Aviation Investigation Final Report

Location:	BRAWLEY, California	**Accident Number:**	LAX00LA087
Date & Time:	February 2, 2000, 15:00 Local	**Registration:**	N23043
Aircraft:	Air Tractor AT-301	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	1 Serious
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The pilot was spraying sulfur on a carrot field when he lost engine power and made a forced landing in an alfalfa field, coming to rest inverted. The pilot had noted an increase in oil consumption the day of the accident. A witness observed two puffs of black smoke emanate from the airplane prior to making the forced landing. During the engine inspection it was noted that the number 5 exhaust rocker arm was found broken. Further disassembly of the number 5 cylinder revealed that the exhaust push rod was bent; due to the appearance and length it was determined that it was the intake push rod. When the exhaust push rod and the intake push rod were placed side-by-side, the intake push rod was the longer of the two and the one that was bent. Maintenance personnel stated that the only way an intake push rod could be installed in the exhaust side of the cylinder was to loosen the cylinder and pull it away from the case to allow for an increased distance between the rocker arm and lifter. When the cylinder was re-torqued, with the push rods in a switched configuration, the intake push rod would bend in the exhaust housing due to its length. After replacement of the pushrods and broken rocker arm, an engine run was conducted with no anomalies noted. Review of the engine logbook revealed that a major overhaul had been conducted on the engine approximately 3 months prior to the accident. Records indicated a mechanic and inspector conducted an inspection of the cylinders and associated components; the engine was test run with no discrepancies and then inspected by a different mechanic and inspector and signed off by all four individuals as being in airworthy condition and returned to service. A review of the engine logbooks also revealed that maintenance had been performed on the airplane since the overhaul, but not in the area of the number 5 cylinder.

Probable Cause and Findings

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

Failure of the engine due to improper installation of the intake and exhaust push rods (components were switched) by unknown maintenance personnel.

Findings

Occurrence #1: LOSS OF ENGINE POWER(TOTAL) - MECH FAILURE/MALF
Phase of Operation: MANEUVERING - AERIAL APPLICATION

Findings
1. (C) ENGINE ASSEMBLY,PUSH ROD - BENT
2. (C) MAINTENANCE,OVERHAUL - IMPROPER - OTHER MAINTENANCE PERSONNEL
3. (C) ENGINE ASSEMBLY,ROCKER ARM/TAPPET - FAILURE,TOTAL

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
4. TERRAIN CONDITION - DITCH

Factual Information

On February 2, 2000, at 1500 hours Pacific standard time, an Air Tractor AT-301, N23043, lost engine power while maneuvering to spray sulfur on a carrot field near Brawley, California. The airplane made a forced landing in an open dirt field and came to rest inverted in an irrigation ditch after colliding with a concrete wall. The aircraft, operated by Val Air, Inc. under the provisions of 14 CFR Part 137, was destroyed by postimpact fire. The commercial pilot sustained serious injuries. Visual meteorological conditions existed for the local area agricultural operation, and no flight plan was filed. The flight had departed from a private dirt strip near the alfalfa field, and was scheduled to terminate at the same private dirt strip.

Federal Aviation Administration (FAA) inspectors interviewed the pilot. The pilot informed the FAA that he was spraying sulfur, approximately 7 feet above ground level (agl), when the engine quit. He did a magneto check, but did not receive a response and made a forced landing. During the forced landing he noted a high rate of airspeed on touchdown, and ran out of open landing area. The airplane struck a concrete wall and nosed over into an irrigation ditch. The pilot stated that the airplane had recently received a 100-hour inspection and had to be returned to the overhaul facility due to "problems," and he had noted an increase in engine oil consumption, approximately 3 gallons every 2 hours, during operations on the day of the accident.

The FAA also interviewed the ground spotter/radio man, who was in contact with the pilot. He stated that the pilot had radioed that he (the pilot) was in trouble, but did not elaborate as to the nature of the problem. The spotter observed two puffs of black smoke emanate from the airplane and then saw it crash. The spotter and two bystanders, who saw the airplane burning, aided the pilot in his egress from the airplane. The spotter was unable to put out the fire.

