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

RR-DERBY

V2500 International Aero Engines

400 MAIN STREET, MAIL STOP 121-10
EAST HARTFORD, CT 06108, USA.
TELEPHONE: 860 565 5515
FAX: 860 565 0600

P.O. BOX 31, DERBY
TELEGRAMS - 'ROYCAR' DERBY
TELEX - 37645
TELEPHONE - DERBY 242424

DATE: Feb. 8/02

V2500-A5/D5 SERIES PROPULSION SYSTEMS SERVICE BULLETIN

This document transmits the Initial Issue of Service Bulletin EV2500-72-0410

Bulletin Initial Issue

Remove	Incorporate	Reason for change
	Pages 1 to 26 of the Service Bulletin	Initial issue

V2500-ENG-72-0410

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 are as follows:

Page	Revision Number	Revision Date
Bulletin		
1		Feb.8/02
2		Feb.8/02
3		Feb.8/02
4		Feb.8/02
5		Feb.8/02
6		Feb.8/02
7		Feb.8/02
8		Feb.8/02
9		Feb.8/02
10		Feb.8/02
11		Feb.8/02
12		Feb.8/02
13		Feb.8/02
14		Feb.8/02
15		Feb.8/02
16		Feb.8/02
17		Feb.8/02
18		Feb.8/02
19		Feb.8/02
20		Feb.8/02
21		Feb.8/02
22		Feb.8/02
23		Feb.8/02
24		Feb.8/02
25		Feb.8/02
26		Feb.8/02

ENGINE - HP COMPRESSOR VARIABLE VANE INNER SHROUDS - INTRODUCTION OF REVISED ONE PIECE BUSHES

1. Planning Information

A. Effectivity

(1) Airbus A319

V2522-A5, V2524-A5, V2527M-A5 Engines prior to Serial No.11400

(2) Airbus A320

V2527-A5, V2527E-A5 Engines prior to Serial No.11400

(3) Airbus A321

V2530-A5, V2533-A5 Engines prior to Serial No.11400

(4) Boeing Longbeach Division MD-90

V2525-D5, V2528-D5 Engines prior to Serial No.20286

(5) ATA Locator

72-41-32.

B. Concurrent Requirements

None.

C. Reason

(1) Condition

Premature deterioration of the HP Compressor VSV inner shroud bushes may occur, allowing the shroud to move relative to the vane inner spindle. This can result in damage between the HP Compressor VSV aerofoils and the inner shrouds.

The problem is attributed to gradual oxidisation causing the inner bush material to become brittle.

(2) Background

The problem has been observed on HP Compressor stages 4 and 5 during engine overhaul.

(3) Objective

Incorporation of the changes introduced by this Service Bulletin (Modification) is designed to improve maintainability.

(4) Substantiation

The changes introduced by this Service Bulletin have been the subject of satisfactory engineering analysis, thermal analysis and successful testing on development engines.

(5) Effect of Bulletin on:

(a) Operation

Not affected.

(b) Maintenance

Not affected.

(c) Overhaul

Affected.

(d) Repair Schemes

Affected.

(e) Interchangeability

Not affected.

D. Description

(1) This Service Bulletin introduces one piece VSV stage 4 and 5 inner spindle bushes with a higher temperature capability, along with inner shrouds and vanes to suit the new bushes. To maintain commonality, this Service Bulletin also covers VIGV and stage 3 bushes, vanes and shrouds.

The changes introduced are:

(a) A revised one piece HP Compressor VSV inner spindle bush replaces the existing two piece bush across VIGV, stage 3, stage 4 and stage 5, similar to the existing item except for the following:

(i) The graphite/polymide material is changed from Vespel SP211 to Vespel ST2030.

(ii) The inner and outer diameters have been changed to suit the thermal properties of the revised material.

(b) Revised HP Compressor VIGV, stage 3, stage 4 and stage 5 vanes, similar to the existing items except for the following:

(i) The penny at the base of the vane spindle is deleted to suit the one piece bush.

(ii) A manufacture option to machine a fillet radius as an alternative to the undercut.

(c) A revised HP Compressor VIGV shroud assembly, similar to the existing item except for the following:

(i) A lip is introduced to the inner spindle hole as a retention feature for the bush.

(ii) The inner spindle hole diameter is increased to suit the revised one piece bush.

(d) A revised HP Compressor stage 3 shroud half assembly, similar to the existing item except for the following:

(i) A lip is introduced to the inner spindle hole as a retention feature for the bush.

(ii) The inner spindle hole diameter is increased to suit the revised one piece bush.

(iii) Revised location pins and retaining rings.

(iv) The stage 3 inner static seal is now an integral part of the shroud half assembly.

(e) As described above, the stage 3 inner static seal is deleted as a separate item, the features are now incorporated within the stage 3 shroud half assembly.

(f) Revised stage 3 inner shroud attaching bolts similar to the existing item except for a reduction in length.

(g) A revised HP Compressor stage 4 shroud half assembly, similar to the existing item except for the following:

(i) A lip is introduced to the inner spindle hole as a retention feature for the bush.

(ii) The inner spindle hole diameter is increased to suit the revised one piece bush.

(iii) Revised location pins are introduced.

(iv) The stage 4 inner static seal is now an integral part of the shroud half assembly.

(h) As described above, the stage 4 inner static seal is deleted as a separate item, the features are now incorporated within the stage 4 shroud half assembly.

(i) Revised stage 4 inner shroud attaching bolts, similar to the existing item except for a reduction in length.

(j) A revised HP Compressor stage 5 shroud half assembly, similar to the existing item except for the following:

(i) A lip is introduced to the inner spindle hole as a retention feature for the bush.

(ii) The inner spindle hole diameter is increased to suit the revised one piece bush.

(2) Existing HP Compressor Vanes may be reworked, refer to Fig 4.

(3) This Service Bulletin is in five parts as follows:

Part 1 - Covers full embodiment of HP Compressor VIGV, stage 3, stage 4 and stage 5.

Part 2 - Embodiment of HP Compressor VIGV.

Part 3 - Embodiment of HP Compressor stage 3.

Part 4 - Embodiment of HP Compressor stage 4.

Part 5 - Embodiment of HP Compressor stage 5.

NOTE: New production engines fully embodying this Service Bulletin will not be annotated with a mod part and can be considered equivalent to Part 1.

