URGENT

TB 1–1520–238–20–104

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

ALL AH–64 SERIES AIRCRAFT FOR INITIAL AND RECURRING INSPECTIONS OF THE TAIL ROTOR HANGER BEARING NUTATION

Headquarters, Department of the Army, Washington, D. C.
18 February 2000

NOTE

THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.

1. **Priority Classification. Urgent**.

a. Aircraft in Use. Upon receipt of this Technical Bulletin (TB) the condition status symbol of the cited aircraft will be changed to a **red horizontal dash //–//.** The **red horizontal dash //–//** entry shall state “Inspect the Tail Rotor Hanger Bearings Nutation IAW TB 1–1520–238–20–104 within the next 10 flight hours or no later than (NLT) 28 Feb 00”. The **red horizontal dash //–//** may be cleared when the inspections of para 8 are completed. The affected aircraft shall be inspected as soon as practical but NLT 10 flight hours or 28 Feb 00. Failure to comply with the requirements of this message within the time frame specified will cause the status symbol of the affected aircraft to be upgraded to a **red //X//.**

b. Aircraft in Depot Maintenance. Aircraft will not be issued until compliance with this TB has been completed.

c. Aircraft Undergoing Maintenance. Aircraft will not be issued until compliance with this TB has been completed.

d. Aircraft in Transit. For aircraft away from home station, this message authorizes a one time flight, with intermediate stops, to return to the nearest secured maintenance facility/home station.

(1) Surface/Air Shipment. Same as para 1a.

(2) Ferry Status.

(a) Same as para 1a.

(b) Those aircraft that have a DD 250 and are at Boeing will be inspected prior to ferry to final destination.

e. Maintenance Trainers (Category A and B). Same as para 1a.

f. Component/Parts in Stock Including War Reserves at All Levels (Depot and Others). Upon receipt of this TB, the material condition tags of all items in all condition codes listed in para 6 and 7 shall be annotated to read (TB 1–1520–238–20–104), “Inspection of Tail Rotor Hanger Bearings Nutation, not complied with”.

This TB supersedes USAATCOM Safety of Flight Message 280022Z Jan 00 (AH–64–00–ASAM–09).

(1) Wholesale Stock – Report receipt of this TB IAW para 14c(1). Upon receipt of this TB all serviceable items (condition codes //A//, //B//, //C//, //D//, and //E//) listed in para 6 and 7 located in wholesale depot storage shall be placed in condition code //J// and tagged with a suspended tag/label– materiel, DD Form 1575/DD Form 1575–1. Do not remove original condition tags. Report compliance with this TB IAW para 14D(1).

(2) Retail Stock – Report receipt of this TB IAW para 14c(2). Upon Receipt of this message Commanders and others maintaining retail stock at installation level and below shall contact the supported aviation unit to perform the inspection required by para 8 and the correction procedures of para 9 on discrepant materiel. Disposition of discrepant materiel will be IAW para 10. Report compliance with this TB IAW para 14d(2)

g. Components/Parts in work (Depot Level and Others) – Items listed in para 6 in work will not be issued until compliance with this TB.

2. **Task/Inspection Suspense Date.** Complete the inspection IAW para 8 within the next 10 flight hours, but NLT 28 Feb 00, and report IAW para 14b as applicable.

3. **Reporting Compliance Suspense Date**. N/A.

4. **Summary of the Problem**.

a. A number of hanger bearing assemblies reworked by Corpus Christi Army Depot (CCAD) have been found to be below minimum nutation torque requirements. This problem has been corrected at CCAD, however, approximately 150 suspect hanger bearing assemblies have been delivered.

b. Manpower/Downtime and funding impacts see para 12..

c. The purpose of this TB is to:

(1) Locate, inspect and repair suspected improperly assembled hanger bearing assemblies.

(2) Add nutation and nut torque check requirements to TM 1–1520–238–23, TM 1–1520–238–PM, and AH–64D IETM.

5. **End Items to be inspected**. All AH–64 series aircraft.

6. **Assembly Components to be Inspected**.

NOMENCLATURE	PART NUMBER	NATIONAL STOCK NUMBER
Forward Hanger Bearing Assembly	7–31135008	3130–01–188–4531
Forward Hanger Bearing Assembly	7–31135008–3	3130–01–333–8491
Forward Hanger Bearing Assembly	7–31135008–5	3130–01–333–8491
Aft Hanger Bearing Assembly	7–21135007	3130–01–161–3962
Aft Hanger Bearing Assembly	7–21135007–3	3130–01–333–8490
Aft Hanger Bearing Assembly	7–21135007–5	3130–01–333–8490

7. **Parts to be Inspected**.

a. Forward hanger bearing assembly by serial number:

011837–1143–U	011837–1246–U	011837–1561–U	011837–1787	011837–1789
011837–1810	011837–1844	011837–1868	011837–1891	011837–1898
011837–1899	011837–1913	011837–1939	011837–1954	011837–1971
011837–1975	011837–2042	011837–2153	011837–2201	011837–2251
011837–2284	11837–1057–U	11837–1062–U	11837–1067–U	11837–1179–U
11837–1222–U	11837–1233–U	11837–1243–U	11837–1256–U	11837–1273–U
11837–1286–U	11837–1312–U	11837–1338–U	11837–1352–U	11837–1415–U
11837–1422–U	11837–1426–U	11837–1435–U	11837–1441–U	11837–1451–U
11837–1458–U	11837–1464–U	11837–1465–U	11837–1485–U	11837–1493–U
11837–1520–U	11837–1544–U	11837–1574–U	11837–1590–U	11837–1598–U
11837–1601–U	11837–1602–U	11837–1642–U	11837–1644–U	11837–1670–U
11837–1734	11837–1737	11837–1748	11837–1785	11837–1793
11837–1849	11837–2148			

b. AFT hanger bearing assembly by serial number:

