Aviation Investigation Final Report

Location:	Fergus Falls, Minnesota	**Accident Number:**	CHI07LA173
Date & Time:	June 20, 2007, 08:00 Local	**Registration:**	N23667
Aircraft:	Air Tractor AT-301	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	1 Minor
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The agricultural spray airplane sustained substantial damage during a forced landing following a severe engine vibration during cruise flight. The pilot reported that he was in cruise flight about 500 feet above ground level (agl) when the engine and airframe started to vibrate violently, and the windshield became covered with oil. He made a forced landing to a field, but the main landing gear broke off and the airplane flipped over. Inspection of the airplane revealed that one of the propeller blades was missing about 9 inches of the propeller blade tip. The propeller blade was cut and the piece with the fracture surface was sent to the National Transportation Safety Board's Materials Laboratory for examination. The inspection of the fracture surface revealed that the propeller bladed failed as a result of a fatigue crack, with features typical of impact of a rotating propeller blade with a foreign object. Aircraft maintenance records indicated that the propeller blade was repaired and overhauled on October 21, 2003. The overhaul documents indicated that the no discrepancies were found when the propeller blades and hub underwent visual and non-destructive testing. The aircraft operator reported that he had purchased the propeller blade from another operator as a "0" time blade since major overhaul. Since installing the propeller on the accident airplane, it had been flown for about 30 hours. The operator reported that the accident airplane did not have a propeller strike during the 30 hours of operation prior to the accident flight.

Probable Cause and Findings

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

The propeller blade failure during climb due to a fatigue crack. The oil leak that obstructed the pilot's vision was a factor in the accident.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CLIMB - TO CRUISE

Findings
1. (C) PROPELLER SYSTEM/ACCESSORIES,BLADE - FAILURE
2. (C) PROPELLER SYSTEM/ACCESSORIES,BLADE - FATIGUE

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

Occurrence #3: HARD LANDING
Phase of Operation: EMERGENCY LANDING

Findings
3. LANDING GEAR,MAIN GEAR - SEPARATION
4. LANDING GEAR,MAIN GEAR - OVERLOAD
5. (F) FLUID,OIL - LEAK
6. (F) WINDOW,FLIGHT COMPARTMENT WINDOW/WINDSHIELD - OBSTRUCTED

Occurrence #4: NOSE OVER
Phase of Operation: EMERGENCY LANDING

Findings
7. TERRAIN CONDITION - GROUND

Factual Information

On June 20, 2007, at approximately 0800 central daylight time, an Air Tractor AT-301, N23667, sustained substantial damage during a forced landing following a severe engine vibration during cruise flight near Fergus Falls, Minnesota. The 14 Code of Federal Regulations Part 137 flight departed Fergus Falls Municipal Airport-Einar Mickelson Field (FFM), Fergus Falls, Minnesota, at approximately 0750 for a local aerial application flight. The commercial pilot reported minor injuries. Visual meteorological conditions prevailed at the time of the accident. No flight plan was filed.

The pilot reported that he was in cruise flight about 500 feet above ground level (agl) when the engine and airframe started to vibrate violently. The windshield became covered with fluid, and because the door had come open, fluid was getting into the cockpit making it difficult for the pilot to see. He executed a forced landing to a field. The main landing gear broke off and the airplane flipped over. The pilot released his harness and evacuated the airplane.

The inspection of the airplane revealed that one of the propeller blades was missing about nine inches of the propeller blade tip. The propeller blade was cut and the piece with the fracture surface was sent to the National Transportation Safety Board's (NTSB) Materials Laboratory for examination. The inspection of the fracture surface revealed that the central and leading edge portions of the fracture face were relatively flat and perpendicular to the exterior surfaces of the blade, gross features normally associated with fatigue. The trailing edge portion of the fracture was on a slant plane and displayed a grainy surface texture, consistent with a final overstress fracture region. The central portion of the fracture displayed an impacted surface consistent with intermittent contact with its mating fracture face; another gross feature consistent with fatigue. The inspection revealed a black indentation on the flat surface of the blade and that the crack arrest marks would be indicative of a crack originating in that vicinity. The indentation was oriented chordwise and penetrated progressively deeper into the surface toward the trailing edge, features typical of impact of a rotating propeller blade with a foreign object.

Aircraft maintenance records indicated that the Hamilton Standard propeller, model 22D40, type 6533A-12, was repaired and overhauled on October 21, 2003. The overhaul documents indicated that no discrepancies were found when the propeller blades and hub underwent visual and non-destructive testing. The propeller hub was checked using magnaflux and eddy current non-destructive testing procedures. The propeller blades were checked using the zyglo non-destructive testing procedure.

The aircraft operator reported that he had purchased the propeller blade in the winter of 2005/2006, and that the propeller was installed on the airplane in the spring of 2006. The propeller was purchased from another operator as a "0" time blade since major overhaul

(SMOH). The operator reported that the propeller blade appeared to be "freshly overhauled" and it looked fine to him. Since installing the propeller on the accident airplane, it had been flown for a total of about 30 hours. The accident airplane was used as a backup airplane, so it did not fly regularly. The operator reported that the accident airplane did not have a propeller strike with a foreign object during the 30 hours of operation prior to the accident flight.

Pilot Information

Certificate:	Commercial	**Age:**	53,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Center
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	Airplane	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 None	**Last FAA Medical Exam:**	May 1, 2007
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	
Flight Time:	3501 hours (Total, all aircraft), 300 hours (Total, this make and model), 3393 hours (Pilot In Command, all aircraft), 65 hours (Last 90 days, all aircraft), 65 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Air Tractor	**Registration:**	N23667
Model/Series:	AT-301	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	301-0410
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	June 1, 2007 Annual	**Certified Max Gross Wt.:**	
Time Since Last Inspection:		**Engines:**	1 Reciprocating
Airframe Total Time:	5981 Hrs as of last inspection	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Not installed	**Engine Model/Series:**	R-1340
Registered Owner:	West Central Aerial Sprayers Inc	**Rated Power:**	600 Horsepower
Operator:		**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	KMCG

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KFFM,1182 ft msl	**Distance from Accident Site:**	4 Nautical Miles
Observation Time:	07:56 Local	**Direction from Accident Site:**	135°
Lowest Cloud Condition:	Scattered / 8000 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	260°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.03 inches Hg	**Temperature/Dew Point:**	19°C / 14°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	FERGUS FALLS, MN (FFM)	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	07:50 Local	**Type of Airspace:**	

Airport Information

Airport:	FERGUS FALLS MUNI-EINAR MICKEL FFM	**Runway Surface Type:**	
Airport Elevation:	1182 ft msl	**Runway Surface Condition:**	
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

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:**	46.279396,-96.05931(est)

Administrative Information

Investigator In Charge (IIC):	Silliman, James
Additional Participating Persons:	Laura McCoy; FAA - Minneapolis FSDO; Minneapolis, MN
Original Publish Date:	March 31, 2008
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=66095