V2500 International Aero Engines

SERVICE BULLETIN

ENGINE - HP DISKS AND BLADES - STAGES 7 AND 8 ROTOR BLADES WITH DAMPING WIRES AND STAGES 6, 7 AND 8 BLADES WITH ANTI-FRET COATING

MODEL APPLICATION

V2500-A1

BULLETIN INDEX LOCATOR

72-41-00

Compliance Category Code	Internal Reference No.
R 6	EC92VR386
	ECM92VR386-03
R	ECM92VR386-04
	EC93VR778
	EC93VR778A
	EC93VR778B

ENGINE - HP DISKS AND BLADES - STAGES 7 AND 8 ROTOR BLADES WITH DAMPING WIRES AND STAGES 6, 7 AND 8 BLADES WITH ANTI-FRET COATING

1. Planning Information

A. Effectivity

(1) Aircraft : Airbus A320

(2) Engine : V2500-A1 Engines prior to Serial No.V0322 except V0312 and V0314

B. Reason

(1) Condition

Several incidents have occurred where stage 7 and 8 rotor blades have become detached from the disk.

(2) Background

An operational condition has induced high vibratory stresses and frettage in the HP compressor stages 7 and 8 rotor blades.

(3) Objective

To ensure that blade disengagement potential has been eliminated and to improve HP compressor reliability.

(4) Substantiation

Damping wires have been introduced at stages 7 and 8 and an anti-frettage coating applied to stages 6, 7 and 8 blade dovetail roots. The damping wires reduce the amplitude of vibration of the blades and the frettage fatigue condition is addressed by the coating.

Mechanical rig, straingauge and endurance testing successfully demonstrated the damping effect of the wires and the improvement gained by application of the anti-frettage coating.

Finite element analysis of the steady stress at the platforms confirmed that the increased loading due to the damping wires will be satisfactory. Life analysis showed that there is no effect on the cyclic life of the compressor front drum.

(5) Effect of Bulletin on Workshop Procedures:

Removal/Installation	Not affected
Disassembly/Assembly	Affected (see Supplemental Information)
Cleaning	Affected (see Supplemental Information)
Inspection/Check	Affected (see Supplemental Information)
Repair	Affected (see Supplemental Information)
Testing	Not affected

(6) Supplemental Information

(a) The Disassembly/Assembly will be revised to add new configuration of this Service Bulletin.

(b) Cleaning, Inspection/Check and Repair will be revised to add new configuration of this Service Bulletin.

C. Description

This Service Bulletin introduces H.P. compressor stages 6,7 and 8 rotor blades with a PL 239 anti-frettage coating on the dovetail flanks and a stage 3 to 8 disk assembly with stages 7 and 8 damping wires. Existing blades can be reworked by applying the anti-frettage coating to the dovetail root flanks.

R METHOD 1

Existing stage 3 to 8 disk assemblies can be reworked by machining grooves to house the damping wires.

R METHOD 2

R Existing Stage 3 to 12 disk assemblies, rear shaft and seal assembly can be
R reworked by machining grooves to house the damping wires.

In addition, the opportunity is taken to adjust the quantities of nominal and undersize blades that can be selected for an engine set. This requirement has been brought about by engine build experience.

For effect on declared lives, see Engine Manual, 05-10-01, Group 'A' Parts Lives.

D. Approval

The part number changes and/or modifications described in Section 2 and 3 of this Service Bulletin have been shown to comply with the applicable Federal Aviation Regulations and are FAA-APPROVED for the Engine Model listed.

E. Compliance

R Category Code 6

R Accomplish when the subassembly (i.e. modules, accessories, components,
R build groups) is disassembled sufficiently to afford access to the affected
R part and to all affected spare parts.

F. Manpower

Estimated manhours to incorporate the full intent of this Bulletin:

Venue		Estimated Manhours
(1)	In service	Not applicable
(2)	At overhaul	
(a)	To remove HP compressor assy.	14 hours 45 minutes
(b)	To strip HP compressor assy.	14 hours 15 minutes
(c)	To strip HP compressor rotor	4 hours 30 minutes
(d)	To crack test blades stages 7 & 8	1 hour
(e)	To etch blades stages 7 & 8	7 hours
(f)	To binocular inspect blades stages 7 & 8	8 hours
(g)	To shot peen blades stages 7 & 8	1 hour
(h)	To coat blades stages 6, 7 & 8	10 hours 15 minutes
(i)	To machine disc	5 hours 40 minutes
(j)	To assemble HP compressor rotor	5 hours 30 minutes
(k)	To assemble HP compressor	33 hours 30 minutes
(l)	To install HP compressor to engine	13 hours 45 minutes

G. Material - Price and Availability

(1) Modification Kit not required.

(2) See "Material Information" section for prices and availability of future spares.

H. Tooling - Price and Availability

The following tools are required to accomplish this Service Bulletin when reworking the existing H.P. compressor disk assembly.

Tool No.	Qty	Description	Function	Avail
IAE3R18735	1	Turning arbor	Rework disk assembly	(1)
IAE3R19079	1	Front groove tool	Form location slot	(1)
IAE3R19080	1	Rear groove tool	Form location slot	(1)
IAE3R19100	1	Front groove tool	Form location slot	(1)

(1) Indicates that tool design aperture card is currently available from IAE

I. Weight and Balance

(1) Weight change	+ 0.1 lb (+ 0.045 kg)
(2) Moment arm	18.5 in. (470 mm) rearward of datum
(3) Datum	Engine front mount centreline (Power Plant Station - PPS 100)

J. Electrical Load Data

This Service Bulletin has no effect on the aircraft electrical load.

K. References

(1) IAE V2500 Service Bulletins:

V25000-ENG-72-0130 - H.P. Compressor Disks - Compressor Stage 3 to 8 Rotor Drum Assembly with Spacers in Triple Melt Titanium.

L. Other Publications Affected

(1) The V2500 Engine Illustrated Parts Catalog, 72-41-00, Figure 1 and 72-41-15, Figure 2 to add the new parts.

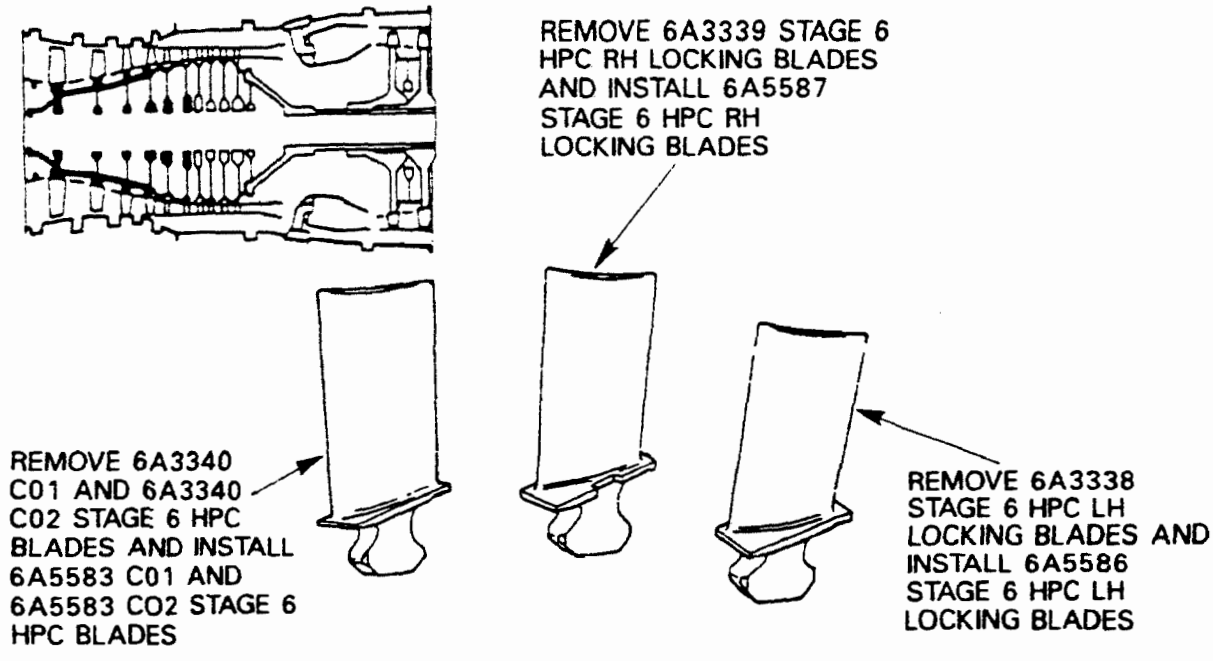
(2) The V2500 Engine Manual, 5-10-01, Group 'A' Part Lives, to add the new parts.

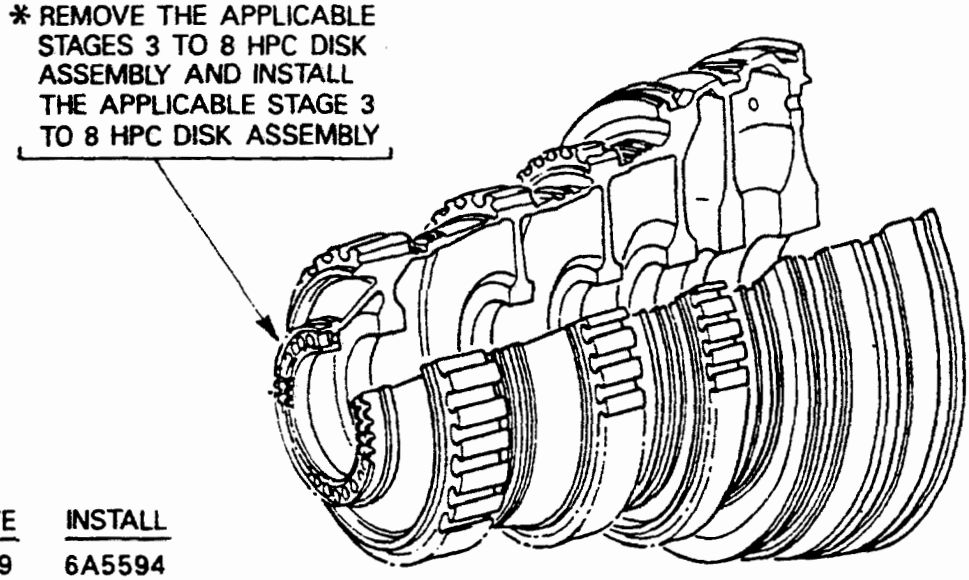
(3) The V2500 Engine Manual, 72-41-10 Assembly-01.

(4) The V2500 Engine Manual, 72-41-11 Cleaning-00, Cleaning-01, Inspection-00, Inspection-01 and Rework.

(5) The V2500 Engine Manual, 72-41-15 Cleaning-00, Cleaning-01, Inspection-00, Inspection-01, Inspection-04, Inspection-05, Inspection-06 and Rework.

(6) Repair Schemes VRS6007, VRS6012, VRS6013, VRS6014, VRS6047, VRS6048, VRS6052, VRS6053, VRS6054, VRS6068, VRS6069, VRS6070, VRS6122, VRS6132, VRS6149, VRS6150, VRS6220, VRS6300 and VRS6487 are affected.

