



HUGHES SERVICE INFORMATION NOTICE

NOTICE NO. N-101

DATE 27 March 1972

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SUBJECT: SHIM INSTALLATION - TAIL ROTOR HUB AT
FORK (TEETER) BEARINGS; REPLACEMENT -
TAIL ROTOR FORK BEARINGS

MODELS AFFECTED: All 269 Series Helicopters equipped with
P/N 269A6034 Low Tip Speed (LTS) Tail
Rotor Assembly

TIME OF COMPLIANCE: At owners and operators discretion

PREFACE: The information given in this Service Information Notice lists a procedure for shimming the tail rotor hub, to adjust for tail rotor out-of-balance condition caused by excessive play between inner and outer races of the delta hinge (teeter) fork bearings, and/or design tolerance build up between the hub and fork assemblies.

The optional shimming and balancing procedures outlined may be performed in the field. A procedure for field replacement (if required) of the tail rotor fork bearings is also provided in Part III of this notice.

It is noted that a tail rotor dynamic balancing kit, a main rotor tracking kit, and a special bushing wrench are required for the field fix. In addition, an auxiliary 24-volt power source is required for dynamic balancing of tail rotor assembly installed on helicopter with a basic 12-volt electrical system.

Extreme care and caution must be exercised to prevent damage to the tail rotor strap pack, when bench handling and assembling the hub and drive fork assemblies.

Reference

269 Series - Basic Handbook of Maintenance Instructions, Revised 1 February 1972

CUSTOMER SERVICE DEPARTMENT • HUGHES TOOL COMPANY • AIRCRAFT DIVISION • CULVER CITY, CALIFORNIA

TOOLS & EQUIPMENT

<u>Nomenclature</u>	<u>Part No. or Description</u>	<u>Mfgr</u>
Dynamic Balancing Kit, Tail Rotor	369A9999	HTC-AD
Tracking Kit, Main Rotor	369A9926-5	HTC-AD
Wrench, Bushing	369A1600-80902	HTC-AD
Pin, Alignment	1/4-inch drill rod	Commercial
Press, Arbor		Commercial
Wrench, Torque		Commercial
Micrometer, Inside or Calipers		Commercial
Micrometer, Outside or Calipers		Commercial
Oven or Heat Lamps or equivalent		Commercial
Power Source, Auxiliary - 24 volt		Commercial

MATERIALS

Dry Ice		Commercial
Sealing Compound	Loctite Grade A	Loctite Inc

PARTS LIST

<u>Nomenclature</u>	<u>Part No.</u>	<u>Qty</u>	<u>Mfgr</u>
*Shim	369A1717	A/R	HTC-AD
Washer, Tang	HS1551-275	1	HTC-AD
Pin, Cotter	MS24665-151	1	Commercial
**Bearing, Fork	369A1709	2	HTC-AD

*See Table 1 for shim required

**As required

PART I - SHIM INSTALLATION - TAIL ROTOR HUB AND DRIVE FORK

a. Remove tail rotor assembly, per Section 9 of Basic HMI; removal of pitch control assembly is not required.

CAUTION

1. During bench handling, do not allow blade pitch travel on hub to exceed pitch limitations shown in Figure 1. Rotating blades to excessive pitch angles may result in undetected damage to tension-torsion strap assembly.
2. Exercise care when removing teeter bolt from hub, to prevent damage to strap pack laminates by bolt threads.

