

Robinson Helicopter Company Accident Report

AIRCRAFT MODEL:	<u>R22 Beta II</u>
SERIAL NUMBER:	<u>4358</u>
REGISTRATION:	<u>N566BC</u>
ACCIDENT DATE:	<u>18 October, 2020</u>
ACCIDENT LOCATION:	<u>Winder, Georgia</u>
NTSB IDENTIFICATION:	<u>ERA21LA024</u>

REPORT WRITTEN BY: Thom Webster

SIGNATURE: 

DATE: 24 June 2021

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Note: A digital disc (DVD) containing all photos taken by Robinson Helicopter Company is included at the end of this report.

GENERAL ACCIDENT DATA

Time and Location Data

Date of Accident: 18 October 2020 Time: 1059 Eastern Daylight Time
Location: Winder, Georgia
GPS Coordinates: 34.003829° -83.667184°
Surface Elevation: 850 Feet Above Sea Level
Accident Occurred During: Take-off
Route of Flight: Barrow County Airport, left crosswind turn
Purpose of Flight: Practice take-offs and landings
Last Fuel Point (Location; gal.): N/O
Date & Time: N/O

Helicopter Data

Model: R22 Beta II Serial No. 4358 Registration N566BC

Airworthiness Certificate

Type: N/O Category: N/O Issue Date: N/O

	<u>Aircraft</u>	<u>Engine</u>
Total Time:	<u>2384.8 hours</u>	<u>2384.8 hours</u>
Total Time Since Overhaul:	<u>180.3 hours</u>	<u>180.3 hours</u>

Annual Inspection

Date of Last Inspection:	<u>14 May 2020</u>	<u>14 May 2020</u>
Time Since Last Inspection:	<u>180.3 hours</u>	<u>180.3 hours</u>

100 Hour Inspection

Date of Last Inspection:	<u>20 July 2020</u>	<u>20 July 2020</u>
Time Since Last Inspection:	<u>84.8 hours</u>	<u>84.8 hours</u>

Owner (Name/Address):: Blue Ridge Helicopters Inc.
[REDACTED]
Wilmington, Delaware 19810-4902

Operator (Name/Address):: Blue Ridge Helicopters Inc.
[REDACTED]
Lawrenceville, Georgia 30046-4400

N/A = Not Applicable

N/O - Not Obtained

Pilot in Command Data

Name: Tyrus Anthony Raymer Sr.

Address:

Pilot Certificate No.: N/O

Date of Birth:

Citizenship: N/O

Occupation: N/O

Seat Occupied: Right

Degree of Injury: Serious, Broken Leg

Certificates

☐ None ☐ Student ☒ Private ☐ Commercial ☐ Recreational
☐ ATP ☐ Flight Instructor ☐ Flight Engineer ☐ Mechanic ☐ Military
☐ Foreign

Ratings

Airplane: ☒ None ☐ SE Land ☐ ME Land ☐ SE Sea ☐ ME Sea
Other A/C: ☐ None ☒ Helicopter ☐ Gyroplane ☐ Free Balloon ☐ Powered Lift
☐ Airship ☐ Glider
Instrument: ☒ None ☐ Airplane ☐ Helicopter ☐ Powered Lift
Instructor: ☒ None ☐ SE Airplane ☐ ME Airplane ☐ Instr. Airplane ☐ Instr. Helicopter
☐ Glider ☐ Helicopter ☐ Gyroplane ☐ Powered Lift
Mechanic: ☒ None ☐ Airframe ☐ Powerplant ☐ Repairman ☐ Inspection
Authorization

Medical Certificate

Date Issued: 12/18/2019 Class: Third

Limitations: None

Pilot Time

<u>Aircraft</u>	<u>Last 24 Hrs.</u>	<u>Last 90 Days</u>	<u>Total</u>	<u>Total PIC</u>
R22			154	
R44				
R66				
Total Helicopter	0	7	168	
Total Other			0	

Source of Pilot Time Data: Submitted Form 6120

N/A = Not Applicable

N/O - Not Obtained

Second Pilot or Passenger Data

Name: None

Address: _____

Pilot Certificate No.: _____

Date of Birth: _____

Citizenship: _____

Occupation: _____

Seat Occupied: _____

Degree of Injury: _____

Certificates

☐ None ☐ Student ☐ Private ☐ Commercial ☐ Recreational
☐ ATP ☐ Flight Instructor ☐ Flight Engineer ☐ Mechanic ☐ Military
☐ Foreign

Ratings

Airplane:	☐ None	☐ SE Land	☐ ME Land	☐ SE Sea	☐ ME Sea
Other A/C:	☐ None	☐ Helicopter	☐ Gyroplane	☐ Free Balloon	☐ Powered Lift
	☐ Airship	☐ Glider			
Instrument:	☐ None	☐ Airplane	☐ Helicopter	☐ Powered Lift	
Instructor:	☐ None	☐ SE Airplane	☐ ME Airplane	☐ Instr. Airplane	☐ Instr. Helicopter
	☐ Glider	☐ Helicopter	☐ Gyroplane	☐ Powered Lift	
Mechanic:	☐ None	☐ Airframe	☐ Powerplant	☐ Repair Station	☐ Inspection Authorization

Medical Certificate

Date Issued: _____ Class: _____
Limitations: _____

Pilot Time

<u>Aircraft</u>	<u>Last 24 Hrs.</u>	<u>Last 90 Days</u>	<u>Total</u>	<u>Total PIC</u>
R22				
R44				
R66				
Total Helicopter				
Total Other				

Source of Pilot Time Data:

N/A = Not Applicable

N/O - Not Obtained

Weight & Balance

Basic Empty Weight, Center of Gravity,

Basic Empty Weight 882.9 lb

Longitudinal CG 103.7 in

Longitudinal Moment 91582 in-lb

Loading

		Location (in)	Moment (in- lb)
<u>Occupants</u>			
Right Seat	<u>186</u> lb	<u>78</u>	<u>14508</u>
Left Seat	<u>0</u> lb	<u>78</u>	<u>0</u>

<u>Cargo</u>			
Right Seat	<u>0</u> lb	<u>78</u>	<u>0</u>
Left Seat	<u>37.1</u> lb	<u>78</u>	<u>2893.8</u>

Fuel at Takeoff

Main Fuel	<u>8.6</u> gallons @ 6 b/gallon =	<u>51.6</u> bs	<u>108.6</u>	<u>5603.76</u>
Auxiliary Fuel	<u>3.4</u> gallons @ 6 b/gallon =	<u>20.4</u> bs	<u>103.8</u>	<u>2117.52</u>

Fuel at Time of Accident

Main Fuel	<u>3</u> gallons @ 6 b/gallon =	<u>18</u> bs	<u>108.6</u>	<u>1954.8</u>
Auxiliary Fuel	<u>0</u> gallons @ 6 b/gallon =	<u>0</u> bs	<u>103.8</u>	<u>0</u>

Total Weight, CG, Moment: Takeoff

Total Weight 1178 lb

Longitudinal CG 99.07 in

Longitudinal Moment 116705.08 in-lb

Total Weight, CG, Moment: Time of Accident

Total Weight 1124 lb

Longitudinal CG 98.70 in

Longitudinal Moment 110938.6 in-lb

The data above was calculated using weight and balance information from production records, pilot's weight as reported and operators report of 12 gallons at take-off. Fuel at time of accident was calculated using a consumption rate of 9 gallons per hour for a one-hour flight.

