Aviation Investigation Final Report

Location:	Okeechobee, Florida	**Accident Number:**	MIA02TA109
Date & Time:	June 12, 2002, 16:15 Local	**Registration:**	N911SL
Aircraft:	Agusta A119	**Aircraft Damage:**	Substantial
Defining Event:		**Injuries:**	3 None
Flight Conducted Under:	Part 91: General aviation - Public aircraft		

Analysis

Just after takeoff from the hospital helicopter-pad, at an altitude of about 250 feet, the pilot reported hearing and feeling "a loud bang," and the helicopter "yawed to the right." The paramedic in the rear of the helicopter stated that she saw parts of the tail rotor go by the left side of the helicopter. The pilot turned the helicopter to the right 270 degrees, and elected to perform a run-on landing in a cow pasture. After touchdown the helicopter skidded several feet, and nosed down in the dirt, resulting in the main rotor blades making contact with the tailboom and subsequently separating the tailboom from the fuselage. Laboratory examination revealed that the fracture of one of the tail rotor blades, was a result of fatigue cracking in the blade spar.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: the fracture of one of the tail rotor blades as a result of fatigue cracking in the blade spar, and subsquent impact of the main rotor with the tailboom.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: CLIMB

Findings
1. (C) ROTOR SYSTEM,TAIL ROTOR BLADE - FATIGUE

2. (C) ROTOR SYSTEM,TAIL ROTOR BLADE - FAILURE

Occurrence #2: FORCED LANDING
Phase of Operation: EMERGENCY LANDING AFTER TAKEOFF

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

Occurrence #4: ON GROUND/WATER COLLISION WITH OBJECT
Phase of Operation: LANDING - ROLL

Findings
3. OBJECT - OTHER
4. MISC ROTORCRAFT,TAIL BOOM - SEPARATION

Factual Information

On June 12, 2002, about 1615 eastern daylight time, an Augusta A119 helicopter N911SL, operated and registered to the Saint Lucie County Sheriff's Office, nosed over during a forced landing near Okeechobee, Florida. Visual meteorological conditions prevailed at the time and no flight plan was filed for the 14 CFR Part 91 public-use training flight. The helicopter was substantially damaged. The commercial-rated pilot, and two other occupants, a paramedic and a mechanic, reported no injuries. The flight was originating from the Raulerson Hospital helicopter-pad, and was en route to Fort Pierce, Florida.

According to the helicopter's pilot, they were training and practicing landing at the hospital's helicopter-pad. On takeoff from the hospital, at an altitude of about 250 feet, the pilot reported hearing and feeling "a loud bang," and the helicopter "yawed to the right." The paramedic in the rear of the helicopter stated that she saw parts of the tail rotor go by the left side of the helicopter. The pilot turned the helicopter to the right 270 degrees, and elected to perform a run-on landing in a cow pasture, about 1/2 mile from the hospital. After touchdown the helicopter skidded several feet, and nosed down in the dirt, resulting in the main rotor blades making contact with the tailboom and subsequently separating the tailboom from the fuselage.

The tail rotor blades, and portions of the tail rotor gearbox were removed from the helicopter and examined at the NTSB Materials Laboratory Washington, D.C., on June 19 and 20, 2002. Following the examinations at the NTSB Materials Laboratory, portions of tail rotor blade, P/N 109-8132-01-111, S/N H73512, were given to Agusta with a request to perform specific examinations. A report on the Agusta findings, No. 2381, is included as an attachment to the NTSB Materials Laboratory Report (See the NTSB Materials Laboratory Factual Report, an attachment to this report).

According to the NTSB Materials Laboratory Factual Report, examination of the Tail Rotor Gearbox revealed that all cracks and fractures in these components were "typical of overstress separations." The examination of both tail rotor blades revealed that they were fractured approximately at the same location, near the outboard end of the innermost doublers. The tail rotor blades revealed the blades contain a leading edge spar and skin made from 301 stainless steel, and doublers made from 301 stainless steel. Examination of tail rotor blade S/N H73509, revealed that the spar and skin fractures were mostly on a 45-degree slant plane and were typical of "overstress separations." This blade also contained mechanical damage near the tip. Tail rotor blade S/N H73512, contained significant damage inboard of the fracture, but very little damage adjacent to the outboard fracture face, indicating that the inboard damage "...was produced after the fracture." The paint on the leading edge of this blade was eroded away, and the leading edge was free of evidence of any type of blade strike. The only damage noted on the outboard portion of the blade was a slight deformation to the trailing edge near

the tip end.

