

CEN19LA240 - Engine Cooling Fan Examination

Thursday, October 17, 2019

9:33 AM

National Transportation Safety Board

Office of Aviation Safety

Washington, D.C. 20594

A. ACCIDENT:

Aircraft Make/Model/Registration:	Robinson / R-44 / N7508Z
Date:	7.27.2019
Time	1628 CDT
City:	Blair, NE

B. EXAM LOCATION & PARTICIPANTS:

Robinson Helicopter Company
Torrance, CA

NTSB AS40	Van McKenny Aerospace Engineer (Helicopters) Washington, DC
RHC	Thom Webster Aviation Safety Investigator Torrance, CA

C. DETAILS OF THE EXAMINATION:

- Fan shipped to RHC
- Box was sealed and undamaged
- Visual Exam
 - 6 of 7 hub attachment bolts loose (probably a result of removing fan from engine)
 - Field added balance weights in place on one back plate bolt. Factory applied balance weights were in place.
 - Rotational scuff marks on the exterior backing plate.
 - Cracks on backing plate at bolt placement.

- 3 cracks visually identified on plate.
 - Backing plate had rust colored powder originating at each bolt head, tailing opposite direction of rotation. Indicates movement of backing plate.
- No damage noted on the external diameter of the fan.
- Galling & fretting marks observed on the inner diameter of the fan hub, running in the direction of rotation.
 - Micrometer measurement of width of gall marks (inches)
 - 0.250 in
 - 0.240 in
 - 0.120 in
 - 0.100 in
 - 0.350 in
 - 0.300 in
 - 0.550 in (possibly 2 linked marks)
 - 0.375 in
- Maintenance Records (extract pages sent from FAA)
 - 7.20.2018, TT 2201.3, fan R&R for other maintenance
 - 7.16.2019, 2267.3, RH magneto replaced (500 hr inspection)
- Backing plate bolts torque check (70 inlb spec)
 - All bolts turned 1/6 of a turn. Two bolt torque measured at 40 inlb.
 - Paint on bolts threads were still coated with OEM paint. (No signs of complete removal of nuts from bolts). Except the bolt that held the field added balance weights.
 - All bolts were retorqued to 70 inlb for the balance test.
- Hub attachment bolts (300 inlb spec)
 - 6 of 7 bolts had been previously loosened
 - 7th bolt torque check was less than 100 inlb
 - All bolts retorqued to 300 inlb for balance test
- Balance Test
 - Hub interior radius was polished with 320 sandpaper & scotch bright pad to remove surface deformations/burs. One spur was ground down with a Dremel tool.
 - Test revealed out of balance condition.
 - Removed field mounted balance weights. Bolt head washers associated with the field added weights not present. 14.1g of weight removed.
 - Added washers to bolt heads for 2nd balance test and added normal factory spacers. Balance test slightly out of spec balance condition.
- Cracked back plate bolt holes in 3 locations.
 - Removed bolts.
 - 2 locations revealed cracks thru the back plate
 - 1 location the crack had progressed completely to the outer diameter of the back plate, liberating the fragment from the back plate when the bolt was removed.

D. Maintenance Questions:

- o Helicopter overhauled ? (2200 hour OH per MM)
- o Hours since OH?
- o Fan replacement record?
- o Fan balancing record?
- o IO-540 engine crankshaft balance weight problems - result in fan in balance
- o Engine overspeed can result in fan rotating on the shaft.