# URGENT

**TB 1–1520–251–20–03**

# DEPARTMENT OF THE ARMY TECHNICAL BULLETIN

# OPERATIONAL, ALL AH–64D AIRCRAFT WITH EMBEDDED GLOBAL POSITIONING AND INERTIAL NAVIGATION UNIT (EGI)

**Headquarters, Department of the Army, Washington, D.C.**

**21 December 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THIS PUBLICATION IS EFFECTIVE UNTIL RESCINDED OR SUPERSEDED.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), make the following entry on the DA Form 2408–13–1. Enter a red horizontal dash //–// status symbol with the following statement: “Post copy of AH–64–01–01 (TB 1–1520–251–20–03), in TM 1–1520–251–10 and TM 1–1520–251–CL prior to next flight.” Clear the red horizontal dash //–// entry when the publication change has been posted to TM 1–1520–251–10 and TM 1–1520–251–CL.

b. Aircraft in Depot Maintenance. N/A

c. Aircraft Undergoing Maintenance. N/A.

d. Aircraft in Transit.

(1) Surface/Air Shipment. N/A.

(2) Ferry Status.

(a) Upon arrival at final destination, commanders shall brief aircrews on the contents of this TB and post a copy of this TB in the TM 1–1520–251–10 and TM 1–1520–251–CL.

(b) Boeing will ensure DD 250 aircraft are in compliance with this TB prior to those aircraft departing for ferry to final destination.

e. Maintenance Trainers (Category A and B). N/A.

f. Component/Parts in Stock at All Levels (Depot and Others) Including War Reserves. N/A.

This TB supersedes USAAMCOM Safety of Flight 082200Z Dec 00 (AH–64–01–01)

g. Components/Parts in Work (Depot Level and Others). N/A.

**2**. **Task/Inspection Suspense Date.**

a. Prior to their next flight, unit commanders will brief all assigned AH–64D aviators and ensure that they are familiar with the procedures contained in this TB.

b. Prior to next flight, post a copy of this TB in TM 1–1520–251–10, TM 1–1520–251–CL, and TM 1–1520–251–MTF.

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

**4**. **Summary of the Problem.**

a. During a day VFR flight, at an altitude of 1000 feet AGL, 143 knots true airspeed (KTAS), an AH–64D experienced an unexpected pitch–down attitude of approximately 12 degrees with no corresponding caution, warning or advisory message. Subsequent investigations revealed that during an in–flight alignment, the EGIs sent differing velocity data signals to the flight management computer (FMC) which resulted in the FMC inappropriately scheduling the stabilator to approximately 25 degrees trailing edge down position.

b. For manpower/downtime and funding impacts. N/A.

c. The purpose of this TB is to:

(1) Provide flight crews with additional information relative to this incident.

(2) Provide additional emergency procedures, notes, and cautions to TM 1–1520–251–10 and TM 1–1520–251–CL.

**5**. **End Items To Be Inspected**. N/A.

**6**. **Assembly Components To Be Inspected.** N/A.

**7**. **Parts To Be Inspected**. N/A.

**8**. **Inspection Procedures**. N/A.

**9**. **Correction Procedures.** (Relative Information)

a. Extensive testing by Boeing has concluded that the AH–64D flight controls system, including the stabilator, can be adversely impacted by erroneous data from the EGI. If the stabilator were slewed down in response to an erroneous velocity generated by the EGI, that velocity would be displayed on the PDS and HDU. As such, the same inappropriate velocity that caused the stabilator to slew down, also allows the pilot to take manual control of the stabilator and return it to an appropriate position.

b. The EGIs in the AH–64D provide attitude, rate and velocity information to the FMC and other systems. In this instance both EGIs aligned with very poor position confidence values, even though both EGIs were tracking satellites. The automatic EGI alignment mode failed and the attempted manual reset mode also failed. The indications to the crew that the EGIs were not aligned properly were the poor position confidence values displayed on the TSD utility page, waypoint and route information was not displayed on the TSD utility page, waypoint and route information was not displayed on the TSD, and an update position advisory message was displayed on the UFD. Just prior to the incident, displayed airspeed began to change rapidly and erratically (143 KTAS to 258 KTAS within one second then decreased back to 143 over a period of 10 seconds). Because neither EGI detected a fault during the continuous built in test sequence, no indication of failure was presented to the crew. The erroneous velocity, attitude, and position errors were passed directly to the system processor and flight management computer (FMC).