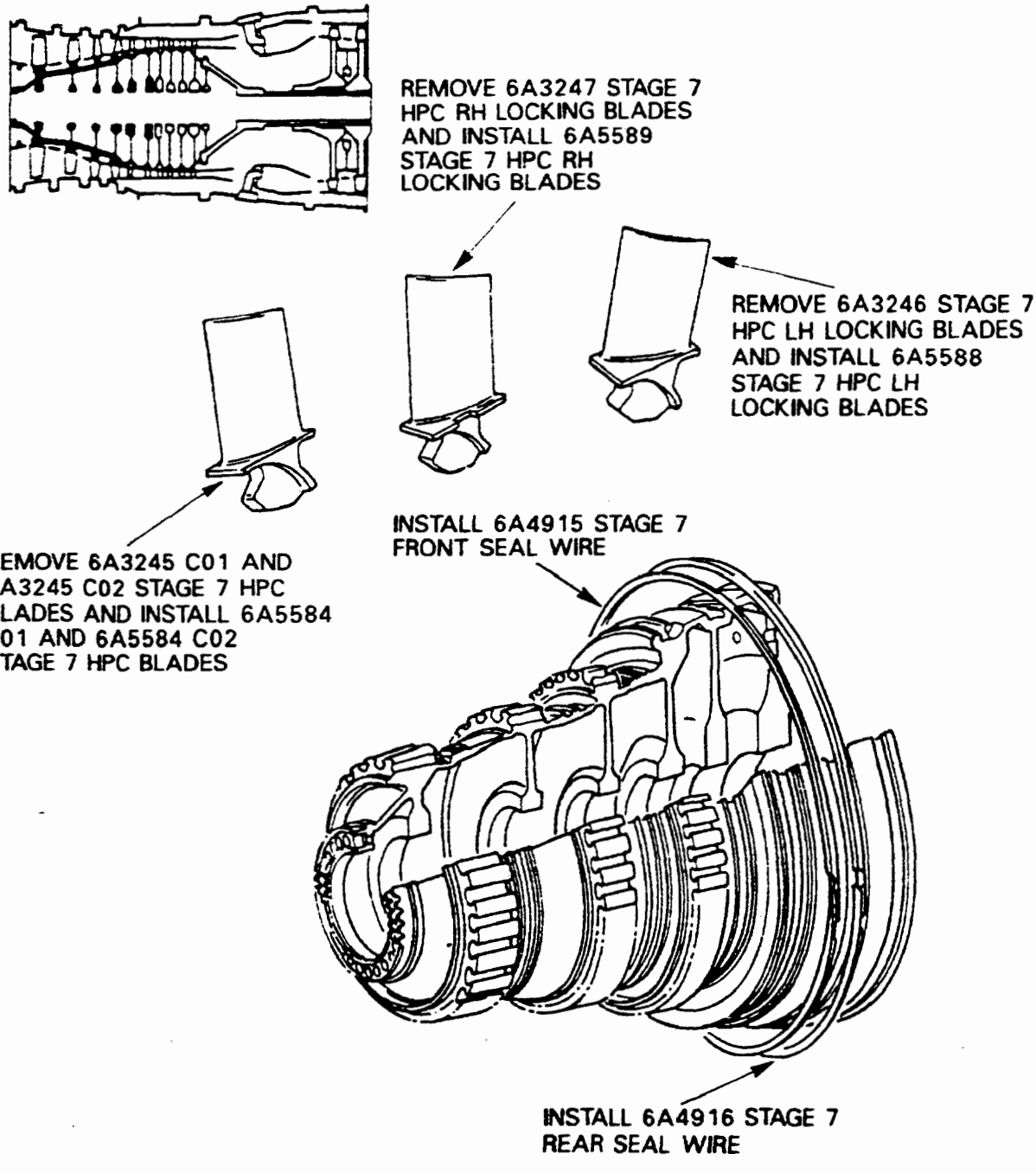




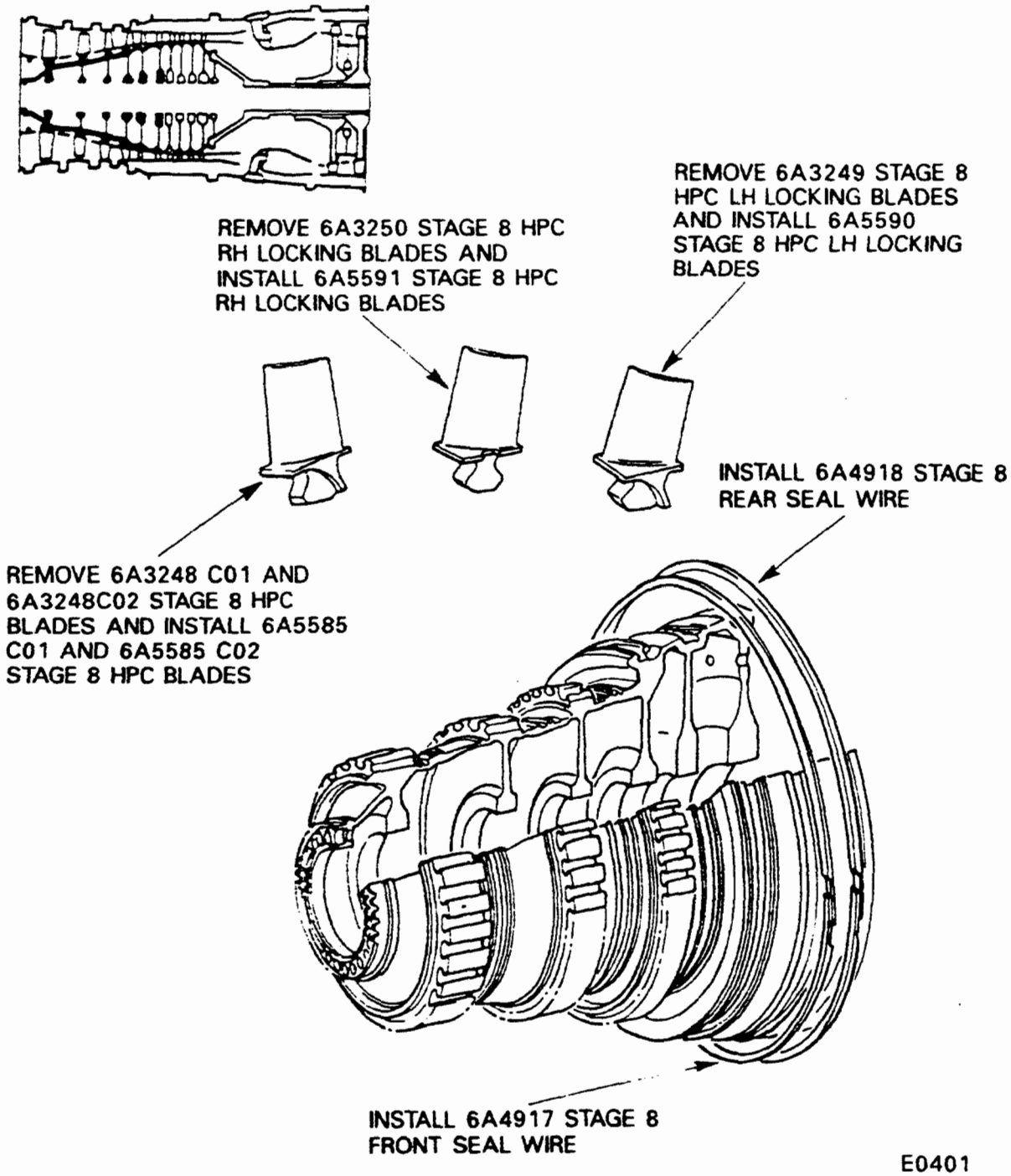
* REMOVE	INSTALL
6A4189	6A5594
6A3934	6A5592
6A3936	6A5659

E0399

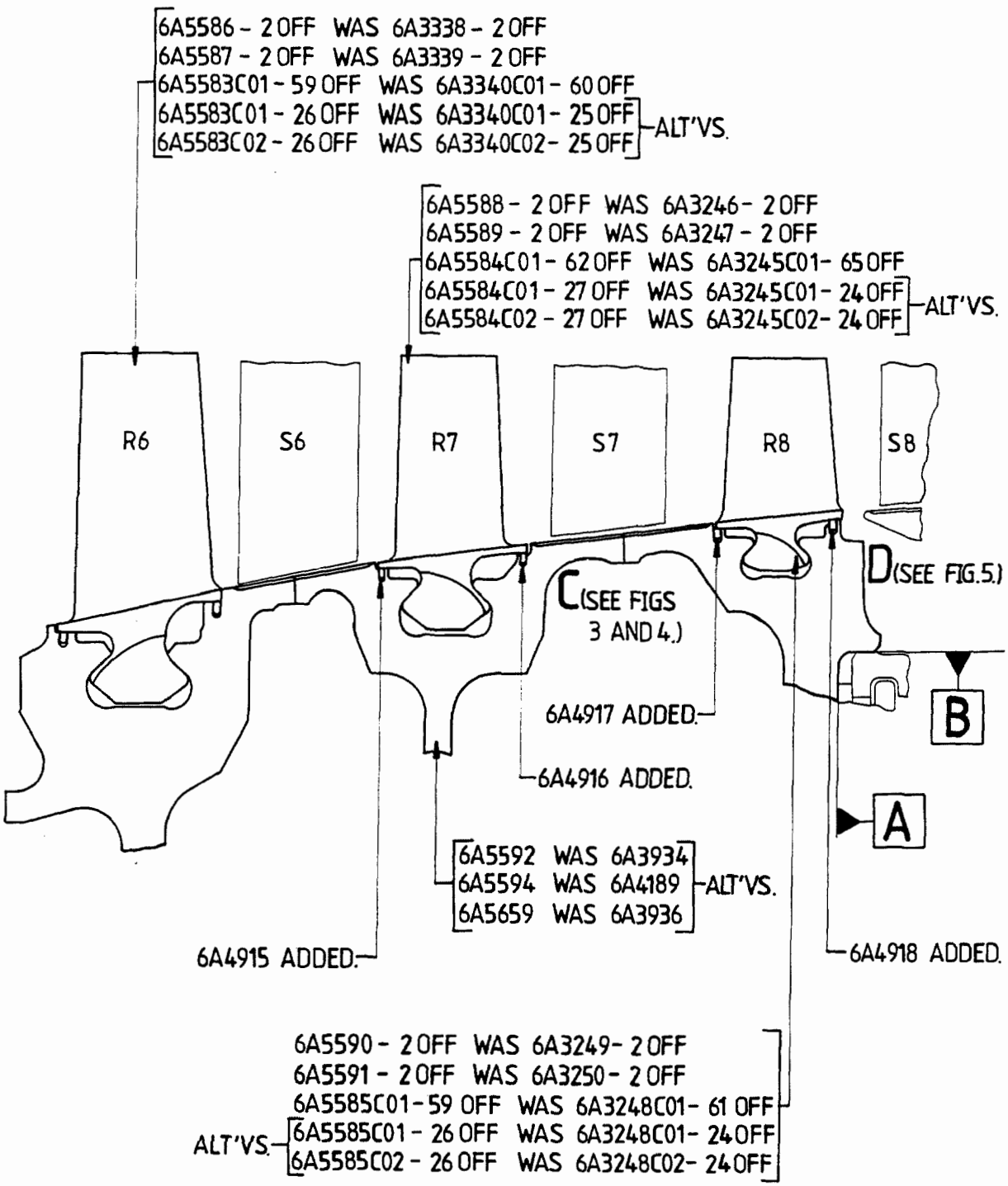
Location of HPC rotor blades
(stage 6)
Figure 1 (Sheet 1 of 3)



Location of HPC rotor blades
(stage 7)
Figure 1 (Sheet 2 of 3)



Location of HPC rotor blades
(stage 8)
Figure 1 (Sheet 3 of 3)



General section thru HP compressor
- Before and after alteration
Figure 2

2. Accomplishment Instructions

A. Prerequisite Instructions

(1) Remove HP compressor assembly from engine, refer to Engine Manual, 72-00-41.

(2) Disassemble HP compressor assembly, refer to Engine Manual, 72-41-00.

(3) Disassemble HP compressor rotor, refer to Engine Manual, 72-41-10.

R NOTE: Two alternative methods of rework are available refer to B.
R Rework Instructions Methods 1 and 2 to determine the extent of
R disassembly necessary.

B. Rework Instructions

METHOD 1

(1) Rework 6A4189, 6A3934 or 6A3936, H.P. compressor stage 3 to 8 disk assembly. (Refer to 72-41-11, Fig/Item 01-200).

