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V2500-A5/D5 SERIES PROPULSION SYSTEMS SERVICE BULLETIN

This document transmits Revision 7 to Service Bulletin EV2500-72-0373

Document History

Service Bulletin Revision Status		Supplement Revision Status
Initial Issue	Mar.16/00	
Revision 1	Apr.28/00	
Revision 2	Jun.19/00	
Revision 3	Jul.28/00	
Revision 4	Jan.10/01	
Revision 5	May 18/01	
Revision 6	May 5/04	

Bulletin Revision 7

Remove	Incorporate	Reason for change
Pages 1 to 11 of the Service Bulletin	Pages 1 to 12 of the Service Bulletin	To update tooling identifications

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

The effective pages to this Service Bulletin following incorporation of Revision 7 are as follows:

	Page	Revision Number	Revision Date
	Bulletin		
R	1	7	Jun.11/04
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R	9	7	Jun.11/04
R	10	7	Jun.11/04
R	11	7	Jun.11/04
R	12	7	Jun.11/04

ENGINE - HP COMPRESSOR STAGE 4 ROTOR BLADES - ULTRASONIC INSPECTION OF BLADE ROOTS
NON-MODIFICATION SERVICE BULLETIN

1. Planning Information

A. Effectivity

In-Service Engines pre SB72-0295 standard.

(1) Airbus A319

V2522-A5, V2524-A5, V2527M-A5 engines prior to V11100

(2) Airbus A320

V2527-A5, V2527E-A5 engines prior to V11100

(3) Airbus A321

V2530-A5, V2533-A5 engines prior to V11100

(4) Boeing Longbeach Division MD 90

V2525-D5, V2528-D5 engines prior to V20286

In-Overhaul Shop Engines pre SB72-0295 standard.

(1) Airbus A319

V2522-A5, V2524-A5, V2527M-A5 engines prior to V11100

(2) Airbus A320

V2527-A5, V2527E-A5 engines prior to V11100

(3) Airbus A321

V2530-A5, V2533-A5 engines prior to V11100

(4) Boeing Longbeach Division MD 90

V2525-D5, V2528-D5 engines prior to V20286

B. Reason

(1) Problem

The purpose of this Non-Modification Service Bulletin is to introduce an inspection for cracking of the stage 4 HPC rotor blade roots.

Cracking has been found in the root of HPC stage 4 rotor blades. The cracking initiates from the forward edge of the blade root where the blade contacts the stage 4 disc. To date there have been a few occasions where this cracking has propagated sufficiently for the remainder of the blade to be released causing severe secondary damage to the engine.

A means of inspecting the stage 4 blades in service has been developed. This inspection utilises a specially designed ultrasonic probe that is inserted into the engine through the borescope access port at stage 4.

The purpose for revision 6 of this Non-Modification Service Bulletin is to extend the effectivity to cover all V2500-A5 engines with pre SB72-0295 blades and revise the associated compliance categories.

C. Description

This Non-Modification Service Bulletin has been divided into two parts:

Part 1	Details an ultrasonic inspection procedure that can be used for engines that are installed on wing
Part 2	Details an equivalent level of inspection that can be used for engines at overhaul where the stage 4 HPC rotor blades have been removed from the engine

Accomplishment of this NMSB can be claimed for engines that satisfactorily comply with the relevant criteria of Part 1 or Part 2 and meet the concurrent requirements detailed in 1.G.

D. Compliance

In-Service Engines

Airbus and Boeing Aircraft

Optional on-wing inspection to be accomplished at next aircraft C check on all engines that have not previously been inspected. The ultrasonic inspection must only be performed by suitably qualified persons who have received specialist training. The specialist training must be provided by IAE instructors or by holders of an IAE certificate of competence for this inspection.

