96-18-22 Robinson

This Priority Letter Airworthiness Directive (AD) is prompted by an inflight failure of the main rotor gearbox (gearbox) on a French-registered Model R44 helicopter which resulted in an accident. An inspection of the gearbox revealed that the 18 bolts securing the gear, part number (P/N) C146-3, to the gear carrier assembly (gear carrier), P/N C268-2, had lost clamping torque due to the differences in the mating surface finish of these components. As the rough surface of the gear seated into the smoother surface of the gear carrier, the bolts lost clamping torque, resulting in fretting and failure of the gear carrier. Inspections of two other gearboxes that were returned to the manufacturer for overhaul and maintenance revealed that the bolts securing the gear to the gear carrier had also lost clamping torque.

Prior to October 31, 1995, Robinson Helicopter Company (Robinson) did not have a requirement in their receiving inspections to verify that the surface finish of the gear was completed in accordance with the type design. As a result, gears have been found to have an improper surface finish. This condition, if not corrected, could result in fatigue failure of the gear carrier within the gearbox, and subsequent loss of power to the main rotor which could lead to a forced landing.

Since an unsafe condition has been identified that is likely to exist or develop on other Robinson Model R44 helicopters of the same type design, this AD requires, before further flight, an inspection of the gearbox for pitting, elongated holes, or machining grooves (which appear similar to grooves on a phonograph record) that can be felt with a fingernail, and replacement of the gearbox with an airworthy gearbox if pits greater than 0.001-inch deep, elongated holes, or machining grooves are discovered on a mating surface; and replacement of the 18 bolts that attach the gear to the gear carrier with NAS6606-5 bolts and spacers, P/N C130-29.

This rule is issued under 49 U.S.C. Section 44701 (formerly section 601 of the Federal Aviation Act of 1958) pursuant to the authority delegated to me by the Administrator, and is effective immediately upon receipt of this priority letter.

96-18-22 ROBINSON HELICOPTER COMPANY : Priority Letter issued August 29, 1996. Docket No. 96-SW-25-AD.

Applicability: Model R44 helicopters, with main rotor gearbox (gearbox), part number (P/N) C006-1, Revisions A through P, installed, certificated in any category.

NOTE 1: This AD applies to each helicopter identified in the preceding applicability provision, regardless of whether it has been modified, altered, or repaired in the area subject to the requirements of this AD. For helicopters that have been modified, altered, or repaired so that the performance of the requirements of this AD is affected, the owner/operator must use the authority provided in paragraph (v) to request approval from the FAA. This approval may address either no action, if the current configuration eliminates the unsafe condition, or different actions necessary to address the unsafe condition described in this AD. Such a request should include an assessment of the effect of the changed configuration on the unsafe condition addressed by this AD. In no case does the presence of any modification, alteration, or repair remove any helicopter from the applicability of this AD.

Compliance: Required before further flight, unless accomplished previously.

To prevent loosening of the bolts securing the gear to the gear carrier, which could lead to fatigue failure of the gear carrier within the gearbox, and subsequent loss of power to the main rotor which could lead to a forced landing, accomplish the following:

(a) Drain the oil from the gearbox, part number (P/N) C006-1, and remove the gearbox from helicopter.

(b) Lay the gearbox on its side with input yoke up. Loosen the eight cap screws attaching the mast tube to the gearbox, but do not remove the screws. Remove the twelve bolts and six cap screws holding the sump and baffle in place (Figure 1). Note the location of ground wires.

(c) Gently remove the sump, using care to keep all shim stacks on their respective bolts. With the bolts still attached to the sump, replace the nuts on the bolts and finger-tighten to retain the shim stacks (shim stack is the same at each location). Discard the O-Ring.

(d) Bend out the locking tabs on lockwashers, P/N C269-1 and P/N C269-2, and remove the spanner nuts, P/N C153-1, from the main rotor shaft. A scrap main rotor hub bolt, or equivalent, inserted through the teeter hinge bolt hole in the main rotor shaft may be used to react torque; clamp the bolt in a vice or fasten to a work bench. Do not clamp the main rotor shaft. Retain the spanner nuts and discard the lockwashers.

