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# V2500-D5 SERIES PROPULSION SYSTEMS SERVICE BULLETIN



This document transmits Revision 4 to Service Bulletin EV2500-72-0409

Document History

| Service Bulletin Revision Status | | Supplement Revision Status |
|---|---|---|
| Initial Issue | Aug.20/01 | |
| Revision 1 | Oct.12/01 | |
| Revision 2 | Apr.30/02 | |
| Revision 3 | Jan.22/04 | |

Bulletin Revision 4

| Remove | Incorporate | Reason for change |
|---|---|---|
| Pages 1 to 9 of the Service Bulletin | Pages 1 to 10 of the Service Bulletin | To add Scotchbrite CAUTION. |
| All pages of Appendix 1 | Page 1 and 2 of Appendix 1 | To add Scotchbrite CAUTION. |
| All pages of Appendix 2 | Pages 1 to 3 of Appendix 2 | To add Scotchbrite CAUTION. |
| All pages of Appendix 3 | Page 1 of Appendix 3 | To add Scotchbrite CAUTION. |



CHECK THAT ALL PREVIOUS TRANSMITTALS HAVE BEEN INCORPORATED
If any have not been received please advise Customer Data Services, Rolls-Royce plc, Derby, England

LIST OF EFFECTIVE PAGES

The effective pages to this Service Bulletin following incorporation of Revision 4 are as follows:

| Page | | Revision Number | Revision Date |
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| | Bulletin | | |
| R | 1 | 4 | Mar.8/06 |
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International Aero Engines

SERVICE BULLETIN

# ENGINE - LP COMPRESSOR FAN BLADES - DOVETAIL ROOT FLANK ULTRASONIC INSPECTION AND APPLICATION OF DRY FILM LUBRICANT (ROOT FRETTING/WEAR - SCARRING) - NON-MODIFICATION SERVICE BULLETIN



## 1. Planning Information

### A. Effectivity

(1) Boeing Long Beach Division MD-90

V2525-D5, V2528-D5 Engines.

(2) ATA Locator

72-31-00.

### B. Concurrent Requirements

None.

### C. Reason

Latest fan blade dovetail inspections have revealed the need for early action to make sure fan blade dovetail deterioration is minimised. The intent of this NMSB is:

(1) To make sure the blade root dovetail dry film lubricant is maintained in the best possible condition, thereby minimising root stresses.

To make sure there is current population integrity, before the dry film lubricant is re-applied.

### D. Compliance

Category Code 3

R NOTE: This NMSB is split into 4 sections

SECTION 1. Visual inspection and re-application of dry film lubricant.

SECTION 2. Shop visit inspection.

SECTION 3. All inspected engines.

R SECTION 4. Revised interval for re-application of Dry Film Lubricant
R (DFL) after use of Scotchbrite (or other abrasive).

NOTE: IN ORDER TO REDUCE THE POTENTIAL FOR MULTIPLE ENGINE IN-FLIGHT SHUTDOWN, POWER LOSS, OR OTHER ANOMALIES DUE TO MAINTENANCE ERROR, IAE RECOMMENDS THAT OPERATORS AVOID PERFORMING MAINTENANCE ON MULTIPLE ENGINES INSTALLED ON THE SAME AIRCRAFT AT THE SAME TIME. IF IT IS NOT POSSIBLE TO AVOID MAINTENANCE ON MORE THAN ONE ENGINE AT THE SAME TIME, IAE RECOMMENDS THAT ADDITIONAL CONTROLS BE APPLIED IN ORDER TO ENSURE THAT MAINTENANCE TASKS HAVE BEEN COMPLETED AS DEFINED. MAINTENANCE GUIDELINES SHOULD BE REVISED WHERE POSSIBLE, TO PROMOTE THIS RECOMMENDATION.

NOTE: DURING REMOVAL/INSTALLATION OF FAN BLADES ENSURE THAT BLADES ARE RE-INSTALLED IN THE SAME POSITION THAT THEY WERE REMOVED FROM.

