



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety
Western Pacific Region

February 5, 2019

ACCIDENT SITE, AIRFRAME , & ENGINE EXAMINATION SUMMARY

WPR18FA077

This document contains 0 embedded photos.

A. ACCIDENT

Location: Newport Beach, California
Date: January 30, 2018
Aircraft: Robinson R44, N7530R
NTSB Investigator-in-Charge: Joshua Cawthra

B. DETAILS OF THE INVESTIGATION

1.0 Accident Site Examination

Examination of the accident site revealed that the helicopter impacted multiple residential structures and a residential street about 0.95 miles south, southeast of the departure end of runway 20R at SNA. The first impact marks observed was damage to the roof of a single-story residential home and damage the roof of a two-story residential home. The tailrotor gearbox and one tailrotor blades were located on top of the roof of the single-story home, partially lodged within a hole in the homes roof structure. The empennage and opposing tailrotor blade were located between both homes, surrounded by thick vegetation. Additional impact damage was observed to a palm tree located between both homes.

Numerous impact gouges and paint transfer marks were located on the residential street in front of both homes, consistent with fuselage and main rotor blade impact. The helicopter came to rest on its left side against a single-story residential home on a heading of about 189 degrees magnetic, about 86 feet from the first identified point of impact. Throughout the wreckage debris path, plexi glass fragments, clay roofing material, palm tree fragments, and portions of both main rotor blades were observed.

2.0 Airframe Examination

Examination of the wreckage revealed that the empennage and the aft section of the tailcone were separated from airframe. The forward section of the tailcone was bent forward almost 180-degrees. The forward area of the cabin was crushed and partially torn away. The empennage was separated from the tailcone. The tailrotor gearbox was separated from the empennage and tailcone. The skids were detached and folded underneath the wreckage. The emergency floats were found inflated and remained attached to each skid.

The forward tailrotor drive shaft flex coupling was intact. The intermediate flex coupling was distorted and detached at one arm. The tailrotor drive shaft was separated into multiple sections. The tailrotor drive shaft damper assembly was detached from the tailcone and the tailrotor drive shaft bearings. The bearing rotated freely. The friction at the damper linkage was normal. The aft flex coupling was detached at the tail rotor gearbox yoke input arms. The tailrotor gearbox rotated freely (one turn) and contained oil. The slider bearing rotated freely. One of the tail rotor blades was separated and distorted. The opposing blade remained attached and exhibited leading edge damage.

The drive belts remained intact and in place within their respective grooves. The sprag clutch operated normally. The belt tension actuator was intact and when operated, the belt tension actuator extended and contracted. Both the upper and lower actuator bearings rotated freely.

Remnants of dark colored oil was visible in the main rotor gearbox sight glass. The main rotor gearbox was intact. The main rotor drive shaft and mass tube appeared to be intact. The main rotor drive shaft was rotated 360 degrees with no anomalies noted.

The main rotor head droop stop and tusks were intact. One elastomeric teter stop was crushed, the other was lightly compressed. Light scoring was observed on the main rotor hub inboard of the main rotor pitch change housings on both blades.

The main rotor blades remained attached to the hub. Both main rotor blades were intact. One of the rotor blades was bent upward about mid span and exhibited slight bending opposite of the direction of rotation near the blade tip. A portion of the blade honeycomb skin structure was torn away from the spar at the blade tip. The opposing main rotor blade exhibited dents and scuffs about 10 inches outboard of the hub. The blade was bent downward about 135 degrees about 2 feet outboard of the hub. The blade was also bent upward mid span, and bent aft, opposite direction along the outboard one-third of the blade. A portion of the blade honeycomb skin structure was torn away from the blade tip.

Dents observed in the oil cooler were found consistent with impact from the starter ring gear. The impressions were similar to the shape of the gear teeth. At the upper belt sheave, score marks consistent with rotational contact adjacent components was observed. The marks are consistent with engine rotation.

The throttle was found about $\frac{1}{4}$ position in the cabin, however, was about full throttle at the carburetor connection point. The carburetor heat control was extended slightly in the cockpit, however, the slider in the airbox was in the "hot" position. The mixture control was full rich in the cockpit, and the arm on the carburetor was in the full rich position, however detached from the cable (cable pulled out of the hardware).

