Aviation Investigation Final Report

Location:	Weiser, Idaho	**Accident Number:**	WPR16LA159
Date & Time:	August 2, 2016, 09:35 Local	**Registration:**	N23923
Aircraft:	AIR TRACTOR INC AT 301	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The airline transport pilot reported that, during an aerial application flight, he observed rising engine cylinder head temperatures and a partial loss of engine power. Unable to maintain altitude, he jettisoned the load of liquid fertilizer and made a forced landing to an alfalfa field. During the landing, the airplane collided with a wheel line sprinkler system.

A postaccident examination of the radial engine revealed damage to the No. 1 cylinder lower piston skirt and the oil scraper ring. The inside of the piston exhibited multiple indentations consistent with continued battering. The remaining eight cylinders and pistons were removed and exhibited similar signatures. Multiple metallic fragments that resembled bearing material were found in the crankcase, and the magnetic chip detector displayed metallic debris. The master rod and link rod assembly were removed from the crankshaft, and the front side of the master rod exhibited two perpendicular dents. The master rod crankpin bearing revealed substantial wear and gouging-type damage, consistent with its failure initiating the engine failure. The master rod crankpin bearing was thinned, or gouged out, consistent with the metallic shavings found in the crankcase and oil galley. No maintenance records were provided, and the engine's service and maintenance history could not be determined.

Probable Cause and Findings

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

A partial loss of engine power due to an internal catastrophic failure of the master rod crankpin bearing.

Findings

Aircraft	Recip eng cyl section - Failure
Aircraft	(general) - Damaged/degraded
Environmental issues	Ground equipment - Contributed to outcome
Environmental issues	Tree(s) - Contributed to outcome

Factual Information

History of Flight

Maneuvering-low-alt flying	Loss of engine power (partial) (Defining event)
Landing-landing roll	Off-field or emergency landing
Landing-landing roll	Collision with terr/obj (non-CFIT)

On August 2, 2016, about 0935 mountain daylight time, an Air Tractor, AT 301 airplane, N23923, experienced a partial loss of engine power. The pilot subsequently initiated an off airport landing to a field near Weiser, Idaho. The airline transport pilot was not injured. The airplane was substantially damaged during the landing roll when it collided with a sprinkler system. The airplane was operated by Beck's Flying Service under the provisions of Title 14 *Code of Federal Regulations* Part 137. Visual meteorological conditions prevailed, and no flight plan had been filed. The local agricultural application flight departed Weiser, Idaho, about 0920.

In a report submitted to the National Transportation Safety Board investigator-in-charge, the pilot reported that after departing on the fifth aerial application load of the morning, and while approaching the target field, the cylinder head temperatures (CHTs) rose to over 400^{o}; the airplane had just enough power at 30 inches of manifold pressure (MP) to maintain altitude and airspeed above stall speed. The pilot stated that after making one pass on the field, he observed that the cylinder head temperatures had risen to 414^{o}. The pilot further stated that to stay above gradually rising terrain, he increased engine power to 32 inches MP and half flaps, at which time he noticed that the CHTs had risen to 454^{o} with a full rich mixture. With wings level and about 40 ft above the ground and descending, the pilot dumped part of the load and set his power to 30 inches MP; CHTs remained around 440^{o}. The pilot opined that the airplane would only continue to fly in a slight descent, which prompted him to dump the remainder of the load. With no improved performance, the pilot abandoned the idea of being able to return to the departure airport. However, he was able to maneuver slightly in order to reach an alfalfa field, [avoiding] pear trees before touching ground with the wings in buffet. During the landing [roll], the airplane collided with a wheel line sprinkler system and a tree bordering the field, which resulted in substantial damage to the airplane.

A postaccident examination of the engine was performed at the facilities of Anderson Aeromotive, Inc., Grangeville, Idaho.

All nine cylinders remained attached to the engine crankcase. A visual examination of the engine revealed that the cylinder head temperature (CHT) and exhaust gas temperature (EGT) probes were connected to the No. 1 cylinder.

The front spark plugs were removed from all cylinders with no anomalies noted. The crankshaft was manually rotated, and internal mechanical continuity was established throughout. The cylinders developed compression when the crankshaft was manually rotated.

The No. 1 cylinder was removed. When the piston was removed, the lower piston skirt and the oil scraper ring were observed damaged. The inside of the piston had multiple indentations consistent with continued battering. The remaining eight cylinders and pistons were removed, with the similar results noted. Multiple metallic fragments that resembled bearing material were found in the crankcase throughout this process.

The chip detector was covered with metallic debris consistent with debris found throughout the internal portion of the engine.

The front case, cam ring assembly, and front crankcase assembly were removed with no anomalies noted. The master rod counterweight revealed multiple battering like indentations consistent with the damage observed to the inside of the pistons. Multiple metallic fragments were found in the oil galley.

The master rod and link rod assembly was removed from the crankshaft, and the front side of the master rod exhibited two perpendicular dents. The master rod crankpin bearing revealed substantial wear and gouging type damage. The master rod crankpin bearing was thinned or gouged out consistent with the metallic shavings found in the crankcase and oil galley. (Refer to the engine examination report, which is appended to the docket for this accident.)

Historical records for the engine were not made available during the investigation.

Pilot Information

Certificate:	Airline transport	**Age:**	49,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	None	**Restraint Used:**	4-point
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	July 1, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 21, 2016
Flight Time:	9205 hours (Total, all aircraft), 110 hours (Total, this make and model), 6420 hours (Pilot In Command, all aircraft), 220 hours (Last 90 days, all aircraft), 95 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	AIR TRACTOR INC	**Registration:**	N23923
Model/Series:	AT 301 NO SERIES	**Aircraft Category:**	Airplane
Year of Manufacture:	1982	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	301-0466
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:		**Certified Max Gross Wt.:**	7400 lbs
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	P&W
ELT:	Not installed	**Engine Model/Series:**	R1340 SERIES
Registered Owner:	On file	**Rated Power:**	600 Horsepower
Operator:	On file	**Operating Certificate(s) Held:**	Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KONO,2193 ft msl	**Distance from Accident Site:**	13 Nautical Miles
Observation Time:	15:53 Local	**Direction from Accident Site:**	201°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:		**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	21°C / 9°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	WEISER, ID (S87)	**Type of Flight Plan Filed:**	None
Destination:	WEISER, ID (S87)	**Type of Clearance:**	None
Departure Time:	09:20 Local	**Type of Airspace:**	Class G

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:**	44.220275,-116.907501(est)

Administrative Information

Investigator In Charge (IIC):	Jones, Patrick
Additional Participating Persons:	Kenneth Hawkins; Federal Aviation Administration; Boise, ID
Original Publish Date:	September 11, 2018
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=93759