
RTW 2021

Airbus

SA Family

Liebherr Saline

LIEBHERR

Liebherr-Aerospace



Presenters

Mark Sobol	Technical Support Manager	Liebherr Saline, US
Laila Rideau	Technical Support Engineer	Liebherr Toulouse, France
Elisabeth Dahan	Technical Support Engineer	Liebherr Toulouse, France
Luize Bartelega	Customer Support Engineer	Liebherr Lindenberg, Germany
Nadine Welzel	Customer Support Engineer	Liebherr Lindenberg, Germany
Anne-Laure Galloux	Customer Support Product Leader	Airbus Toulouse, France

Agenda

1 Introduction

2 Fleet brief

3 ATA 36 - SAneo - HPV faults

4 ATA 36 - SAneo - FAV Actuator and FAV Body

5 ATA 36 - SAceo - TLT Improvement

6 ATA 21 - AIR PACK REGUL FAULT ORPHAN

7 ATA 21 - FCV 1806D0000-02

Introduction



Welcome speech

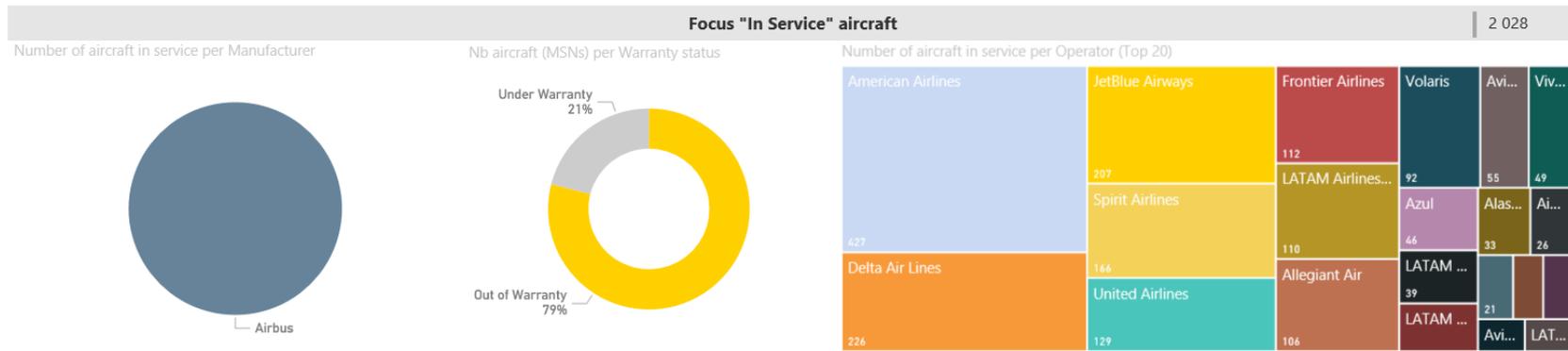
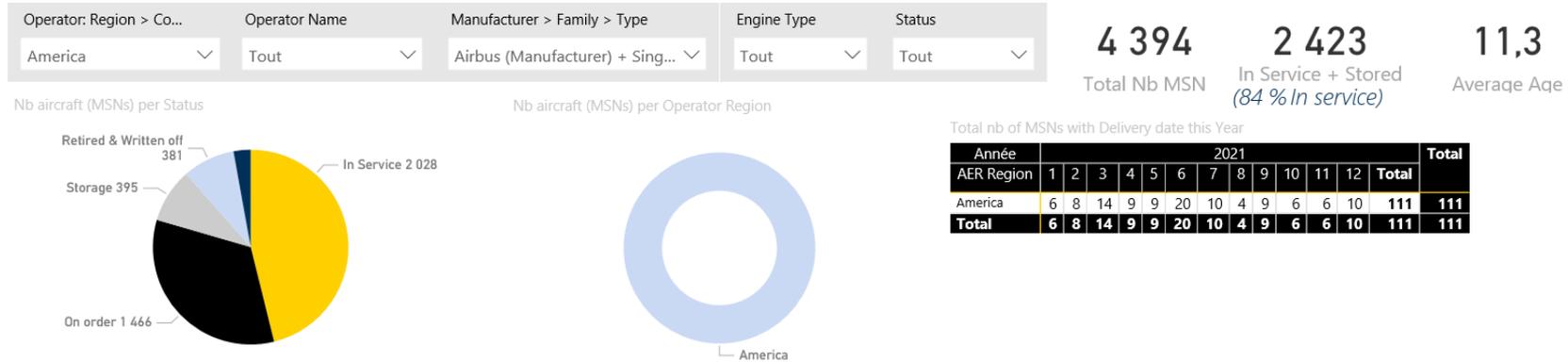


Safety rules

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Fleet overview



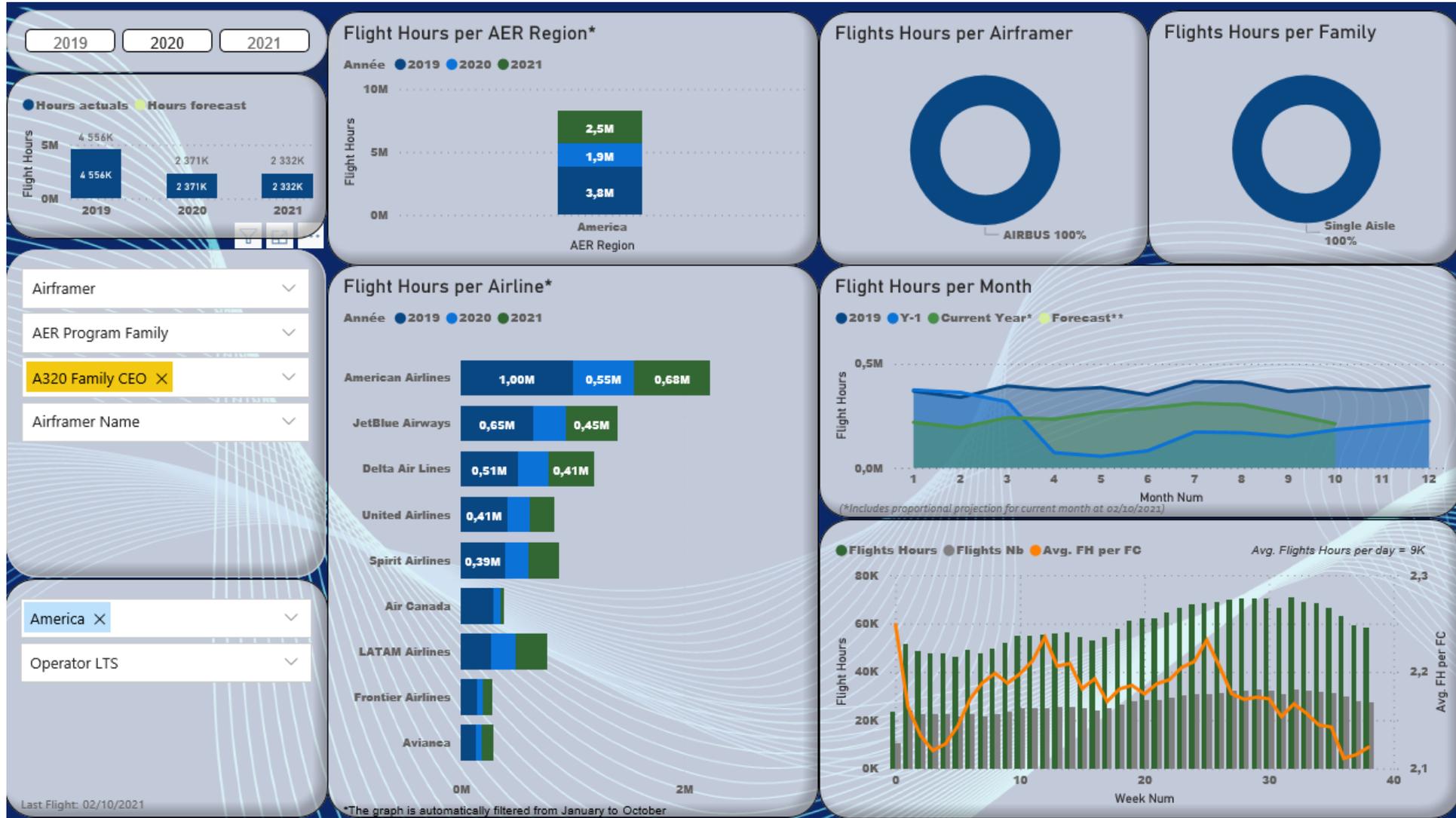
Detailed data

Focus mode : on the table (up, right), you can click on the icon to open the table in focus page :

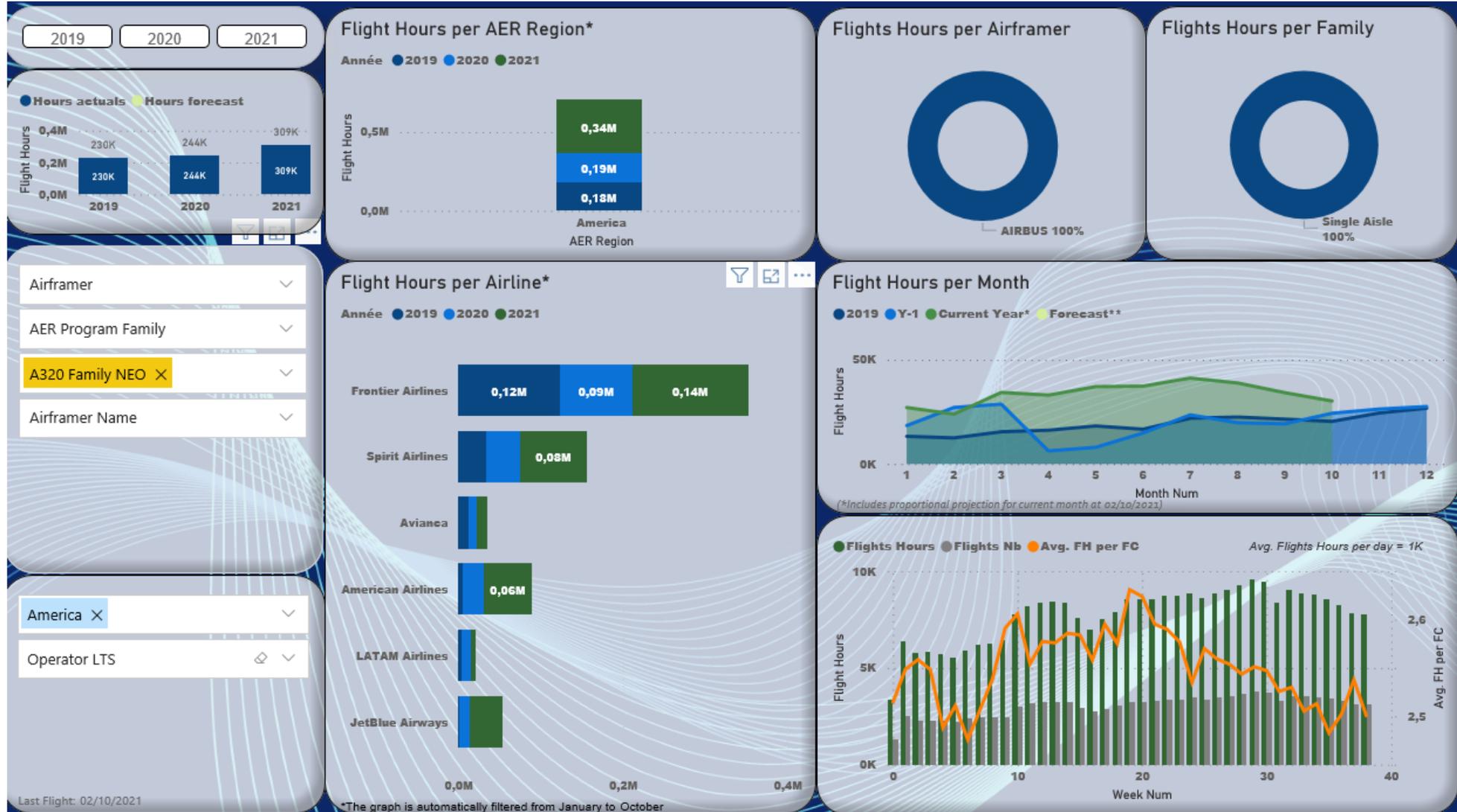
Manufacturer	Aircraft Family	Aircraft Type	Serial Number	Engine Type	Age	Status	Operator	Operator Country	AER Region	In Service Date	Cumulative Hours	Average Annual Hours	Previous 12 Months Hours
Airbus	Single Aisle	A318	3602	PW6000		Retired	A318 Aircraft Holdings LLC	United States	America	22/08/2008	4 225	346,31	2 418
Airbus	Single Aisle	A318	3642	PW6000		Retired	A318 Aircraft Holdings LLC	United States	America	05/11/2008	3 630	302,50	2 340
Airbus	Single Aisle	A319	2174	CFM56	17,70	Storage	A319 LDA-LDB-LDC Ltd	Cayman Islands	America	08/03/2004	46 014	2 706,71	889
Airbus	Single Aisle	A320	0225	V2500		Retired	AAR Aircraft Sales & Leas...	United States	America	11/10/1991	48 556	2 638,91	2 266
Airbus	Single Aisle	A320	0304	V2500		Retired	AAR Aircraft Sales & Leas...	United States	America	24/04/1992	52 361	3 098,28	3 169
Airbus	Single Aisle	A320	0315	V2500		Retired	AAR Aircraft Sales & Leas...	United States	America	01/09/1992	50 959	2 928,68	3 242
Airbus	Single Aisle	A320	0527	V2500		Retired	AAR Corp	United States	America	30/03/1995	55 998	2 533,85	1 613
Total											81 010 691	6 814 070,80	4 904 020