In Overhaul Shop Engines

V2500-A5/D5 engines

Category 4

Accomplish at every shop visit of an engine to an overhaul base regardless of planned maintenance action. The ultrasonic inspection must only be performed by suitably qualified persons who have received specialist training. The specialist training must be provided by IAE instructors or by holders of an IAE certificate of competence for this inspection.

If the HP compressor is not planned to be disassembled or the stage 4 blades are not planned to be removed from the rotor, Part 1 of the NMSB should be accomplished at a suitable point in the shop visit. If the stage 4 blades are planned to be removed from the rotor, Part 2 should be accomplished.

E. Approval

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

F. References

(1) IAE V2500 Service Bulletin:

ENG-72-0295

Engine - HP Compressor Blades - Introduction of a Redesigned Stage 4 Blade Assembly.

(2) Airbus A319/A320/A321 Aircraft Maintenance Manual (AMM), Chapter Section 72-00-00, Inspection/Check.

(3) V2500-A1/A5 Engine Manual (EM), Chapter Section 72-41-15, Inspection Check

(4) Boeing MD 90 Aircraft Maintenance Manual (AMM), Chapter Section 72-00-00, Inspection/Check.

(5) V2500-D5 Engine Manual (EM), Chapter Section 72-41-15, Inspection Check

(6) Internal reference ECOOVR736, ECOOVR736A, ECOOVR736B, ECOOVR736C, ECOOVR736D, ECOOVR736E and ECOOVR736F.

(7) ATA Locator 72-00-00.

G. Concurrent Requirements

None

H. Manpower

Estimate of man-hours necessary to embody this Service Bulletin in full:

(1) In service

(a) To gain access

1 hour

(b) To embody

1 hour

(c) To close up

30 minutes

(d) Total

2 hours and 30 minutes

(2) At overhaul

Not affected

NOTE: The parts affected by this Service Bulletin are accessible at overhaul

2. Material Information

None.

3. Accomplishment Instructions

A. Part 1 - Ultrasonic inspection of stage 4 blades on an installed engine

(1) Tools and Equipment

R NOTE: Items (b) and (c) are to be supplied on loan from IAE.

(a) Ultrasonic flaw detector preferably with a selectable frequency amplifier capable of working in the 5 to 10 MHz range.

R (b) Turning tool and Borescope inspection kit - IAE tool number IAE2R19544
R or IAE2R19545.

R (c) Ultrasonic probe inspection kit - IAE tool number IAE2R19750.

R The kit contains the following:

R (i) IAE 2R19395 - Ultrasonic Probe.

R (ii) IAE 2R19751 - Working Standard.

R (iii) IAE 2R19752 - Working Standard.

R (iv) IAE 2R19753 - Borescope Hole Adaptor.

R (v) IAE 2R19754 - Lead.

R (vi) 2 Standard 20 ml. Syringes.

(2) Calibration of Ultrasonic Detector

(a) Connect probe to ultrasonic flaw detector, adjust filters to the 5 to 10 MHz range and delay to zero.

(b) Position the probe on the leading edge platform of test piece
R IAE2R19752 and align probe edge with edge of the blade, refer to Figure 2.

(c) Identify large signal reflected from the bottom corner of the test
R piece IAE2R19752. Position this signal at division 8 on the timebase and adjust to 50% screen height. Increase gain by 12 dB and transfer
R the probe to test piece IAE2R19751 containing the 2,0 mm slot, identify the signal reflected from the slot.

(d) Adjust amplitude of this signal to 50% screen height and position monitor gate over signal, to aid identification. Increase gain by a further 6dB, the signal should now be full screen height.

(e) Adjust width of monitor gate to 1.5 timebase divisions and position centrally over calibration signal.

(f) If available, set gate alarm to trigger at 50%.

(3) Installation of Turning tool and Borescope inspection kit

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 1 HOUR 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.

(a) Follow manufacturer's instructions to install the engine turning tool.

(b) Ensure that you familiarise yourself with the operation of the engine turning tool.