011837–1207–U	011837–1895	011837–1989	011837–2110	011837–2222
11837–1054–U	11837–1064–U	11837–1089–U	11837–1120–U	11837–11244
11837–1143–U	11837–1171–U	11837–1223–U	11837–1224–U	11837–1227–U
11837–1303–U	11837–1337–U	11837–1338	11837–1357–U	11837–1371–U
11837–1419–U	11837–1428–U	11837–1441–U	11837–1458–U	11837–1495–U
11837–1521–U	11837–1572–U	11837–1597–U	11837–1620–U	11837–1643–U
11837–1656–U	11837–1658–U	11837–1659–U	11837–1664–U	11837–1668–U
11837–1695–U	11837–1697–U	11837–1711C	11837–1722–U	11837–1731
11837–1741	11837–1742	11837–1751	11837–1763	11837–1792
11837–1865	11837–1890	11837–1925	11837–1938	11837–1948
11837–1971	11837–1975	11837–1978	11837–1990	11837–1995
11837–1997	11837–2015	11837–2032	11837–2040	11837–2056
11837–2068	11837–2140	11837–2173	11837–2197	11837–2198
11837–2216	11837–2233	11837–2273	11837–2274	11837–2284
11837–2336	11837––2338	11837––2329		

8. **Inspection Procedures**.

a. For all hanger bearing assemblies listed in para 7.

(1) AMCOM Logistic Assistance Representatives (LAR) will physically inspect aircraft and supply facilities to determine location of suspect hanger bearing assemblies listed in para 7.

(2) Upon indentification of suspect hanger bearing assemblies. Depot teams (CCAD–CONUS/ OLR Europe) will verify the proper nutation torque.

b. Upon installation of any hanger bearing assemblies and at each 250 Hour Phase Maintenance Inspection– AVUM/AVIM personnel shall verify nut torque and check nutation IAW this para using locally fabricated AH–64 Hanger Bearing Nutation/Torque Reactor Tool (tool number AH64HBTN), Figure 1.

(1) Perform nutation check as follows:

(a) Remove drive shafts and tail rotor couplings per TM 1–1520–238–23 or Longbow IETM.

(b) Install AH–64 Nutation/Torque Reactor Tool. Ensure that the small flange is pointed inward toward the hanger bearing, see Figure 2. Attaching the tool with the flange pointed away from the bearing will add to the torque arm and result in an incorrect nutation check.

NOTE

Nutation is the angular movement of the bearing off of its center axis. It is not rotation.

(c) Attach a torque wrench, to the small flange with the 3/8 inch attachment hole.

(d) Check the breakaway nutation torque in three planes (12, 4, and 8 o'clock positions) from the centered starting position. Ensure that the breakaway nutation torque is between 10 and 300 INCH POUNDS in all three planes.

(2) Perform the nut torque check as follows:

(a) Inspect NAS1022C14 nut for broken or missing torque stripe. If torque stripe is intact, inspection is complete.

(b) If torque stripe is missing or broken, verify 700–800 inch pound torque by turning nut in clockwise direction. Use the AH–64 Nutation/Torque Reactor Tool and 1/2 inch drive breaker bar to restrain hanger bearing flange.

(c) If nut turns before reaching 700 INCH POUNDS replace nut. Torque new nut to 700–800 INCH POUNDS above running torque. Apply torque stripe.

9. **Correction Procedures.** If any forward or aft hanger bearing assembly break–away nutation torque is less than 10 INCH POUNDS replace hanger bearing assembly. If any forward or aft hanger bearing assembly break–away nutation torque is over 300 INCH POUNDS, disassemble and clean the bearing as follows:

a. Record the torque value on the DA Form 2408–5–1, regardless of whether it passes or fails. Identify this measurement as "initial nutation torque". If disassembly, cleaning, and reassembly produces an acceptable nutation torque value, record that value also. Identify this measurement as "installation nutation torque".

b. The following procedures shall be used to perform the aft hanger bearing cleaning. See Figure 3 for item call out numbers.

(1) Secure hanger bearing to work bench. Match mark flanges, bearing retainer, and mount.

(2) Install the nutation tool onto the hanger bearing.

(3) Remove self locking nut (1), pilot spacer (2), input flange (4), and bearing spacer (5) from the hanger bearing subassembly, use a 1/2 inch breaker bar attached to the nutation tool as a torque reactor.

(4) Remove six bolts (7), six self–locking nuts (8), and 12 flat washers (9). Discard self–locking nuts.

(5) Tag and remove spacer shims (11), output flange (3), two bearing retainers (12), and ball bearing (13) from bearing hanger (10). Out put flange (3), one retainer (12), and ball bearing (13) will come off as an assembly.

(6) Inspect bearing for nicks, scratches none allowed.

(7) Inspect bearing for corrosion pits, no measurable pits allowed. Surface corrosion is allowable.

(8) Use Scotch Brite (NSN 7920–01–146–5127) to clean corrosion and debris from the bearing surface. Clean bearing surface and teflon race using cheese cloth (NSN 8305–01–125–0725) and alcohol (NSN 6810–00–205–6786).

(9) Install same spacer shims (11), output flange (3), two bearing retainers (12), and ball bearing (13) onto bearing hanger (10) in same order and orientation as removed.

(10) Install six bolts (7), six self locking nuts (item 8, P/N MS21042–4), and 12 flat washers (9) with bolt heads on the same side as the spacer shims.

(11) Torque six self–locking nuts to 65–75 INCH POUNDS above running torque and apply torque stripes.