E. Compliance

Category Code 7

Accomplish when the supply of superseded parts has been depleted.

F. Approval

The part number changes and/or part modifications described in sections 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(s) listed.

G. Manpower

(1) In service

Not applicable.

(2) At overhaul

Not affected.

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

H. Material Price and Availability

Modification kit not required; parts supplied as single line items.

For prices and availability of future spares see 2. Material Information.

I. Tooling Price and Availability

Special tool IAE 1R19633 Assembly Tool is required (supercedes assembly tool IAE 1R18250).

J. Industry Support Information

None.

K. Weight and Balance

(1) Weight Change

Minus 0.6 lb. (0,27 kg.).

(2) Moment Arm

7.7in. (196 mm.) rearwards of datum.

(3) Datum

Engine front mount centreline (Power Plant Station (PPS) 100).

L. Electrical Load Data

The aircraft electrical load is not affected by this Service Bulletin.

M. Software Accomplishment Summary

Not applicable.

N. References

(1) Engineering Change number 01VR007

(2) Engine Manual, 72-41-00 and 72-41-30, Disassembly and Assembly (see Other Publications Affected).

O. Other Publications Affected

(1) Illustrated Parts Catalogue (IPC), 2IA, 2IB, 3IA, 3IB, 5IA, 5IB, 6IA, 6IB, 7IA, 7IB, will be revised.

(2) Engine Manual, 72-41-00 (1IA)

(a) Disassembly, Config-02

(b) Assembly-02, Config-02

(3) Engine Manual, 72-41-30 (1IA)

(a) Disassembly, Config-03

(b) Assembly -02, 07, 08, 09, 10, Config-02

(c) Assembly -03, 04, 05, 06, Config-03

(4) Engine Manual, 72-41-32 (1IA)

(a) Cleaning -00

(b) Cleaning -01, 02, Config-01

(c) Inspection/Check -00

(d) Inspection/Check -01, 02, 03, 04, Config-02

(e) Rework 001, 002, 003, 004

(f) Repairs

(5) Engine Manual, 72-41-33 (1IA)

(a) Cleaning -00

(b) Cleaning -01, 02, 03, Config-01

(c) Inspection/Check -00

(d) inspection/Check -01, 03, 05, 06, 07, Config-02

(e) Repairs

(6) Engine Manual, 72-41-00 (3IA)

(a) Disassembly

(b) Assembly -02

(7) Engine Manual, 72-41-30 (3IA)

(a) Disassembly, Config-01

(b) Assembly -02, 07, 08, 09, 10

(c) Assembly 03, 04, 05, 06, Config-01

(8) Engine Manual, 72-41-32 (3IA)

(a) Cleaning -00, 01, 02

(b) Inspection/Check -00

(c) Inspection/Check -01, 02, 03, 04, Config-01

(d) Rework 001, 002, 003, 004

(e) Repairs

(9) Engine Manual, 72-41-33 (3IA)

(a) Cleaning -00, 01, 02, 03

(b) Inspection/Check -00

(c) Inspection/Check -01, 03, 05, 06, 07, Config-02

(d) Repairs

P. Interchangeability of Parts

(1) The parts introduced by this Service Bulletin must be fitted as a Service Bulletin set.

A Service Bulletin set may consist of Service Bulletin parts 1, 2, 3, 4 or 5.

2. Material Information

A. The kit required consists of the following parts:

None.

B. Parts to be reworked:

None.

C. Material prices and availability:

PART NO.	QTY	UNIT PRICE US DOLLARS
6A7558	50	597.00
6A7559	60	535.00
6A7560	4	535.00
6A7561	2	2591.00
6A7563	2	4068.00
6A7719	2	2546.00
6A7723	38	709.00
6A7725	2	709.00
6A7727	1	3713.00
6A7728	186	38.30
6A7729	30	611.00
6A7730	2	611.00
4W0114	40	3.84
AS20763	3	1.17
AS20745	3	8.39
AS26114	32	7.67

NOTE: The unit prices, if shown, are an estimate and they are given for the purpose of planning only. For actual prices, refer to the IAE Price Catalogue or contact IAE's spare parts sales department.

D. Parts affected by this bulletin:

All Engines

Part 1 and Part 2

72-41-32

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
01500	6A7723	38	Vane, assy VIGV long spindle	-	6A5653 6A7472	(A)(C)(S1) (S2)

Printed in Great Britain

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
01600	6A7725	2	.Vane, assy VIGV short spindle	-	6A5655 6A747 4	(A)(C)(S1) (S2)

72-41-33

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
01190	6A7728	40	Bush VIGV inner shroud	-	6A3497	(A)(C)(S1) (1D)
01200	6A7727	1	Shroud, assy VIGV	-	6A3464	(A)(C) (S1)

Part 1 and Part 3

72-41-32

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
02500	6A7729	30	Vane stage 3 long spindle	-	6A5677 6A7476	(A)(C)(S1) (S2)
02600	6A7730	2	Vane stage 3 short spindle	-	6A5678 6A7477	(A)(C)(S1) (S2)

72-41-33

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
02138	4W0114	16	Bolt (see appendix 5)(.190 dia x 1.188)	-	4W0116	(B) (S1) (5D)
02150	-	2	Seal, half half ring stage 3 - shroud	-	6A1093	(C)
02190	6A7728	32	Bush stage 3 inner shroud	-	6A3497	(A)(C)(S1) (2D)
02200	6A7719	2	Shroud, assy stage 3 half	-	6A3467	(A)(C)(S1)
02220	AS20763	3	Ring, retaining	-	AS20762	(B)(S1)
02222	AS20745	3	Pin, grooved headless	-	LK41751	(B)(S1)

Part 1 and Part 4

72-41-32

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
03500	6A7558	50	Vane, stage 4	-	6A56 9 6A7478	(A)(C)(S1) (S2)

72-41-33

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
03138	4W0114	24	Bolt (see appendix 5) (.190-dia x 1.188)	-	4W0116	(B)(S1) (5D)
03150	-	2	Seal, half ring stage 4	-	6A1427	(C)
03190	6A7728	50	Bush stage 4 inner shroud	-	6A3497	(A)(C)(S1) (3D)
03200	6A7561	2	Shroud, assy stage 4 half	-	6A3469	(A)(C)(S1)

Part 1 and Part 5

72-41-32

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
04500	6A7559	60	Vane, stage 5 short spindle	-	6A5762 6A7479	(A)(C)(S1) (S2)
04600	6A7560	4	Vane, stage 5 long spindle	-	6A5763 6A7480	(A)(C)(S1) (S2)

72-41-33

FIG ITEM NO.	NEW PART NO.	QTY	PART TITLE	MAT	OLD PART NO.	INSTR DISP
04138	AS26114	32	Bolt, close tol dee head (.190 dia x .875)	-	AS26113	(B)(S1) (5D)
04190	6A7728	64	Bush stage 5 inner shroud	-	6A3497	(A)(C)(S1) (4D)
04200	6A7563	2	Shroud, assy stage 5 half	-	6A3471	(A)(C)(S1)

E. Instruction disposition codes:

(A) New part will be made available from December 2001.