TESTS AND RESEARCH

A Safety Board Investigator conducted a review of the airplane's engine logbook. The review revealed that on November 17, 1999, the major overhaul for the engine was signed off by the overhaul facility, Aero Engines, Inc., and the engine was returned to the owner on December 7, 1999. A compression check was completed on January 31, 2000; however, there was not an indication as to why a compression check was conducted.

On February 23, 2000, the engine was inspected at Aero-Engines Inc. in Los Angeles, California, by an airworthiness inspector from the Los Angeles Flight Standards District Office. The examination revealed that the magneto timing was off by 3 degrees; the timing should have been 25 degrees and was found to be 28 degrees. The number 1 cylinder was removed to verify that it was not damaged, no abnormalities were found. Fuel drained from the system appeared to be yellow in color and smelled like automobile fuel. Inspection of the carburetor

revealed that it was damaged. To facilitate an engine run, the carburetor shaft was straightened. The rocker arm covers were removed from the remaining cylinders, and the number 5 exhaust rocker arm was found broken. Further disassembly showed that the exhaust push rod was bent. Upon removal of the exhaust push rod, it was noted that it had been switched with the intake push rod. The exhaust push rod is shot peened, making it dull in color, and is shorter than the intake push rod. According to the overhaul facility, the only way the push rods could be installed in a switched orientation would be for the cylinder to be loosened and pulled away from the case to allow for an increased distance between the rocker arm and lifter. However, after tightening the push rods in the switched configuration, the intake push rod would show a bend after tightening. The exhaust rocker arm was found to have shinny and peened surface at the fatigue origin. The cylinder was removed to inspect for valve piston contact with no anomalies noted. The cylinder and new exhaust and intake rocker arms, as well as push rods, were replaced and the engine was test run. The engine was run at 2,200 rpm and a magneto check was conducted at 1,800 rpm; no discrepancies were noted with the run or the magneto check.

According to records obtained from Aero-Engines, an engine inspection was completed on November 10, 1999. Records further indicate that the valves were adjusted and signed off by the mechanic, and then inspected and signed off by an inspector. The engine was placed on a test stand for an engine run. After completion of the engine run, a different mechanic and a different inspector inspected the valve installation and clearance. No discrepancies were noted, and the engine was shipped to the operator.

An FAA Airworthiness inspector from the San Diego Flight Standards District Office examined the airplane engine logbook and noted that there had been maintenance performed on the airplane since the overhaul, but not in the area of the number 5 cylinder.

Pilot Information

Certificate:	Commercial	**Age:**	44,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Unknown
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--no waivers/lim.	**Last FAA Medical Exam:**	July 1, 1999
Occupational Pilot:	UNK	**Last Flight Review or Equivalent:**	
Flight Time:			

Aircraft and Owner/Operator Information

Aircraft Make:	Air Tractor	**Registration:**	N23043
Model/Series:	AT-301 AT-301	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	301-0352
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	January 10, 2000 100 hour	**Certified Max Gross Wt.:**	7000 lbs
Time Since Last Inspection:	41 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	5693 Hrs	**Engine Manufacturer:**	P&W
ELT:		**Engine Model/Series:**	AN1-R-1340
Registered Owner:	VAL AIR CO. INC.	**Rated Power:**	600 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	LSVG

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	IPL	**Distance from Accident Site:**	14 Nautical Miles
Observation Time:	14:50 Local	**Direction from Accident Site:**	170°
Lowest Cloud Condition:	Scattered / 2000 ft AGL	**Visibility**	25 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	/	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	0°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	24°C / -1°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:		**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	
Departure Time:	00:00 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	PVT DIRT STRIP	**Runway Surface Type:**	
Airport Elevation:		**Runway Surface Condition:**	
Runway Used:	0	**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	1 Serious	**Aircraft Damage:**	Destroyed
Passenger Injuries:		**Aircraft Fire:**	On-ground
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 Serious	**Latitude, Longitude:**	33.019256,-115.449279(est)

Administrative Information

Investigator In Charge (IIC):	Cornejo, Tealeye
Additional Participating Persons:	JIM MCNAMARA; SAN DIEGO , CA
Original Publish Date:	July 2, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=48582