Instrument and Cabin Data

<u>Instruments:</u>		<u>Switches:</u>	
Vertical Speed	Zero	NAV Lights	Off
Airspeed	Zero	Strobe	Damaged
Engine/Rotor Tach.	Lower pins	Clutch	Disengaged
Altimeter	7200' @ 30.30	Clutch Guard	Damaged
Manifold Pressure	30 inhg	Alternator	Off
CAT	Lower pin	Master	Off
OAT	Inop	Ignition	Off
Amps	70+ amps	Landing Light	Off
Oil Pressure	Lower pin	Heater Blower	Off
Oil Temperature	Lower pin	Map Light	Off
Cyl. Head Temp.	Lower pin	Governor	On
Main Fuel	Empty	Air Conditioner	N/A
Aux Fuel	Empty	Intercom	Inop
Dimmer/Panel Lights	¼ bright	Trim	Up
Clock	2:16		
Compass	Not recovered	<u>Control Knobs:</u>	
Hour Meter	2384.8 hours	Cabin Air	Closed
		Mixture	Damaged
Transponder	Removed	Mixture Guard	Not recovered
Comm/Nav Radios	Removed	Carburetor Heat	Off/Unlocked
Attitude Indicator	N/A	Cabin Heat Valve	Closed
GPS	Removed	Cyclic Friction	Off
Directional Gyro	N/A	Collective Friction	Off
		Fuel Valve	On
		Restraint System	Both unbuckled

Survey of Temperature Stickers

Main Rotor Gear Box	All Silver	(220-270)
	140 Silver, 150 Darkened,	
Tail Rotor Gear Box	160-190 Silver	(140-190)
	140 Black, 150 Gray, 160-190	
Top Belt Actuator Bearing	Silver	(140-190)
Bottom Belt Actuator Bearing	140-160 Black, 170-190 Silver	(140-190)
Hydraulic Pump	N/A	(220-270)

Circuit Breaker Information

All circuit breakers were "Down" or "In".

Warning Light Information

<u>Description</u>	<u>Tight Coil</u>		<u>Stretched Coil</u>
Low Rotor RPM	X		
Low Fuel	X		
TR Chip	X		
Starter On	X		
MR Chip	X		
MR Temp	X		
Clutch	X		
Alternator	X		
Oil Pressure - Engine		Damaged	
Governor OFF		Damaged	
Rotor Brake	X		
Carbon Monoxide	X		
Engine Fire		N/A	
Fuel Filter		N/A	
Aux Fuel Pump		N/A	

Weather at Time of Accident

Reporting Point Location	Hartsfield Jackson- Atlanta International Airport @ 10:52 am		
Distance from Accident Site	50 statute miles		
Direction From Accident Site	Southwest		
Sky Cover	Partly Cloudy		
Wind	10 MPH from east southeast	Temperature	60°F
Visibility	10 Statute Miles	Dew Point	44°F
Turbulence	None Reported	Altimeter Setting	29.22 inhg
Source of Weather	Internet – Weatherunderground		

Reporting Point Location			
Distance from Accident Site			
Direction From Accident Site			
Sky Cover			
Wind		Temperature	
Visibility		Dew Point	
Turbulence		Altimeter Setting	
Source of Weather			