Last Data Update: 11/10/2021 07:24

Saceo Fleet recovery / FH America



SAneo Fleet recovery / FH America



Airbus SAneo

ATA 36

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Agenda

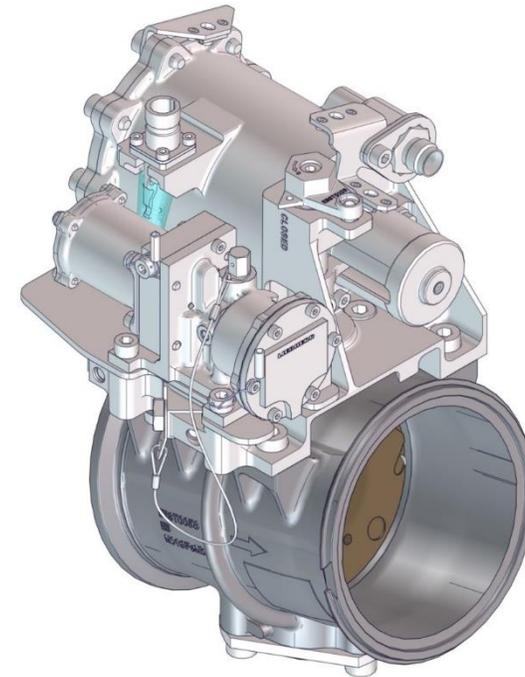
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HPV In-service occurrences

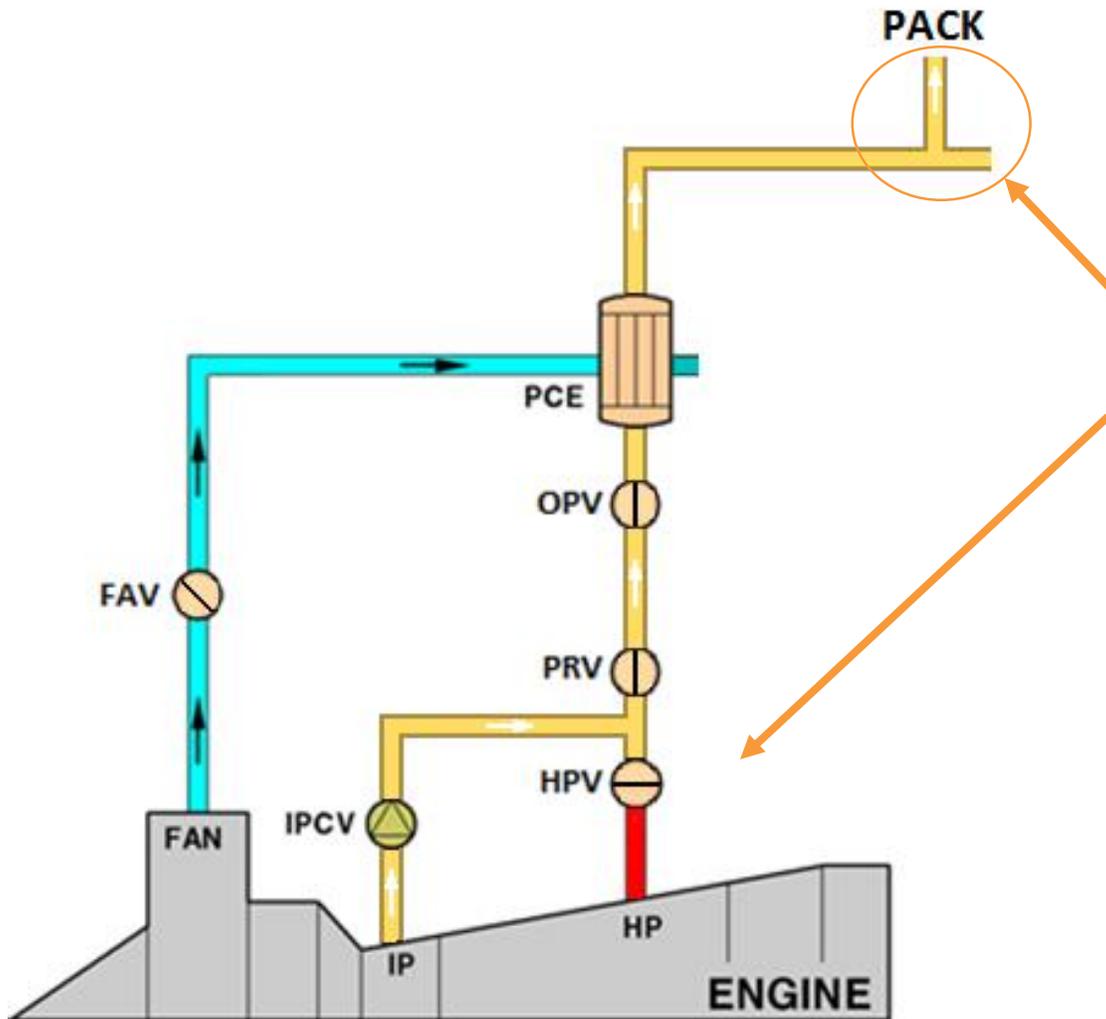
High Pressure Valve (HPV) 70645A020001

- HPV Failed Closed
 - RCP-Saneo-36-0339
 - TFU 36.11.00115

- HPV Failed Open
 - RCP-Saneo-36-0380
 - TFU 36.11.00106



HPV Fault - Failed closed system effect



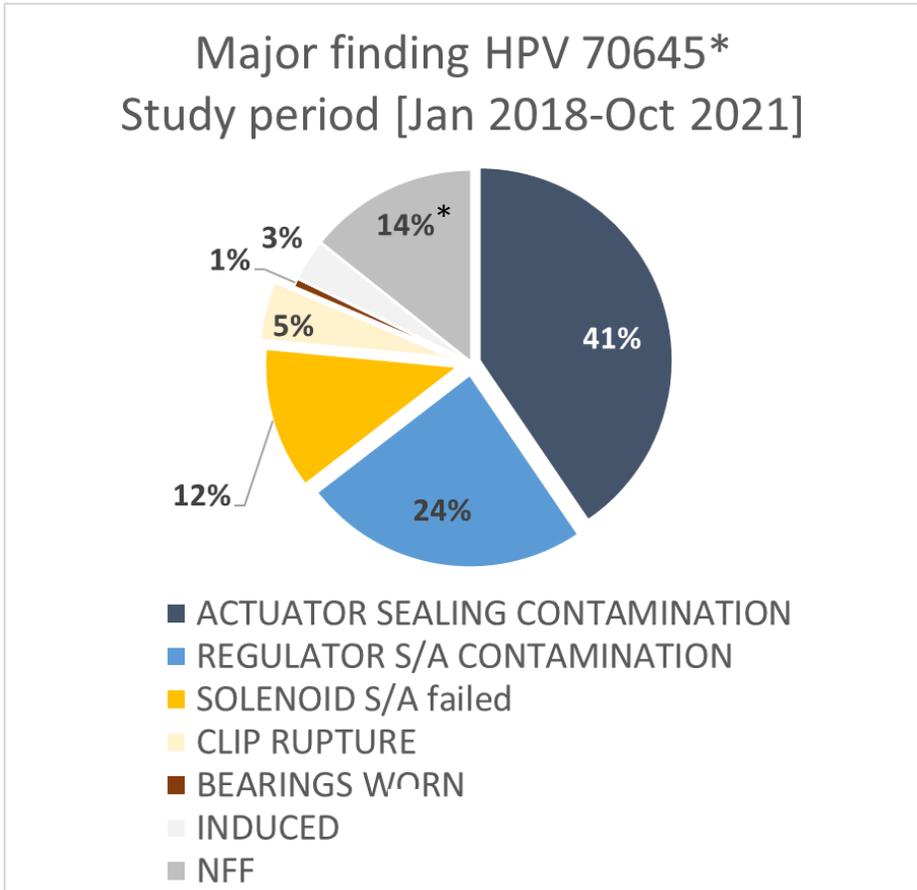
Context

Cruise, bleed on Intermediate Pressure port
Top of descent leads to engine thrust reduction

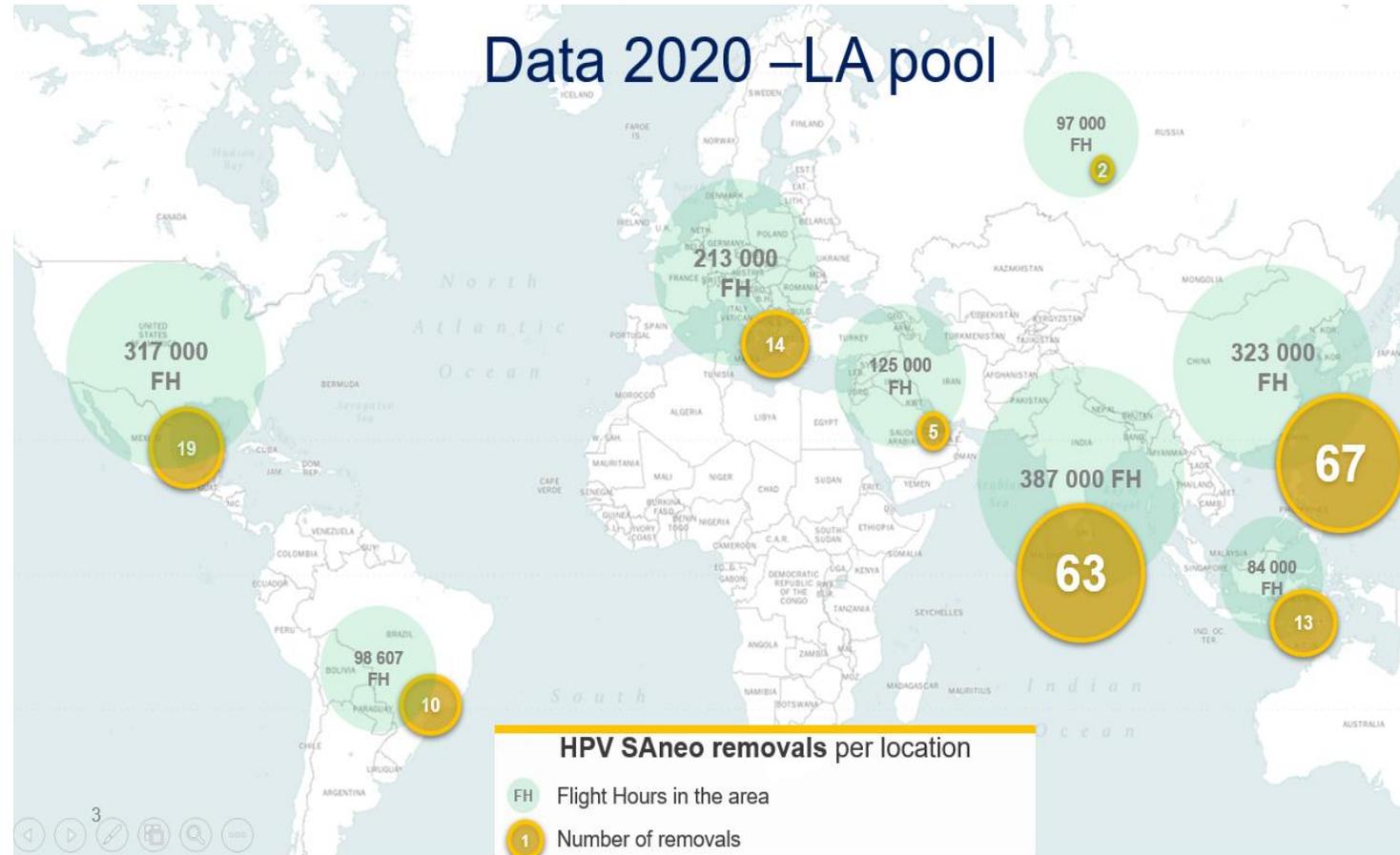
Pack Inlet Pressure is detected below 18 psig
HPV is detected closed while commanded to open



HPV Faults in-service findings

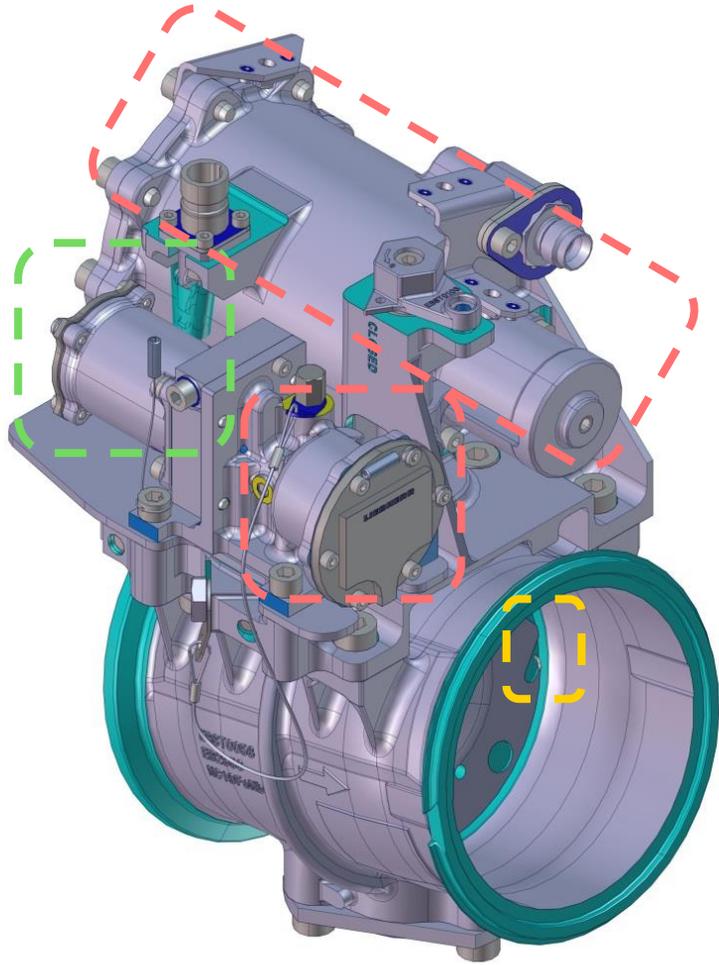


*NFF rate drastically reduced starting from CMM update



Asia more affected than the rest of the world

HPV Faults in-service findings



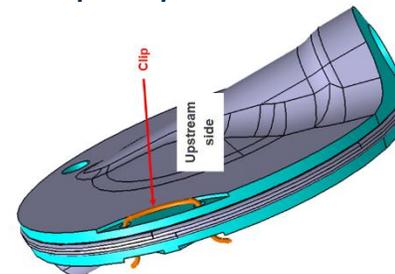
- ✓ *Aluminium phosphate exudation from JPXX32 graphite on actuator seals and regulation clapper*