(12) Install bearing spacer (5) flat side in, over output flange (3) and against ball bearing (13).

(13) Install spacer shims (11), output flange (3), two bearing retainers (12), bearing spacer (5), and ball bearing (13) onto bearing hanger (10) in same order and orientation as removed.

(14) Install pilot spacer (2) over input flange (4) with flat side facing out.

(15) Install self locking nut (1) onto threaded end of input shaft (4) and finger tighten.

(16) Ensure that self–locking nut (1), P/N NAS1022C14, has a run–on torque of at least 70 INCH–POUNDS.

(17) Torque self–locking nut (1) to 700 to 800 INCH POUNDS above running torque and apply a torque stripe, use a 1/2 inch breaker bar attached to the nutation tool as a torque reactor.

(18) Recheck the breakaway nutation torque IAW paragraph 8.b.

c. The following procedures shall be used to perform the forward hanger bearing cleaning. See Figure 4 for item call out numbers.

(1) Secure hanger bearing to work bench. Match mark flanges, bearing retainer, and mount.

(2) Install the nutation tool the hanger bearing.

(3) Remove self locking nut (1), pilot spacer (2), input flange (4), and bearing spacer (5) from the hanger bearing subassembly, use a 1/2 inch breaker bar attached to the nutation tool as a torque reactor.

(4) Remove six bolts (7), six self–locking nuts (8), and 12 flat washers (9). Discard self–locking nuts.

(5) Tag and remove spacer shims (12), output flange (3), two bearing retainers (13), and ball bearing (14) from bearing hanger supports (10 and 11). Out put flange (3), one retainer (13), and ball bearing (14) will come off as an assembly.

(6) Inspect bearing for nicks, scratches none allowed.

(7) Inspect bearing for corrosion pits, no measurable pits allowed. Surface corrosion is allowable.

(8) Use Scotch Brite (NSN 7920–01–146–5127) to clean corrosion and debris from the bearing surface. Clean bearing surface and teflon race using cheese cloth (NSN 8305–01–125–0725) and alcohol (NSN 6810–00–205–6786).

(9) (9). Install same spacer shims (12), output flange (3), two bearing retainers (13), and ball bearing (14) onto bearing hangers (10 and 11) in same order and orientation as removed.

(10) Install six bolts (7), six self locking nuts (item 8, P/N MS21042–4), and 12 flat washers (9) with bolt heads on the same side as the spacer shims.

(11) Torque six self–locking nuts to 65–75 INCH POUNDS above running torque and apply torque stripes.

(12) Install bearing spacer (5) flat side in, over output flange (3) and against ball bearing (14).

(13) Install spacer shims (12), output flange (3), two bearing retainers (13), bearing spacer (5), and ball bearing (14) onto bearing hanger (10 and 11) in same order and orientation as removed.

(14) Install pilot spacer (2) over input flange (4) with flat side facing out.

(15) Install self locking nut (1) onto threaded end of input shaft (4) and finger tighten.

(16) Ensure that self–locking nut (1), P/N NAS1022C14, has a run–on torque of at least 70 INCH–POUNDS.

(17) Torque self–locking nut (1) to 700 to 800 INCH POUNDS above running torque and apply a torque stripe, use a 1/2 inch breaker bar attached to the nutation tool as a torque reactor.

(18) Recheck the breakaway nutation torque IAW paragraph 8.b.

10. **Supply/Parts and Disposition.**.

a. Parts Required. Items cited in para 6 and 7 may be required to replace defective items.

b. Requisitioning Instructions. Requisition replacement parts using normal supply procedures. All the requisitions and turn–ins shall use project code (CC 57–59) “XGD” (X–ray–Golf–Delta).

NOTE

Project code “XGD” is required to track and establish a data base of stock fund expenditures incurred by the field as result of this TB. Units will also provide requisition information to The Apache War Room by e–mail at wr–im@redstone.army.mil, datafax DSN 746–9541 or (256) 876–9541.

c. Bulk and Consumable Materials.

NOMENCLATURE	PART NUMBER	NATIONAL STOCK NUMBER
Nut	NAS1022C14	5310–00–723–3224

d. Disposition.

(1) CONUS: Expedite Turn–In through installation level (SARSS). The Installation will notify the Apache War Room by e–mail at wr–im@redstone.army.mil, datafax DSN 746–9541 or (256) 876–9541.

(2) OCONUS: Expedite Turn–in through installation level (SARSS). The Installation will notify the Apache War Room by e–mail at wr–im@redstone.army.mil, datafax DSN 746–9541 or (256) 876–9541.

(3) A CAT II PQDR is required for any forward or aft hanger bearing assembly not passing para 8 inspections. Submit CAT II PQDR IAW DA PAM 738–751, para 3–2.B(2).(c), dated 15 March 1999.

e. Disposition of Hazardous Materiel. IAW Environmental Protection Agency directives as implemented by you servicing environmental coordinator (AR 200–1).

11. **Special Tools, Jigs and Fixtures Required**. Locally fabricated AH–64 hanger bearing nutation/Torque Reactor Tool. Contact the Apache War Room IAW para 16b for fabrication instructions.

12. **Application**.

a. Category of Maintenance.

(1) Initial inspection, IAW para 8b– LAR with Depot Team Assistance.

(2) Recurring Inspection, IAW para 8b– AVUM.

b. Estimated Time Required.

(1) To conduct the inspection IAW para 8–

(a) Total of 1.0 man–hours using 1 person.

(b) Total of 1 hour downtime for one end item.

(2) To conduct the correction procedures–

(a) Total of 8.0 man–hours using 2 persons.

(b) Total of 4.0 hours of downtime for one end item.

c. Estimated Cost Impact of Stock Fund Items to the Field.