Flight Plan: None reported

Weather Brief: None reported

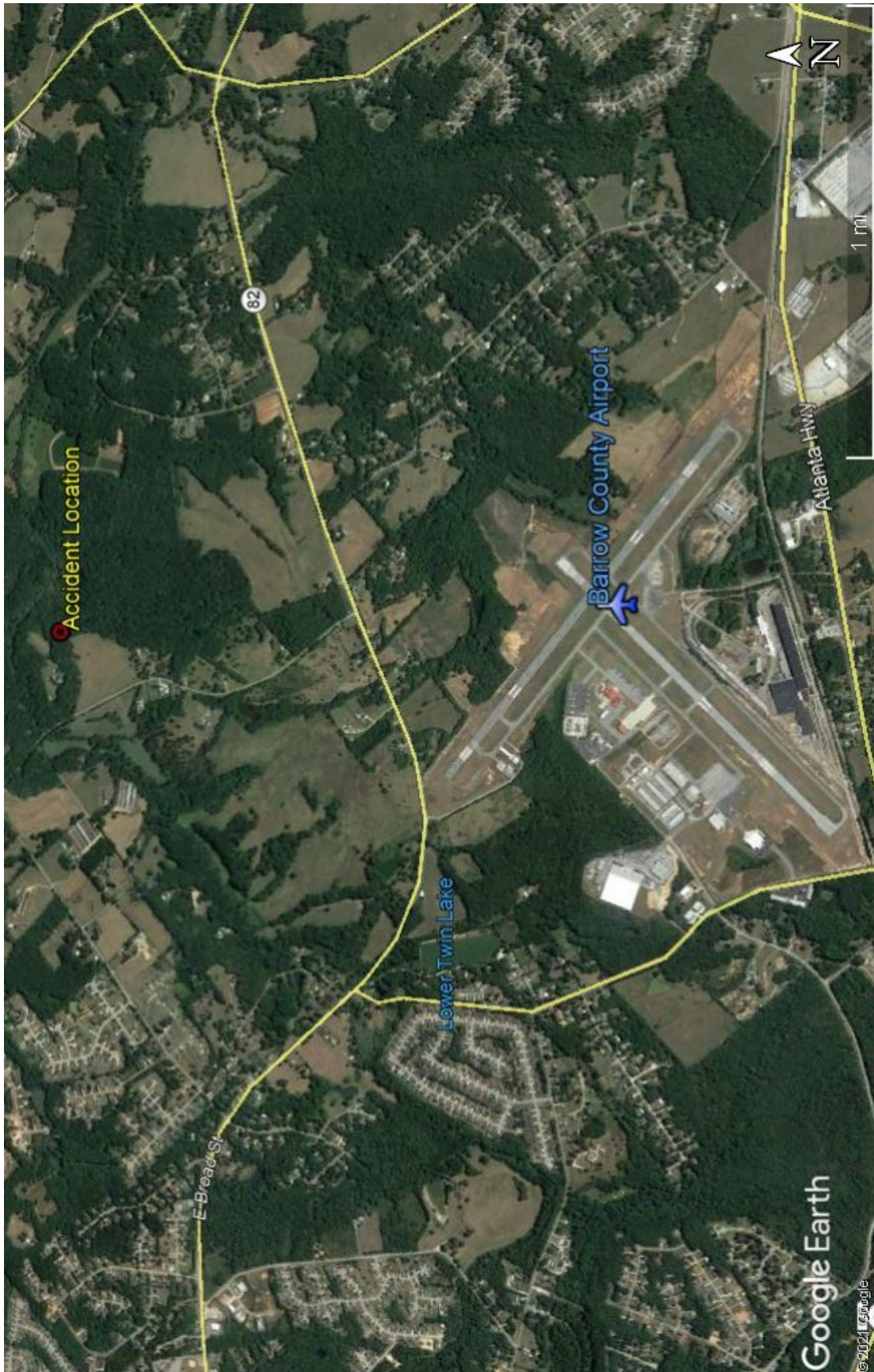
Ground Conditions at Accident Site

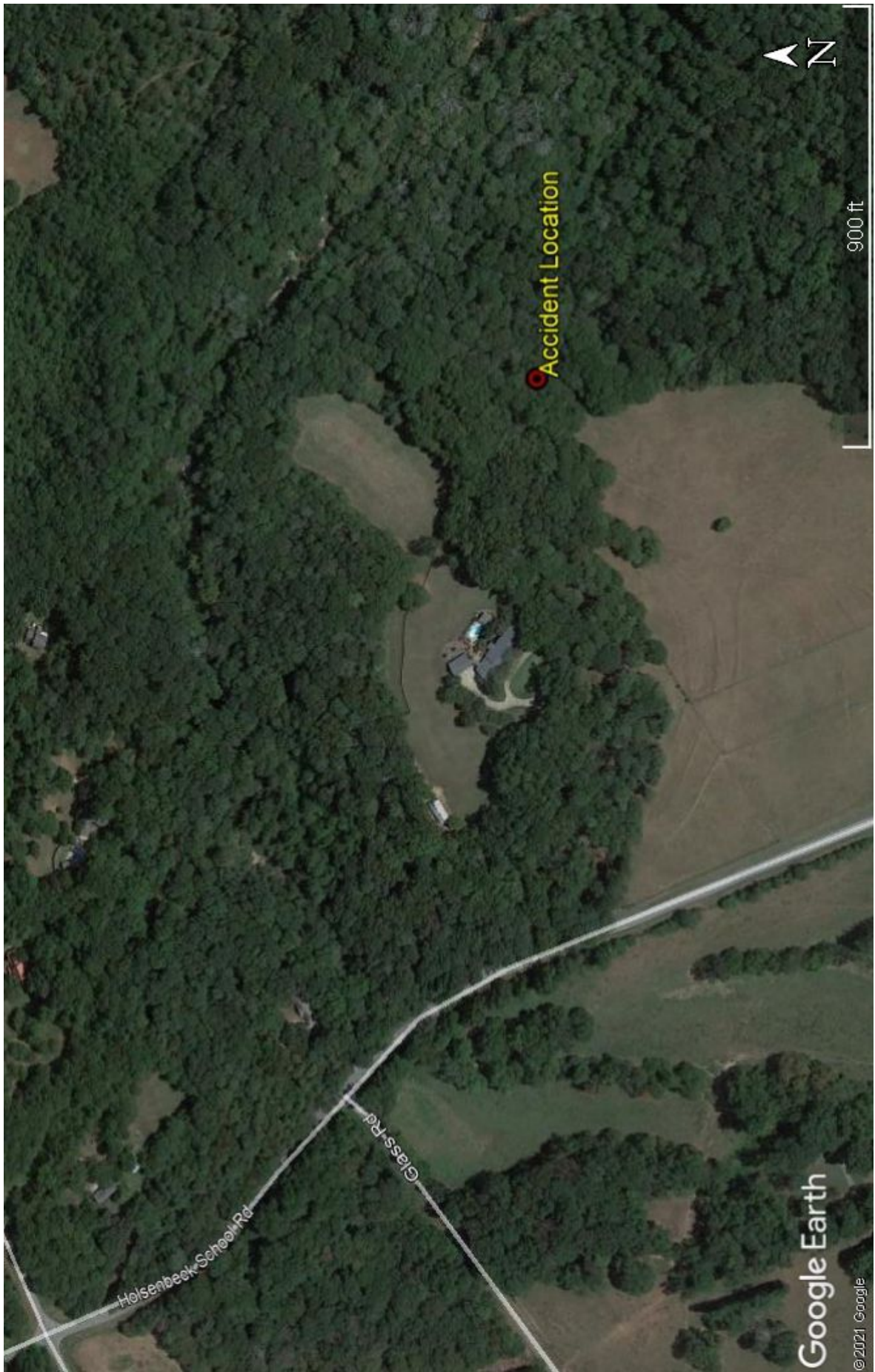
Not observed

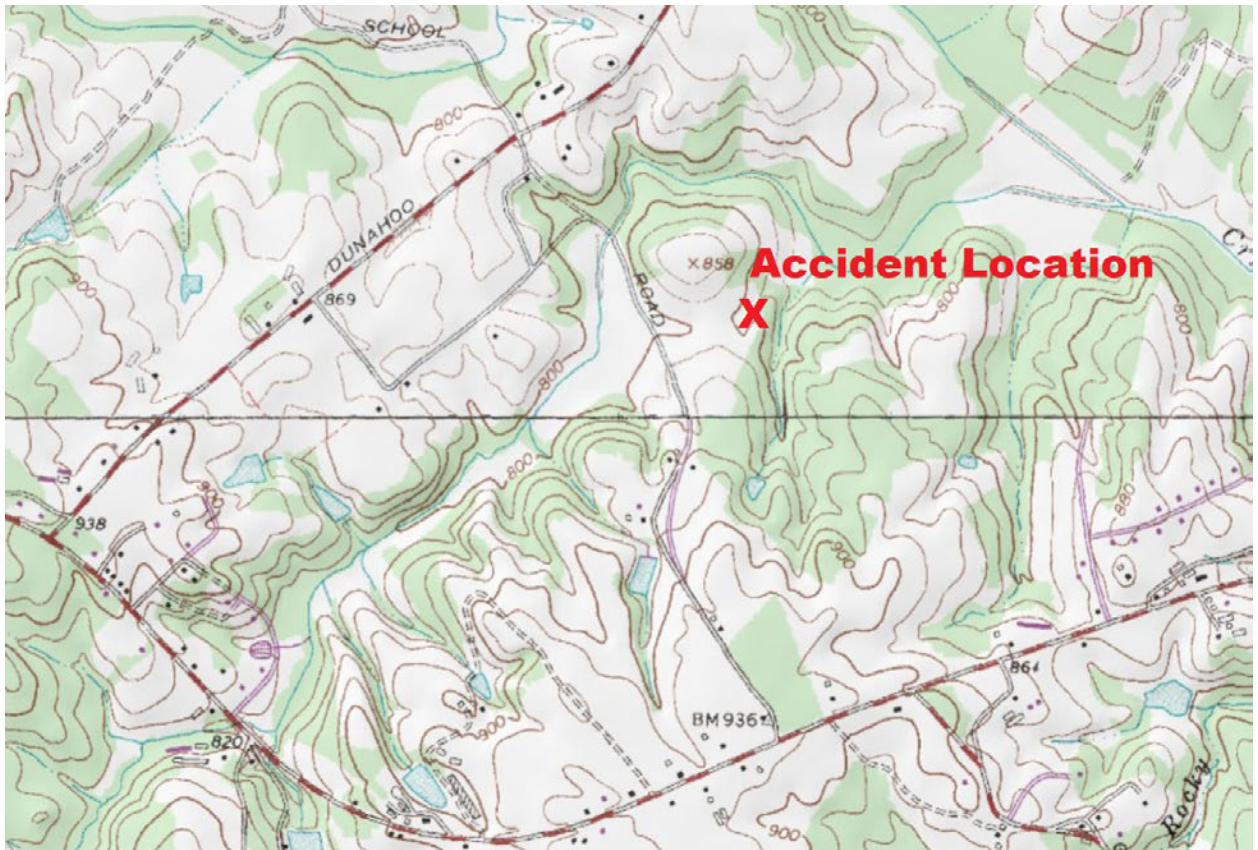
Ground Damage

Unknown

ACCIDENT LOCATION







WRECKAGE EXAMINATION - GENERAL

On 18 February, 2021, A detailed examination of the aircraft was performed at Atlanta Air Salvage in Griffin, Georgia. Present for the examination were Ralph Hicks (NTSB) and Thom Webster (RHC).

Details and photographs of the examination can be found in the following pages.

COCKPIT AND CABIN

The nose of the cabin area was crushed inward, compressing the console and floor area. The upper console was separated from the lower console and tethered by the wire harness. The cyclic stick was bent forward just above the cyclic boot.

The avionics sustained impact damage and had been removed from the console.

The pilot side cyclic grip was disconnected below the switch box. The removable cyclic and collective were installed, the removable pedals were under the left seat. The collective control was raised 40% of its upward travel and was partially moveable. The pilot side tail rotor pedals were separated near the lower weld joints.

The seat bottom cushions were deformed along with the seat supports.

Both seat belts were unbuckled. Both seat belt latches and inertia reels operated properly.

FUEL SYSTEM

The outer skin of the main fuel tank was dented and deformed. The bladder was uncompromised. The filler cap was secure on the neck. The finger strainer was clear of any debris.

The outer skin of the auxiliary fuel tank was dented at the forward edge. The bladder was uncompromised. The filler cap was secure on the neck. The finger strainer was clear of any debris.

All fuel hose connections were secure.

The rollover valve on the main fuel tank vent was separated from the upper vent hose. The auxiliary fuel tank rollover valve remained secured. The vent tubes and hose were clear of any blockages when blown through by investigator.