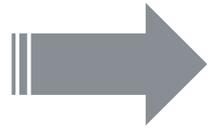
- ✓ *Solenoid winding weakness*



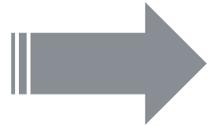
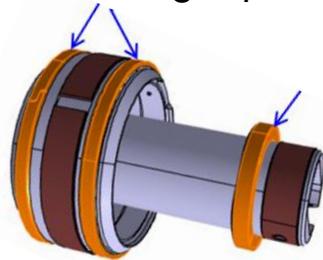
- ✓ *Butterfly clip rupture*



HPV Faults – Actuator piston seals



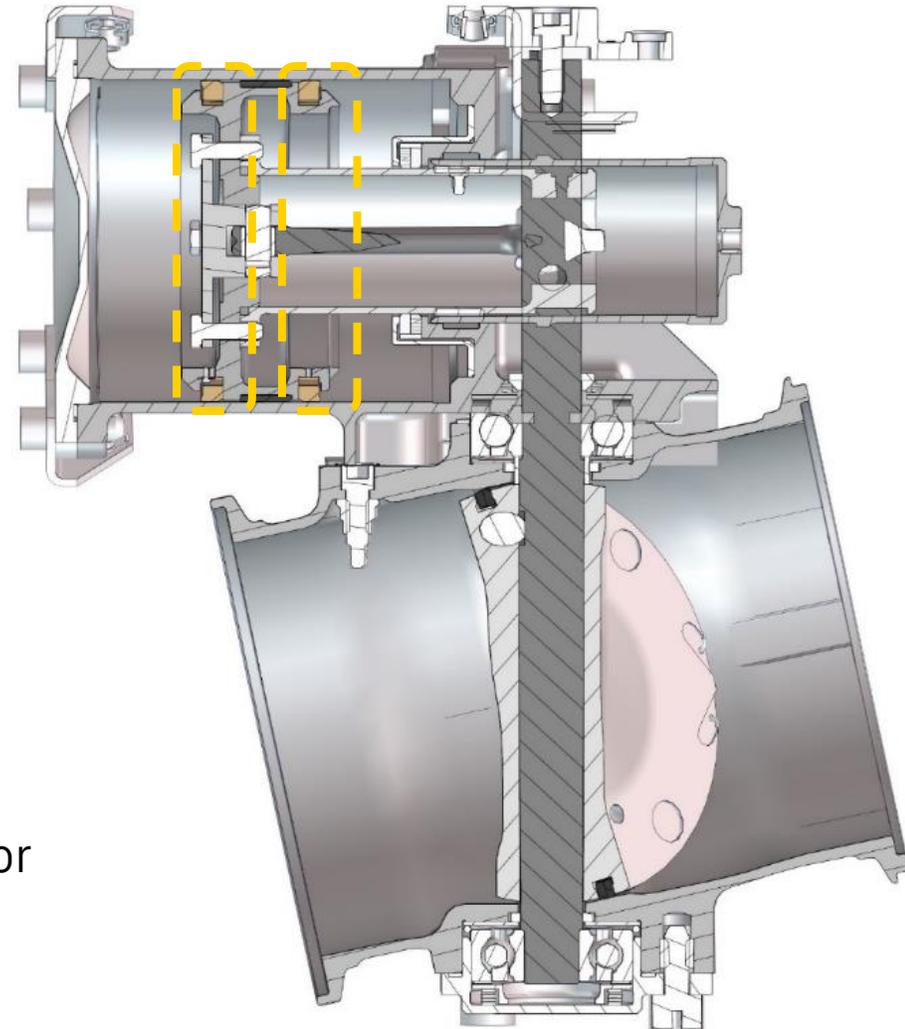
Actuator piston seals graphite exudation



Seals get stuck on the piston

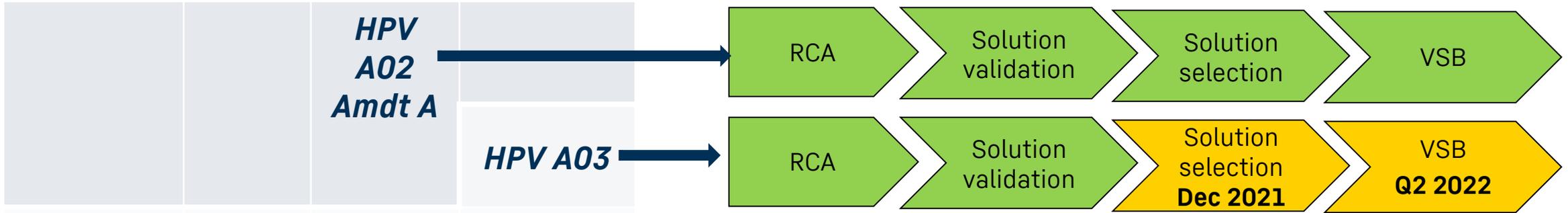


Pressure transfer between both Actuator chambers



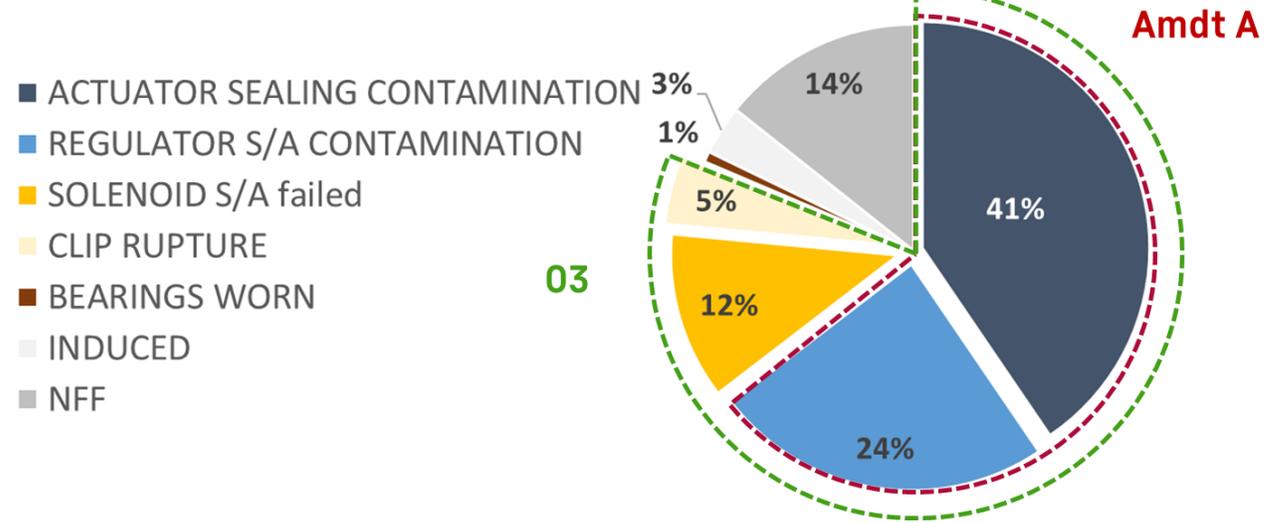
This finding contributes to both HPV failed open and failed closed occurrences

HPV faults & solution generalization timeline

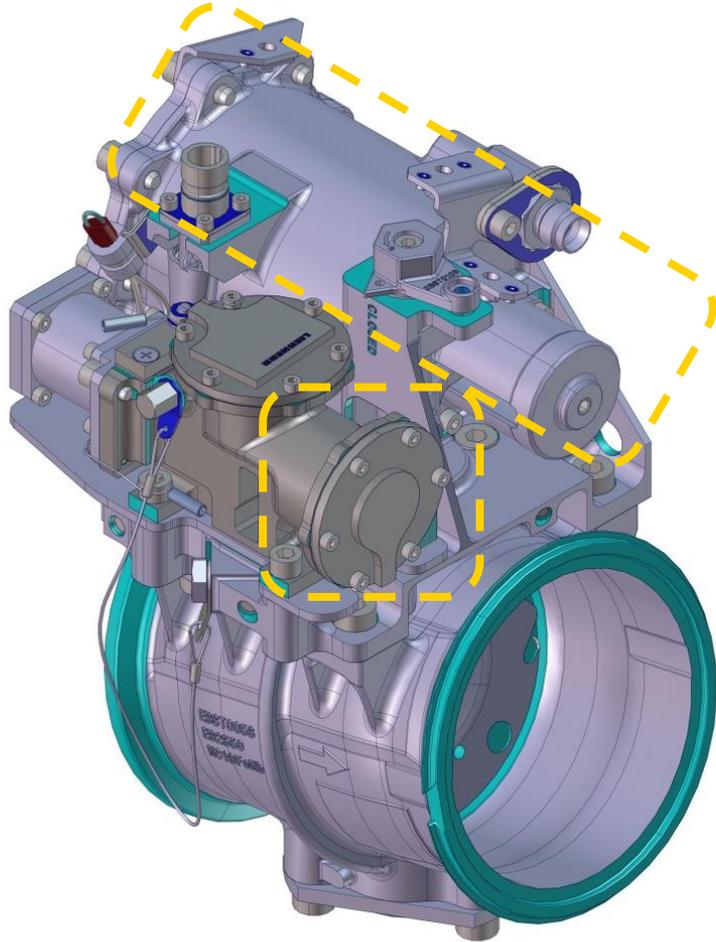


Design solutions	Failure Mode			
	FC	FO		
Graphite piston seals	X	X	✓	✓
Graphite regul. clapper	X		✓	✓
New piston seal anti-rotation	X	X		✓
Butterfly clip		X		✓
Solenoid sleeve	X			✓

Major finding HPV 70645*
Study period [Jan 2018-Oct 2021]



PRV design improvement generalization



PRV 70646A01 will benefit from HPV design improvements

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FAV In-service occurrences

Fan Air Valve (FAV)
70649A01000x (body)
70654A0x0001 (actuator)

- FAV Investigation
 - RCP-Saneo-36-0318
 - TFU 54.51.00.014 (CFM)
 - TFU 54.51.00.018 (PW)



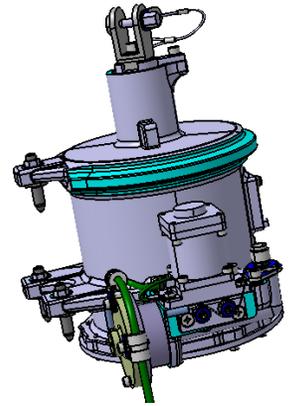
A320neo

FAV actuator

– Overview

Multiple cases of FAV actuators removed and found in Liebherr shops with high level of water contamination and traces of corrosion

ECAM warning: “ENG 1(2) BLEED FAULT” with maintenance message FAN AIR-V (9HA1(2))) / SENSE LINE / PRECOOLER (7150HM1(2))



FAV actuator overview

Actuator body



Regulator S/A



Piston Head

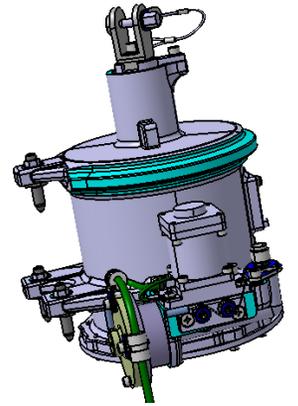


A320neo

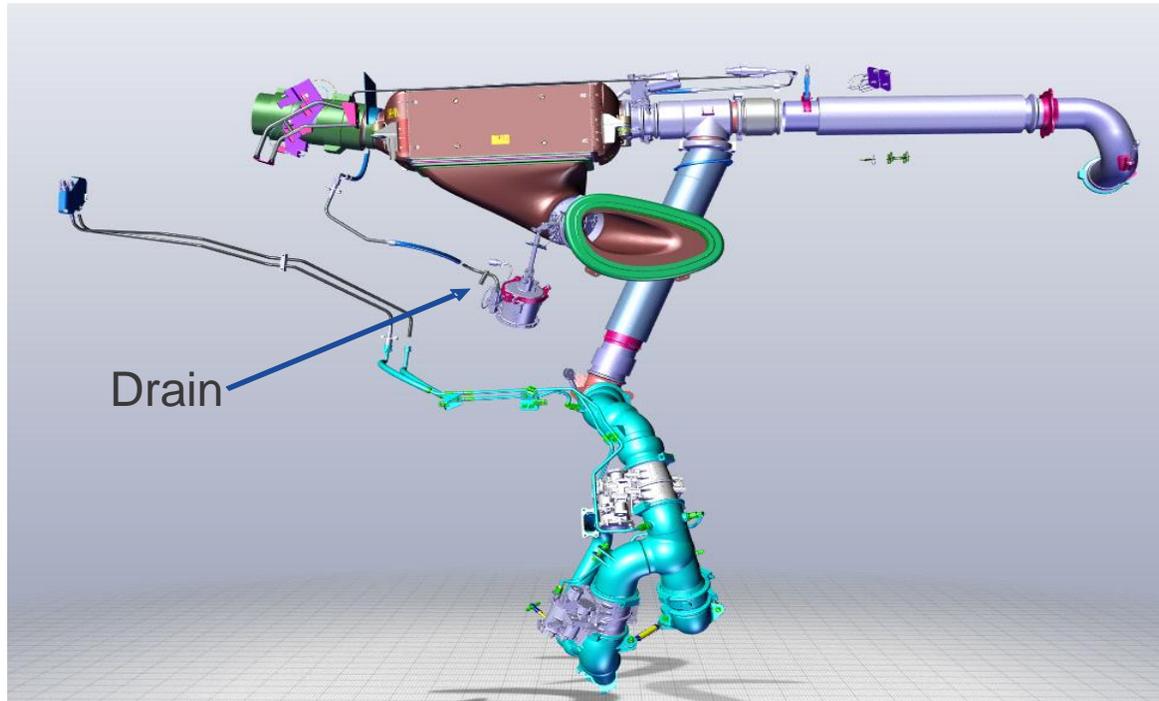
FAV actuator

– Root causes

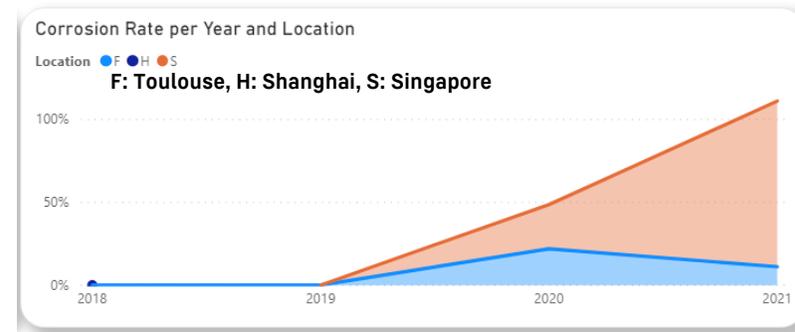
Water ingestion thru sense line at FAV muscle pressure port creating corrosion and contamination damages within FAV actuator subassemblies.