(B) New part is currently available.

Printed in Great Britain

(C) Old part becomes redundant upon embodiment of this modification.

(S1) Old and new parts are not interchangeable.

(S2) Old part may be reworked and re-identified to the new part number.

(1D) Quantity reduced from 80 to 40.

(2D) Quantity reduced from 64 to 32.

(3D) Quantity reduced from 100 to 50.

(4D) Quantity reduced from 128 to 64.

(5D) Old part may be used up on other applications.

3. Accomplishment Instructions

A. Prepare the HP Compressor

(1) Remove the HP compressor assembly from the engine. Refer to the applicable Engine Manual (EM) 72-00-41, Removal and Installation.

(2) Disassemble the HP compressor assembly. Refer to the applicable Engine Manual (EM) 72-41-00, Removal and Installation.

(3) Disassemble the HP compressor rotor. Refer to the applicable Engine Manual (EM) 72-41-00, Removal and Installation.

B. Rework Instructions

(1) Rework the parts that follow:

6A5653 and 6A7472, HP compressor VIGV assembly. Refer to Illustrated Parts Catalogue (IPC), 72-41-32, Fig/Item 01-500.

6A5655 and 6A7474, HP compressor VIGV assembly. Refer to Illustrated Parts Catalogue (IPC), 72-41-32, Fig/Item 01-600.

(2) Standard equipment

Vibro-engraving equipment
Dial test indicator
Standard workshop equipment
Standard workshop inspection equipment
Chemical cleaning equipment
penetrant crack test equipment

(3) Consumable materials

CoMat 06-022 Fluorescent penetrant

(4) Re-identify the VIGV

PROCEDURE	RELATED DATA
(a) Make a note of the part number	
(b) Re-identify repair markings	Re-identify any repair markings identified on the vane. Refer to Fig 4. Refer to SPM 70-09-00-400-501. Use vibro-engraving equipment. Remove all burrs and raised material made by vibro-engraving.

(5) Machine the HPC VIGV

CAUTION: TITANIUM COMPONENT - YOU MUST USE SILICON CARBIDE TYPE WHEELS, STONES AND PAPERS TO DRESS, BLEND AND POLISH THIS COMPONENT.

CAUTION: TITANIUM COMPONENT - AVOID BUILD UP OF HEAT BY APPLYING ONLY GENTLE PRESSURE AND KEEPING THE TOOL SPEED AS LOW AS POSSIBLE.

CAUTION: TITANIUM COMPONENT - YOU MUST MAKE SURE THAT WHEN YOU DRESS MATERIAL, BLEND AND POLISH, TO MAKE SMOOTH, NO SPARKS ARE PRODUCED.

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

PROCEDURE	RELATED DATA
(a) Set the VIGV true to be machined	Use a dial test indicator and standard workshop equipment
(b) Machine the VIGV to length	Refer to Fig 4. Use standard workshop equipment
(c) Machine the chamfer on the VIGV	Refer to Fig 4. Use standard workshop equipment
(d) Remove burrs	Use standard workshop equipment
(6) Inspect the HPC VIGV	Refer to Fig 4. Use standard workshop inspection equipment
(7) Swab etch the HPC VIGV	
(a) Chemically clean	Refer to SPM TASK 70-11-08-300-503, SUBTASK 70-11-08-300-001. Use chemical cleaning equipment
(b) Swab etch the reworked area(s)	Refer to SPM TASK 70-11-08-300-503, SUBTASK 70-11-08-300-002. Use chemical cleaning equipment
(8) Do a local penetrant crack test	Refer to SPM TASK 70-23-05-230-501. Use CoMat 06-022 fluorescent penetrant, with penetrant crack test equipment. Cracks are not permitted

(9) Cancel the existing part number and re-identify the HP compressor VIGV assembly with the new part number adjacent to existing part number

Refer to SPM TASK 70-09-00-400-001. Use vibro-engraving equipment. Remove all burrs and raised material made by vibro-engraving

Existing	Re-number
6A5653	6A7723
6A7472	6A7723
6A5655	6A7725
6A7474	6A7725

(10) Rework the parts that follow:

6A5677 and 6A7476, HP compressor stage 3 vane. Refer to Illustrated Parts Catalogue (IPC) 72-41-32, Fig/Item 02-500.

6A5678 and 6A7477, HP compressor stage 3 vane. Refer to Illustrated Parts Catalogue (IPC) 72-41-32, Fig/Item 02-600.

6A5679 and 6A7478, HP compressor stage 4 vane. Refer to Illustrated Parts Catalogue (IPC) 72-41-32, Fig/Item 03-500.

6A5762 and 6A7479, HP compressor stage 5 vane. Refer to Illustrated Parts Catalogue (IPC) 72-41-32, Fig/Item 04-500.

6A5763 and 6A7480, HP compressor stage 5 vane. Refer to Illustrated Parts Catalogue (IPC) 72-41-32, Fig/Item 04-600.