(c) Prepare the engine for borescope access - refer to AMM TASK 72-00-00. Refer to Figure 1.

(d) Borescope access port cover B (ATA 72-41-31, 01-100 part no. 6A2330) and the tooling blank immediately behind access port cover B (ATA 72-41-31, 01-120 part no. 6A1069) are the only access port covers that need to be removed. The clip holding the wiring harness to the pipe immediately in front of access port B will need to be loosened and the clip removed.

R (e) Install the borescope Hole Adaptor IAE2R19753 to the HPC front casing at borescope access port B.

(i) Torque the bolts sufficiently to secure the support tool in place.

CAUTION: BEFORE INSERTING THE BORESCOPE PROBE THE VSV'S WILL HAVE TO BE MOVED TO THE FULLY OPEN POSITION TO ENABLE PROPER ACCESS.

(f) Move the VSVs to allow proper access.

(i) Use a suitable spanner on the wrench flats of the crankshaft and move the VSVs to the fully open position.

(ii) Check the VSVs are at the correct position by inserting the rigging pin (IAE1R18254) through the hole in the crankshaft into the high speed rigging position in the crankshaft housing.

(iii) Remove the rigging pin (IAE1R18254).

(g) Insert the borescope probe in to the correct position.

(i) Insert the borescope probe into the engine through the support tool installed at access port B.

(ii) Connect the video camera and screen to the borescope probe - refer to manufacturer's instructions.

(iii) Adjust the borescope probe until it is looking rearwards (through the open stage 3 VSVs) at the leading edge of the stage 4 rotor blades. Make sure that you have a clear view of the forward edge of the stage 4 rotor blade platforms.

(h) With the borescope probe and camera installed check again that you are familiar with the operation of the engine turning tool equipment.

(4) Installation and inspection using the Ultrasonic probe.

CAUTION: YOU MUST MAKE SURE THAT THE ULTRASONIC PROBE DOES NOT FOUL THE ROTATION OF THE ENGINE. LEAVING THE PROBE IN CONTACT WITH THE STAGE 4 ROTOR BLADE PLATFORM WHILE ROTATING THE ENGINE MAY RESULT IN DAMAGE TO THE PROBE AND TO THE ENGINE.

CAUTION: IT IS IMPORTANT THAT THE PROBE IS IN THE CORRECT POSITION ON THE STAGE 4 ROTOR BLADE PLATFORM.

(a) Carefully insert the ultrasonic probe through the tooling access port.

(b) Secure the bolts to attach the ultrasonic probe guide in position over the tooling access port.

(c) Use the view given by the borescope probe inserted at 3.A.3.g to check that the ultrasonic probe is clear of the rotor assembly. Use the engine turning tool, in jog mode, set at power level 9 and speed 10 minutes per revolution to take up the backlash in the drive assembly. Use the top green arrow on the turning tool handset for V2500-A5 engines, for V2500-D5 engines use the lower green arrow. Rotate at least two blades to ensure that the drive is turning smoothly.

(d) As the rotor is slowly rotated, in jog mode, rotate and lower the ultrasonic probe into position. The rotor should be stopped when the forward corner of the blade to be inspected is level with the trailing edge of the VSV. Inject a small amount of couplant and observe signals on the ultrasonic flaw detector. The probe should be finally positioned by jogging the rotor. The final position is determined by observing and maximising the large signal from the bottom corner of the blade at position 8 on the time base, the signal from the front surface of the probe will decrease at this stage. The probe may need to be lifted and re-seated with fresh application of couplant to achieve this (note - this signal will only be achieved with an un-cracked blade).

(e) When the ultrasonic probe is in the correct position on the stage 4 rotor blade platform the location should be noted from the engine turning tool. An illustration of the correct probe position is given in Figure 2.

(f) Continue inspection by rotating the ultrasonic probe out of the path of the stage 4 rotor blades. Then use the engine turning tool to move the HP rotor to the next blade position. Repeat until all 38 stage 4 rotor blades have been inspected or until a cracked blade is discovered.