The actions detailed in 3. Accomplishment Instructions are to be carried out at the intervals that follow:

(1) SECTION 1 - Visual inspection and re-application of dry film lubricant (DFL)

(a) All in-service engines, except those at (b) below:

| | |
|---|---|
| INTERVAL | If fan blade life has exceeded 2000 cycles (from new or since last DFL application), remove the fan blades from the fan disc within 500 cycles from receipt of this NMSB and action as below.(Refer to Aircraft Maintenance Manual (AMM) 72-31-11, Removal/Installation and Fig.1).<br><br>Repeat at intervals no greater than 2500 cycles. |
| CLEAN | Remove any loose particles of dry film lubricant on the fan blade root using a lint free cloth.<br>R CAUTION:<br>R DO NOT USE ANY ABRASIVE (E.G. SCOTCHBRITE) TO<br>R REMOVE ANY DFL. IF ABRASIVE HAS BEEN USED REFER TO<br>R SECTION 4. |
| INSPECT | Perform a visual inspection (Refer to AMM 72-31-11, Inspection/Check) |
| ACTION | Apply a coating of dry film lubricant to the fan blade root dovetail flanks prior to re-installation of the fan blades (Refer to AMM 72-31-11, VRS1030). |

R

(b) All in-service engines with SB72-0375 and/or SB72-0384 (Metco 58 coated blade roots) fan blades installed:

| | |
|---|---|
| INTERVAL | At a time period not exceeding '2C' check or within 5000 cycles whichever is sooner, following receipt of this NMSB remove the fan blades from the fan disc and action as below. (Refer to AMM 72-31-11, Removal/Installation and Fig.1). Repeat at '2C' Check intervals or every 5000 cycles, whichever is sooner. |
| CLEAN | Remove any loose particles of dry film lubricant on the fan blade root using a lint free cloth. |
| R | CAUTION: |
| R | DO NOT USE ANY ABRASIVE (E.G. SCOTCHBRITE) TO |
| R | REMOVE ANY DFL. IF ABRASIVE HAS BEEN USED REFER TO |
| R | SECTION 4. |
| INSPECT | Do a visual inspection (Refer to AMM 72-31-11, Inspection/Check). |
| ACTION | Apply a coating of dry film lubricant to the fan blade root dovetail flanks prior to re-installation of the fan blades (Refer to AMM 72-31-11, VRS1030). |

(2) SECTION 2 - Shop Visit Inspections

All rated engines with pre or SB72-0375 and pre or SB72-0384 (Metco 58 and non-Metco 58 coated root)

(a) Remove the dry film lubricant on all fan blades and the fan disc, regardless of the condition of the coating on receipt (Refer to Fig.1 and Engine Manual (EM) 72-31-11, Cleaning and 72-31-12, Cleaning.

(b) Do an ultrasonic inspection on all fan blades (Refer to 3. Accomplishment Instructions).

(c) If any blade is rejected following (b) do a detailed inspection of the Fan Disc, including a x30 binocular inspection of the bedding surfaces of the fan disc dovetail slots (Refer to EM 72-31-12, Inspection/Check). Advise the IAE Representative of the findings of both the fan blade(s) and fan disc binocular inspections.

(d) On acceptable parts accomplish all remaining engine manual inspections (EM, 72-31-11, Inspection/Check) and rework including the re-application of dry film lubricant on all acceptable fan blades and fan discs (Refer to EM, 72-31-11, VRS1023 and 72-31-12, VRS1154).

(3) SECTION 3 - All inspected engines

(a) When the accomplishment instructions are completed on acceptable parts, record that V2500 Non-Modification Service Bulletin 72-0409 has been completed. It is also recommended to notify the IAE representative that this Non-Modification Service Bulletin has been accomplished.

(b) In addition IAE would recommend to complete the proforma attached in Appendix 1 for each engine and provide a copy to your IAE Representative.

(c) For tracking purposes IAE recommends that all operators record all fan blade change details, along with the Part number, Serial number, life and location of all fan blades in their fleet, including any removed and held as serviceable spares.

R (4) SECTION 4 - Revised interval for re-application of DFL after use of
R Scotchbrite (or other abrasive)

R (a) Post SB72-0375 and SB72-0384 fan blade roots are coated by Metco 58.
R Metco 58 is a metal spray, which leaves a rough surface designed to
R improve the retention of root lubricant. At new production root
R lubricant is stoved onto the Metco 58 coating. Subsequent coats of DFL
R applied in service (as per this service bulletin) are air dried.

