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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V2500-A5/D5 SERIES PROPULSION SYSTEM NON-MODIFICATION SERVICE BULLETIN

This document transmits the Revision 2 of Non-Modification Service Bulletin V2500-ENG-72-0496.

Document History
Non-Modification Service Bulletin Revision Status

Initial Issue	Jul. 1/05
Revision 1	Jul.25/06

Non-Modification Service Bulletin Revision 2

Remove	Incorporate	Reason for change
All pages of this Non-Modification Service Bulletin	Pages 1 to 23 of the Non-Modification Service Bulletin	Instruct engine removal within 500 cycles of clapper wear being classified as Amber. Definition of RED, AMBER and GREEN Inspection findings and illustration Updated

V2500–ENG–72–0496

CHECK THAT ALL PREVIOUS TRANSMITTALS HAVE BEEN INCORPORATED
If any have not been received please advise IAE International Engines AG

NON-MODIFICATION SERVICE BULLETIN – ENGINE – HP COMPRESSOR, STAGE 3 ROTOR – REPEAT INSPECTION OF CLAPPERS

1. Planning Information

A. Effectivity Data

(1) For all V2500-A5 and V2500-D5 Engines which do not have the Service Bulletin V2500-ENG-72-0487, ENG-72-0560 or ENG-72-0561 standard incorporated.

B. Concurrent Requirements

None

C. Reason

This Non-Modification Service Bulletin (NMSB) requires an inspection of the High Pressure Compressor (HPC) rotor 3 blade clappers for signs of irregular wear or mis-alignment and gives data to identify wear and to reduce rotor 3 blade fractures. To date there have been a number of HPC Rotor 3 blade fractures that have occurred within the A5 and D5 fleets.

The majority of blade fractures have been connected with a Foreign Object Damage (FOD) event or a birdstrike. During the investigations, it has been noted that these engines have all also had a degree of rotor 3 blade clapper wear. It is thought that a FOD event can be made worse by worn clappers with certain types of wear patterns.

These wear patterns may shingle the clappers and cause the blade airfoil to vibrate in 1st Flap with possible blade fracture.

As there is a possible connection between blade fractures and a FOD or birdstrike or some wear patterns, SB 72-0496 has been written to monitor wear on HPC rotor 3 blade clappers that have done above 7000 cycles since new or 5000 cycles since repair.

D. Compliance

Category Code 3

For all engines recorded in section 1.A. (1) Effectivity with HPC rotor 3 blades with either:

(1) more than 7000 cycles since new or

(2) 5,000 cycles since rotor 3 blade clapper repair, do an inspection of the clappers. Refer to the steps in section 3. Accomplishment Instructions, and repeat inspections at the following intervals:

(a) A5 Engines: Within 750 cycles and done again at the same intervals unless specified by this Service Bulletin.

(b) D5 Engines: Beginning at the next 'A' check and done again every subsequent 'A' check unless specified by this Service Bulletin.

E. Description of Clapper Alignment and Wear

Note: The pictures shown in the inspection check are general and may not be typical of all examples of clapper wear.

(1) **Radial Alignment** – how completely the faces of the two contacting clappers are covering each other. This is given as a percentage with 100% alignment meaning they are completely aligned. Refer to figure 2.

(a) **Aligned** – clappers which are at least 50% aligned of the contact surface.

(b) **Mis -aligned** – clappers less than 50% aligned of the contact surface.

NOTE: There are differences in the clapper face areas between blade vendors. As a result, the clapper face of one blade may 'go across' the face of the mating blade on both the top and bottom. If this occurs, use the smaller of the two faces for determining the percentage of alignment.

NOTE: 50% alignment usually is related to 0.040 in. (1 mm) of exposed clapper face in the radial direction.

(2) **Shingling** – clappers that are no longer abutting each other but are riding over each other. This happens after total misalignment of the clappers.

(3) **Vertical Wear** – wear/erosion of the mating clapper faces usually due to loss of hard-face coating on one or both faces. The clapper faces are not slanted. Refer to figure 1.

(a) **Regular Wear** – wear into the clapper faces which is flat or even, but is not slanted.

(b) **Irregular Wear** – uneven wear into clapper faces when seen from the radial or axial direction.

(c) **Stepped Wear** – wear into clapper faces which causes a step shape. The step can be in the radial direction, or along the face of the clapper (in the direction of the airflow). The wear between the two clapper faces is vertical (radial) – not slanted.

(4) **Slanted Wear –** wear between the clapper faces which is at an angle (usually 45 degrees). This type of wear shows a condition for the clappers to slide on top/under each other and become shingled. Refer to figure 1.

F. Approval

The compliance statement in section D of this NMSB complies with the Federal Aviation Regulations and is FAA-Approved for the engine models listed.

