



# National Transportation Safety Board Aviation Accident Final Report

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<b>Location:</b>	WALDRON, AR	<b>Accident Number:</b>	FTW99FA148
<b>Date &amp; Time:</b>	05/23/1999, 1915 CDT	<b>Registration:</b>	N9729H
<b>Aircraft:</b>	Beech C18S	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>		<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General Aviation - Business		

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## Analysis

During a cross-country flight, the pilot of the twin-engine airplane reported to air traffic control that he has 'lost an engine.' A witness observed the right engine hanging from its lower mounts as the airplane turned right and headed towards the nearest airport. The airplane impacted trees approximately 1 mile short of the runway threshold. Examination of the right engine propeller revealed that one of its blades was separated about mid-span. The separated tip section of the blade was not recovered. Metallurgical examination of the fracture surface revealed that the blade failed as a result of a fatigue crack that originated from corrosion pits on the camber surface (face) of the blade. The failed blade was examined approximately 6 hours prior to the accident in accordance with an airworthiness directive (AD 81-13-06 R2) that called for inspections of the blade for corrosion and fatigue. However, the inspections called out in the AD were only applicable to the blade fillet and shank regions, well inboard of the fracture location on the failed blade. Overhaul of the propeller in accordance with the propeller manufacturer's manual includes grinding of each blade to 'remove all visual evidence of corrosion.' According to the airplane's owner, the propellers had not been overhauled in the eight years that he had owned the aircraft. The maintenance records were destroyed in the accident, which precluded determination of the date and time of the last propeller overhaul. The accident airplane was being operated under Title 14 CFR Part 91, and therefore, the propellers were not required to be overhauled at specified intervals.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the separation of a propeller blade in cruise flight as a result of fatigue cracking emanating from surface corrosion pitting.

## Findings

Occurrence #1: PROPELLER FAILURE/MALFUNCTION

Phase of Operation: CRUISE

### Findings

1. (C) PROPELLER SYSTEM/ACCESSORIES, BLADE - CORRODED
2. MAINTENANCE, OVERHAUL - NOT PERFORMED
3. (C) PROPELLER SYSTEM/ACCESSORIES, BLADE - FATIGUE
4. (C) PROPELLER SYSTEM/ACCESSORIES, BLADE - CRACKED
5. (C) PROPELLER SYSTEM/ACCESSORIES, BLADE - SEPARATION

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Occurrence #2: ENGINE TEARAWAY

Phase of Operation: CRUISE

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Occurrence #3: FORCED LANDING

Phase of Operation: EMERGENCY DESCENT/LANDING

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Occurrence #4: IN FLIGHT COLLISION WITH OBJECT

Phase of Operation: EMERGENCY DESCENT/LANDING

### Findings

6. OBJECT - TREE(S)

## Factual Information

### HISTORY OF FLIGHT

On May 23, 1999, approximately 1915 central daylight time, a Beech C18S twin engine airplane, N9729H, owned and operated by a private individual, impacted terrain during a forced landing following the separation of a propeller blade in cruise flight near Waldron, Arkansas. The airplane was destroyed by impact forces and fire, and the commercial pilot, the sole occupant, was fatally injured. A VFR flight plan was filed and visual meteorological conditions prevailed for the 14 Code of Federal Regulations (CFR) Part 91 cross-country business flight. The airplane departed Beaumont, Texas, about 1700 with a destination of Springdale, Arkansas.

According to air traffic control personnel, after the flight departed from Beaumont, the pilot requested and received VFR radar advisory service. The pilot was in contact with the approach control facility in Fort Smith, Arkansas, when, at 1912, he reported that he had "lost an engine." At this time, the airplane was on a northerly heading, at an altitude of 5,500 feet msl, approximately 1 nautical mile north of the Waldron Municipal Airport. The controller advised the pilot of his position relative to the Waldron Airport, and the pilot elected to turn back to Waldron and land. Radar and radio contact with the airplane were lost at 1915.

A witness, who was in the town of Waldron (about 2 statute miles northeast of the airport), reported that he observed the airplane south of his position heading north. He "witnessed [the airplane] emit short trail of white smoke from #2 [right] engine, two seconds later, saw flash under right engine nacelle." The airplane "yawed to steep [right] bank with increased power on left engine." As the airplane continued to turn right, the witness retrieved his 20-power binoculars from his car and using them "observed [right] engine dangling from mount as [aircraft] completed 180 degree turn toward south."