R (b) When applying the DFL any existing root lubricant must not be removed.
R All that is required is to wipe the root with a lint free cloth made
R moist with methyl-ethyhlketone (material number V10-076) or isopropyl
R alcohol (material number V10-106) prior to lubricant application. This
R is to make sure that no grease remains on the fan blade root and any
R loose flakes of existing lubricant are removed.

R (c) There have been cases where the operators have completely removed
R existing coats of root lubricant before re-applying DFL.

R (d) The DFL specified in this service bulletin are not as durable as the
R stoved on lubricant applied during new manufacture or overhaul.
R Therefore it is the beneficial to leave as much of the existing
R coating on the fan blade root as possible.

R (e) Also the removal of existing root lubricant can involve the abrasion
R of the Metco 58 coating. This abrasion can cause the Metco 58 coating
R to become smoother and lose its ability to retain root lubricant.

R (f) Failure to correctly apply DFL can increase friction between the fan
R disc and fan blade root. This can lead to increased levels of
R vibration and increased stresses in the fan disc and the fan blade
R root. In addition, increased levels of wear in the fan disc and the
R fan blade root can be observed.

R CAUTION:

R IF AN ABRASIVE HAS BEEN USED TO REMOVE DFL FROM THE METCO 58 COATING
R THEN THE SURFACE ROUGHNESS HAS TO BE ASSUMED TO HAVE BEEN REMOVED. IN
R SUCH CASES THE RETENTION PROPERTIES OF THE METCO 58 COATING MUST BE
R ASSUMED INEFFECTIVE. THEREFORE THE PRE METCO 58 INTERVAL RATES IN
R PARAGRAPH 1.D. SECTION 1 (a).

E. Approval

The compliance statement at 1.D. and the procedures outlined in Section 3 of this Non-Modification Service Bulletin, comply with the Federal Aviation Regulations and are FAA approved for the engine model listed.

F. Manpower

Estimate of manhours to embody this Service Bulletin in full:

(1) In service

7 hours 24 mins.

(2) At overhaul

6 hrs 30 mins.

NOTE: The parts affected by this Service Bulletin are accessible at scheduled maintenance and/or overhaul.

G. References

R (1) Internal reference number 01VJ624D.

(2) Other References

(a) In-Service

(i) MD-90 Aircraft Maintenance Manual (AMM):

(1) 72-31-11, Removal/Installation, Inspection/Check and Repair VRS1030.

(ii) Powerplant Illustrated Parts Catalogue, 72-31-11.

(b) In-Shop

(i) V2500 Engine Manual (EM) ( E-V2500-3IA):

(1) 72-31-00, Disassembly/Assembly.

(2) 72-31-11, Inspection/Check, Cleaning and Repair VRS1023.

(3) 72-31-12, Inspection/Check, Cleaning and Repair VRS1154.

(ii) V2500 Standard Practices/Processes Manual (SPM-V2500-3IA).

(iii) Engine Illustrated Parts Catalogue, 72-31-11.

(c) V2500 Service Bulletins:

(i) ENG-72-0375 - Engine - LP compressor blades and fillers - Introduction of a revised LP compressor blade with Metco 58.

(ii) ENG-72-0384 - Engine - LP compressor blades and fillers - Introduction of a revised LP compressor blade with Metco 58 - Rework.

2. Material Information

None.

3. Accomplishment Instructions

A. Tools and Equipment

(1) Ultrasonic flaw detector - For operation in the 5-10 MHz range (IAE recommend the use of Buehler Krautkramer - USN52 (Krautkramer Branson - USN52) or EPOCH 3B).

(2) Ultrasonic couplant CoMat 06-148.

(3) Items 4) and 5) are included in kit IAE 2R19429.

(4) Test block QC6827 - IAE2R19315.

(5) Ultrasonic probe - IAE2R19316.

