

# EMERGENCY

\*TB 1-2840-229-20-15

DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

SCREENING PROCEDURES FOR UH-1 SERIES

AIRCRAFT WITH THE T53-L-13B ENGINE

(P/N 1-000-060-22) INSTALLED

Headquarters, Department of the Army, Washington, D. C.  
21 April 1998

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## NOTE

THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.

1. Priority Classification. **EMERGENCY**

## NOTE

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

a. **Aircraft in Use.** TB 1-1520-210-15-1 (SOF UH-1-98-04) placed all affected aircraft under a **Red X** condition status symbol. Change the status symbol to a **Circled Red X** for the purpose of performing the inspection procedures of paragraph 8. only. The **Circled Red X** entry shall state "Aircraft restricted to fly IAW the flight restrictions cited in TB 1-2840-229-20-15 (SOF UH-1-98-05) paragraph 9." Additionally, enter a **Red Dash** status symbol. The entry shall state "T53-L-13B Engine N2 vibration inspection procedures required IAW TB 1-2840-229-20-15 (SOF UH-1-98-05)." Depending on the results of this inspection, leave the status symbol as a **Circled Red X** and release the aircraft for flight with the restrictions cited in paragraph 9., or return the aircraft status symbol to a **Red X** IAW this TB.

b. **Aircraft in Depot Maintenance.** Same as paragraph 1.a.

c. **Aircraft Undergoing Maintenance.** Same as paragraph 1.a.

d. **Aircraft In Transit.** Same as paragraph 1.a.

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

\*This TB supersedes USAAMCOM Safety of Flight Message 152026Z, APR 98, UH-1-998-5, TB 1-2840-229-20-13, dated 16 December 1997, and TB 1-1520-210-15-1, dated 31 March 1998.

**f. Component/Parts in Stock at All Levels (Depot and Others) Including War Reserves.** Upon receipt of this TB the materiel condition tags of all items in all condition codes listed in paragraph 6. shall be annotated to read "TB 1-2840-229-20-15 (SOF UH-1-98-05) not complied with".

**2. Task/Inspection Suspense Date.** Immediately upon receipt of this TB.

**3. Reporting Compliance Suspense Date.** No later than 8 May 1998 IAW paragraph 14.a. of this TB.

**4. Summary of the Problem.**

**NOTE**

**This TB supersedes Safety Of Flight Messages UH-1-98-02 (TB 1-2840-229-20-13) and UH-1-98-04 (TB 1-1520-210-15-1).**

**NOTE**

**This TB supplements Safety Of Flight Message (SOF) UH-1-96-03 (TB 1-2840-229-20-9). The engine repairs scheduled as a result of SOF UH-1-96-03 (TB 1-2840-229-20-9) will be completed. The restrictions imposed by this TB will be adhered to whether corrective actions of SOF UH-1-96-03 (TB 1-2840-229-20-9) are complete or not.**

**a.** TB 1-1520-210-15-1 (SOF Message UH-1-98-04) immediately grounded all UH-1 series aircraft with the T53-L-13B engine (P/N 1-000-060-22) installed in response to a trend of spur gear failures caused by vibration. An inspection procedure has been established to screen and detect the presence of the vibration associated with failure of the spur gear. This procedure utilizes the Aviation Vibration Analyzer (AVA), with a specialized application program (Memory Card) specifically designed to detect the vibration.

**b.** Aircraft that are screened and are found to exhibit the damaging vibration will remain grounded until such time that redesigned N2 carrier assemblies are procured and installed. Aircraft that are screened and do not exhibit the damaging vibration will be released to fly under specific flight restrictions. All aircraft released to fly will be required to repeat the vibration inspection every 25 flight hours until redesigned N2 carrier assemblies can be procured and installed.