(1) For inspection IAW 8a. N/A.

(2) For inspection IAW 8b–

Nomenclature	Part Number	QTY.	Cost Each	Total Cost
Forward Hanger Bearing	7–311350008–3/–5	1	$ 5,954.00	$ 5,954.00
AFT Hanger Bearing	7–211340007–3/–5	1	$ 4,146.00	$ 4,146.00

Total Cost Per Aircraft = $ 10,100.00

d. TB/MWOs to Be Applied Prior to or Concurrently with this Inspection. N/A.

e. Publications Which Require Change as a Result of This Inspection.– The following publications shall be changed to reflect this TB, A copy of this TB shall be inserted in the appropriate TM as authority to implement the change until printed change is received.

(1) TM 1–1520–238–23.

(2) TM 1–1520–238–PM.

(3) Longbow IETM.

13. **References**

a. TM 1–1520–238–23, Aviation Unit and Intermediate Maintenance Manual for AH–64A Apache Attack Helicopter, 16 May 94.

b. TM 1–1520–238–PM, Phased Maintenance Manual for AH–64A Apache Attack Helicopter, 30 June 94.

c. Interactive Electronic Technical Manual (IETM): TM 1–1520–Longbow/Apache IETM, CD No. 1, Version 3.1.2, Data 19 Nov 98, CD Date 1 Dec 98 or subsequent.

14. **Recording and Reporting Requirements**.

a. Upon entering requirements of this TB on DA Form 2408-13-1 on all subject MDS aircraft, forward a priority message, datafax or e-mail to Commander, AMCOM, ATTN: AMSAM-SF-A (SOF Compliance Officer), Redstone Arsenal, AL 35898–5000 IAW AR 95-1. datafax number is DSN 897-2111 or commercial (256) 313-2111. E-Mail address is “safeadms@redstone.army.mil”. The report will cite this TB number, date of entry in DA Form 2408-13-1, the aircraft mission design series, and serial numbers of aircraft in numerical order.

b. Task/Inspection reporting suspense date (aircraft)–Upon completion of inspection, units will forward a priority message to: Apache War Room IAW para 16b. The report will cite this message number, date of inspection, aircraft serial number, aircraft and compnent hours and results of the inspection. Inspection and reports will be completed no later than 7 days after the task/inspection suspense date.

c. Reporting compliance suspense date (spares)–

(1) Materiel in Wholesale Depot Storage – Report receipt of this TB by e–mail or datafax to the wholesale materiel (spares) point of contact listed in para 16C within 3 working days from the date of this TB. Provide local point of contact.

(2) Materiel in Retail Storage – Report receipt of this TB by e–mail or datafax to the Logistical point of contact listed in para 16B within 7 days from the date of this message. Provide local point of contact.

d. Task/Inspection reporting suspense date (spares)–

(1) Materiel in Wholesale Depot Storage – Report compliance with this message to the Wholesale materiel point of contact (Spares) listed in para 16C within 7 days of the date of this TB on DD form 1225. Provide the cost of compliance with this message to include an estimate of the Cost Reimbursable Funding required to move serviceable items on hand listed in para 6 and 7 to a work area, unpack the materiel, repack the materiel after inspection to return the materiel to storage, as appropriate.

(2) Materiel in Retail Storage – Report receipt of this TB by e–mail or datafax to the Logistical point of contact listed in para 16B within 14 days from the date of this message. Report quantity inspected by condition code and the resulting condition code.Report by e–mail or datafax. Provide local point of contact.

e. The following forms are applicable and are to be completed in accordance with DA PAM 738-751,15 June 1992:

NOTE

ULLS–A users will use applicable “E” forms

(1) DA Form 2408-5–1, Equipment Modification Record (Fwd Hanger Bearing Assy and Aft Hanger Bearing Assy).

(2) DA Form 2408-13, Aircraft Status Information Record.

(3) DA Form 2408-13-1, Aircraft Inspection and Maintenance Record.

(4) DA Form 2408-15, Historical Record for Aircraft. (Annotate the serial number of the Fwd Hanger Bearing Assy and Aft Hanger Bearing Assy inspected.)

(5) DA Form 2408-16, Aircraft Component Historical Record.

(6) DA Form 2408-18, Equipment Inspection List. The 250 Phase Inspection will be carried on this form until incorporated into the TM. ULLS–A users will use one of their 800 inspection numbers.

(7) DA Form 2410, Component Removal and Repair/Overhaul Record.

(8) DA Form 1574/ DD Form 1574–1 Serviceable Tag/Label – materiel (Color Yellow). Annotate remarks block with “Inspected Serviceable IAW SOF AH–64–00–ASAM– 09.”

(9) DD Form 1575/ DD Form 1575–1, Suspended Tag/Label – materiel (Color Brown). Annotate Remarks Block with “Suspended IAW SOF AH–64–00–ASAM– 09.”

(10)DD Form 1577–2/ DD Form 1575–3, Unserviceable (Reparable) Tag/Label – materiel (Color Green). Annotate remarks block with “ Unserviceable IAW SOF AH–64–00–ASAM– 09.”

15. **Weight and Balance**. N/A.