Another witness, who was at his residence about 1/4 statute mile east-northeast of the accident site, reported that he heard a "sound like a rifle shot" followed by the sound of an engine operating at high power. He then saw the airplane "directly to the north," banking to the right. As the airplane passed within 200 to 300 yards of his position, he observed that the "top two mounts" for the right engine had broken and the engine was "hanging from the lower motor mounts." He also observed that the right engine cowling was missing. The witness reported that the airplane was heading toward the airport when it descended into trees and "exploded."

### PERSONNEL INFORMATION

The pilot held a commercial pilot certificate with airplane single and multi-engine land and instrument ratings. Additionally, he held a ground instructor certificate, a flight instructor certificate, and airframe and powerplant mechanic certificates. He held a second class medical certificate dated November 30, 1998, with no limitations.

According to the airplane's owner, the pilot had accumulated a total flight time of 6,860 hours, of which 860 hours were in a Beech 18. He was employed by a Title 14 CFR Part 135 on-demand cargo operator as a pilot-in-command (PIC) on the Beech 18. He completed the operator's initial flight and ground training on the Beech 18 in January 1998. He satisfactorily completed his most recent Part 135 PIC proficiency check in a Beech 18 on January 12, 1999.

### AIRCRAFT INFORMATION

The 1942-model, twin radial engine, conventional-retractable gear airplane was originally

certified in the normal category. On January 18, 1990, the airplane was registered to the current owner. At the owner's request, on June 22, 1990, the airplane was removed from the normal category and issued an airworthiness certificate in the experimental exhibition category. The purpose of the category change was to allow the owner to perform aerobatic routines in the airplane as part of his professional air show business.

According to FAA records and the owner, on November 7, 1998, the airplane was involved in an incident at Kessler Air Force Base in Biloxi, Mississippi. As the owner was taxiing the airplane to a parking area following an air show performance, the left engine's propeller struck a vehicle.

The owner reported that the maintenance logbooks were onboard the airplane at the time of accident, and they are presumed to have been destroyed by fire. The owner further reported that the airplane had accumulated a total airframe time of 4,400 hours. The most recent condition inspection was completed on May 12, 1999, and the airplane had been flown approximately 6 hours since that time.

During the condition inspection, both Pratt and Whitney R-985 AN-14B engines were removed, transported to a certified engine repair station for repair, and reinstalled following the repairs. According to the repair station work order, the right engine (S/N 10771) was brought in "due to high oil consumption." All cylinders were removed and overhauled. Additionally, both magnetos were replaced with overhauled magnetos. The engine was then run in a test cell for 4.0 hours and approved for return to service. According to the repair station work order, the left engine (S/N 23317) was brought in "due to prop strike." The engine was disassembled for inspection, and the crankshaft was found to be cracked. The crankshaft was replaced with a serviceable crankshaft, and an overhauled blower assembly and overhauled magnetos were installed. The engine was run in a test cell for 2.0 hours and approved for return to service.

Additionally, during the condition inspection, both Hamilton Standard 22D30-35 propellers were removed, transported to a certified propeller repair station for repair, and reinstalled following the repairs. According to the repair station work order, the right propeller (hub S/N: E876, blade S/Ns: N657927 and N657928) was inspected in accordance with Airworthiness Directive (AD) 81-13-06 R2, and no corrosion was found. (AD 81-13-06 R2 requires recurring inspection of the propeller blade fillet and shank regions (blade butt area) for corrosion.) The propeller hub was resealed, and the propeller was returned to service. According to the repair station work order, the left propeller (hub S/N: E3420, blade S/Ns: 527016 and 527017) was inspected in accordance with AD 81-13-06 R2 and corrosion was found. A "minor blade bend" was repaired, the hub was resealed, and the propeller was returned to service.

#### METEOROLOGICAL INFORMATION

At 1853, the reported weather conditions at Fort Smith Regional Airport, Fort Smith, Arkansas, located 30 nautical miles northwest of the accident site, were wind from 320 degrees at 10 knots, visibility 10 statute miles, scattered clouds at 4,900 feet, temperature 26 degrees C, dew point 16 degrees C, and altimeter setting 29.99 inches of mercury.

