he had attempted to utilize the landing gear to expedite the descent, and both times the landing gear failed to initially extend, but at some point, it eventually deployed as he got closer to the ground. He stated that he discussed the problem with multiple mechanics, with the consensus that this was not necessarily unusual, could likely be attributed to the cold temperatures, and that a thorough landing gear inspection should be performed if it persisted. It did not happen again, and he did not have the landing gear inspected.

Administrative Information

Investigator In Charge (IIC):	Simpson, Eliott
Additional Participating Persons:	Rudy Rossi; Federal Aviation Administration FSDO; Boise, ID Chris Lang; Continental Motors, Inc; Mobile, AL Charles Little; Piper Aircraft; Vero Beach, FL
Original Publish Date:	September 6, 2017
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=92662