G. Manpower

Estimated man-hours to embody the inspection task of this Service Bulletin:

In Service	Est. Manhours
To gain access	1 hour
To embody	2 hours
To close up	0.5 hour
Total	3.5 hours

H. References

(1) Boeing AMM Reference:

(a) 72-00-02-290-801 – Borescope of HP Compressor

(2) Airbus AMM Reference:

(a) 72-00-00-210-012 – Inspection of the HP Compressor Stage 3 Rotor Clapper

(3) IAE Engineering Change Number – 06VR866A.

(4) ATA Locator – 72-00-00

2. Material Information

None

3. Accomplishment Instructions

A. Inspect the HPC stage 3 blades

(1) Do an inspection of the HPC stage 3 blades for signs of damage (for example: nicks, tears, cracks, dents or any tip damage or discoloration). Follow the procedure in the applicable AMM at intervals as follows or unless stated otherwise

(a) V2500-A5: every 750 cycles

(b) V2500-D5: every next "A-Check"

CAUTION: IN ORDER TO REDUCE THE POTENTIAL FOR MULTIPLE ENGINE IN-FLIGHT SHUT DOWNS, 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: Because of the different types of clapper wear conditions, it is not possible to give an accurate measure of permitted clapper wear. The wear condition of each pair of clappers must be inspected independently according to the inspection check. Any further, subsequent procedures must be agreed between the operator and IAE Technical Services.

B. Inspect the clappers

(1) Record engine flight cycles at each inspection. Also record the number of times the inspection has been performed since clapper wear was classified as being in the AMBER category. For example:

Engine CSN _____ / Amber Inspection No. 3

(2) Do an Inspection of the Clappers and compare with the pictures in each of the colored sections.

RED CATEGORY:

(a) Shingled Clappers: reject the engine immediately if any shingled clappers are found. Refer to the red section.

(b) Cracks or loss of material in non-contact areas: reject the engine immediately. Refer to the red section.

(c) Peeling of material that indicates clapper override (e.g. Peeling of material on the clapper horizontal surface), or uniform heavy peeling along the full width of the clapper contact face indicating significant loss of hard coating: reject the engine within 10 cycles. Refer to the red section.

(d) Aligned with slanted wear: reject the engine within 10 cycles. Refer to the red section.

(e) Aligned with severe irregular wear: reject the engine within 10 cycles. Refer to the red section.

(f) Aligned with severe stepped wear: reject the engine within 10 cycles. Refer to the red section.

Note: Refer to Figure 2 for clapper alignment acceptability. There can be gaps between the clapper faces and this can be acceptable. However, gaps can visually make the misalignment look worse. Be very careful when inspecting wear and misalignment where there is a gap between clapper faces. If unsure, review from other angles to better assess alignment. The minimum recommendation for reviewing clappers is to inspect from two different angles (to assess both the vertical and horizontal faces of the clappers).

(g) Mis-aligned: reject the engine immediately. Refer to the red section.

AMBER CATEGORY:

Note: Once R3 blade clapper wear has been classified as AMBER, the Engine MUST be removed within 500 cycles.

(h) Aligned with advanced vertical regular, irregular or stepped wear: accept and do an inspection again within 100 cycles. Once clapper wear is classified as being in the amber category, remove the engine within 500 cycles. Refer to the Amber section.

GREEN CATEGORY:

(a) Aligned with no wear: accept. Refer to the green section.

(b) Aligned with mild vertical regular, irregular or stepped wear: accept. Refer to the green section.

IAE recommends that operators digitally record evidence of inspections, either as videos or as photographs. Digital recording allows the previous condition to be reviewed when performing a repeat inspection, which will enable a better understanding of how the clappers are wearing.

