



AIR, MARITIME AND RAILWAY ACCIDENT
INVESTIGATION NATIONAL BOARD
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SERIOUS INCIDENT, OCCURRED ON NOVEMBER 17, 2022, INVOLVING A319-111 AIRCRAFT, REGISTRATION MARKS G-EZBV, OPERATED BY „EASYJET“, RELATED TO THE LACK OF PRESSURISATION DURING CLIMB

Purpose of Report and Responsibility Level

Under Annex 13 of the Chicago Civil Aviation Convention of 07.12.1944, Regulation 996/20.10.2010 of the European Parliament and the Council on the investigation and prevention of accidents and events in Civil Aviation and Ordinance No. 13/27.01.1999 of the Ministry of Transport (last amendment and addition - 22.01.2016) of the Republic of Bulgaria, the investigation of an aviation event aims at identifying the reasons that led to the event to eliminate and exclude these in future **without identifying someone's guilt or liability.**

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01. List of abbreviations

ALT	-	Altitude;
AMRAINB	-	Aircraft, Maritime and Railway Accident Investigation National Board;
AMM	-	Aircraft Maintenance Manual
ARP	-	Aerodrome reference point;
ATIS	-	Automatic terminal information service;
ATPL(A)	-	Airline Transport Pilot License
A/C	-	Aircraft;
ALT	-	Altitude;
AP	-	Autopilot;
ASR	-	Air Safety Report;
A/THR	-	Autothrust;
BULATSA	-	Bulgarian Air Traffic Services Authority;
BEA	-	Bureau d'Enquetes et d'Analyses;
CAA	-	Civil Aviation Authority;
CAS	-	Calibrated AirSpeed;
CLB	-	Climb;
CPC	-	Cabin Pressure Controller;
CRC	-	Continuous Repetitive Chime;
CVR	-	Cockpit Voice Recorder;
DG CAA	-	Directorate General Civil Aviation Administration;
DAR	-	Digital Access Recorder;
EASA	-	European Aviation Safety Agency;
ECAM	-	Electronic Centralized Aircraft Monitor;
FDR	-	Flight Data Recorder;
ECAM	-	Electronic Centralized Aircraft Monitor;
FCOM	-	Flight Crew Operating Manual;
FCU	-	Flight Control Unit;
FD	-	Flight Director;
FL	-	Flight Level;
FMGS	-	Flight Management and Guidance System;
FH	-	Flight Hour
ft	-	Foot;
ICAO	-	International Civil Aviation Organization;
KT	-	Knots;
LBSF	-	Sofia Airport
MAG	-	Magnetic course
MEL	-	Minimum Equipment List
MSN	-	Manufacturer Serial Number;
MTITC	-	Ministry of transport, information technology and communications;

MTOM	- Maximum Take-Off Mass;
MBN	- Maintenance Briefing Note;
MRO	- Maintenance and Repair Organisation;
MSN	- Manufacturer Serial Number;
QRH	- Quick Reference Handbook
p.	- page;
NAV	- Navigation (lateral AP/FD mode);
OIT	- Operators Information Transmission;
OP DES	- Open Descent (longitudinal AP/FD mode);
p.	- page;
PSI	- Pounds per Square Inch;
QNH	- Altimeter sub-scale setting to obtain elevation when on the ground;
PM	- Pilot monitoring;
PIC	- Pilot in command;
RWY	- Runway;
RPCU	- Residual Pressure Control Unit;
SRIS	- Safety Recommendations Information System;
SPD	- Speed;
STD	- Standard;
SVS	- Selected Vertical Speed;
TLB	- Technical Log Book;
TWY	- Taxiway;
VC	- Vicinity of the aerodrome;
WPT	- Waypoint;
UTC	- Coordinated Universal Time;
VS	- Vertical Speed;
UTC	- Universal Coordinated Time;
VC	- Vicinity of the aerodrome;
WO	- Work Order;
WPT	- Waypoint.

1. Introduction

Date and time of the aviation event: November 17, 2022, 17:48 h. The difference between local and universal coordinated times is +2 h. All times in the report are given in UTC.

Notified: Air, Maritime and Railway Accident Investigation National Board (AMRAINB) and Directorate General "Civil Aviation Administration" (DG CAA) of the Republic of Bulgaria, the European Commission, the European Aviation Safety Agency (EASA), the International Civil Aviation Organization (ICAO), the Air Accidents Investigation Branch of the UK and the National Bureau of Aviation Occurrences Investigation (BEA) of the Republic of France.

On the grounds of Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation and the provisions of Article 9, Para 1 of Ordinance No 13 of the Ministry of Transport of the Republic of Bulgaria dated 27.01.1999 on Investigation of Aviation Accidents the occurrence was classified as a serious incident by the AMRAINB. The materials on the aviation occurrence have been filed in case No 04/2022 in Aviation Transport Unit archives at AMRAINB.

The investigation was conducted by the appointed Commission with the support of Airbus Industrie and Lufthansa Technik Sofia.

In accordance with the provisions of Article 5, para 1 of Regulation (EU) No. 996/2010 on the investigation and prevention of accidents and incidents in civil aviation, Article 142. Para. 2 of the Civil Aviation Act of the Republic of Bulgaria, dated 01.12.1972, and Article 10, para. 1 of Ordinance No. 13 of the Ministry of Transport, dated 27.01.1999, on the Investigation of Aviation Occurrences, and on the grounds of the provisions of Article 6, para 1, point 8 of the Rules of procedure on the activity, structure and organization of the AMRAINB by Order No. RD-08-29, dated December 17, 2022, of the Chairperson of the Management Board, a Commission is appointed for investigation of the serious incident.