Standard Equipment

Centre lathe
Milling machine
Dial test indicator
Standard turning tool
Ball-nosed milling cutter
Standard workshop tools
Vibro-engraving tool

R
R

Procedure	Supplemental Information
CAUTION: 1. TITANIUM COMPONENT - USE SILICON CARBIDE TYPE ABRASIVE WHEELS, STONES AND PAPERS TO DRESS, BLEND AND POLISH THIS COMPONENT.	
2. TITANIUM COMPONENT - DO NOT USE FORCE WITH MECHANICAL CUTTERS OR THE MATERIAL WILL BECOME TOO HOT.	
3. TITANIUM COMPONENT - IF THE MATERIAL SHOWS A CHANGE IN COLOR TO DARKER THAN A LIGHT STRAW COLOR, THE COMPONENT IS TO BE REJECTED.	
(a) Clean the disk assembly	Use overhaul process facility. Refer to SPM, TASK 70-11-34-300-503.

	Procedure	Supplemental Information
(b)	Set up the disk assembly for machining	Use IAE 3R18735 turning arbor, 1 off, with centre lathe. Use dial test indicator to ensure disk assembly runs true.
(c)	Face-off angled surface at at the rear of the stage 8 dovetail slot leaving the 0.028 in. (0,72 mm) to 0.032 in. (0,82 mm) dimension intact	Flat surface required to avoid deflection/breakage of fine groove tool during machining. Use standard turning tool. Refer to Figures 2 and 5
(d)	Machine the damping wire location slots at the front of stages 7 and 8 blade root location slots	Use IAE 3R19100 front groove tool, 1 off. Refer to Figures 2,3 and 5
	NOTE: Do not machine to full depth of above, allowance for final machining is required.	
(e)	Machine the damping wire location slots at the front and rear of stages 7 and 8 blade root location slots	Use IAE 3R19079 front groove tool, 1 off, and IAE 3R19080 rear groove tool, 1 off, as applicable. Refer to Figures 2,3 and 5
(f)	Remove sharp edges	Use standard turning tool
(g)	Remove disk assembly from machine	
(h)	Set up the disk assembly machine cusp at stage 7 location slot	Use 0.160 in. (4mm) dia. ball-nosed milling cutter with standard milling machine
(i)	Machine to remove the cusp	See Figures 3 and 4
(j)	Remove sharp edges	Use standard workshop tools
R (k)	Chemically clean the machined surfaces in preparation for crack test	Refer to SPM, TASK 70-11-26-300-503
(l)	Swab etch machined surfaces	Refer to SPM, TASK 70-11-08-300-503
(m)	Crack test affected areas	Refer to SPM, TASK 70-23-04-230-501. Reject if cracked

Procedure	Supplemental Information
(n) Clean the disk assembly	Use overhaul process facility. Refer to TASK 72-41-11-100-001-B00 (72-41-11, P.B.601), SUBTASK 72-41-11-110-057
(o) Cancel the existing part number and re-identify with the new part number	Use vibro-engraving equipment. Refer to SPM, TASK 70-09-00-400-501 Existing — Re-number 6A4189 — 6A5594 6A3934 — 6A5592 6A3936 — 6A5659

METHOD 2

(2) Rework the HP compressor stage 3 to 12 disk assembly, rear shaft and seal assembly. Remove the following HP compressor rotor blades, stages 6,7 and 8 during the rework cycle. Other stages of rotor blades can be removed as necessary.

Consumable Materials

CoMat 01-031	Acetone (CH3)2CO
CoMat 02-005	Masking tape
CoMat 06-022	Fluorescent penetrant
CoMat 06-032	Dry developer
CoMat 06-045	Hydrophilic penetrant remover

NOTE: To identify consumable materials, refer to Process Consumable Index, P.C.I.

Standard Equipment

Centre lathe
Milling machine
Dial test indicator
Standard turning tool
Ball-nosed milling cutter
Standard workshop tools
Vibro-engraving tool

Procedure	Supplemental Information

CAUTION:

1. TITANIUM COMPONENT - USE SILICON CARBIDE TYPE ABRASIVE WHEELS, STONES AND PAPERS TO DRESS, BLEND AND POLISH THIS COMPONENT.

2. TITANIUM COMPONENT - DO NOT USE FORCE WITH MECHANICAL CUTTERS OR THE MATERIAL WILL BECOME TOO HOT.

3. TITANIUM COMPONENT - IF THE MATERIAL SHOWS A CHANGE IN COLOR TO DARKER THAN A LIGHT STRAW COLOR, THE COMPONENT IS TO BE REJECTED.

4. YOU MUST TAKE CARE AT ALL TIMES DURING THE REWORK CYCLE AND MAKE SURE THAT NO HANDLING DAMAGE OCCURS TO THE INSTALLED ROTOR BLADES.

5. DURING THE REWORK CYCLE OF THE HP COMPRESSOR ARRANGEMENT, MASKING IS NECESSARY. REFER TO FIGURE 2A. MAKE SURE MASKING IS KEPT SOUND DURING REWORK CYCLE, REPLACE AS NECESSARY.

6. DURING THE REWORK CYCLE OF THE HP COMPRESSOR ARRANGEMENT ALL CUTTING AND CLEANING FLUIDS USED MUST BE CHLORINE FREE.

R 7. CHLORINE WILL CAUSE DAMAGE TO TITANIUM COMPONENTS AND IF USED
R WILL NECESSITATE A COMPLETE STRIP AND CLEAN OF THE HP
R COMPRESSOR ARRANGEMENT.

	Procedure	Supplemental Information
R (a)	Clean the disk assembly locating faces, prior to machining.	Use overhaul process facility. Refer to SPM, TASK 70-11-26-300-503.
R (b)	Apply masking tape to the interface between stage 8 and 9 disks and all other areas, surfaces that does not have to be machined.	Use CoMat 02-005. Make sure that cutting and cleaning fluids cannot penetrate the masking. Refer to Figure 2A.
R (c)	Set up the HP compressor arrangement for machining	Use standard workshop tools with centre lathe. Use dial test indicator to make sure HP compressor arrangement runs true. Refer to Figure 2B.
R (d)	Face-off angled surface at the rear of the stage 8 dovetail slot leaving the 0.028 in. (0,72 mm) to 0.032 in. (0,82 mm) dimension intact	Flat surface required to avoid deflection/breakage of fine groove tool during machining. Use standard turning tool. Refer to Figures 2 and 5
R (e)	Machine the damping wire location slots at the front of stages 7 and 8 blade root location slots	Use IAE 3R19100 front groove tool, 1 off. Refer to Figures 2, 3 and 5
R	NOTE: Do not machine to full depth of above, allowance for final machining is required.	
R (f)	Machine the damping wire location slots at the front and rear of stages 7 and 8 blade root location slots	Use IAE 3R19079 front groove tool, 1 off, and IAE 3R19080 rear groove tool, 1 off, as applicable. Refer to Figures 2, 3 and 5
R (g)	Remove sharp edges	Use standard turning tool
R (h)	Remove disk assembly from machine	

		Procedure	Supplemental Information
R R R	(i)	Set up the disk assembly machine cusp at stage 7 location slot	Use 0.160 in. (4mm) dia. ball-nosed milling cutter with standard milling machine
R	(j)	Machine to remove the cusp	See Figures 3 and 4
R	(k)	Remove sharp edges	Use standard workshop tools
R R R	(l)	Chemically clean the machined surfaces in preparation for crack test	Refer to SPM, TASK 70-11-26-300-503
R R	(m)	Swab etch machined surfaces	Refer to SPM, TASK 70-11-08-300-503
R R R R R R R R	(n)	Crack test affected areas	Refer to SPM, TASK 70-23-05-230-501, use CoMat 01-031 acetone (CH3)2CO, CoMat 06-022 fluorescent penetrant, CoMat 06-032 dry developer and CoMat 06-045 hydrophilic penetrant remover. Reject if cracked
R R R	(o)	Clean the machined surfaces	Refer to SPM, TASK 70-11-03-300-503. SUBTASK 70-11-03-300-002
R R	(p)	Remove masking tape	Make sure all remnants of tape are removed
R R R	(q)	Chemically clean to remove masking tape remnants as necessary	Refer to SPM, TASK 70-11-03-300-503 SUBTASK 70-11-03-300-002
R R R R	(r)	Visually inspect rotor blades and HP compressor arrangement for any form of handling damage	Refer to SPM, TASK 70-21-00-220-501

R (s) Cancel the existing part number and re-identify with new part number.
R NOTE: Stage 3 rotor blades require to be moved forwards to allow re-identification of stage 3 to 8 HP disk assembly.
R Disassembly/Assembly of stage 3 to 8 HP disk assembly. Refer to Engine Manual, 72-41-10.

Use vibro-engraving equipment. Refer to SPM, TASK 70-09-00-400-501

Existing	Re-number
6A4189	6A5594
6A3934	6A5592
6A3936	6A5659

R (3) Rework the following parts:

6A3338, Blade, LH locking - HP compressor stage 6 (Refer to 72-41-15, Fig/Item No.02-170)
6A3339, Blade, RH locking - HP compressor stage 6 (Refer to 72-41-15, Fig/Item No.02-185)
6A3340 C01, Blade, HP compressor stage 6 (Refer to 72-41-15, Fig/Item No.02-200)
6A3340 C01, Blade, HP compressor stage 6 (Refer to 72-41-15, Fig/Item No.02-215)
6A3340 C02, Blade, HP compressor stage 6 (refer to 72-41-15, Fig/Item No.02-217)
6A3246, Blade, LH locking - HP compressor stage 7 (Refer to 72-41-15, Fig/Item No.02-270)
6A3247, Blade, RH locking - HP compressor stage 7 (Refer to 72-41-15, Fig/Item No.02-285)
6A3245 C01, Blade, HP compressor stage 7 (Refer to 72-41-15, Fig/Item No.02-300)
6A3245 C01, Blade, HP compressor stage 7 (Refer to 72-41-15, Fig/Item No.02-315)
6A3245 C02, Blade, HP compressor stage 7 (Refer to 72-41-15, Fig/Item No.02-317)
6A3249, Blade, LH locking - HP compressor stage 8 (Refer to 72-41-15, Fig/Item No.02-370)
6A3250, Blade, RH locking - HP compressor stage 8 (Refer to 72-41-15, Fig/Item No.02-385)
6A3248 C01, Blade, HP compressor stage 8 (Refer to 72-41-15, Fig/Item No.02-400)
6A3248 C01, Blade, HP compressor stage 8 (Refer to 72-41-15, Fig/Item No.02-415)
6A3248 C02, Blade, HP compressor stage 8 (Refer to 72-41-15, Fig/Item No.02-417)

R Consumable Materials

R CoMat 02-002 Masking tape)
R) Alternatives
R CoMat 02-019 Masking tape)

R CoMat 07-009 Thinners

R CoMat 10-002 Dry film lubricant graphite

R NOTE: To identify consumable materials, refer to Process Consumable
R Index, P.C.I.

R Standard Equipment

R Vibro-engraving tool
R Spray gun
R Oven

	Procedure	Supplemental Information
(a)	Etch stage 7 & 8 rotor blades	Refer to Appendix 1
(b)	Binocular inspect stage 7 & 8 rotor blades	Refer to Appendix 1
(c)	Crack test stage 7 rotor blades	Refer to Engine Manual, 72-41-15-230-055. Reject if cracked.
(d)	Crack test stage 8 rotor blades	Refer to Engine Manual, 72-41-15-230-056. Reject if cracked.
(e)	Shot peen stage 7 & 8 rotor blades	Refer to Repair Scheme VRS6152

CAUTION: DO NOT ABRASIVE BLAST THE DOVETAIL ROOTS OF THE BLADES. THIS IS A SHOT-PEENED AREA.

