
		NTSB ID: IAD98FA092		Aircraft Registration Number: N2XK	
		Occurrence Date: 08/11/1998		Most Critical Injury: Fatal	
		Occurrence Type: Accident		Investigated By: NTSB	
Location/Time					
Nearest City/Place NORTHAMPTON		State PA	Zip Code 18013	Local Time 1832	Time Zone EDT
Airport Proximity: Off Airport/Airstrip		Distance From Landing Facility:			
Aircraft Information Summary					
Aircraft Manufacturer Austin		Model/Series REVOLUTION MINI 500 /REVOLUTION		Type of Aircraft Helicopter	
Revenue Sightseeing Flight: No			Air Medical Transport Flight: No		
Narrative					
Brief narrative statement of facts, conditions and circumstances pertinent to the accident/incident:					
HISTORY OF FLIGHT					
<p>On August 11, 1998, at 1832 eastern daylight time, a homebuilt Revolution Mini 500 helicopter, N2XK, was destroyed during collision with terrain following an uncontrolled descent near Northampton, Pennsylvania. The certificated commercial pilot was fatally injured. Visual meteorological conditions prevailed for the maintenance test flight that originated at Bangor, Pennsylvania, approximately 1800. No flight plan was filed for the flight conducted under 14 CFR Part 91.</p>					
<p>In a telephone interview, one witness stated his attention was drawn to the helicopter because it sounded unusual. He said the helicopter was maneuvering approximately 200 feet in the air. The witness said:</p>					
<p>"I saw it circle around but it didn't sound too good. I heard it making these weird noises. It stopped in the air and then turned towards my house. I heard it go 'pow' then another sharp 'snap'. It sounded like a gunshot. Then I saw this piece flying. The helicopter rotated approximately one-quarter turn, the tail came up, the nose dropped, and then the aircraft fell out of sight."</p>					
<p>In a telephone interview, a second witness said his attention was drawn by the sound. He stated:</p>					
<p>"It sounded like a helicopter, but it had a funny sound, it had a rat-a-tat-tat sound. I couldn't see it, then I saw him make a right hand turn heading due west gaining altitude. I heard a 'poof-poof'...Just the sounds of the rotors didn't sound normal. I heard the lighter 'pop' and then the louder 'pop'."</p>					
<p>The witness stated the helicopter then descended behind a tree line out of view.</p>					
<p>The accident occurred during the hours of daylight approximately 42 degrees, 28 minutes north latitude, and 76 degrees, 8 minutes west longitude.</p>					
PILOT INFORMATION					
<p>The pilot held a commercial pilot certificate with ratings for airplane single engine land and sea, multi-engine land, rotorcraft helicopter, and instrument airplane.</p>					
<p>His most recent Federal Aviation Administration (FAA) Second Class Medical Certificate was issued on June 30, 1998.</p>					
<p>The pilot's family provided copies of the last 5 pages of the pilot's logbook. Examination of the pages revealed a total flight experience of 1,440 hours. The pilot had also accrued 98 hours of</p>					
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Narrative (Continued)

helicopter time of which 55 hours were in the accident aircraft.

AIRCRAFT INFORMATION

The helicopter was purchased as a kit, serial # 303, and was uncrated by the owner on March 26, 1997.

The pilot's family provided copies of the helicopter's maintenance records to the FAA. Detailed construction and maintenance records begin March 26, 1997. A stamp dated February 2, 1998, certified an airworthiness certificate was issued for the helicopter on that date.

The maintenance records end with an entry on April 11, 1998. However, the pilot's logbook reveals the helicopter flew, and maintenance was performed, between that date and April 20, 1998. A search of the pilot's workshop/hangar by the Safety Board investigator in the presence of the pilot's son and the family attorney revealed no additional maintenance records. According to the family's attorney, continued searches revealed no further maintenance records for N2XK.

An examination of Revolution Helicopter Corporation's customer service records revealed that on May 13, 1998, the pilot sent purchase orders and work orders to the company for major drive train and airframe components. In a hand written work order, the pilot said, "[Transmission] must bent-[Aircraft] suffered rollover damage."

Company records further revealed complete overhaul of the main transmission to include replacement of the main rotor mast (bent) and the transmission case. The case was replaced due to elongation of the mount bolt holes. The tail rotor gearbox was also overhauled. The overhaul included the replacement of the gearbox output shaft, which was also bent.

Among the parts purchased by the owner for the helicopter were: tailboom, tail rotor driveshaft, main rotor blades, and landing gear skid. The pilot remitted a check for \$ 6,250.95 to Revolution Helicopter for "parts for #303" on May 13, 1998.

Examination of National Transportation Safety Board records revealed that no accidents were reported for Mini 500, N2XK, between April 20, 1998 and May 13, 1998.

