



# Aviation Investigation Final Report

<b>Location:</b>	Union City, Tennessee	<b>Accident Number:</b>	ERA17LA326
<b>Date &amp; Time:</b>	September 15, 2017, 09:15 Local	<b>Registration:</b>	N4531K
<b>Aircraft:</b>	AIR TRACTOR INC AT 502	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Loss of engine power (total)	<b>Injuries:</b>	1 None
<b>Flight Conducted Under:</b>	Part 137: Agricultural		

## Analysis

The pilot of the aerial application flight indicated that the airplane was in cruise flight on its way to an application site when he heard a "pop," and the engine lost total power. The pilot maneuvered the airplane for a forced landing on a roadway but changed his forced landing site to a corn field due to vehicle traffic. After touchdown, the main landing gear separated, which resulted in substantial damage to the fuselage.

Examination of the engine revealed catastrophic internal damage; all compressor turbine blades were fractured. Metallurgical examination revealed fracture features consistent with high-velocity impact and high-temperature deformation such as "creep." The primary fracture could not be identified; therefore, the sequence in which the fractures occurred could not be determined.

The engine was an assembled compilation of manufacturer and aftermarket parts manufacturer approval (PMA) parts. Some PMA parts installed were not authorized for the application, and the serial numbers reflected in the maintenance records did not match the components installed. For example, the factory original compressor turbine disk was installed, but the logbook indicated another disk was installed. The compressor turbine disk was a time-limited item, and the total hours on the installed disk could not be verified.

## Probable Cause and Findings

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

The catastrophic failure of the compressor turbine blades, which resulted in a total loss of engine power. Contributing to the accident was the installation of undocumented, time-limited engine components of indeterminate age.

## Findings

<b>Aircraft</b>	(general) - Failure
<b>Aircraft</b>	(general) - Incorrect service/maintenance

# Factual Information

## History of Flight

<b>Enroute-cruise</b>	Loss of engine power (total) (Defining event)
<b>Emergency descent</b>	Off-field or emergency landing
<b>Landing</b>	Part(s) separation from AC

On September 15, 2017, about 0915 central daylight time, an Air Tractor AT-502, N4531K, was substantially damaged during collision with terrain following a forced landing after a total loss of engine power while in cruise flight near Union City, Tennessee. The commercial pilot was not injured. Visual meteorological conditions prevailed, and no flight plan was filed for the aerial application flight which was conducted under the provisions of 14 Code of Federal Regulations Part 137.

In an interview with a Federal Aviation Administration (FAA) inspector, the pilot reported he was in cruise flight on his way to an application site when he heard a 'pop' and the engine stopped producing power. The pilot maneuvered the airplane for a forced landing on a roadway but had to amend his forced landing site to a cornfield adjacent to the road due to vehicle traffic. After touchdown, the main landing gear separated which resulted in substantial damage to the fuselage.

At 0915, the weather recorded at Everett-Stewart Regional Airport (UCY), about 6 miles east of the accident site, included clear skies and wind from 160° at 4 knots. The temperature was 23°C, and the dew point was 20°C. The altimeter setting was 30.06 inches of mercury.

The pilot held a commercial pilot certificate with a rating for airplane single-engine land. The pilot reported 18,000 total hours of flight experience, of which 3,034 hours were in the accident airplane make and model.

According to FAA records, the airplane was manufactured in 1990 and had accrued 5,490 total aircraft hours. The engine had two data plates and had been changed from a PWC PT6A-15AG engine to a PWC PT6A-34 engine under an FAA supplemental type certificate (STC).

A Pratt & Whitney Canada (PWC) accident investigator performed a field examination of the accident airplane's engine under the supervision of an FAA aviation safety inspector. The examination revealed catastrophic internal damage, and parts of the compressor turbine wheel with blade fragments were harvested and forwarded to the NTSB Materials Laboratory for examination.

An NTSB Senior Powerplants Investigator reviewed the report prepared by Pratt & Whitney following the field examination of the engine and maintenance records. He concurred with the report and commented on some of its findings.

In summary, the engine was an assembled compilation of PWC and aftermarket (Parts Manufacturer Approval – PMA) parts. Some PMA parts installed were not authorized for the application, and the serial numbers reflected in the maintenance records did not match the components installed and reflected

a compressor turbine stator (weld) repair that was not PWC approved. For example, the factory original compressor turbine disk was installed while the logbook indicated another disk was installed. The compressor turbine disk was a time-limited item, and the total hours on the installed disk could not be verified.

Metallurgical examination of the compressor turbine blades revealed fracture features consistent with high-velocity impact and high-temperature deformation such as "creep." All blades were fractured, the primary fracture could not be identified, and therefore the sequence in which the fractures occurred could not be determined.

### Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	63, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Single
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	4-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2	<b>Last FAA Medical Exam:</b>	March 28, 2017
<b>Occupational Pilot:</b>	Yes	<b>Last Flight Review or Equivalent:</b>	January 7, 2016
<b>Flight Time:</b>	18000 hours (Total, all aircraft), 3034 hours (Total, this make and model)		

### Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	AIR TRACTOR INC	<b>Registration:</b>	N4531K
<b>Model/Series:</b>	AT 502 UNDESIGNAT	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1990	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Restricted (Special)	<b>Serial Number:</b>	502-0102
<b>Landing Gear Type:</b>	Tailwheel	<b>Seats:</b>	1
<b>Date/Type of Last Inspection:</b>		<b>Certified Max Gross Wt.:</b>	
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Turbo prop
<b>Airframe Total Time:</b>	5490 Hrs at time of accident	<b>Engine Manufacturer:</b>	Pratt and Whitney
<b>ELT:</b>		<b>Engine Model/Series:</b>	PWC PT6A-15AG
<b>Registered Owner:</b>		<b>Rated Power:</b>	750 Horsepower
<b>Operator:</b>		<b>Operating Certificate(s) Held:</b>	Agricultural aircraft (137)

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	UCY,341 ft msl	<b>Distance from Accident Site:</b>	6 Nautical Miles
<b>Observation Time:</b>	09:15 Local	<b>Direction from Accident Site:</b>	97°
<b>Lowest Cloud Condition:</b>	Clear	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	None	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	4 knots /	<b>Turbulence Type Forecast/Actual:</b>	/
<b>Wind Direction:</b>	160°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.05 inches Hg	<b>Temperature/Dew Point:</b>	23°C / 20°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Hickman, KY (1M7 )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Hickman, KY (1M7 )	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	09:15 Local	<b>Type of Airspace:</b>	Class G

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 None	<b>Latitude, Longitude:</b>	36.392776,-89.116668(est)

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Rayner, Brian
<b>Additional Participating Persons:</b>	Addison Baxter; FAA/FSDO; Memphis, TN Leslie Ederer; Pratt and Whitney
<b>Original Publish Date:</b>	August 10, 2020
<b>Note:</b>	The NTSB did not travel to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=96017">https://data.nts.gov/Docket?ProjectID=96017</a>

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