FAV actuator overview



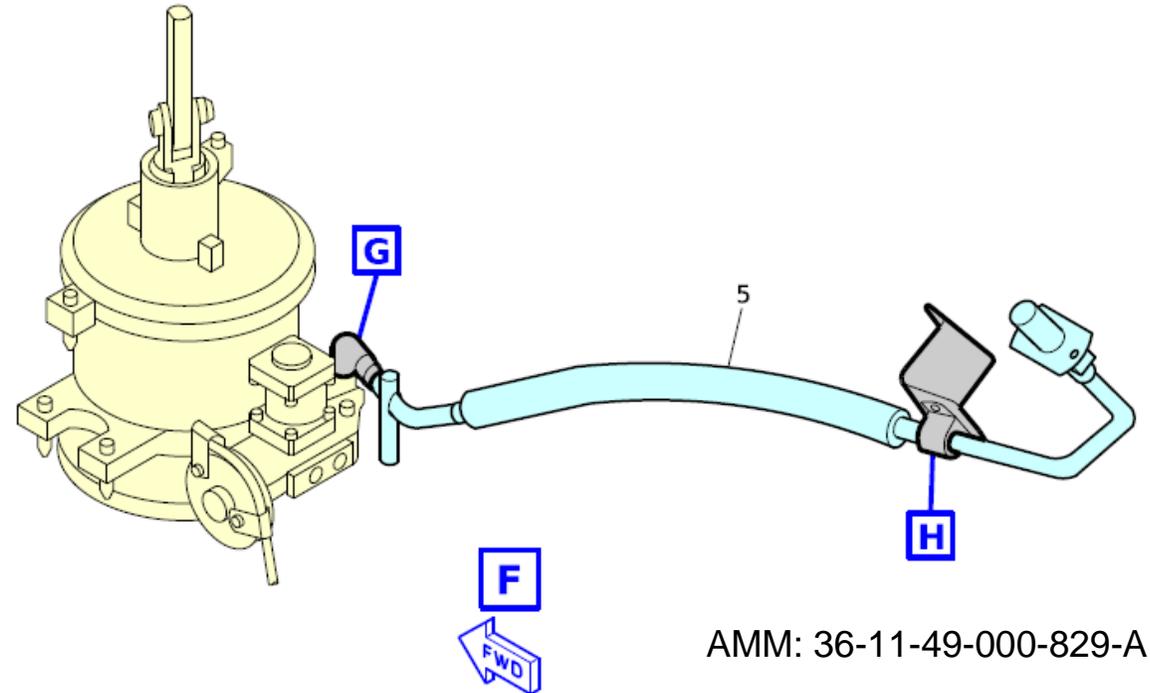
Ex on CFM installation, note that PW installation is very similar for FAV sense line integration.



Water retention increased during A/C parking or storage period

FAV actuator

- Mitigation
 - OIT-999-0037-20-02 - ATA36-
Maintenance actions &
recommendations after long parking
period



- Investigation progress

A320neo

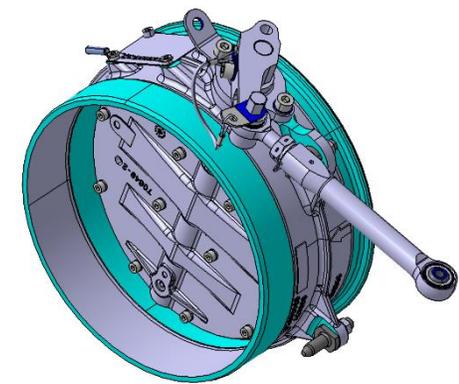
FAV body

– Root cause for FAV valve body observed damages

For CFM & PW engine installation, a combination of aeroacoustics resonances in the fan inlet scoop & Installation variability lead to excessive vibrations and break the inlet scoop brackets. Load are then transmitted to FAV sub assemblies.

Original bracket installation were first affected.

Post bracket MOD aircraft (2018) are also affected by FAV Body heavy damages.



FAV valve body overview

Retaining cable damaged



Retaining cable missing



Lock wire or seal damaged



Pins damaged



Valve body damaged



Lever assy damaged



Special screw damaged

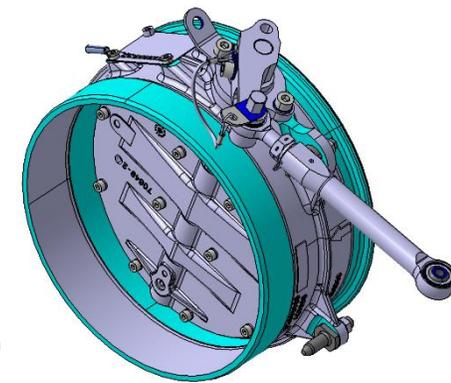


FAV body

– Recommendation in case of damage

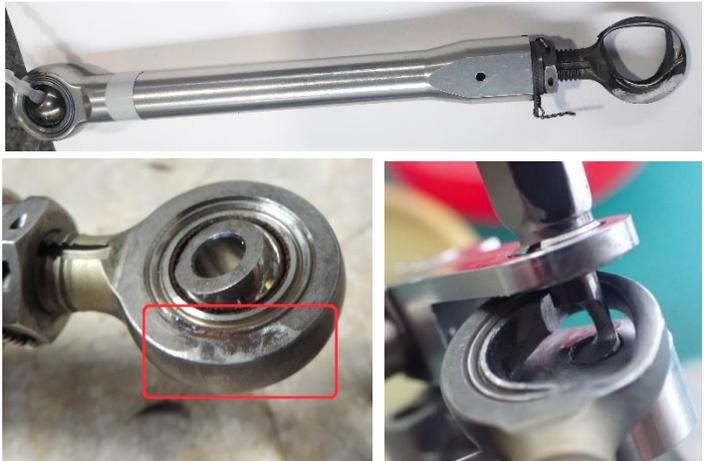
During aircraft inspection, if any of these damages are observed, the complete FAV Body + ROD needs to be replaced.

Important reminder: AMM does not provide instructions to replace only the FAV rod on the wing. Airbus and Liebherr absolutely do not recommend replacing only the rod because other parts integrity cannot be ensured.



FAV valve body overview

Rod assy damaged



Rod assy broken



FAVB - Airbus presentation

Airbus SAceo

ATA 36

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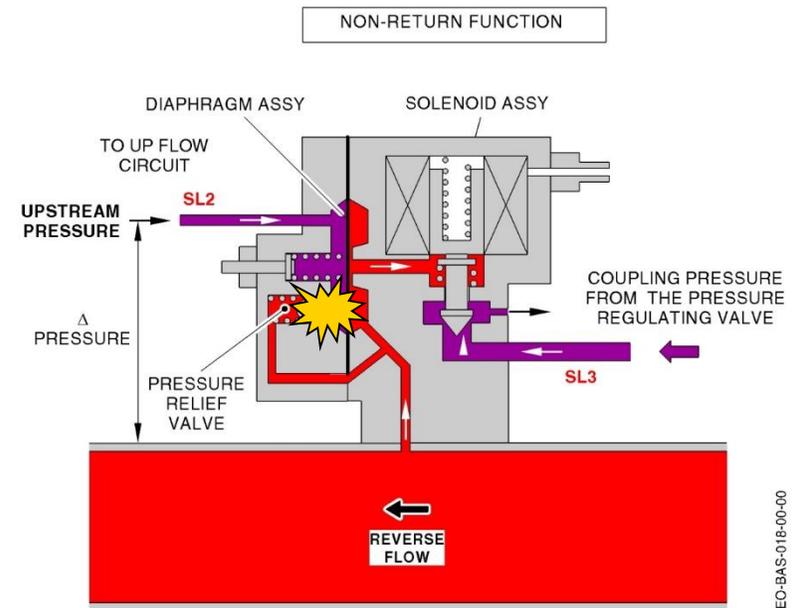
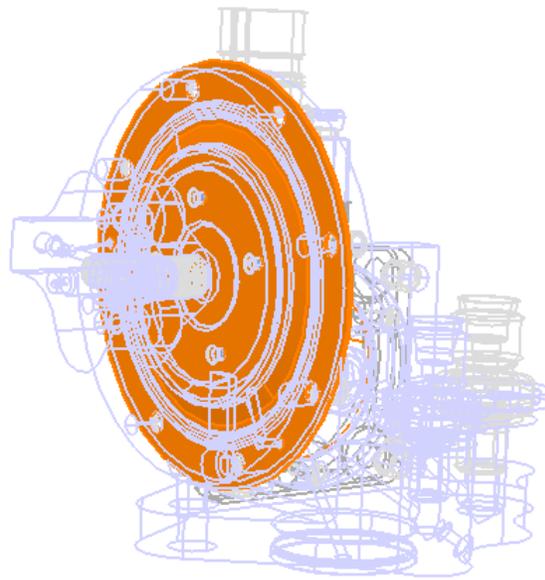
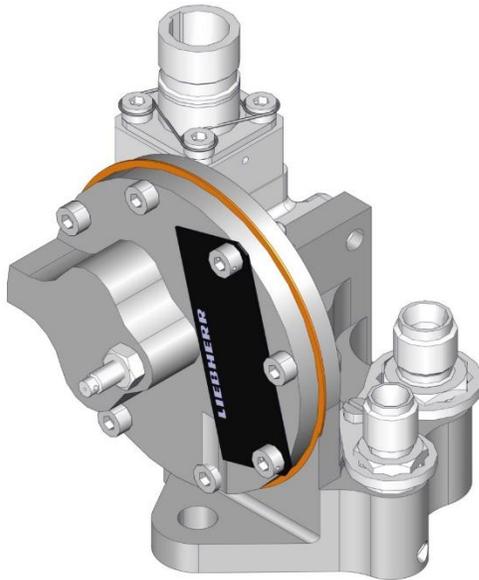
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TLT 341F manufacturing improvement

After engine stall events, a lot of TLT (341F010000) were investigated and found with pollution in the Non-return function and the solenoid.

After analysis, some RTV was found as part of the pollution and RTV is used in the manufacturing of TLT diaphragm

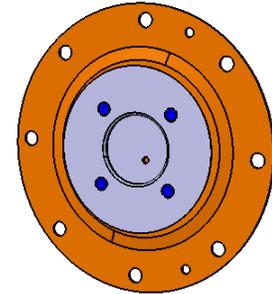


A320NEO_CEO-BAS-018-00-00

TLT 341F manufacturing improvement

With temperature the RTV can migrate and partially obstruct the non-return function hole.

The modification will consist in removing RTV during diaphragm manufacturing only.



