Aviation Investigation Final Report

Location:	Cameron, North Carolina	**Accident Number:**	ERA17LA032
Date & Time:	November 1, 2016, 11:30 Local	**Registration:**	N139RD
Aircraft:	Bell OH 58C	**Aircraft Damage:**	Substantial
Defining Event:	Part(s) separation from AC	**Injuries:**	1 Minor
Flight Conducted Under:	Part 137: Agricultural		

Analysis

The commercial pilot was conducting a local aerial application flight in the restricted-category military surplus helicopter. After loading the helicopter with herbicide, the pilot departed from the staging area; however, during the initial climb, as the helicopter was about 50 ft above the ground, the outboard portion of one of the two main rotor blades separated. The main rotor blades then struck the tailboom, and the helicopter entered an uncontrolled descent to the ground. Metallurgical examination of the fractured main rotor blade revealed a crack with fatigue features emanating from multiple origins in the area of the inertia weight attachment hole.

The helicopter manufacturer, Bell, also a restricted-category type certificate holder for the same model helicopter as the accident helicopter, had published a military alert bulletin (MAB) about 30 years before the accident (revised about 9 years before the accident) and an operations safety notice (OSN) about 9 years before the accident applicable to the main rotor blade that fractured during the accident flight; operators were instructed to conduct initial visual inspections of the blades in the area of the inertia weight screw heads and subsequent inspections at intervals of 8 hours or 32 flights, whichever occurred first. However, the OSN only applied to the airframe serial numbers under the responsibility of Bell. Both the operator and the type certificate holder of the accident helicopter, Rotorcraft Development, indicated that they were not aware of the MAB or the OSN until after the accident. Additionally, a preventive maintenance services inspection program that was published by the previous type certificate holder for the accident helicopter (Garlick Helicopters) did not contain requirements to inspect the main rotor blade per the aforementioned MAB and OSN. Performance of the recurrent inspection required by the MAB and the OSN likely would have detected the fatigue cracks on the main rotor blade before its failure during the accident flight. The Federal Aviation Administration did not require sharing of safety information, such as the MAB and the OSN recurrent inspections, between restricted-category type certificate holders.

Probable Cause and Findings

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

An in-flight failure of a main rotor blade due to fatigue cracks. Contributing to the failure of the main rotor blade was the absence of guidance to the operator to inspect an area of the main rotor blade known to be susceptible to fatigue cracks and the accident helicopter type certificate holder's lack of information of an existing inspection published by another restricted-category type certificate holder of the same model helicopter.

Findings

Aircraft	Main rotor blade system - Fatigue/wear/corrosion
Aircraft	Main rotor blade system - Related maintenance info

Factual Information

History of Flight

Prior to flight	Aircraft maintenance event
Initial climb	Part(s) separation from AC (Defining event)
Initial climb	Loss of control in flight
Uncontrolled descent	Collision with terr/obj (non-CFIT)

On November 1, 2016, about 1130 eastern daylight time, a Bell OH-58C, N139RD, operated by Helicopter Applicators Inc., was substantially damaged following a main rotor blade fracture during the initial climb after takeoff in Cameron, North Carolina. The commercial pilot sustained minor injuries. Visual meteorological conditions prevailed and no flight plan was filed for the local aerial application flight. The helicopter was operated under the provisions of Title 14 *Code of Federal Regulations* Part 137.

According to the pilot, he flew earlier in the day at a different field, spraying an herbicide and made approximately 12 landings on a truck to refill the herbicide spray. He subsequently flew to a different field and sprayed one load of herbicide, landed and waited for the loading crew to arrive at the new field. Once the loading crew arrived and loaded the helicopter with 80 gallons (720 pounds) of herbicide, he took off and climbed to about 50 ft. The helicopter traveled about 200 yards away from the staging area, when he heard a loud bang and the helicopter fell to the ground.

According to a witness, shortly after the helicopter took off, the tailboom appeared to have moved to the left and then straight up and into the main rotor blades. The helicopter then fell straight down to the ground and he ran over to help the pilot out of the helicopter.

Examination of the wreckage by a Federal Aviation Administration (FAA) inspector revealed that helicopter came to rest on its left side. The damage to the tailboom was consistent with the main rotor blades striking the tailboom about 10 ft from the main fuselage. The outboard portion of one main rotor blade was found about 1,000 ft from where the helicopter came to rest.

Further examination of the helicopter by an NTSB investigator, revealed that the "white" main rotor blade, part No. 206-011-250-3, serial No. TLK-9054 had two fractures. One fracture was inboard, near the root end, and one fracture was outboard, about 28 inches from the tip end. The inboard fracture was consistent with overload, and the outboard fracture displayed areas with curving arrest lines that were consistent with fatigue. The "red" main rotor blade, part No. 206-011-250-113, serial No. A-FS9, was generally intact. The transmission separated and the main rotor mast was bent. The right transmission mount remained attached to the transmission and the left transmission mount remained attached to the airframe; consistent with transmission separation prior to ground impact.

The fractured outboard portions of the "white" main rotor blade were sent to the NTSB Materials Laboratory, Washington, DC for examination, which revealed fatigue features emanating from multiple origins in the area of the inertia weight attachment hole. The total length of the fatigue region measured

at the lower surface of the blade was 1.4 inches from the leading edge of the inertia weight attachment hole to the leading boundary, and 3 inches from the trailing edge of the hole to the trailing boundary.