Both tanks were void of fuel. A fuel sample was taken from the gascolator. It was blue in color with the aroma of aviation fuel. There was no water visible in the sample.

POWERPLANT CONTROLS

The fuel mixture control knob was bent and the panels around it were heavily deformed. It appeared to be in the full rich position. It did not operate. The mixture guard was not present. The fuel mixture control wire and sheath were secure as was the hardware securing the wire to the mixture arm. The fuel mixture arm on the carburetor was in the full rich position.

The carburetor heat control knob was unlocked and raised approximately .020". The slider valve was in the full cold position. The control wire and sheath were secure as was the hardware securing the wire to the slider. The knob operated the slider properly.

The throttle connecting rod on the collective was in mid travel. The throttle arm on the carburetor was in the idle position. The throttle grip operated the throttle arm partially.

POWERPLANT

The engine sustained very minimal impact damage. The crankshaft was rotated by hand more than 360° using the cooling fan with no anomalies noted.

The alignment marks (torque stripe) on the cooling fanwheel were not aligned with the marks on the nut by about 90° and misaligned with the roll pin by about 10°.

The paint around the fanwheel to hub hardware was displaced and there was surface corrosion on the exposed metal around the hardware. The threads of the bolts extended more than two threads beyond the nuts but the bolts could be easily rotated with a wrench. The fanwheel could not be removed using the appropriate tooling. Heat was applied to the hub but still would not separate. The fanwheel was disassembled, exposing the damage (oval shape) to the fanwheel to hub mounting holes in both the fanwheel and backing plate.

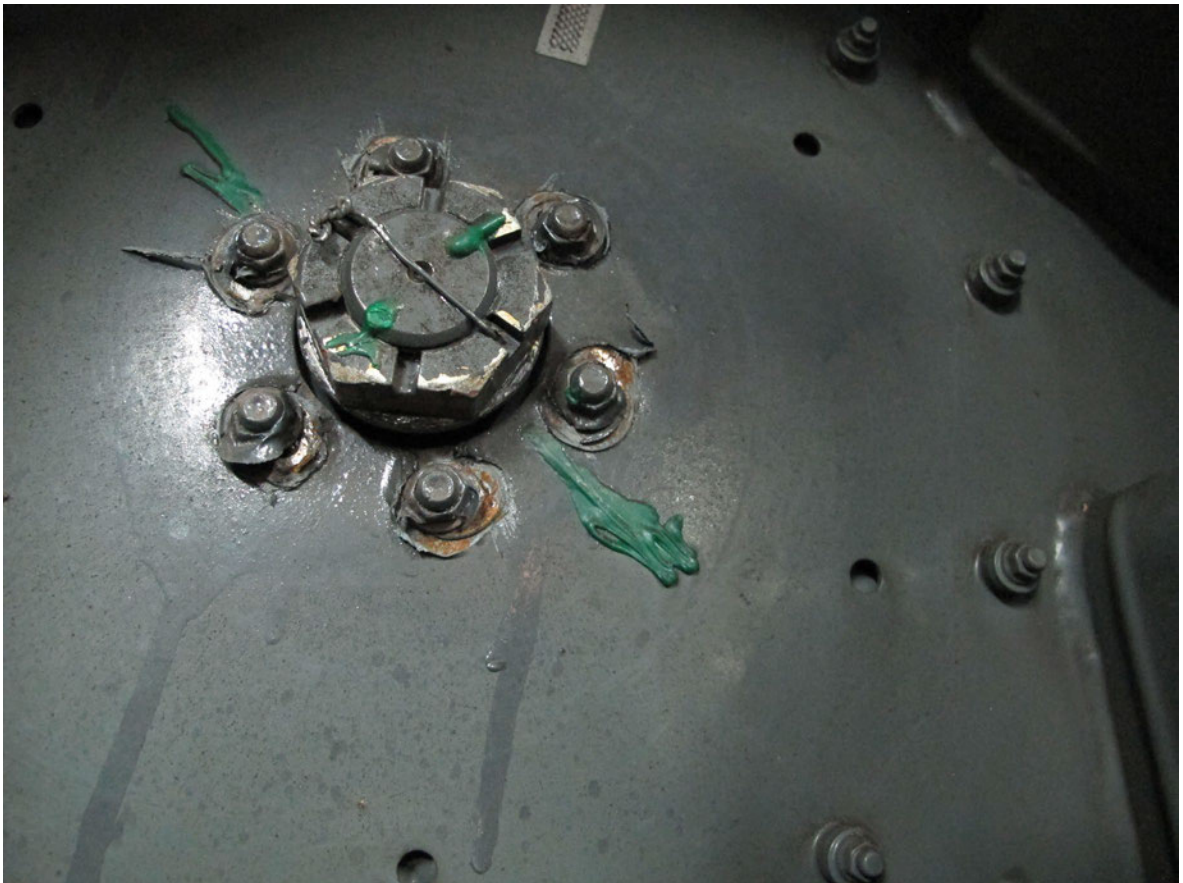
The air filter was crushed/distorted although the airbox was undamaged.

The cooling panels had scoring adjacent to the starter ring gear running in the direction of ring gear rotation on both sides. The aft face of the upper sheave had rotational scoring around the outer edge and the forward surface of the actuator had scoring running in the direction of sheave rotation adjacent to the aft face of the upper sheave. There was no contact between the upper sheave and the clutch centering strut.

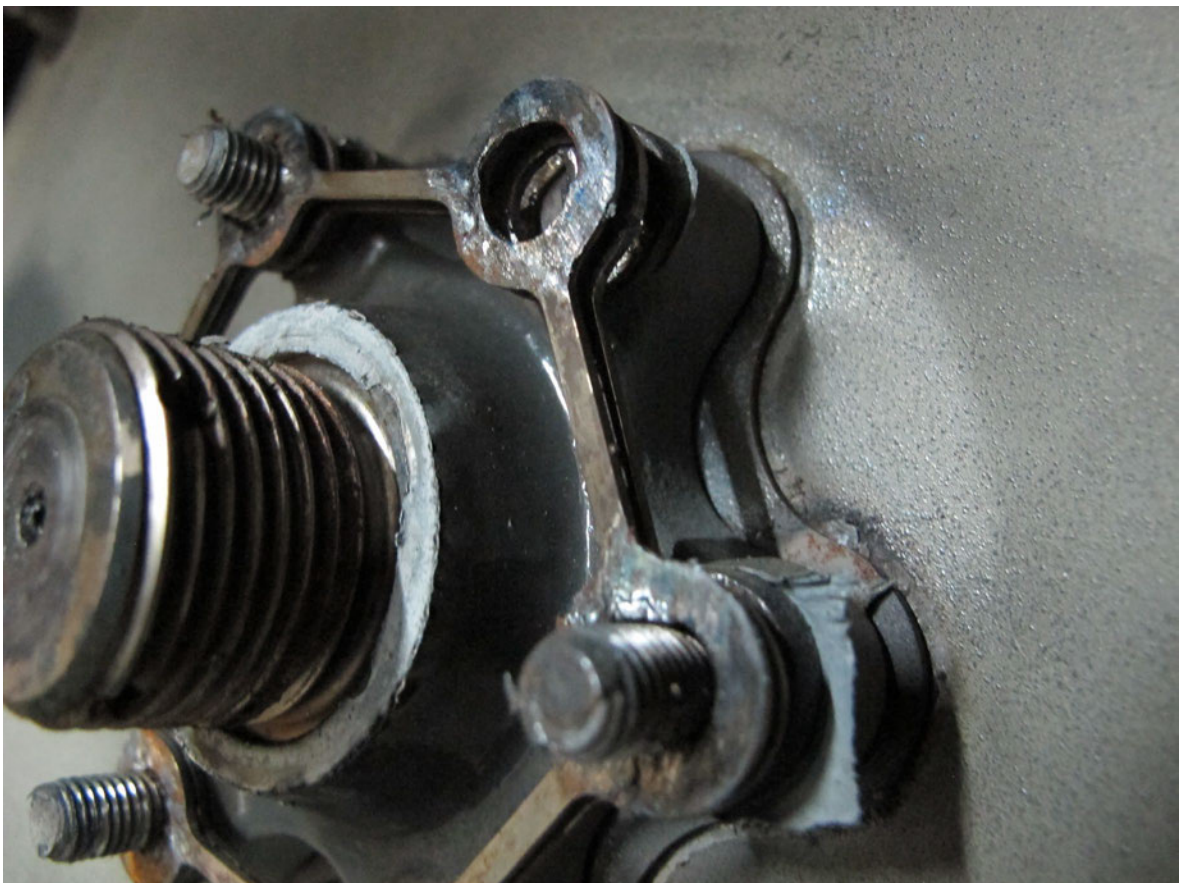


Above and below: Cooling scroll and fan.

