URGENT

***TB 1-2840-229-20-17**

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

ENGINE VIBRATION SCREENING AND RECURRING INSPECTION FOR ALL AH-1 SERIES AIRCRAFT WITH T53-L-703 ENGINE (P/N 1-000-060-23) INSTALLED

Headquarters, Department of the Army, Washington, D. C.
28 July 1998

NOTE

THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.

1. Priority Classification. URGENT

NOTE

See AR 95-1, paragraph 6-6.a., for noncompliance authority of major commanders.

a. Aircraft in Use. Upon receipt of this TB, change the condition status symbol of the cited aircraft to a **Circled Red X.** The **Circled Red X** entry shall state "T53-L-700 Engine N2 vibration inspection procedures required IAW TB 1-2840-229-20-17 (SOF AH-1-98-01)." Enter a **Red Dash** status symbol. The entry shall state "Commander and flight crew member review of risk mitigation measures lAW TB 1-2840-229-20-17 (SOF AH-1-98-01) required prior to flight." This is a recurring daily entry. If the engine passes the vibration inspection per paragraph 8. of this TB, clear the **Circled Red X** status symbol and release the aircraft for flight. If the engine fails the vibration inspection, change the aircraft status symbol to a **Red X.** Inspect the aircraft as soon as practical, but not later than the task/inspection suspense date. Change the aircraft symbol to a **Red X** for aircraft not inspected by this date. While on a **Circled Red X,** continue to report the aircraft as fully mission capable (FMC).

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 released until compliance with this TB has been completed.

***This TB supersedes USAAMCOM Safety of Flight (SOF) Message AH-1-98-01, 242118Z, JUN 98.**

d. Aircraft in Transit.

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

(2) Ferry Status. Same as paragraph 1.a.

e. Maintenance Trainers. Same as paragraph 1.a.

f. Component/Parts in Stock at All Levels (Depot and Others) Including War Reserves. Upon receipt of this TB, the material condition tags of all items in all condition codes listed in paragraph 6. shall be annotated to read "TB 1-2840-229-20-17 (SOF AH-1-98-01) not complied with."

2. Task/Inspection Suspense Date. 10 flight hours or 15 days.

3. Reporting Compliance Suspense Date. No later than 17 July 1998 lAW paragqh 14.a of this TB.

4. Summary of the Problem.

a. In November 1997, the Army placed flight restrictions on all UH-1 helicopters in response to a trend of N2 Spur Gear failures in the aircraft's T-53 Engines caused by vibration. The AH-1 aircraft equipped with the T53-L-703 Engine have also exhibited the same vibration found in the T53-L-13B Engines. However, the T53-L-703 Engine fleet has experienced a lower Spur Gear failure rate. After careful consideration, and as a prudent safety measure, the Army has determined that all AH-1 aircraft T53-L-703 Engines shall be inspected for vibration levels.

(1) An Inspection procedure has been established to screen and detect the presence of the vibration associated with failure of the spur gear (P/N 1-070-062-04, NBN 3020-00-453-9441). This procedure utilizes the Aviation Vibration Analyzer (AVA), with a specialized application program (memory card) specifically designed to detect the vibration.

(2) Aircraft that are screened and are found to exhibit the damaging vibration shall be grounded until the engine is replaced or a long-term corrective action is implemented. This long-term corrective action is expected to be implemented by the second quarter of FY 99. Aircraft that are screened and do not exhibit the damaging vibration will be released to fly. Aircraft released to fly will be required to repeat the vibration inspection every 25 flight hours.

(3) Specialized reporting procedures are required to document the results of the vibration screening. Accurate and timely reporting is crucial to procuring the correct numbers of replacement assemblies and restoring the entire fleet to unrestricted flight status as soon as practical.

b. For Manpower/Downtime and Funding Impacts see paragraph 12.

c. The purpose of the TB is to:

(1) Direct a one-time screening inspection and 25-hour recurring inspections of all AH-1 aircraft with T53-L-703 Engines installed for damaging engine vibration levels.

(2) Identify the procedure to obtain the preprogrammed AVA Memory Cards to perform the vibration test.

(3) Direct special reporting of vibration screening results.

5. End Items to be Inspected. All AH-1 series aircraft with T53-L-703 Engines (P/N 1-000-060-23) installed.

6. Assembly Components to be Inspected.

NOMENCLATURE	PART NUMBER	NATIONAL STOCK NUMBER
T53-L-703	1-000-060-23	2840-00-621-1860

7. Parts to be inepsctad. N/A

8. Inspection Procedures.

a. Inspect the aircraft engine for the part number of the engine. Confirm the serial number of the engine by a physical inspection of the engine of the aircraft and spare engines in stock.

