

National Transportation Safety Board

Office of Aviation Safety

Washington, DC 20594



ANC24FA063

WRECKAGE EXAMINATION

July 30, 2024

A. ACCIDENT:

Aircraft Make/Model/Registration:	Robinson / R44 / N144KW
Date:	July 11, 2024
Time	13:05L
City:	Kekaha, HI
Latitude/Longitude:	N22.1835 / W159.5469
Elevation:	0 msl

B. EXAM LOCATION & PARTICIPANTS:

Cates International
24 Sand Island Access Rd
Honolulu, HI 96819

NTSB IIC	Mark Ward Air Safety Investigator Anchorage, AK
NTSB AS40	Van McKenny Aerospace Engineer (Helicopters) Washington, DC
NTSB	Stacia Joyce Air Safety Investigator Anchorage, AK
RHC	Thom Webster Air Safety Investigator Torrance, CA
Lycoming	Dave Harsanyi Air Safety Investigator Williamsport, PA
FAA	Seth Cossel Aviation Safety Inspector Honolulu, HI
FAA	Dave Keenan Aviation Safety Inspector Washington, DC

C. ACCIDENT SUMMARY:

On July 11, 2024, at approximately 1305 Hawaii-Aleutian standard time, a Robinson R44 helicopter, N144KW, suffered significant damage in an accident near Kekaha, Hawaii, resulting in the fatalities of the pilot and two passengers. The helicopter, operated under Title 14 Code of Federal Regulations Part 91, was conducting a sightseeing flight for Aloha Helicopter Tours LLC, dba Ali'I Air Tours. The flight departed from Li'hue Airport (LIH) at around 1231 for a one-hour tour of Kauai.

According to Federal Aviation Administration (FAA) ADS-B data, the helicopter initially flew west-southwest before turning north. However, ADS-B coverage ended near the northern shore of Kauai due to the region's mountainous terrain. Witnesses on the Kalalua Trail, along the Na Pali Coast, reported strong gusty winds and a loud bang before seeing the helicopter wreckage fall into the ocean in two sections, which sank about a quarter of a mile offshore.

DETAILS OF THE EXAMINATION

Helicopter Information

Robinson R44 II

SN: 12805

Year of Manufacture: 2009

Wreckage Overview

The wreckage was examined at a warehouse in Honolulu. The wreckage consisted of 4 main sections; engine, cockpit/cabin, tail boom, and main gear box/mast/rotor.



Figure 1 Fuselage



Figure 2 Tail cone, tail and tail rotor.

The left landing skid was fractured at the rear landing skid tube saddle, the front cross tube remained attached to the skid. The front cross tube was attached to the fuselage, the rear cross tube had separated from the fuselage at the upper left tube joint. The right landing skid tube was fractured behind the forward skid tube joint. The upper drive belt sheave remained attached to the helicopter frame. The engine had separated from the frame and the frame tubes were fractured at multiple locations. The main gear box (MGB) had fractured and separated from the airframe. The MGB, rotor mast, and main rotor remained together as an assembly. All 4 tail cone attach bolts remained attached to frame tubes with all 4 having tail cone skin fragments sandwiched in-between the bolts and frame. The tail cone had separated from the frame with skin folding and tearing on the left side tail cone attachments and buckling evident on the right side at the tail cone bay 1 and 2 splice. Buckling was also evident at bay 5. The tail fin and tail rotor remained attached to the tail cone.

The airframe structural tubes, where the tail cone attaches, exhibited bending from right to left. Structural tubes were fractured in bending or deformation. No fractures or tube separations at the welded joints were observed. Tube fracture surface characteristics were deformation and 45° shear lips with the fracture surface having red oxidation deposits.



Figure 3 Aft airframe structural members showing right to left deformation.

Cockpit

The nose of the cockpit/cabin (fiberglass) was broken in multiple pieces. Fragments of both front cockpit doors were present. The main cabin doors were missing. The forward chin area, on the right of the landing lights, exhibited an angled straight cut that pointed to a semicircular vertical floor crushed area under the copilot's seat.

