

General info			
Subject:	Boroscoop inspection Gasturbine 3 (GT3)	Inspection Date:	30-06-2020
Location:	RoCa Capelseweg 400 Rotterdam	Contac person:	H. Rijken
Manufacturec:	General Electric	Inspection done by:	R. van Dongen
Type:	Frame 9E (MS9001E)	Report by:	J. Sassenburg
KKS:	EFR31-MB	Report no:	21-1332
Rules:	n.a	Date report:	15-09-2020
Design:	By Manufacturer General Electric	Revision:	00

Content
- Intro - Operating hours - Scope of inspection - Result of inspection - Pictures - Action list

Approval	Prepared(Uniper)	Reviewed (Uniper)	For receipt
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Function:	Integrity Engineer	Maintenance Engineer	Maintenance Engineer
Date:	15-09-2020	15-09-2020	15-09-2020
Signature And stamp:	 J. Sassenburg Integrity Engineer IK2 K2#595		

Distribution			
Name:	Function:	Name:	Function:
L.T. van der Vliet	Manager Maintenance		
H. Rijken	Maintenance Engineer		
H. Bij nagte	Head Tech. Maintenance		
R.J. Verhoef	Head Tech. Maintenance		
E. Nefs	Team Leader		
Integrity Group	Data-Base Roca 3 GT		

1. INTRO

A planned Endoscope inspection was carried out at Roca 3 (GE frame 9E) gas turbine at 30-06-2020. This inspection was carried out with an Iplex NX IV9675 Olympus endoscope, through boroscope hole 1 u/t 4, both static (limited) and during twisting.

The inspection was carried out by: R. van Dongen Maintenance Engineer

2. OPERATING HOURS

	Hour before Major overhoul	Boroscope inspection Sept. 2019 (hr)	Boroscope inspection Juni. 2020 (hr)	Total after the Major overhoul 2015 (hr)
Total starts	961	1170	1275	314
Total trips	257	283	291	34
Starts with flame	545	701	794	249
Total hours with flame	144442	160696	164341	19899

3. SCOPE OF INSPECTION

Critical points that are being looked at

Buckets

- Cracking
- Broken material (missing metal)
- Impact damage (FOD)
- Corrosion, oxidation en erosion
- tip clearance
- Damage of vane top seals
- Condition of the TBC coating (1e buckets)

Nozzles

- Cracking
- Broken material (missing metal)
- Impact damage (FOD)
- Corrosion, oxidation en erosion
- Curved walls, outflow side
- Blokked cooling holes.
- Condition of the TBC coating (1e Nozzle)

1^e row compressorsblades

- This inspection is carried out from inlet channel.

Inlet Guide Vanes

- 100% visal inspection

4. RESULT OF INSPECTION

1st stage nozzle

- There was 1 small crack in the inner wall (see picture) same as 2019
- No closed cooling holes detected
- TBC Coating applied in 2015 some places coating cracked or moved
- Furthermore nothing special.

1st stage bucket

- At the Leading Edge no particularities of the blade
- At the Trailing Edge no particularities of the blade
- TBC Coating applied in 2015 some places coating cracked or moved
- Furthermore nothing special.

2nd stage nozzle

- No cracks were found in the inner and outer wall of the nozzle
- No closed cooling holes detected.
- No curved walls of the outflow side detected.
- Furthermore nothing special

2nd stage bucket

- no particularities.

3th stage nozzle

- no particularities.

3th stage bucket

- Inspected from the exhaust duct. Minor FOD at 3 blades.

Diffusor

- Cracks in the diffuser rack continue to grow, this has worsened since last inspection, cracking is rapidly increasing and is becoming a concern in connecting rods the rack will not completely break down through the partitions, but consideration will have to be given to a complete repair here in the future to be carried out.
- In the sealing ring at the exit side of 3e buckets a crack has been repaired in 2019, no cracks found during this inspection (repair from clock position 6 to 9 flow direction)

Compressor

- 1st row compressor blades show no damage to the blade tips, the adjustment (rounding) at some blades are still in the same condition as after the modification.
- The repaired intermediate strip is still the same as in the previous inspection.

IGV's

- The Inlet Guide Vanes are 100% visually inspected, no peculiarities were observed.