R (f)	Clean the surfaces of the stage 6, 7 and 8 rotor blades which are to be given a layer of dry film lubricant	Refer to SPM, TASK 70-11-14-300-503
(g)	Apply masking tape to areas which are not to be given a layer of dry film lubricant	Use CoMat 02-002 or CoMat 02-019

	Procedure	Supplemental Information
	(h) Apply the dry film lubricant to a thickness of between 0.00031in. (0,008 mm) and 0.0012in. (0,030 mm)	Refer to SPM TASK 70-38-03-380-501, SUBTASK 70-38-03-380-004. Use CoMat 07-009 and CoMat 10-002. Use a spray gun. Refer to Figures 2 and 6.
	(i) Stove the components	Refer to SPM, TASK 70-38-03-380-501, SUBTASK 70-38-03-380-005. Use an oven
	(j) Examine the dry film lubricant	Refer to SPM, TASK 70-38-03-380-501, SUBTASK 70-38-03-220-001
R	(k) (i) This procedure is alternative to step (k)(ii). Cancel the existing part number and re-identify with the new part number	Use vibro-engraving equipment. Refer to SPM, TASK 70-09-00-400-501

Existing	Re-Number
6A3338	6A5586
6A3339	6A5587
6A3340 C01	6A5583 C01
6A3340 C01	6A5583 C01
6A3340 C02	6A5583 C02
6A3246	6A5588
6A3247	6A5589
6A3245 C01	6A5584 C01
6A3245 C01	6A5584 C01
6A3245 C02	6A5584 C02
6A3249	6A5590
6A3250	6A5591
6A3248 C01	6A5585 C01
6A3248 C01	6A5585 C01
6A3248 C02	6A5585 C02

R R R R R R R R	(ii) This procedure is alternative to step (k)(i). It is permissible to re-identify the blade by adding the symbol as shown in Figure 6. Do not delete the existing part number if you use this procedure	Use vibro-engraving equipment. Refer to SPM, TASK 70-09-00-400-501

Procedure | Supplemental Information

C. Assembly Instructions

(1) New 6A5594, 6A5592 and 6A5659 stage 3 to 8 HPC disk assemblies and 6A5586, 6A5587, 6A5583 C01, 6A5583 C01, 6A5583 C02, 6A5588, 6A5589, 6A5584 C01, 6A5584 C01, 6A5584 C02, 6A5590, 6A5591, 6A5585 C01, 6A5585 C01 and 6A5585 C02 stages 6, 7 and 8 HPC blades are only interchangeable as a COMPLETE SET with in use disk assemblies and blades.

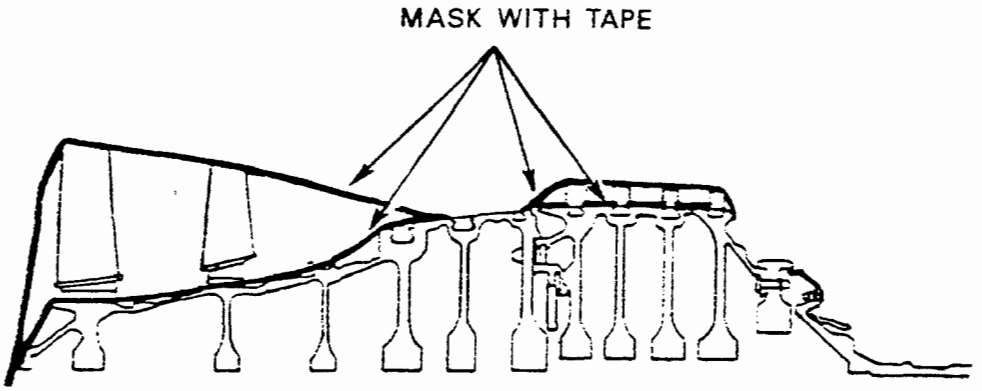
(2) Assemble new or re-identified 6A5594, 6A5592 and 6A5659 stage 3 to 8 HPC disk assemblies and 6A5586, 6A5587, 6A5583 C01, 6A5583 C01, 6A5583 C02, 6A5588, 6A5589, 6A5584 C01, 6A5584 C01, 6A5584 C02, 6A5590, 6A5591, 6A5585 C01, 6A5585 C01 and 6A5585 C02 stages 6, 7 and 8 HPC blades and new 6A4915, 6A4916, 6A4917 and 6A4918 stages 7 and 8 seal wires by use of approved procedures, Engine Manual, 72-41-10, Assembly.

(3) Assemble the HP compressor by use of approved procedures, Engine Manual, 72-41-00, Assembly.

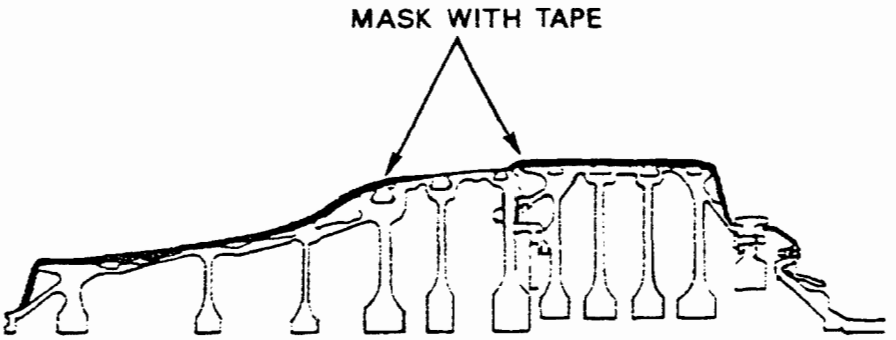
(4) Install the HP compressor to the engine by use of approved procedures, Engine Manual, 72-00-41.

D. Recording Instructions

A record of accomplishment is necessary.



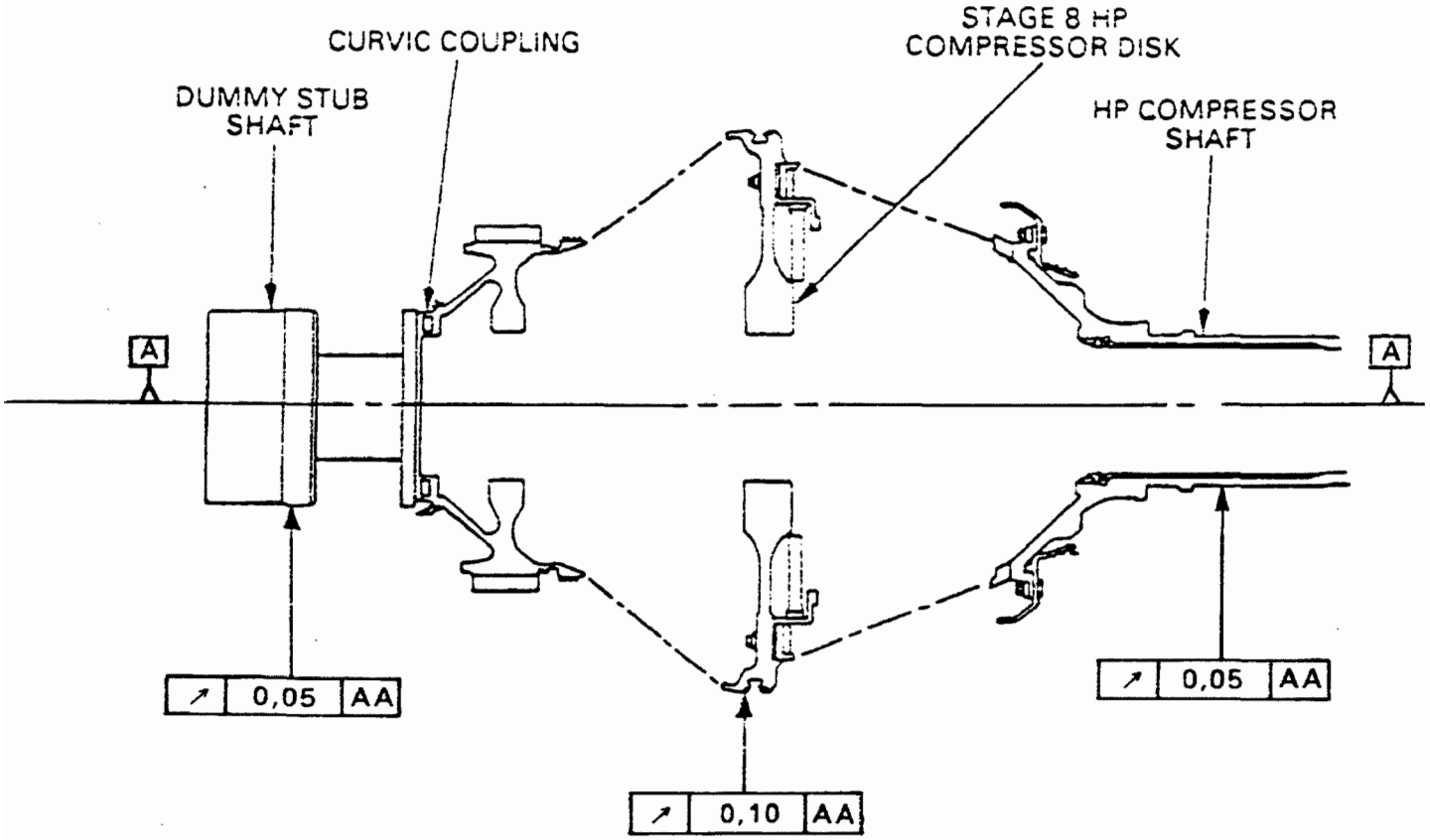
MASKING OF GROOVES AND BLADES BEFORE MACHINING



MASKING OF GROOVES BEFORE MACHINING

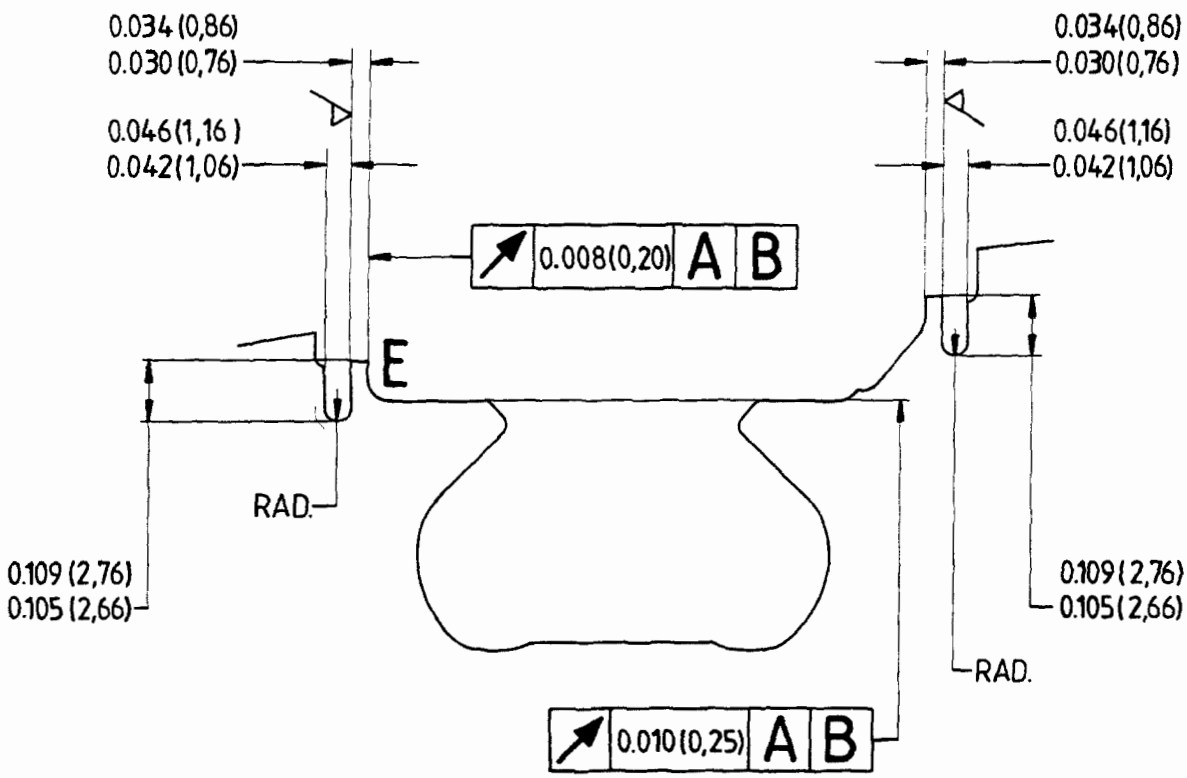
E1421

HP compressor rotor assembly
Figure 2A

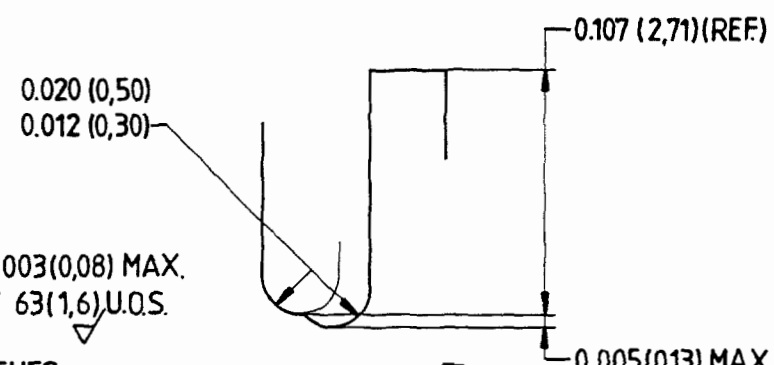


E1422

Install the HP compressor rotor assembly for stage 7 and 8 slot machining
Figure 2B



ENLARGED VIEW AT C (SEE FIG. 2.)