Bell Helicopter Textron, Inc., published Military Alert Bulletin (MAB) USA-OH-58-87-1, revision B, originally dated August 12, 1987, and revised April 12, 2007. The purpose of the revised MAB was to notify military operators of model OH-58A, B, C and 206B-1 model helicopters with part numbers 206-011-250-003/113 main rotor blades to conduct initial visual inspections of the blades before returning them to service and subsequently inspect them at intervals of 8 hours or 32 flights, whichever occurred first. The inspection, to be performed with a 10x power scope was focused on the area of the inertia weight screw heads. Paint was to be removed prior to the first inspection, and a clear-coat finish was to be applied to facilitate subsequent inspections. On April 12, 2007, Bell also issued Operations Safety Notice (OSN) OSN-GEN-07-38, Revision A, to all OH-58 operators referencing the aforementioned MAB and providing a notification of changes incorporated in the revised MAB. Both the MAB and OSN noted that the inspection requirement did not apply to main rotor blades manufactured by Bell Helicopter identified with serial Nos. A-1 and subsequent.

The NTSB Materials Laboratory examination also revealed that the black paint on the lower leading edge of the main rotor blade had a tapered edge consistent with erosion wear. No evidence of a clear-coat finish was observed on the surface of the inertia weight attachment hole, as required by the MAB and OSN.

According to FAA airworthiness records, the accident helicopter, serial No. 71-20396 was manufactured in 1971. It was originally owned and operated by the U.S. Army, and issued an FAA special airworthiness certificate in the restricted category for the purpose of agriculture and pest control on May 4, 1999. According to the FAA type certificate database, the accident helicopter serial No. and registration No. were listed in the approved serial number list under type certificate data sheet No. R00006DE. The original holder of this type certificate was Garlick Helicopters, Inc., and the type certificate was transferred to Rotorcraft Development Corporation on February 2, 2009.

Review of the maintenance records revealed that the helicopter's most recent 100-hour inspection was completed on September 29, 2016. At that time, the helicopter's total airframe time was noted as 12,604.5 hours. The engine total time was noted as 2,690.3 hours since new. The helicopter had been operated about 52 hours since the inspection. The operator indicated that they were unaware of the MAB and immediately initiated a campaign to implement and inspect the rest of their OH-58 helicopter fleet.

Garlick Helicopters, Inc. preventive maintenance services inspection program, publication No. GHI-OH58-PMS, contained recurrent inspection requirements for Garlick Model OH-58A, OH-58A+, and OH-58C helicopters. The daily inspection criteria included an inspection of the main rotor blade for nicks, scratches, dents, security, and delamination of the bonded areas. Additionally, the blade finish was to be inspected for bare spots, blistered paint, and evidence of corrosion. A 25-hour inspection required inspection of the main rotor blades' protective coating, and to clean and wax the blades as required. No inspections of the main rotor blade tip area, specifically of the area of the inertia weight, was found in GHI-OH58-PMS. Rotorcraft Development Corporation stated that in a search of documents pertaining to OH-58 helicopters, they did not have the aforementioned MAB and OSN.

Pilot Information

Certificate:	Commercial; Flight instructor	**Age:**	51,Male
Airplane Rating(s):	None	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	4-point
Instrument Rating(s):	Helicopter	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	February 9, 2016
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 24, 2016
Flight Time:	3731 hours (Total, all aircraft), 2888 hours (Total, this make and model), 3639 hours (Pilot In Command, all aircraft), 323.7 hours (Last 90 days, all aircraft), 76 hours (Last 30 days, all aircraft), 3 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Bell	**Registration:**	N139RD
Model/Series:	OH 58C NO SERIES	**Aircraft Category:**	Helicopter
Year of Manufacture:	1971	**Amateur Built:**	
Airworthiness Certificate:	Restricted (Special)	**Serial Number:**	71-20396
Landing Gear Type:	N/A; Skid	**Seats:**	4
Date/Type of Last Inspection:	September 29, 2016 100 hour	**Certified Max Gross Wt.:**	3200 lbs
Time Since Last Inspection:	52 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	12604.5 Hrs as of last inspection	**Engine Manufacturer:**	Rolls-Royce
ELT:	Not installed	**Engine Model/Series:**	T63A720
Registered Owner:	HELICOPTER APPLICATORS INC	**Rated Power:**	420 Horsepower
Operator:	HELICOPTER APPLICATORS INC	**Operating Certificate(s) Held:**	Rotorcraft external load (133), Agricultural aircraft (137)

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	SOP,461 ft msl	**Distance from Accident Site:**	8 Nautical Miles
Observation Time:	11:56 Local	**Direction from Accident Site:**	214°
Lowest Cloud Condition:		**Visibility**	10 miles
Lowest Ceiling:	Overcast / 2500 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	5 knots /	**Turbulence Type Forecast/Actual:**	/ None
Wind Direction:	70°	**Turbulence Severity Forecast/Actual:**	/ N/A
Altimeter Setting:	30.36 inches Hg	**Temperature/Dew Point:**	16°C / 10°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Cameron, NC	**Type of Flight Plan Filed:**	None
Destination:	Cameron, NC	**Type of Clearance:**	None
Departure Time:	11:30 Local	**Type of Airspace:**	Class G

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:**	35.350833,-79.295829

Administrative Information

Investigator In Charge (IIC):	Boggs, Daniel
Additional Participating Persons:	Mike Foster; FAA; Greensboro, NC
Original Publish Date:	November 6, 2019
Last Revision Date:	
Investigation Class:	Class
Note:	The NTSB did not travel to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=94326