



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 action."

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 Medicalno 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:	<u>Class</u>
Note:	The NTSB traveled to the scene of this incident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=52918

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The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available <u>here</u>.