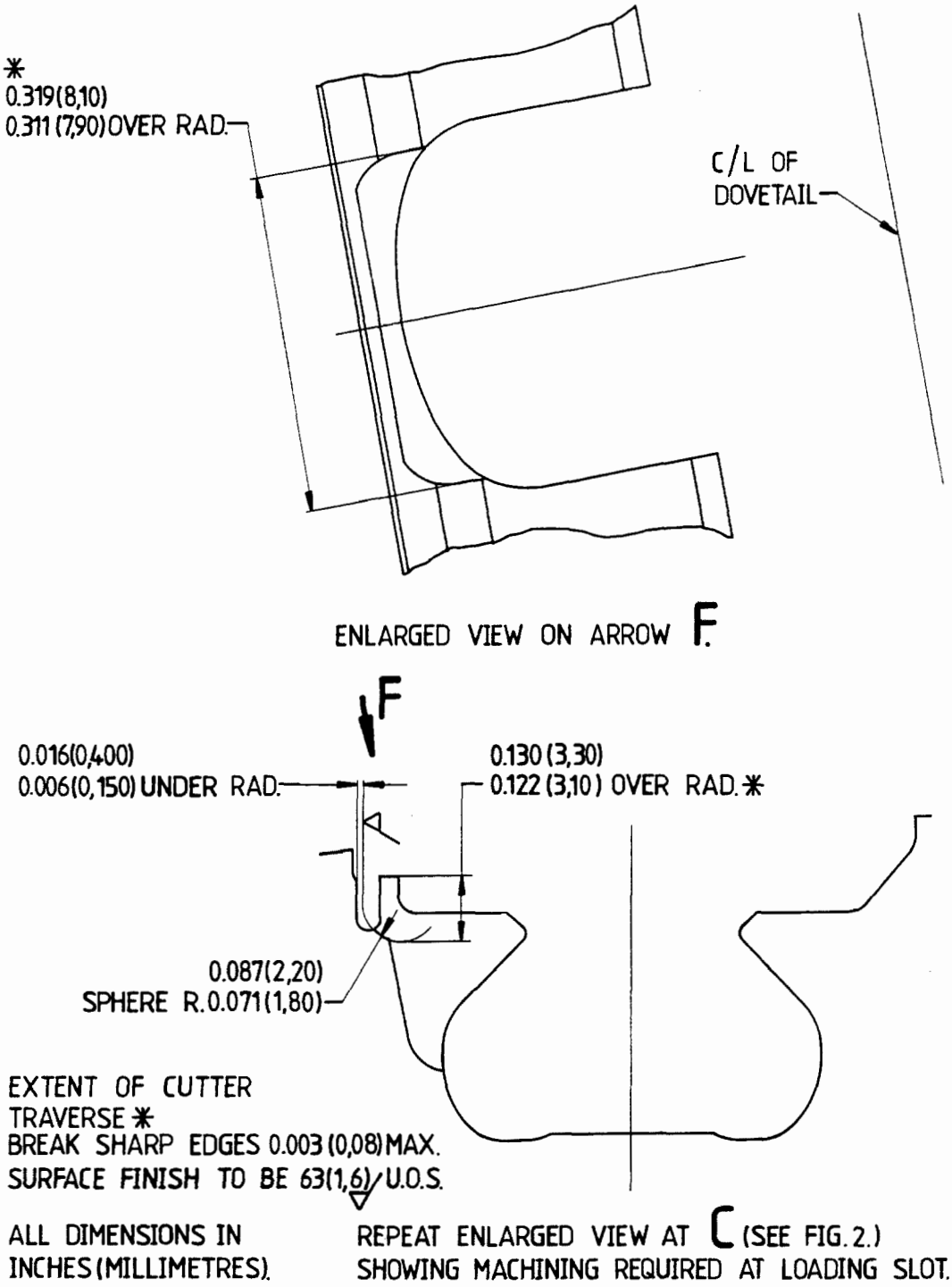


BREAK SHARP EDGES 0.003 (0,08) MAX.
SURFACE FINISH TO BE 63 (1,6) U.O.S.

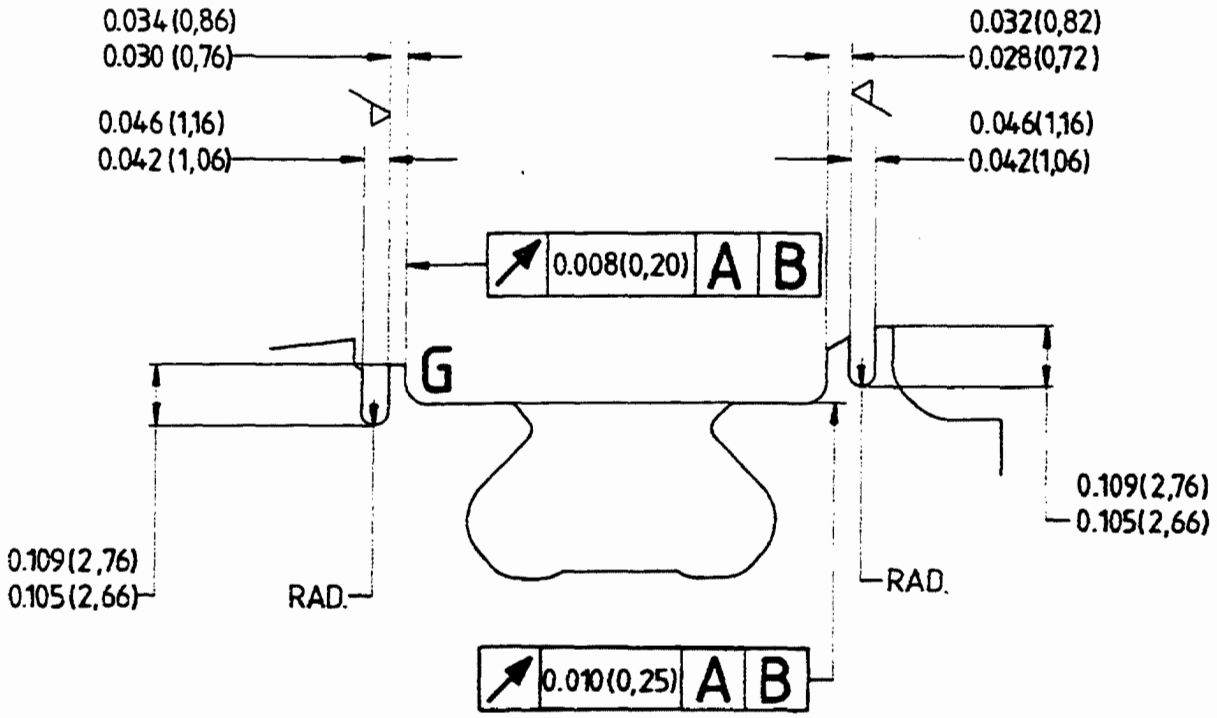
ALL DIMENSIONS IN INCHES (MILLIMETRES).

ENLARGED VIEW AT E (TYPICAL 2 POSITIONS) SHOWING ALTERNATIVE REWORKING METHOD.

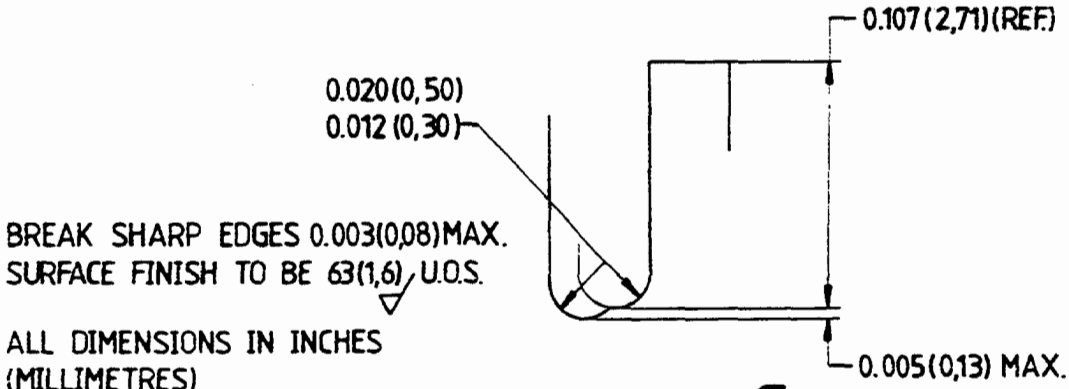
Reworking of existing compressor shaft assembly (stage 7)
Figure 3



Reworking of existing compressor shaft assembly (stage 7)
Figure 4

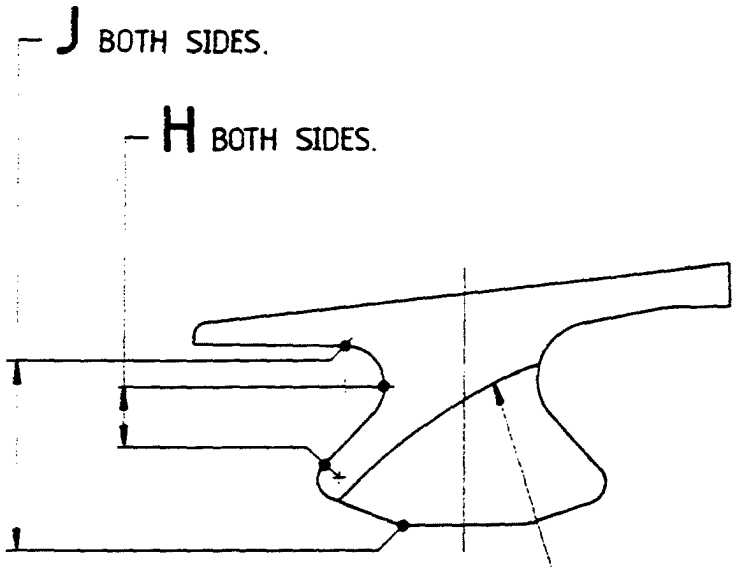


ENLARGED VIEW AT D (SEE FIG. 2.)



ENLARGED VIEW AT G (TYPICAL 2 POSITIONS)
SHOWING ALTERNATIVE REWORKING METHOD.