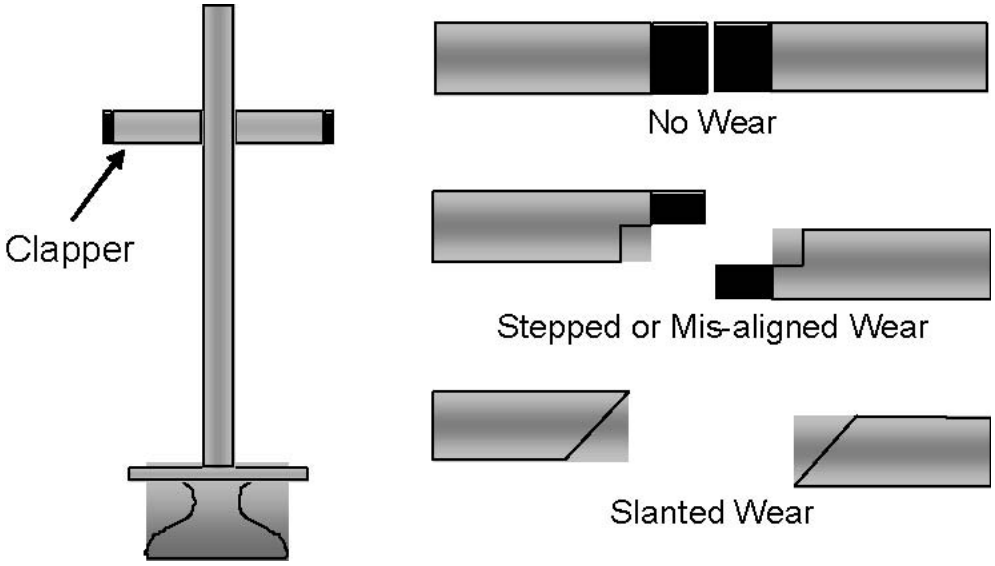


Figure 1: Axial View of Clapper Showing Types of Wear

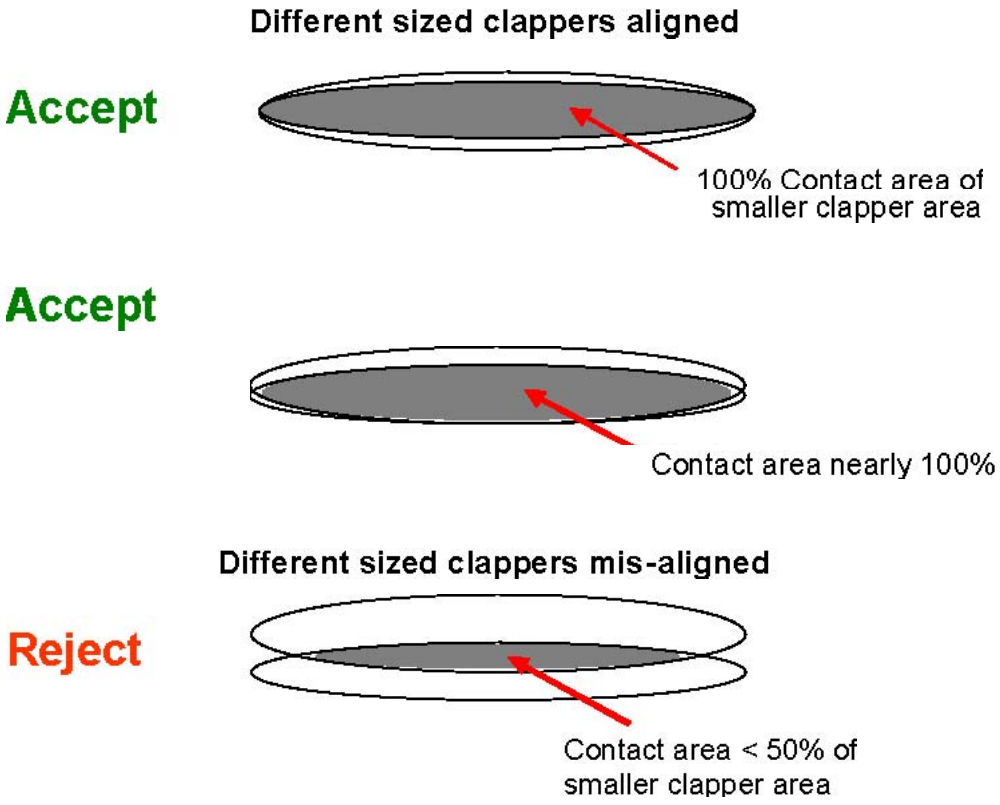


Figure 2: Clapper alignment Criteria

RED SECTION

REJECT THE FOLLOWING

Aligned Severe Irregular Wear – Reject within 10 cycles

Cracking and Material Missing – Reject Immediately

Mis-Aligned > 50% – Reject Immediately

Severe Stepped Wear – Reject within 10 cycles

Material Peeling that indicates clapper override (horizontal surface) or uniform peeling along the full width of the clapper contact face – Reject within 10 cycles