Summary:

On November 17, 2022, the Airbus 319-111 aircraft, registration marks G-EZBV, operated by easyJet UK Limited performing ferry flight EZY9002 after base maintenance from LBSF Sofia (Bulgaria) to London/Gatwick/ EGKK with two people on board. During the climb out phase shortly after take-off, approximately 10 min after departure, at FL290 a message Cabin Altitude Warning is appeared on ECAM. The pilots levelling off around FL300 and donned their oxygen masks. The cabin altitude was rising rapidly to about 9000 ft resulting in low cabin pressure, they declared "MAYDAY" and made the decision to return to LBSF. The flight crew set squawk 7700 on the transponder and initiated an emergency descent. During the descent the cabin pressure slowly recovered and at 10500 ft reached normal values. The aircraft landed safely on runway 27. There were no consequences for the flight crew.

Because of the investigation, the Commission considers that the serious incident is due to the following reason:

Root cause:

Disruption of the technological process of the installation of the aft cargo door pressure seal during the base maintenance activities by the maintenance crew of Lufthansa Technik Sofia, which resulted in a significant cabin leakage.

2. Factual information

The commission received information about the realization of an aviation occurrence from written explanations from the flight crew, the maintenance crew of Lufthansa Technik Sofia, witnesses of the event, data from the BULATSA and decoded data from DAR provided by Airbus.

2.1.1. Flight number and type, the last point of departure and time, and planned destination point

Flight Number: EZY9002.

Type of flight: Non-Commercial Air Transport - Relocation – Ferry flight

Last point of departure: Sofia – LBSF, Bulgaria.

Take-off time: 17:37:57 h UTC

Planned destination point: London/Gatwick/ - EGKK, United Kingdom.

2.1.2. Flight preparation and description of the flights

An A319-111 aircraft with registration G-EZBV, operated by AO "easJet UK Limited", was accepted for scheduled basic maintenance (16 YR-check) at the technical base of Lufthansa Technik Sofia. From 5 to 16 November 2022, the scheduled activities have been carried out and a technical overflight (Ferry flight) to London-Gatwick is planned on 17 November 2022. A crew commander and co-pilot have been appointed. After pre-flight preparations the aircraft was refueled and took off at 17:37:57 h UTC.

At 17:43:57 UTC, aircraft was in climb crossing 20000 ft STD altitude:

- AP1 and both FDs were engaged in CLB/NAV mode.
- A/THR was engaged and active in thrust (CLB) mode.
- FCU selected altitude (SALTFCU) was 28000 ft
- Both BLEED and PACK were ON.
- Cross bleed valve was closed.
- The cabin altitude was 4000 ft increasing.
- Cabin altitude rate (V/S) was 500 ft/min.
- Cabin differential pressure was 5.9 PSI increasing.

At 17:44:25 UTC, while crossing 21405 ft STD, the cabin altitude rate started to increase from 500 to 1750 ft/min (over 60s). The cabin differential pressure was 6.18 PSI and reached its maximum of 6.31 PSI 33s later.

At 17:45:25 UTC, while crossing 24309 ft STD, the cabin altitude rate reached its maximum of 1750 ft/min. Cabin differential pressure was 6.25 PSI and decreasing. The value of 1750 ft/min is the threshold of the cabin altitude rate ECAM advisory.

At 17:47:05 UTC, while crossing 28225 ft STD, cabin altitude exceeded the advisory threshold of 8800 ft. Cabin differential pressure was 5.84 PSI and decreasing. The cabin altitude started to pulse green on the ECAM CRUISE page.

At 17:47:36 UTC, crossing 29230 ft STD, cabin altitude was 9580 ft when MASTER WARNING triggered for 4s, and CABIN ALTITUDE WARNING triggered for 4min47s. Cabin differential pressure was 5.75 PSI and decreasing. The triggering of the Cabin Altitude Warning [CABALTW=1] is consistent with the cabin altitude exceeding the threshold of 9550 ft. This Level 3 alert is associated with a Master Warning and the aural Continuous. The PFR recorded the CAB PR EXCESS CAB ALT warning at 17:47 UTC.

At 17:47:47 UTC, crossing 29600ft STD, AP1/FDs were engaged in VS/NAV modes, with a selected VS=0ft/min. Cabin altitude was 9776 ft. FCU altitude was 32000 ft.

At 17:48:38 UTC, AP1/FDs were engaged in OPDES/NAV modes. FCU altitude was reduced to 14000 ft. A/THR engaged to thrust IDLE mode. The flight crew donned their oxygen masks, initiated an Emergency Descent and declared an emergency with 7700 on the transponder.

At 17:48:51 UTC, the aircraft reached its maximum altitude at 29850 ft STD, then started to descend. At 17:49:15 UTC, speed brakes were commanded out.

At 17:49:43 UTC, cabin altitude reached a maximum at 11184 ft, then started to decrease. Cabin differential pressure was 4.98 PSI and decreasing.

Between 17:49:50 UTC and 17:56:56 UTC, aircraft performed an emergency descent followed by a level off at 10500 ft QNH:

- Altitude decreased from 28000 ft STD to 10500 ft QNH.
- Selected altitude was set to 10500 ft on FCU.
- CAS was between 245kt and 257kt.
- VS decreased down to -5000ft/min.
- Cabin altitude was 11184 ft and decreased to 5536ft.
- Cabin differential pressure decreased from 4.86 PSI to 2.16 PSI.

The flight crew elected to perform an IFTB towards Sofia airport, as the FMS destination (City pair “TO”) was changed from Gatwick (EGKK) to Sofia (LBSF).

At 17:56:56 UTC, the aircraft levelled off at 10500ft QNH until the descent to Sofia. The cabin altitude was 5536ft and decreasing. Cabin differential pressure was 2.16 PSI. The rest of the flight was performed uneventfully.

The landing was performed normally at 18:14:02 UTC with vertical overload $N_y = 1.3125$.

2.1.3. Location of aviation occurrence

The serious accident occurred on a flight en route from Sofia Airport (LBSF) to London/Gatwick Airport (EGKK) in Class C airspace over the territory of the Republic of Bulgaria, in the process of climbing, while crossing FL 290, 65 NM Northwest from the Sofia Airport (LBSF).

2.2. Injuries to persons

No injuries of crews, passengers, or other persons because of the occurrence.