(e) Remove the gear carrier from the main rotor shaft. Mark the gear and gear carrier for alignment during reassembly. Remove the 18 NAS6606-3 bolts attaching the gear to the gear carrier and remove the gear. Discard the bolts, washers, and nuts.

(f) Clean the main rotor shaft splines, shoulder, and threads with methyl-ethyl ketone or a comparable solvent that leaves no residue upon evaporation. Clean the gear and gear carrier with the solvent.

(g) Using a Scotch-Brite pad or 320 grit (or finer) sandpaper and a flat block, remove any fretting or stains from the mating surfaces of both the gear and the gear carrier. Visually inspect the mating surfaces around all 18 holes for signs of pitting, elongated holes, or machining grooves (which appear similar to grooves on a phonograph record) that can be felt with a fingernail. If pits greater than 0.001-inch deep, elongated holes, or machining grooves are discovered on a mating surface, replace the gearbox with an airworthy gearbox.

(h) Align the gear to the gear carrier and install NAS6606-5 bolts, spacers, P/N C130-29, and MS21042L6 nuts in 18 places (Figure 2). Keep the mating surfaces and hardware dry, clean, and free of oil. Torque the nuts to 40 ft.-lb. (includes self-locking torque) using the torquing sequence shown on Figure 3.

(i) Install the gear carrier on the main rotor shaft. Keep the main rotor shaft clamping shoulder and the gear carrier clean and dry during reassembly.

(j) For gearboxes, P/N C006-1, Revision P, use the following torques for paragraphs (k) and (m): 560 ft.-lb. to seat the gear carrier; 420-480 ft.-lb. for the first nut; and, 280-320 ft.-lb. for the second nut.

(k) Install an unused lockwasher, P/N C269-2. Apply anti-seize, P/N A257-9, or Loctite Anti-seize 767, to the main rotor shaft threads and to the chamfered-side face and threads of one spanner nut and install the nut with the chamfered side against the lockwasher. Verify the pins are aligned with the holes in the lockwasher. For Revision A through O gearboxes: Torque the nut to 370 ft.-lb. to seat the gear carrier; loosen the nut and retorque to 280-320 ft.-lb., as required to align the two lockwasher tabs with the nut. Bend the two tabs into the nut and visually inspect the edges of the bent tabs for cracks.

(l) Before installing the unused lockwasher, P/N C269-1, note that the edges are sharp on one side and rounded on the other. De-burr the sharp edges on two opposite tabs (Figure 2). This will reduce the chance of cracking when these tabs are bent. Install the lockwasher with the de-burred edges toward the first nut.

(m) Apply anti-seize, P/N A257-9, or Loctite Anti-seize 767, to the chamfered-side face and threads of the second nut. Align the two de-burred tabs with the first nut and install the second nut with the chamfered side against the lockwasher. Hand-tighten the nut to hold the lockwasher in place. Bend the two de-burred tabs to lock the first nut. For Revision A through Revision O gearboxes: Torque the second nut to 180-220 ft.-lb., as required to align two washer tabs. Bend the two tabs to lock the second nut.

(n) Verify that all six bent tabs properly engage the nuts and visually inspect the edges of the bent tabs for cracks. Replace any cracked lockwashers. Remove any excess anti-seize.

(o) Lubricate the unused O-Ring, P/N C215-279, with oil, P/N A257-2, and install the O-Ring on the sump. Clean and visually inspect the sealing surface of the gearbox housing. Lightly lubricate the sealing surface with oil, P/N A257-2.

(p) Install the sump on the gearbox housing, using care not to damage the O-Ring.

(q) Install the baffle, P/N C747-1, and all the sump attaching hardware. Ensure all the sump bolts have the same shim stack as before. The threaded cap screws can damage the shim stack if not installed properly. Install the ground wires using NAS6604-15, -16, or -17 bolts (the other 11 bolts are NAS6604-15 bolts).