16. **Points of Contact**.

a. Technical point of contact for this TB is Mr. Ken Muzzo, AMSAM-RD–AE–I–P–A, DSN 897-4812 or commercial (256) 313-4812. Datafax is DSN 897–4923 or (256) 313–4923. E–mail is kenneth.muzzo@redstone.army.mil.

b. Logistical point of contact for this TB is The Apache War Room, DSN 746–4791 or commerical (256) 876–4791, datafax DSN 746-4591 or commercial (256) 876–4591. E–mail is wr–a_–status@redstone.army.mil.

c. Wholesale Materiel point of contact Ms. Pam Watkins, AMSAM–MMC–VS–AB, DSN 897-1347 or commercial (256) 313-1347. Datafax is DSN 897–1556 or (256) 313–1556. E–mail is “watkinsp@redstone.army.mil”.

d. Forms and records point of contact for this TB is Ms. Ann Waldeck, AMSAM-MMC-RE–FF, DSN 746-5564 or commercial (256) 876-5564. Datafax is DSN 746–4904 or commercial (256) 876–4904. E–mail is waldeck–ab@redstone.army .mil.

e. Safety point of contact for this TB is Mr. Howard Chilton. AMSAM-SF-A, DSN 897-2068 or commercial (256) 313-2068, datafax is DSN 897–2111 or commercial (256) 313–2111. E–mail is chilton–hl@redstone.army.mil.

f. Foreign Military Sales (FMS) recipients requiring clarification of action advised by this TB should contact one of the following:

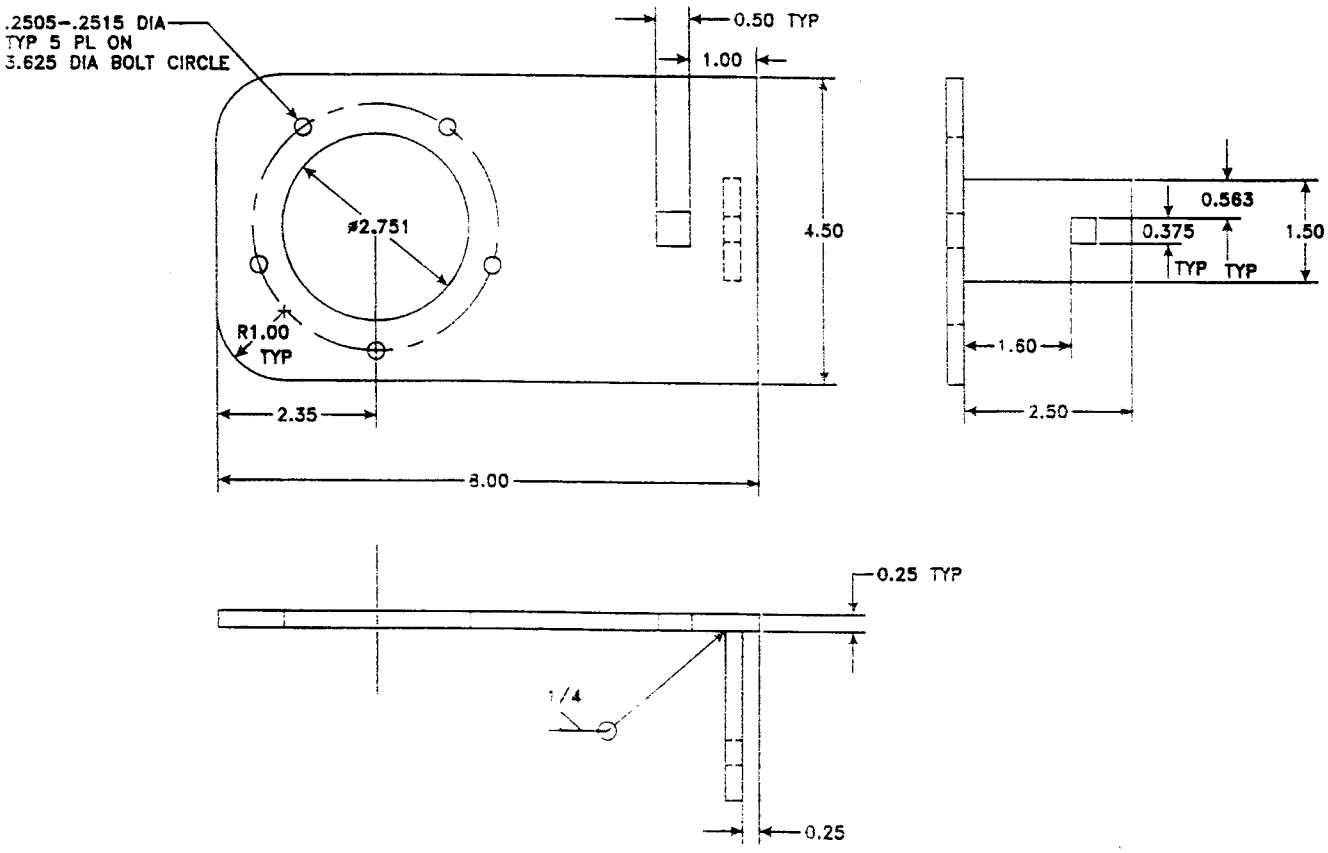
(1) CW5 Joseph L. Wittstrom, Security Assistance Management, AMSAM-SA, DSN 897-0681 or commercial (256) 313-0681. E–mail is wittstrom–jl@redstone.army.mil.

(2) Mr. Ronnie W. Sammons, AMSAM–SA–CS–NF, DSN 897–08691 or commercial (256) 313–0869. Datafax is DSN 897–0411 or commercial (256) 313–0411. E–mail is sammons–rw@redstone.army.mil. Huntsville, AL is GMT minus 6 hours.

g. After hours, contact AMCOM Command Operations Center (COC) DSN 897-2066/7 or commercial (256) 313-2066/7.

17. **Reporting of Errors and Recommending Improvements.** You can improve this TB. If you find any mistakes or if you know of a way to improve these procedures, please let us know. Mail your letter or DA Form 2028 (Recommended Changes to Publications and Blank Forms) directly to: Commander, US Army Aviation and Missile Command, ATTN.: AMSAM–MMC–LS–LP, Redstone Arsenal, AL 35898–5230. You may also submit your recommended changes by e–mail directly to ls–lp@redstone.army.mil. Instructions for sending an electronic 2028 may be found at the back of this manual. A reply will be furnished directly to you.