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Total in the aircraft</i>	<i>Others</i>
<i>Fatal</i>	0	0	0	0
<i>Serious</i>	0	0	0	0
<i>Minor</i>	0	0	0	0
<i>None</i>	2	0	2	<i>Not applicable</i>
<i>Total</i>	2	0	2	0

2.3. Damage to aircraft

During the inspection carried out after the completion of the flight it was found that the Aft cargo door seal was incorrectly installed. From the photograph below the inflation holes are oriented towards the outer side of the aircraft and not towards the inner side.



Fig.1

2.4. Other damages

No other damage.

2.5. Personnel information:

2.5.1. Commander

Man	40 years old, Dutch citizen;
License:	GBR FCL.ATPL(A),CPL(A), PPL(A); Issued by United Kingdom CAA. Valid until 30.11.2023.
Qualifications:	A320 LR/PBN.
Medical Validity:	Class 1, valid to 28.10.2023.
Medical restrictions:	None.
Proficiency in English:	English Level 6.
Flight experience:	
Total Flying Hours:	12037,00 FH.
Total Flying Hours on Type:	10337:00FH.
Information on the working hours and rest:	
For the last 24 hours:	03:00 FH.
For the last 90 days:	90:00 FH.

Rest time prior to duty on 17 Nov 2022: 16:25 h.

Aviation events until present: No information.

The Commission assumes that the captain possess the required qualification and medical fitness for flights in accordance with existing regulations and that there is no breach of the rules on working time and pre-flight rest periods.

2.5.2. Co-pilot

Man 29 years old, UK citizen.

License: GBR FCL.ATPL(A);
Issued by United Kingdom CAA.
Valid until.

Qualifications: FO A320.

Medical Validity: Class 1.

Medical restrictions: None.

Proficiency in English: English Level 6.

Flight experience:

Total Flying Hours: 1600:00 FH.

Total Flying Hours on Type: 1500:00FH.

Information on the working hours and rest:

For the last 24 hours: 00:00 FH.

For the last 90 days: 112:00 FH.

Rest time prior to duty on 17 Nov 2022: More than 8 hours.

Aviation events until present: No information.

The Commission assumes that the captain possess the required qualification and medical fitness for flights in accordance with existing regulations and that there is no breach of the rules on working time and pre-flight rest periods.

2.5.3. Maintenance crew

Three people have been assigned to perform it - one Level 1 (L1) mechanic as performer supervised by a Level 2 (L2) inspector and another L2 inspector tasked to perform an independent inspection. Staff records were reviewed, further details below:

2.5.3.1. L1 mechanic

Unlicensed, authorized i.a.w. LHT BMS Authorization System as competent mechanic Level 1 for CRG area (cargo and air-conditioning) on A320 since October 2020. Has valid continuation trainings (Human factors, EWIS, FTS, Company Procedures), assessment for continuous control of competence is also valid.

2.5.3.2. First L2 inspector

Unlicensed, authorized i.a.w. LHT BMS Authorization System as competent mechanic Level 2 for CRG area on A320 since March 2022. Has previous- experience of 3 years as L1 mechanic (since Feb 2019). Has valid continuation trainings (Human factors, EWIS, FTS, Company Procedures), assessment for continuous control of competence is also valid.

2.5.3.3. Second L2 inspector

Unlicensed, authorized i.a.w. LHT BMS Authorization System as competent mechanic Level 2 for CRG area on A320 since May 2015. Has previous experience of 2 years as L1 mechanic (since May 2013). Has valid continuation trainings (Human factors, EWIS, FTS, Company Procedures), assessment for continuous control of competence is also valid.

2.6. Aircraft Information

2.6.1. Airworthiness Information

The A319-111 aircraft, serial No. (MSN) - 03122, was manufactured by Airbus Industries, France. The operator of the aircraft is easyJet (EZY), United Kingdom.

The aircraft is registered with registration marks G-EZBV and is entered in the Register of United Kingdom

Lufthansa Technik Sofia, holding Part 145 approval - DE.145.0001, performing the base maintenance (16 YR) of the aircraft of easyJet.

From the beginning of the operation until 17.11.2022, the day of the aviation occurrence, the aircraft has flown 41280:00 h and made 27836 landings.

The aircraft is equipped with two CFM56-5B5/P engines.

2.6.2. Aircraft Pressurization System

System description - Pressurization (ATA 21 -30):

General description:

The pressurization system has four general functions:

- Ground function: Fully opens the outflow valve on ground.
- Pressurization: During takeoff, increases cabin pressure to avoid a surge in cabin pressure during rotation.
- Pressurization in flight: Adjusts cabin altitude, and rate of change to provide passengers with a comfortable flight.
- Depressurization: After touchdown, gradually releases residual cabin overpressure before the ground function fully opens the outflow valve.

The aircraft pressurized area covers both the cabin and the cargo compartment.

The system consists of:

- Two Cabin Pressure Controllers (CPC)
- One Residual Pressure Control Unit (RPCU)
- One outflow valve, with an actuator that incorporates three motors (two for automatic operation, one for manual operation)
- One control panel
- Two safety valves.

Any one of the three independent electric motors may power the outflow valve. Normally, one of the two cabin pressure controllers operates the outflow valve by means of its associated automatic motor. In normal operation, cabin pressurization is fully automatic.

Automatic operation

The flight crew monitors the operation of the system but does nothing to control it.

Air pressure in the cabin follows external schedules that the system receives as signals from the Flight Management and Guidance System (FMGS). When FMGS data is not available for automatic pressurization, the crew only needs to select the landing field elevation. The pressurization system then uses the manually selected landing field elevation for internal schedules.

Manual operation In manual mode, the flight crew controls the cabin altitude via the manual motor of the outflow valves, by operating controls on the pressurization control panel.

Pressurization schedule in climb mode In the climb mode, the CPC controls the pressure in the cabin in relation with the changes in ambient pressure and the aircraft climb speed. In this mode, the CPC

makes sure that the cabin pressure is always less than the maximum differential pressure during the aircraft climb.

As shown in the AMM figure 21-31-00-15000-00-A below, during a typical climb the cabin altitude rate would be around 400ft/min on average.