**c.** An interim approach using a spray coating on the spur gears to attenuate the stresses to lower levels is being evaluated. Should this approach be found feasible, aircraft will be scheduled for installation of these coated gears and once complete could be released for flight without restrictions but still subject to the recurring 25 flight hour vibration inspection. Aircraft priority will be established jointly by the Department of the Army and the MACOMs. If approved, units with high priority aircraft shall receive special training for the installation of the new coated gear. Coated Spur Gears are intended for installation on engines that pass the vibration inspection of this TB. Engines that fail the inspection are not candidates for the coated gear.

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

**e.** For manpower/downtime and funding impacts see paragraph 12.

**f.** This TB has the following purpose:

(1) Directs a one time screening inspection and 25 hour recurring inspections of all UH-1 aircraft with T53-L-13B engines (P/N 1-000-060-22) installed for damaging engine vibration levels.

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

(3) Directs special reporting of vibration screening results.

5. **End Items to be inspected.** All UH-1 series aircraft with T53-L-13B engines (P/N 1-000-060-22) installed.

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

NOMENCLATURE	PART NUMBER	NATIONAL STOCK NUMBER
T53-L-13B	1-000-060-22	2840-00-134-4803

7. **Parts to be Inspected.** N/A.

8. **Inspection Procedures.**

**NOTE**

Perform the engine screening through a limited maintenance test flight IAW TM 1-1500-328-23, using qualified personnel only. The test pilot shall review the limitations of paragraph 9.b. The symptoms concerning this possible N2 failure mode, and emergency actions of TM 55-1510-210-10, paragraph 9-17., Emergency Procedure for Engine Overspeed.

**NOTE**

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

**NOTE**

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

a. 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.

b. A preprogrammed AVA Memory Card (with script file T53N2, version 2.0) and data sheets are required to conduct and record this test. To obtain the memory card and data sheets contact your MACOM 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
62/90	6200 RPM 90% N1
64/85	6400 RPM 85% N1
64/90	6400 RPM 90% N1
63/95	6300 RPM 95% N1
64/95	6400 RPM 95% N1
65/95	6500 RPM 95% N1
64/MAX	6400 RPM MAX Torque
66/90	6600 RPM 90% N1

c. Install T53N2 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, Version 2.0 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.**

d. 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 6680-01-328-1913 from AVA test set into top of modified adapter mount using two flat washers NSN 5310-00-141-1795 between bracket and accelerometer.

**NOTE**

**The inlet duct assembly, which is directly above the forward lifting eye on the engine, must be removed to enable installation of the adapter and accelerometer assembly on the forward lifting eye bracket.**

e. Prepare the upper forward engine vibration mount as follows:

- (1) Disconnect starter generator duct from inlet duct assembly. Secure off to side with tie wrap.
- (2) Remove inlet duct assembly (TM 55-1520-210-23P-1, Figure 76, Item 72).

f. AVA Test Set installation (reference paragraph 11., for items required).

- (1) Secure Data Acquisition Unit (DAU) in aircraft with canvas straps and "D" rings.
- (2) Connect the UH-1 DC power adapter cable (29312800) to the heater blanket and to the 10-ft. power cable (29104700).
- (3) Connect power cable to the DAU receptacle marked 28VDC.
- (4) 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.**

(5) 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
Bolt, Machine, Aircraft 1/2-20 UNF-3AX2	AN8-23A
Washer, Flat	AN960-816
Washer, Lock, Spring	AN935-816
Nut, Plain, Airframe, 1/2-20	AN315-8R

(6) 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, then 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 UH-1 flight plan. 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. The ability to get all test states on the ground may vary with DA, GW, etc. 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 'DO' when the engine is stable at the highlighted selection to take the measurement and hold the test point until the measurement screen disappears (approximately 40 seconds). 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 of the measurements were not taken and the in-flight measurements are not necessary due to ground test failure, 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 the test. 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 'Quit' to return to the main menu.

**h.** Disconnect equipment:

(1) Disconnect and remove AVA equipment.

**NOTE**

**Do not leave bracket installed.**

(2) Remove accelerometer bracket from forward lifting eye.