On August 12, 1998, a Federal Aviation Administration (FAA) Aviation Safety Inspector visited the location where the helicopter was hangared and maintained. He found the construction manual for the helicopter opened to the section for the rigging and balancing of the rotor system and a copy of the "Revolution Helicopter Airworthiness Directive (AD) #09031997...New Dynamic Main Rotor System Balancing Procedures." According to Revolution Helicopter Corporation, Inc., the AD was "...Urgent (Must Be Complied With Before Further Flight)."


The FAA Inspector interviewed the pilot's son regarding any work performed on the helicopter and the purpose of the flight. According to the Inspector's report:

"His son informed me that he was assisting his father with rotor tracking by holding the tracking flag and his father was adjusting the blade track with the pitch change links. The son left prior to his father finishing the ground portion of the checks and when he returned the aircraft and his father were gone."

METEOROLOGICAL INFORMATION

Weather reported at Allentown, Pennsylvania, approximately 15 miles southwest of the accident was: few clouds at 3,000 feet with winds from 270 degrees at 7 knots.

WRECKAGE INFORMATION

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The wreckage was examined at the site on August 12, 1998, by a team of Federal Aviation Administration (FAA) Aviation Safety Inspectors. All major components were accounted for at the scene. According to one Inspector's statement:

"The helicopter wreckage showed a vertical impact where the aircraft wreckage remained within a very confined area. No wreckage was more than a few feet from the fuselage. The only part of the aircraft not within the main fuselage was one main rotor blade that was discovered over 400 feet from the aircraft.

Upon further investigation of the crash site, I observed that the pitch horn (a casting) was fractured on one of the main rotor hubs and disconnected. The blade yoke was still attached but only about twelve inches of the blade was attached. This part matched with the blade assembly that was over 400 feet from the wreckage. The rest of the hub assembly was found intact and all control rods and assemblies were attached. The mast showed no signs of mast bumping or deformation. The tailboom assembly and tail rotor assembly showed no signs of main rotor blade contact nor prior damage before impact...the pitch change rod to the hub with the missing main rotor blade was loose and the jam nuts to the rod and bearings were loose and not torqued at all."

The FAA forwarded portions of the main rotor system to the NTSB Materials Laboratory in Washington, D.C. for further examination. The remainder of the wreckage was recovered and stored by a colleague of the pilot's. The wreckage was later moved to the NTSB Materials Laboratory in Washington, D.C. for further examination.

MEDICAL AND PATHOLOGICAL INFORMATION

The FAA Toxicology Accident Research Laboratory, Oklahoma City, Oklahoma performed toxicological testing for the pilot. Test results revealed Verapamil and Noverapamil were detected in the blood and urine.

Dr. Samuel Land performed an autopsy on the pilot on August 12, 1998, for the Northampton County Coroner's Office.

TESTS AND RESEARCH

On October 9, 1998, the fractured main rotor blade and pitch horn were examined in the NTSB Materials Laboratory in Washington, D.C. According to the metallurgist's factual report, examination of the main rotor spar fracture and the pitch horn fracture surfaces revealed evidence typical of overstress fracture with no evidence of fatigue.

On January 26, 1999, the engine was examined in the NTSB Materials Laboratory in Washington, D.C. The carburetors, all hoses, and the 2-cycle oil tank were not installed. Fire and impact extensively damaged the exterior of the engine.

Removal of the four spark plugs revealed the electrodes were black, with oily soot deposits. The electrode gaps were measured and three of the four were found to be 0.030 inches. The fourth was measured at 0.032 inches. The electrode gap specified by the manufacturer was 0.020 plus or minus 0.002 inches.

The engine was disassembled and the pistons and cylinders were examined. Cylinder walls, bearings, O-rings and seals all showed evidence of fire damage. The pistons and the cylinder walls displayed no evidence of mechanical damage or seizure.

On January 27, 1999, the tailboom and remaining airframe components were examined in the NTSB Materials Laboratory in Washington, D.C. The cockpit, fuselage, engine and transmission pylon

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areas were completely destroyed by fire and impact damage. Examination of the tailboom revealed impact damage consistent with the size and curvature of the main rotor blade spar. The tailboom and tail rotor driveshaft also displayed torsional damage at the point of impact.

Materials consistent with the fiberglass and foam core construction of the main rotor blade was found embedded beneath the bolt head of a tail rotor driveshaft hanger bearing attachment bolt.


Chordwise impact damage to one rotor blade was consistent with the dimensions of the head of the hanger bearing attachment bolt. The location of the hanger bearing and the rotor blade damage are at approximately the same position inboard of the rotor tip-path plane.


ADDITIONAL INFORMATION

According to FAA Advisory Circular 20-27A-Certification and Operation of Amateur-Built Aircraft:

"The FAA does not formally approve these designs since it is not practicable to develop design standards for the multitude of unique design configurations generated by kit manufacturers and amateur builders. Since 1983, FAA inspections of amateur-built aircraft have been limited to ensuring the use of acceptable workmanship methods, techniques, practices, and issuing operating limitations necessary to protect persons and property not involved in this activity."