Overload fractures were observed in the C343-5 torque tube (under the pedals), in the C121-9 torque tube (near the cyclic box), in the front and aft ends of the C121-17 torque tube. The C121-17 tube itself between both fractures was not located at the accident site (most likely on a roof or in vegetation).

An overload fracture was observed in the aft end of the collective push pull tube. An overload fracture was observed in one of the pitch links of one of the main rotor blades. Everything else within the control system remained intact.

Flight control continuity was established throughout the helicopter from the cockpit controls throughout the main rotor and tail rotor controls despite various overload fractures.

Both fuel caps remained attached to the fuel tanks. The gascolator screen was free of debris and the gascolator bowl contained fuel, free of debris. All vent lines were clear of debris. At the accident site, fuel was observed leaking from the carburetor (most likely the needle valve was unseated from attitude of the final rest position of the helicopter). During recovery of the wreckage, approximately 26 gallons of fuel was recovered from the fuel tanks.

The warning lights for the instrument panel were examined. All of the filaments appeared to be normal. The magneto switch was in the "both" position and the key was broken off. All other switches were in

the “off” position. The clutch switch was in the engaged position with the guard down. The collective friction slider was found in a position consistent with full up collective.

Gauges:

Aux Fuel: 0:

Main Fuel: 0

Oil Temp: Deflected full left

Cylinder Head Temp: Deflected full left

Oil Pressure: Deflected full left

Amps 0

Carburetor Temp: Deflected left

Clock: Moving, 930

VSI: Slightly above 400 fpm climb

Altimeter: 8,680' (about)

Kollsman: 29.99 inches

Manifold Pressure: Impact damaged, deflected full right

Engine / Rotor RPM: Both deflected down, 0

Airspeed: 0

All four seat structures were collapsed. The front right and right rear seatbelts were buckled. The left side seat belts were not buckled. All four seat restraints exhibited various cuts from first responders.

No evidence of any preexisting mechanical malfunction was observed with the airframe.

3.0 Engine Examination

The engine remained attached to the airframe. The exhaust exhibited impact damage and coloration consistent with a slightly lean condition. The number 5-cylinder exhaust stack exhibited some oil within the stack. The number 1 and 3 cylinders exhibited impact damage to the induction pipes. The number 3-cylinder bottom spark plug wire exhibited impact damage. The right magneto cap exhibited a damaged spark plug lead.

The upper spark plugs were removed. The electrodes were undamaged and exhibited color consistent with normal operation with the exception of the number 3 spark plug, which was oil soaked. The engine crankshaft was rotated using the cooling fan. Compression and suction was obtained on all six cylinders.

The carburetor was removed to facilitate transport to a local engine facility. The carburetor drain plug was removed and fuel inside the float bowl was free of debris.

The oil sump screen was removed and contained two small plastic fragments consistent with the magneto drive bushings. The oil filter was removed and cut open. The internal filter element exhibited no debris.

The engine was installed on an engine test stand. In order to facilitate an engine run, a slave starter and propeller were installed. Prior to replacement of the starter, the original installed starter was tested and found operational. The engine was started and ran uneventfully. During the engine run, the number three cylinder was not producing any exhaust gas temperatures (EGT) on the engine monitoring unit installed on the test stand. The engine was shut down and further inspected. The bottom spark plug

lead of the number three cylinder was impact damaged, and the upper park plug lead was pulled away from the ignition cap. A serviceable ignition harness was installed for both the left and right magnetos. The engine was started a second time uneventfully and ran throughout various power settings. At maximum power, the engine produced 2,600 rpm at 29 inches of manifold pressure. The magneto RPM drops were within specification. An observed idle manifold pressure of 12 to 13 inches was observed. The engine ran uneventfully until it was shut down using the mixture cut off.

Post run differential compression check was completed. The results were as follows: 1: 79/80, 2: 78/80, 3: 80/80, 4: 80/80, 5: 80/80, 6: 80/80

No evidence of any preexisting mechanical malfunction was observed with the engine.

Submitted by: Joshua Cawthra