(11) Standard equipment

Vibro-engraving equipment
Dial test indicator
Standard workshop equipment
Standard workshop inspection equipment
Chemical cleaning equipment
penetrant crack test equipment

(12) Consumable materials

CoMat 06-022 Fluorescent penetrant

(13) Re-identify the HPC stage 3, 4 and/or 5 vanes

PROCEDURE	RELATED DATA

(a) Make a note of the part number

	(b) Re-identify repair markings	Re-identify any repair markings identified on the vane. Refer to Fig 4. Refer to SPM 70-09-00-400-501. Use vibro-engraving equipment. Remove all burrs and raised material made by vibro-engraving

(14) Machine the HPC stage 3, 4 and/or 5 vanes

	(a) Set the vanes true to be machined	Use a dial test indicator and standard workshop equipment
	(b) Machine the vanes to length	Refer to Fig 4. Use standard workshop equipment
	(c) Machine the chamfer on the vanes	Refer to Fig 4. Use standard workshop equipment
	(d) Remove burrs	Use standard workshop equipment
	(e) Inspect the HPC vanes	Refer to Fig 4. Use standard workshop inspection equipment
	(f) Chemically clean the HPC vanes	Refer to SPM TASK 70-11-01-300-503. Use chemical cleaning equipment
	(g) Cold ferric chloride etch the HPC vanes	Refer to SPM TASK 70-11-39-300-503, SUBTASK 70-11-39-300-001. Use chemical cleaning equipment
	(h) Do a local penetrant crack test	Refer to SPM TASK 70-23-05-230-501. Use CoMat 06-022 fluorescent penetrant, with penetrant crack test equipment. Cracks are not permitted

(i) Re-identify the HP compressor stage 3, 4 and/or 5 vanes with the new part number	Refer to Fig 4. Refer to SPM TASK 70-09-00-400-001. Use vibro-engraving equipment. Remove all burrs and raised material made by vibro-engraving	

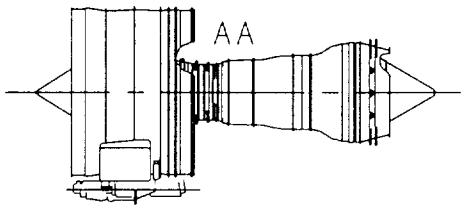
Existing	Re-number
6A5677	6A7729
6A7476	6A7729
6A5678	6A7730
6A7477	6A7730
6A5679	6A7558
6A7478	6A7558
6A5762	6A7559
6A7479	6A7559
6A5763	6A7560
6A7480	6A7560

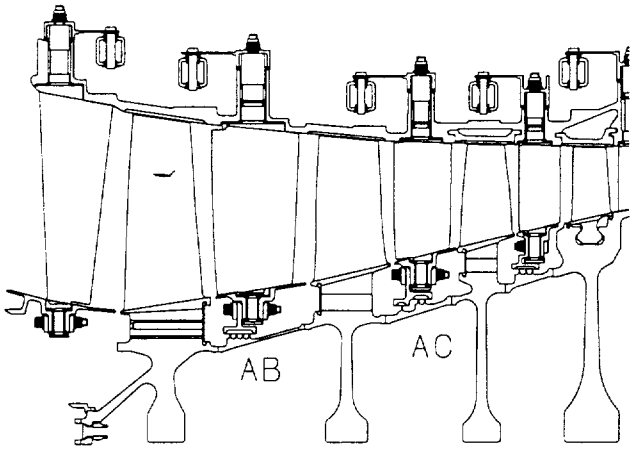
C. Assembly Instructions

The revised parts introduced by this Service Bulletin must be installed as a Service Bulletin set. Remove and install in accordance with current overhaul procedures (Engine Manual, 72-41-00 and 72-41-30, Disassembly and Assembly).

D. Recording Instructions

A record of accomplishment is necessary.