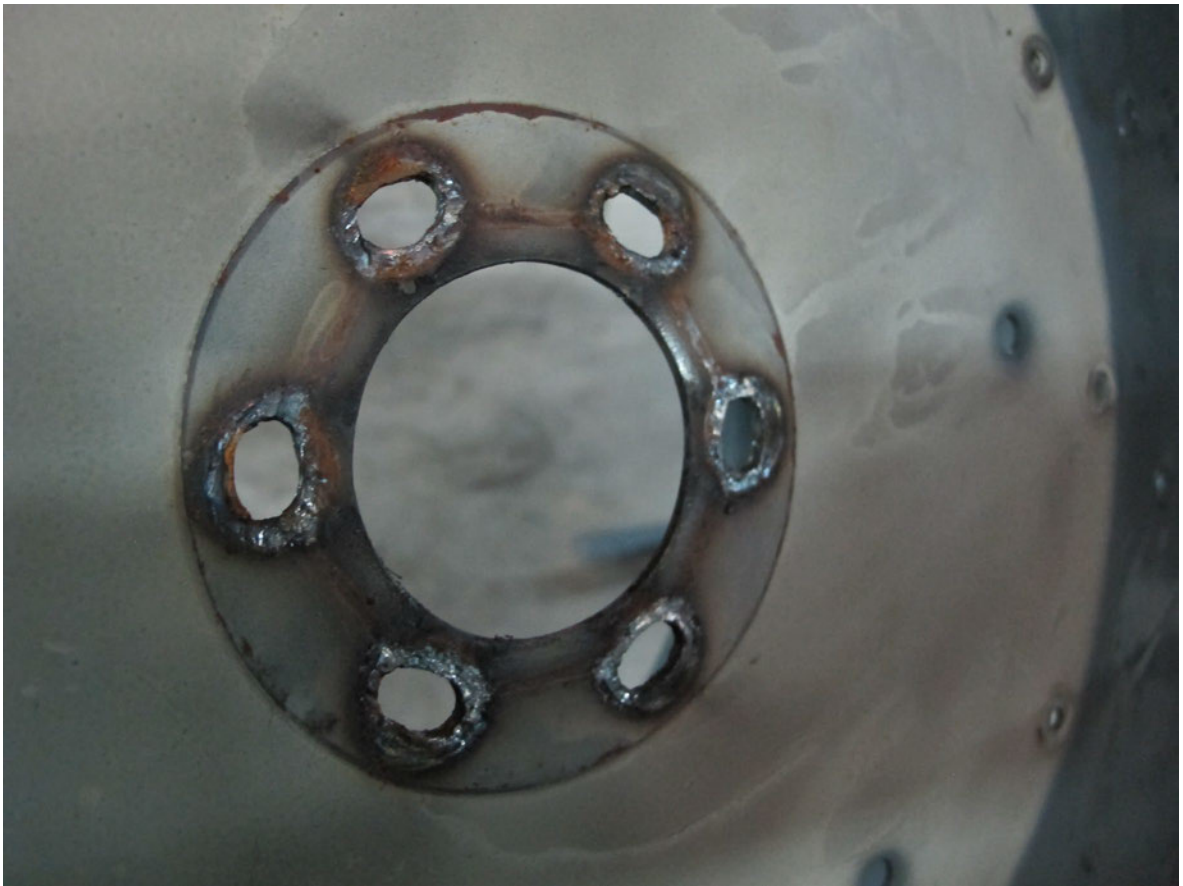




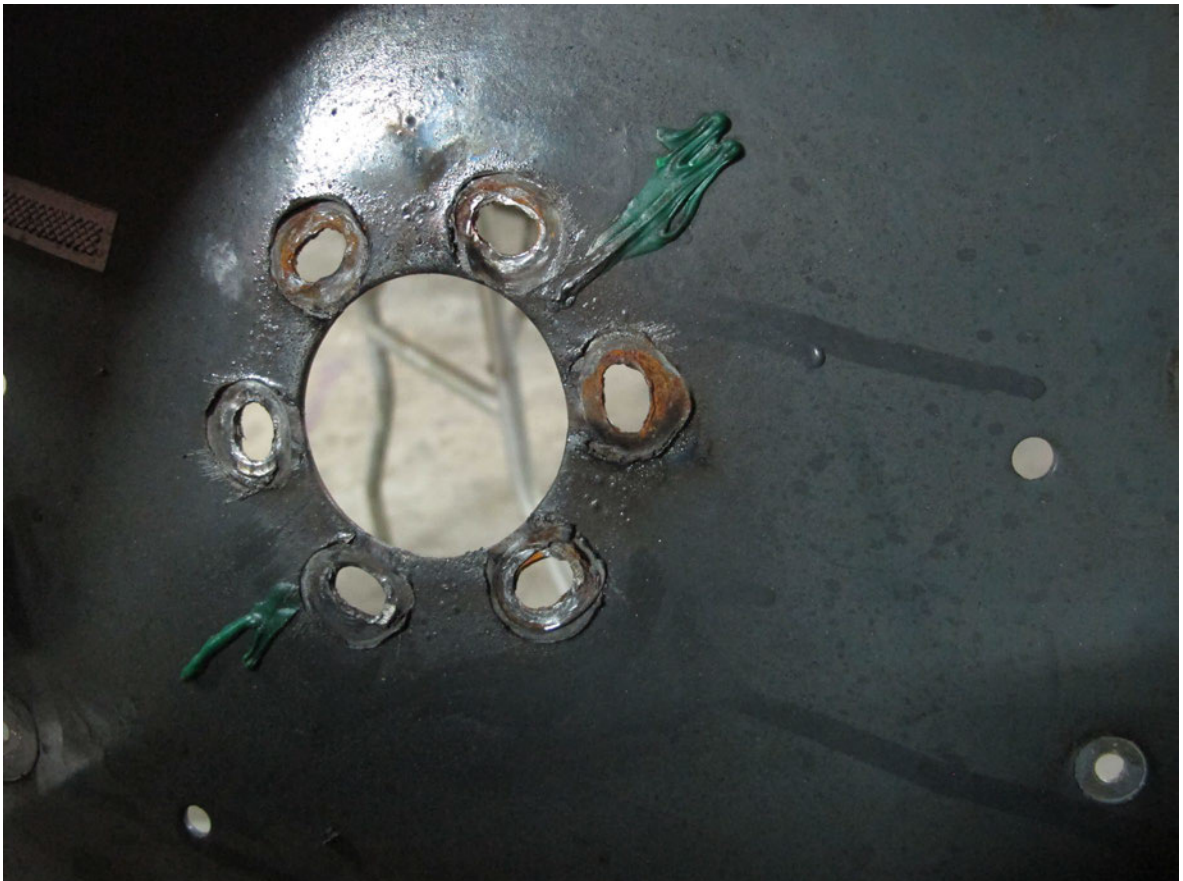
Fanwheel to hub attachment hardware and hub nut. Note misaligned torque stripe.



Fanwheel hub and spacer with fanwheel removed.