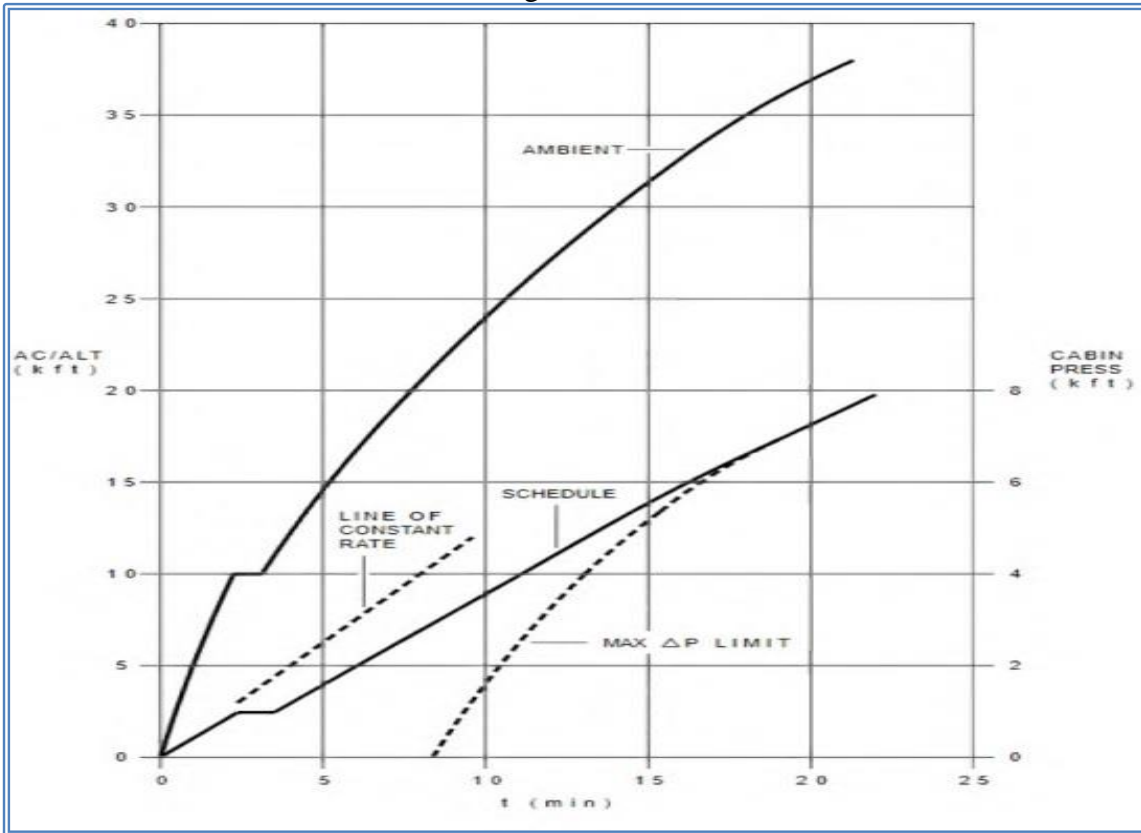


Fig.2

Controls and indications

The ECAM CRUISE page is typically displayed when above 1500ft AGL and is displayed as follows:

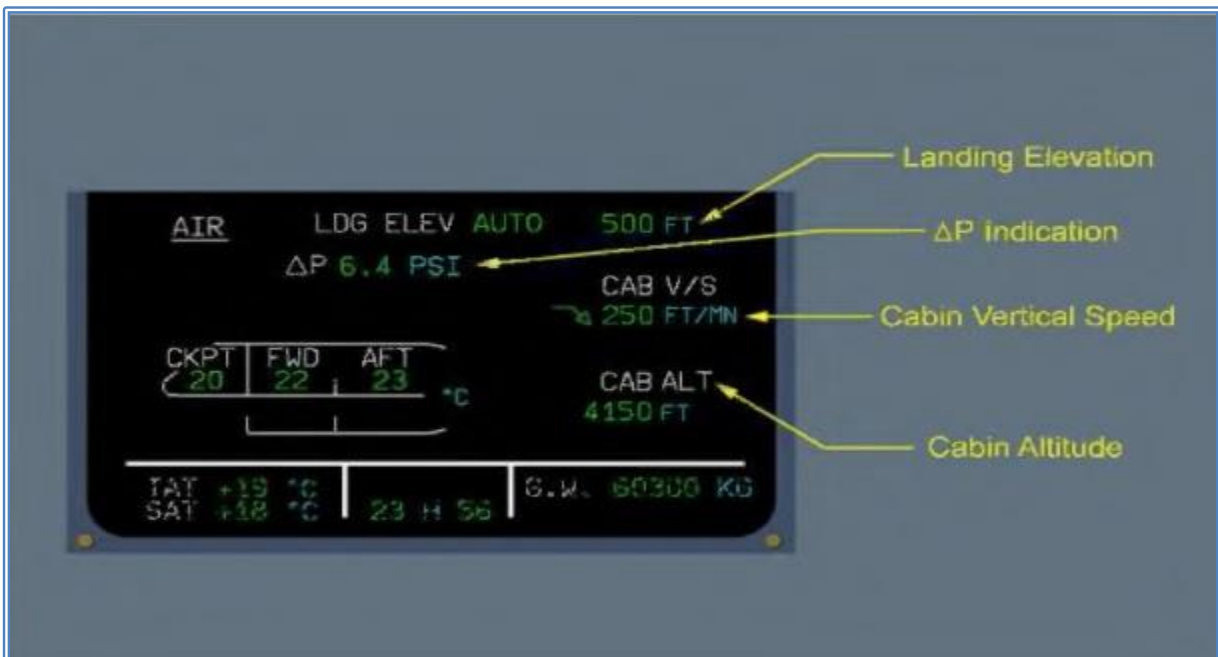


Fig.3

The cabin vertical speed (CAB V/S) flashes green when it reaches 1750 ft/min and stop flashing when returning below 1650 ft/min.

