P U B L I C A T I O N T R A N S M I T T A L

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DATE: Apr.30/02

V2500-D5 SERIES PROPULSION SYSTEMS NON-MODIFICATION SERVICE BULLETIN

This document transmits the Initial Issue of Service Bulletin EV2500-72-0424

Bulletin Initial Issue

Remove	Incorporate	Reason for change
	Pages 1 to 12 of the Service Bulletin	Initial issue
	Page 1 and 2 of Appendix 1	Initial issue

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

LIST OF EFFECTIVE PAGES

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ENGINE - LP COMPRESSOR FAN BLADES - DOVETAIL ROOT FLANK ULTRASONIC INSPECTION (HIGH STRESS EVENT) - NON-MODIFICATION SERVICE BULLETIN

1. Planning Information

A. Effectivity

(1) Boeing Longbeach Division - MD-90

V2525-D5, V2528-D5 Engines

(2) ATA Locator

72-31-00

B. Concurrent Requirements

None

C. Reason

(1) During the shop visit of a V2500-D5 engine, routine inspection of the fan blades revealed cracking of the root dovetail flanks of 12 fan blades.

(2) Analysis of data from engine and rig testing carried out to investigate this condition, has shown that high root stresses sufficient to crack fan blade roots can be generated during stabilised engine running, in the region of 63 percent N1 under specific crosswind conditions.

As a result of this finding:

A0W 1056 issue 4 (09 July 2001) introduced a N1 keep out zone of 61 to 74 percent to avoid conditions where high blade root stresses may occur.

There is however, a possibility that cracks have already been induced prior to the implementation of A0W 1056. The risk that this possibility exists is sufficient to justify an ultrasonic inspection of D5 fan blades to maintain satisfactory levels of safety.

D. Compliance

Category Code 3

NOTE: This NMSB is split into 2 sections

SECTION 1. In-service ultrasonic inspections.

SECTION 2. All inspected engines.

NOTE: FIGURE 4 SUMMARISES THE IN-SERVICE INSPECTIONS REQUIRED BY THIS NMSB ON V2500-D5 ENGINES.

NOTE: FAN BLADES FITTED ON ENGINES: (a) WHICH HAVE NEVER BEEN INSTALLED SINCE NEW OR LAST SHOP VISIT INSPECTION (I.E. 0 HRS/ 0 CYCLES) or (b) INSTALLED AS NEW OR FOLLOWING A SHOP VISIT INSPECTION (0 HRS/ 0 CYCLES) AFTER IMPLEMENTATION OF AOW 1056 ISSUE 4 RELEASED ON 09 JULY 2001 (ADHERENCE TO KOZ), ARE NOT AFFECTED BY THIS NMSB ISSUE.

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.

(1) SECTION 1 - In service ultrasonic inspection

(a) Engines with pre SB 72-0375 and/or pre SB 72-0384 (Non-Metco 58 coated blade roots) fan blades installed

(i) In service engines with fan blade life of LESS THAN 2500 CYCLES since new or since last FPI following receipt of NMSB 72-0386 Aug.20/01 , action as below:

INTERVAL	Before fan blade life exceeds 2500 cycles* or next C check, whichever is more convenient, remove the fan blades from the fan disc and action as below (Refer to Fig.1 and AMM, 72-31-11, Removal/Installation). * From new or since last Fluorescent Penetrant Inspection (Refer to Standard Practices/Processes Manual, TASK 70-23-03-230-501).
CLEAN	Remove any loose particles of dry film lubricant from the fan blade root using a lint free cloth.

INSPECT — Do a visual inspection (Refer to AMM, 72-31-11, Inspection/Check) and an ultrasonic inspection (Refer to 3. Accomplishment Instructions A, B, C).

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).

(ii) In-service engines with fan blade life of GREATER THAN 2500 CYCLES since new or since last FPI following receipt of NMSB 72-0386 Aug.20/01 issue, action as below:

INTERVAL — If fan blade life is greater than 2500 cycles from new or since the last Fluorescent Penetrant Inspection (Refer to Standard Practices/Processes Manual, TASK 70-23-03-230-501) remove the fan blades from the fan disc within 500 cycles following receipt of NMSB 72-0386 Aug.20/01 issue and action as below (Refer to Fig.1 and AMM, 72-31-11, Removal/Installation).