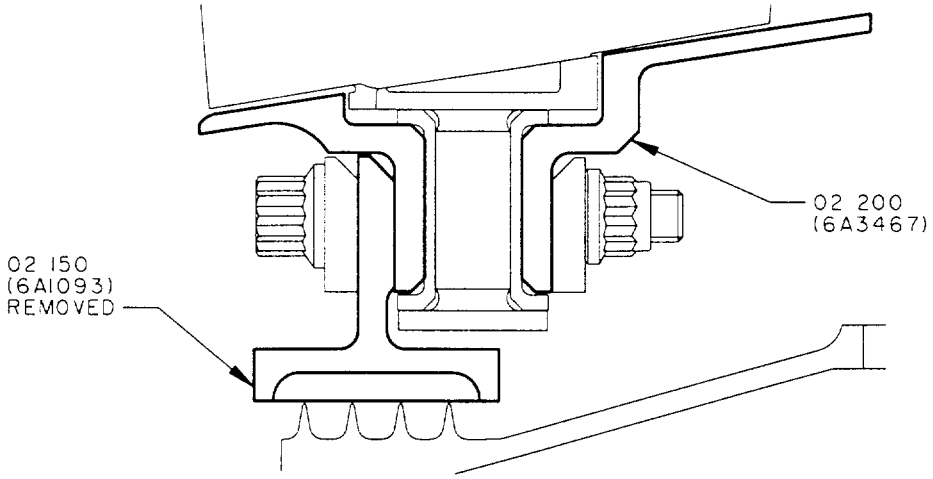




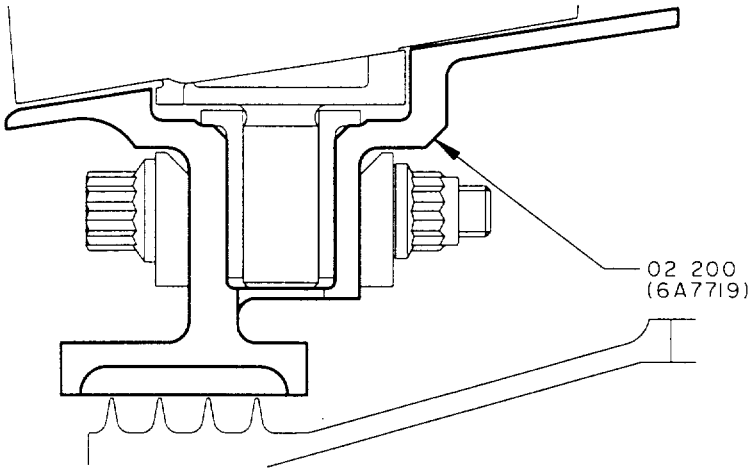
DETAIL AT AA

dem0000681

Detail at AA
Fig.1



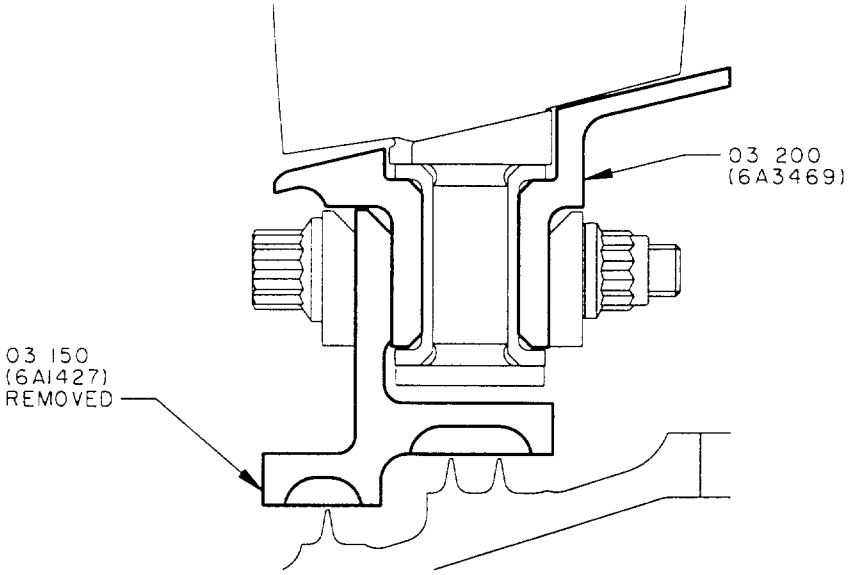
DETAIL AT AB BEFORE MODIFICATION
SHOWING STAGE 3 INNER SHROUD
AND VANE ASSEMBLY

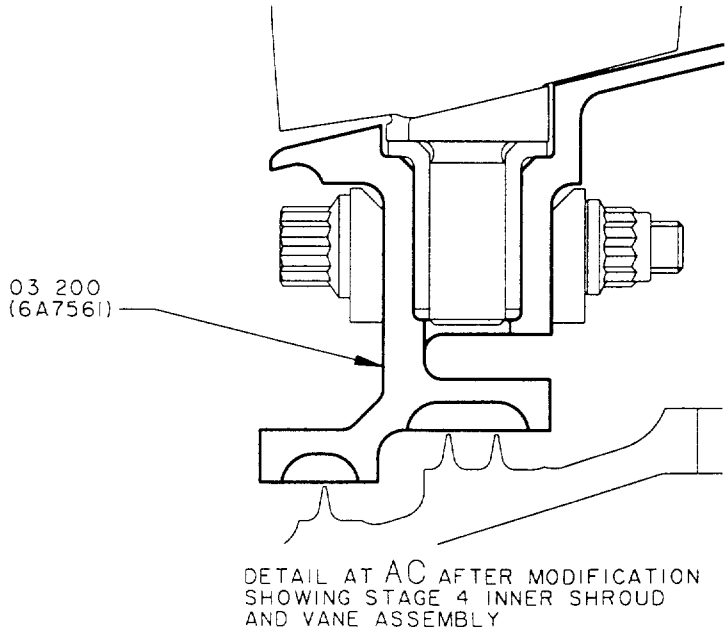


DETAIL AT AB AFTER MODIFICATION
SHOWING STAGE 3 INNER SHROUD
AND VANE ASSEMBLY

dem0000682

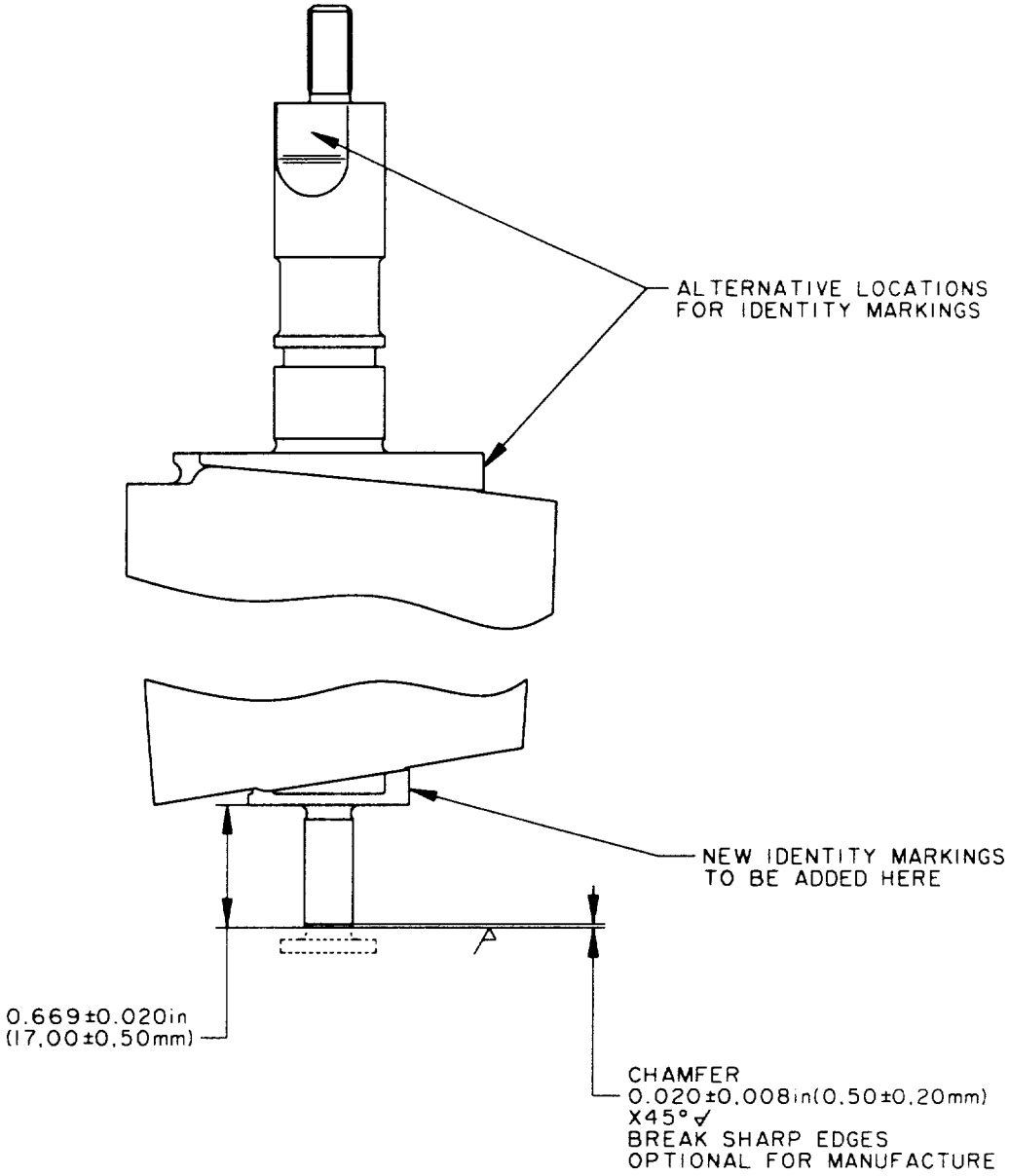
Detail at AB before and after alteration
Fig.2