The cabin altitude (CAB ALT) flashes green when it reaches 8800 ft and stop flashing when returning below 8600 ft. It is displayed in red when the Cabin altitude is at or above 9550 ft.

The specific ECAM System Display (SD) CAB PRESS page is as follows:



Fig.4

Consistently with the CRUISE page:

- The cabin vertical speed (CAB V/S) flashes green when it reaches 1750 ft/min and stop flashing when returning below 1650 ft/min.
- The cabin altitude (CAB ALT) flashes when it reaches 8800 ft and stop flashing when returning below 8600 ft. It is displayed in red when the Cabin altitude is at or above 9550 ft.

Cargo doors (ATA 52-30)

General arrangement:

On the A319, there are two cargo compartment doors on the right side of the lower fuselage. They are referred to as FWD and AFT cargo compartment doors and give access to the related cargo compartment.



Fig.5

The FWD and AFT cargo compartment doors are similar, but they are not interchangeable because of different structural design. They have a manual locking mechanism and open hydraulically away from the aircraft. It is only possible to open or close the FWD and AFT cargo compartment doors from the outer side.

Cargo door seal

The door seal made of silicone rubber integrated with fabric is a round hose-type seal with inflation holes. The door seal is installed in the retainers so that the inflation holes show to the inner side of the cargo compartment.

When the cargo door is in the closed position, the door seal comes into contact with the fuselage profile. Due to the higher internal pressure of the cargo compartment during flight, the door seal is inflated via the inflation holes so that the cargo compartment is sealed air tight.

The AMM figure below (reference 52-32-18-991-00100-00-C) illustrates the installation of the cargo door seal on the aft cargo door, and the correct location of the inflation holes on the inner side.

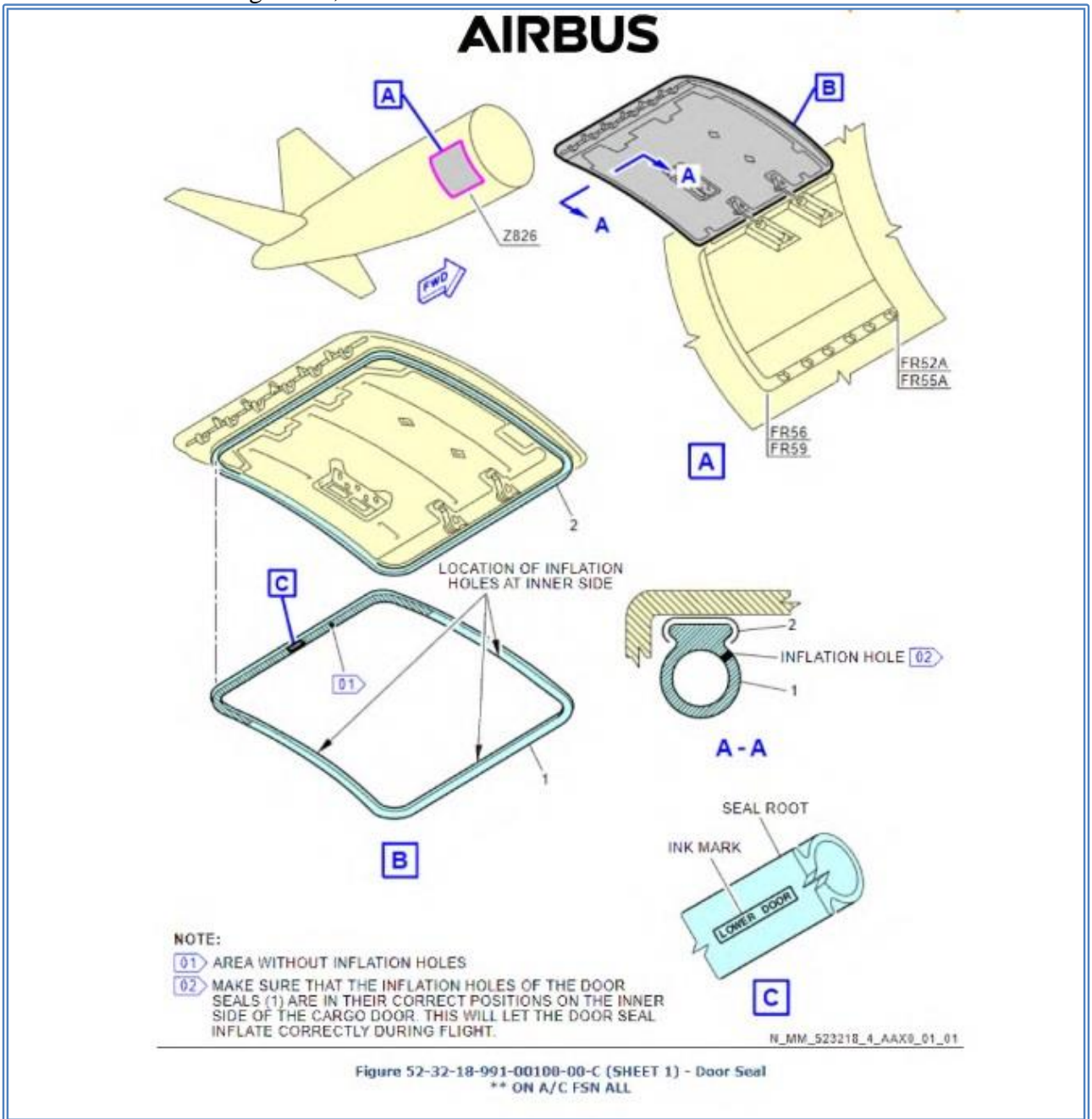


Fig.6

2.6.3. Maintenance procedures

The AMM Task 52-32-18-400-001-A Installation of the Door Seal is directly relevant to this incident investigation, as it relates to the installation of the door seal on the aft cargo door.

Due to similarities in the design between the forward and aft cargo doors, the AMM Task 52-31-18-400-001-A Installation of the Door Seal is also relevant, as it relates to the installation of the door seal on the forward cargo door.

Both tasks have been reviewed after this incident. At the time of the event, a caution indicated that an incorrect cargo door seal installation could result in a pressurisation issue. This caution will be replaced by a warning in the next scheduled revisions of the AMM.