c. The AH–64D flight controls system, including the stabilator, can be adversely impacted by erroneous data from the EGI. It is critical that the crew understands that erronoeus attitudes, velocities and rates generated by an improperly aligned or operating EGI will pass those errors to the flight control system, the displays and the FCR. The pilot must insure that both EGIs have aligned properly and are

displaying similar confidence values and have similar position coordinates prior to takeoff. There are functionally two portions to the EGI, an inertial navigation unit (INU) and the global positioning receiver. When aligning the EGIs with a new position coordinate, it is important that the entering of the new position take place in the initial alignment sequence of the EGIs while the “HDG” selection is displayed on the TSD page. In doing so, this helps to insure a good alignment of the ring laser gyros takes place. Entering of the position coordinate, correct Zulu time and date resets the global positioning receiver and allows it to find the proper satellite constellation. It is possible to have a very large position error (in the case of the incident aircraft over 600 nautical miles) and still have a normal display of GPS information on the TSD utility page. In this case, the EGIs would disregard the GPS input because of the large position error.

d. The AH–64D has sufficient control power to overcome an uncommanded scheduling of the stabilator within normal operating conditions. The stabilator is electrically powered and takes approximately 6 seconds to schedule from a trailing–edge–up position to full trailing–edge–down. Depending on airspeed, this event can generate significant aircraft pitch changes and decelerative forces. The instinctive AFT cyclic input applied will begin to slow the aircraft. However, a reduction in collective generates an additional pitch down moment and decreases the amount of thrust the main rotor can produce, aggravating this situation. The crew should react normally to the emergency, moderating power and cyclic inputs to slow the aircraft and avoid obstacles. Aircraft control is the first and overriding consideration. Rapid aircraft pitch changes may also cause a momentary flickering of the ACC oil PSI caution message with tone. If the stabilator is slewed down in response to an erroneous velocity generated by the EGI, that velocity would be displayed on the MPDS and HDU. As such, the same erroneous velocity that caused the stabilator to slew down, also allows the pilot to take manual control of the stabilator and return it to an appropriate position.

e. The following is provided with regard to procedures for the AH–64D Longbow Apache –

**NOTE**

Unit commanders will provide an initial briefing on the contents of this TB to assigned AH–64D aviators prior to their next flight.

**NOTE**

Unit commanders will place a copy of this TB in the units aircrew reading file.

(1) Urgent change to TM 1–1520–251–10, page 8–9, para 8.16A and 8.16B, add –

(a) 8.16A *EGI Operational Check Pilot/CPG.

1. TSD and flight page – select.
2. Heading, attitude, and position verify.
3. TSD utility page – select. Note position confidence value, verify current date and time.
4. Secondary EGI – select as primary. Note position confidence value, verify current date and time.
5. TSD page – select.
6. PP button – select. Verify position.
7. TSD utility page – Select EGI with lowest position confidence value as primary.

CAUTION

The pilot will insure that both EGIs have aligned properly and are displaying the same position, heading, position confidence values, valid date, time and GPS tracking. This will prevent erroneous velocity data signals from the EGIs being sent to the flight management computer (FMC), which should prevent an uncommanded scheduling of the stabilator.

**NOTE**

If one or both of the EGIs displays a position error greater than one nautical mile from the aircraft's known position or if the date and time is incorrect, perform the on ground manual reset and alignment procedure. Longitude and latitude are displayed in degrees, minutes and 100ths of minutes; one minute equates to approximately one mile.

(b) 8.16B on ground manual reset and alignment procedures.

1. Current position – load into KU.
2. INU 1 and INU 2 – reset. Check TSD page for the HDG selection displayed.
3. PSN – select.
4. POS – select.
5. KU enter button – press.

**NOTE**

If HDG selection is not displayed or is removed while the current position data is being entered, perform an INU 1 and INU 2 reset and then quickly (within one minute) re–enter the current position.

6. UPT – select.
7. Time – select. Enter current Zulu time.
8. Date – select. Enter current Zulu date.

(2) Urgent change to TM 1–1520–251–CL page N–10 and TM 1–1520–251–MTF, page 2–38.1/(2–38.2 Blank), add –

(a) **EGI Operational Check Pilot/CPG.