B. Calibration of Ultrasonic Detector

(1) Set up the ultrasonic flaw detector for dual or through transmission operation, with zero delay

(2) Set the amplifier switch to 5-10 MHz

(3) Apply couplant to the rear angled flank and position the probe on the test block

(4) Identify the signal produced by the large slot A. With the range control, position this signal at division line 5 on the time base and adjust the amplitude to approximately 50 percent screen height

(5) Increase the gain by 20dB. Move the probe over slot B and identify the signal produced. Adjust the amplifier to bring the signal to 60 percent screen height

(6) If a monitor gate is available, position it between the 4.5 and 5.5 division lines on the time base. Adjust any visual or audible alarms to trigger at 60 percent screen height

C. Ultrasonic inspection - Engine shop visit

(1) Remove the fan blades. (Refer to the Engine Manual (EM) 72-31-11, Disassembly)

(2) Do a general inspection of the fan blades. (Refer to EM 72-31-11, Inspection/Check)

(3) Do an ultrasonic inspection on each of the fan blades

(a) Apply the couplant to the concave face of the blade root flank at the area to be inspected. Position the probe at the front of the concave blade root flank and move the probe along the first 2.4in. (60mm) of the chordal width of the blade root. (Refer to Fig 2)

(b) Monitor the signal very carefully as you move the probe over this area

(c) Reject the blade if a signal greater than 60 percent screen height is produced between the 4.5 and 5.5 division lines on the time base. It is recommended to identify the locations of all indications over 60 percent screen height from the root front face and record on the proforma (refer Appendix 1) the ultrasonic signal percentage height and position from the root front face.

(d) Subsequently to the above, on pre SB72-0375 or pre SB72-0384 fan blades (non-Metco 58) perform a x30 binocular inspection at each indication position (refer to Appendix 2). Reject any blades where cracking is confirmed by this inspection. On post SB72-0375 or post SB72-0384 fan blades (Metco 58), remove the Metco coating and reperform the ultrasonic inspection (refer to Appendix 3). Reject any blades where cracking is confirmed by this inspection.

(e) Apply the couplant to the convex face of the blade root flank at the area to be inspected. Position the probe 1.77in. (45mm) from the front face of the blade root (immediately behind the front chocking pad if still installed) and move the probe along the next 4.33in. (110mm) of the chordal width of the blade root, terminating the inspection at 6.10in. (155mm) from the front face of the blade root (approximately 3.3in. (85mm) from rear face of the root)

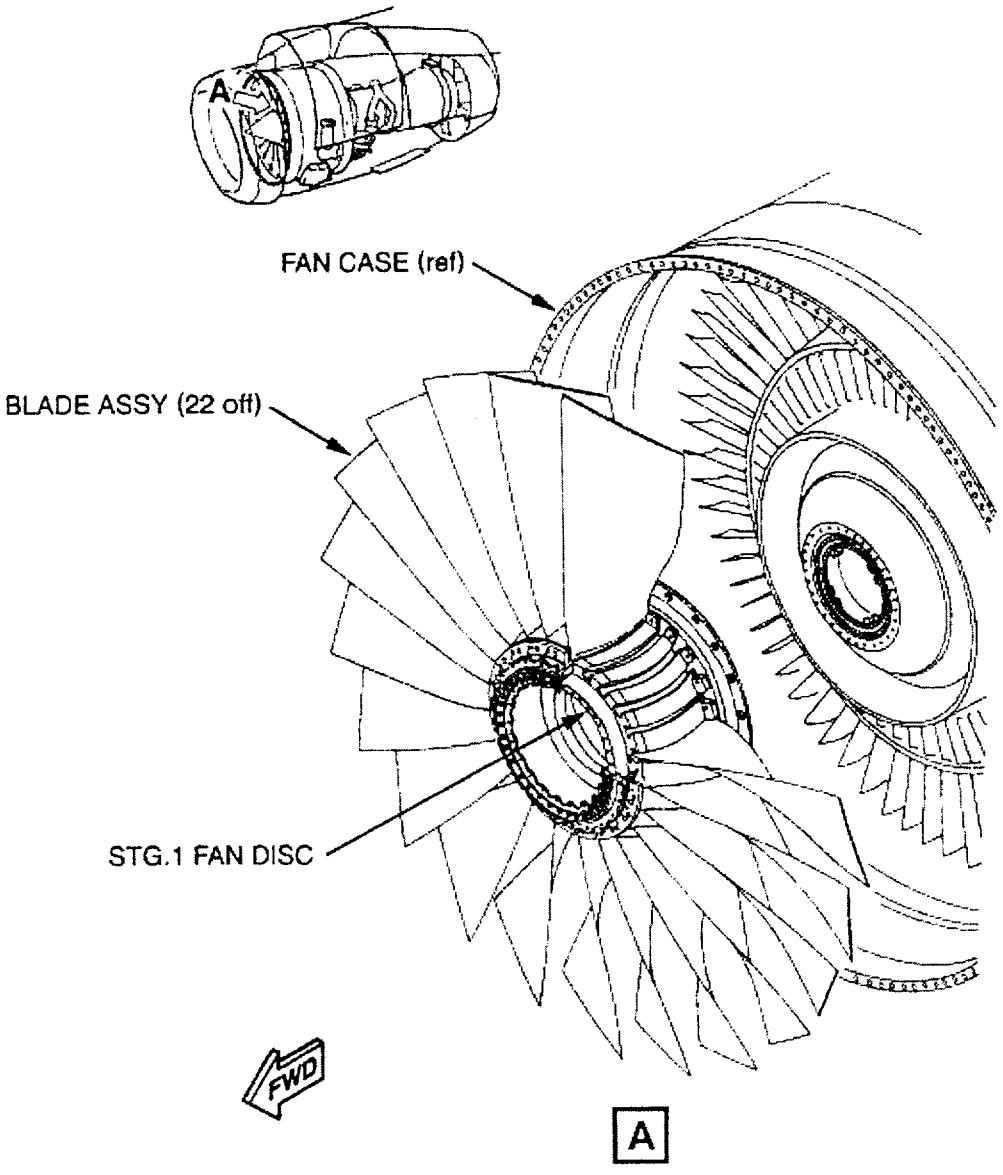
(f) Monitor the signal very carefully as you move the probe over this area