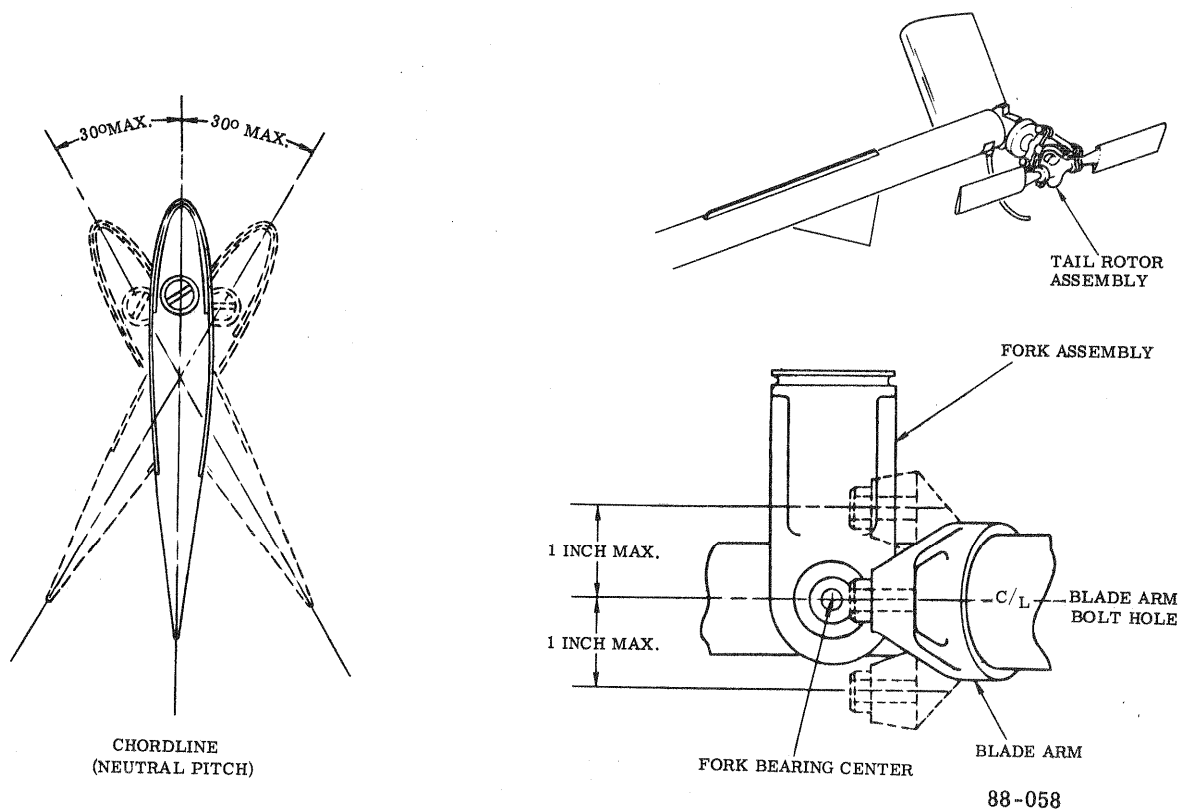
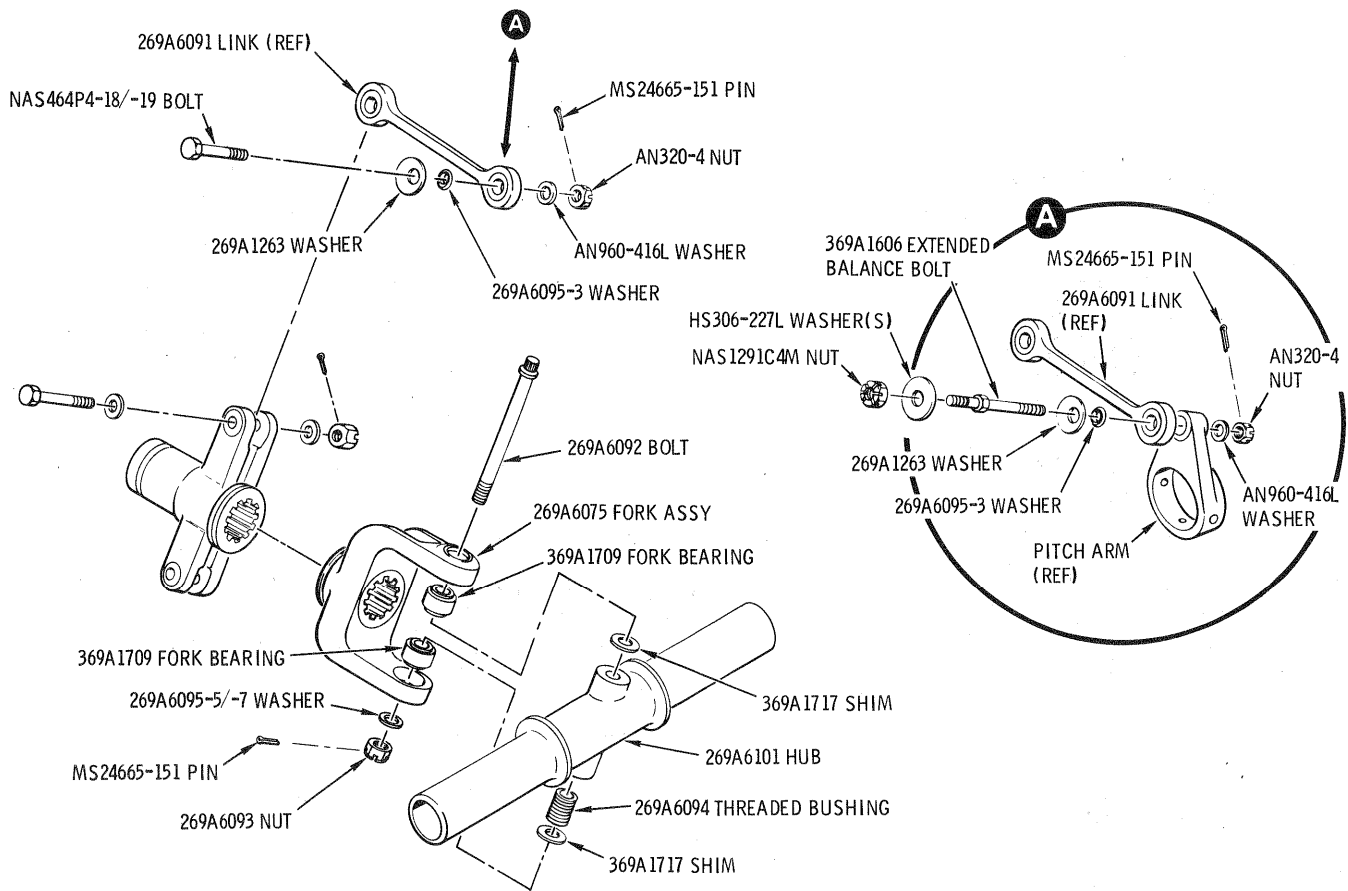