The quantity and quality of the fuel had no influence on the realisation of the event.

2.7. Meteorological information

The meteorological conditions at the time of the air occurrence were of no effect to the serious incident.

For the period in review from 17:00 to 19:00 h. UTC on 17.11.2022, the northwestern part of FIR Sofia is under the influence of a rising ridge of relatively high pressure from the southwest, forming a barrier saddle in the rear of a cyclone moving to the northeast.

At altitude the circulation is zonal. As a result, the transport of air masses up to FL140 is oriented from the west-southwest and above FL140 from the west-northwest. At FL300, the wind is from the west 45-55kt.

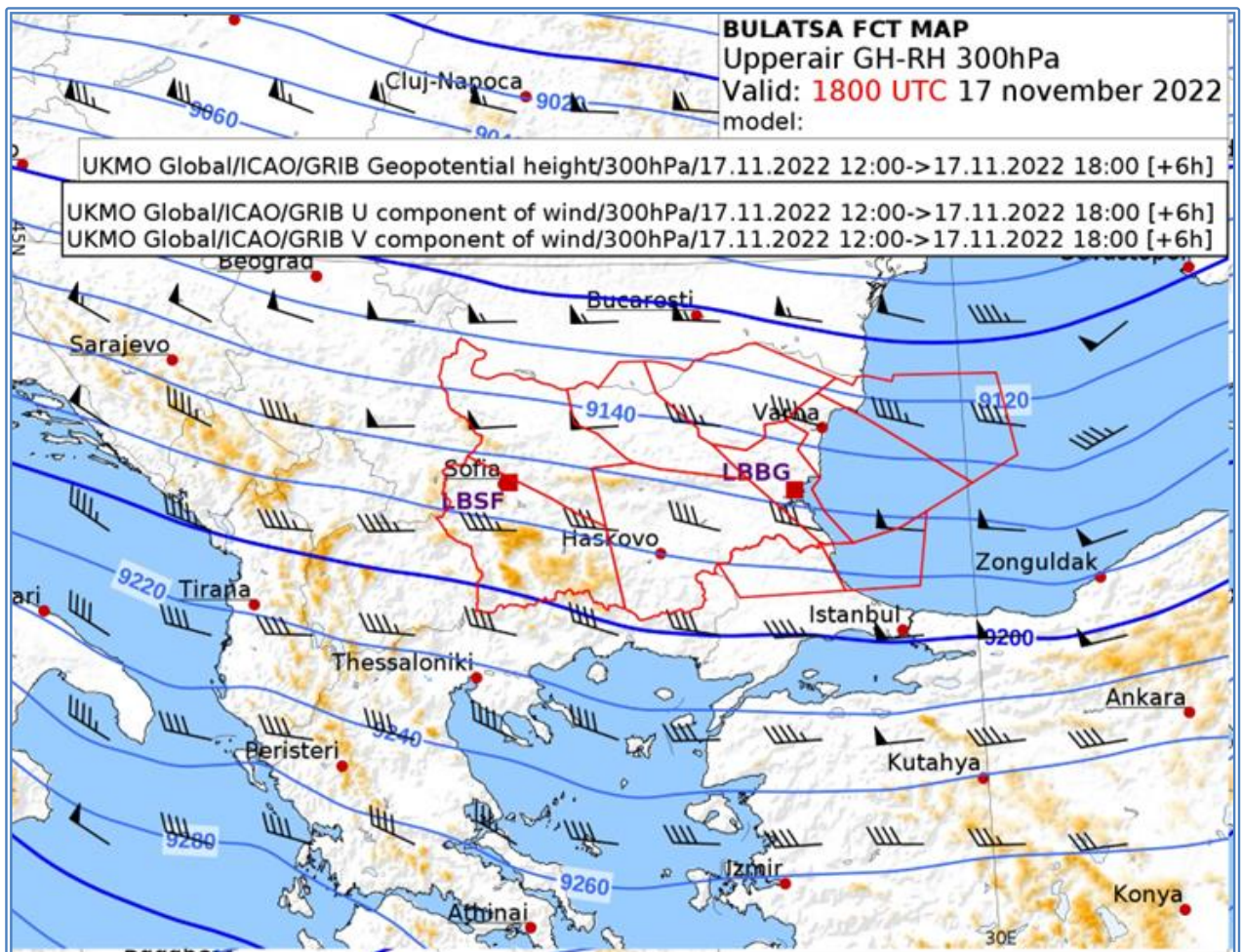


Fig.7 Wind map (in kt) at altitude FL 300

No dangerous phenomena have been predicted and observed, no SIGMET and AIRMET information has been broadcast for the considered period for the territory of Sofia FIR.

Weather conditions for Sofia Airport are characterized by low winds, visibility over 10 km decreasing at 19:00 UTC to 4000 m. and broken to insignificant clouds, temperature 8-10°C and pressure QNH 1005hPa. The table below gives the METAR messages for the period:

LBSF 2022-11-17 17:00 METAR LBSF 171700Z VRB02KT 9999 SCT055 10/09 Q1005 NOSIG=

LBSF 2022-11-17 17:30 METAR LBSF 171730Z 16005KT 9000 NSC 09/09 Q1005 NOSIG=

LBSF 2022-11-17 18:00 METAR LBSF 171800Z VRB01KT 7000 NSC 10/09 Q1005 TEMPO
5000 BR=

LBSF 2022-11-17 18:30 METAR LBSF 171830Z 23003KT 4500 2200W BR FEW032 SCT056
08/08 Q1005 TEMPO 1500 BR=

LBSF 2022-11-17 19:00 METAR LBSF 171900Z 09003KT 4000 BR FEW054 08/08 Q1005
TEMPO 1500 BR=

The meteorological conditions at the time of the air occurrence were of no effect to the serious incident.

2.8. Aids to navigation

The aircraft performed the flights with the standard navigation equipment for the aircraft type A319-111.

There are no reported technical failures of the navigation equipment of the aircraft.

