



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

June 28, 2018

WRECKAGE EXAMINATION

WPR18LA133

A. ACCIDENT

Location: Borrego Springs, California
Date: April 30, 2018
Aircraft: Robinson Helicopter Company R44 II, Registration Number:
N423ML, Serial #: 13453
NTSB IIC: Tealeye Cornejo

B. EXAMINATION PARTICIPANTS:

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C. SUMMARY

On April 30, 2018, about 1330 Pacific daylight time, a Robinson Helicopter Company (RHC) R44 II, N423ML, was substantially damaged when it was involved in an accident near Borrego Springs, California. The pilot and 2 passengers were not injured, and one passenger received minor injuries. The helicopter was operated as a Title 14 *Code of Federal Regulations* Part 91 business flight.

About 10 minutes into the flight the pilot heard a thump followed by a yaw of the helicopter from the left to the right. Shortly thereafter the clutch light illuminated. The pilot initiated the clutch light procedure per the RHC pilot's operating handbook and began a 10 second countdown. During the countdown, the low rotor rpm light illuminated as well as the low rotor warning horn audio as well. The pilot attempted to make a forced landing to the desert floor. During the autorotation, the helicopter weathervaned, he raised the collective, landed hard, and the helicopter rolled onto its right side.

No evidence of preimpact mechanical malfunction was noted during the examination of the recovered airframe and engine.

D. DETAILS OF THE INVESTIGATION

1.0 Airframe Examination

A review of the helicopter logbooks revealed that the helicopter total time was 941.66 hours. The last inspection was performed on December 8, 2017, with a total of 118.66 hours accrued since the last inspection.

Weight & Balance, R44

Basic Empty Weight, Center of Gravity, Moment

Basic Empty Weight 1561 lb Longitudinal CG 106.8 in Longitudinal Moment 166712

Loading

		Location (in)	Moment (lb)
<u>Occupants</u>			
Right Front Seat	<u>195</u> lb	<u>49.5</u>	<u>9652.5</u>
Left Front Seat	<u>220</u> lb	<u>49.5</u>	<u>10890</u>
Right Rear Seat	<u>210</u> lb	<u>79.5</u>	<u>16695</u>
Left Rear Seat	<u>160</u> lb	<u>79.5</u>	<u>12720</u>

<u>Cargo</u>			
Right Front Seat	<u>0</u> lb	<u>44</u>	<u>0</u>
Left Front Seat	<u>0</u> lb	<u>44</u>	<u>0</u>
Right Rear Seat	<u>0</u> lb	<u>79.5</u>	<u>0</u>
Left Rear Seat	<u>0</u> lb	<u>79.5</u>	<u>0</u>
Cargo Pod	<u>63</u> lb	<u>100</u>	<u>6300</u>

<u>Fuel at Takeoff</u>					
Main Fuel	<u>9</u>	gallons	@ 6 lb/gallon =	<u>54</u> lbs	<u>106</u>
Auxiliary Fuel	<u>2</u>	gallons	@ 6 lb/gallon =	<u>12</u> lbs	<u>102</u>

<u>Fuel at Time of Accident</u>					
Main Fuel	<u>8.75</u>	gallons	@ 6 lb/gallon =	<u>52.5</u> lbs	<u>106</u>
Auxiliary Fuel	<u>1</u>	gallons	@ 6 lb/gallon =	<u>6</u> lbs	<u>102</u>

Total Weight, CG, Moment: Takeoff

Total Weight 2412 lb Longitudinal CG 92.71 in Longitudinal Moment 223617

Total Weight, CG, Moment: Time of Accident

Total Weight 2404.5 lb Longitudinal CG 92.68 in Longitudinal Moment 222846

RHC calculated the weight and balance with information from the helicopters' production records. The pilot reported the passenger weights and cargo pod weight. Pilot reported 11 gallons of fuel at takeoff. The fuel consumption rate was calculated with 15 gallons per hour for a 5-minute flight. Any additional baggage on board is unknown.

AIRFRAME

The fuselage sustained significant impact damage, the right-side door frames were distorted, and the right-side doors had shattered; both windshields also were shattered. The lower right side of the nose from the tail sustained impact damage that is characterized as scrape marks. The front and aft right-side doors sustained impact damage. The front and aft left side doors were undamaged.

The upper frame, and horizontal firewall appeared undamaged. The vertical firewall was distorted and crushed across the bottom edge. The lower right frame was bent and disconnected near the landing gear mount. The surface of the disconnect was angular and jagged. The lower left frame was bent.

The tail cone was separated into several pieces with dents/creases, and black and yellow paint transfer appearing to match the shape and color of a main rotor blade. Several Bays remained undamaged; however, there were a couple of bays that were partially damaged/separated or had been cut to facilitate recovery. The surfaces of all the separations in the tail cone skins were angular and jagged, the surfaces of the separations in the casted bulkhead were rough and matte grey in color.

The empennage remained attached to the bulkhead. The horizontal stabilizer sustained crush damage from its outboard tip and was folded downward. The upper vertical stabilizer sustained crush damage to its upper tip and was folded over to the left. The lower vertical stabilizer was creased and folded at the trailing edge near the top and the tail skid was bent upward. The tail rotor guard separated from the tail cone and was broken in two places. The surfaces of all the separations were angular and jagged.

A "Helipod" (non-factory storage compartment) was installed and sustained impact damage to its inboard wall.

COCKPIT AND CABIN

All circuit breakers were either in the DOWN or IN positions.

The upper console shell sustained impact damage to its upper right side.