SB to be applied on attrition basis, at no additional cost on top of agreed Major repair



Technical Publication release:

*CMM 36-11-10 /CRM 36-11-10RM
update*

VSB 341F-36-01

Airbus SA

ATA 21

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AIR PACK REGUL FAULT E/W ORPHAN INVESTIGATION

– Previous investigations:

➤ 2014 : AIR PACK REGUL FAULT E/W without associated FM

✓ **Solution 1 : Correction of « AIR PACK X REGUL FAULT » logic in Software 1803B0000-03**

➤ 2017 : CDS high removal rate investigation

✓ **Solution 2 : CDS disparity monitoring change logic in new hardware & software 71103A010001**

– 2020 : AIR PACK REGUL FAULT E/W ORPHAN new investigation

Investigation results :

- One CDS intermittent failure leading to Orphan E/W → reporting logic correction is planned for next software batch [expected target date not before 2023]
- TSM 21-61-810-820/821-A called by Orphan E/W AIR PACK X REGUL FAULT has been reviewed.
- New troubleshooting tips in case of E/W Orphan [see next page]

– Investigation progress 

AIR PACK REGUL FAULT E/W ORPHAN INVESTIGATION

 **Applicability**
 **Interchangeability**
 One way
 Two ways

		ceo	neo		features
			P&W	CFM	
	1803B0000-02				CEO features
VSB 1803B-21-02 Issued Apr. 2016					
	1803B0000-03				NEO P&W requirements + Correction of « AIR PACK X REGUL FAULT » logic
VSB 1803B-21-03 Issued Dec. 2016					
	1803B0000-04				NEO CFM requirements + Correction of « AIR PACK X REGUL FAULT » logic
VSB 1803B-21-04 Issued Aug. 2018					
	1803B0000-05				NEO CFM Enhanced Engine Support Function + Correction of « AIR PACK X REGUL FAULT » logic
NO VSB EIS Oct 2020					
	71103A010101				Same as 1803B0000-05 + CDS disparity monitoring change + HW ready for ventilation & CSAS control

SOLUTION 1

SOLUTION 2

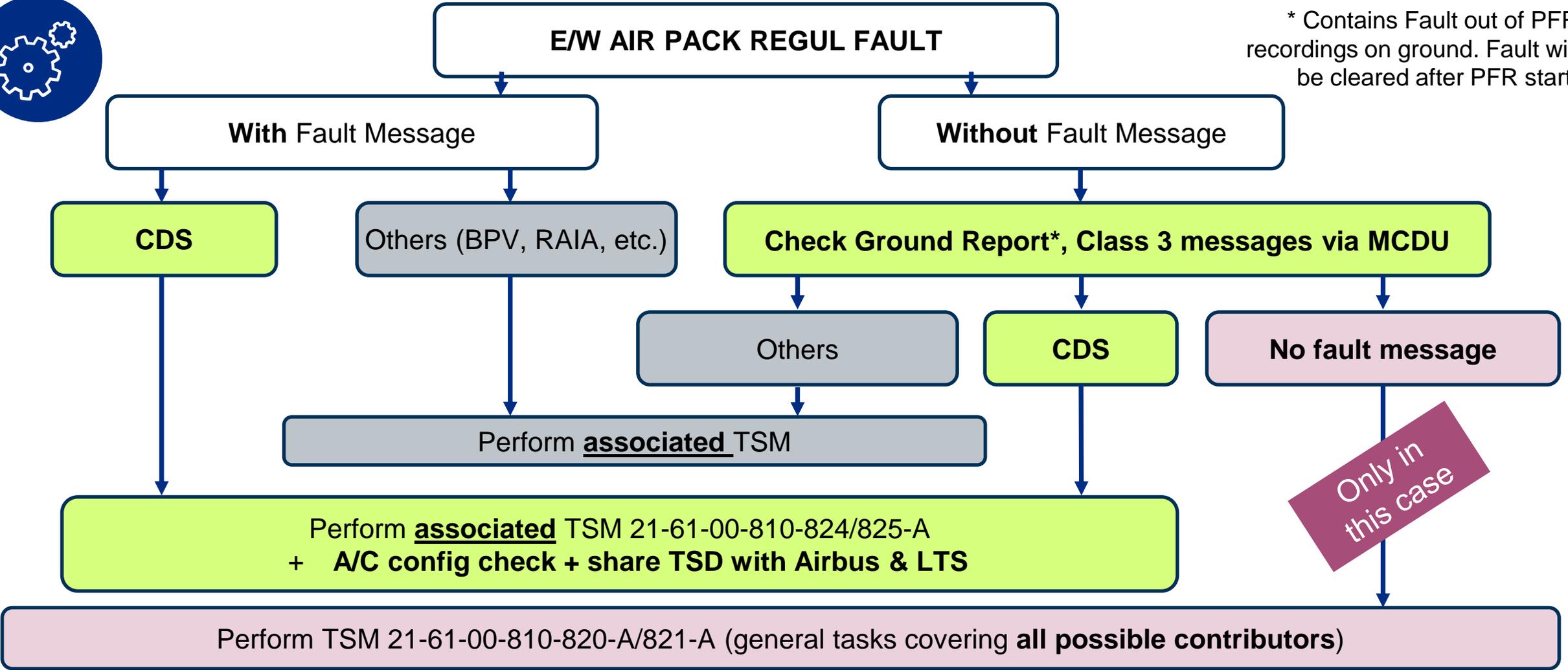
NEW HARDWARE

/// Software modification of 1803 hardware not available, pending on 71103 results

AIR PACK REGUL FAULT E/W ORPHAN INVESTIGATION



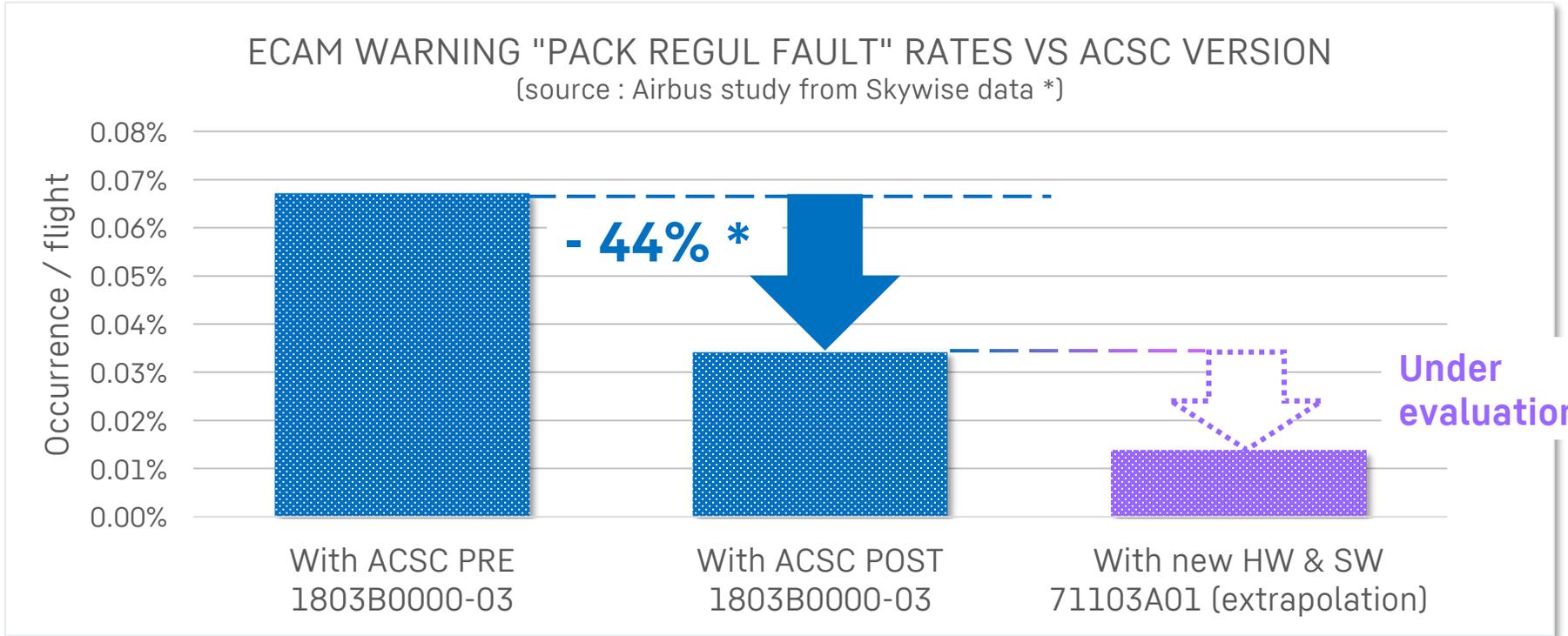
* Contains Fault out of PFR recordings on ground. Fault will be cleared after PFR start.



AIR PACK REGUL FAULT E/W ORPHAN INVESTIGATION

– ACSC software modification improvement measure

In June 2021, Airbus performed a comparative study in ECAMs “AIR PACK# REGUL FAULT” occurrence rate per flight between pre and post mod 1803B0000-03 software. The result is very positive, with a reduction of :



(*) : Based on A319-A320-A321 aircraft delivered from 2010 to 2019, on a total of nearly 3,500,000 flights.

/// Operator encouraged to install post 1803B0000-03 standard to ease T/S of this E/W

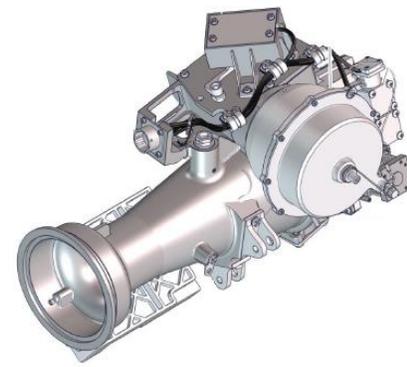
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FCV 1806D0000-02

– Issue description

Liebherr noticed since Q4 2020 an increase of Flow Control Valves P/N 1806D0000-02 removals within the standard warranty period.



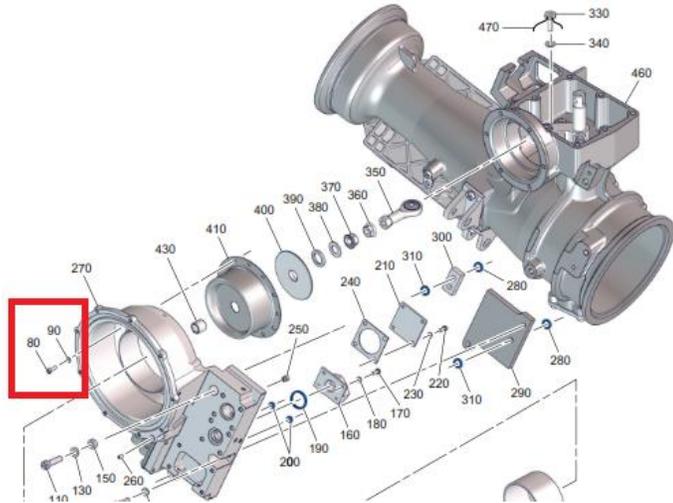
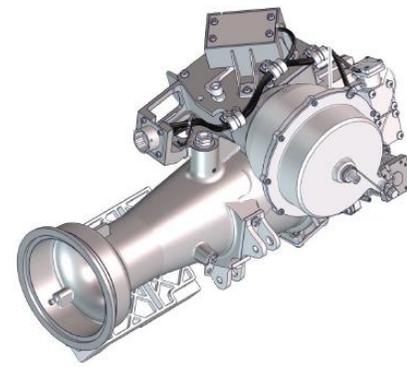
– Impact

- A/C level: “AIR PACK X REGUL FAULT” associated to “P1/2 PACK FLOW CTL VALVE (23HB/24HB)” CFDS message (depending on the level of the leakage)
- FCV level: external leakage high, torque motor drift

FCV 1806D0000-02

– Issue description

Majority of removed units have loose screws inside the actuator body :



Actuator screws found loose



Component consequence : lower actuator diaphragm wear found on some units

– Mitigation

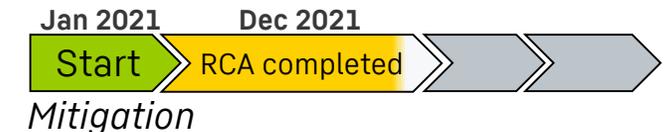
Manufacturing process & repair shop in Jan 2021 : addition of a second torqueing task of the actuator screws to secure the tightening on a longer period than with a single torqueing.

– Status

Root Cause Analysis (RCA) 90% complete. Potential solutions under evaluation.

Upon identification of the solution. The planning will be determined once the solution is identified.

– Investigation progress



**Thank
you.**

A320 SLAT GRA ATA 27

RTW 2021

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AGENDA

- Overview
- Component Description
- Investigation and Root Cause
- Way-forward
- Timeline