- (3) Reinstall the inlet duct assembly.
- (4) Connect the hose and hose clamp on the inlet duct assembly.

i. Review data:

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

- (a) With the desired flight ID picked 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 to view data.

- (2) This will display the vibration spectrum. Use the cursor keys to move the reference line to view vibration peaks.

## 9. Correction Procedures.

### 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

**Repairs or component exchanges on engines that fail the screening inspection are not authorized. A follow-on SOF will direct the installation of the re-designed N2 carrier assembly.**

### 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.**

- a. Aircraft that fail the initial (or any subsequent 25 hour) vibration screening inspection shall be assigned the condition status symbol of **Red X** Further information/guidance will be provided on the installation of the re-designed carrier assembly, which will clear the **Red X**, in a follow-on SOF message.

### NOTE

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

- b. Any aircraft which passes the initial vibration screening shall be assigned the condition status symbol **Circled Red X** and is released for flight under the following flight restrictions:

(1) Except for take off and landing, no operations inside the avoid or caution regions as defined in the appropriate height velocity diagram in (figure 9-3 or 9-3.1), TM 55-1520-210-10 except when both of the following conditions have been satisfied:

- (a) An instructor pilot is at one set of flight controls.
- (b) The flight will be conducted in an area which contains suitable landing areas.

**NOTE**

**Maintenance test flights do not require an instructor pilot at one set of the controls.**

(2) No IMC operations except when the forecast ceiling is at or greater than 1,000 feet (non-mountainous) or 2,000 feet (mountainous), and 3 miles visibility for the entire flight, to include departure, enroute and arrival.

(3) No operations in areas where "**Land As Soon As Possible**" could not be accomplished (extensive swamps, forests, etc.).

(4) No flights over water when another land route is available, even if the land route is longer in distance.

**WARNING**

**Over-water flights are considered high risk missions.**

(5) No sling load training or operations except for actual fire bucket missions when loss of life or severe injury is a factor.

**WARNING**

**Fire bucket operations are considered high risk missions.**

(6) No rescue hoist operations other than actual MEDEVAC or search and rescue missions where loss of life or severe injury is a factor, except currency and/or qualification training. Under no circumstances will hoist training operations utilize live rescue subjects.

**WARNING**

**Hoist operations/training are considered high risk missions.**

(7) Minimum of 1,000 feet AGL on night unaided flights except during takeoff and landing.

**NOTE**

**Further restrictions for NVG operations are not deemed necessary.**

(8) No rappelling operations or training.

c. For aircraft released under **Circled Red X**, as part of the pre-mission briefing, all pilots and maintenance test pilots shall review the limitations of paragraph 9.b., the symptoms concerning this possible N2 failure mode, and emergency actions of TM 55-1520-210-10, paragraph 9-17., Emergency Procedure for Engine Overspeed.

**NOTE**

**Insert 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 Informational video tape will be distributed to each installation/activity/facility operating the UH-1 aircraft.**

d. The operating restrictions of this TB apply to MEDEVAC missions with consideration given to mission planning. The nature of the MEDEVAC mission will be considered when planning en route flight path to comply, when possible, with restrictions listed in para 9.b. Commanders of MEDEVAC units should consider executing only urgent and priority missions and should consider ceasing most missions until this engine problem is totally resolved.

e. As part of their operational risk management process, commanders at all levels with aircraft that have passed the screening should consider:

- (1) Carrying only mission essential crew and passengers.
- (2) Conducting operations at night only for essential missions and/or to maintain proficiency.
- (3) Conducting no IMC operations except when no alternative exists.
- (4) Maintain altitude of 500 ft. above highest obstacle (for day operation).

f. Aircraft records shall be annotated to show a recurring vibration screening every 25 flight hours per the procedure specified in paragraph 8. (IAW TM 1-1500-328-23, page 2-8, paragraph 2-10.). Vibration screening data sheets shall be completed for each 25-hour recurring inspection and forwarded to your MACOM POC listed in paragraph 16. The aircraft shall remain in the **circled Red X** status and flyable under the restrictions of paragraph 9.b., as long as the aircraft passes the recurring 25-hour inspection. All ULLS-A users shall use inspection code #52 for this recurring inspection.