(r) Torque the sump bolts and drain plug assembly as follows: Twelve lock nuts on NAS6604 bolts, 120 in.-lb. (includes locking torque); six NAS1352-4H16P cap screws, 120 in.-lb. and safety wire; A7260 drain plug assembly large hex, 150 in.-lb. and safety wire; small hex, 75 in.-lb. and safety wire.

(s) Torque the eight NAS1356-6H24P cap screws attaching the mast tube to the gearbox to 220 in.-lb. and safety wire.

(t) Reinstall the gearbox. Fill the gearbox with oil, P/N A257-2, to the middle of the sight glass. Perform the main rotor balance procedures.

(u) Report the serial number of any gearbox that has been replaced in accordance with paragraph (g) of this AD, within 10 days after the inspection to Mr. Randall Erwin, Principal Inspector, Los Angeles Manufacturing Inspection District Office, FAA, Northwest Mountain Region, 3960 Paramount Blvd., Lakewood, California 90712, telephone (310) 627-5294, fax (310)

627-5293. Reporting requirements have been approved by the Office of Management and Budget and assigned OMB control number 2120-0056.

(v) An alternative method of compliance or adjustment of the compliance time that provides an acceptable level of safety may be used if approved by the Manager, Los Angeles Aircraft Certification Office, FAA. Operators shall submit their requests through an FAA Principal Maintenance Inspector, who may concur or comment and then send it to the Manager, Los Angeles Aircraft Certification Office.

NOTE 2: Information concerning the existence of approved alternative methods of compliance with this AD, if any, may be obtained from the Los Angeles Aircraft Certification Office.

(w) Compliance with Robinson Helicopter Company Service Bulletin SB-15, dated August 2, 1996, and the reporting requirements contained in paragraph (u) of this AD is an acceptable means of compliance with this AD.

(x) Special flight permits may be issued in accordance with sections 21.197 and 21.199 of the Federal Aviation Regulations (14 CFR 21.197 and 21.199) to operate the helicopter to a location where the requirements of this AD can be accomplished.

(y) Priority Letter AD 96-18-22, issued August 29, 1996, becomes effective upon receipt.

FOR FURTHER INFORMATION CONTACT: Ms. Elizabeth Bumann, Aerospace Engineer, FAA, Los Angeles Aircraft Certification Office, 3960 Paramount Blvd., Lakewood, California 90712; telephone (310) 627-5265, fax (310) 627-5210.