dem0000683

Detail at AC after modification
Fi. 3



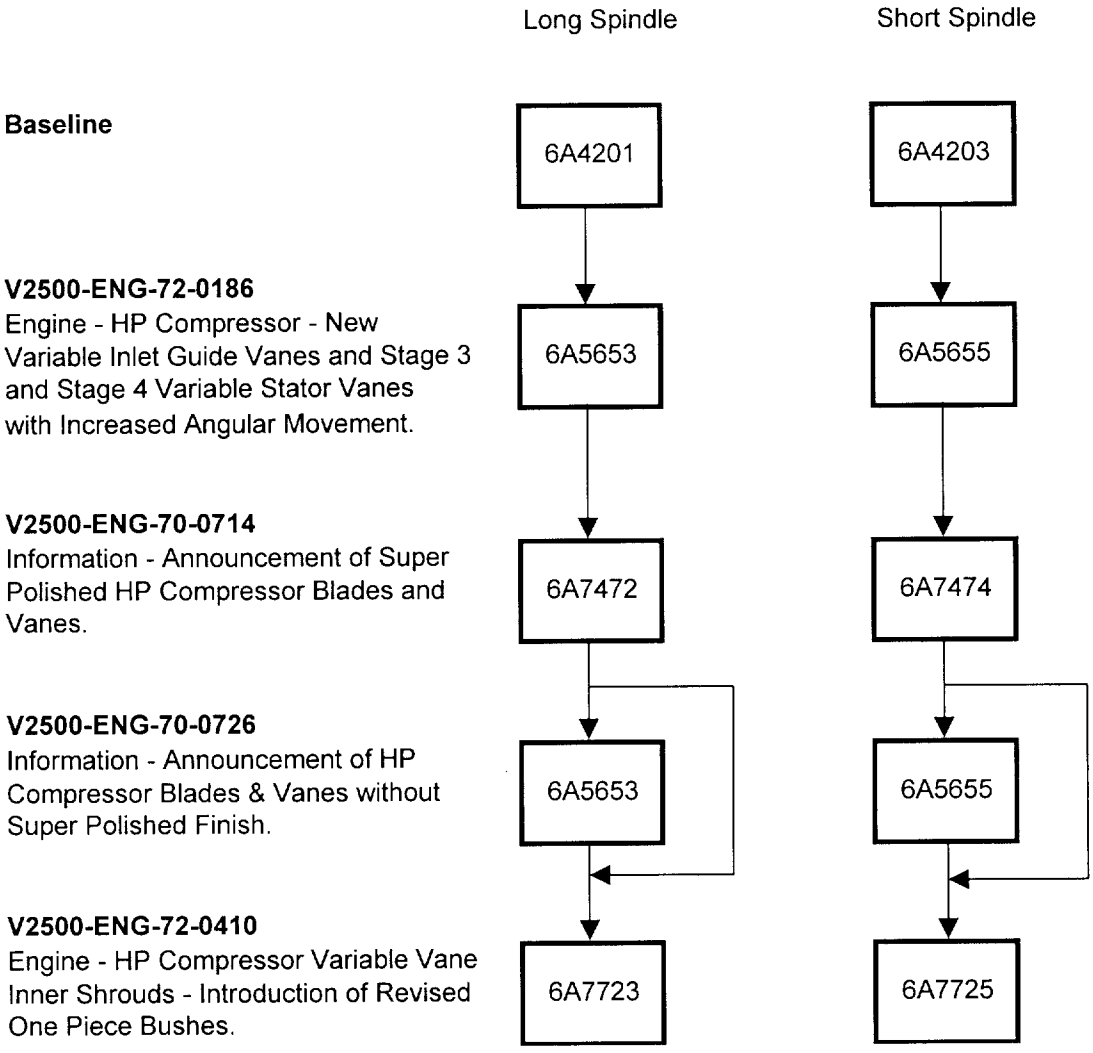
VIEW SHOWING VANE REWORK
TYPICAL ALL STAGES

dem0000684

MACHINE WHERE MARKED
SURFACE FINISH TO BE 125 MICROINCHES (3.2 MICROMETRES)