Conclusie:

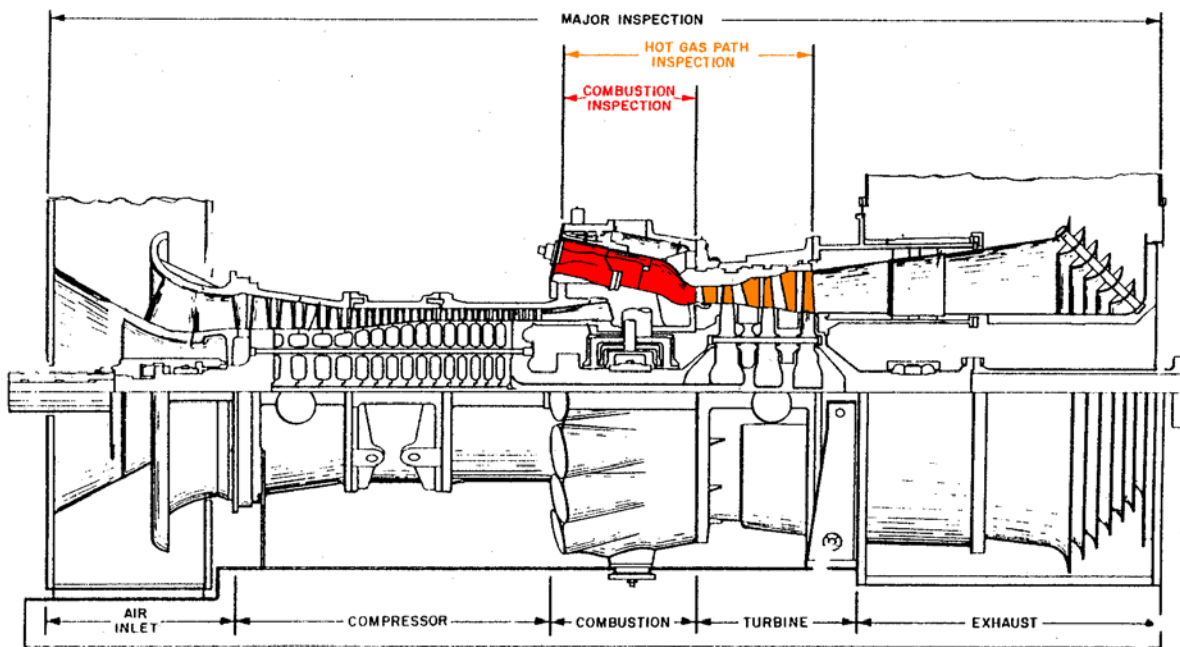
- During this endoscoop inspection no damage etc. were observed, the inspected parts have the view as the last inspection from 2019..

Recommendation :

Repair or replacement of diffuser is highly recommended, crack growth severely aggravates, 1 piece is broken out. The broken part from the rack is about 80% cracked at the intermediate supports. Grinding and welding cracks will do not prevent it from cracking again during operation of the GT.

Several repairs in exhaust are done by company MJB International Ltd, see report 21088-Uniper Roca Exhaust Frame repair Iss1

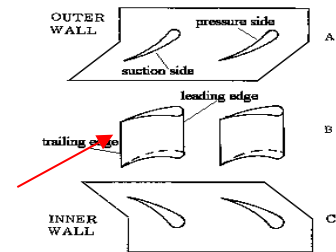
5. PICTURES



T/E = Trailing Edge
L/E = Leading Edge

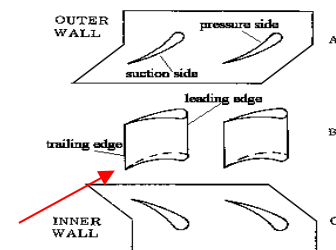
First Stage Nozzle (Set 3)