CLEAN — Remove any loose particles of dry film lubricant on the fan blade root using a lint free cloth.

INSPECT — Do a visual inspection (Refer to AMM, 72-31-11, Inspection/Check) and an ultrasonic inspection (Refer to 3. Accomplishment Instructions A, B, C).

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).

(b) Engines with post SB 72-0375 and/or post SB 72-0384 (Metco 58 coated blade roots) fan blades installed

NOTE: The following requirements only apply to post SB 72-0375 and post SB 72-0384 (Metco 58 coated blade roots) fan blades installed before implementation of A0W 1056 issue 4 released on 09 July 2001.

INTERVAL — Upon receipt of this NMSB, remove the fan blades from the fan disc at next C check and action as below (Refer to Fig.1 and AMM, 72-31-11, Removal/Installation).

CLEAN	Remove any loose particles of dry film lubricant on the fan blade root using a lint free cloth.
INSPECT	Do a visual inspection (Refer to AMM, 72-31-11, Inspection/Check) and an ultrasonic inspection (refer to 3. Accomplishment Instructions, A, B and C).
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 - All inspected engines

(a) When the accomplishment instructions are completed on acceptable parts, record that V2500 Non-Modification Service Bulletin 72-0424 has been completed. It is recommended to notify the IAE representative that this Non-Modification Service Bulletin has been accomplished.

(b) IAE recommends to complete a copy of the attached proforma (Refer Appendix 1) for each engine and provide a copy to your IAE Representative.

(c) For tracking purposes, IAE would recommend 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

E. Approval

The compliance of statement 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:

8 hrs 45 mins

NOTE: The parts affected by this Service Bulletin are accessible at scheduled maintenance.

G. References

(1) Internal reference number 02VJ607.

(2) Other References

(a) MD-90 Aircraft Maintenance Manual (AMM): 72-31-11, Removal/Installation, Inspection/Check and Repair VRS1030.

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

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

(d) 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.

(iii) ENG-72-0409 - Engine - LP compressor fan blades - Dovetail root flank ultrasonic inspection and re-application of dry film lubricant.

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: IAE2R19429

(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 - In-Service (Installed and spare engines)

WARNING: YOU MUST PUT A WARNING NOTICE ON THE INSTRUMENT PANEL IN THE COCKPIT TO TELL PERSONS NOT TO START THE ENGINES.

WARNING: YOU MUST MAKE SURE THAT THE ENGINE HAS BEEN SHUT DOWN FOR AT LEAST 5 MINUTES BEFORE STARTING THE INSPECTION.

WARNING: YOU MUST MAKE SURE THAT THE RED WARNING PENNANTS ON THE WORKMAT CAN BE SEEN AT A DISTANCE FROM THE AIRCRAFT.

(1) Remove the fan blades. (Refer to Aircraft Maintenance Manual (AMM) 72-31-11, Removal/Installation)

(2) Do a general inspection of the fan blades. (Refer to AMM 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 leading edge 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

(d) Apply the couplant to the convex face of the blade root flank at the area to be inspected. Position the probe at 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 the rear face of the root)