View showing vane rework typical all stages
Fig.4

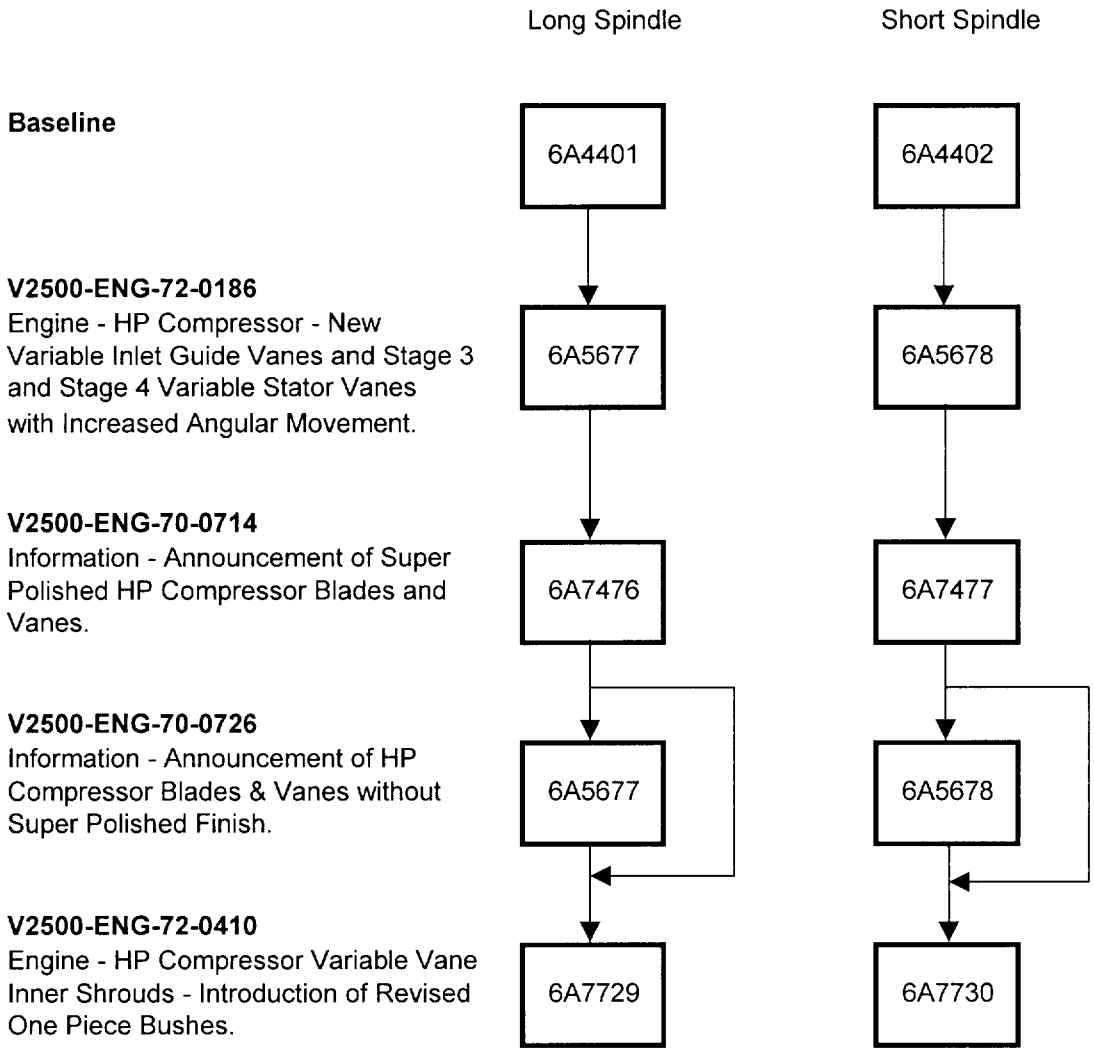
HP Compressor VIGV Vane Assembly Family Tree



ded0004268

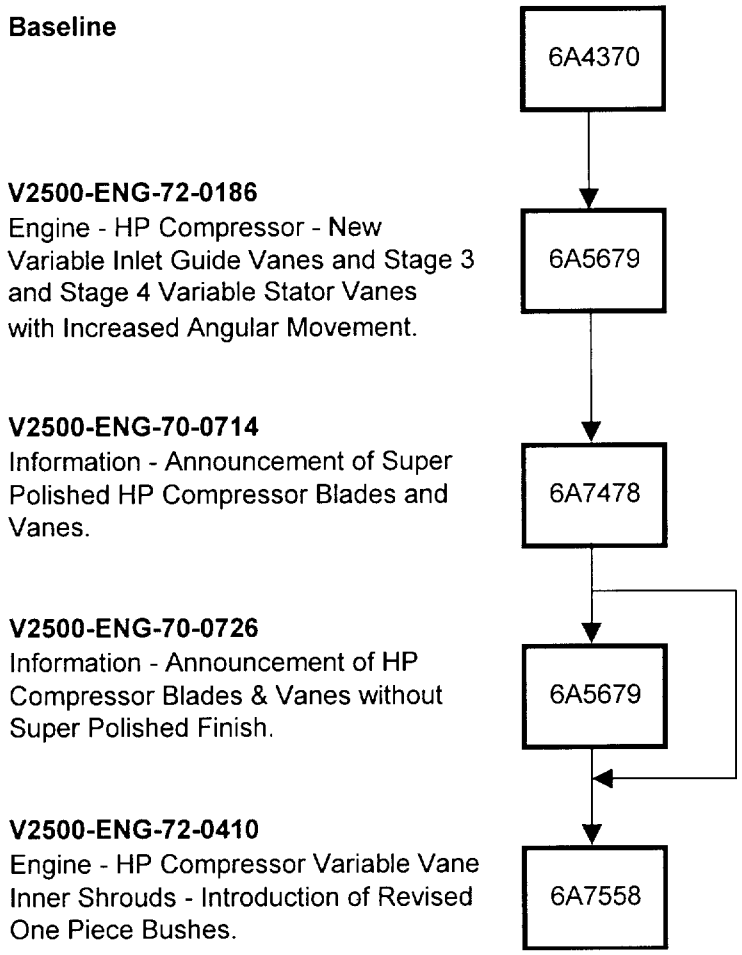
HP compressor VIGV vane assembly family tree
Fig.5