Reworking of existing compressor shaft assembly (stage 8)
Figure 5



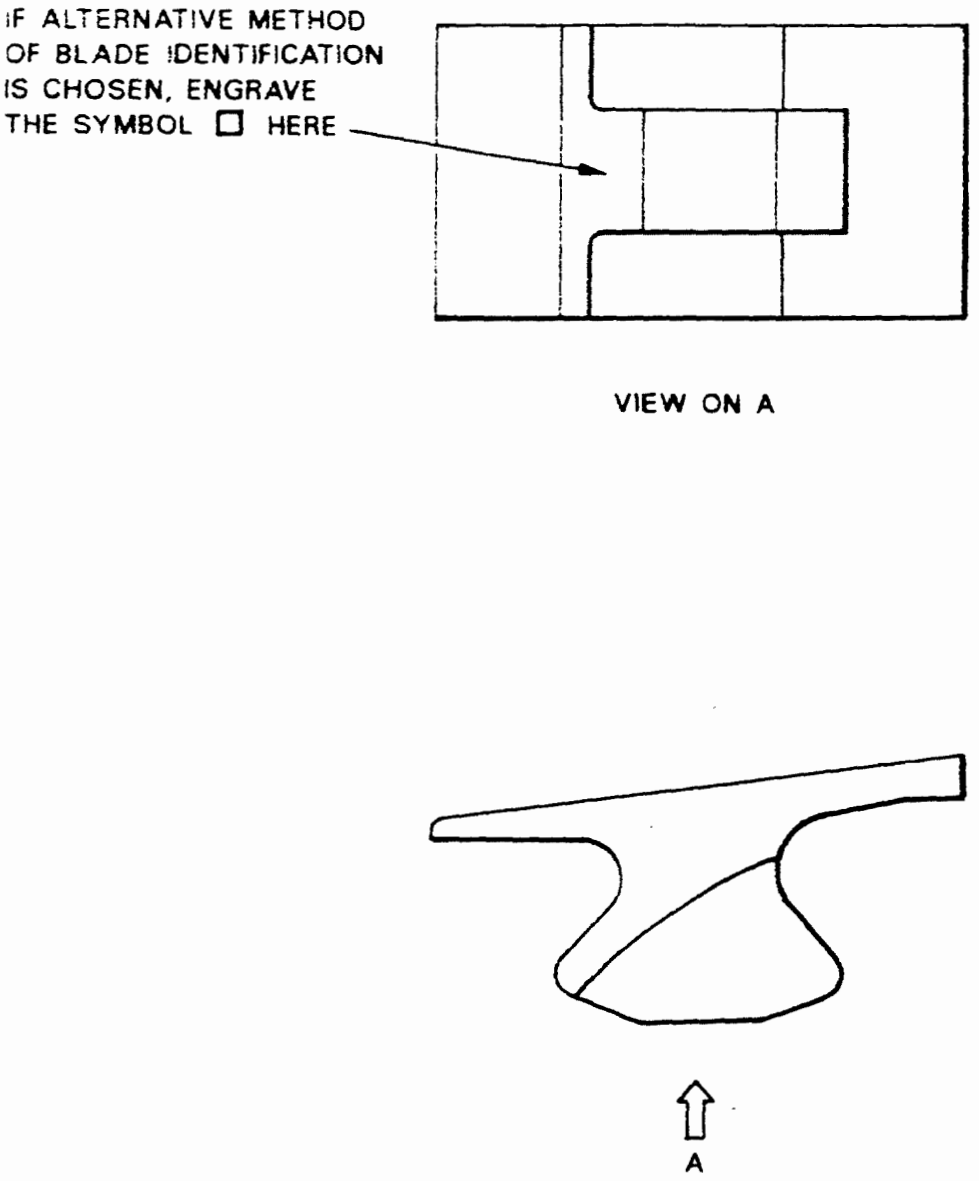
COAT AREAS MARKED H IN ACCORDANCE WITH ACCOMPLISHMENT INSTRUCTIONS(0.0003(0,008) TO 0.0012(0,030) THICK.)
OVERSPRAY IS PERMISSIBLE ON ADJACENT SURFACES WITHIN AREAS MARKED J.

OVERSPRAY ONLY IS PERMISSIBLE ON THIS EDGE. TYPICAL BOTH SIDES.

ALL DIMENSIONS IN INCHES (MILLIMETRES).

Reworking of existing stages 6, 7 and 8 rotor blades
Figure 6 Sheet 1 of 2

R



R Reworking of existing stages 6, 7 and 8
R rotor blades
R Figure 6 Sheet 2 of 2

3. Material Information

Applicability: For each V2500 Engine to incorporate this Bulletin.

A. Kits associated with this Bulletin:

None

B. Parts affected by this Bulletin:

New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions Disposition
6A5594 (72-41-11)	1		Disk assy, stages 3 to 8 HPC (Post-SBE 72-0130)	6A4189 (01-200)	(A)(B) (S1)(S2)(1D)
6A5592 (72-41-11)	1		Disk assy, stages 3 to 8 HPC (Pre-SBE 72-0130)	6A3934 (01-200)	(A)(B) (S1)(S2)(1D)
6A5659 (72-41-11)	1		Disk assy, stages 3 to 8 HPC (Pre-SBE 72-0130)	6A3936 (01-200)	(A)(B) (S1)(S2)(1D)
6A4915 (72-41-11)	1	554.00	Wire, seal - Stage 7 front	- (01-390)	(A)(C)(S1)
6A4916 (72-41-11)	1	554.00	Wire, seal - Stage 7 rear	- (01-392)	(A)(C)(S1)
6A4917 (72-41-11)	1	554.00	Wire, seal - Stage 8 front	- (01-394)	(A)(C)(S1)
6A4918 (72-41-11)	1	554.00	Wire, seal - Stage 8 rear	- (01-396)	(A)(C)(S1)
6A5586 (72-41-15)	2	184.00	Blade, L.H. locking - H.P. compressor stage 6	6A3338 (02-170)	(A)(B)(S1) (1D)
6A5587 (72-41-15)	2	184.00	Blade, R.H. locking - H.P. compressor stage 6	6A3339 (02-185)	(A)(B)(S1) (1D)
6A5583 C01 (72-41-15)	59	156.00	Blade, H.P. compressor stage 6	6A3340 C01 (02-200)	(A)(B)(S1) (1D)(2D)
6A5583 C01 (72-41-15)	26 max	156.00	Blade, H.P. compressor stage 6	6A3340 C01 (02-215)	(A)(B)(S1) (1D)(3D)(S3)
6A5583 C02 (72-41-15)	26 max	156.00	Blade, H.P. compressor stage 6	6A3340 C02 (02-217)	(A)(B)(S1) (1D)(3D)(S3)

New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions Disposition
6A5588 (72-41-15)	2	188.00	Blade, L.H. locking - H.P. compressor stage 7	6A3246 (02-270)	(A)(B)(S1) (1D)
6A5589 (72-41-15)	2	188.00	Blade, R.H. locking - H.P. compressor stage 7	6A3247 (02-385)	(A)(B)(S1) (1D)
6A5584 C01 (72-41-15)	62	160.00	Blade, H.P. compressor stage 7	6A3245 C01 (02-300)	(A)(B)(S1) (1D)(4D)
6A5584 C01 (72-41-15)	27 max	160.00	Blade, H.P. compressor stage 7	6A3245 C01 (02-315)	(A)(B)(S1) (1D)(5D)(S4)
6A5584 C02 (72-41-15)	27 max	160.00	Blade, H.P. compressor stage 7	6A3245 C02 (02-317)	(A)(B)(S1) (1D)(5D)(S4)
6A5590 (72-41-15)	2	189.00	Blade, L.H. locking - H.P. compressor stage 8	6A3249 (02-370)	(A)(B)(S1) (1D)
6A5591 (72-41-15)	2	189.00	Blade, R.H. locking - H.P. compressor stage 8	6A3250 (02-385)	(A)(B)(S1) (1D)
6A5585 C01 (72-41-15)	59	159.00	Blade - H.P. compressor stage 8	6A3248 C01 (02-400)	(A)(B)(S1) (1D)(6D)
6A5585 C01 (72-41-15)	26 max	159.00	Blade - H.P. compressor stage 8	6A3248 C01 (02-415)	(A)(B)(S1) (1D)(7D)(S5)
6A5585 C02 (72-41-15)	26 max	159.00	Blade - H.P. compressor stage 8	6A3248 C02 (02-417)	(A)(B)(S1) (1D)(7D)(S5)

C. Instructions/Disposition Code Statements

(A) New parts are currently available
(B) Old parts are no longer available
(C) Additional parts
(S1) New parts coded (S1) must replace old parts coded (S1) as a COMPLETE SET per engine
(S2) Alternative parts
(S3) Selective parts
(S4) Selective parts
(S5) Selective parts
(1D) Old part may be reworked and re-identified to new part number
(2D) Quantity decreased from 60 to 59
(3D) Quantity increased from 25 to 26
(4D) Quantity decreased from 65 to 62
(5D) Quantity increased from 24 to 27

New Part No. (ATA No.)	Qty	Est'd Unit Price ($)	Keyword	Old Part No. (IPC No.)	Instructions Disposition

(6D) Quantity decreased from 61 to 59
(7D) Quantity increased from 24 to 26

NOTE: The estimated 1993 unit prices are provided for planning purposes only and do not constitute a firm quotation. Consult the IAE Price Catalog or contact IAE's Spare Parts Sales Department for information concerning firm prices.

APPENDIX 1

R GENERAL

1. The Source Demonstration requirements of this rework mean that any facility not authorized to accomplish the rework either utilize the Authorized Repair Vendors listed below or contact IAE Technical Services to determine if a qualification program can be initiated at their facility.

   IAE - INTERNATIONAL AERO ENGINES AG
   Corporate Center II
   628 Hebron Ave.
   Glastonbury, CT. 06033-2595 USA

2. Authorized Rework Vendors for the bulletin are listed below:

   MTU-Maintenance GmbH
   Munchen Strasse 31
   Postfach 1720
   D-3012 Langenhagen 7, Hanover
   Germany

   Rolls Royce Aero Engine Services
   Mavor Avenue
   Nerston Ind Estate
   East Kilbride
   Glasgow G74 4PY
   Scotland

   AVIALL
R Ryder Systems, Inc.
R Airline Services Division
R 3412 Putnam Street
R Dallas, Texas 75235 USA

   IHI
   229, Tonogaya,
   Mizuho-Machi Nishitama-Gun,
   Tokyo 190-12, Japan

3. The designation by IAE of an authorized rework vendor indicates that the vendor has demonstrated the necessary capability to enable it to carry out the listed rework. However, IAE makes no warranties or representations concerning the qualifications or quality standards of the vendors to carry out the rework, and accepts no responsibility whatsoever for any work that may be carried out by a rework vendor, other than when IAE is listed as the vendor. Authorized rework vendors do not act as agents or representatives of IAE.

R REWORK PROCEDURE FOR STAGE 7 AND 8 HP COMPRESSOR BLADES

1. Equipment

		Tank Material	Heating Required
1	Alkali Cleaner Tank	Stainless steel	Yes
2	Scale Conditioner	Stainless steel	Yes
3	Nitric Acid	Stainless steel	No
4	Etch	Plastic	No
5	Neutraliser	Plastic	No
6	Vapor Degreaser	Stainless steel	Yes

Local extraction required for tanks 1, 2, 3, 4 & 6

2. Consumables

	CoMat No
Trichloroethylene	01-003
Degreaser	01-112
Conditioner	01-042
Nitric Acid HN03	01-025
Hydrofluoric Acid	01-027
Sodium Carbonate Na2C03	01-030
Stopping-off lacquer	07-049
R Masking tape	02-002
R Masking tape	02-019

3. During the following cleaning and etching procedure it is most important that the compressor blades are etched as quickly as practicable after oxide removal, preferably within 2 hours of cleaning.

4. Once compressor blades are in the etched condition they are susceptible to staining from both atmospheric contamination and finger printing. Blades should be stored in clean polythene bags whenever practicable and only handled with clean cotton gloves.

5. Only the processes detailed below are permitted, no alternatives can be used without the written prior approval of IAE.

R Initial Cleaning
R Oxide Removal
R Vapor Blast
R Mask Blade
R Blade Etch
R Binocular Examination
R Removal of Maskant

R

INITIAL CLEANING

1. Equipment and Materials

   A. Consumable materials

      CoMat 01-112 Degreaser

      NOTE: To identify the consumable materials refer to the PCI.

2. Safety Precautions

   WARNING: 1. YOU MUST ALWAYS WEAR RUBBER GLOVES.