Bent or Totally Mis-Aligned Clappers – Reject Immediately

Clapper Shingling – Reject Immediately

Slanted Wear – Reject within 10 cycles

RED SECTION

Severe Irregular Wear Material Missing and Cracking

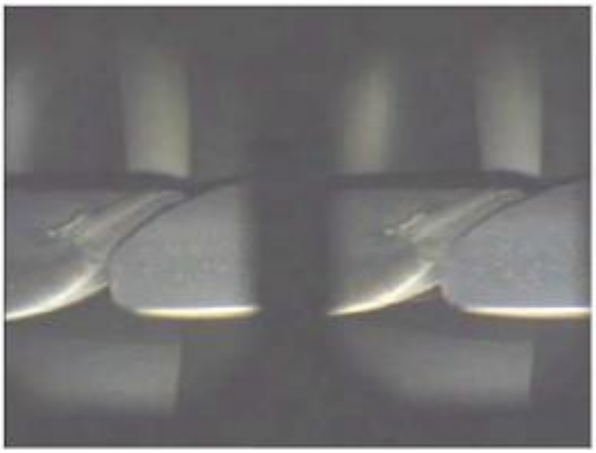
Material Peeling

Material Peeling

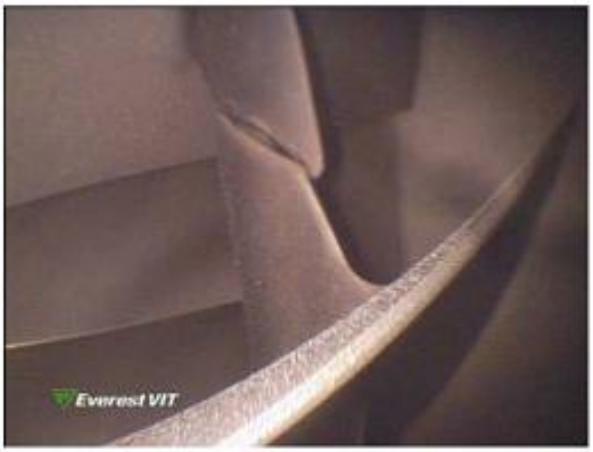
RED SECTION

Mis-Aligned Stepped Wear

Irregular Wear Leading to Slanted Wear

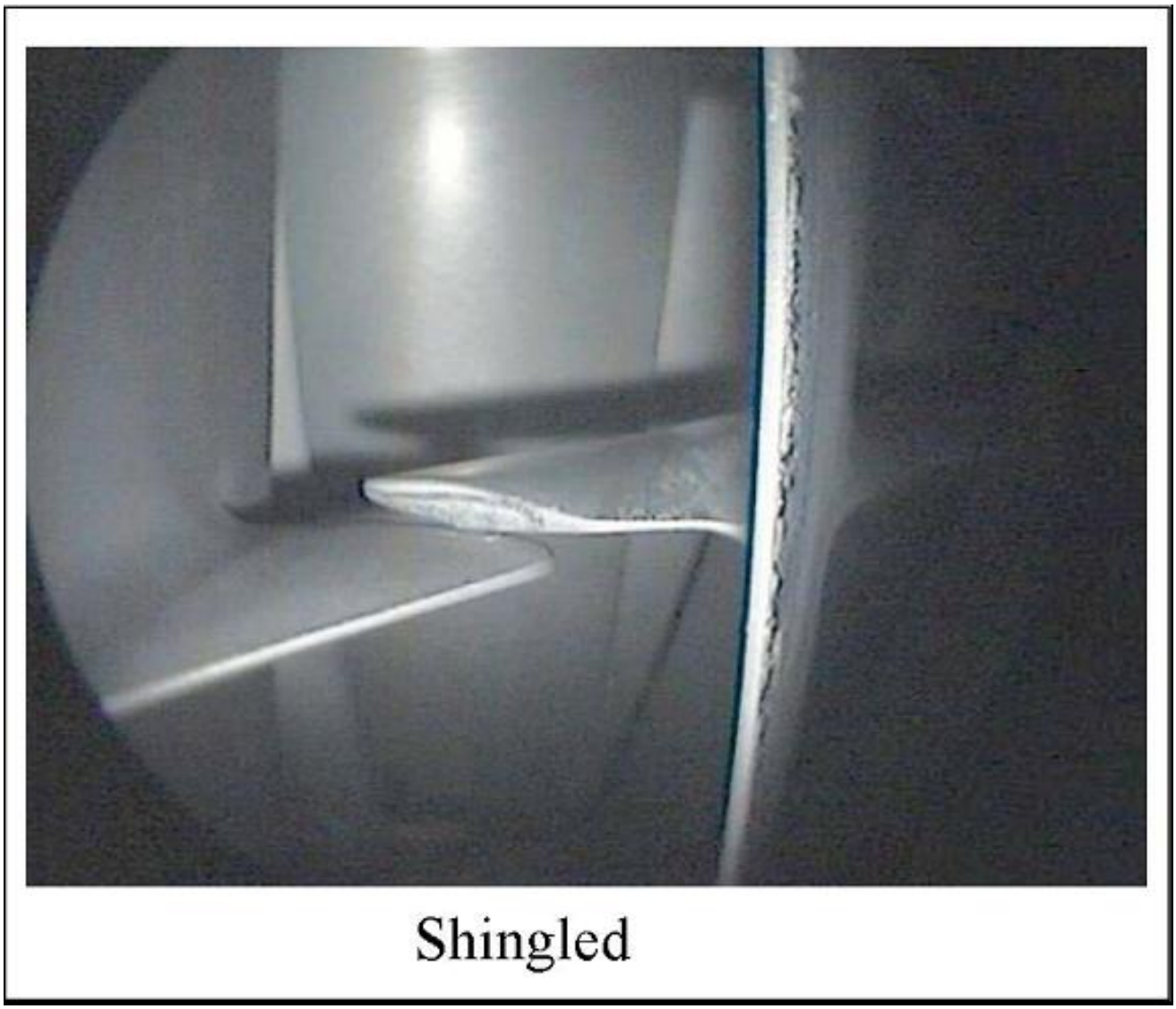