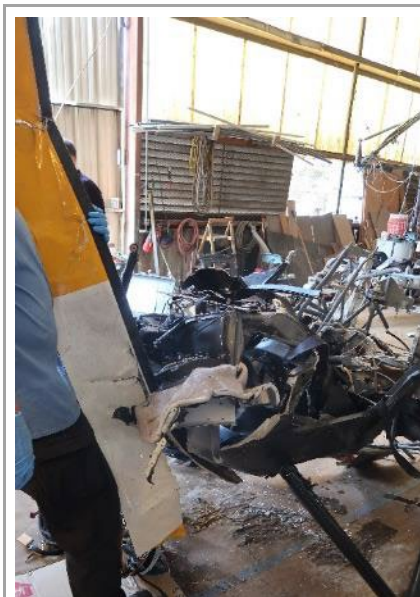


Figure 4 Approximate angle the main rotor blade passed through the cockpit.



Figure 5 Crushed cabin floor structure deformed semi circularly aligned with the leading edge of the main rotor blade.

The instrument pedestal and center console had separated from structure. The circuit breaker panel was present with the majority of the circuit breakers popped. The right seat (pilot) antitorque pedals were not located. The center cyclic post was separated from its base, the cyclic cross tube had separated from the post, and the cyclic grip was not present. The right seat collective was attached to its base, the twist grip was seized,

and the GOV switch was in the ON position. The left seat collective was not present, presumed removed by the operator.

Both left and right front cockpit seats were missing the seat cushions and both seat box structures were destroyed. Both front seat buckles and the left rear seat buckle was unbuckled, the right rear seat buckle was buckled. No stretching/overload signatures were identified on any of the seat belt webbing material.

Instruments:

Hobbs	Face plate only, missing mechanism
Amps	+35 amps
Oil Pres	At red line – 25 psi
Fuel	1/2
Oil Temp	75° F
Aux Fuel	Needle missing
Cyl Head Temp	200° F
Alt	1,000 ft / 30.10 inHg
Attitude Indicator	Missing
Airspeed	105 mph
Bat	ON
Clutch	ENG
Ignition Key	Key broken in slot, slot positioned towards the PRIME position
Mixture	Full down.

The cockpit annunciator lights were examined using a magnifying loupe.

Oil	Lens and bulb broken from impact. No filament
Alt	Filament broken
Gov Off	Broken
Rotor Brake	Not broken
Clutch	Filament broken
MR Temp	Filament broken
MR Chip	Filament not broken
Starter On	Filament not broken
TR Chip	Filament not broken

Low Fuel	Filament broken
Low RPM	Filament broken
Carbon Monoxide	Filament broken
Fuel Filter	Filament not broken
Aux Fuel Pump	Filament broken, bulb glass was broken
Engine Fire	Bulb damaged, no filament

Flight controls

Cyclic flight controls were traced from the cockpit cyclic to the yoke assembly. The cyclic stick was fractured at the base. The left control tube up to the servo was fractured at the yoke assembly. The right control tube was fractured at the servo input rod end. The aft control rod was attached to the yoke and jackshaft. The control rod from the jackshaft to the aft servo fractured at the servo input rod end. The aft servo was connected to the stationary swashplate by a slightly bent control rod. The upper right lateral control rod was connected to the right servo and fractured just below the stationary swashplate rod end. The upper left lateral control rod was connected to the left servo and fractured at the stationary swashplate rod end. The stationary scissors were connected and the rotating scissors were connected. Both pitch links were attached to the rotating swashplate and fractured at their respective blade pitch horn rod ends.

The right collective was attached to the torque tube assembly. The twist grip and governor linkages were connected. The twistgrip was seized and could not be rotated by hand. The collective push-pull tube was fractured between the torque tube and yoke.

The antitorque pedals were not recovered. The first area of pedal control system identified was the fractured push-pull tube that connects to the lower aft bellcrank. The pedal control rods were traced via multiple breaks to the tail rotor pitch control bell crank. The control rod moved the tail rotor bellcrank in concert with movement of the tail rotor blades.