NOTES:
1. MTL: 1020 CR/HR STEEL OR EQUIV. .25 INCH THK.
2. TOL: ±.01 INCH UNLESS OTHERWISE NOTED.
3. .06 INCH RADIUS ON ALL CORNERS.
4. PAINT ALL SURFACES WITH MIL-P23377 EPOXY PRIMER.



HANGER BEARING TOOL
TORQUE REACTOR
AND
NUTATION CHECK

TOOL NO.
AH64HBTN

MS018621

Figure 1

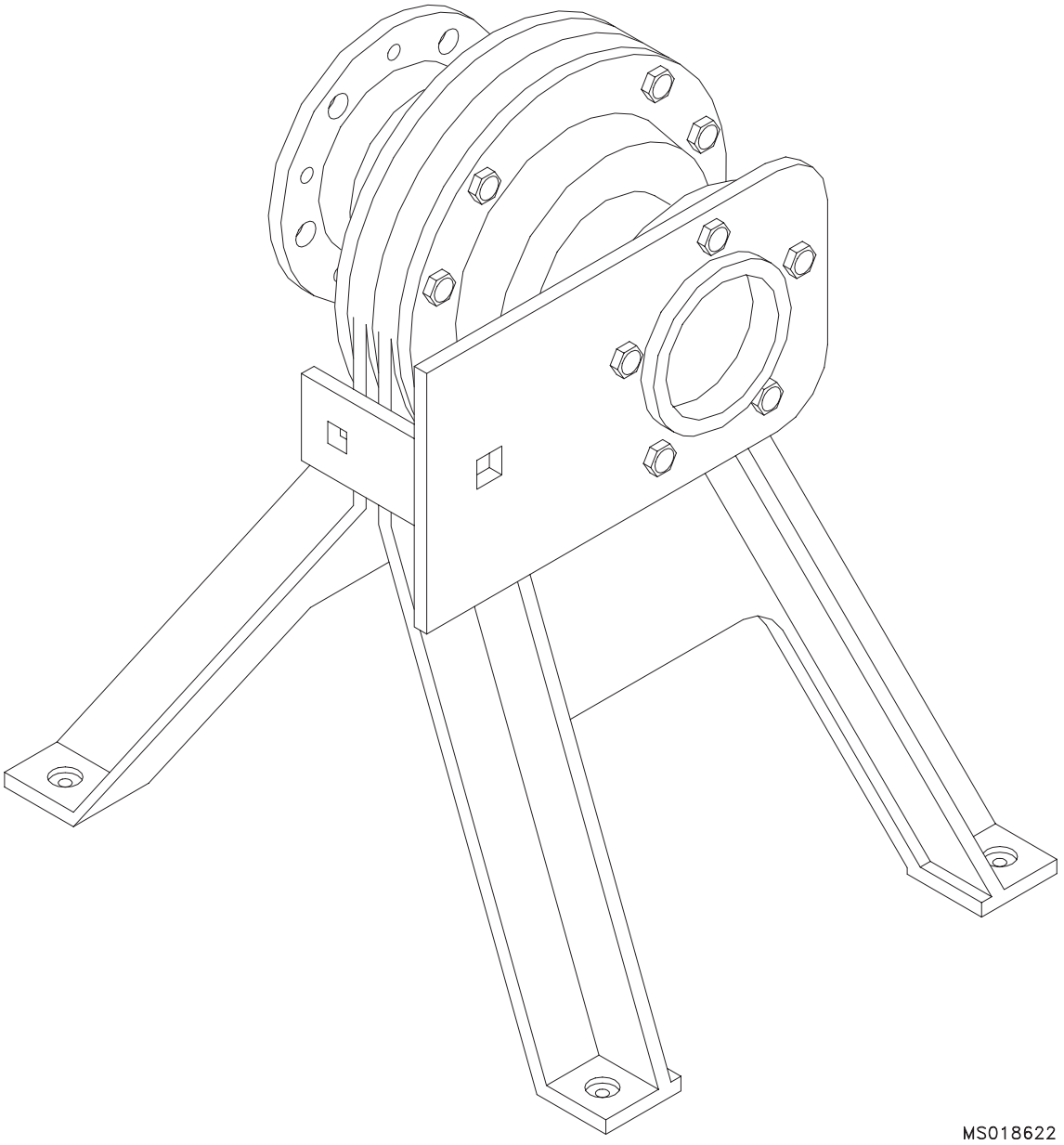


Figure 2

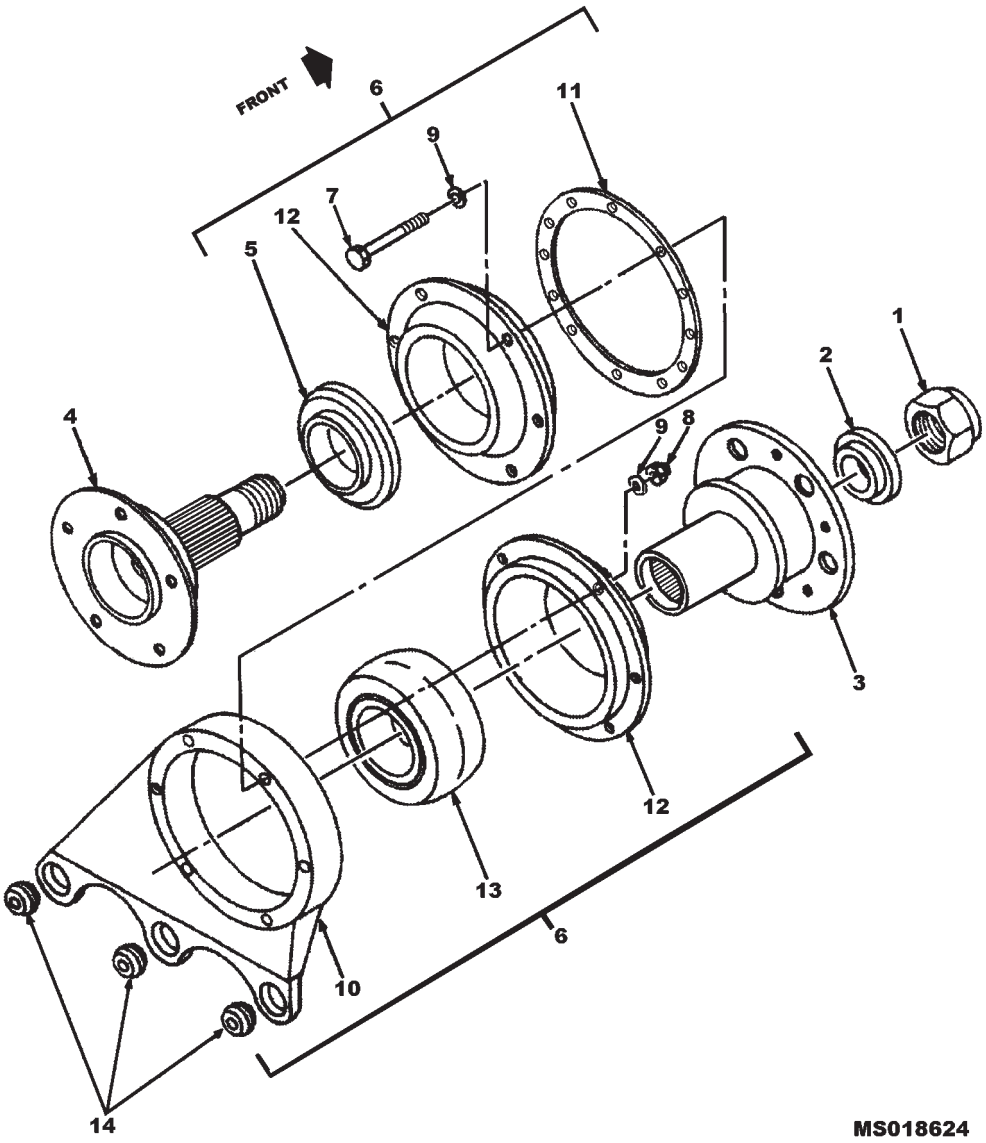


Figure 3

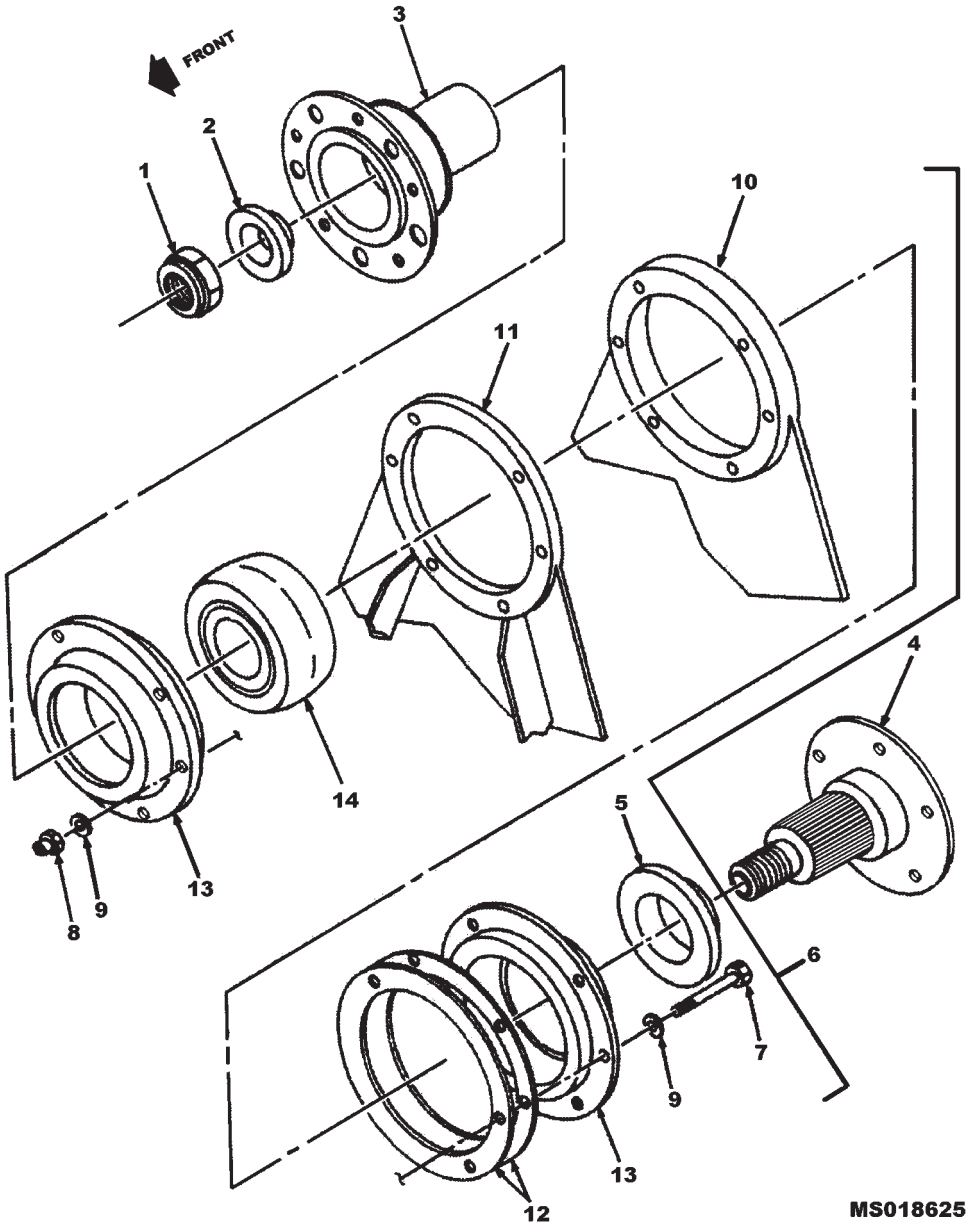
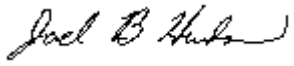