Top side of nozzle T/E outer wall flow side



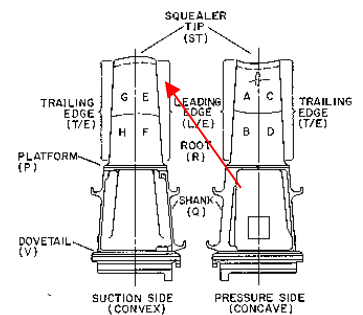
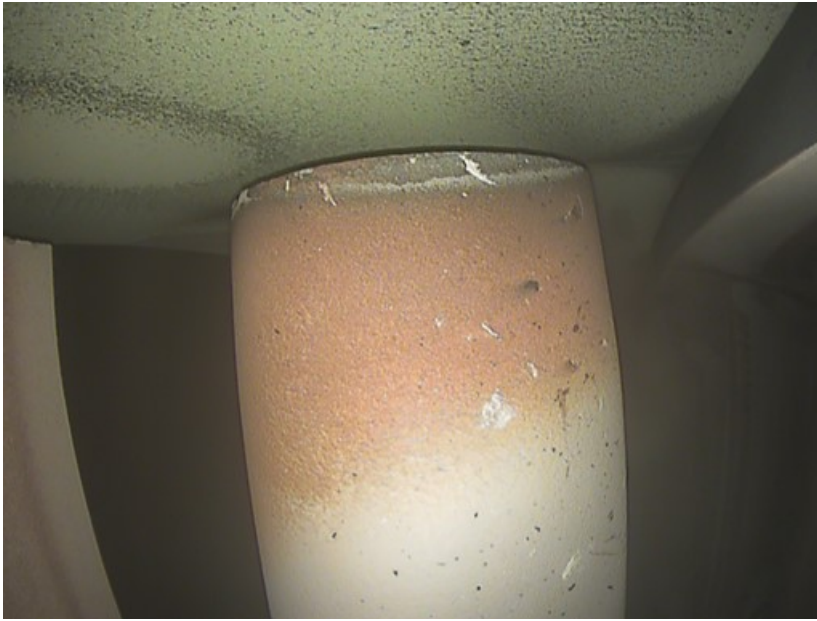
Foot side of nozzle T/E inner wall flow side

Image of the cooling holes on the TE of the inner and outer walls. The TBC coating applied in 2015 is cracked at some segments. Crack found in T/E outer wall.

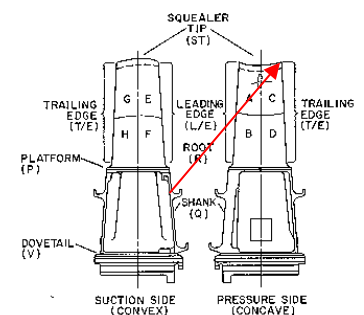
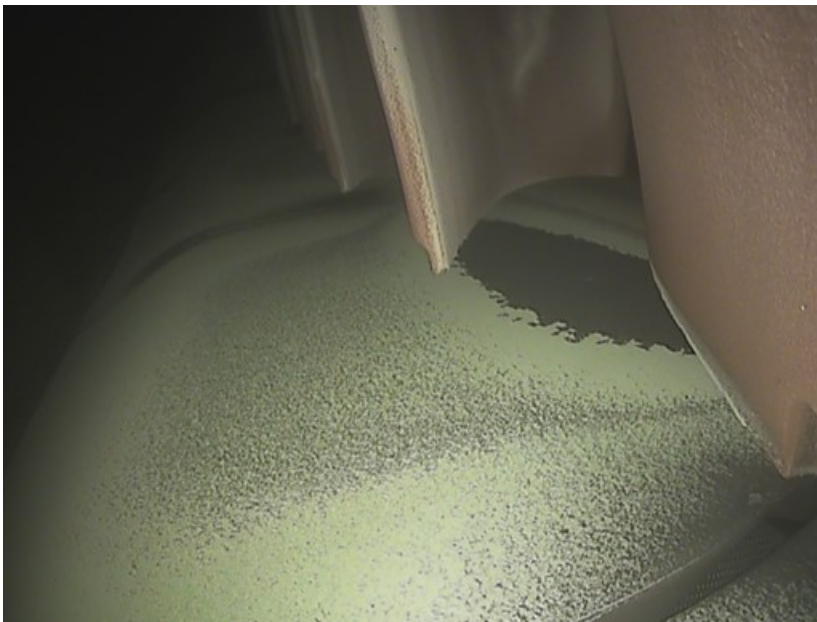


First Stage Buckets (Set 3)

