



NATIONAL TRANSPORTATION SAFETY BOARD

Office of Aviation Safety

Western Pacific Region

01 October, 2015

AIRFRAME AND ENGINE EXAMINATION

WPR15LA219

This document contains 18 embedded photos.

Examination Report: N121PT, Garlick Helicopter, UH-1H

Thursday, October 01, 2015

6:24 PM

Exam Location:

AvTech
Auburn, WA

Participants:

NTSB	Van McKenny
Honeywell	John Eller
FAA	Kevin McKee
General Aircraft Services	Carl Hagglund

Accident Location:

City:	Walla Walla, WA
Latitude/Longitude:	N46 02.989 / W118 05.264
Elevation:	2,200 feet msl

Circumstances/Terrain:

The pilot stated that he was in a 165 foot hover over a shallow creek, filling the fire bucket. The creek flows in a southeast to northwest direction in a narrow canyon with 150 foot ridge to the southwest and a 300 foot and higher terrain to the northeast. The helicopter was hovering over the creek facing downstream with the nose turned about 30° to the south relative to the creek. About one minute into the hover, the pilot sensed the helicopter start to settle. He did not hear any unusual noises, feel any unusual vibrations, or feel the helicopter make an uncommanded yaw. He applied collective to arrest the settling but did not feel the correct response, and sensed the rotor rpm start to droop, but the low rotor horn had not activated. He immediately, lowered the collective, and performed a hovering autorotation toward the stream embankment to his left. The helicopter's rotors struck a number of trees, and landed hard, coming to rest 180° from its original heading and rolled over onto it's right side. The pilot was able to shut the fuel off and secure battery power before egressing. He also believes that the engine may have still been operating after the accident and shut down when he shut the fuel off. He also was wearing a noise canceling headset.

The pilot stated that the winds in the canyon area were light and variable. Above the canyon the wind was driving the smoke from the fire to the north.

Examination Summary:

The helicopter had been exposed to an extreme post crash fire which destroyed the entire fuselage, engine case, and main transmission case. All major components of the helicopter were laid out, engine, transmission, main rotor hub & blades, tail boom, and tail rotor hub & blades. The remaining wreckage had been placed in large grain bags to facilitate transportation. The grain bags were emptied one at a time and sorted through by hand. The exam verified that the majority of the helicopter was accounted for, however, the fuel control, droop compensator, and half of the KaFlex shaft were not accounted for and presumed to either have been destroyed by the fire or the remnants remained at the accident site. Complete accounting of all elements and/or components of the helicopter was not possible.

Airframe:

- Garlick Helicopters Inc
UH-1H, SN: 4418, Military SN: 64-14711
- Main cabin and cockpit were completely destroyed by fire.
- Pilot's collective was located within the wreckage debris.
- Pilot's cyclic was not located.
- 2 steel seat frames were present.
- Fragments of floor decking, tie down rings, door handles, wire cutter, engine deck, door latches, and transmission mounts were present within the wreckage debris.



Forward section of the tail boom



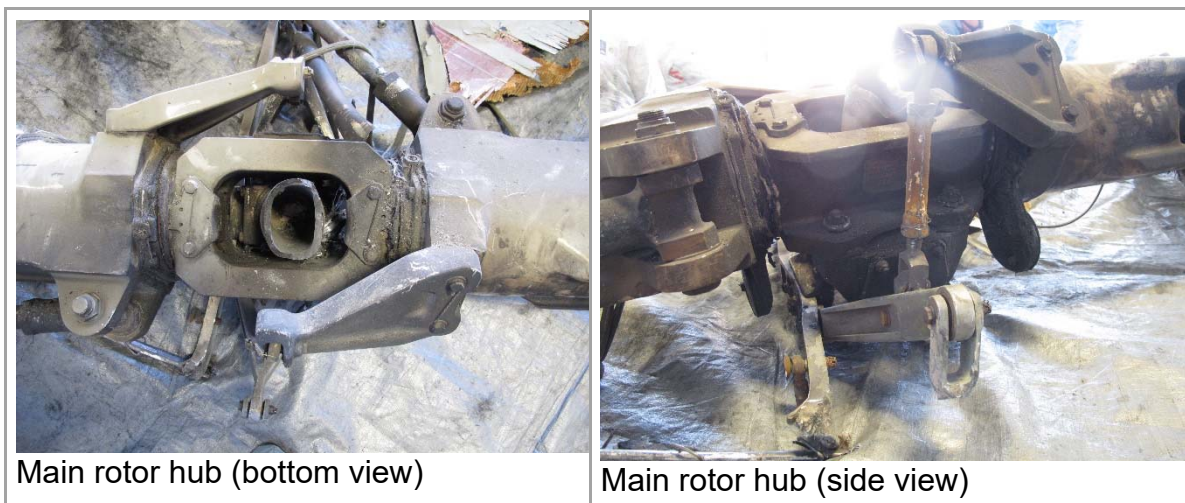
Aft section of the tail boom with tail rotor.

- Tail boom had separated aft of the main cabin. Recovery personnel had cut the tail boom in half at mid span.
 - Tail rotor drive shaft had separated near the same location that the boom had separated from the airframe. The drive shaft fracture appeared to be consistent with torsional overload.

- Tail rotor drive shaft aft of the horizontal stabilizer to the 42-degree gear box, and up to the tail rotor gearbox rotated freely with no binding felt.
- Left horizontal stab was bent upward in a S shape fashion.
- Right horizontal stab outboard 18 inches was curled upwards.
- Tail rotor control cables were present and had been cut by recovery personnel.
- The horizontal stab control push/pull tubes were connected to the horizontal stab and the bell crank located forward of the stab. The forward tube had fractured along the same plane line as the tail boom had separated along.