(g) Reject the blade if a signal greater than 60 percent screen height is produced between the 4.5 and 5.5 division lines on the time base. It is then recommended to identify the locations of all indications over 60 percent screen height from the root front face and record on the proforma (Refer Appendix 1) the ultrasonic signal percentage height and position from the root front face.

(h) Subsequently to the above, on pre SB72-0375 or pre SB72-0384 fan blades (non-Metco 58) perform a x30 binocular inspection at each indication position (refer to Appendix 2). Reject any blades where cracking is confirmed by this inspection. On post SB72-0375 or post SB72-0384 fan blades (Metco 58), remove the Metco coating and reperform the ultrasonic inspection (refer to Appendix 3). Reject any blades where cracking is confirmed by this inspection.

(i) On any rejected blade at (d) or (h) above, identify the location of any such indication(s) on the blade and record on the proforma (Refer to Appendix 1) the ultrasonic signal percentage height and position from the root front face and advise the IAE Representative.

(j) If no cracking is present after step (d) and (h), the blade is considered suitable for completion of any further engine manual inspection/rework operations required to return it to service operation. On any such blade, record, on the proforma, that a x30 binocular inspection or repeat ultrasonic inspection has been successfully completed with no cracking being detected.

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Location of blade assembly and stage 1 fan disc
Fig 1

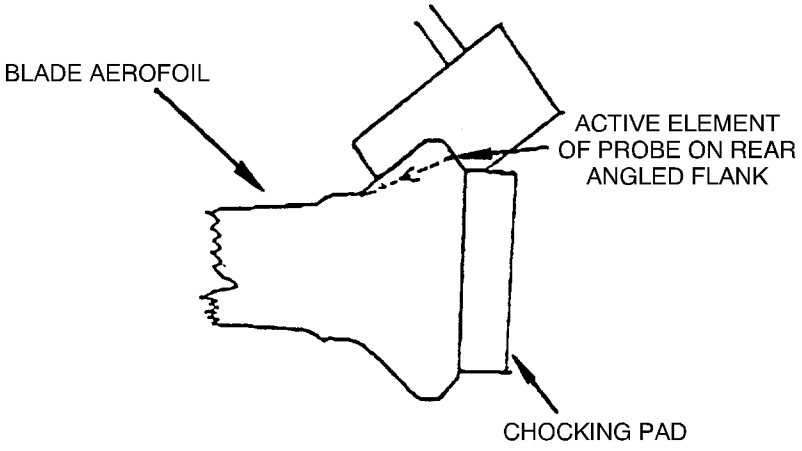


FIGURE 2

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Schematic diagram showing position of probe on blade root flank
Fig 2