NOTE

Perform engine screening through a maintenance test flight using qualified maintenance test flight personnel only.

NOTE

Questions regarding use of the AVA Memory Card or the vibration screening procedures listed in paragraph 8. shall be addressed to Mr. Bob Branhof at DSN 897-4948 or Commercial (256) 313-4948, E-mail <branhofb@ redstone.army.mil>, or the technical POC listed in paragraph 16.a

NOTE

This is a temporary vibration check. It does not replace the engine vibration check that is required per TM 55-2840-229-23.

NOTE

During the vibration test, take as many points as possible on the ground.

b. Set up for use of components of Aviation Vibration Analyzer (AVA) test set (NSN 6625-01-282-3746). Reference paragraph 11. for parts required and TM 1-6625-724-13&P.

c. A preprogrammed AVA Memory Card (with T53N2, Version 2.0 script file) and data sheets are required to conduct and record this test. To obtain the memory card and data sheets, contact your MACCM POC as identified in paragraph 16. This script file (T53N2, Version 2.0) has eight test states that are used for this engine vibration screening. The test states are listed below:

NOTE

Take as many test state points as possible on the ground.

TEST STATES	TEST CONDITIONS
94/90	94% N2; 90% N1
97/85	97% N2; 85% N1
97/90	97% N2; 90% N1
95/95	95.5% N2; 95% N1
97/95	97% N2; 95% N1
98+/95	98.5% N2; 95% N1
97/MAX	97% N2; MAX Torque
100/90	100% N2; 90% N1

d. Install T53N2, Version 2.0 script file from AVA Memory Card:

(1) Reboot Control and Display Unit (CADU). Press "OFF", hold "HELP", and press "ON".

(2) Insert AVA Memory Card that contains T53N2, Version 2.0 script file.

(3) Select option three (3).

(4) Select the number next to the T53N2 script file.

(5) After the file loads and the selection screen appears, press "QUIT" to return to the boot up menu. Remove memory card and press "One" to proceed with normal AVA operation.

NOTE

If adapter mount (P/N LTCT535) is not available, units may fabricate the adapter using the drawing supplied with the AVA Memory Card, The adapter mount must meet the specifications of the drawing.

e. Modify adapter mount (P/N LTCT535) from Spectrum Analyzer Kit (NSN 6625-00-590-6502) as follows:

(1) Drill hole 0.213 inch (#3) in top-center of adapter.

(2) Tap hole for threads 1/4 x 28 UNF.

(3) Install accelerometer (NSN 6680-01-326-1913) from AVA Test Set into top of modified adapter mount using two, flat washers (NSN 5310-00-141-1795) between bracket and accelerometer.

f. AVA Test Set installation.

(1) Secure Data Acquisition Unit (DAU) in aircraft with canvas straps and "D" rings.

(2) Remove the assembly from one of the pilot's console lights. Remove the bulb. Plug the AH-1 power cable adapter (29317100) lamp socket. Ensure that the lamp is set to full intensity (clockwise).

(3) Connect the grounding clip to a screw head or any non-painted metal surface, which will provide an adequate path to aircraft ground.

(4) Connect power cable to the DAU receptacle marked 28vDC.

(5) Locate Control and Display Unit (CADU) in aircraft and connect CADU to DAU cable (29325601).

NOTE

Ensure adequate clearance between end of accelerometer threads and mounting lug.

(6) Attach adapter and accelerometer assembly to upper-forward engine lifting eye, utilizing hardware supplied in the Spectrum Analyzer Kit. There should be a bolt, washers, lock washer and nut in that kit to secure the bracket to the lifting eye. Reference TM 55-2840-229-23-1, pages 1-214 and 1-215. If the hardware is not available the following is a list of parts required:

DESCRIPTION	PART NUMBER	NSN
Bolt, Machine, Aircraft 1/2-20 UNF-3AX2, 15/32 LG	AN8-23A	5306-00-180-0097
Washer, Flat	AN960-816	5310-01-259-1239
Washer, Lock, Spring	AN935-816	5310-01-258-0051
Nut, Plain, Airframe, 1/2-20	AN315-8R	5310-00-298-9267

(7) Connect accelerometer cable (29105605) to accelerometer and to DAU channel three (3). Ensure that the accelerometer cable is secured and away from any hot surfaces.

g. Perform the following tests utilizing the CADU:

(1) From the main menu on the CADU, use the cursor keys and highlight aircraft type, than press "DO".