- Tail rotor gearbox contained oil and the tail rotor shaft moved freely. The tail rotor blades had been cut off at the roots by recovery personnel. The leading edge of each blade was straight and no dings, indentations, or chordwise scratching was noted on either blade. Both pitch change links were connected at both ends.



- Main Rotor hub was intact, with blade roots attached to the blade grips. The main rotor mast had separated just below the rotor head with the fracture surface exhibiting 45° shear lips, granular surface, and darkened by soot. The fracture surface was consistent with torsional overload. One balance bar remained attached to the hub, the other was present in the wreckage. All pitch change links

had push/pull tube rod ends attached, however the tubes connecting the rod ends had been destroyed by the fire.



Main rotor blade



Main rotor blade

- Main rotor blades exhibited heat damage exposing carbon fiber strips. Both rotor blades had been cutoff chordwise about 3 feet outboard of the rotor head blade grips. Portions of both rotor blades had split and separated along the main spar.



Transmission (overview)



Transmission gearing



Engine drive input



K-flex torque tube

- Main transmission case had been destroyed by fire, exposing the bull gear and planetary gears. The stationary swashplate and rotating swash plate were present above the transmission. One of the 3 horns on the rotating swashplate had been fractured and was not present. The scissors attaching the collective pitch change to the stationary swash plate was attached and connected. The engine drive input and bevel gear was present. The KaFlex coupling on the transmission side was fractured at multiple locations, the associated torque tube end was not present and was not located. The engine side KaFlex coupling and torque tube half was present and exhibited overload fractures.

Cockpit:



Cockpit instruments

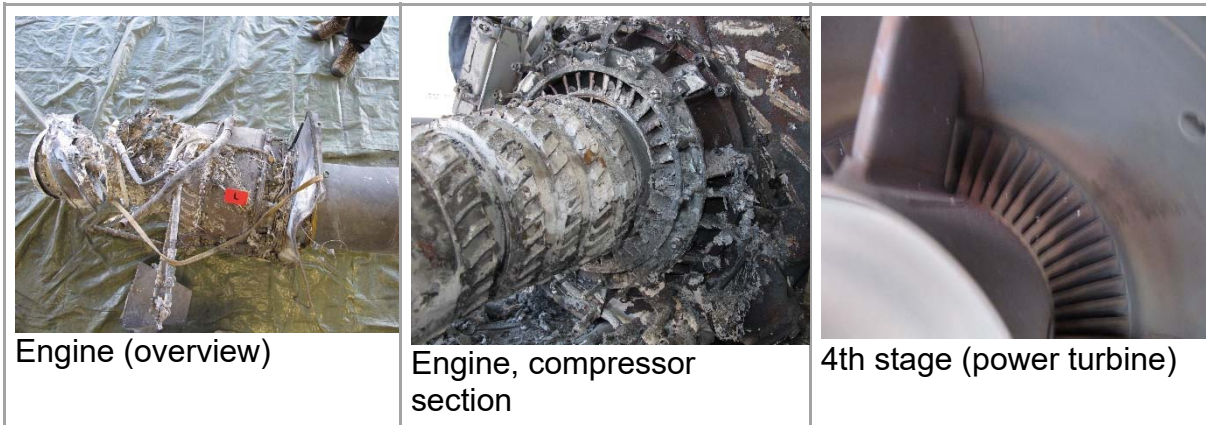


Cockpit seats

- The cockpit was completely destroyed by fire. The steel cockpit seat frames were present. A number of instruments were also present. The annunciator panel was fire damaged and the front face was destroyed.
 - Turn and bank indicator
 - 2 gyros

- o Airspeed - 0
- o N1 - 4%
- o Altimeter - 5700

Engine:



- Per the engine logs, the engine information was as follows:
 - o Engine Model: T53-L-703 (Data plate was not recovered.)
 - o S/N: LE-11448Z
- There was significant thermal damage all around the engine.
 - o The air inlet housing was destroyed by fire and was no longer present.
 - o The forward gear reduction housing was destroyed by fire and was no longer present.
 - o The axial compressor housings were destroyed by fire and were no longer present.
 - o There was evidence of fire sooting and melted metal on and around the engine.
- The axial compressor rotors and nozzles were exposed and observable.
- All of the axial compressor blades were broken at the root of the rotor for each stage.
- All of the 4th stage axial compressor blades were not present in the rotor.
- A few axial compressor blades were found under the engine after removal of the axial compressor nozzle stages.
- All of the axial compressor blades that were found exhibited leading edge damage and bending.
- A quantity of 4 inlet guide vanes (IGVs) were located around the engine wreckage. All exhibited damage consistent with foreign object damage.
- Several vanes of the centrifugal compressor exhibited evidence of leading edge damage and bending opposite the direction of rotation.
- While sifting through the bags of debris recovered at the crash scene the following engine parts were identified:

- o Various gears from the accessory gearbox were located in the wreckage.
 - o Various fuel control parts were located within the wreckage.
 - o Various power turbine governor parts were located within the wreckage.
 - o The main tower shaft to the accessory gearbox was located within the wreckage.
- Metal spray was noted on the aft side of the 2nd stage power turbine nozzle.
- The front power output coupling to the transmission was still connected to the engine with portions of KaFlex still attached. The coupling appeared to be intact.