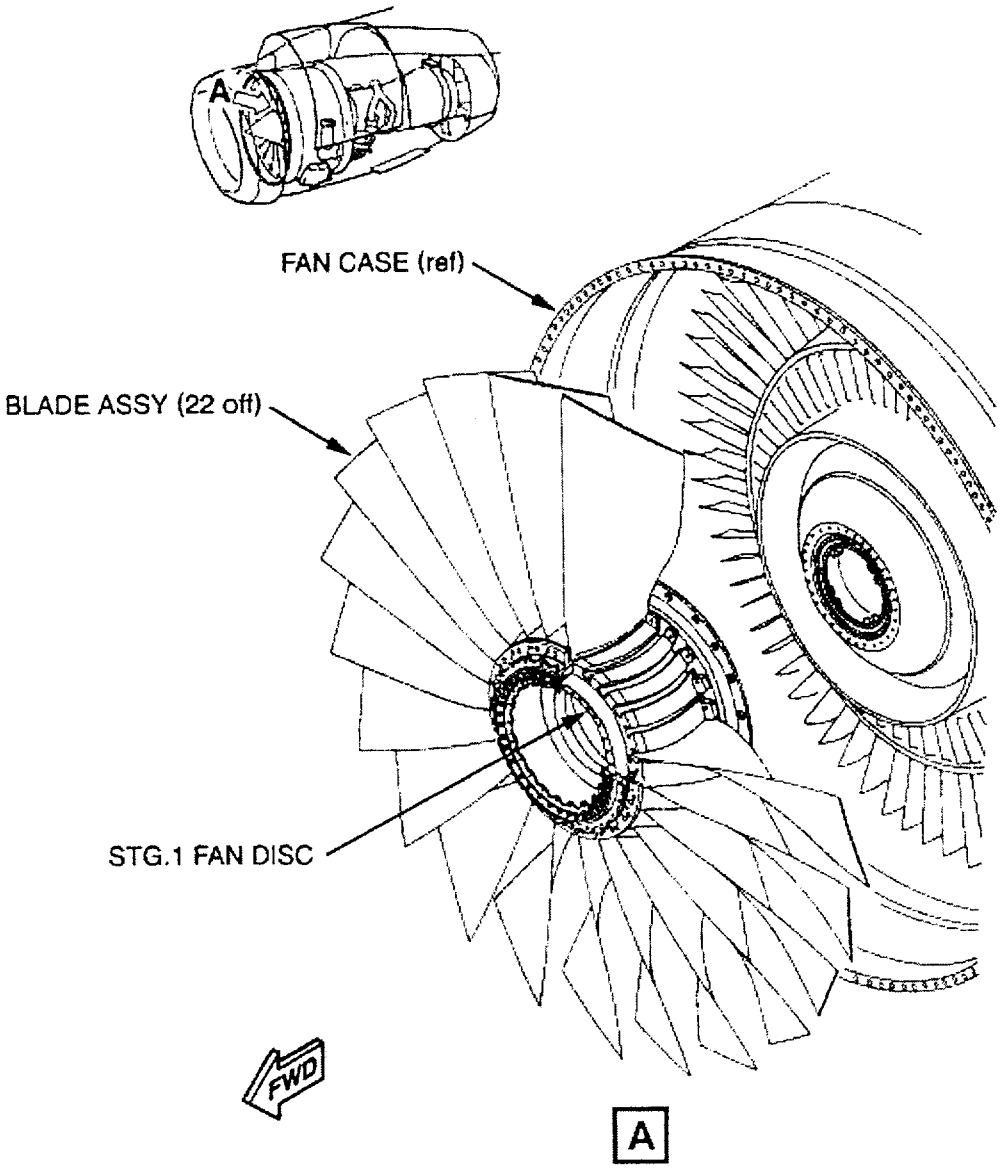
(e) Monitor the signal very carefully as you move the probe over this area

(f) 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

(g) Subsequently to the above, if excess dry film lubricant is still present at the ultrasonic reject indication position on the blade root flank in the areas X and Y defined in Fig.3, remove this by lightly rubbing with Scotchbrite (using CoMat 05-125 to 05-127). Repeat the ultrasonic check as in (a), (b), (d) and (e) above. Reject the blade if a signal greater than 60 percent screen height is still present between the 4.4 and 5.5 division lines on the time base.

(h) If any fan blades are rejected at (g) above, it is recommended to identify the location of any such indication(s) on the blade and record on the proforma (Refer Appendix 1) the ultrasonic signal percentage height and position from the root front face and advise the IAE Representative.

(i) If no cracking is present following step (g) it is recommended to record, on the proforma, that an ultrasonic inspection has been successfully completed.



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Location of blade assembly and stage 1 fan disc
Fig.1