1. TSD and flight page – select.
2. Heading, attitude, and position verify.
3. TSD utility page – select. Note position confidence value, verify current date and time.
4. Secondary EGI – select as primary. Note position confidence value, verify current date and time.
5. TSD page – select.
6. PP button – select. Verify position.
7. TSD utility – page select EGI with lowest position confidence value as primary.

**NOTE**

If one or both of the EGIs displays a position error greater than one nautical mile from the aircraft's known position or if the date and time is incorrect, perform the on ground manual reset and alignment procedure.

(b) *On ground manual reset and alignment.

1. Current position – load into KU.
2. INU 1 and INU 2 – reset. Check TSD page for the HDG selection displayed.
3. PSN – Select.
4. POS – Select.
5. KU enter button – press.
6. UPT – Select.
7. Time – select. Enter current Zulu time.
8. Date – select. Enter current Zulu date.

(3) Change to TM 1–1520–251–10, page 9–18.2, para 9–23.5, add the following –

CAUTION

In flight, depending on airspeed, an uncommanded scheduling down of the stabilator can generate significant aircraft pitch changes and decelerative forces. The instinctive AFT cyclic input applied will begin to slow the aircraft. However, a reduction in collective generates an additional pitch down moment which aggravates this situation and should be avoided.

9.23.5 EGI In–Flight Misalignment. Misalignment of an EGI will be indicated by a position confidence error of 1.85K and erratically climbing and/or descending or EGI present position information on the TSD page is more than 1 nautical mile in error and growing. In the event of an EGI misalignment perform the following –

(a) Position update – Perform. Monitor position confidence.

If misalignment continues –

(b) Airspeed – Adjust to 80 KTAS or less.

(c) Stabilator – Manually control as required.

(d) Land as soon as practicable.

(4) Urgent change to TM 1–1520–251–CL, page E–17/(E–18 blank), add –

EGI In–flight Misalignment

(a) Position update – Perform. Monitor position confidence.

If misalignment continues –

(b) Airspeed – Adjust to 80 KTAS or less.

(c) Stabilator – Manually control as required.

(d) Land as soon as practicable.

f. In the event the EGIs cannot be properly aligned, the aircraft status symbol will be changed to a red //X//. The AH–64D ISAQ temporarily restricts the aircraft from performing in flight realignments of the EGIs. The intent of the paragraph in the ISAQ that states “If a proper alignment cannot be performed on a single EGI prior to flight, the crew will disable the nonaligned EGI by pulling the appropriate EGI 1A and EGI 1B or EGI 2A and EGI 2B circuit breakers prior to flight” is to allow for aircraft recovery only. The following caution is extracted from the AH–64D ISAQ. This caution is temporary and is reprinted in this TB for emphasis to the aviators.

CAUTION

In flight, reset and realignment of the EGIs is not allowed. A successful reset of an EGI may result in large position, attitude, and velocity errors. This in turn may result in inappropriate scheduling of the stabilator when the FMC reacts to the erroneous information.

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

**11**. **Special Tools and Fixtures Required.** N/A.

**12**. **Application.**

a. Category of Maintenance – N/A.

b. Estimated Time Required – N/A.

c. Estimated Cost 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 – The following technical manuals shall be changed to reflect this TB. A copy of this TB shall be inserted in the appropriate TMs as authority to implement the change until the printed change is received.

(1) TM 1–1520–251–10

(2) TM 1–1520–251–CL

**13**. **References**.

a. TM 1–1520–251–10, AH–64D Operator's Manual.

b. TM 1–1520–251–CL, AH–64D Operator's Checklist.

c. Interim Statement of Airworthiness Qualification (ISAQ), AH–64D.

d. DA Pam 738–751.

**14**. **Recording and Reporting Requirements** – The following forms are applicable and are to be completed IAW DA Pam 738–751, 15 Mar 99 –

**NOTE**

ULLS–A users will use applicable "E" forms.

a. DA Form 2408–13, Aircraft Status Information Record.

b. DA Form 2408–13–1, Aircraft Inspection and Maintenance Record.

c. DA Form 2408–15, Historical Record for Aircraft.