Figure 1. Blade Pitch Travel Limitations for Bench Handling



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Figure 2. Shim Installation - Tail Rotor Hub and Drive Fork

- b. Carefully remove teeter bolt, nut, washer, and shims attaching hub to drive fork. Insert alignment pin in hub from opposite side to accomplish removal of teeter bolt. Retain pin in hub through strap pack assembly until reinstallation of teeter bolt.
- c. Using special bushing wrench, check for proper torque (60 to 65 inch pounds) on threaded bushing to ensure that bushing is correctly seated against shoe of tension-torsion strap assembly.
- d. Check that teeter bearings are seated properly against shoulders of drive fork bores (gap not exceeding 0.003 inch permissible between bearing outer race and bearing bore shoulder).
- e. Check that excessive looseness does not exist between inner and outer bearing races (axial play up to 0.015 inch and/or radial looseness up to 0.008 inch is usually the maximum tolerance at which vibration condition becomes apparent).

NOTE

Improper seating of bearing or excessive looseness between bearing races requires replacement of fork bearings, per Part III of this notice.

- f. Determine proper thickness of shims as follows:
 1. Using outside micrometer or calipers, measure distance from solid shoulder on hub to opposite side (face of threaded bushing). Label this dimension "A". Use the alignment pin installed in hub and through strap pack and bushing bores to help ensure alignment.

NOTE

Repeat measurement at points 180° opposite initial measuring points on bearing inner races. Add both dimensions and divide by two (2) to obtain average distance between inner bearing races.

2. Using inside micrometer or calipers, measure distance between inner races (balls) of teeter bearings in drive fork. Label this dimension "B". The bearing faces must be parallel and square to the bores in line. This alignment can be accomplished by installing teeter bolt in both bearings as an alignment tool.

3. Divide dimension "B" by 2 and label the result "C".
4. Subtract 1.126 from Dimension "A" and label the result "D".
5. Subtract 1.126 from "C" and add 0.006; select this amount of shims to install on the solid side of hub (see table 1).
6. Subtract "D" from "C" and add 0.006; select this amount of shim to add to the threaded bushing side of the hub.

NOTE

If it is not possible to meet shim values exactly, use nearest smaller value available.