Examination of the fracture in blade S/N H73512 revealed "...that a large portion of the fracture through the spar was on a flat plane, typical of fatigue cracking." In addition, a portion of the spar fracture beyond the end of the flat fatigue region was in a "saw tooth pattern...indicative of high stress fatigue propagation." Beyond this saw tooth region, the fracture was on a slant plane "...typical of overstress fracture." The fatigue cracking (flat region and saw tooth region) progressed through about 3/4 of the spar before final fracture. Detailed optical examination of the flat fracture region revealed that most of this region "...did not contain features that would positively indicate crack propagation directions." However, several areas of faint crack arrest positions were found, and the orientation of these arrest positions indicated that the cracking in the flat fatigue region on the camber portion of the spar "...propagated from the trailing edge of the spar toward the leading edge." The blade skin was bonded to the trailing edge portion of the inside surface of the spar, and the skin fracture was approximately at the same blade station as the spar fracture. The skin fracture adjacent to the spar was on multiple flat planes, "...indicative of fatigue propagation through the thickness of the skin, with minimal extension of the fatigue cracking aft of the spar." The spar fracture area on the outboard portion of the blade was cut from the remainder of the blade and cleaned. The SEM (Scanning Electron Microscope) examination "...did not reveal a fatigue striation pattern." However, at lower SEM magnifications, a radiating pattern indicated "...fatigue crack propagation away from an origin area near the trailing edge end of the flat fracture region." The origin area was located 0.43 mm from the trailing edge of the spar. X-ray energy dispersive spectroscopy (EDS) was performed on the areas with dark deposits, and the resulting spectra were compared to spectra generated from portions of the fracture surface without deposits. The dark regions at the fatigue origin area extended onto the spar surface and were found in what appeared to be cavities or pits.

The laboratory examination revealed that the fracture of tail rotor blade, S/N H73512, was a result of fatigue cracking in the blade spar. The cracking initiated just under the outboard tip of the innermost doubler on the curved side of the blade. The origin area was near the trailing edge of the spar, and was a region that contained material inconsistent with the specified 301 stainless steel alloy. The origin region was part of a three-dimensional volume of material similarly affected. A constituent within the origin region generated a spectrum that was very similar to the adhesive primer, indicating that the origin region was partially porous when the primer was applied at the time of construction of the blade. A second constituent identified within the origin area was very rich in chromium and oxygen, indicating the presence of inclusions containing these elements.

Pilot Information

Certificate:	Commercial	**Age:**	48,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Helicopter	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	No
Medical Certification:	Class 2 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	December 22, 2001
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	April 28, 2002
Flight Time:	3750 hours (Total, all aircraft), 20 hours (Total, this make and model), 60 hours (Last 90 days, all aircraft), 42 hours (Last 30 days, all aircraft), 2 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Agusta	**Registration:**	N911SL
Model/Series:	A119	**Aircraft Category:**	Helicopter
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	14022
Landing Gear Type:	Skid	**Seats:**	4
Date/Type of Last Inspection:	April 30, 2002 Annual	**Certified Max Gross Wt.:**	5621 lbs
Time Since Last Inspection:	72.8 Hrs	**Engines:**	1 Turbo shaft
Airframe Total Time:	82.4 Hrs at time of accident	**Engine Manufacturer:**	Pratt & Whitney Canada
ELT:	Installed, not activated	**Engine Model/Series:**	PT6B37A
Registered Owner:	St. Lucie County Sheriff	**Rated Power:**	1008 Horsepower
Operator:		**Operating Certificate(s) Held:**	None

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KSUA,18 ft msl	**Distance from Accident Site:**	35 Nautical Miles
Observation Time:	16:49 Local	**Direction from Accident Site:**	115°
Lowest Cloud Condition:	Scattered / 2400 ft AGL	**Visibility**	9 miles
Lowest Ceiling:	Broken / 5000 ft AGL	**Visibility (RVR):**	
Wind Speed/Gusts:	8 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	180°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	29.9 inches Hg	**Temperature/Dew Point:**	26°C / 23°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Okeechobee, FL (OBE)	**Type of Flight Plan Filed:**	None
Destination:	Fort Pierce, FL (FPR)	**Type of Clearance:**	None
Departure Time:	16:15 Local	**Type of Airspace:**	Unknown

Airport Information

Airport:	Okeechobee County OBE	**Runway Surface Type:**	
Airport Elevation:	34 ft msl	**Runway Surface Condition:**	Unknown
Runway Used:		**IFR Approach:**	None
Runway Length/Width:		**VFR Approach/Landing:**	Forced landing

Wreckage and Impact Information

Crew Injuries:	3 None	**Aircraft Damage:**	Substantial
Passenger Injuries:		**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	3 None	**Latitude, Longitude:**	27.262777,-80.849723

Administrative Information

Investigator In Charge (IIC):	Yurman, Alan J.
Additional Participating Persons:	Rick Sheppard; FAA; Orlando, FL
Original Publish Date:	May 13, 2003
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=54929