APPENDIX 1

Inspection Proforma

# Appendix 1
## Proforma for reporting inspection results

After completion fax this information to to the IAE representative

| | | |
|---|---|---|
| **Operator:** | **Rating:** | **Date of Inspection:** |
| **Engine S/N:** | **Previous rating if applicable:** | Engine TSN / CSN: |
| **Fan Set TSN/CSN (If different to engine cycles)** | | **TSN/CSN:** |
| **U/Sonic Inspection of Fan Set** | | **Yes/No (delete as appropriate)** |
| **Are the Fan Blades Metco 58 standard** | | **Yes/No (delete as appropriate)** |
| **(Shop visit only) Metco 58 coating applied per SB 72-0384 at this shop visit** | | **Yes/No (delete as appropriate)** |

Note: The information contained above is required as a minimum.

**The table below is to be completed if any Fan Blade/s are rejected by Ultrasonic inspection.**

| NMSB 72-0409 Fan Blade | | | % DFL loss on contact surface | Frettage on contact surface | Time (TSN / CSN) since | | U/sonic Inspection (USI) (Rejection Indication Data) | | | Binocular inspection (shop visit only) | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| P/N | S/N | TSN / CSN * | Concave (CV) / Convex (CX) | Yes/No | Last DFL lubri-cation | Last USI | US signal (% screen height | CX or CV side of Fan Blade | position from Leading Edge (mm) | Confirmed indication yes/no | Length of indication |
| 6A | RG | | | | | | | | | | |

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* (If different to engine cycles)

Inspection Proforma
Appendix 1, Fig.1

APPENDIX 2

Binocular inspection on a blade rejected following the Ultrasonic Inspection on shop visit engines - Pre SB72-0375 or Pre SB72-0384 Fan Blade Only (Non-Metco 58)

Tooling and Equipment

| | |
|---|---|
| Desk lamp (local supply) | 40 - 50W bulb with shade, less than 110 mm dia. and 110 mm. length. |
| Blade mounting fixture | Local manufacture |
| Binocular (local supply) | Minimum magnification range of x10 to x30 and overhang such that centre of binocular can be positioned 350 mm. away from edge of base mounting. |

NOTE: Advice on suitable binoculars can be provided by IAE. An example of a suitable binocular would be a Nikon SMZ645 with x10 eyepieces and C-US2 stand.

A. Introduction

This technique covers the additional binocular inspection of V2500 fan blade roots for possible top edge of bedding cracking, detected by ultrasonic inspection as shown in Appendix 2, Figure 1.

The person carrying out this inspection should be proficient at binocular inspections. Additional specific training is recommended for this inspection, contact IAE.

B. Preparation

Ensure that dry film lubricant (DFL) has been removed from the fan blade root using:

TASK 72-31-11-100-002-A00 for Non Metco 58 coated root in accordance with EM practices.

C. Inspection

(1) Position fan blade in mounting fixture to view the side of the fan blade root presenting an ultrasonic indication.

(2) Adjust lamp to optimum illumination position for highlighting top edge of bedding at ultrasonic indication position, as illustrated in Appendix 2, Figure 1.

(3) Set magnification of binocular to x10 and bring the top edge of bedding at the ultrasonic indication position into focus. Adjust magnification to x30 and re-focus if necessary.

(4) Slowly traverse along the blade, inspecting the top edge of bedding 10 mm. either side of the ultrasonic indication position, as shown in Appendix 2, Figure 1.

(5) Check any suspicious features by inspecting at the highest magnification available.