Figure 4

By Order of the Secretary of the Army:

Official:



JOEL B. HUDSON
Administrative Assistant to the Secretary of the Army

0004701

ERIC K. SHINSEKI
General, United States Army
Chief of Staff

Distribution:
To be distributed in accordance with Initial Distribution Number (IDN) 313883, requirements for TB 1-1520-238-20-104.

RECOMMENDED CHANGES TO EQUIPMENT TECHNICAL PUBLICATIONS

THEN...JOT DOWN THE DOPE ABOUT IT ON THIS FORM. CAREFULLY TEAR IT OUT, FOLD IT AND DROP IT IN THE MAIL.

SOMETHING WRONG WITH PUBLICATION

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE

BE EXACT PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO.

IN THIS SPACE, TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT.

PRINTED NAME, GRADE OR TITLE AND TELEPHONE NUMBER	SIGN HERE

TEAR ALONG PERFORATED LINE

DA FORM 1 JUL 79 2028-2

PREVIOUS EDITIONS ARE OBSOLETE.

P.S.--IF YOUR OUTFIT WANTS TO KNOW ABOUT YOUR RECOMMENDATION MAKE A CARBON COPY OF THIS AND GIVE IT TO YOUR HEADQUARTERS.

THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches
1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
1 Kilometer = 1000 Meters = 0.621 Miles

'VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces
1 Kilogram = 1000 Grams = 2.2 lb.
1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces
1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches
1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches
1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

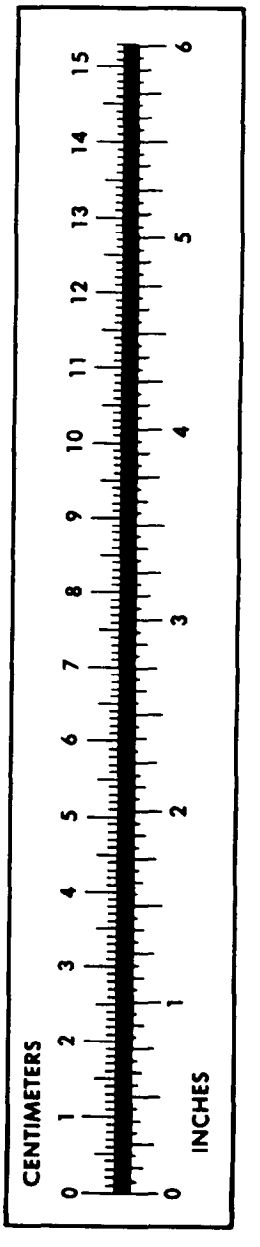
TEMPERATURE

5/9(°F - 32) = °C
212° Fahrenheit is evuivalent to 100° Celsius
90° Fahrenheit is equivalent to 32.2° Celsius
32° Fahrenheit is equivalent to 0° Celsius
9/5C° + 32 =°F

APPROXIMATE CONVERSION FACTORS

TO CHANGE	TO	MULTIPLY BY
Inches	Centimeters	2.540
Feet	Meters	0.305
Yards	Meters	0.914
Miles	Kilometers	1.609
Square Inches	Square Centimeters	6.451
Square Feet	Square Meters	0.093
Square Yards	Square Meters	0.836
Square Miles	Square Kilometers	2.590
Acres	Square Hectometers	0.405
Cubic Feet	Cubic Meters	0.028
Cubic Yards	Cubic Meters	0.765
Fluid Ounces	Milliliters	29.573
ıts	Liters	0.473
arts	Liters	0.946
allons	Liters	3.785
Ounces	Grams	28.349
Pounds	Kilograms	0.454
Short Tons	Metric Tons	0.907
Pound-Feet	Newton-Meters	1.356
Pounds per Square Inch	Kilopascals	6.895
Miles per Gallon	Kilometers per Liter	0.425
Miles per Hour	Kilometers per Hour	1.609

TO CHANGE	TO	MULTIPLY BY
Centimeters	Inches	0.394
Meters	Feet	3.280
Meters	Yards	1.094
Kilometers	Miles	0.621
Square Centimeters	Square Inches	0.155
Square Meters	Square Feet	10.764
Square Meters	Square Yards	1.196
Square Kilometers	Square Miles	0.386
Square Hectometers	Acres	2.471
Cubic Meters	Cubic Feet	35.315
Cubic Meters	Cubic Yards	1.308
Milliliters	Fluid Ounces	0.034
Liters	Pints	2.113
Liters	Quarts	1.057
ers	Gallons	0.264
ms	Ounces	0.035
ograms	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
lometers per Liter	Miles per Gallon	2.354
meters per Hour	Miles per Hour	0.621



PIN: 077869-000