Slanted Wear with Evidence of Material Peeling that indicates Clapper Override



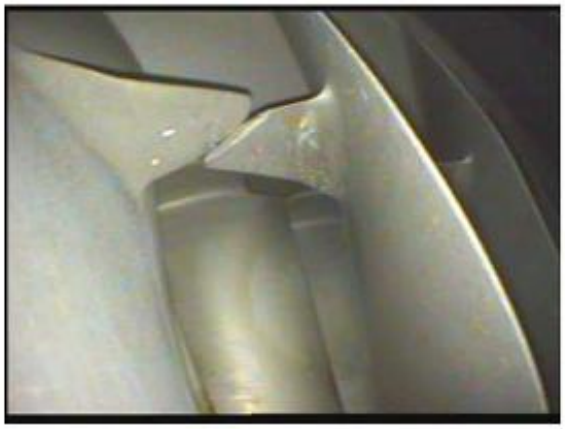
Has the appearance of Slanted Wear: Review from other angles

RED SECTION

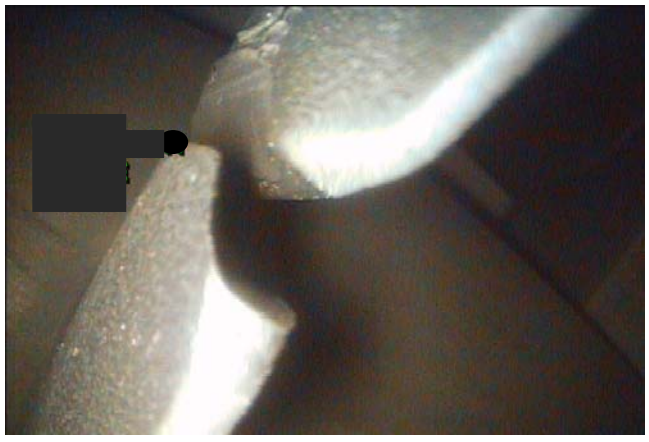


Shingled

RED SECTION



Shingled as a Result of Bird Strike



Peeling Material along large section of clapper horizontal surface – evidence of clapper override