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

a. Parts Required. N/A.

b. Requisitioning Instructions. Requisition replacement parts using normal supply procedures. All requisitions shall use project code (CC 57-59) "XDY".

**NOTE**

**Project code "XDY" is required to track and establish a database of stock fund expenditures incurred by the field as a result of SOF actions.**

c. Bulk and Consumable Materials.

NOMENCLATURE	P/N	NSN	QTY.	COST EACH	TOTAL \$
Washer, Flat	28110900	5310-00-141-1795	2 EA	0.03	0.06
.213 Drill Bit (#3)		5433-00-189-9248	1 EA	9.71	9.71
1/4 x 28 UNF Tap		5136-00-580-7360	1 EA	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 * Accelerometer * Data Acquisition Unit (DAU) * Control/Disp. Unit (CADU) * 10-Ft. CADU to DAU Cable * 10-Ft. Aircraft Power Cable * 50-Ft. 54MV/G Accel. Cable * UH-1 DC Power Cable ** Adapter, Mount	29313102 28110900 29328201 29314102 29325601 29104700 29105600 29312800 LTCT535	6625-01-282-3746 6680-01-328-1913 6695-01-325-3391 6625-01-325-3390 6150-01-327-4177 6150-01-327-6827 6150-01-328-1872 6150-01-327-6829 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. 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 Cost Impact to the Field. N/A.

d. TB/MWOs to be Applied Prior to or Concurrently with this Inspection.

(1) TB 1-2840-229-20-9 (UH-1-96-03).

(2) TB 1-2840-229-20-13 (UH-1-98-02).

(3) TB 1-1520-210-15-1 (UH-1-98-04).

e. Publications Which Require Change as a Result of This Inspection. N/A.

**13 References.**

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

b. TM 55-1520-210-23P-1.

c. TM 55-1520-210-23.

d. TM 55-2840-229-23.

e. TM 55-1520-210-10.

f. TM 1-1500-328-23.

- g. TB 1-2840-229-20-9 (UH-1-96-03).
- h. TB 1-2840-229-20-13 (UH-1-98-02).
- i. TB 1-1520-210-15-1 (UH-1-98-04).

#### 14. Recording and Reporting Requirements.

**a. Reporting Compliance Suspense Date (Aircraft).** IAW 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-Mail address is <safeadm@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).**

(1) Units will provide the results of the vibration screening entered on the data forms supplied with the AVA Memory Card, signed by the Unit Commander, to their MACOM POCs listed in paragraph 16. Assume 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 sheets to the logistics POC listed in paragraph 16. MACOM POCs will be provided routine updates as further information becomes available on gear replacement/N2 carrier assembly replacement schedules and training.

**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 SOF/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 738-751,15 June 1992:**

**NOTE**

**For ULLS-A users, use applicable "E" forms.**

- (1) DA Form 2408-5-1, Equipment Modification Record (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 (Repairable) Tag/Label-Materiel (Color Green). (Annotate Remarks Block with "Unserviceable IAW UH-1-98-05, TB 1-2840-229-20-15").

**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) 313-4964; Datafax is DSN 897-4961 or (256) 313-4961. E-mail is <heitertm@redstone.army.mil> or Mr. Ralph Vemmer, AMSAM-AR-E-I-B, DSN 645-0663 or (256) 955-0663. E-mail is <vemmer-rc@redstone.army.mil>.