#### WRECKAGE AND IMPACT INFORMATION

The accident site was located approximately 1 nautical mile east of the threshold of runway 27 at Waldron Municipal Airport. A handheld global positioning satellite (GPS) receiver located the site at 34 degrees 52.800 minutes north latitude and 94 degrees 5.180 minutes west

longitude. The terrain at the accident site was level and consisted of soft, wet dirt with numerous trees measuring about 50 feet in height. Evidence of a freshly severed treetop marked the beginning of the wreckage distribution path. The main wreckage, consisting of the fuselage, wing center section, and both engine nacelles, was found about 222 feet on a magnetic bearing of 232 degrees from the severed tree. The majority of the main wreckage sustained extensive fire damage. The landing gear and flaps were found in the retracted position.

The left engine remained attached to the left wing by control cables and electrical wires. The rear portion of the engine was destroyed by fire. The left propeller remained attached to the engine, and both blades remained intact and attached to the hub. Both blades exhibited gouges, scratches and bending.

The right engine had separated from the right wing and was found about 217 feet from the initial severed treetop directly in front of the left engine. The engine did not receive any fire damage. The right propeller remained attached to the engine, and both blades remained attached to the hub. One of the blades was intact, and the other blade was separated approximately 21.5 inches outboard from the hub. The separated 22-inch section of blade was not found at the accident site. Additionally, the right engine cowling was not found at the accident site. The separated blade was cut off approximately 19 inches outboard from the hub, and the cut off piece was sent to the NTSB Materials Laboratory in Washington, DC, for examination.

#### MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy of the pilot was performed at the Arkansas State Crime Laboratory in Little Rock, Arkansas. Toxicological tests performed by the FAA's Toxicology and Accident Research Laboratory were negative for carbon monoxide, cyanide, ethanol and drugs.

#### TESTS AND RESEARCH

The propellers were removed from their respective engines at the Dawson Aircraft facility in Clinton, Arkansas on July 6, 1999. The propellers were transported to the Mid America Propeller facility in Wynne, Arkansas for complete disassembly and inspection on July 7, 1999.

Disassembly of both propellers revealed no visible signs of any abnormalities of the internal components. Impact witness marks indicated blade angles at the time of impact of 21 to 24 degrees and 26 to 33 degrees for the left and right propellers, respectively. (Blade angles from 13 to 43 degrees are in the normal governing range for this model propeller.) After both left propeller blades and the intact right propeller blade were cleaned, inspection of the blade airfoil surfaces revealed visible corrosion scattered across the airfoil surfaces. A dye penetrant inspection of the camber surfaces of the blades, which had a non-painted, polished mirror finish, confirmed the presence of corrosion pitting. Following disassembly of the propellers, the separated right propeller blade (N657927) was sent to the NTSB Materials Laboratory in Washington, DC for further examination.

The NTSB Materials Laboratory examination of the fracture surface on the separated right propeller blade revealed features indicative of fatigue crack progression. A single fatigue origin was visible on the camber surface of the blade about 1/3 of the blade chord from the leading edge. From the origin location, the fatigue propagated through the thickness and toward the leading and trailing edges of the blade over an estimated 70% of the cross section before final fast fracture.

Magnified optical viewing of the camber surface surrounding the fatigue origin found numerous corrosion pits and some surface staining. The fatigue origin was located at a side by side pair of corrosion pits on the camber surface. The entire unpainted camber surface of the fractured blade section was pitted to some extent. For the most part, the individual pits measured much less than 0.01 inches in diameter, but in many places, closely spaced clusters of pits ranged up to 0.05 inches in diameter.

Maintenance instructions published by the propeller manufacturer recommend a corrosion inspection of the entire propeller be conducted every 18 months. Overhaul of the propeller in accordance with the manufacturer's instructions includes grinding of each blade to "remove all visual evidence of corrosion and the majority of nicks and gouges." According to the airplane's owner, the propellers had not been overhauled in the eight years he had owned the aircraft. Loss of the maintenance records precluded determination of the date and time of the last propeller overhaul. For aircraft operating under 14 CFR Part 91, there are no requirements for these propellers to be overhauled at specified intervals.