   2. IT IS THE RESPONSIBILITY OF THE OPERATOR TO OBTAIN AND OBSERVE THE MANUFACTURERS MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION SUCH AS, HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES AND ALSO TO TAKE LOCAL REGULATIONS INTO CONSIDERATION.

   CAUTION: THIS PROCEDURE MUST NOT BE USED WITH ALUMINUM ALLOYS.

3. General

   Hot aqueous alkaline silicate solution is used to remove oil, grease and loose carbonaceous particles from steel, nickel base alloy and titanium parts.

   A. Immerse in 5% w/v CoMat 01-112 degreaser solution at 90-100 deg.C for 30 minutes to remove oil, grease and loose carbonaceous soil.

   B. Cold water wash

   C. Hot water dry off if not proceeding directly to scale removal operation

   D. Examine for acceptable cleanliness, repeat procedure if necessary

   E. TASK 70-11-03 is considered a suitable alternative

R

OXIDE REMOVAL

1. Equipment and Material

A. Consumable materials

CoMat 01-025	Nitric Acid NHO3
CoMat 01-042	Conditioner

NOTE: To identify the consumable materials refer to the PCI.

2. Safety Precautions

WARNING: IT IS THE RESPONSIBILITY OF THE OPERATOR TO OBTAIN AND OBSERVE THE MANUFACTURERS MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION SUCH AS, HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES AND ALSO TO TAKE LOCAL REGULATIONS INTO CONSIDERATION.

A. Nitric acid precautions

WARNING: EVERY POSSIBLE CARE MUST BE TAKEN TO AVOID THE SOLUTION COMING INTO CONTACT WITH THE EYES OR BARE SKIN. PROTECTIVE CLOTHING INCLUDING RUBBER GLOVES AND GOGGLES MUST BE PROVIDED FOR THE OPERATORS WHEN PREPARING AND USING THE NITRIC ACID SOLUTION. RUBBER GLOVES SHOULD BE CHECKED REGULARLY FOR PIN HOLES AND REPLACED IF NECESSARY.

WARNING: SAFETY NOTICES MUST BE PLACED IN A CONSPICUOUS PLACE.

WARNING: EYE-WASH BOTTLES AND HF BURN JELLY MUST BE PROVIDED AS CLOSE AS POSSIBLE TO THE PLACE OF WORK.

WARNING: IF SKIN BECOMES CONTAMINATED WITH THE SOLUTION IT MUST BE RINSED WITH COPIOUS AMOUNTS OF CLEAN RUNNING WATER.

WARNING: ALL BURNS, HOWEVER SLIGHT, SHOULD BE TREATED AT THE NEAREST SURGERY OR FIRST AID POST.

WARNING: THE SURGERY MUST BE TOLD WHICH SOLUTION (THE ACIDS INVOLVED) HAS CAUSED THE BURN.

B. Conditioner Precautions

WARNING: 1. COMAT 01-042 CONDITIONER CONTAINS SODIUM HYDROXIDE.

2. IF SODIUM HYDROXIDE SOLUTION GETS INTO THE EYES FULLY FLUSH THEM, WITH CLEAN WATER, THEN GET MEDICAL TREATMENT IMMEDIATELY.

3. A SUPPLY OF BUFFERED PHOSPHATE SOLUTION MUST ALWAYS BE EASILY AVAILABLE, TO APPLY TO BURNS.

4. CARE MUST BE TAKEN WHEN YOU ADD COMPOUNDS WHICH CONTAIN SOLID SODIUM HYDROXIDE TO WATER, BECAUSE HEAT IS GIVEN OUT WHEN THE COMPOUND DISSOLVES. MAKE MUCH MOVEMENT OF THE SOLUTION, WITH AIR OR MECHANICAL METHODS, AS YOU ADD THE COMPOUND TO THE SURFACE OF THE SOLUTION. DO NOT ADD LARGE QUANTITIES OF THE COMPOUND, TO ONE SMALL AREA OF THE TANK, BECAUSE THE SOLUTION WILL BOIL.

5. THE INSTRUCTIONS GIVEN BY THE SAFETY OFFICER MUST ALWAYS BE OBEYED.

3. General

This procedure prepares titanium parts for inspection, by the removal of surface oxidation and color changes caused by heat. The procedure is only applicable to engine parts when specified in the Engine Manual.

4. Remove Color Changes Caused by High Temperatures

CAUTION: PARTS WITH SPRAYED METAL OR NICKEL/ELECTROLESS PLATING WILL BE DAMAGED BY THE CONDITIONER AND NITRIC ACID SOLUTIONS. DO NOT SOAK SUCH PARTS IN THESE SOLUTIONS, UNLESS THE PLATING IS TO BE REPLACED.

A. Immerse in (600 g/l) of CoMat 01-042 conditioner solution at 85-95 Deg.C for 1 hour to remove oxidation.

Note: 1 hour immersion not to be exceeded. Time sufficient to remove frettage oxidation products

B. Cold water wash

C. Immerse in 50%w/v CoMat 01-025 nitric acid solution at room temperature for 30 minutes. (Prepared in SUBTASK 70-11-09-100-003).

D. Cold water wash

E. Hot water dry off or alternatively oven dry at 105 Deg.C for 30 minutes.

R VAPOR BLAST

R 1. Equipment and Materials

R A. Consumable materials

R CoMat 02-002 Masking tape
R CoMat 02-019 Masking tape

R NOTE: To identify the consumable materials refer to the PCI.

R 2. General

R A. Mask aerofoil and platform of blade using CoMat 02-002 masking tape or
R CoMat 02-019 masking tape to prevent any vapor blasting of these surfaces.

R B. Vapor blast the blade front and rear dovetail load faces, with the blade
R positioned approximately 4 to 8 in. (100 to 200 mm) from the blast source.
R Vapor blast for the minimum time necessary to remove oxide deposits, in
R accordance with SPM TASK 70-12-01-120-501.

R C. Remove masking tape from the aerofoil and platform of the blade.

R D. Clean the blades fully, in accordance with SPM TASK 70-12-01-120-501.

R MASK BLADE

R 1. Equipment and Materials

R A. Consumable materials

R CoMat 07-049 Stopping-off lacquer

R NOTE: To identify the consumable materials refer to the PCI

R 2. General

A. Mask aerofoil and platform of blade by immersion in CoMat 07-049 Stopping-off lacquer

B. Drain excess maskant and allow to air dry

R

PREPARATION OF ETCH

1. IAE consider the operating range of the Hydrofluoric/Nitric acid etch to be:

Hydrofluoric Acid	55-20 g/l
Nitric Acid	180-220 g/l

2. In the context of the subject blades this range has been found by trials to be too wide particularly when fresh solutions are used at the top of the Hydrofluoric Acid concentration range. Resulting in over etching of the compressor blades.

3. It is recommended that the etch be made to the following composition and procedure. Measure out the appropriate quantities of Nitric and Hydrofluoric acids to give a final concentration of

200 g/l Nitric Acid
25 g/l Hydrofluoric Acid

and add to water.
Allow to cool to room temperature then age the solution by adding sufficient weighed scrap titanium to achieve dissolution of 2 g/l. This takes approximately 30 minutes. Reweigh to confirm dissolution of titanium. Repeat ageing process until dissolution rate achieved. Allow the solution to cool to room temperature. Solution should now have a light yellow to green colour.

4. Carry out trial etching for 60 seconds on prepared test piece to confirm etch condition before proceeding with compressor blades.

R

ETCH BLADE

1. Equipment and Material

A. Standard equipment - none

B. Consumable materials

CoMat 01-027	Hydrofluoric Acid
CoMat 01-025	Nitric Acid HN03

NOTE: To identify the consumable materials refer to the PCI.

2. Safety Precautions

WARNING: YOU MUST NOT LET THE ACID SOLUTION TOUCH YOUR EYES OR BARE SKIN. YOU MUST HAVE ON PROTECTIVE CLOTHING, RUBBER GLOVES AND EYE PROTECTION WHEN THE ACIDS ARE USED.

WARNING: YOU MUST BE VERY CAREFUL WHEN ACIDS ARE USED. HYDROFLUORIC ACID IS VERY DANGEROUS.

WARNING: SAFETY NOTICES MUST BE PUT IN A POSITION WHERE THEY ARE EASY TO SEE.

WARNING: EYE-WASH BOTTLES AND HF BURN JELLY MUST BE AVAILABLE AS NEAR AS POSSIBLE TO THE WORK LOCATION.

WARNING: YOU MUST FLUSH ACID SOLUTIONS OFF THE SKIN WITH A LARGE QUANTITY OF CLEAN WATER IMMEDIATELY.

WARNING: YOU MUST GET MEDICAL AID FOR ALL BURNS.

WARNING: YOU MUST TELL THE SURGERY WHICH ACIDS HAVE CAUSED THE BURN. THIS APPLIES PARTICULARLY WHEN HYDROFLUORIC ACIDS ARE CONSTITUENTS.

WARNING: IT IS THE RESPONSIBILITY OF THE OPERATOR TO OBTAIN AND OBSERVE THE MANUFACTURERS MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION SUCH AS, HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES AND ALSO TO TAKE LOCAL REGULATIONS INTO CONSIDERATION.

CAUTION: ALL SOLUTIONS MUST BE USED AT TEMPERATURES BETWEEN 64.4 AND 73.4 DEG.F (18 TO 23 DEG.C). THEY MUST BE CONTAINED IN A POLYTHENE OR OTHER APPLICABLE MATERIAL TANK WHICH HAS FUME EXTRACTION INSTALLED.

CAUTION: ETCHING MUST ONLY BE USED WHEN RECOMMENDED IN THE APPLICABLE ENGINE MANUAL. REFER TO THE APPLICABLE CLEANING TASK FOR THE SPECIFIED SOLUTION AND TIME NECESSARY FOR THE PART TO STAY FULLY IN THE SOLUTION.

A. Immerse in 200 g/l CoMat 01-025 nitric acid / 25 g/l CoMat 01-027
R hydrofluoric acid at room temperature for 90 seconds.