OVERVIEW

COMPONENT

A320 GEAR ROTARY ACTUATOR
830D0000-01/-02



SLAT JAM

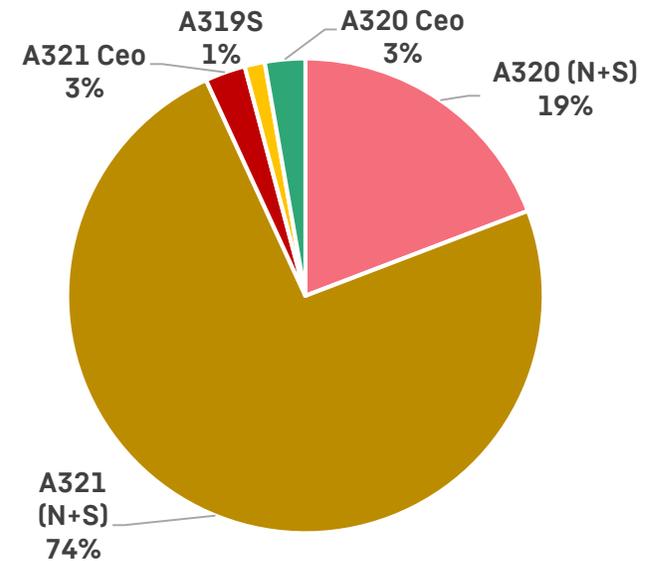
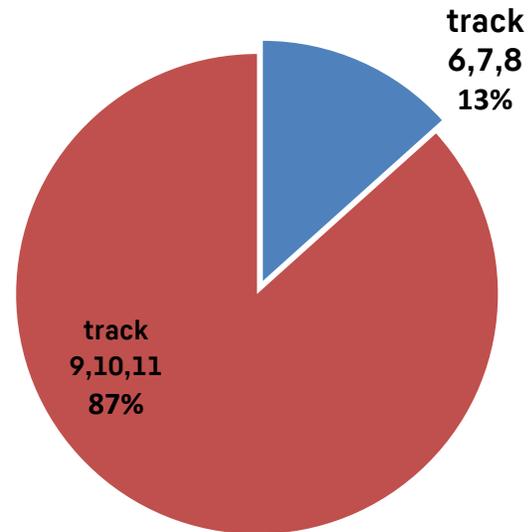
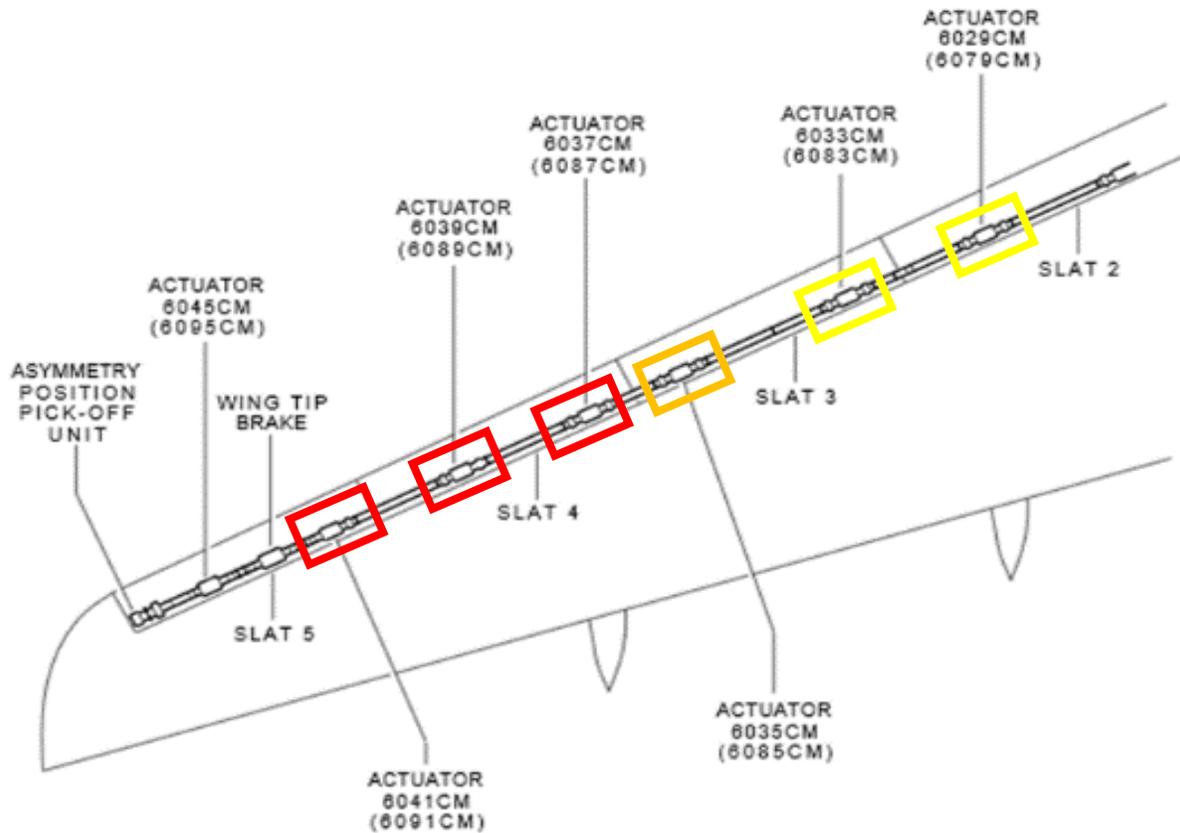
LOCKOUT INDICATOR ACTIVATED
MOSTLY ON A321 TRACKS 9, 10, 11:



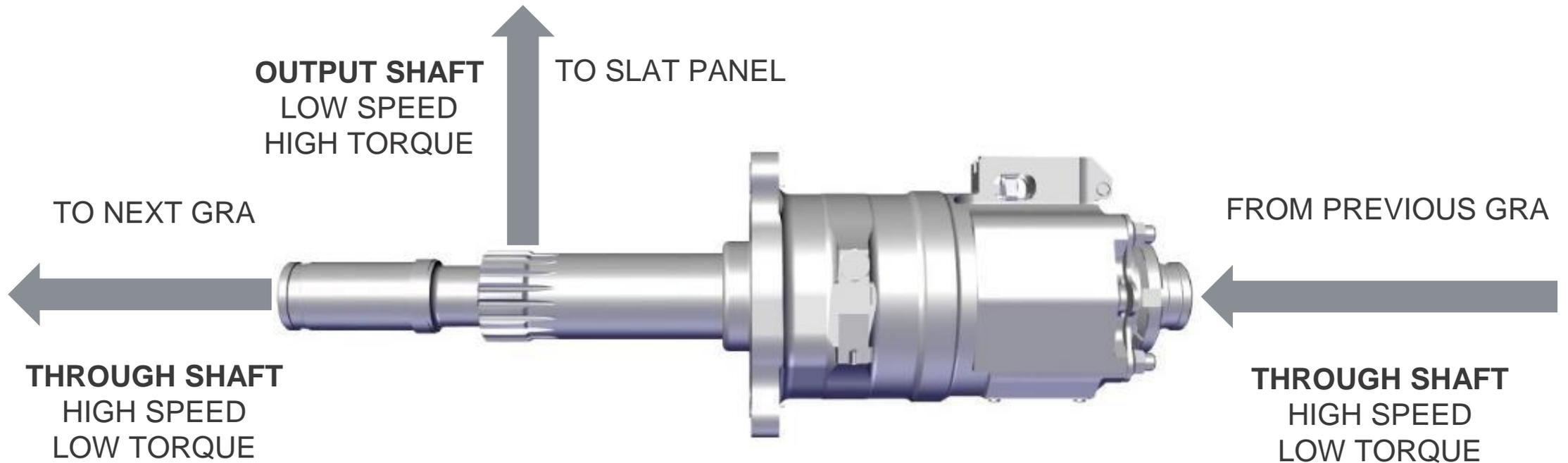
A320 SLAT GRA ATA 27 - RTW 2021

OVERVIEW

- Mainly slat track 9/10/11
- 76 reported slat Jam cases since 2013

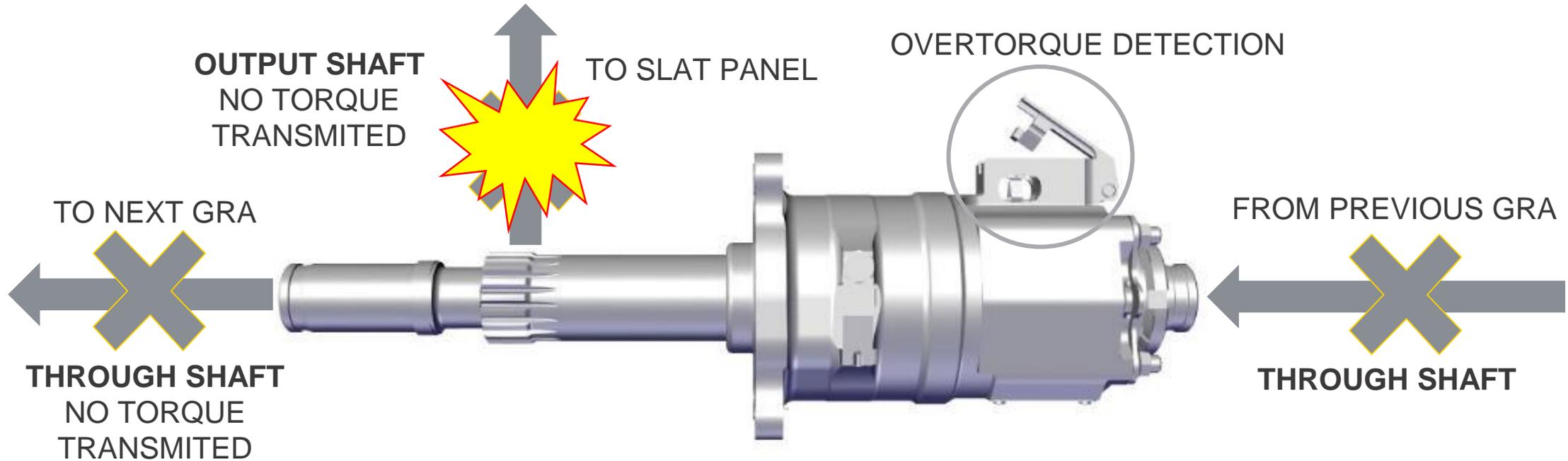


DESCRIPTION: A320 GRA



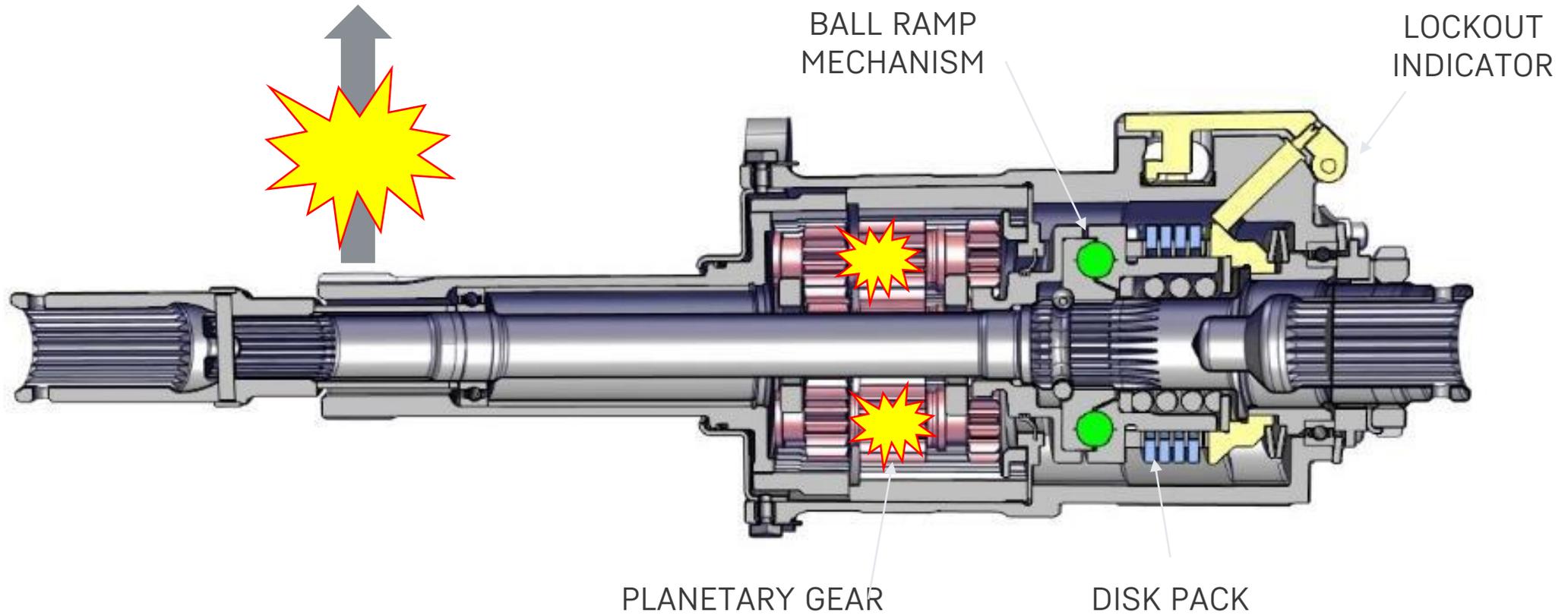
NORMAL OPERATION

DESCRIPTION: A320 GRA



ABNORMAL OPERATION

DESCRIPTION: A320 GRA



A320 SLAT GRA ATA 27 - RTW 2021

DESCRIPTION: A320 GRA



INVESTIGATIONS & ROOT CAUSE

- 43% of returned GRAs jammed @ -40°C test *
- Moisture found on 45% GRAs during disassembly.*

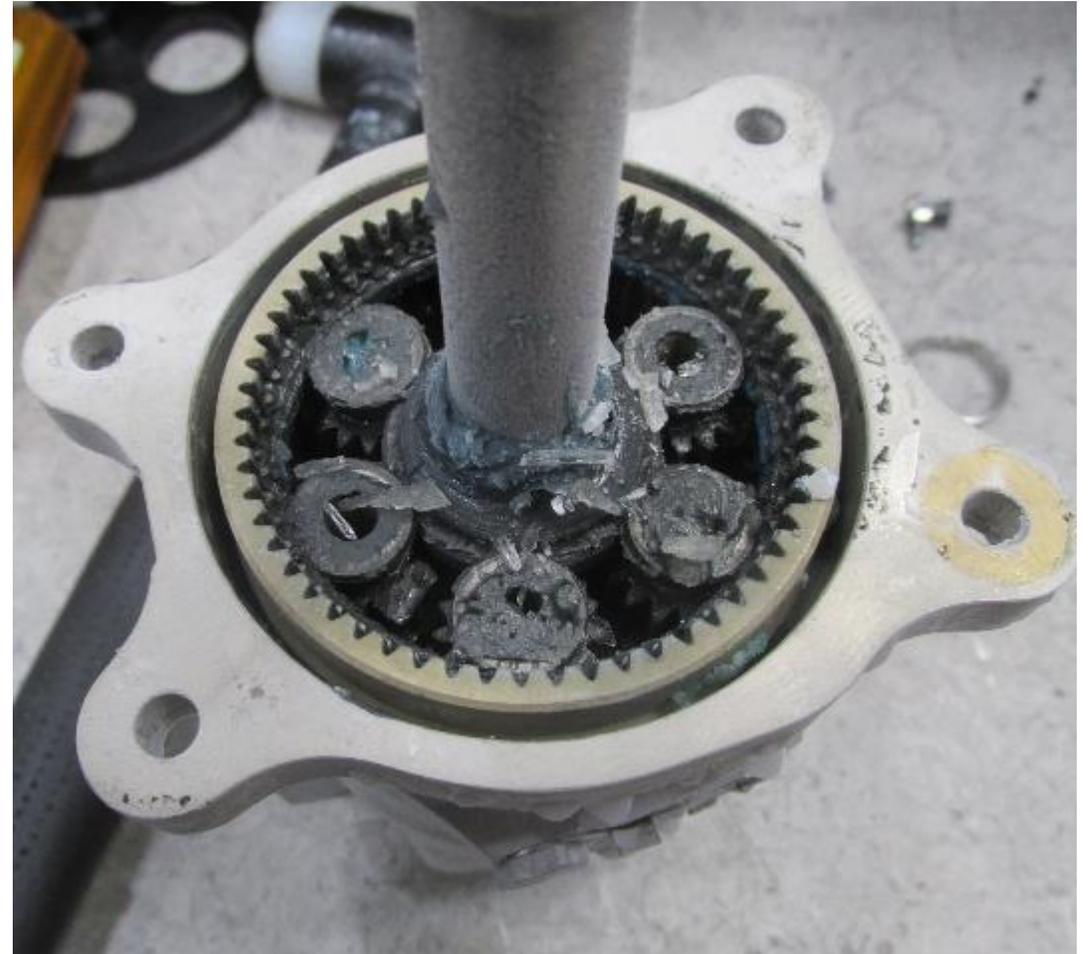
- Recommendation: ship affected units in sealed plastic bags to avoid water evaporation
- Reminder: Report every slat jam event to Airbus