The flights of the aircraft were carried out in air space of Bulgaria, under the conditions of zonal navigation and in conformity with the Instrument Flight Rules.

There is no information about technical failures of the navigation system of the Bulgarian Air Traffic Services Authority (BULATSA), which could cause the occurrence.

All facilities included in the national net for course navigation operated normally.

In the daily briefing statement of the ACC Sofia, no technical failures were recorded, which might directly affect the operational ability at the time of the occurrence.

2.9. Communications

The aircraft performed the flights with the standard communication equipment for the types of aircraft.

The air-ground radio communication in the FS Tower, the Approach, the Sofia Control and the aircraft serviced was carried out at the frequency of 118,100 MHz, 123.7 MHz and 131,225 MHz in English.

After hearing the radio conversations at the operating frequencies of FS Tower and Approach, the Investigation Commission found that there had been no loss of radio communication and that there were no interruptions and disturbances during the radio broadcasting with not a single aircraft in the sector. The transcripts of the radio communications between ATC and the flight crew are attached in Annex 4

2.10. Aerodrome information

Aerodrome Location Indicator and Name – LBSF-SOFIA.

ARP coordinates and site at aerodrome - N42°41'42" E023°24'30", RWY centre.

Elevation - 1742 ft (531m);

Designations - RWY 09/27 - MAG 091°/271°.

Dimensions of RWY (m) - 3600 x 45 m.

2.11. Flight recorders

The analysis has been carried out from DAR data supplied to Airbus by the Operator. The provided DAR raw n128ezy1data was from 128 words/s. A standard calibration file (n128ezy1) was used for decoding. The recorded parameters are attached to the case for investigation of the serious incident and the plots are attached in Annex 1.

The Post Flight Report (PFR) was also available, and recorded a CAB PR EXCESS CAB ALT warning at 17:47 UTC as shown below. No other alert or failure messages were recorded.

After decoding and analysing the flight parameter records from the flight data recorders, were provided to the Commission by Airbus.

2.12. Wreckage and impact information

The occurrence was not related to the aircraft destruction.

2.13. Medical and pathological information

Because of the nature of the aviation occurrence, medical and pathological research was not performed.

2.14. Fire

No fire arising.

2.15. Factors for Survival

Sofia Airport has established an immediate response organization in case the situation develops into an emergency during the landing phase. Due to the normal landing of the aircraft, no emergency rescue action was necessary.

2.16. Tests and research

For the safety investigation, the following activities were carried out:


1. Discussion with the maintenance crew who carried out the aircraft maintenance.
2. Analysis of the crew members' reports in relation to the event.
3. Research and analysis of aircraft operational documentation.
4. Research of the results of the Lufthansa Technik Sofia internal investigation related to the replacement of the Aft cargo door seal.
5. Research of the results of the investigation of Airbus SE.
6. Assessment of the aircraft's flight performance.
7. Analysis of the decoded aircraft FDR data provided by Airbus SE.
8. Analysis of crew actions in accordance with manufacturer and AO procedures.
9. Logical-probabilistic analysis of possible causes of the aviation event.

2.17. Organizational and management information.

2.17.1. Flight Crew Operating Manual

2.17.1.1. Operating procedures and training material. ECAM Advisory Conditions

The FCOM section PRO-ABN-ABN-ADV [ADV] ECAM ADVISORY provides the following recommendations in case of ECAM Advisory Condition related to the Cabin pressurization:

 A319/A320/A321 FLIGHT CREW OPERATING MANUAL		PROCEDURES ABNORMAL AND EMERGENCY PROCEDURES [ADV] ECAM ADVISORY	
ECAM ADVISORY CONDITIONS			
Ident: PRO-ABN-ABN-ADV 00012117.0003001 / 17-Mar-17			
Applicable to: ALL			
SYSTEM	CONDITIONS	RECOMMENDED ACTION	
APU	EGT > EGT MAX -33 °C (inhibited during APU start)		
	OIL QTY (message LOW OIL LEVEL pulsing)	If there is no oil leak, then the remaining oil quantity allows normal APU operation for about 10 h.	
Ident: PRO-ABN-ABN-ADV 00012107.0001001 / 05-Mar-19			
Applicable to: ALL except MSN 06651			
CAB PR	CAB VERTICAL SPEED V/S > 1 800 ft/min	CPC changeover is recommended: - MODE SEL: MAN - Wait 10 s - MODE SEL: AUTO • If unsuccessful: - MODE SEL: MAN - Manual pressure control	
	CAB ALTITUDE altitude ≥ 8 800 ft	PACK FLOW: HI CPC changeover is recommended: - MODE SEL: MAN - Wait 10 s - MODE SEL: AUTO • If unsuccessful: - MODE SEL: MAN - Manual pressure control	
	ΔP ≥ 1.5 PSI in phase 7	LDG ELEV: ADJUST • If unsuccessful: - MODE SEL: MAN - Manual pressure control	

Continued on the next page

Fig.8

2.17.1.2.ECAM warning CAB PR EXCESS CAB ALT


The CAB PR EXCESS CAB ALT red warning triggers on the ECAM when:

- In climb or descent, the cabin altitude is above the higher of 9550 ft, or 1000 ft above the airfield pressure altitude.

- In cruise, the cabin altitude is above 9550 ft.

This red alert is associated with a Master Warning and a Continuous Repetitive Chime (CRC).