EXAMPLE:

- | | | | |
|--|-------------------------|--------------|------------------------------|
| 1. Measure hub | | <u>2.250</u> | Dimension "A" |
| 2. Measure between fork bearings | | <u>2.300</u> | Dimension "B" |
| 3. Divide "B" by 2 | $2.300 \div 2 = 1.150$ | | Dimension "C" |
| 4. Subtract 1.126 from "A" | $2.250 - 1.126 = 1.124$ | | Dimension "D" |
| 5. Subtract 1.126 from "C" and add 0.006 | $1.150 - 1.126 = 0.024$ | <u>0.006</u> | |
| | | 0.030 | Shim for solid side of hub |
| 6. Subtract "D" from "C" and add 0.006 | $1.150 - 1.124 = 0.026$ | <u>0.006</u> | |
| | | 0.032 | Shim for bushing side of hub |

- g. Reassemble tail rotor drive fork and hub assemblies as follows:

CAUTION

During bench handling, do not allow blade pitch travel on hub to exceed pitch limitations shown in figure 1. Also exercise care when inserting threaded teeter bolt through hub and strap pack.

1. Insert teeter bolt into fork bearing at side opposite threaded bushing in hub, displacing alignment pin to align hub and fork assembly on opposite side.
 2. Carefully insert each shim in its respective space between hub and fork bearings, by alternately displacing the teeter bolt and alignment pin to clear the shim spaces. Roll or slide shims into place by rolling the opposite bearing.
 3. When shims are properly positioned, seat bolt head against fork bearing, taking care not to damage shims with bolt threads while bolt is being pushed into place.
 4. Install washer and nut on bolt and tighten nut to torque value of 170 to 210 inch pounds. Safety nut with cotter pin.
 5. Pivot hub within fork throughout the full range of flapping movement. Moderate to heavy hand pressure may be required to pivot the hub; however, there should not be any bearing roughness when hub is pivoted from one extreme to another.
- h. Reinstall tail rotor assembly, per Section 9 of Basic HMI.

PART II DYNAMIC BALANCING - TAIL ROTOR ASSEMBLY

- a. Perform adjustment of tail rotor balance (with dynamic balancing kit), per Section 9 of Basic HMI.

CAUTION

The shimming procedure assumes that the accumulative tolerances either cancel out or do not occur. No allowance is made for discrepant parts. If visual examination of parts discloses apparent non-symmetry, this condition shall be remedied or discrepant parts replaced.

Perform first run up in a cautious manner, so that vibrations from an out-of-balance tail rotor assembly will not be destructive.

NOTE

If the full complement of weights at the pitch horn does not correct the balance, relocate shims at hub as follows:

1. Transfer shims from side that has weights on pitch horn and add shims to opposite side. Use alignment pin, per step b. of Part I.
2. One thin (0.016) weight or washer is equivalent to 0.001" of shim. Thus, if ten (10) thin weights are on pitch horn, transfer 0.010" of shims.

PART III BEARING REPLACEMENT - TAIL ROTOR DRIVE FORK

- a. Using arbor press and suitable adapters, press out unserviceable bearings through fork center opening. Support fork on inside so that press force is not carried through fork.
- b. Brush an even coating of Loctite sealing compound over outer race of replacement bearing, taking care not to allow compound to enter bearing ends or working surfaces.

NOTE

Ensure that the bearing OD is clean before applying compound and that bearing bore is clean before installing bearing(s).

If fit is metal-to-metal or looser, use Loctite sealant. However, if press fit is encountered, shrink bearing by packing in dry ice and heat drive fork in oven or equivalent for five minutes at $275^{\circ} \pm 25^{\circ} \text{F}$ ($135^{\circ} \pm 12^{\circ} \text{C}$). Do not use Loctite if bearing is cooled and drive fork is heated.

- c. Use an arbor press to seat replacement bearing firmly against bearing shoulder of fork; be sure to exert all installation pressure against bearing outer race only.

CAUTION

Do not apply pressure against bearing inner race.
Do not reinstall any previously installed bearing; the bearing will have been rendered unserviceable by the removal pressure applied against the inner race.

d. As applicable, wipe away any excess sealing compound; allow sealing compound to cure for length of time specified on compound container, before reassembling the fork and hub assemblies, per Part I of this Notice.

WEIGHT AND BALANCE DATA

Weight and balance not affected.

Table 1. Spacing Shims - Tail Rotor Hub and Drive Fork

369A1717 Spacing Shim - Tail Rotor Hub and Drive Fork

<u>Configuration</u>	<u>Thickness</u>
-53	0.010
-55	0.011
-57	0.012
-59	0.013
-61	0.014
-63	0.015
-65	0.016
-67	0.017
-69	0.018
-71	0.019

NOTE: Shims are shipped five (5) to a package