Above and below: Fanwheel to hub mounting holes.
Note: The black soot is from applying heat to the hub while attempting to remove it.



DRIVELINE

The lower and upper sheave grooves were unremarkable. Most of the V-belts were not recovered. A 2' section of one vee was recovered. The backing was not present. One end had a jagged surface, the other end was frayed. The friction surfaces were smooth with no glazing or thermal damage.

The belt tension actuator was extended 1.65" measured between the scissor mounts. The scissors were deformed and the overtravel switch was damaged. The upper and lower actuator support bearings rotated smoothly. The actuator was removed and functionally tested at Robinson Helicopter Company. The "Load Tension" and the "Amperage Draw" were slightly above production specifications. The fuse installed in the actuator circuit protection fuse holder was a 2-amp fuse. Specifications require a 1.5-amp fuse. The spare fuse holder contained a 1.5-amp fuse. An actuator time delay assembly was not installed as required with Service Bulletin SB-113A.

The upper sheave rotated freely and smoothly on the clutch shaft when moved in a clockwise direction (looking forward) and locked on the shaft when moved in a counterclockwise direction.

The forward flex coupling was undamaged.

A very small amount of oil, blue in color, was visible in the main rotor gearbox sight gauge. The main rotor driveshaft was rotated by hand more than 360° of the main rotor with no anomalies. The mast tube and driveshaft were straight.

One elastomeric teeter stop was dented across the center; the other stop was undamaged.

Both droop stops were undamaged.

There was no evidence of contact between the pitch horn boot and the main rotor hub on either side.

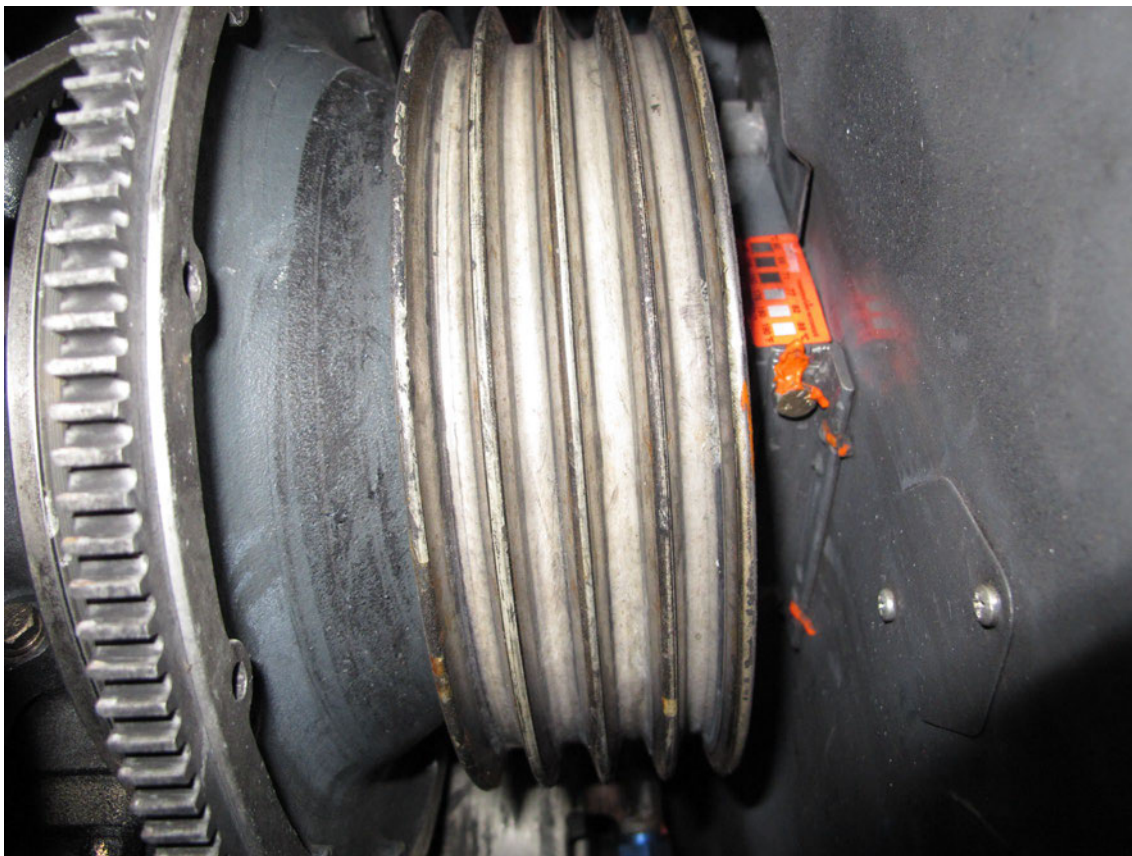
Main rotor blade SN5004 was bowed upward slightly near the root and sustained impact damage to the trailing edge near the tip along with several dents, creases and wrinkles running chordwise throughout the span.

Main rotor blade SN5006 was bowed downward near the root and near the tip along with several dents, creases and wrinkles running chordwise throughout the span.

The intermediate flex coupling was undamaged as was the tail rotor driveshaft damper bearing. There were a couple of pieces of masking tape on the damper bearing support bracket. The damper arm was bent slightly. The friction hardware moved smoothly with no anomalies. The tail rotor driveshaft appeared to be straight back to the disconnect at tailcone bay 5. The aft flex coupling was undamaged.

The tail rotor gearbox was undamaged with the exception of the vent fitting which was broken off. A very small amount of oil, blue in color, was visible in the sight gauge when the tail rotor gearbox was tilted with the gauge pointing downward. The output shaft was straight. The output shaft was rotated more than 360° of the tail rotor by hand, with no anomalies, confirming continuity through to the input shaft.

Tail rotor blade SN 9750 was separated near the root. The surface of the separation was angular and jagged. It sustained impact damage to the leading edge 5" from the tip. Tail rotor blade SN 9753 sustained impact damage to the leading edge 11" from the tip.



The lower sheave grooves.



The upper sheave grooves.

