



National Transportation Safety Board Aviation Accident Final Report

Location:	Bethel, AK	Accident Number:	ANC17LA006
Date & Time:	11/11/2016, 1650 AKS	Registration:	N9084J
Aircraft:	PIPER PA32R	Aircraft Damage:	Substantial
Defining Event:	Powerplant sys/comp malf/fail	Injuries:	1 Minor
Flight Conducted Under:	Public Aircraft		

Analysis

The commercial pilot reported that the airplane took off, and at 800 ft, the engine oil pressure dropped to zero. The pilot stated that he immediately turned back to the departure airport and that, while he was maneuvering for landing, the engine began "popping loudly," and engine oil began emanating from the oil access panel and splattered onto the windscreen. Shortly after, the engine lost all power. The pilot subsequently conducted a forced landing on tundra about 1 mile from the airport. During the landing roll, the nose and left landing gears collapsed, and the left wing and fuselage impacted terrain.

After the accident, a large puddle of oil was found on the airport ramp where the engine was started. During the recovery of the airplane, the engine oil access panel was found open with no dipstick present. The oil access panel had an impact mark on the underside that was about the same size as the dipstick top.

Postaccident examination of the engine revealed that there were holes and fractures on the top and bottom of the crankcase and that no oil was present in the oil tank. Several connecting rods were separated from the crankshaft and exhibited mechanical and thermal damage, consistent with oil starvation. When compressed air was applied to the right oil cooler, air was expelled from a small fracture between the brazed plates. Detailed examination of the oil cooler revealed an overstress fracture at a brazed seam; the fracture exhibited signatures of overstress with no evidence of preexisting defects. No anomalies of the oil pressure and temperature regulating systems were noted.

It is likely that the oil cooler seam fractured after the engine start and that most of the engine oil was expelled before takeoff. Once the oil supply to the engine was exhausted, the internal friction of the metal components resulted in thermal damage and connecting rod fractures and the subsequent loss of all engine power. It is possible that the crankcase was pressurized during the engine failure sequence, which resulted in the oil dipstick being ejected from the engine. The reason for the engine oil overpressure in the oil cooler 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 due to oil starvation, which resulted from an oil cooler leak at a fractured brazed seam.

Findings

Aircraft	Cooler - Capability exceeded (Cause) Oil - Fluid level (Cause)
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Factual Information

On November 11, 2016, about 1650 Alaska standard time, a Piper Saratoga PA-32R-301, N9084J, sustained substantial damage during a forced landing following a total loss of engine power near Bethel Airport (BET), Bethel, Alaska. The commercial pilot sustained minor injuries. The airplane was registered to and being operated by the Alaska Department of Public Safety (DPS) as a visual flight rules (VFR) public-use flight under the provisions of Title 14 *Code of Federal Regulations* Part 91. Visual meteorological conditions prevailed, and a VFR flight plan was filed. The flight originated from BET about 1635 destined for Nunapitchuk Airport (16A), Nunapitchuk, Alaska.

The pilot reported that after departing runway 1L at BET while climbing through 800 ft to the west, he felt a momentary vibration and noted the engine oil pressure at zero pounds per square inch (psi). He made an immediate left turn back to the airport and declared an emergency with BET air traffic control tower. While maneuvering for a landing at the airport, the engine began "popping loudly" and engine oil emanated from the oil access panel and splattered onto the wind screen. Shortly thereafter, the propeller stopped rotating and all engine power was lost. The pilot maneuvered to land in the tundra covered terrain southwest of the airport, away from residential areas. During the landing, the airplane encountered uneven terrain, which collapsed the left main and nose landing gears. The left wing impacted terrain and sustained substantial damage.

The pilot further reported that earlier that day he prepared for his flights by performing a preflight and checking the engine oil quantity, which was at 10 quarts. He did not remove the oil dipstick from the housing. He flew two passengers to 16A and returned to BET where he shut down the airplane, installed an engine cover and waited about three hours. When he returned to the airplane, the engine cowling was still warm and there were no fluid leaks evident. The airplane started normally and no ground run up was conducted for the second flight. The pilot stated that all the engine instruments were "in the green" before departing.

After the accident flight, Alaska DPS employees discovered a substantial amount of engine oil on the airport parking ramp where the airplane had been parked. The airplane's engine oil access panel was discovered open with no dipstick present during the airplane's recovery from the accident site. The oil dipstick was not recovered during airport ramp sweeps or other searches.

An external examination of the engine revealed that there was a hole in the crankcase above cylinder no. 4 with fractures emanating from the hole. There was a small amount of oil deposit around the oil dipstick neck, and none around the hole in the crankcase nor the top of the engine. All accessible fuel and oil lines were intact. No oil was present when the quick oil drain was opened. The oil access panel had impact marks on the underside of the panel that corresponded to the approximate size of the oil dipstick top.

The engine was disassembled and examined further. The no. 1 cylinder revealed no evidence of mechanical malfunction. The no. 2 and 6 connecting rods were in place; however, the no. 2 rod had dark discoloration and extrudence at the rod cap and the no. 6 piston skirt exhibited

extensive scoring and carbon deposits in the direction of travel. The no. 3, 4 and 5 connecting rods were separated from the crankshaft by rod shank fractures with extensive thermal discoloration and deformation. Signatures were all indicative of engine operation without sufficient oil lubrication.