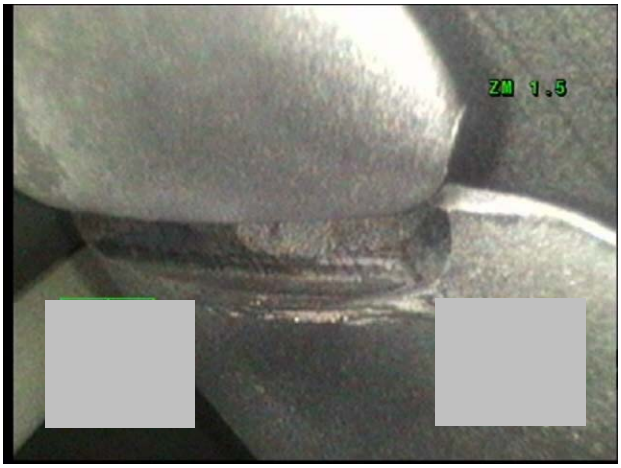
RED SECTION

Mis-Aligned > 50%

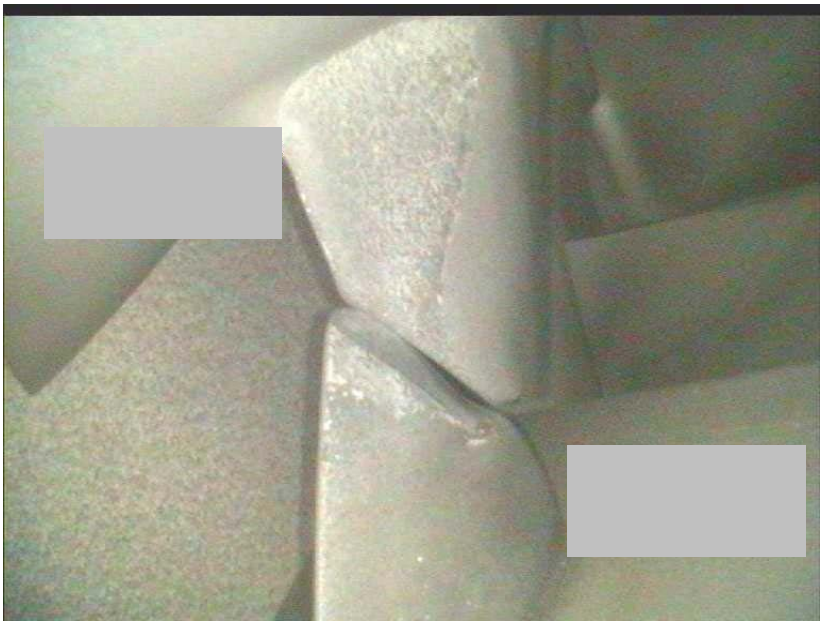
RED SECTION

Clappers Totally Mis-Aligned and Blade Bent
Result of Bird Strike

RED SECTION



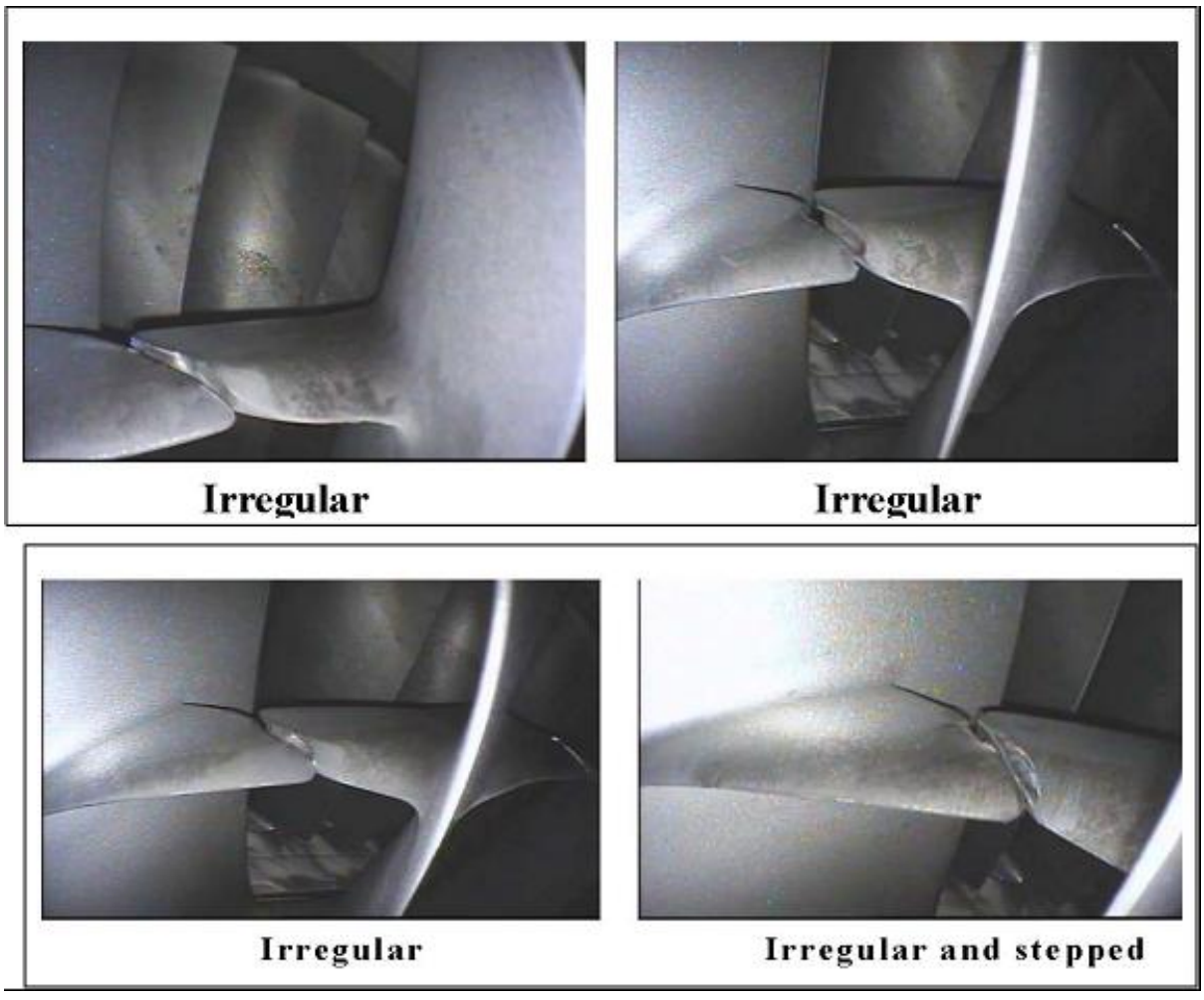
Aligned with severe stepped wear



