



Aviation Investigation Final Report

Location:	Wray, Colorado	Accident Number:	CEN14LA439
Date & Time:	August 19, 2014, 07:40 Local	Registration:	N4542W
Aircraft:	Air Tractor AT-401	Aircraft Damage:	Substantial
Defining Event:	Loss of engine power (total)	Injuries:	1 Minor
Flight Conducted Under:	Part 137: Agricultural		

Analysis

During initial climb, the pilot felt a subtle vibration from the engine and noticed the manifold pressure dropping rapidly. When he attempted to increase manifold pressure by opening the throttle, the engine began to vibrate violently and lost all power. The pilot made a downwind forced landing, and the airplane nosed over. The engine was later partially disassembled and examined. A small amount of aluminum and steel filings were recovered from oil drained from the rocker arm sump. A cylinder compression check revealed that the Nos. 1 and 3 cylinders were non-functioning and that the No. 4 cylinder exhibited weak compression. The intake valve in the No. 3 cylinder was found to have a ridge worn on its face, and the valve seat was worn excessively. The No. 1 cylinder's exhaust valve was stuck open and was binding in the valve guide. The exhaust valve clearances for the cylinders were then checked and found to be less than the Pratt and Whitney overhaul limits of 0.003" to 0.0055", with a maximum wear limit of 0.010". Most likely, the engine lost power due to the stuck exhaust valve.

Probable Cause and Findings

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

A loss of the No. 1 cylinder's compression due to a stuck exhaust valve caused by a lack of sufficient valve clearance, which resulted in a loss of engine power and a forced landing. Contributing to the loss of engine power were the worn intake and exhaust valves in cylinders No. 3 and 4.

Findings

Aircraft	Recip engine power section - Malfunction
Aircraft	Recip engine power section - Damaged/degraded

Factual Information

History of Flight

Initial climb	Loss of engine power (total) (Defining event)
Emergency descent	Off-field or emergency landing
Landing-landing roll	Nose over/nose down

On August 19, 2014, about 0740 mountain daylight time, the pilot of an Air Tractor AT-401, N4542W, made a forced landing in a field near Wray, Colorado. The pilot, the sole occupant on board, sustained a minor injury. The airplane was substantially damaged. The airplane was being operated by Tri-County Ag of Wray, Colorado, under the provisions of 14 Code of Federal Regulations Part 137 as an aerial application flight. Visual meteorological conditions prevailed at the time of the accident, and no flight plan had been filed. The local flight originated from Wray Municipal Airport (2V5), Wray, Colorado, approximately 0700.

According to the pilot's accident report, he had just finished spraying a field and was climbing out to return to his home base when he felt a subtle vibration from the engine and noticed manifold pressure dropping rapidly. When he attempted to increase manifold pressure by opening the throttle, the engine began to vibrate violently and lost all power. The pilot made a downwind forced landing. To avoid a drainage ditch and power lines ahead, the pilot applied heavy braking and the airplane nosed over. The vertical stabilizer and rudder, cockpit, and left wing sustained crushing damage.

On October 14 and 15, the engine was partially disassembled and examined. Engine oil was drained from the rocker arm sump. In addition to carbon, a small amount of aluminum and steel filings were recovered. A compression check of all the cylinders was made with the following results:

Cylinder 1 0/80
Cylinder 2 50/80
Cylinder 3 0/80
Cylinder 4 20/80
Cylinder 5 25/80
Cylinder 6 75/80
Cylinder 7 65/80
Cylinder 8 55/80
Cylinder 9 55/80

Cylinders 1, 3, and 4 were removed and examined. The intake valve in the number 3 cylinder had a ridge worn off its face, and the valve seat was worn excessively. The exhaust valve in the number 1 cylinder was stuck open and was found to be binding in the valve guide. It was removed with extreme difficulty. The exhaust valve clearances were then checked and found to be less than the Pratt and Whitney overhaul limits of .003" - .0055", with a maximum wear limit of .010", to wit:

Cylinder 1 Clearance .002" Stem size .610" Guide size .613"
 Cylinder 3 Clearance .0022" Stem size .611" Guide size .6132"
 Cylinder 4 Clearance .0022" Stem size .611" Guide size .6132"

Pilot Information

Certificate:	Commercial	Age:	22
Airplane Rating(s):	Single-engine land	Seat Occupied:	Single
Other Aircraft Rating(s):	None	Restraint Used:	4-point
Instrument Rating(s):	None	Second Pilot Present:	No
Instructor Rating(s):	None	Toxicology Performed:	No
Medical Certification:	Class 2 Without waivers/limitations	Last FAA Medical Exam:	March 17, 2014
Occupational Pilot:	Yes	Last Flight Review or Equivalent:	
Flight Time:	(Estimated) 750 hours (Total, all aircraft), 400 hours (Total, this make and model), 625 hours (Pilot In Command, all aircraft), 250 hours (Last 90 days, all aircraft), 170 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Air Tractor	Registration:	N4542W
Model/Series:	AT-401	Aircraft Category:	Airplane
Year of Manufacture:	1989	Amateur Built:	
Airworthiness Certificate:	Restricted (Special)	Serial Number:	401-0767
Landing Gear Type:	Tailwheel	Seats:	1
Date/Type of Last Inspection:	August 8, 2014 100 hour	Certified Max Gross Wt.:	7880 lbs
Time Since Last Inspection:	30 Hrs	Engines:	1 Reciprocating
Airframe Total Time:	7969 Hrs at time of accident	Engine Manufacturer:	Pratt & Whitney
ELT:	Not installed	Engine Model/Series:	R-1340-S3H1G
Registered Owner:	Wilmington Trust Company, Trustee	Rated Power:	600 Horsepower
Operator:	Aurora Cooperative	Operating Certificate(s) Held:	Agricultural aircraft (137)
Operator Does Business As:	Tri-County Ag	Operator Designator Code:	K9JG

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	Condition of Light:	Day
Observation Facility, Elevation:	2V5,3677 ft msl	Distance from Accident Site:	
Observation Time:	07:15 Local	Direction from Accident Site:	
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:	/ N/A
Altimeter Setting:	29.95 inches Hg	Temperature/Dew Point:	16°C / 13°C
Precipitation and Obscuration:			
Departure Point:	Wray, CO (2V5)	Type of Flight Plan Filed:	None
Destination:	Wray, CO (2V5)	Type of Clearance:	None
Departure Time:	07:00 Local	Type of Airspace:	Class G

Wreckage and Impact Information

Crew Injuries:	1 Minor	Aircraft Damage:	Substantial
Passenger Injuries:		Aircraft Fire:	None
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Minor	Latitude, Longitude:	40.100276,-102.240837(est)

Administrative Information

Investigator In Charge (IIC):	Scott, Arnold
Additional Participating Persons:	Sean Shambo; FAA Flight Standards District Office; Denver, CO
Original Publish Date:	February 11, 2015
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=89906

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