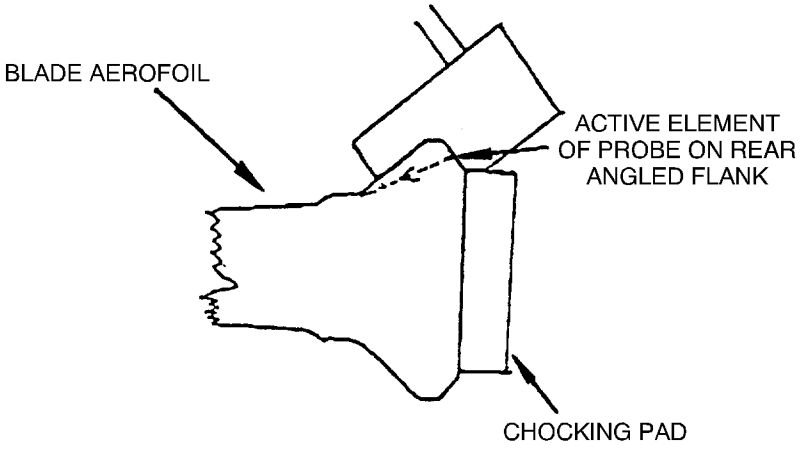

FIGURE 2

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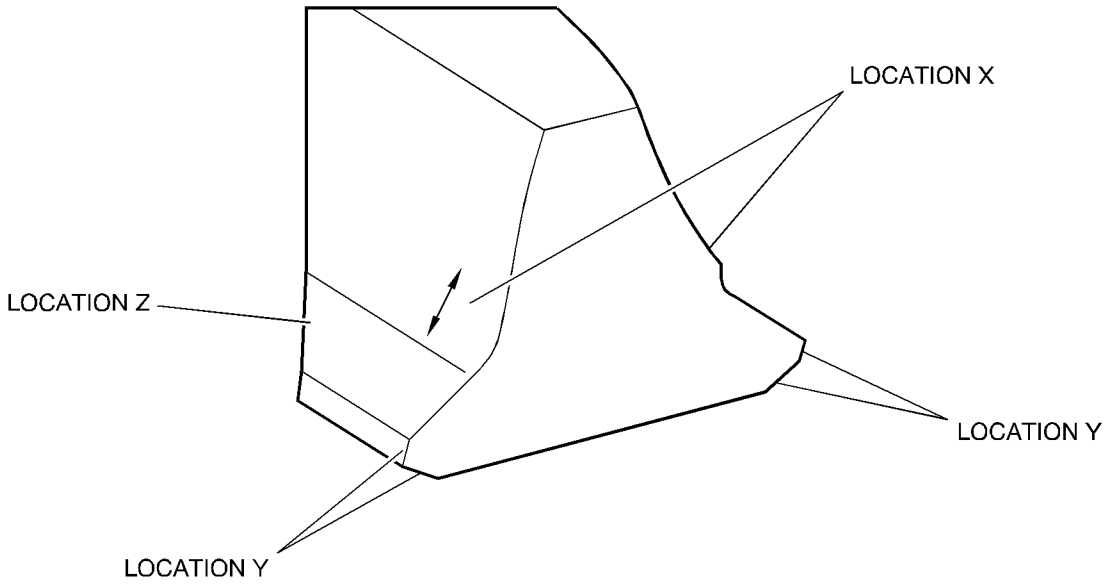
Schematic diagram showing position of probe on blade root flank
Fig.2



ACTIONS :

1) At the ultrasonic reject indication locations, on either the concave or the convex flanks, remove any excess Dry Film Lubricant (DFL) by lightly rubbing with 'Scotchbrite' using CoMat No 05-125 to 05-127 in the following areas:
   - above the top edge of the bedding (location X)
   - at the lower corner of the root where the ultrasonic probe locates (location Y)

   CAUTION 1: On post SB 72-0375 and post SB72-0384 (Metco 58 coated root) fan blades it is essential not to "scotchbrite" the fan blade bedding surface (Location Z) as this will have a detrimental effect to the coating.

2) If excessive DFL is present, at location X and/or Y that cannot be removed by lightly rubbing with 'Scotchbrite' it is permissable to remove this using a non metallic scraper and then remove any loose residual DFL using 'Scotchbrite'

   CAUTION 2: On post SB 72-0375 and post SB72-0384 (Metco 58 coated root) fan blades it is important not to damage the fan blade bedding surface (Location Z) when using a scraper