On October 5, 2000, the right engine was disassembled at the Airmotive facility in Clinton, Arkansas. Disassembly revealed no visible signs of any abnormalities that would have prevented normal operation of the engine.

#### ADDITIONAL INFORMATION

The airplane was released to a representative of the owner on December 26, 2000.

#### Pilot Information

<b>Certificate:</b>	Flight Instructor; Commercial	<b>Age:</b>	36, Male
<b>Airplane Rating(s):</b>	Multi-engine Land; Single-engine Land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Seatbelt
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	Airplane Single-engine; Instrument Airplane	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 2 Valid Medical--no waivers/lim.	<b>Last FAA Medical Exam:</b>	11/30/1998
<b>Occupational Pilot:</b>	<b>Last Flight Review or Equivalent:</b>		
<b>Flight Time:</b>	6860 hours (Total, all aircraft), 860 hours (Total, this make and model)		

## Aircraft and Owner/Operator Information

Aircraft Make:	Beech	Registration:	N9729H
Model/Series:	C18S C18S	Aircraft Category:	Airplane
Year of Manufacture:		Amateur Built:	No
Airworthiness Certificate:	Experimental	Serial Number:	8205
Landing Gear Type:	Retractable - Tailwheel	Seats:	0
Date/Type of Last Inspection:	05/12/1999, Annual	Certified Max Gross Wt.:	7850 lbs
Time Since Last Inspection:	6 Hours	Engines:	2 Reciprocating
Airframe Total Time:	4400 Hours	Engine Manufacturer:	P&W
ELT:	Installed	Engine Model/Series:	R-985 AN-14B
Registered Owner:	ROBERT A. YOUNKIN	Rated Power:	450 hp
Operator:	ROBERT A. YOUNKIN	Operating Certificate(s) Held:	None

## Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	Condition of Light:	Day
Observation Facility, Elevation:	FSM, 469 ft msl	Distance from Accident Site:	30 Nautical Miles
Observation Time:	1853 CDT	Direction from Accident Site:	330°
Lowest Cloud Condition:	Scattered / 4900 ft agl	Visibility	10 Miles
Lowest Ceiling:	None / 0 ft agl	Visibility (RVR):	0 ft
Wind Speed/Gusts:	10 knots /	Turbulence Type Forecast/Actual:	/
Wind Direction:	320°	Turbulence Severity Forecast/Actual:	/
Altimeter Setting:	29 inches Hg	Temperature/Dew Point:	26° C / 17° C
Precipitation and Obscuration:			
Departure Point:	BEAUMONT, TX (BPT)	Type of Flight Plan Filed:	VFR
Destination:	SPRINGDALE, AR (ASG)	Type of Clearance:	VFR on top
Departure Time:	1700 CDT	Type of Airspace:	Class E

## Airport Information

Airport:	WALDRON MUNICIPAL (M27)	Runway Surface Type:	
Airport Elevation:	695 ft	Runway Surface Condition:	
Runway Used:	0	IFR Approach:	None
Runway Length/Width:		VFR Approach/Landing:	Forced Landing

## Wreckage and Impact Information

Crew Injuries:	1 Fatal	Aircraft Damage:	Destroyed
Passenger Injuries:	N/A	Aircraft Fire:	On-Ground
Ground Injuries:	N/A	Aircraft Explosion:	None
Total Injuries:	1 Fatal	Latitude, Longitude:	

## Administrative Information

Investigator In Charge (IIC):	GEORGIA R SNYDER	Report Date:	08/13/2001
Additional Participating Persons:	RICK G D'ANGELO; LITTLE ROCK, AR		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at <a href="mailto:pubinquiry@ntsb.gov">pubinquiry@ntsb.gov</a> , or at 800-877-6799. Dockets released after this date are available at <a href="http://dms.nts.gov/pubdms/">http://dms.nts.gov/pubdms/</a> .		

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The Independent Safety Board Act, as codified at 49 U.S.C. Section 1154(b), precludes the admission into evidence or use of any part of an NTSB report related to an incident or accident in a civil action for damages resulting from a matter mentioned in the report. A factual report that may be admissible under 49 U.S.C. § 1154(b) is available [here](#).