Aviation Investigation Final Report

Location:	Kenesaw, Nebraska	**Incident Number:**	CHI01IA246
Date & Time:	July 27, 2001, 10:00 Local	**Registration:**	N4553K
Aircraft:	Air Tractor AT-401	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	1 None
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The airplane sustained minor damage when it nosed over during an emergency landing following an in-flight loss of a propeller blade tip. The pilot was uninjured. The pilot stated, "While on a actual spray run the aircraft began to shake and vibrate violently. At that time I shut the power down, climbed about 100 ft to look for a place to land. The area was rolling with pasture land and a corn field in front of me, no roads to land on in the area. ... After a rolling out for a short while in corn the landing gear became stuck in corn and soft sandy soil." A portion of the remaining blade, including the separation, was shipped to the NTSB's Materials Laboratory Division. The laboratory's report stated that "a large portion of the fracture surface was on a 90-degree flat plane with multiple ratchet marks and crack arrest marks on this portion of the fracture surface. These features are typical of a fatigue crack. The fatigue crack originated from multiple origins at the bottom of a gouge on the flat face of the blade about 2.25 inches from the blade's leading edge. The fatigue crack extended through about two-thirds of the blade's cross-section. The remainder of the fracture surface (about one-third of the blade's cross section) was on a 45-degree slanted plane and was typical of an overstress region stemming from the fatigue crack." A section was saw cut from the fracture containing the fatigue origin. The paint was removed from the areas near the crack origin and the surface was re-examined with a scanning electron microscope (SEM). The gouge was measured using the SEM. The report further stated, "The length of the gouge was 0.6 inch (1.5 millimeters), and the depth of the gouge was 0.0055 inch (0.14 millimeters). ... Optical examination of the flat face of the blade near the gouge did not show any evidence of blending or rework in this area." The propeller's last overhaul was completed on January 13, 1998. The propeller accumulated 240 hours of flight since that overhaul.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: The propeller blade fatigue leading to its tip separating during an aerial application. Factors were no suitable terrain for an emergency landing, high vegetation, and soft terrain encountered during the emergency landing.

Findings

Occurrence #1: PROPELLER FAILURE/MALFUNCTION
Phase of Operation: MANEUVERING - AERIAL APPLICATION

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

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

Findings
3. (F) TERRAIN CONDITION - NONE SUITABLE

Occurrence #3: NOSE OVER
Phase of Operation: EMERGENCY DESCENT/LANDING

Findings
4. (F) TERRAIN CONDITION - HIGH VEGETATION
5. (F) TERRAIN CONDITION - SOFT

Factual Information

On July 27, 2001, about 1000 central daylight time, an Air Tractor AT-401, N4553K, piloted by a commercial pilot, sustained minor damage when it nosed over during an emergency landing following an in-flight loss of a propeller blade tip while maneuvering near Kenesaw, Nebraska. The aerial application flight was operating under 14 CFR part 137. Visual meteorological conditions prevailed at the time of the accident. No flight plan was on file. The pilot reported no injuries. The local flight departed from Roseland, Nebraska at 0700 and was performing an aerial application, at the time of the incident.

The pilot stated, "While on a actual spray run the aircraft began to shake and vibrate violently. At that time I shut the power down, climbed about 100 ft to look for a place to land. The area was rolling with pasture land and a corn field in front of me, no roads to land on in the area. Plane was gliding but loosing altitude quickly. I lined up for the corn field, lowered flaps held the aircraft just above stall speed and landed in the corn field with control. ... After a rolling out for a short while in corn the landing gear became stuck in corn and soft sandy soil. Plane stopped and went over on its back."

Approximately 12 inches of one of the propeller blade tips was found to be missing. A Federal Aviation Administration Inspector arranged to a cut away a portion of the remaining blade to include that separated surface. The cut away portion was shipped to the National Transportation Safety Board's Materials Laboratory Division. The laboratory performed an examination and produced a Materials Laboratory Factual Report No. 02-037.

That laboratory report stated that "a large portion of the fracture surface was on a 90-degree flat plane with multiple ratchet marks and crack arrest marks on this portion of the fracture surface. These features are typical of a fatigue crack. The fatigue crack originated from multiple origins at the bottom of a gouge on the flat face of the blade about 2.25 inches from the blade's leading edge. The fatigue crack extended through about two-thirds of the blade's cross-section. The remainder of the fracture surface (about one-third of the blade's cross section) was on a 45-degree slanted plane and was typical of an overstress region stemming from the fatigue crack." A section was saw cut from the fracture containing the fatigue origin. The paint was removed from the areas near the crack origin and the surface was re-examined with a scanning electron microscope (SEM). The gouge was measured using the SEM. The report further stated, "The length of the gouge was 0.6 inch (1.5 millimeters), and the depth of the gouge was 0.0055 inch (0.14 millimeters). ... Optical examination of the flat face of the blade near the gouge did not show any evidence of blending or rework in this area."

The propeller's last overhaul was completed on January 13, 1998. The operator reported that the propeller accumulated 240 hours of flight since that overhaul.

Pilot Information

Certificate:	Commercial	**Age:**	47,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Single
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:**	February 20, 2001
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	February 16, 2000
Flight Time:	7259 hours (Total, all aircraft), 1000 hours (Total, this make and model), 7009 hours (Pilot In Command, all aircraft), 120 hours (Last 90 days, all aircraft), 70 hours (Last 30 days, all aircraft), 12 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Air Tractor	**Registration:**	N4553K
Model/Series:	AT-401	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	401-0809
Landing Gear Type:	Tailwheel	**Seats:**	1
Date/Type of Last Inspection:	June 7, 2001 Annual	**Certified Max Gross Wt.:**	6000 lbs
Time Since Last Inspection:	30 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1397 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney
ELT:	Not installed	**Engine Model/Series:**	R1340-AN1
Registered Owner:	WILLMES, STEVEN J	**Rated Power:**	600 Horsepower
Operator:	WILLMES, STEVEN J	**Operating Certificate(s) Held:**	
Operator Does Business As:		**Operator Designator Code:**	PSMG

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	HSI,1961 ft msl	**Distance from Accident Site:**	15 Nautical Miles
Observation Time:	10:53 Local	**Direction from Accident Site:**	95°
Lowest Cloud Condition:	Few / 1200 ft AGL	**Visibility**	10 miles
Lowest Ceiling:	Broken / 8000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	7 knots / 0 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	170°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.04 inches Hg	**Temperature/Dew Point:**	24°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Roseland, NE	**Type of Flight Plan Filed:**	None
Destination:		**Type of Clearance:**	None
Departure Time:	07:00 Local	**Type of Airspace:**	Class G

Wreckage and Impact Information

Crew Injuries:	1 None	**Aircraft Damage:**	Minor
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	1 None	**Latitude, Longitude:**	40.609912,-98.650634(est)

Administrative Information

Investigator In Charge (IIC):	Malinowski, Edward
Additional Participating Persons:	Eileen Van Lent; Federal Aviation Administration; Lincoln, NE
Original Publish Date:	December 6, 2002
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB traveled to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=52918