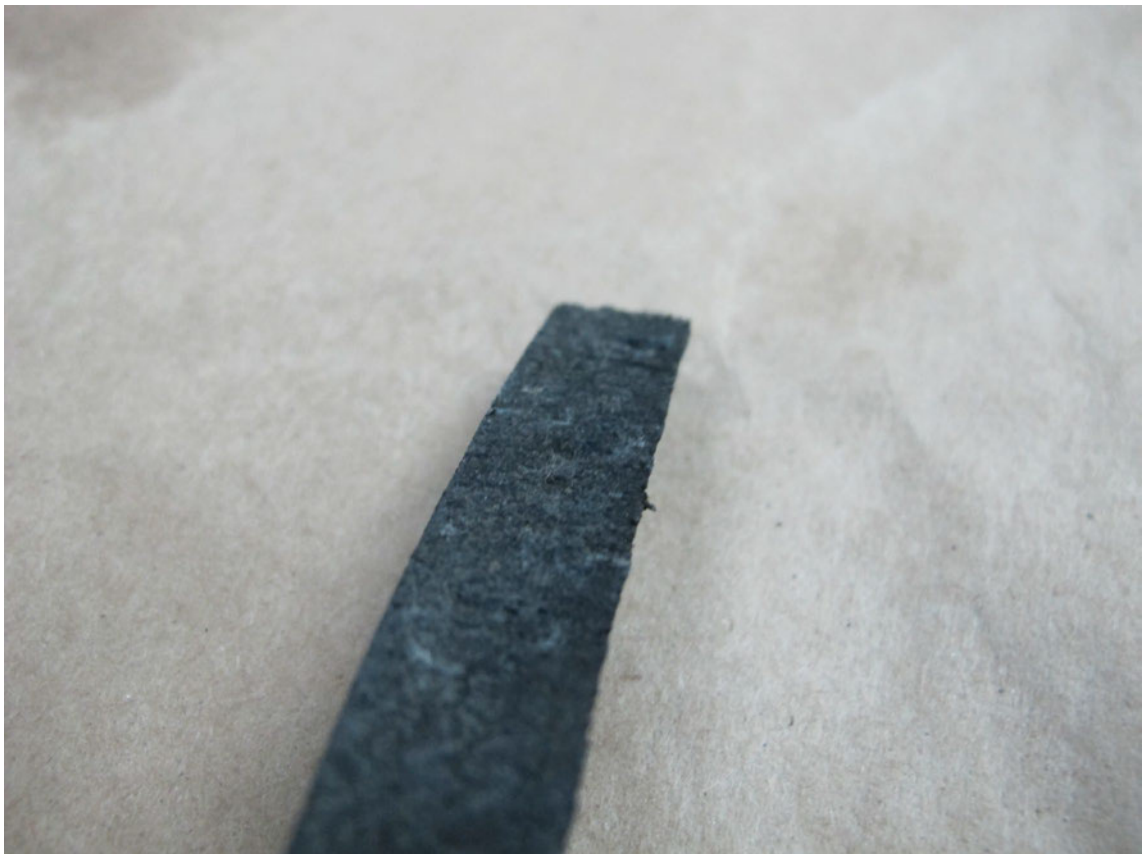


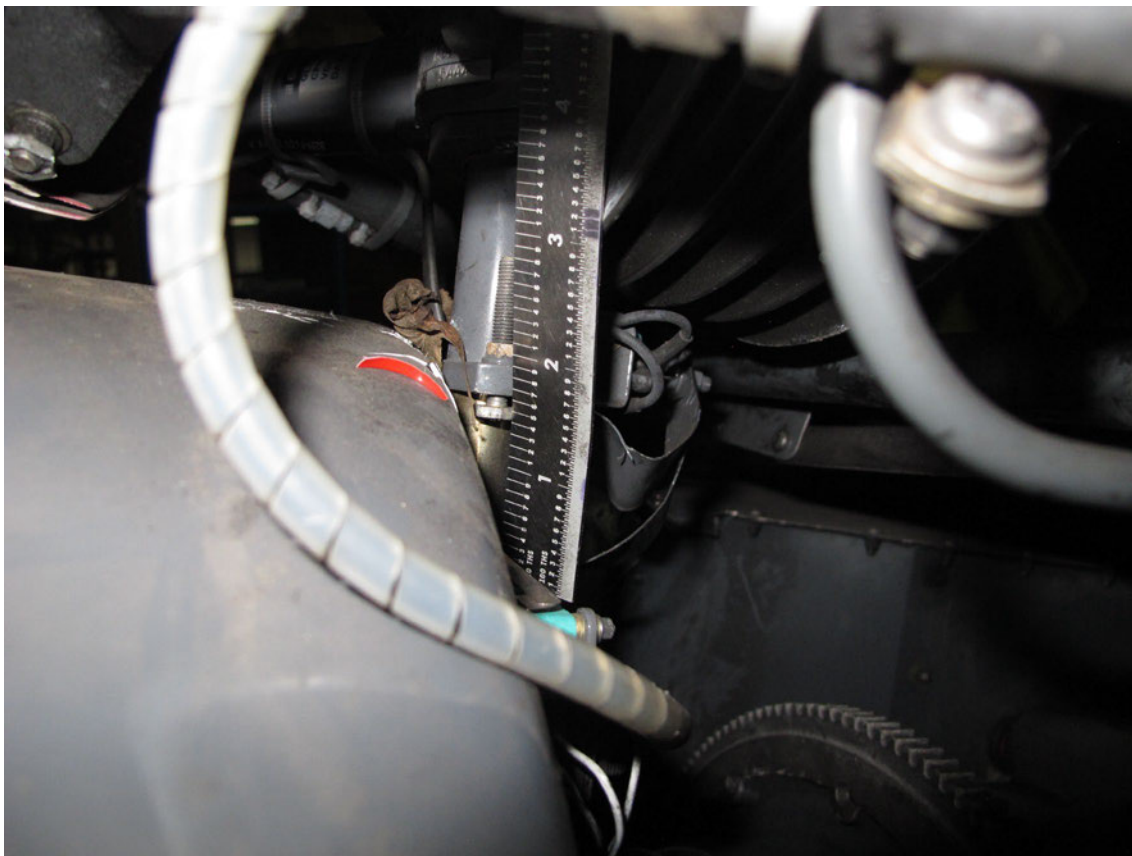
Above and below: The remaining portion of V-belt.





Above and below: The remaining portion of V-belt.





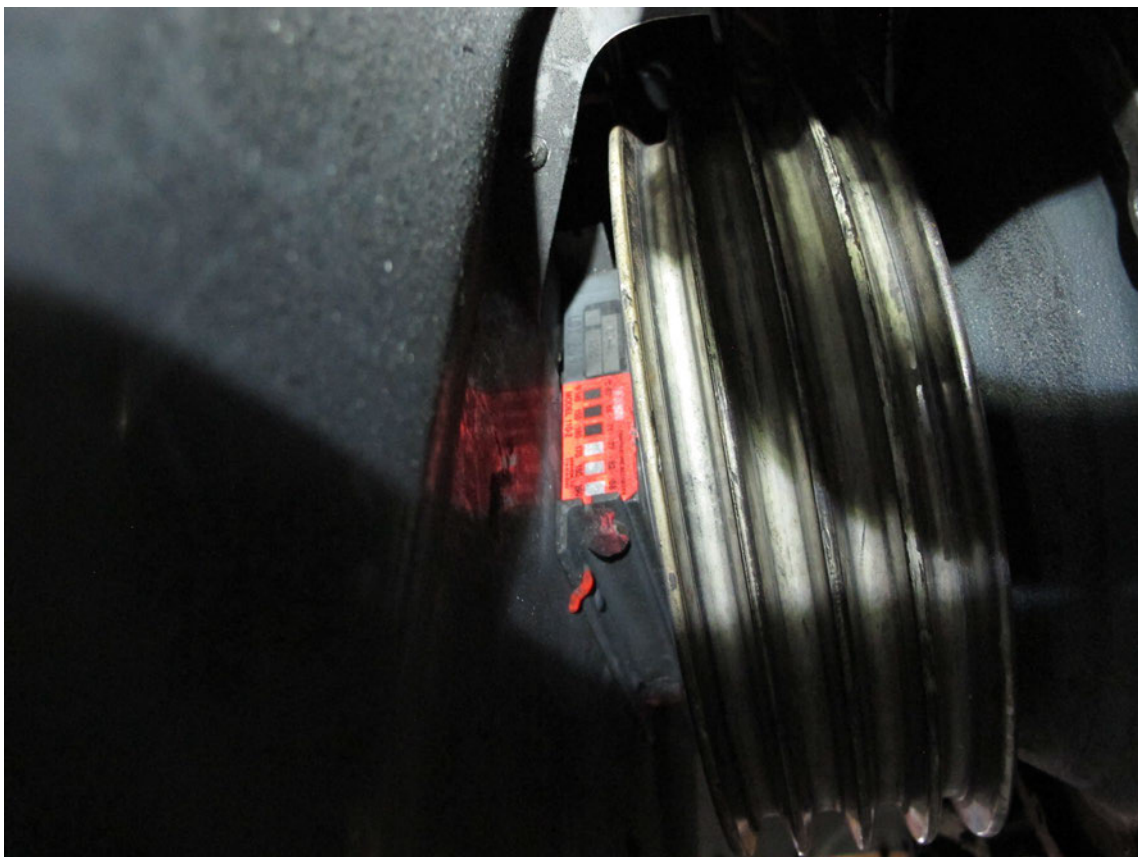
Actuator extension distance.