(2) Use cursor keys to highlight T53N2, then press "DO".

(3) Tail number is highlighted. Press “DO".

(4) Use cursor keys to highlight a tail number, or select "NEW" and enter a new tail number (up to seven digits), then press "DO".

(5) Flight plan is highlighted. Press "DO”.

(6) Select appropriate Right plan, AH-1. Press "DO".

(7) Press "F1" to enter measure mode. Once in the measurement mode press "F4", which will toggle to LIMITS ON. With LIMITS ON, this will check for limits after each test state.

WARNING

If any test state on the ground exceeds the limits, the engine fails the test. Do not fly the aircraft.

(8) Take as many test state points as possible on the ground. If the engine fails the test, collect as many test points as possible on the ground for informational purposes.

(9) Press "DO" on the highlighted selection to set up the measurement. Press l DO= when the engine is stable at the highlighted selection to take the measurement. Perform this operation each time a measurement is completed and another test state is highlighted.

WARNING

Do not fly the aircraft if any test state on the ground is above the limit (see previous WARNING).

(10) If all the measurements were not taken and the in-flight measurements are not necessary, press "QUIT", and then select "SAVE AND EXIT" and press "DO".

(11) After the last measurement is completed, press "DO" on "FINISH", then press "DO" on "DIAGNOSTICS". All of the test states will be checked for limits. If measurements are within limits, view the measured values by pressing the up arrow. Record these values on a copy of the data sheet supplied with the AVA Memory Card. Press "QUIT" to go to the main menu.

(12) If any measurement exceeds the limit the engine fails. If measurements are above limits, view all the measured values by pressing the up arrow. Record these values on a copy of the data sheet supplied with the memory card. Press "QUIT” to exit. The AVA will give a message that there are no diagnostics set up for this aircraft. Press "QUlT" to return to the main menu.

h. Disconnect equipment

(1) Disconnect and remove AVA equipment.

(2) Remove accelerometer bracket from forward-lifting eye assembly.

i. Review data

(1) To display the spectral data, perform the following:

(a) With the desired flight ID selected, enter the display mode by pressing "F2".

(b) Select "ONE TEST STATE" and press "DO".

(c) Select the desired test state to display and press "DO".

(d) Press "DO" again at "FWD LIFTING EYE" to view data.

(2) This will display the vibration spectrum. Use the cursor keys to move the reference line to view vibration peaks between 3600 Hz and 3950 Hz.

CAUTION

No parts are to be removed from engines that failed the AVA Vibration inspection except quick change assembly (QCA) items.

9. Correction Procedures.

a. For aircraft released for flight, as part of the pre-mission briefing, the pilot in command shall review the symptoms concerning this possible N2 failure mode, and the emergency actions of TM 55-1520-236-10, paragraph 9-18., Emergency Procedure for Engine Overspeed.

NOTE

Units with aircraft that fail the screening inspection may replace the engine. However, the status symbol of the aircraft shall not change until the screening procedure is repeated with the newly installed engine. If a new engine is installed, the inspection requirements of this TB must be completed prior to the in-flight requirements of TM 55-2840-229-23.

NOTE

lnsert a copy of this TB into the pilot's information file, and place a copy of this TB in the aircraft logbook.

NOTE

Recovery from N2 spur gear failure training video tape will be distributed by the AH-1 PM the week of 24 June 98 to each installation/activity/facility operating AH-1 aircraft.

b. Aircraft that fail the initial (or any subsequent 25-hour) vibration screening inspection shall be assigned the condition symbol of **Red X.** Further information/guidance will be in a follow-on SOF message/TB concerning a long-term corrective action, which will clear the **Red X.**

NOTE

For aircraft that pass the screening inspection, if the combustor turbine section is removed and replaced for any reason while on the aircraft, the inspection of paragraph 8. shall be repeated.

NOTE

Engines that pass the screening inspection that are removed and re-installed for any reason must be re-installed IAW paragraph 8. of this TB.

c. Any aircraft which passes the initial vibration screening is cleared for flight. As part of their operational risk management process, commanders at all levels with aircraft that have passed the screening should consider the following risk mitigators:

(1) Conducting operations at night only for essential missions and/or to maintain proficiency. Minimum of 1000 feet AGL on night unaided flights, except during takeoff and landings.