**b.** Logistical point of contact for UH-1 aircraft is Mr. Charles Elkins, AMSAM-DSA-UH-U, DSN 645-0073 or commercial (256) 955-0073. Datafax is DSN 645-6590 or (256) 955-6590. E-mail is

<elkins-ce@redstone.army.mil>. The AVA Logistical point of contact is Mr. Larry Quinton, AMSAM-DSA-WAG, DSN 788-0570, (256) 842-0570. E-mail is <quinton-ld@redstone.army.mil>. The Aviation Ground Support Equipment Logistical point of contact is Mike Carty, AMSAM-DSA-WAG, DSN 788-9945 or (256) 842-9945. E-mail is <carty-ma@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 Bobby Brown	DSN 327-7769
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.** Wholesale Materiel point of contact (Spares) is Ms. Donna Reeves, AMSAM-MMC-VS-N, DSN 897-1061 or commercial (256) 313-1061, Datafax is DSN 897-1558 or (256) 313-1558. E-mail is <reeves-dm@redstone.army.mil>.

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

**f.** 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>.

**g.** Safety point of contact for 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 <chilton-hl@redstone.army.mil>.

**h.** 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.mil> or Mr. Ronnie W. Sammons, AMSAM-SA-CS-NF, DSN 897-0869 or (256) 313-0869; Datafax DSN 897-0411 or (256) 313-0411, E-mail <sammons-rw@redstone.army.mil> (Huntsville, AL is GMT minus 6 hrs).

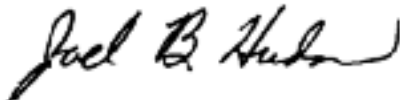
**i.** After hours contact AMCOM Command Operations Center (COC) DSN 897-2066/2067 or commercial (256) 313-2066/2067.

17. Reporting of Errors and Recommending Improvements. You can improve this TB. If you find any mistakes or if you know of away 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, 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.

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# THE METRIC SYSTEM AND EQUIVALENTS

## WEIGHT MEASURE

1 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

## WEIGHTS

1 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

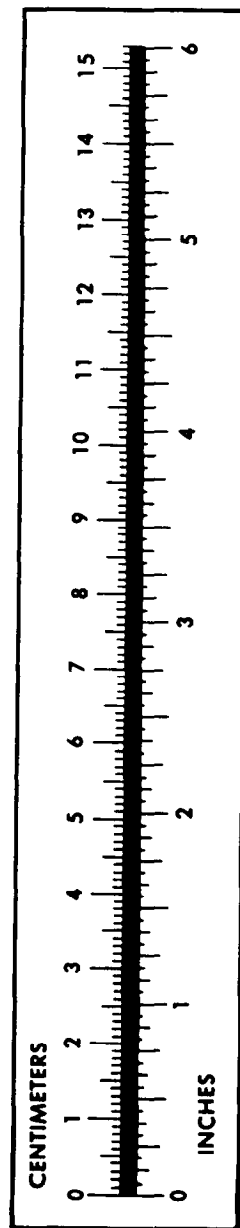
## TEMPERATURE

$5/9(^{\circ}\text{F} - 32) = ^{\circ}\text{C}$   
 212° Fahrenheit is equivalent to 100° Celsius  
 90° Fahrenheit is equivalent to 32.2° Celsius  
 32° Fahrenheit is equivalent to 0° Celsius  
 $9/5^{\circ}\text{C} + 32 = ^{\circ}\text{F}$

## 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
arts	Liters	0.473
gallons	Liters	0.946
Ounces	Liters	3.785
Pounds	Grams	28.349
Short Tons	Kilograms	0.454
Pound-Feet	Metric Tons	0.907
Pounds per Square Inch	Newton-Meters	1.356
Miles per Gallon	Kilopascals	6.895
Miles per Hour	Kilometers per Liter	0.425
	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
gallons	Gallons	0.264
ounces	Ounces	0.035
pounds	Pounds	2.205
Metric Tons	Short Tons	1.102
Newton-Meters	Pounds-Feet	0.738
Kilopascals	Pounds per Square Inch	0.145
Kilometers per Liter	Miles per Gallon	2.354
Kilometers per Hour	Miles per Hour	0.621



**PIN: 076603-000**