All three servo actuators were intact and had control rods or portions of control rods at each end. The pilot valve on each one moved freely. The hydraulic reservoir was attached to the helicopter frame tube near the upper sheave. All hydraulic lines were attached to the reservoir base and all b-nut slip marks were aligned.

Main Rotor Drive



Figure 6 Main rotor gearbox, mast, and rotor head.



Figure 7 Foreword end of the gear box with case separations, and revealing the ring gear.

The transmission/main gear box (MGB), mast, and main rotor separated from the airframe as a single assembly. The two aft transmission mounts and attach bolts had pieces of frame connected. The two forward mounts had been liberated via fracture of the MGB case on each side. Both forward mounts with fragments of the MGB case remained attached to the helicopter frame. The ring gear could be inspected through the holes in the transmission case. No evidence of damage or unusual wear was identified on the ring gear. The magnetic drain plug was examined and had a single 1/4 inch piece of ferrous material. The input pinion to the MGB ring gear was seized. The flex coupling flanges were deformed and the two bolts connecting to the input pinion were connected. The drive shaft side of the flex coupling had one arm torsionally sheared off and the other had ripped away at the bolt hole. Both connecting bolts were present on the drive shaft side flange. Two teletemp indicators were on the transmission. The hydraulic pump teletemp had the 220° F square as black, the 230° F and 260° F were dark gray, 240° F, 250° F, and 270° F were light gray. The MGB teletemp had the 220° F box as gray, and all others as light gray.

The mast tube remained attached to the MGB base, with a slight bend (to the right) at the top. Both swashplates, rotor head, and main rotor blades were present on the drive shaft. The top of the drive shaft was bent above the swashplate.

The upper drive belt sheave and drive shaft remained in the airframe. The sprag clutch teletemp indicator was damaged and unreadable. The freewheel unit rotated freely in the clockwise (cw) direction and locked in the counter clockwise (ccw) direction (as viewed by the pilot). All four drive belts were examined. All had overload separations and no evidence of belt degradation, excessive side wear, cracking, or splitting.

Main Rotor

Rotor Head

The rotor head was attached to the drive shaft located inside the mast tube. Both main rotor blades (MRB) pitch bolts were connected, and the teetering hinge moved in a rocking motion. The pitch links on each blade were fractured at each pitch horn connection rod end. The mast bump (teeter stop) on the red blade had the elastomeric block split in half horizontally, with a witness mark on the drive shaft. The blue blade teeter stop was missing the elastomeric block, but a horizontal witness mark was observed in the center of the block frame on the drive shaft. On each side of the rotor head there were contact witness marks that matched the curvature of each blades spindle housing/blade root.



Figure 8 Rotor head and mast illustrating the bend of the drive shaft and the broken pitch link.



Figure 9 Red blade teeter stop.



Figure 10 Blue blade teeter stop.

Blue Main Rotor Blade:

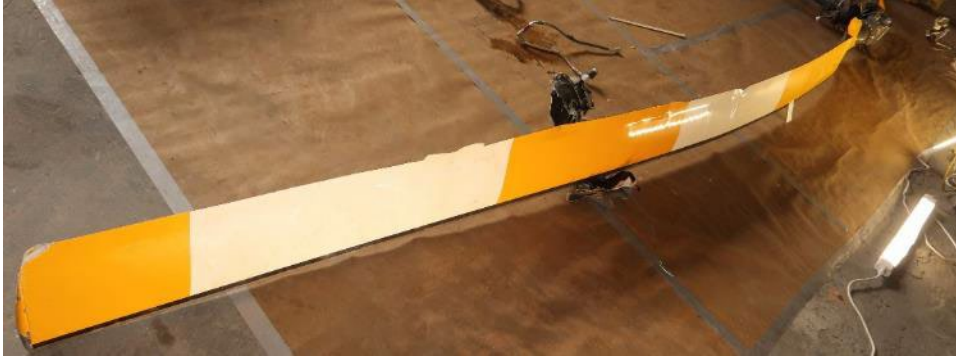


Figure 11 Blue Main Rotor Blade.