*: data based on returned GRAs due to slat jam (total units:55)

INVESTIGATIONS & ROOT CAUSE

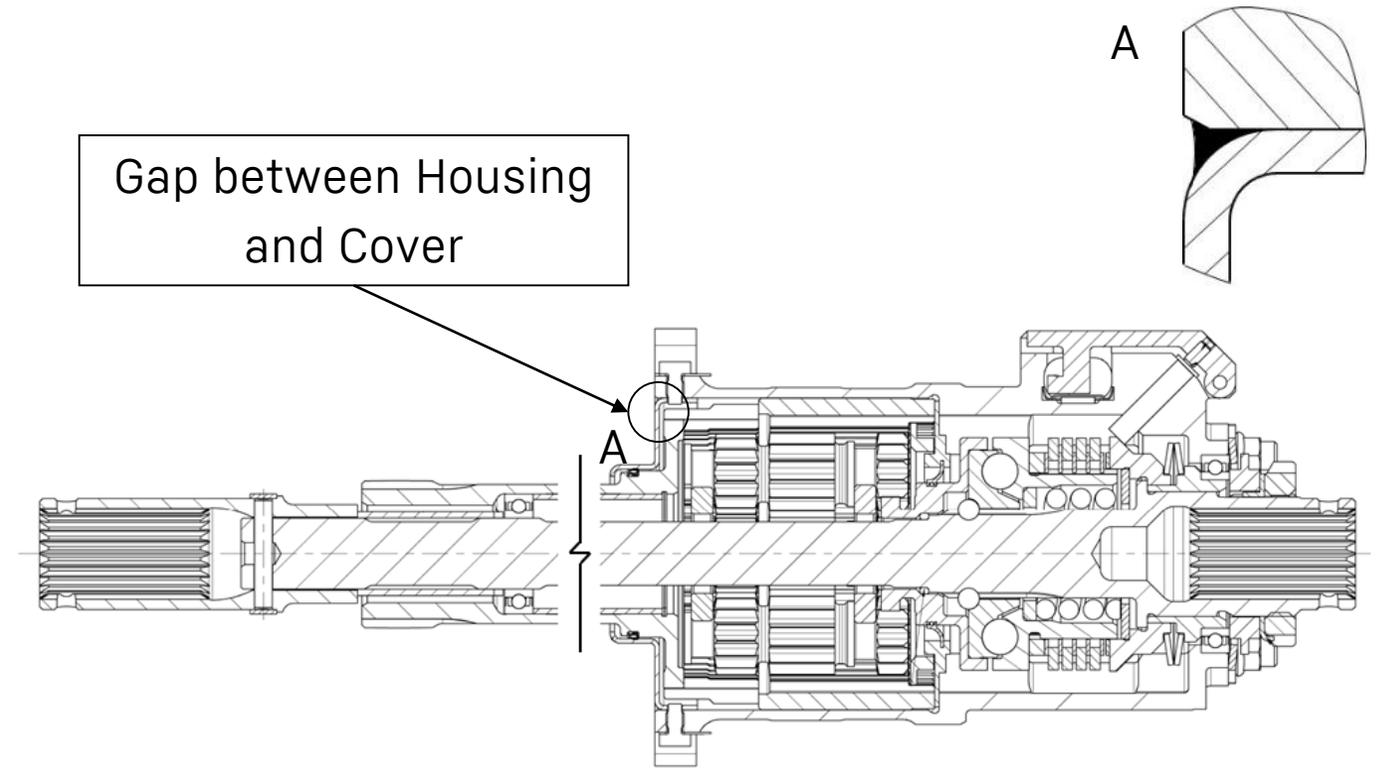
- Root cause on GRA level: Frozen water
- Root Cause contributor on A/C level: Increased wing bending (sharklets)



WAY-FORWARD

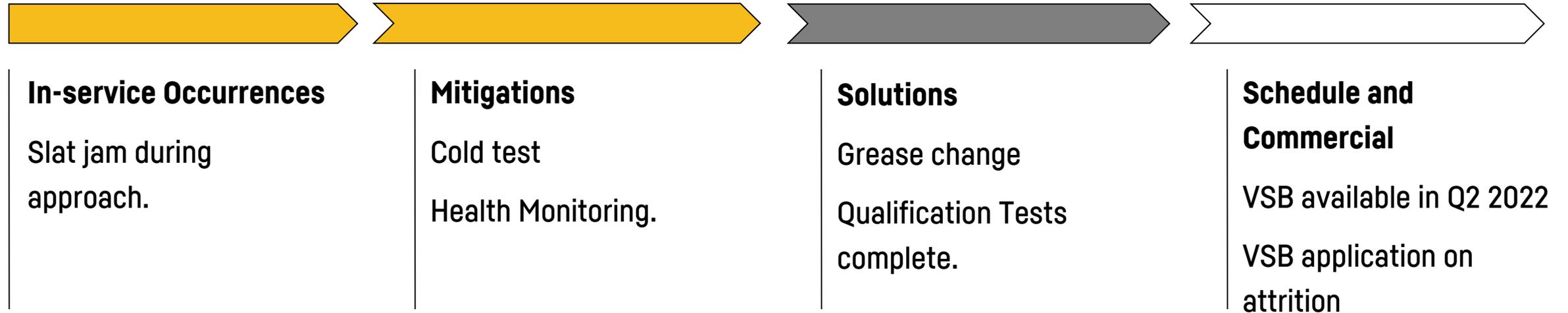
Solution:

- Change the grease from AeroShell 33 back to Nyco GN22
- Sealing the gap between the Housing and the Cover.



Planetary gear filled with lubricating grease NYCO GN22

TIMELINE



Health Monitoring

- Health Monitoring development to identify potentially defective GRAs.
- We need more flight data from Airlines.

A320 PCU BUILD STANDARD

RTW 2021

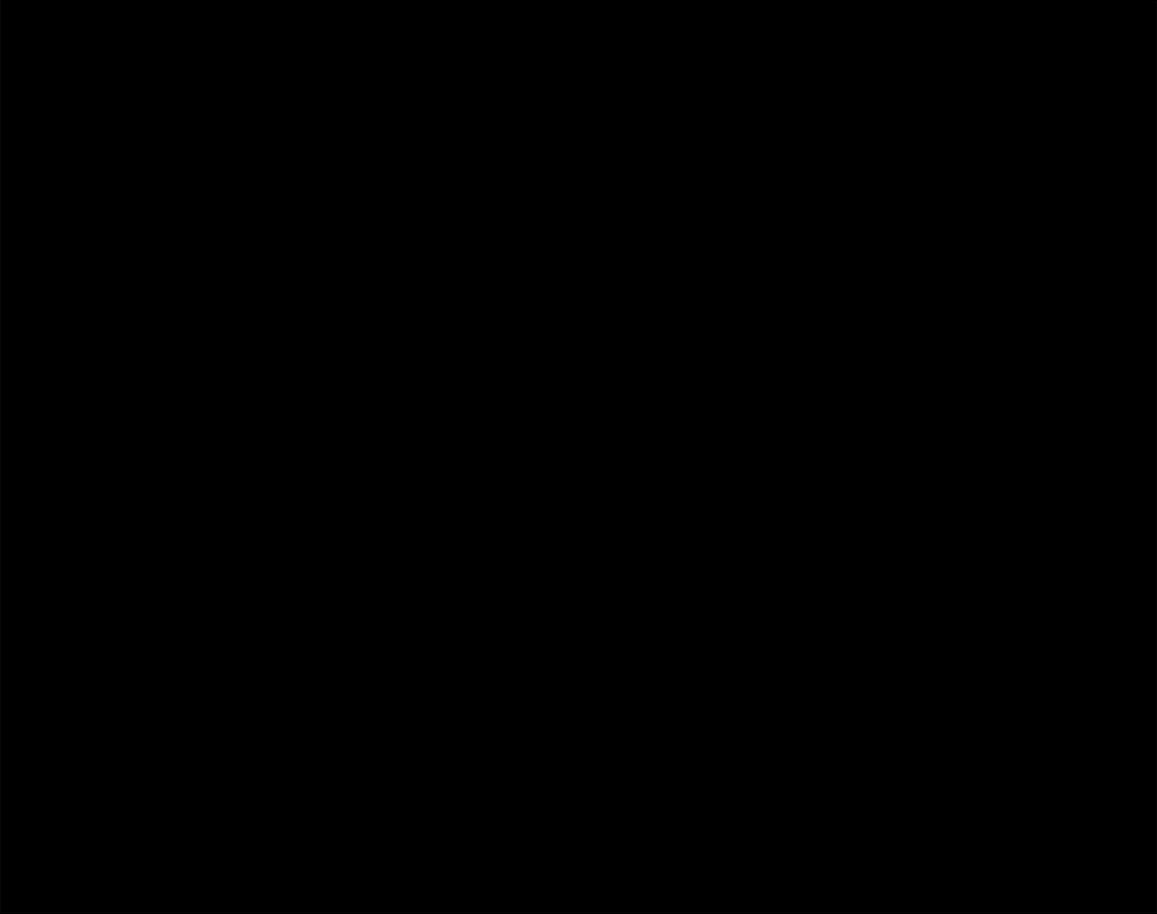
LIEBHERR

Liebherr-Aerospace

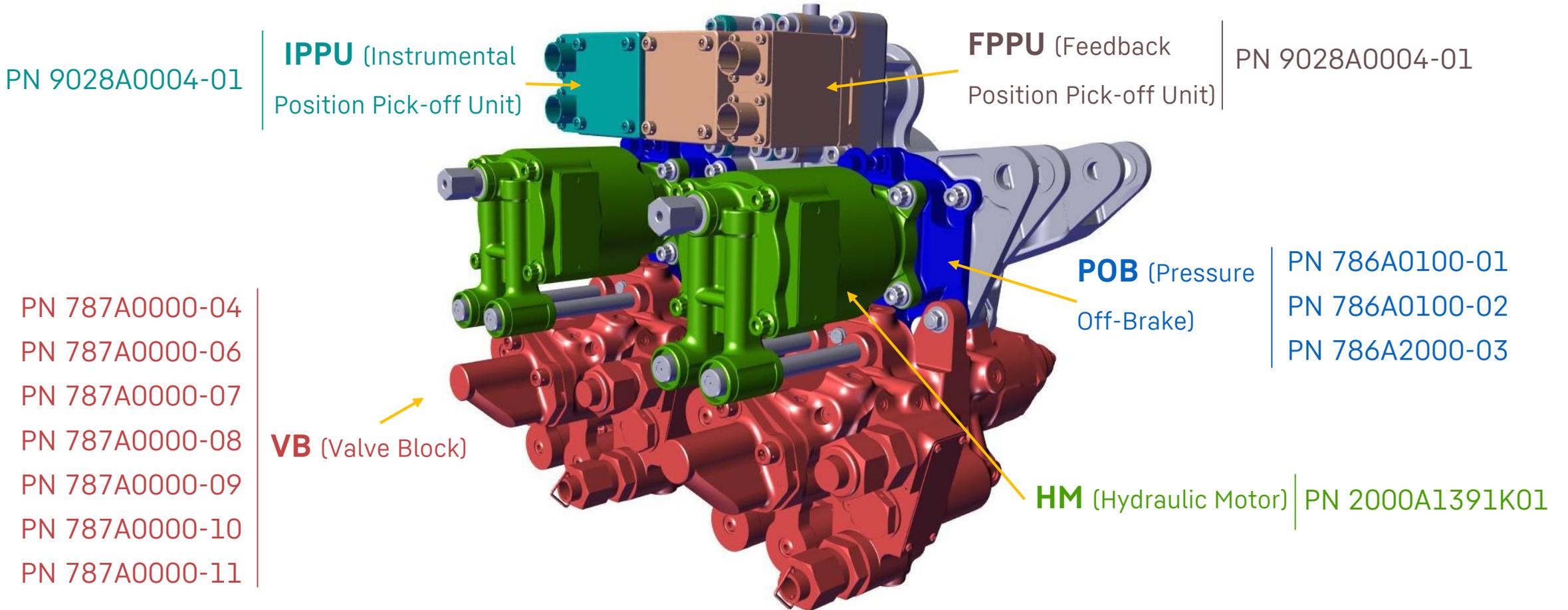
AGENDA

- Overview
- PN – Original Equipped
- PN - Options
- Operator Support Information