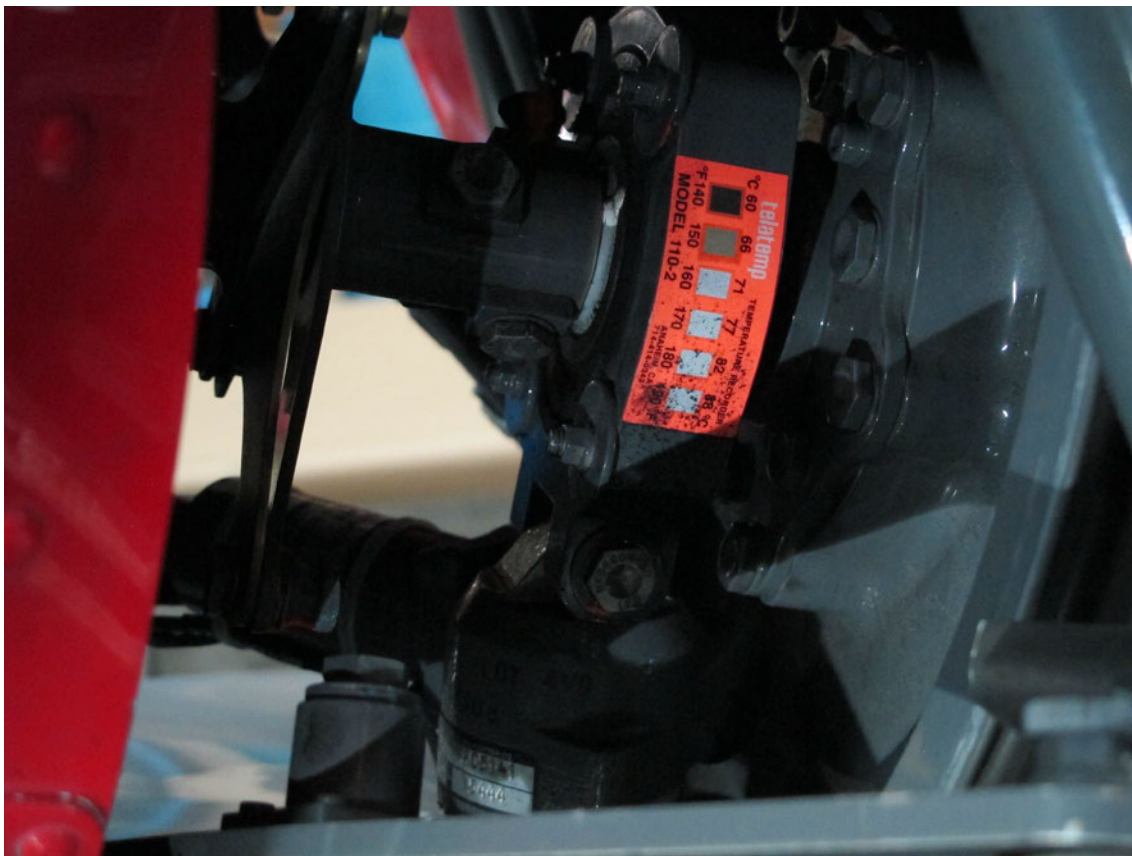
Actuator.



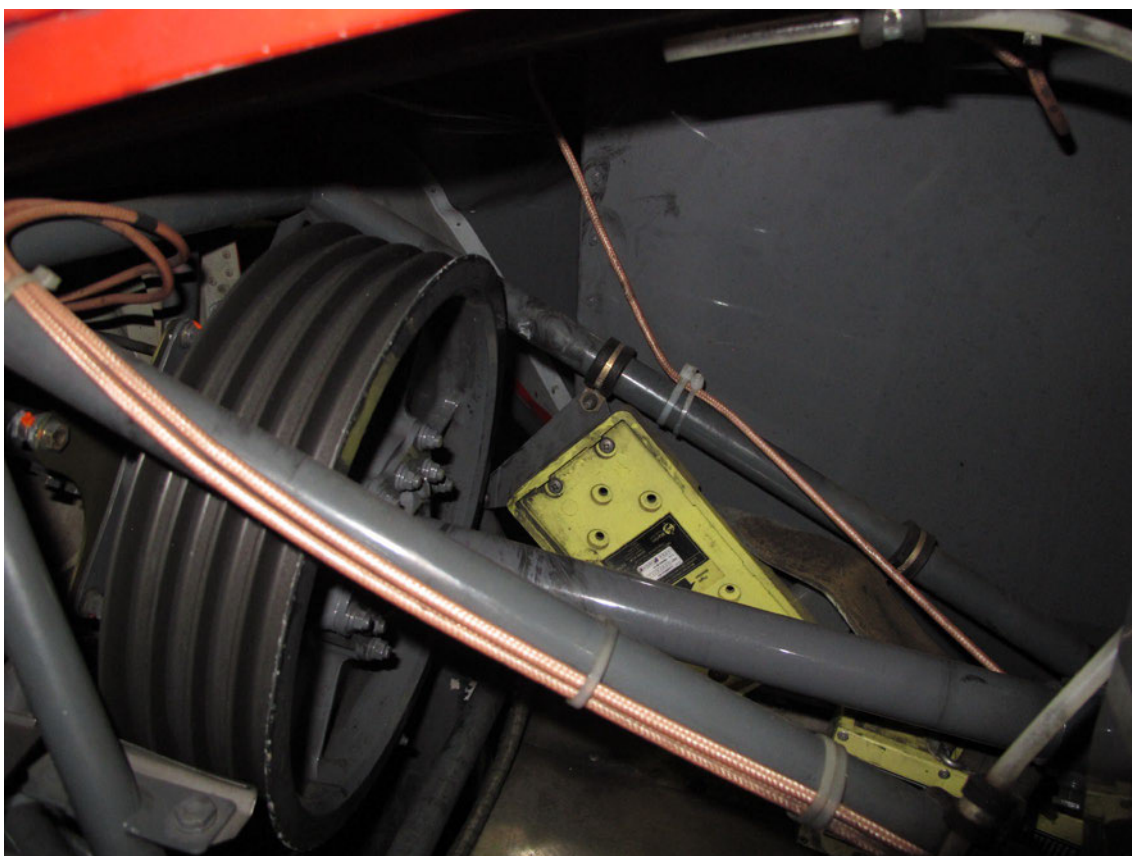
2 amp fuse.



Lower actuator support bearing.



Upper actuator support bearing.



Upper sheave and clutch shaft.

FLIGHT CONTROLS

The flight control system had discontinuities at the locations indicated on the diagrams on pages 12.2 and 12.9. The disconnects are shown individually in the photographs that follow. No evidence of pre-impact failures of the flight control system was found.

The tail rotor pitch change slider was free to slide along the tail rotor gearbox output shaft.

AIRFRAME

The airframe sustained significant impact damage to the nose and cabin area. The windshields were shattered, the center bow and door frames deformed and the roof was distorted and ripped open. The fuselage and mast fairing had multiple dents and wrinkles.

The upper and lower frames appeared undamaged.

The vertical firewall was wrinkled near the lower edge. The horizontal firewall appeared straight.

The tailcone was dented and wrinkled at the forward end. Tailcone bays 1 and 2 had puncture damage on the right side. Tailcone bay 4 and 5 were separated with the entire length of bay 4 ripped open along the bottom. The separation was mostly sheared rivets with a small section of bay 4 ripping in the lower left area. There was no damage consistent with contact from a rotating main rotor blade. Tailcone bays 5 and 6 remained attached to the empennage.

The upper vertical and horizontal stabilizers sustained impact damage. The lower vertical stabilizer appeared undamaged.

The right side door was undamaged. The left side door was separated into multiple pieces.

LANDING GEAR

The right skid was disconnected at the front right strut mount and the left skid was disconnected forward of the front left strut mount. The surface of the disconnects were angular and jagged.

All four elbows remained secure to the airframe. There was no indication of the elbows rotating on the cross tubes.

The aft cross tube was bowed upward on the right side.

The forward cross tube was bowed upward near the center.