(2) Avoiding prolonged operations inside the avoid or caution regions, as defined in the appropriate height velocity diagram (Figure 9-3 or 9-3.1 of TM 55-1520-236-10), except when both of the following conditions have been satisfied:

(a) The flight crew has been trained on all AH-1 Spur Gear failure recognition and emergency actions.

(b) The flight will be conduced in an area which contains suitable landing areas.

(3) Not operating in areas where "land as soon as possible" could not be accomplished (extensive swamps, forests, etc.).

(4) Not approving flights over water when another land route is available, even if the land route is longer in distance. Over water flights are considered high-risk missions.

d. Aircraft records shall be annotated to show a recurring vibration screening every 25 flight hours per the procedure specified in paragraph 8. Aircraft are cleared for flight as long as the aircraft passes the recurring 25-hour inspection. Unit Level Logistics System-Aviation (ULLS-A) users shall use inspection code 52 for this recurring inspection.

NOTE

Some engines may have been pre-screened for vibrations using a test cell. Those engines that have vibrations within an acceptable range may be installed in an airframe, but the "on aircraft" AVA Vibration Test of paragraph 8. must be preformed.

NOTE

Further information/guidance will be provided in a follow-on SOF Message/TB concerning the long-term solution to the N2 Spur Gear problem, which will dear all AH-1 aircraft for flight and eliminate the need for the 25-hour recurring inspection.

10. Supply/Parts and Disposition.

a. Parts Required. N/A

b. Requisitioning Instructions. N/A

c. Bulk and Consumable Materials.

NOMENCLATURE	NSN	QTY.	COST EACH	TOTAL $
Washer, Flat	5310-00-141-1795	2EA	$0.03	S0.06
0.213 Drill Bit (#3)		1EA	$9.71	$9.71
1/4 x 28 UNF Tap		1EA	$1.79	$1.79

Total Cost Per Aircraft = $17.50

d. Disposition. N/A

e. Disposition of Hazardous Material. N/A

11. Special Tools, Jigs and Fixtures Required.

NOMENCLATURE	P/N	NSN
Test Set, AVA	29313102	6625-01-282-3746
*Accelerometer	28110900	6680-01-328-1913
*Data Acquisition Unit (DAU)	29328201	6695-01-325-3391
* Control and Display Unit (CADU)	29314102	6625-01-325-3390
*10-Ft. CADU to DAU Cable	29325601	6150-01-327-4177
*10-Ft. Aircraft Power Cable	29104700	6150-01-327-6827
*50-Ft. 54MV/G Accel Cable	29105600	6150-01-328-1872
*AH-1 DC Power Cable	29317100	
**Adapter, Mount	LTCT535	4920-00-858-0016

* Components of AVA Test Set (NSN 6625-01-282-3746)

** Components of Spectrum Analyzer Set (NSN 6625-00-590-6502)

12. Application.

a. Category of Maintenance (for Engine Vibration Screening). AVUM. Aircraft downtime will be changed to AVUM.

b. Estimated Time Required.

(1) Total of 1 man-hour using 3 persons.

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

c. Estimated Coat Impact to the Field. N/A

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. N/A

13. References.

a. TM 1-6625-724-13&P.

b. TM 55-1520-236-23P-1.

c. TM 55-1520-236-23.

d. TM 55-2840-229-23.

e. TM 55-1520-236-10.

f. TM 1-1500-328-23.

g. TM 55-1520-236-MTF.

h. TM 1-2840-260-23P.

14. Recording and Reporting Requirements.

a. Reporting Compliance Suspense Date (Aircraft). In accordance with AR 95-1, upon entering requirements of this TB on DA Form 2408-13-1, forward a priority message, datafax or E-mail to CDR, AMCOM, ATTN: AMSAM-SF-A (SOF compliance Officer). Datafax number is DSN 897-2111 or commercial (256) 313-2111. E-Mall address is <safeadm@redstone.army.mil>. The report will cite this TB number, data of entry in DA Form 2408-13-1, the aircraft mission design series (MDS) and serial numbers of aircraft in numerical order.

b. Task/Inspection Reporting Suspense Date (Aircraft)

(1) Units will provide the results of the vibration screening entered on the data forms supplied with the AVA Memory Card, approved by the Unit Commander, to their MACOM POCs listed in paragraph 16. Assure that both the aircraft serial number and the engine serial number are entered on the data sheet for each engine screened.