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

**16**. **Points of Contact**.

a. Technical point of contact for this TB is Mr. Dan Rice, AMSAM–RD–AE–I–P, DSN 897-4804 or commercial (256) 313-4804. Datafax is DSN 897-4923 or commercial (256) 313-4923. E-mail is "Dan.Rice@redstone.army.mil".

b. Logistical point of contact for this TB – N/A.

c. Wholesale materiel point of contact (Spares) – N/A.

d. Forms and records point of contact 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 "Ann.Waldeck@redstone.army.mil" .

e. Safety points of contact are –

(1) Primary – Mr. Randall Rushing (SAIC), AMSAM–SF–A, DSN 897–2092 or commercial (256) 313–2092. Datafax is DSN 897–2111 or commercial (256) 313–2111. E–mail is "Randall.Rushing@redstone.army.mil".

(2) Alternate – 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 "Howard.Chilton@redstone.army.mil".

f. Foreign Military Sales (FMS) recipients requiring clarification of action advised by this TB should contact –

(1) CW5 Joseph L. Wittstrom, Security Assistance Management, AMSAM–SA, DSN 897-0410 or commercial (256) 313-0410. E-mail is “Wittstromjl@redstone.army.mil”.

(2) Mr. Ronnie W. Sammons, AMSAM–SA–CS–NF, DSN 897-0408 or commercial (256) 313-0408. Datafax is DSN 897–0411 or commercial (256) 313–0411. E-mail is “Sammonsrw@redstone.army.mil”.

g. After hours, contact the AMCOM Command Operations Center (COC) DSN 897-2066/7 or commercial (256) 313-2066/7. Huntsville, AL, is GMT minus 6 hours.

**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 the following address: 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”. A reply will be furnished directly to you. Instructions for sending an electronic 2028 may be found at the back of this manual.

**By Order of the Secretary of the Army:**

**Official:**

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

JOEL B. HUDSON
*Administrative Assistant to the*
*Secretary of the Army*
0036203

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The following format must be used if submitting an electronic 2028. The subject line must be exactly the same and all fields must be included; however only the following fields are mandatory: 1, 3, 4, 5, 6, 7, 8, 9, 10, 13, 15, 16, 17, and 27.

From: "Whomever" <whomever@avma27.army.mil>
To: <mpmt%avma28@st–louis–emh7.army.mil>

Subject: DA Form 2028

1. ***From:*** Joe Smith
2. *Unit:* home
3. ***Address:*** 4300 Park
4. ***City:*** Hometown
5. ***St:*** MO
6. ***Zip:*** 77777
7. ***Date Sent:*** 19–OCT–93
8. ***Pub no:*** 55–2840–229–23
9. ***Pub Title:*** TM
10. ***Publication Date:*** 04–JUL–85
11. *Change Number:* 7
12. *Submitter Rank:* MSG
13. ***Submitter FName:*** Joe
14. *Submitter MName:* T
15. ***Submitter LName:*** Smith
16. ***Submitter Phone:*** 123–123–1234
17. ***Problem:*** **1**
18. *Page:* 2
19. *Paragraph:* 3
20. *Line:* 4
21. *NSN:* 5
22. *Reference:* 6
23. *Figure:* 7
24. *Table:* 8
25. *Item:* 9
26. *Total:* 123
27. ***Text:***

This is the text for the problem (below line 27).

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

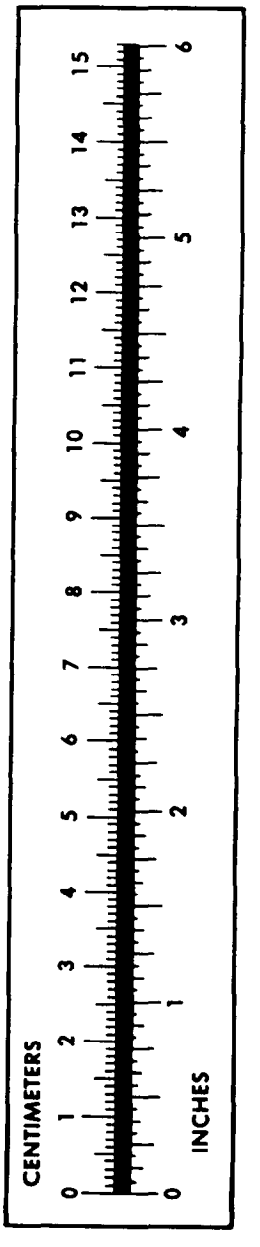
## TEMPERATURE

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: 078759-000