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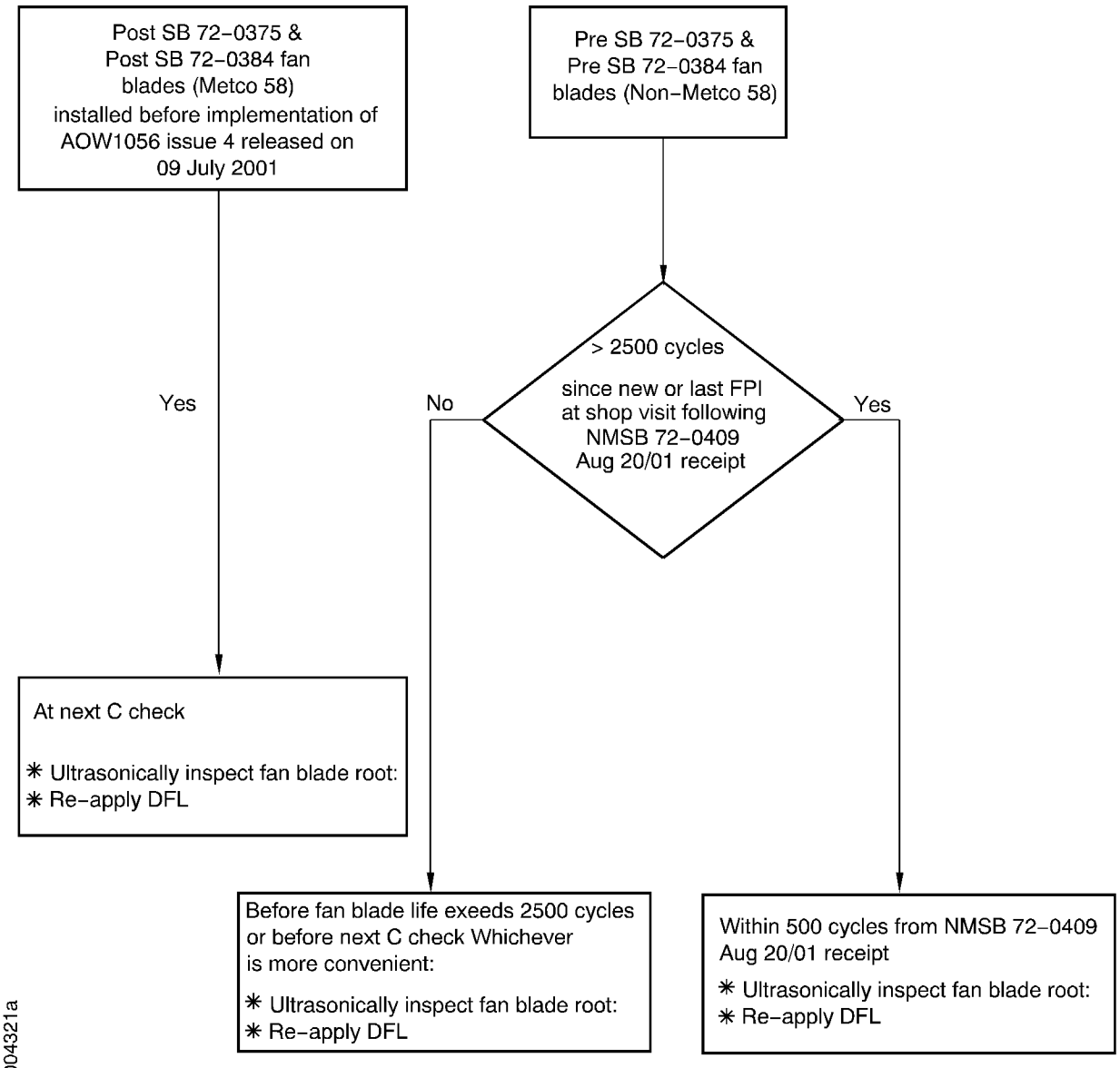
Removal of excess Dry Film Lubricant (DFL)
Fig.3

D5 ENGINES ALL RATINGS



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V2500-D5 - Fan blade in-service inspection requirements
Fig.4

APPENDIX 1

Inspection Proforma

After completion fax this information 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)

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 72-0424 In-Field				% DFL loss on contact surface	Frettage on contact surface	Time (TSN/CSN) SINCE		U/sonic Inspection (Rejection Indication Data)		
Position	Rejected Fan Blade P/N	Rejected Fan Blade S/N	TSN/CSN (If different to engine cycles)	Concave/ Convex	Yes/No	Last DFL lubrication	Last U/Sonic insp.	U/Sonic signal (% screen height)	CX or CV side of Fan Blade	Position from Fan Blade Leading Edge (mm)
	6A	RG								

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Inspection proforma
Appendix 1, Fig.1