(2) MACOMs shall forward the data sheet to the logistics POC listed in paragraph 16. MACOM POCs will be provided routine updates as further information becomes available on the long-term solution.

c. Reporting TB Receipt (Spares). N/A

d. Task/Inspection Reporting Suspense Date (Spares At All Levels). Annotate spares records to require that the requirements of this TB be completed upon component installation on an airframe.

e. The Following Forms are Applicable and are to be Completed in Accordance with DA PAM 738-751, dared 15 June 1992:

NOTE

Unit Level Logistics System-Aviation (ULLS-A) users will use applicable electronic " -E" forms.

(1) DA Form 2408-5-1, Equipment Modification Record (Component) (Engine).

(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.

(5) DA Form 2408-18, Equipment Inspection List.

(6) DD Form 1577-2/DD Form 1577-3, Unserviceable (Reparable) Tag/Label-Materiel (Color Green). Annotate Remarks block with "Unserviceable IAW TB 1-2840-229-20-17 (AH-1-98-01)".

15. Weight and Balance. N/A

16. Points of Contact.

a. Technical point of contact for this TB is Mr. Mark Heitert, AMSAM-AR-E-P-E, DSN 897-4964 or (256) 313-4664; Datafax is DSN 897-4961 or (256) 3134961; E-mail is <heitertm@redstone.army.mil> or Ms. Denise Bouchard, AMSAM-AR-IB-H, DSN 645-9735 or (256) 955-9735; Datafax is (256) 955-9536; E-mail is <bouchard-de@redstone.army.mil>.

b. Logistical point of contact for AH-1 aircraft is Mr. Joe DeWitt, AMSAT-DSA-CO, DSN 645-9551 or (256) 955-9551; Data fax is DSN 645-9536 or (256) 955-9536; E-mail is <dewitt-jh@redstone.army.mil>.

c. MACOM points of contact are as follows:

AMC John Savelli	DSN 767-9891
USAR Monte McDonald	DSN 367-8310
FORSCOM MSG Crawford	DSN 367-5369
NGB Ken Winters	DSN 327-7754
TRADOC Judy Dyer	DSN 680-5683
USAREUR Dave Spinks	011-49-631-413-8900
USARPAC Milt Ford	DSN 438-8623
INSCOM Ken Harvey	DSN 235-1170
EUSA Dennis Reiland	DSN 315-723-4417

d. U.S. Army Aviation Center point of contact is Watt Garner, ATZQ-S, DSN 558-1866 or (334) 255-1866, Datafax is DSN 558-9317 or (334)225-9317. E-mail is<welt_garner@rucker-emh4.army.mil.>

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

f. Safety point of this TB is Mr. Robert Brock, AMSAM-SF-A, DSN 788-8632 or commercial (256) 842-8632, Datafax is DSN 897-2111 or (256) 313-2111. E-mail is <brock-rd@redstone.army.mil>. The alternate POC is Mr. Howard Chilton, AMSAM-SF-A, DSN 746-7271 or commercial (256) 876-7271, Datafax is DSN 897-2111 or (256) 313-2111. E-mail is <chiltonn-hl@redstone.army.mil>.

g. Foreign Military Sales (FMS) recipients requiring clarification of action advised by this TB should contact either CW5 Joseph L. Wittstrom, Security Assistance Management, AMSAM-SA, DSN 897-0681 or commercial (256) 313-0681; E-mail <wittstrom-jl@redstone.army.mii> or Mr. Ronnie W. Sammons, AMSAM-SA-CS-NF, DSN 897-0869 or (256) 313-0869; Datafax DSN 867-0411 or (256) 313-0411, E-mail <sammons-rw-@redstone.army.mil>. Huntsville, AL is GMT minus 6 hrs.

h. After hours contact AMCOM Command Operations Center (COC) DSN 897-2066/2067 or commercial (256) 313-2066/2067.

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 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, Alabama 35898-5230. A reply will be furnished to you. You may also send in your comments electronically to our E-mail address: <ls-lp@redstone.army.mil> or by datafax: DSN 788-6546 or commercial (256) 842-6546. Instructions for sending a 2028 by E-mail may be found at the back of most TMs.

By Order of the Secretary of the Army:

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DISTRIBUTION: To be distributed in accordance with Initial Distribution No. (IDN) 313495, requirements for TB 1-2840-229-20-17.

PIN: 076771-000