Top of bucket L/E pressure side

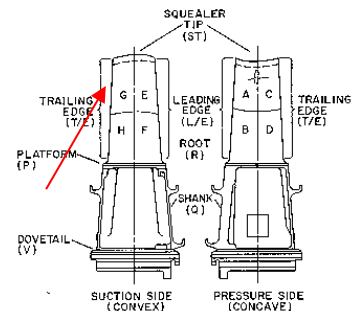


Foot of bucket T/E pressure side

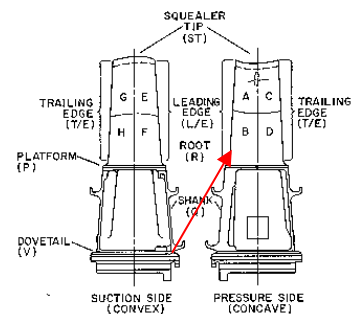
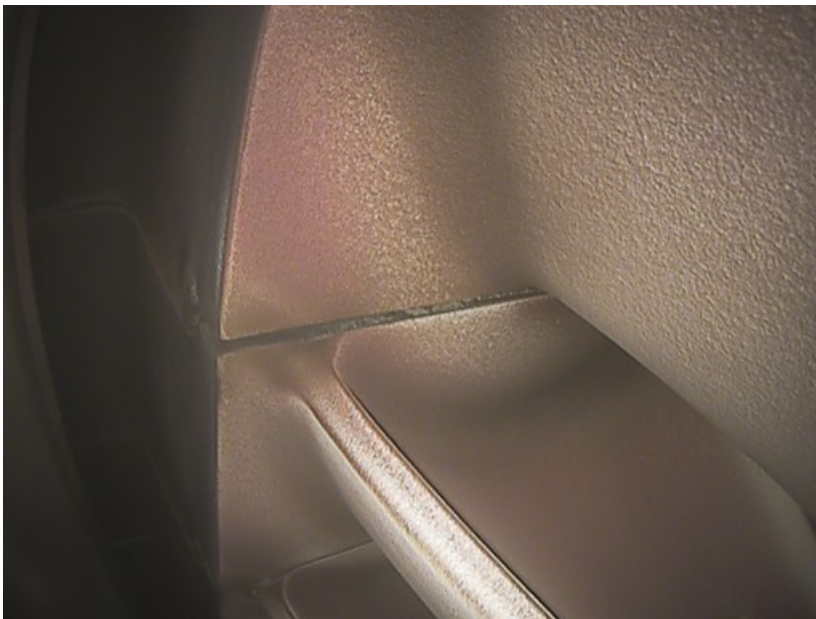


First Stage Buckets (Set 3)

Top of bucket L/E flow side

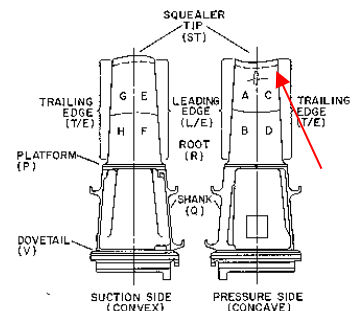
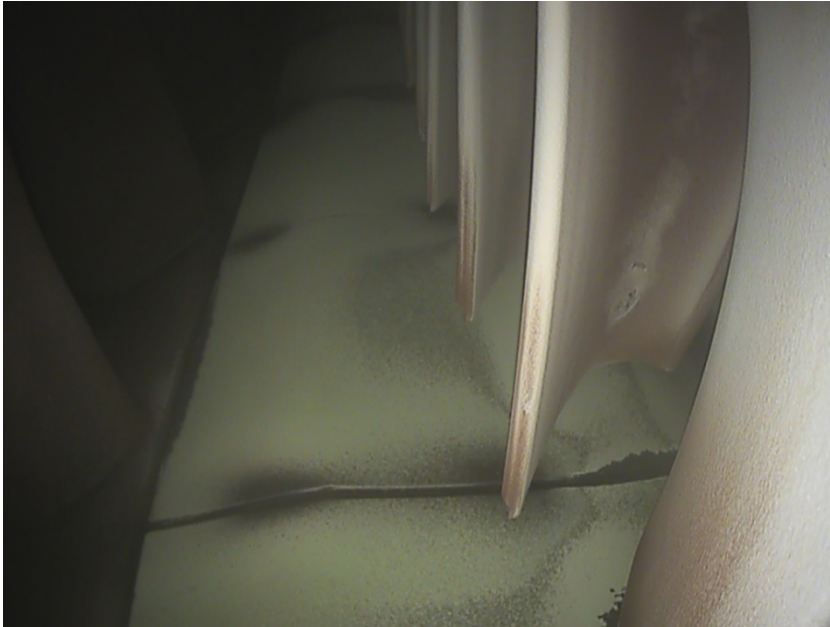