(5) Reject/Acceptance criteria

(a) Observe the flaw detector screen

(i) If the backwall signal is evident at 50 percent screen height or greater with no signal in the gated area, accept the blade.

(ii) If no backwall is evident or is less than 50 percent screen height, apply more couplant and reposition probe. Continual failure to obtain a backwall of 50 percent screen height and/or a signal in the gated area over 50 percent screen height is cause for rejection of the blade.

(b) If a reject blade is found, reject the engine.

(6) Return the engine to a serviceable condition

(a) Disconnect the ultrasonic probe guide from the front casings and carefully remove the probe from the engine.

(b) Carefully remove the borescope probe from the engine.

(c) Disconnect the engine turning tool from the front of the gearbox - refer to the manufacturer's instructions.

(d) Move the VSVs back to the closed position. Use a suitable spanner on the wrench flats of the crankshaft and move the VSVs to the closed position.

R (e) Disconnect the borescope Hole Adaptor IAE2R19753 from borescope access port B

(f) Return the engine to a serviceable condition - refer to AMM TASK 72-00-00.

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B. Part 2 - Piece part inspection of the stage 4 blades at overhaul

(1) Tools and Equipment

Refer to Engine Manual, 72-41-15, for tools and equipment necessary to inspect the stage 4 rotor blades.

(2) Clean the parts

Refer to Engine Manual, 72-41-15, TASK 72-41-15-100-002, for the procedure necessary to clean the parts.

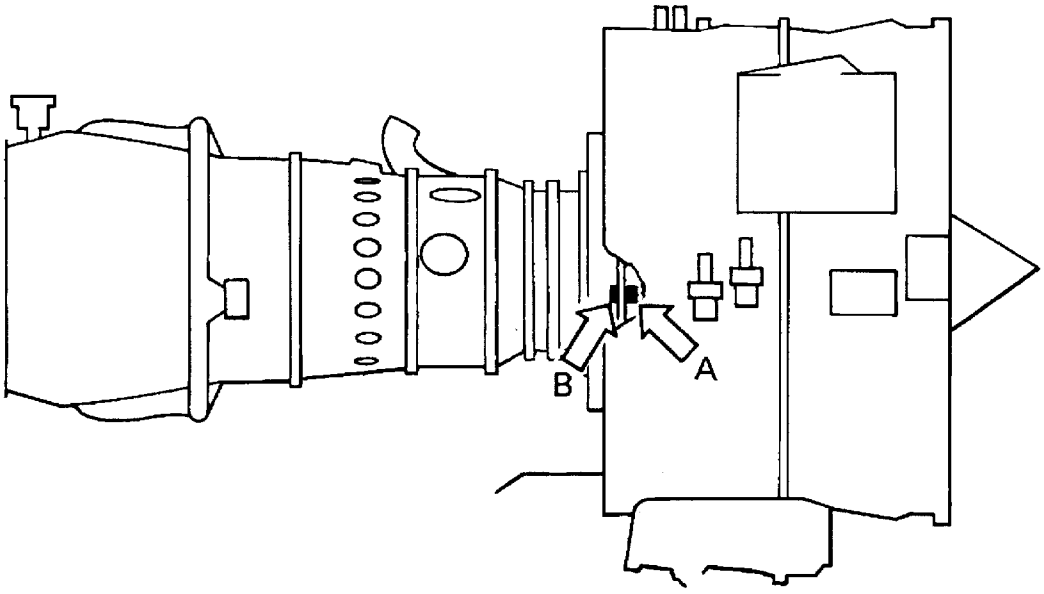
(3) Inspect the parts

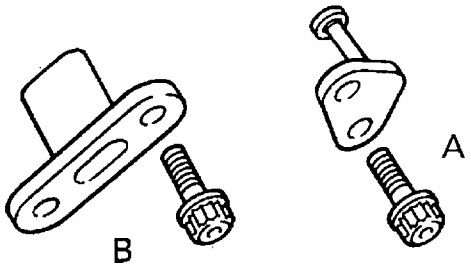
Refer to Engine Manual, 72-41-15, TASK 72-41-15-200-002 for the procedure necessary to inspect the parts.