The wreckage was released to the owner's family on August 1, 1999.

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Landing Facility/Approach Information					
Airport Name	Airport ID:	Airport Elevation Ft. MSL	Runway Used 0	Runway Length	Runway Width
Runway Surface Type:					
Runway Surface Condition:					
Approach/Arrival Flown: NONE					
VFR Approach/Landing: None					
Aircraft Information					
Aircraft Manufacturer Austin		Model/Series REVOLUTION MINI 500 /REVOLUTION		Serial Number 303	
Airworthiness Certificate(s): Experimental (Special)					
Landing Gear Type: Skid					
Amateur Built Acft? Yes	Number of Seats: 1	Certified Max Gross Wt. 840 LBS	Number of Engines: 1		
Engine Type: Reciprocating	Engine Manufacturer: Rotax	Model/Series: 582	Rated Power: 80 HP		
- Aircraft Inspection Information					
Type of Last Inspection Annual	Date of Last Inspection 02/1998	Time Since Last Inspection 35 Hours	Airframe Total Time 55 Hours		
- Emergency Locator Transmitter (ELT) Information					
ELT Installed?/Type	ELT Operated?	ELT Aided in Locating Accident Site?			
Owner/Operator Information					
Registered Aircraft Owner CHARLES J. AUSTIN		Street Address 535 INSTITUTE DRIVE			
		City BANGOR	State PA	Zip Code 18013	
Operator of Aircraft CHARLES J. AUSTIN		Street Address 535 INSTITUTE DRIVE			
		City BANGOR	State PA	Zip Code 18013	
Operator Does Business As:			Operator Designator Code:		
- Type of U.S. Certificate(s) Held: None					
Air Carrier Operating Certificate(s):					
Operating Certificate:			Operator Certificate:		
Regulation Flight Conducted Under: Part 91: General Aviation					
Type of Flight Operation Conducted: Personal					

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First Pilot Information

Name On File	City On File	State On File	Date of Birth On File	Age 50
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Sex: M	Seat Occupied: Center	Occupational Pilot? Engineer	Certificate Number: On File
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Certificate(s): Commercial

Airplane Rating(s): Multi-engine Land; Single-engine Land; Single-engine Sea

Rotorcraft/Glider/LTA: Helicopter

Instrument Rating(s): Airplane

Instructor Rating(s): None

Current Biennial Flight Review?

Medical Cert.: Class 2	Medical Cert. Status: Valid Medical--w/ waivers/lim.	Date of Last Medical Exam: 06/1998
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- Flight Time Matrix	All A/C	This Make and Model	Airplane Single Engine	Airplane Multi-Engine	Night	Instrument		Rotorcraft	Glider	Lighter Than Air
						Actual	Simulated			
Total Time	1440	55	1355	60	296	100	66	98		
Pilot In Command(PIC)	1222	55								
Instructor										
Instruction Received										
Last 90 Days										
Last 30 Days										
Last 24 Hours										

Seatbelt Used? Yes	Shoulder Harness Used? Yes	Toxicology Performed? Yes	Second Pilot? No
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Flight Plan/Itinerary

Type of Flight Plan Filed: None

Departure Point BANGOR	State PA	Airport Identifier NONE	Departure Time 1800	Time Zone EDT
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Destination Local Flight	State	Airport Identifier	
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Type of Clearance: None

Type of Airspace: Class G

Weather Information

Source of Wx Information:

No record of briefing

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Weather Information

WOF ID	Observation Time	Time Zone	WOF Elevation	WOF Distance From Accident Site	Direction From Accident Site
ABE	1851	EDT	394 Ft. MSL	15 NM	210 Deg. Mag.
Sky/Lowest Cloud Condition: Scattered			3000 Ft. AGL	Condition of Light: Day	
Lowest Ceiling: None			0 Ft. AGL	Visibility: 10 SM	Altimeter: 29.00 "Hg
Temperature: 27 °C	Dew Point: 17 °C	Weather Conditions at Accident Site: Visual Conditions			
Wind Direction: 270	Wind Speed: 7	Wind Gusts:			
Visibility (RVR): 0 Ft.	Visibility (RVV) 0 SM				
Precip and/or Obscuration:					

Accident Information

Aircraft Damage: Destroyed	Aircraft Fire: Ground	Aircraft Explosion: None
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- Injury Summary Matrix	Fatal	Serious	Minor	None	TOTAL
First Pilot	1				1
Second Pilot					
Student Pilot					
Flight Instructor					
Check Pilot					
Flight Engineer					
Cabin Attendants					
Other Crew					
Passengers					
- TOTAL ABOARD -	1				1
Other Ground	0	0	0		0
- GRAND TOTAL -	1	0	0		1

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Administrative Information

Investigator-In-Charge (IIC)

BRIAN C. RAYNER

Additional Persons Participating in This Accident/Incident Investigation:

JAMES RYAN
ALLENTOWN, PA