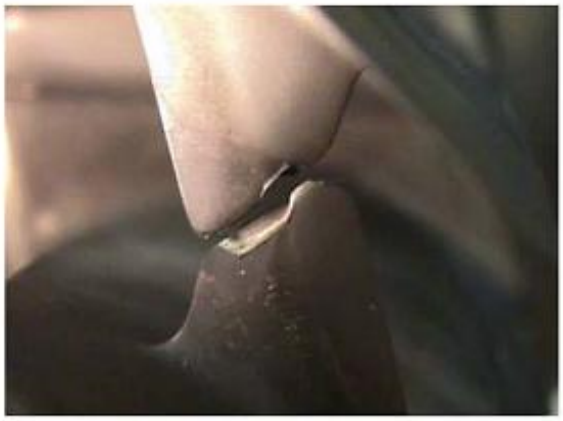
Slanted wear

AMBER SECTION
ACCEPT, RE-INSPECT WITHIN 100 CYCLES

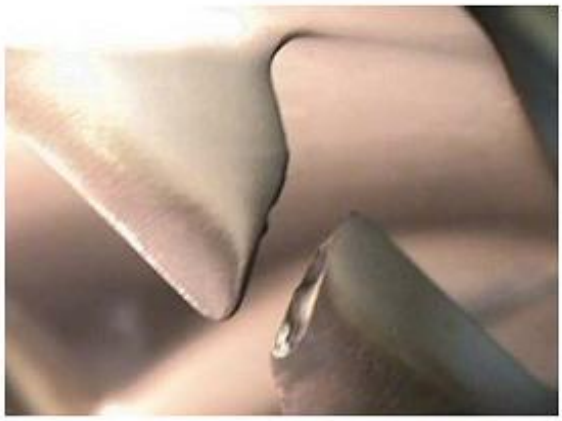
Advanced Aligned Irregular and Stepped Wear, Advanced Mis-Aligned Irregular and Stepped Wear, Mis-Aligned Clappers With More Than 50% Clapper Face Contact.