The oil sump pan was removed and large quantities of metal debris and fractured rods were observed. The oil suction screen was removed and indicated pieces of non-ferrous metal particles. The thermostatic oil cooler bypass valve was removed and examined. The crimp nut and valve seat remained intact and the spring was secure. The oil pump impeller was intact with no anomalies observed.

The oil coolers were each capped off at one end and 100 psi air pressure was applied. The left oil cooler exhibited no leaks. The right oil cooler (Aero-Classics, Inc. P/N 8000074, S/N 1041902) exhibited an air leak through a 2 inch separation at a mated brazed plate that was undetected during a visual exam. The right oil cooler was examined at the National Transportation Safety Board's materials laboratory. The fracture at the brazed seam exhibited signatures of over stress and no indications of fatigue, corrosion or material anomalies. A detailed factual report is available in the public docket.

The airplane was manufactured in 1985 and outfitted with a Lycoming IO-540-K1G5 engine. A review of maintenance records showed that the most recent annual inspection was completed on August 31, 2016. At the time of the accident, a total aircraft time of 6,989.1 hours and 213.4 hours since engine overhaul had accumulated. The maintenance records indicated that the engine was serviced with Phillips X/C SAE 20W50 oil and .5 bottle of CamGuard aviation additive during the annual inspection, which was 21.6 hours before the accident. According to the Piper Pilot Operating Handbook paragraph 8.19, this oil type was appropriate for the operating conditions of 0°F to 90°F.

Lycoming Service Instruction 1505 states that preheating of any Lycoming engine is required when the engine temperature has been allowed to drop below 10°F. According to the BET automated weather observations, the outside air temperatures were between 25°F and 21°F while the airplane was parked on the ramp prior to engine start.

The closest weather reporting facility was BET which was about 1 mile northeast of the accident site. At 1653 an automated special weather observation report indicated the following conditions: wind 030° at 10 knots, clouds and sky condition, scattered at 10,000 feet, broken at 25,000 feet; visibility 10 statute miles; temperature 21°F; dewpoint 19°F; and altimeter 29.98 inches of mercury.

History of Flight

Initial climb	Powerplant sys/comp malf/fail (Defining event) Loss of engine power (total)
Landing-landing roll	Off-field or emergency landing Landing gear collapse Collision with terr/obj (non-CFIT)

Pilot Information

Certificate:	Commercial; Private	Age:	51, Male
Airplane Rating(s):	Single-engine Land; Single-engine Sea	Seat Occupied:	Left
Other Aircraft Rating(s):	None	Restraint Used:	
Instrument Rating(s):	Airplane	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without Waivers/Limitations	Last FAA Medical Exam:	03/02/2016
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	08/17/2016
Flight Time:	(Estimated) 3664 hours (Total, all aircraft), 20 hours (Total, this make and model), 44 hours (Last 90 days, all aircraft), 15 hours (Last 30 days, all aircraft), 0 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	PIPER	Registration:	N9084J
Model/Series:	PA32R 301	Aircraft Category:	Airplane
Year of Manufacture:	1985	Amateur Built:	No
Airworthiness Certificate:	Normal	Serial Number:	32-8506013
Landing Gear Type:	Retractable - Tricycle	Seats:	6
Date/Type of Last Inspection:	08/31/2016, Annual	Certified Max Gross Wt.:	3600 lbs
Time Since Last Inspection:	22 Hours	Engines:	1 Reciprocating
Airframe Total Time:	6989.1 Hours at time of accident	Engine Manufacturer:	Lycoming
ELT:	C126 installed, not activated	Engine Model/Series:	IO-540-K1G5
Registered Owner:	STATE OF ALASKA	Rated Power:	300 hp
Operator:	STATE OF ALASKA Department Of Public Safety	Operating Certificate(s) Held:	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	PABE, 102 ft msl	Distance from Accident Site:	3 Nautical Miles
Observation Time:	0153 UTC	Direction from Accident Site:	47°
Lowest Cloud Condition:	Scattered / 10000 ft agl	Visibility	10 Miles
Lowest Ceiling:	Broken / 25000 ft agl	Visibility (RVR):	
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	30°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	28.98 inches Hg	Temperature/Dew Point:	-6° C / -7° C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Bethel, AK (BET)	Type of Flight Plan Filed:	Company VFR
Destination:	Nunapitchuk, AK (16A)	Type of Clearance:	None
Departure Time:	1645 AKS	Type of Airspace:	Class D; Class E

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:	N/A	Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Minor	Latitude, Longitude:	60.772778, -161.886667 (est)

Administrative Information

Investigator In Charge (IIC):	Noreen O Price	Report Date:	11/06/2019
Additional Participating Persons:	Spencer Leonard; Anchorage FSDO; Anchorage, AK Mike Inman; Alaska Wildlife Troopers, DPS; Anchorage, AK		
Publish Date:	11/06/2019		
Note:	The NTSB did not travel to the scene of this accident.		
Investigation Docket:	http://dms.nts.gov/pubdms/search/dockList.cfm?mKey=94365		

The National Transportation Safety Board (NTSB), established in 1967, is an independent federal agency mandated by Congress through the Independent Safety Board Act of 1974 to investigate transportation accidents, determine the probable causes of the accidents, issue safety recommendations, study transportation safety issues, and evaluate the safety effectiveness of government agencies involved in transportation. The NTSB makes public its actions and decisions through accident reports, safety studies, special investigation reports, safety recommendations, and statistical reviews.

The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).