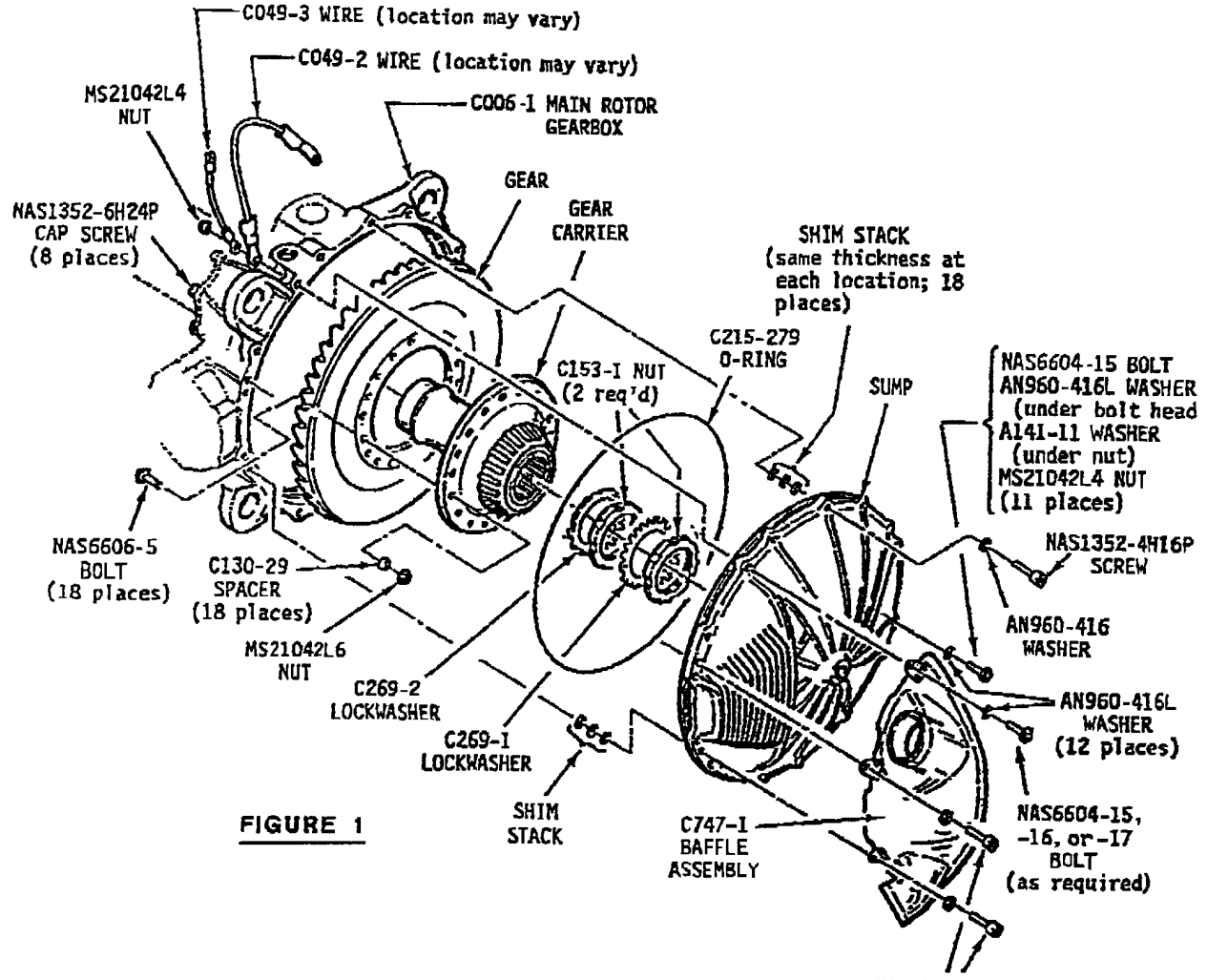


FIGURE 1

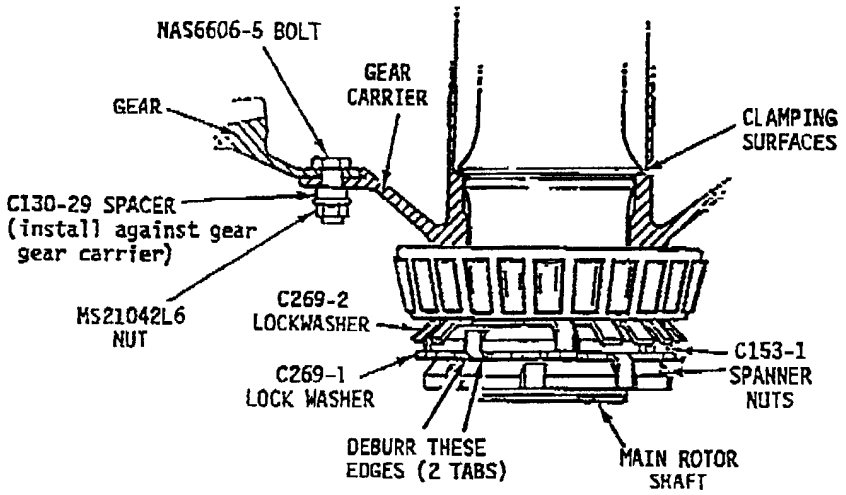
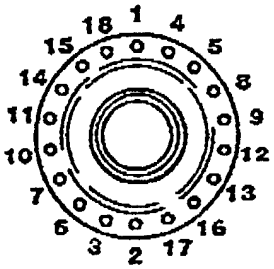


FIGURE 2



GEAR CARRIER TORQUING SEQUENCE

FIGURE 3