HP Compressor Stage 3 Vane Family Tree



HP compressor stage 3 vane family tree
Fig.6

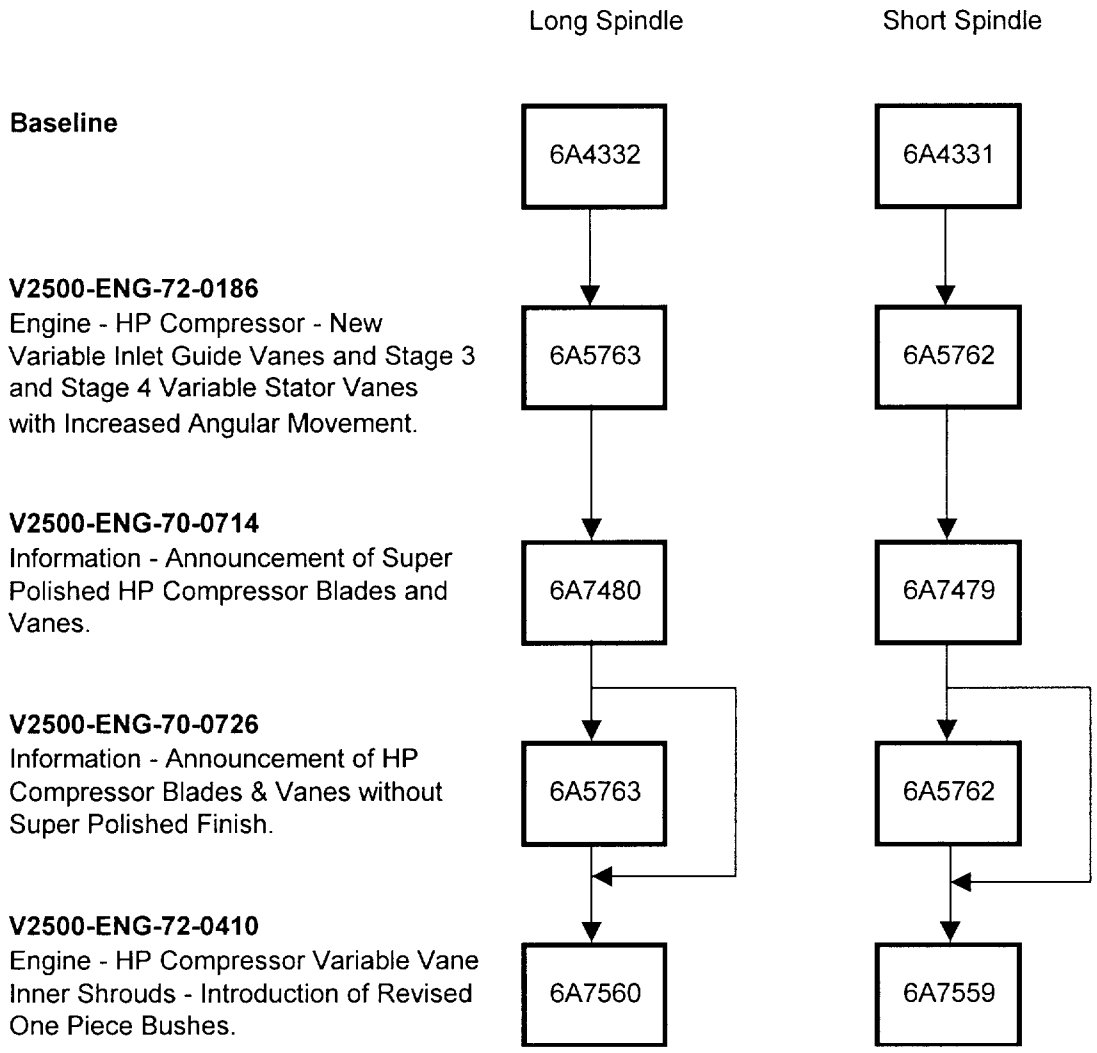
HP Compressor Stage 4 Vane Family Tree



ded0004270

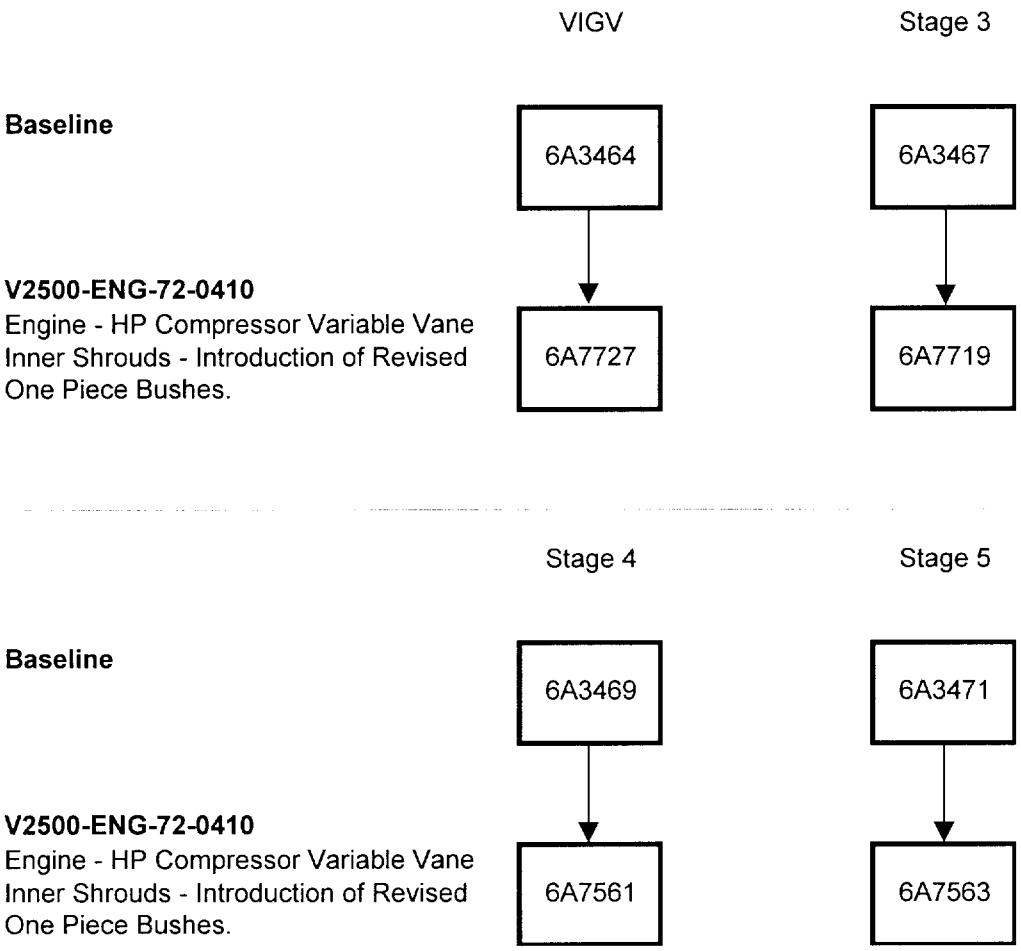
HP compressor stage 4 vane family tree
Fig.7

HP Compressor Stage 5 Vane Family Tree



HP compressor stage 5 vane family tree
Fig.8

HP Compressor Inner Shroud Bush Family Trees



ded0004272

HP compressor inner shroud bush family trees
Fig.9

HP Compressor Inner Shroud Bush Family Tree

Baseline

6A3467

V2500-ENG-72-0410
Engine - HP Compressor Variable Vane Inner Shrouds - Introduction of Revised One Piece Bushes.

6A7728

ded0004273

HP compressor inner shroud bush family tree
Fig.10