Foot of bucket L/E flow side

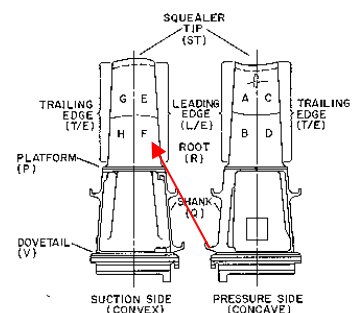
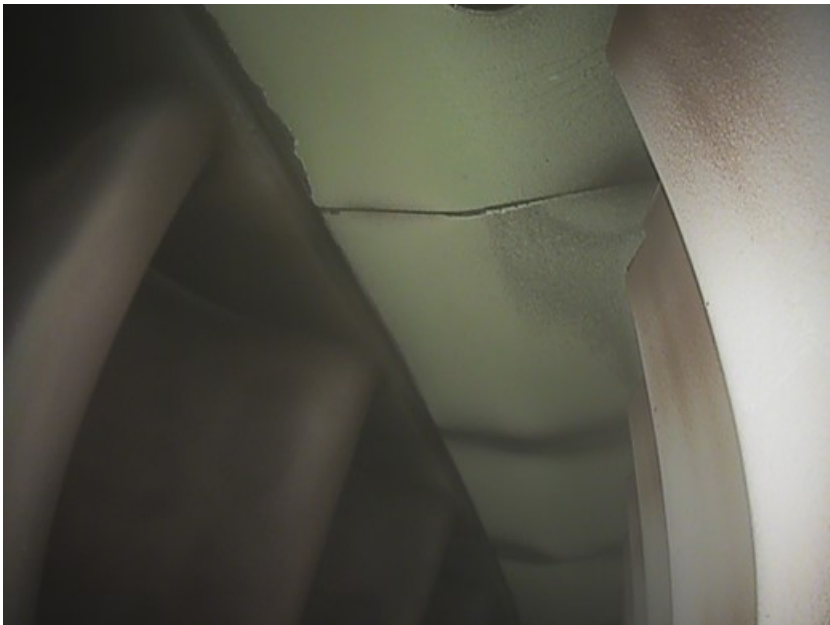


First Stage Buckets (Set 3)

Top of bucket T/E flow side

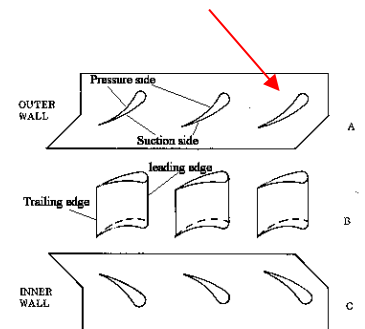


Foot of bucket L/E flow side

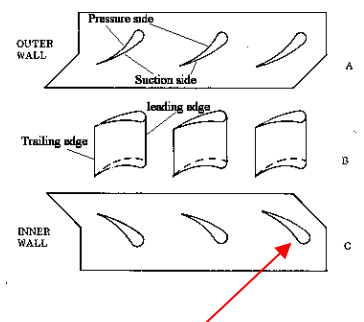
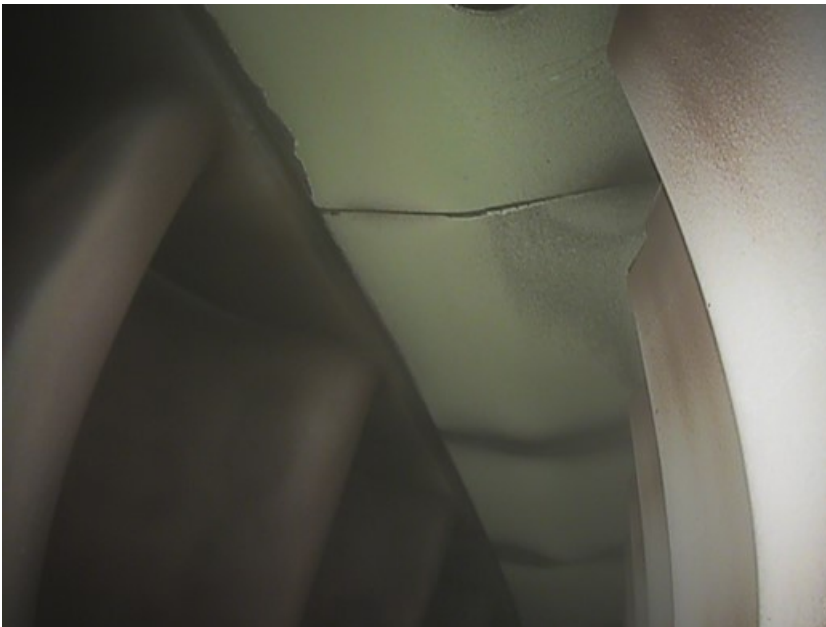