C. Record of Accomplishment

(1) A record of accomplishment is necessary

(2) When the accomplishment instructions are completed, tell the IAE representative that this Non-Modification Service Bulletin has been accomplished, the inspection record sheet, Fig 3 can be used for this purpose.





Tooling Blank

Borescope Access Port 'B'

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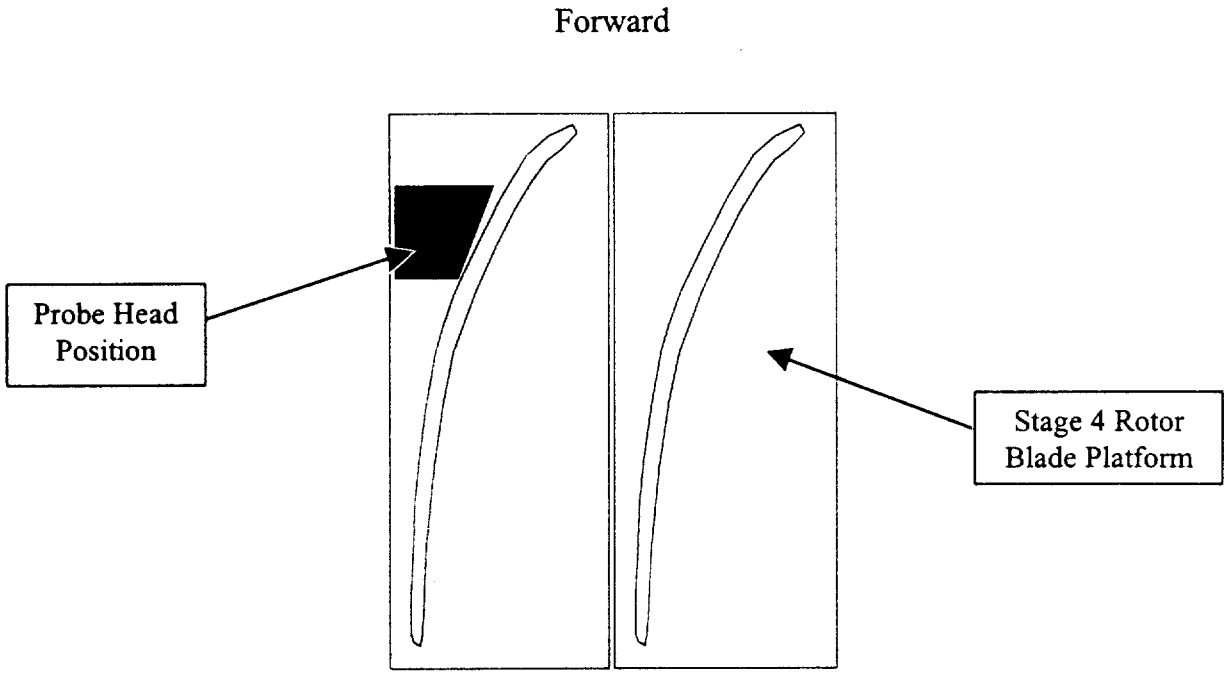
Access ports to be removed
Fig 1



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Correct position of ultrasonic probe relative to stage 4 blade platform
Fig 2

NMSB 72-0373 Inspection Record		
Operator		
Aircraft Reg		
Date of Inspection		
Engine Position/Number		
Engine TSN/CSN		
Inspection Pass/Fail		
Inspected by (Stamp)		

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Inspection record sheet
Fig 3