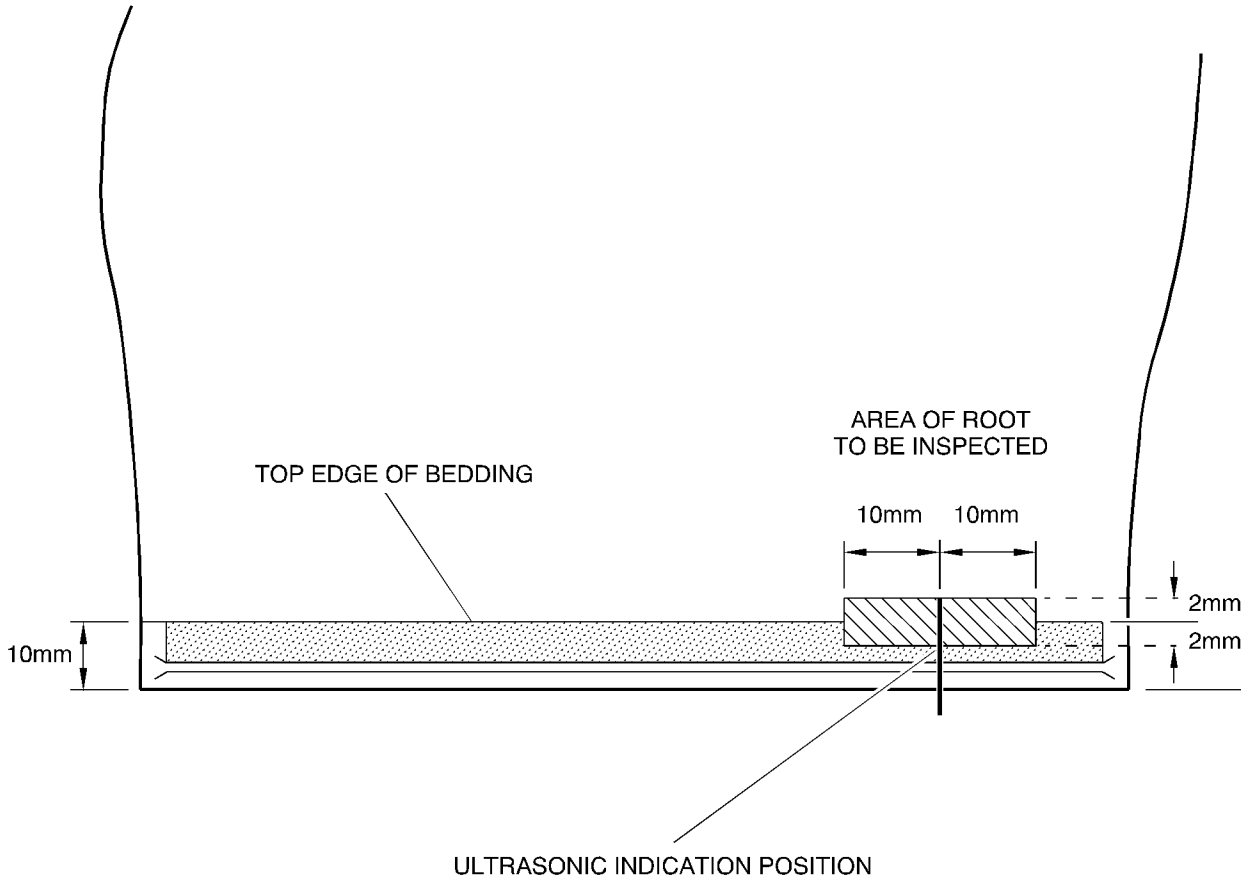
NOTE: The inspection should cover the area approximately 2 mm. above and below the top edge of bedding. Re-focus the binocular and adjust the lamp as required.

(6) Repeat steps (1) to (5) above for each ultrasonic indication position.

D. Rejection criteria:

(1) Reject any blade exhibiting a crack-like feature running axially along the root in the inspected region.

(2) Reject any blade exhibiting a 'scar' or crater-like feature.

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Inspection areas
Appendix 2, Fig.1

## APPENDIX 3

## Repeat Ultrasonic Inspection of a Blade Rejected Following the Initial Ultrasonic Inspection on Shop Visit Engines - Post SB72-0375 or Post SB72-0384 Fan Blades Only (Metco 58)

A. Introduction

This technique covers the repeat ultrasonic inspection of V2500 fan blade roots for possible top edge of bedding cracking, detected by initial ultrasonic inspection as shown in Appendix 2, Figure 1.

B. Preparation

(1) Ensure the dry film lubricant (DFL) has been removed from the fan blade root in accordance with EM TASK 72-31-11-100-002-B00 for Metco 58 coated root.

(2) Remove the Metco 58 coating in accordance with EM TASK 72-31-11-300-032.

C. Inspection

(1) Repeat the ultrasonic examination of the root flank as described in the Accomplishment Instructions 3.C.(3).

C. Rejection Criteria

(1) Rejection criteria are as per the Accomplishment Instructions 3.C.(3).