PN: C016-7 Rev: AK
SN: 16266

The entire blue blade remained attached to the rotor hub. The blade had a trailing edge buckle 2.5 feet from the blade root, and had a permanent continuous downward lengthwise bend. The pitch bolt was removed. The pitch bolt hole was observed to be out of round. The spindle tusk was slightly bent downward.



Figure 12 Pitch bolt and spindle tusk.

Red Main Rotor Blade:



Figure 13 Red Main Rotor Blade:

PN: C016-7
SN: 16262

A 9 foot section of blade remained attached to the rotor hub. At the fractured end, a two foot section of leading edge had separated in a forward bend from the blade body. The blade had downward bend 2.5 feet from the root and there was a chordwise buckle 4.5 feet from the root. The remaining outboard section of blade (approximately 7.5 feet) was not recovered. The chordwise fracture area was characterized by torn blade skin and 45° shear lip features on the leading edge stainless steel spar. The bottom (black) side of the blade had a scattered distribution of small whiteish marks where the black paint had chipped off.



Figure 14 Pitch bolt and spindle tusk.

Pitch bolt and spindle tusk.

The pitch bolt was removed and the pitch bolt hole was observed to be out of round. The spindle tusk was slightly bent, but bent less than the blue blade's tusk.

Tail Rotor Drive System

Tail rotor drive continuity was established through a bending overload break of the drive shaft just aft of the sheave and freewheel unit flex coupling. A second drive shaft torsional fracture (opposite the direction of drive shaft rotation) was at the frame splice of tail boom bays 3 and 4. The tail rotor rotated freely by hand and the drive shaft moved in concert. The magnetic drain plug from the tail rotor gear box was examined and had no metallic particles.

Tail Rotor



Figure 15 Tail rotor assembly.

Both tail rotor blades were attached to the tail rotor hub. Both pitch links were attached and both blades moved in concert when manipulated by hand. No leading edge damage on either blade was observed. Both blade tips exhibited indications of a corrosion or possibly a repair.

Engine

Mfr: Lycoming	Model: IO-540-AW1A	SN: L-3363848E
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Figure 16 Top view of the engine as recovered.

The engine had separated from the airframe and was located by recovery divers about 40 feet from the fuselage wreckage. All 6 cylinders were attached to the engine case and there was no damage to the engine case halves. The engine drive belt sheave and fan were attached to the forward end of the engine. The valve covers on the left side of the engine (helicopter's right side) had been hydraulically deformed into the valve rockers. The valve covers on the engine's right side were undamaged. Push rods for the number 2, 4, and 6 cylinders (engine left side) were bent or broken, the push rod tubes on the 1, 3, and 5 cylinders were dented but remained relatively straight. All valves and rockers were intact. The starter ring had broken free, however, there was a starter ring grind mark on the engine oil cooler. The engine could not be rotated by hand. Holes were drilled into the engine case to examine the connecting rods, camshaft, and crank shaft.

The fuel pump was seized, however, upon disassembly, fluid with a strong fuel odor drained from the pump. All spark plugs had no mechanical damage and exhibited normal operational wear. The oil suction screen was clear. The engine had a after market oil filter (STC), there was no debris observed in the filter elements. 3 of the six fuel nozzles were blocked with organic slime like substance that was easily cleared with air pressure. The throttle body throttle plate was at idle and moved freely. The mixture lever was halfway between lean and rich and, by hand manipulation, a little movement from the mixture lever was achieved. Both throttle and mixture linkages were not connected to the airframe controls. One impact tube in the throttle venturi body was missing/fractured. The fuel distributor had a small amount of fluid with a fuel odor. The gascolator had fluid with a fuel odor in it. The fluid tested positive for water using water testing paste. Both magnetos were seized but intact.