The tail rotor pedals were positioned with the left pedal slightly forward.

Both pedals were moved by hand without any binding.

The collective was positioned at 35% of upward travel.

The removable controls were not installed.

All the seats sustained impact damage and sustained varying degrees of deformation.

All four seat belts were unbuckled and undamaged. All four inertia reels operated properly.

FLIGHT CONTROLS

The flight control system sustained impact damage throughout the system. There was no evidence of pre-impact failures of the flight control system was found.

The hydraulic servos were operated by hand with no anomalies.

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

LANDING GEAR

The landing gear remained attached to the airframe and sustained impact damage. The front cross tube was bowed upward at both ends. The aft cross tube was bent upward and remained connected near the right elbow; the left elbow was disconnected. The right skid toe was bent slightly inward.

FUEL SYSTEM

The main and auxiliary fuel tanks sustained impact damage to the outer skins, but the bladders remained intact.

Both filler caps remained secure on their necks. Both finger screens were clear.

All fuel hoses and fittings remained secure with no leaks.

The rollover valves were separated from the upper hoses but operated properly. The vent tubes and hoses were clear of obstructions when blown through.

POWERPLANT CONTROLS

The fuel control knob guard was hanging off of the knob. The fuel mixture control knob was 0.35" from the bezel which was the full rich position. The fuel mixture arm on the fuel control unit was in the full rich position. The control functioned properly.

The throttle grip was in the idle position as was the throttle arm on the fuel control unit. The throttle control operated properly.

POWERPLANT

The engine sustained no impact damage except for the exhaust system.

The valve covers and spark plugs were removed. The visible valve train appeared normal. The right-side spark plugs were coated in oil but all spark plugs appeared normal when compared to the Champion spark plug chart AV-27. The crankshaft was rotated by hand, several revolutions, using the cooling fan. Thumb suction and compression was present in all six cylinders and spark was observed at all 12 ignition leads.

Both magnetos were secure and properly timed to the engine.

The air filter was clean, and the intake hose was unobstructed.

The starter ring gear did not contact the adjacent oil cooler or cooling panel. The upper sheave had two dents in the aft face approximately 90° apart from each other. The smaller dent had no score marks in or near it. The larger dent was scuffed and had score marks on both sides of it along the outer edge of the aft face. The clutch centering strut was bent, and the rod end hardware was deformed and scuffed.

DRIVELINE

All four V-belts jumped forward three grooves on the upper sheave, displacing the forward belt off the sheave and allowing it to hang out of the grooves of the lower sheave. The three aft belts remained in their grooves on the lower sheave.

The grooves in both the upper and lower sheaves had normal wear. The friction surface of the V-belts appeared normal.

The belt tension actuator was undamaged. It was extended approximately 1.3" between the scissor mounts. The upper and lower support bearings rotated smoothly by hand.

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

The forward flex coupling was secure and undamaged.

The main rotor gearbox was undamaged. Oil, dark blue in color, was visible in the sight gauge. The mast tube and driveshaft were straight. The main rotor was rotated by hand more than 360° with no anomalies, confirming continuity from input yoke through the driveshaft.

The elastomeric teeter stop for main rotor blade was crushed across the center and the bracket was bent. The elastomeric teeter stop for main rotor blade was dented across the center. The droop stops were undamaged.

Both main rotor blades were cut near the roots during recovery. One of the main rotor blades was bowed downward slightly near the root and bent downward and aft (opposite the direction of rotation) near the tip. At 6-7 ft inboard of the tip, the spar was bent upward approximately 90° and the skins in the area were separated. Both the upper and lower skins had multiple dents and creases throughout. The leading edge had scuff marks of the outboard section of the blade.

The other main rotor blade was bent downward near the root and partially separated. At 9 ft outboard of the root, it was bent upward approximately 30° with wrinkling of the upper skin and separating the lower skin chordwise. Both the upper and lower skins had multiple dents and wrinkles throughout. Scuff marks were present along the leading edge of the outboard section of blade. At 3 ft inboard of the tip, the spar was bent downward approximately 25° separating the spar and skins in the area. At 18-19 inches inboard of the tip, the spar was bent aft (opposite the direction of rotation), wrinkling the skin chordwise. All the surfaces at the separations were angular and jagged.

The intermediate flex coupling was undamaged except for score marks on the tips of the yokes. The frame tube adjacent to the flex coupling had deep score marks and dents running in the direction of rotation of the flex coupling.

The tail rotor driveshaft was bent and disconnected forward of the damper bearing. The damper bearing rotated smoothly by hand. The damper bearing support arm was bent yet the friction in the arm felt normal. The tail rotor driveshaft was also disconnected forward of the aft flex coupling in association with tail cone damage. The surfaces of both disconnects were angular and jagged. The areas around the disconnects were twisted in the direction of normal rotation from the forward end.

The aft flex coupling was undamaged.

The tail rotor gearbox was partially separated from the aft tail cone bulkhead with disconnects in both the bulkhead and the gearbox mounting flanges. The surfaces of the disconnects were rough and matte gray. Oil, blue in color, was visible in the sight gauge. The input yoke was rotated by hand, more than 360° with no anomalies confirming continuity from the input yoke through the output shaft. The output shaft was straight.

Both tail rotor blades sustained impact damage to their tips and leading edges, bending, and deforming the blades overall. One tail rotor blade was missing 6 inches of its tip. The other tail rotor blade was missing the forward half of its tip cap. The remaining surfaces of the missing sections were angular and jagged.

Submitted by: Investigator T. Cornejo