Second Stage Nozzle (Set 2)

Top of nozzle L/E outer wall pressure side

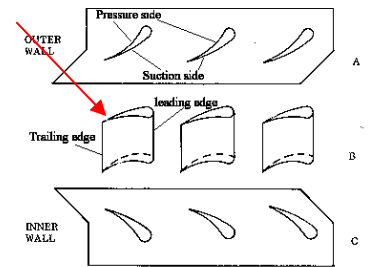


Foot of nozzle L/E inner wall pressure side

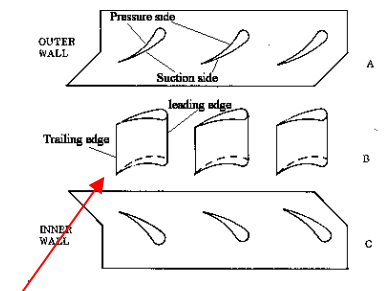


Second Stage Nozzle (Set 2)

Top of nozzle T/E outer wall flow side

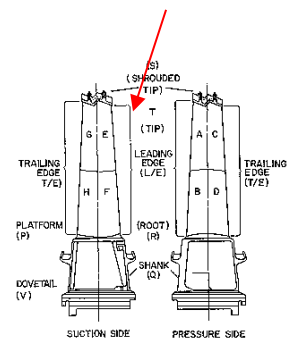


Foot of nozzle T/E inner wall flow side

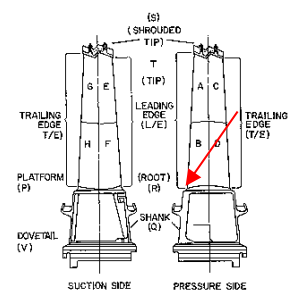


Second Stage Bucket (Set 2)

Top of bucket L/E pressure side

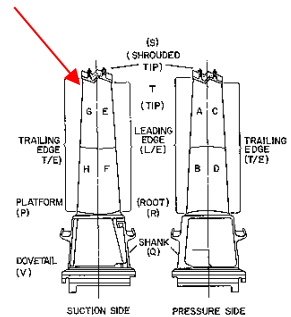


Foot of bucket L/E pressure side



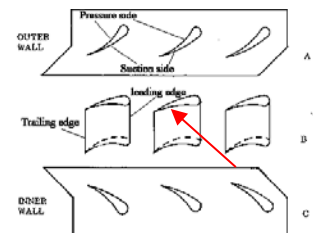
Second Stage Bucket (Set 2)

Top of bucket T/E flow side

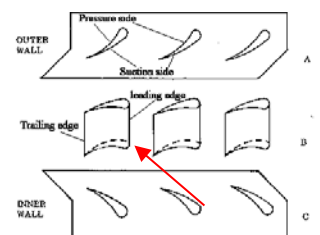


Third Stage Nozzle (Set 1)

Top of nozzle L/E inner wall pressure side

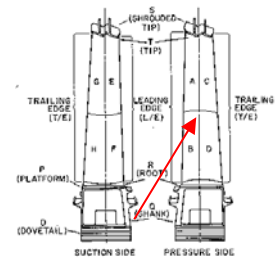


Foot of nozzle L/E inner wall pressure side

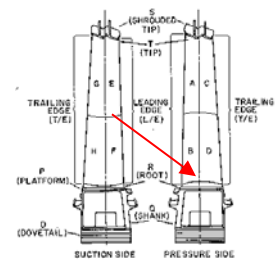


Third Stage Buckets (Set 2)

Flow side inspection through the exhaust duct



Foot of 3^e stage bucket flow side



Minor FOD, T/E 3e stage buckets



Inlet Guide Vanes (IGV) inspection

Inspection of IGV and 1e row compressor blades



View modification no difference with the inspection before (2019)

6. ACTION LIST

No.	Description	Who	When	Closed