OVERVIEW



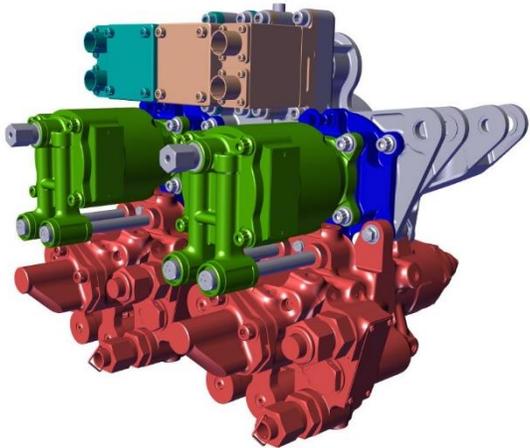
OVERVIEW



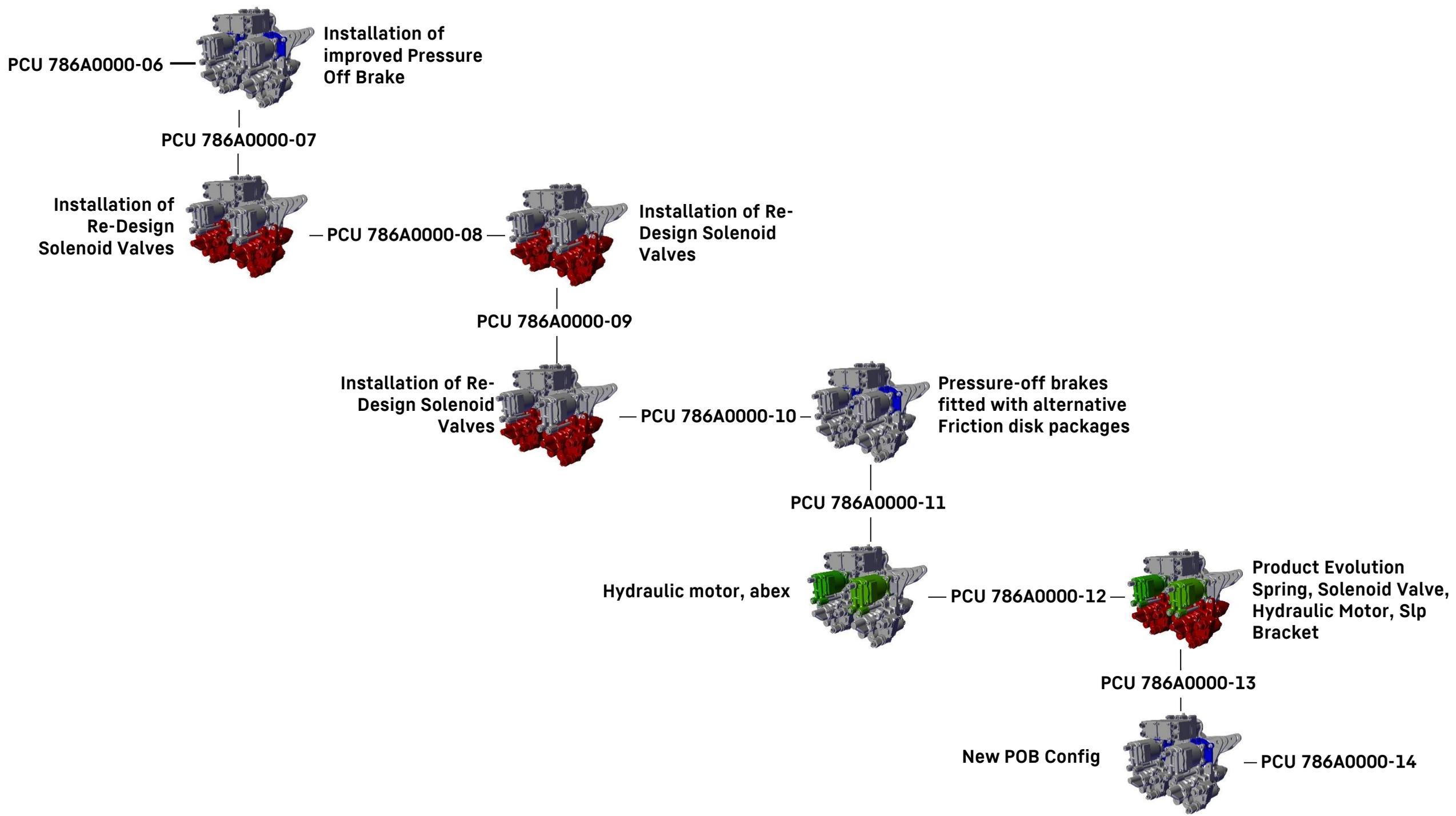
PNs – ORIGINAL EQUIPPED

PCU	POB	VB	IPPU	FPPU	HM
786A0000-06	786A0100-01	787A0000-04	9028A0004-01	9028A0004-01	2000A1391K01
786A0000-08	786A0100-01	787A0000-06			
786A0000-09	786A0100-02	787A0000-06			
786A0000-10	786A0100-02	787A0000-07			
786A0000-11	786A2000-01	787A0000-07			
786A0000-12	786A2000-01	787A0000-07			
786A0000-13	786A2000-01	787A0000-08			
	786A2000-02	787A0000-07			
786A0000-14	786A2000-03	787A0000-09			
		787A0000-10			
		787A0000-11			

PNs – OPTIONS



PCU	POB	VB	IPPU	FPPU	HM
786A0000-06					
786A0000-08					
786A0000-09					
786A0000-10		787A0000-07			
786A0000-11	786A2000-01	787A0000-08			
786A0000-12	786A2000-02	787A0000-09	9028A0004-01	9028A0004-01	2000A1391K01
786A0000-13	786A2000-03	787A0000-10 787A0000-11			
786A0000-14					



OPERATOR SUPPORT INFORMATION

Document Validation Record **LIEBHERR**

REF.-NO. 27-52-35 ISSUE 12

Product Support
Component Maintenance Manual
POWER CONTROL UNIT

PLATFORM :
SYSTEM :
EQUIPMENT :
PARTNUMBER : 786A0000-10 -, 786A0000-06 -, 786A0000-11 -, 786A0000-13 -,
786A0000-08 -, 786A0000-12 -, 786A0000-09 -, 786A0000-04 -,
786A0000-14 -

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CMM 27-52-35
PCU (all PNs)

Document Validation Record **LIEBHERR**

REF.-NO. 27-09-22 ISSUE 10

Product Support
Component Maintenance Manual
VALVE BLOCK

PLATFORM :
SYSTEM :
EQUIPMENT :
PARTNUMBER : 787A0000-09 -, 787A0000-11 -, 787A0000-04 -, 787A0000-06 -,
787A0000-08 -, 787A0000-07 -, 787A0000-10 -

DOCUMENT REF. NO. :
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EXTERNAL REVISION : 10
CONFIDENTIAL LEVEL : CONFIDENTIAL SECRET

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Approve	Technical Publication Manager	Thomas Walter Rainer Duldner	23.11.2018	Electronic Signature

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CMM 27-09-22
VB (all PNs)

Document Validation Record **LIEBHERR**

REF.-NO. 27-09-31 ISSUE 06

Product Support
Component Maintenance Manual
PRESSURE-OFF BRAKE

PLATFORM :
SYSTEM :
EQUIPMENT :
PARTNUMBER : 786A2000-01 -, 786A2000-02 -, 786A2000-03 -, 786A0100-01 -,
786A1900-01 -, 786A0100-02 -

DOCUMENT REF. NO. :
CREATION DATE : 10.05.2019
CREATED BY : Theodor Nidas
FILE NAME : 27-09-31_r06_147864737_587.pdf

EXTERNAL ID : 27-09-31
EXTERNAL REVISION : 06
CONFIDENTIAL LEVEL : CONFIDENTIAL SECRET

SIGNATURE-TYPE	ROLE	NAME	DATE	SIGNATURE
Approve	Technical Publication Manager	Thomas Walter	10.05.2019	Electronic Signature

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CMM 27-09-31
POB (all PNs)

CASES UPDATE A320 ATA 27

RTW 2021

LIEBHERR

Liebherr-Aerospace

Agenda

- Valve Block LVDT
- Rudder Servo Actuator Eye-end
- E-Rudder Servo Control

Valve Block LVDT

SCHEDULE AND COMMERCIAL

Liebherr SB: 787A-27-05 Since 24.03.2016.

MITIGATIONS

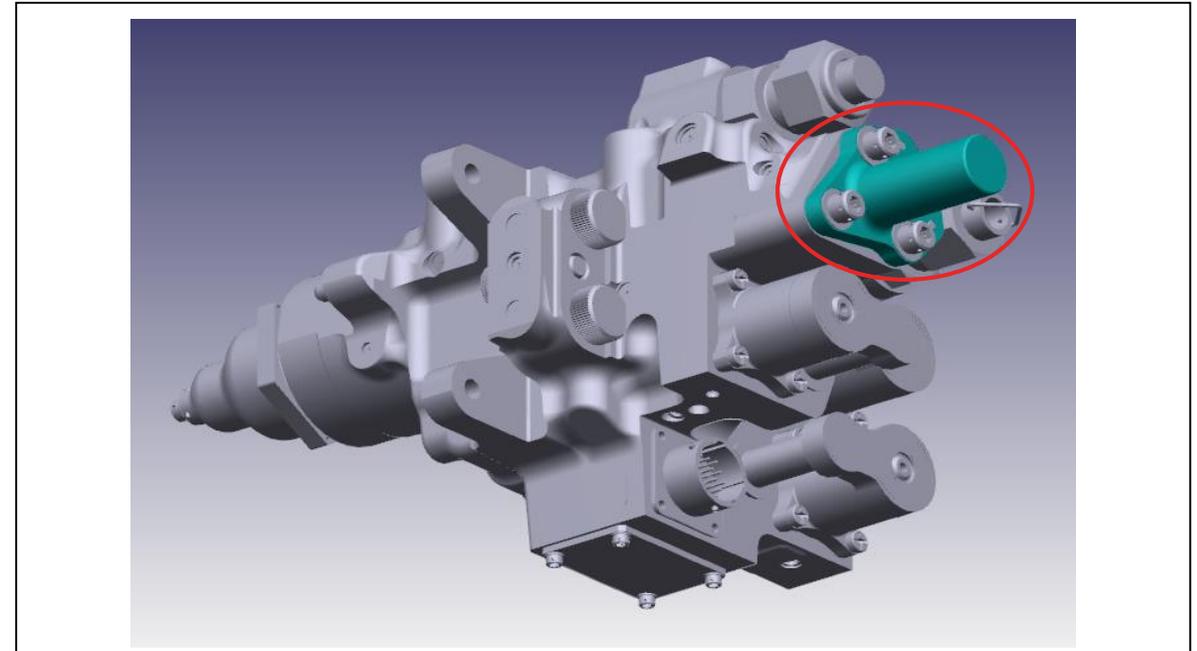
Low Temperature Test
High Temp Test

SOLUTIONS

LVDT PN: 9070A0008-03
since 24.03.2016.

IN-SERVICE OCCURRENCES

FLAP (SLAT) SYS 1 (2)
Fault with failure
message VALVE
BLOCK - VALVE SENSOR



- New LVDT shows good reliability.
- No more removals of new LVDT 9070A0008-03

Rudder Servo Actuator Eye-end

**SCHEDULE AND
COMMERCIAL**
VSB 810A-27-06
introduced 24 Jun.
2013.

MITIGATIONS

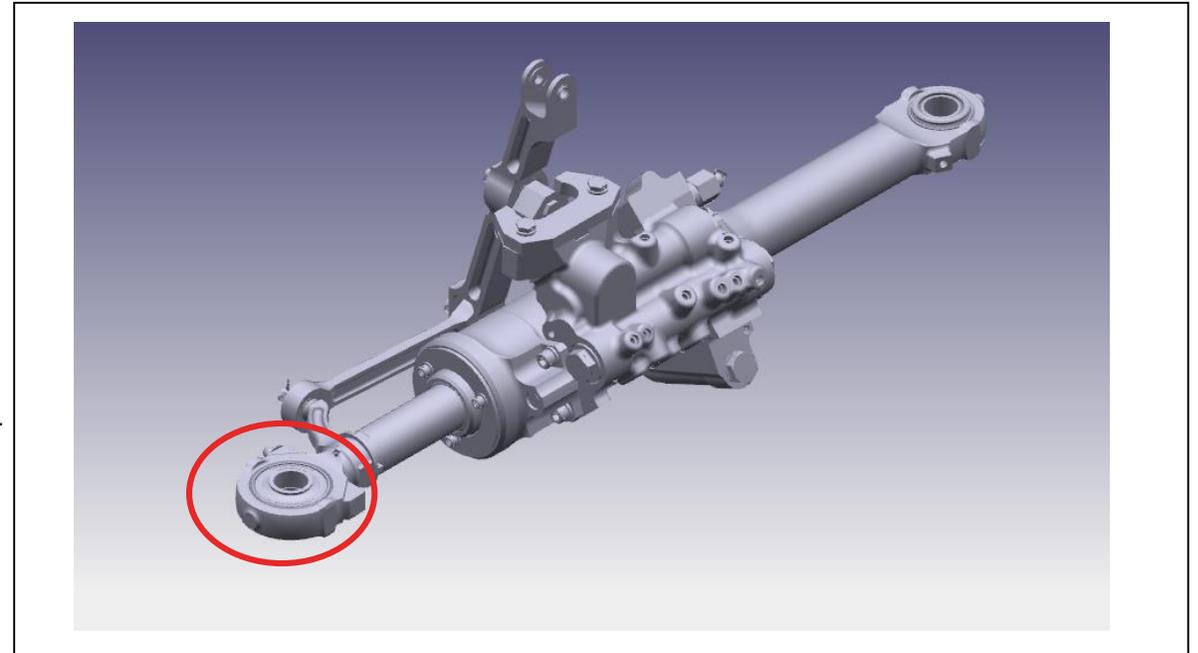
Change of liner eye-end bearing on-wing via in-situ tool.

SOLUTIONS

Introduction of new roller bearing.

IN-SERVICE OCCURRENCES

Excessive play in contributes to aircraft vibration.



- New Eye-end shows good reliability
- No new complaints
- About 3,400 Rudder Servo Actuators modified

E-Rudder Servo Control

E-Rudder Servo Control PN 812A0000-02 for A320Neo E-Rudder system. Modification not possible from current build standard. (First A/C will be delivered 3rd-4th Quarter 2022)

Component Name	Replacement Level
Rudder servo control	AMM level On AC
Rod End Assy	AMM level Off AC
EHSV	AMM level On AC
DPT	CMM level
Solenoid Valve	AMM level On AC
Bearing at Cylinder Housing Assy	CMM level
Jack Mounting point	CMM level
Filter	AMM level On AC

