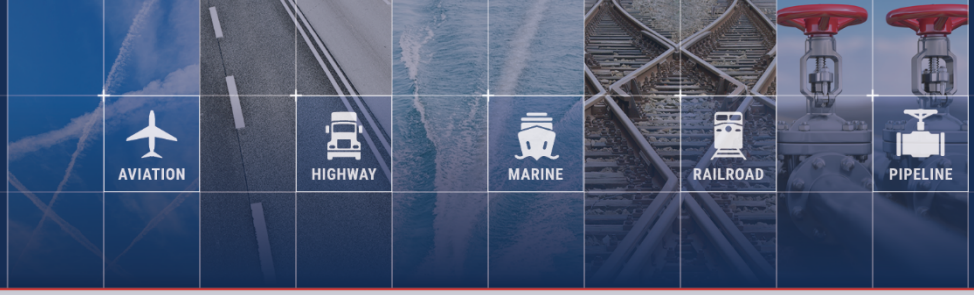

Aviation Investigation Final Report

Location:	Tappen, North Dakota	**Accident Number:**	CEN18LA249
Date & Time:	June 27, 2018, 20:00 Local	**Registration:**	N502S
Aircraft:	Air Tractor AT502	**Aircraft Damage:**	Substantial
Defining Event:	Loss of engine power (partial)	**Injuries:**	1 None
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The pilot reported that he noticed degraded engine performance when the airplane was about halfway down the runway during takeoff for the aerial application flight. Specifically, the engine torque decreased from 1,700 ft-lbs at the start of the takeoff to 1,500 ft-lbs. He determined that there was not enough runway to abort the takeoff and stop the airplane, so he applied full power and dumped the product load. The engine continued to lose power, and the airplane subsequently continued off the end of the runway and nosed over in high vegetation. Postaccident examination of the airplane and engine, including individual testing of several engine components, confirmed that the engine was producing power during the impact sequence, but no determination could be made as to how much power the engine produced. The examination did not reveal any mechanical malfunctions or failures that would have precluded normal operation.

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 for reasons that could not be determined based on the available evidence.

Findings

Not determined	(general) - Unknown/Not determined

Factual Information

History of Flight

Takeoff	Loss of engine power (partial) (Defining event)
Takeoff	Runway excursion
Takeoff	Nose over/nose down

On June 27, 2018, about 2000 central daylight time, an Air Tractor 502B, N502S, impacted vegetation and the terrain following a reported partial loss of engine power during takeoff from a private airstrip near Tappen, North Dakota. The pilot was not injured, and the airplane was destroyed. The airplane was registered to and operated by Ross Seed Company, Inc. under the provisions of Title 14 *Code of Federal Regulations* Part 137 as an aerial application flight. Visual meteorological conditions prevailed for the flight, which was not on a flight plan The local flight was originating at the time of the accident.

The pilot reported that he had performed a full day of spraying in the accident airplane, which had performed normally all day with no abnormal sounds, vibrations, or indications. He stated that during the accident takeoff, the engine torque was initially set to 1,700 ft-lbs. When the airplane was just past the halfway point of the runway, he noticed that the tail of the airplane was not coming up as expected. He looked at the torque indicator and it was reading 1,500 ft-lbs of torque. He determined that he would not be able to abort the takeoff and stop the airplane on the remaining runway, so he elected to push the power lever full forward and dump the chemical load. He said that he believed the engine continued to lose power. The airplane continued off the end of the runway into a cattail patch and nosed over.

The airplane engine was examined by Federal Aviation Administration inspectors and a representative of Pratt & Whitney Canada, the engine manufacturer. The exhaust duct was impact fractured adjacent to the exhaust duct ports. This separated the majority of the power section components and the propeller from the engine and the aircraft. The rotational signatures that were found on the compressor turbine vane, compressor turbine, power turbine vane, and the power turbine were consistent with the engine producing power during the impact with the terrain. Static impact marks were noted on downstream side of the power turbine vane baffle from contact with the power turbine. The power turbine had static impact marks on the downstream side from contact with the power turbine shaft housing. The static impact marks indicated that the power turbine stopped rotating during the impact sequence. There were no indications of any pre-impact distress found to any of the examined components. The starting flow control unit (SFCU), fuel pump, fuel control unit (FCU), propeller governor (CSU), and over-speed governor (OSG) were removed for independent testing. Observations recorded during testing of the SFCU, CSU, FCU and OSG were consistent with field adjustments or impact damage. There were no defects or damage evident that would have prevented normal operation prior to the accident.

Pilot Information

Certificate:	Commercial	**Age:**	54,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Single
Other Aircraft Rating(s):	Glider; Helicopter	**Restraint Used:**	5-point
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:**	March 19, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	13000 hours (Total, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Air Tractor	**Registration:**	N502S
Model/Series:	AT502 B	**Aircraft Category:**	Airplane
Year of Manufacture:	1997	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	502B-0456
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	8000 lbs
Time Since Last Inspection:		**Engines:**	Turbo prop
Airframe Total Time:		**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:		**Engine Model/Series:**	PT-6A-34AG
Registered Owner:		**Rated Power:**	750 Horsepower
Operator:		**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:	BIS,1661 ft msl	**Distance from Accident Site:**	46 Nautical Miles
Observation Time:	19:52 Local	**Direction from Accident Site:**	260°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	6 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	260°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.81 inches Hg	**Temperature/Dew Point:**	29°C / 11°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Tappen, ND (PVT)	**Type of Flight Plan Filed:**	None
Destination:	Tappen, ND (PVT)	**Type of Clearance:**	None
Departure Time:	20:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	Private PVT	**Runway Surface Type:**	Dirt;Grass/turf
Airport Elevation:	1740 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	27	**IFR Approach:**	None
Runway Length/Width:	2500 ft / 100 ft	**VFR Approach/Landing:**	None

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:**	45.875,-99.63639

Administrative Information

Investigator In Charge (IIC):	Brannen, John
Additional Participating Persons:	Jeffery Vigdal; FAA - Fargo FSDO; Fargo, ND
Original Publish Date:	June 3, 2020
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97666