B. Cold water wash

C. Immerse in 7% CoMat 01-030 sodium carbonate Na2C03 neutraliser

D. Cold water wash

E. Rinse blades with deionised water

F. Oven dry at 105 deg.C for 30 minutes

R

BINOCULAR EXAMINATION FOR STAGE 7 AND 8 HP COMPRESSOR BLADES

1. Good quality binocular microscope should be employed capable of times 40 magnification or higher.

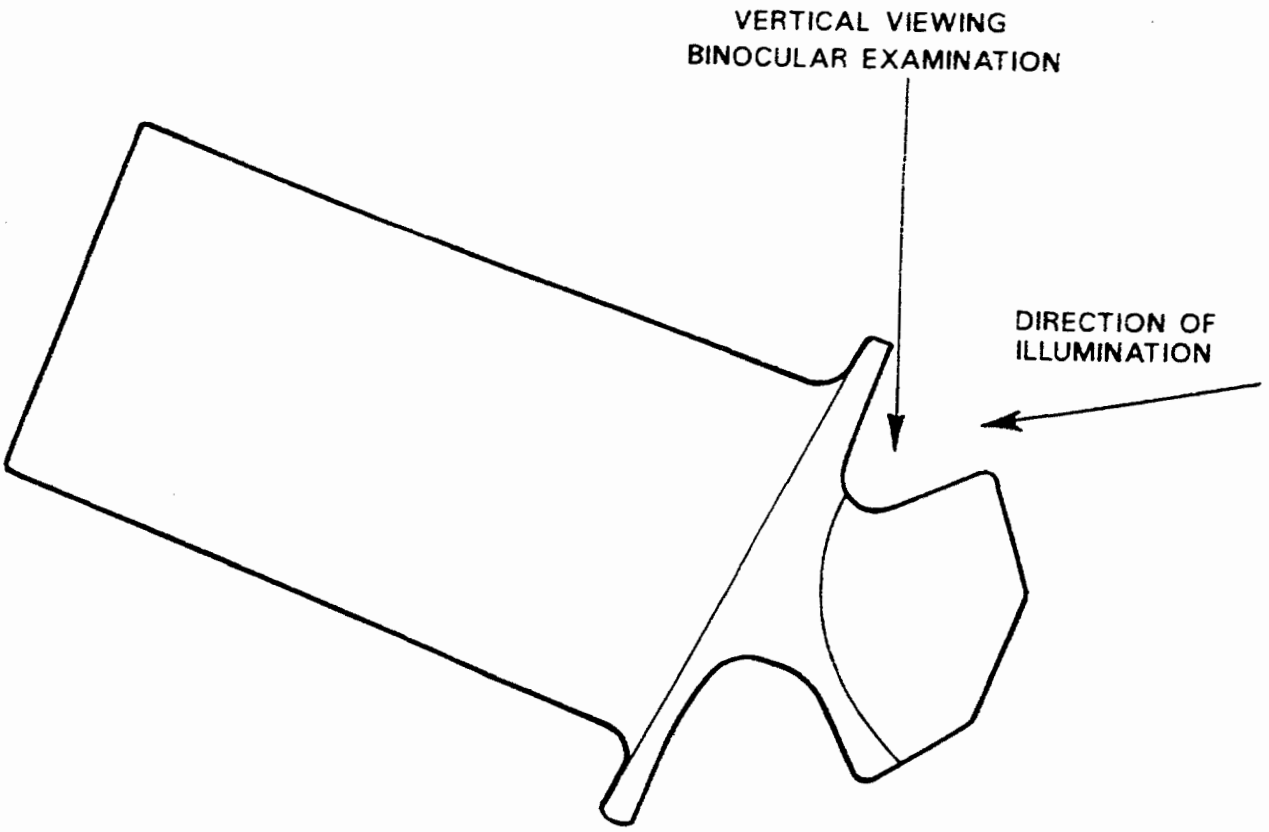
2. Use an angle-poise type of lamp with a 60 watt standard light bulb for illumination purposes. Fibre-optic light sources are not considered suitable for this type of inspection nor are fluorescent or ring type illuminators.

3. The de-oxidised and etched blade should be placed on an inspection table or fixture so that it can be located/positioned at the angular dispositions shown in Figs.1 and 2.

4. The recommended angle of illumination may appear shallow but this is to achieve back reflection on to the dovetail load face from the underside of the blade platform.

5. The cracking generally occurs at the positions schematically illustrated in Fig.3. However, the total load face flank should be scrutinised.

NOTE: A. Commence inspection at times 20 magnification minimum and use up to times 40 or higher to positively identify cracking. The angular position of the blade, type and angle of illumination are critical to the success/effectiveness of this inspection.

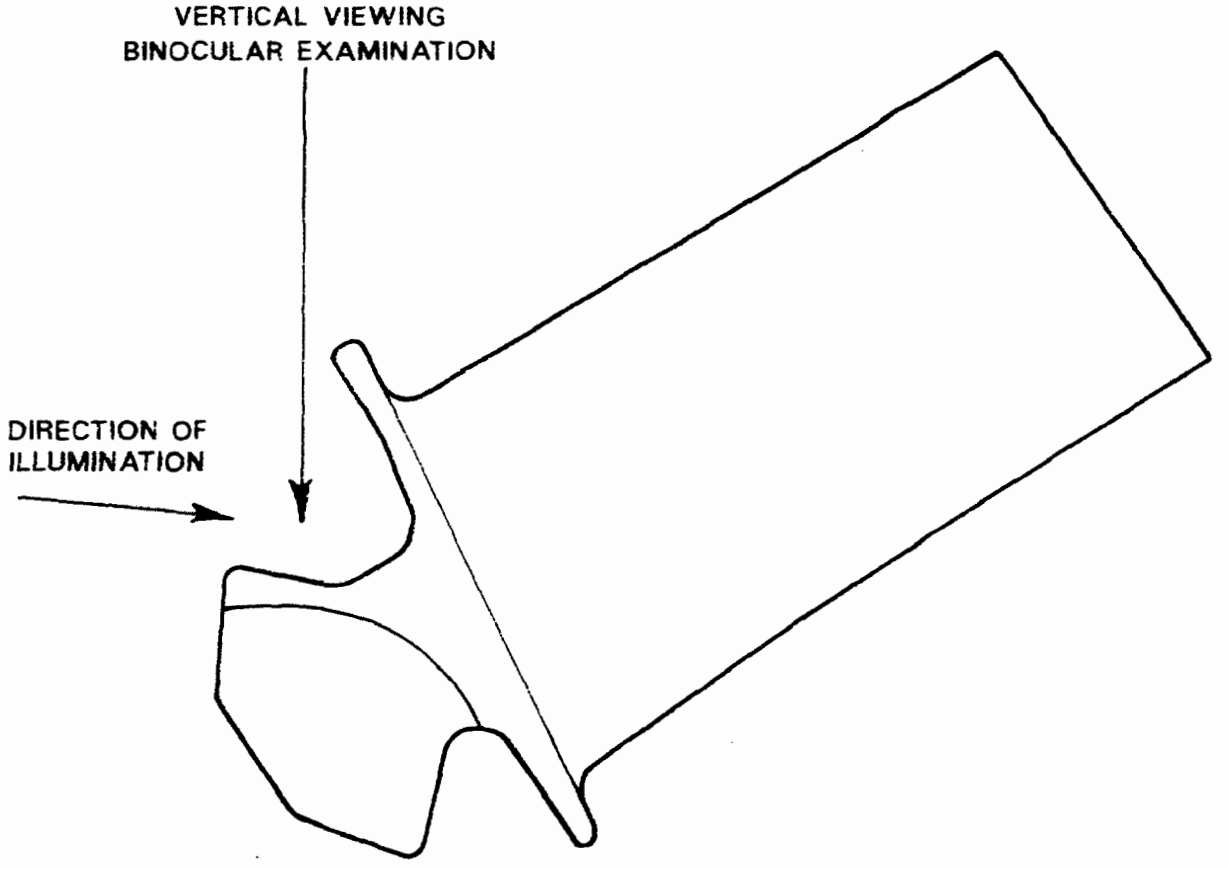


ANGULAR POSITION OF BLADE TO FACILITATE
BINOCULAR EXAMINATION OF NARROW LOAD FACE

E1396

Angular position of blade to facilitate
binocular examination of narrow load face

Figure 1

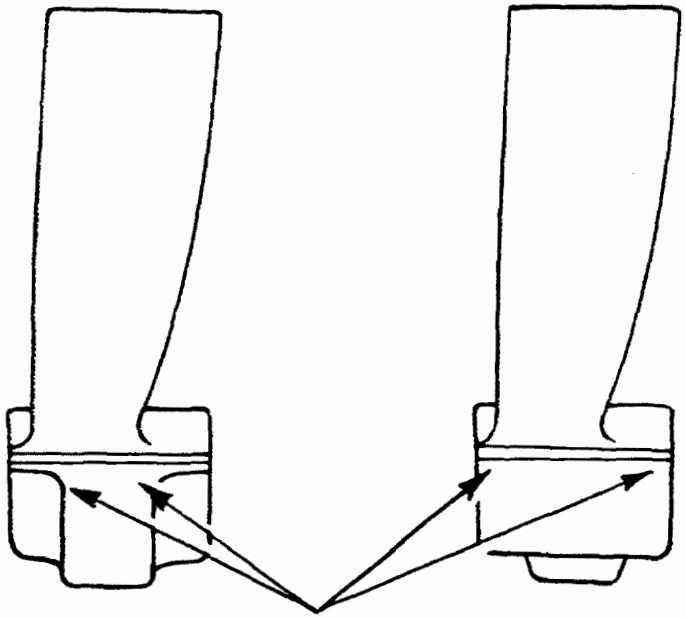


ANGULAR POSITION OF BLADE TO FACILITATE
BINOCULAR EXAMINATION OF NARROW LOAD FACE

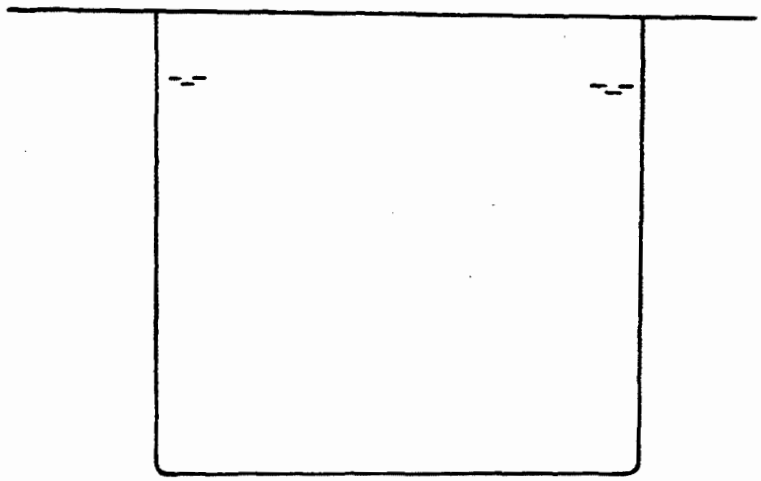
E1397

Angular position of blade to facilitate
binocular examination of wide load face

Figure 2



TYPICAL CRACKING LOCATIONS



ENLARGED SCHEMATIC OF TYPICAL
CRACKING CHARACTER

E1398

Enlarged schematic of typical
cracking character

Figure 3

R

REMOVAL OF MASKANT

1. Equipment and Material

A. Consumable materials

CoMat 01-001	Inhibited and stabilized trichloroethane
CoMat 01-002	Inhibited and stabilized trichloroethane
CoMat 01-003	Trichloroethylene
CoMat 01-004	Trichloroethylene

NOTE: To identify the consumable materials refer to the PCI.

2. Safety Precautions

WARNING: 1. IT IS THE RESPONSIBILITY OF THE OPERATOR TO OBTAIN AND OBSERVE THE MANUFACTURERS MATERIAL SAFETY DATA SHEETS FOR CONSUMABLE MATERIALS INFORMATION SUCH AS, HAZARDOUS INGREDIENTS, PHYSICAL/CHEMICAL CHARACTERISTICS, FIRE, EXPLOSION, REACTIVITY, HEALTH HAZARD DATA, PRECAUTIONS FOR SAFE HANDLING, USE AND CONTROL MEASURES AND ALSO TO TAKE LOCAL REGULATIONS INTO CONSIDERATION.

2. WHEN YOU USE COMAT 01-001 AND COMAT 01-002 INHIBITED AND STABILIZED TRICHLOROETHANE OR COMAT 01-003 AND COMAT 01-004 TRICHLOROETHYLENE YOU MUST USE THE NECESSARY PROTECTIVE CLOTHING. DO NOT GET THE SOLVENT ON YOUR SKIN OR IN YOUR EYES. YOU MUST NOT SMOKE WHEN YOU USE THE SOLVENT AS THE VAPOR CHANGES AND BECOMES TOXIC. TRICHLOROETHANE AND TRICHLOROETHYLENE MUST NOT BE MIXED.

3. Vapor Degrease the Part

CAUTION: 1. YOU MUST NOT PUT PARTS IN VAPOR FOR MORE THAN 30 MINUTES. USUALLY 5 TO 10 MINUTES IS SUFFICIENT.

A. Use CoMat 01-001 inhibited and stabilized trichloroethane, CoMat 01-002 inhibited and stabilized trichloroethane, CoMat 01-003 trichloroethylene or CoMat 01-004 trichloroethylene in a nichrome steel bath at the temperature given in TASK 70-11-01-100-501.

B. Put the parts in to a basket or on a sling and then position them in the vapor.

C. Remove the parts from the vapor when the condensation of vapor on the part has stopped.

NOTE: The condensation of vapor on the part will stop when the temperature of the part is equal to the temperature of the vapor.

D. If it is necessary to clean the parts more, let them cool to room temperature. Then locate the parts in the basket or sling in a position which will permit dirty areas to be cleaned.

E. Position the parts in the vapor.

F. Slowly remove the parts from the vapor. This will permit inspection and make sure the parts are fully cleaned and drained.

NOTE: Remaining liquid solvent must be drained back into the solvent container before the parts are removed from the equipment.