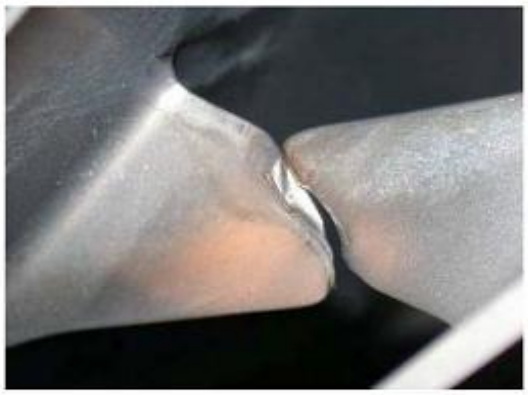
AMBER SECTION



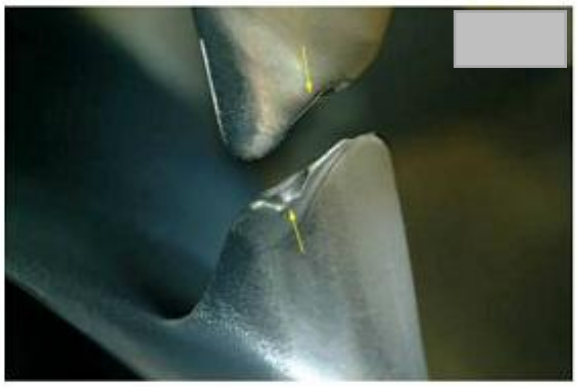
Irregular and Stepped



Irregular Hollowing



Irregular and Stepped



Irregular and Stepped

AMBER SECTION

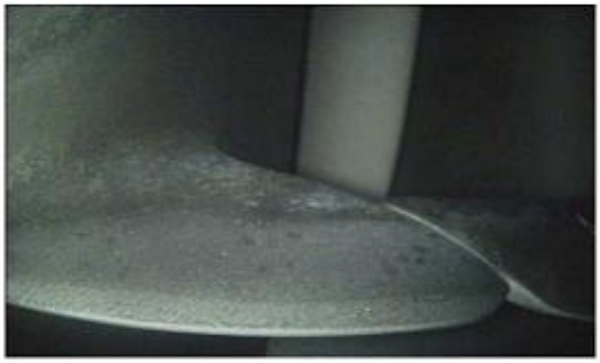
Aligned Stepped Wear

Advanced Aligned Irregular Wear to same pair of blades

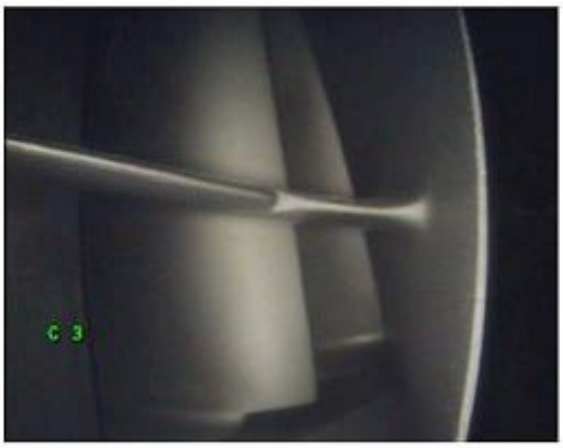
AMBER SECTION

Advanced Aligned Vertical Wear

GREEN SECTION
ACCEPT

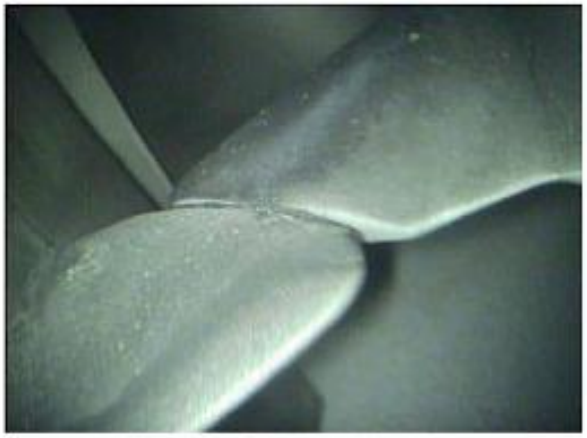


CLAPPERS WITH GOOD ALIGNMENT NO OBVIOUS WEAR



CLAPPERS WITH GOOD ALIGNMENT NO OBVIOUS WEAR

GREEN SECTION



COULD BE HIDING
SOME WEAR REVIEW

GOOD ALIGNMENT NO
OBVIOUS WEAR

Normal

Normal

GREEN SECTION

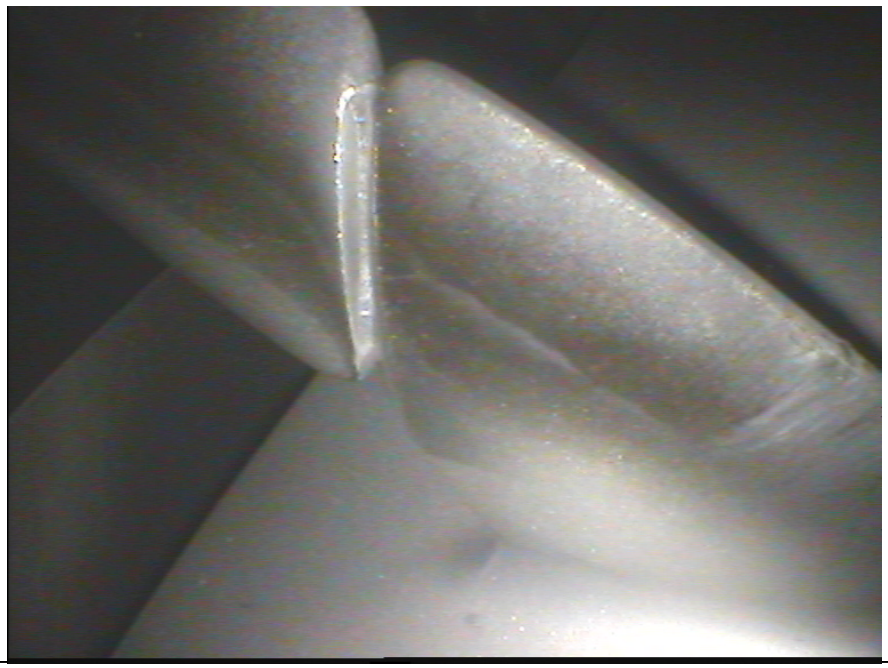
Aligned

Greater than 50% Aligned

Aligned Irregular Wear

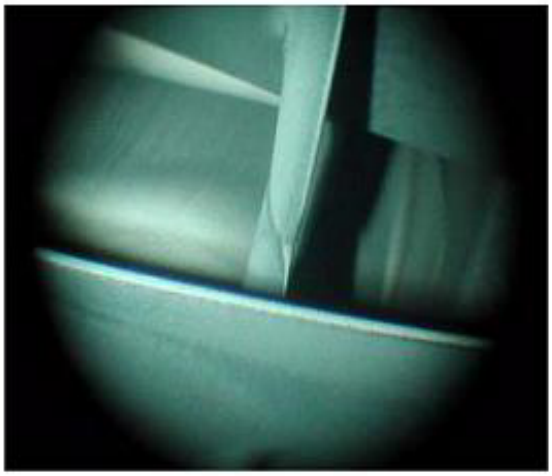
Aligned Hollowing of Face

GREEN SECTION



Aligned Stepped Wear

Aligned Vertical wear



Aligned