The associated ECAM procedure is as follows:

 A319/A320/A321 FLIGHT CREW OPERATING MANUAL	PROCEDURES ABNORMAL AND EMERGENCY PROCEDURES CAB PR
Ident: PRO-ABN-CAB_PR 00018066.0005001 / 20-Dec-16 Applicable to: ALL	
Rely on the CAB PR EXCESS CAB ALT warning even if not confirmed on the CAB PRESS SD page. The warning can be triggered by a cabin pressure sensor different from the one used to control the pressure and display the cabin altitude on the SD.	
<ul style="list-style-type: none"> ● If above FL 100: <ul style="list-style-type: none"> CREW OXY MASKS.....USE ■ If below FL 160: <ul style="list-style-type: none"> DESCENTINITIATE CABIN CREWADVISE MAX FL100/MEA-MORA ■ If above FL 160: <ul style="list-style-type: none"> SIGNSON 	
EMER DESCENT:	
DESCENTINITIATE	
<ul style="list-style-type: none"> ● If A/THR is not active: <ul style="list-style-type: none"> THR LEVERS.....IDLE If the A/THR is active, check A/THR is at IDLE on the ED.	
SPD BRK.....FULL	
Extension of speedbrakes will significantly increase VLS. In order to avoid autopilot disconnection and automatic retraction of speedbrakes due to possible activation of angle of attack protection, allow the speed to increase before starting to use speedbrakes.	
SPDMAX/APPROPRIATE	
Descend at maximum appropriate speed. However, if structural damage is suspected use the flight controls with care and reduce speed as appropriate. The landing gear may be extended. In this case, speed must be reduced to VLO/VLE.	
ENG MODE SELIGN	
ATCNOTIFY	
Notify ATC of the nature of the emergency, and state intention. The flight crew can communicate with the ATC using voice, or CPDLC when the voice contact cannot be established or has a poor quality.	
EMER DESCENT (PA).....ANNOUNCE	
The flight crew must inform the cabin of emergency descent on the PA system.	
XPDR 7700.....CONSIDER	
Continued on the next page	
EZY A319/A320/A321 EZY/EZS/EJU FCOM	PRO-ABN-CAB_PR P 3/14 09-Aug-22


 <p>A319/A320/A321 FLIGHT CREW OPERATING MANUAL</p>	<p>PROCEDURES ABNORMAL AND EMERGENCY PROCEDURES CAB PR</p>
<p>Squawk 7700 unless otherwise specified by ATC. L2</p> <p><i>Note:</i> To save oxygen, set the oxygen diluter selector to N position. With the oxygen diluter left to 100 %, oxygen quantity may not be sufficient for the entire descent profile. Ensure crew communication is established with oxygen masks. Avoid continuous use of the interphone to minimize the interference from the oxygen mask breathing noise.</p> <p>MAX FL 100/MEA-MORA L1</p> <p>● IF CAB ALT > 14 000 FT:</p> <p>PAX OXY MASKS MAN ON L2</p> <p><i>This action confirms that the passenger oxygen masks are released.</i></p> <p><i>Note:</i> When descent is established and if time permits, check that the OUTFLOW VALVE is closed on the CAB PRESS SD page. If it is not closed and ΔP is positive, select the other CPC. If the OUTFLOW VALVE is still not closing set the cabin pressure MODE SEL pb to MAN and the V/S CTL sw to full down. Notify the cabin crew when the aircraft reaches a safe flight level, and when cabin oxygen is no more necessary.</p>	
<p>Ident: PRO-ABN-CAB_PR 00010755.0002001 / 22-Dec-14 Applicable to: ALL</p>	
<p style="text-align: right;">STATUS</p> <p>MAX FL 100/MEA-MORA </p>	
<hr/> <p>EZY A319/A320/A321 PRO-ABN-CAB_PR P 4/14 EZY/EZS/EJU FCOM 09-Aug-22</p>	

Fig.9

2.17.1.3.EMERGENSY DESCENT Memory Item procedure

The emergency descent is a MEMORY ITEM, meaning that the flight crew has no time to refer to the ECAM/QRH/FCOM to ensure a safe flight path, and therefore should do this procedure immediately and by memory.


 A319/A320/A321 FLIGHT CREW OPERATING MANUAL	PROCEDURES ABNORMAL AND EMERGENCY PROCEDURES MISC
[MEM] EMER DESCENT	
Ident: PRO-ABN-MISC 00012092.0001001 / 17-Mar-17 Applicable to: ALL	
CREW OXY MASKS..... USE SIGNS..... ON EMER DESCENTINITIATE	
<ul style="list-style-type: none"> ● If A/THR not active: THR LEVERS IDLE 	
SPD BRKFULL	
<ul style="list-style-type: none"> ● When descent established: SPEED..... MAX/APPROPRIATE ● If structural damage suspected: MANEUVER WITH CARE 	
CONSIDER L/G EXTENSION ENG MODE SEL IGN ATC NOTIFY <i>Notify ATC of the nature of the emergency, and state intention. The flight crew can communicate with the ATC using voice, or CPDLC when the voice contact cannot be established or has poor quality.</i>	
EMER DESCENT (PA)ANNOUNCE <i>The flight crew must inform the cabin of emergency descent on the PA system.</i>	
ATC XPDR 7700..... CONSIDER <i>Squawk 7700 unless otherwise specified by ATC.</i>	
CREW OXY MASKS DILUTION NORM <ul style="list-style-type: none"> - To save oxygen, set the oxygen diluter selector to the N position - If the oxygen diluter selector remains set to 100 %, oxygen quantity may be insufficient to cover the entire emergency descent profile - Ensure that crew communication is established with oxygen masks. Avoid the continuous use of the interphone to minimize interference with the breathing noise in the oxygen mask. 	
MAX FL: 100/MEA-MORA	
<ul style="list-style-type: none"> ● If CAB ALT above 14 000 ft: OXYGEN PAX MASK MAN ON PRESS <i>This action confirms that the passenger oxygen masks are released.</i> 	
Continued on the next page	
EZY A319/A320/A321 EZY/EZS/EJU FCOM	PRO-ABN-MISC P 1/32 09-Aug-22

Fig.10

3. Analysis

In order to determine the causes of the serious incident, the following aspects were considered:

1. Actions of the maintenance crew when installing the Aft cargo door seal.
2. Actions of the flight crew of aircraft A319-111, registration G-EZBV, in case of lack of pressurisation during climb.

The first aspect relates to the installation of the pressure seal on the aft cargo door during the aircraft's 16-year base maintenance at Lufthansa Technic Sofia.

From the information received by the commission from Lufthansa Technic-Sofia it is determined that after take-off, during a climb en route from Sofia, aircraft A319-111, registration G-EZBV, returned to Sofia due to pressurization issues. Post flight inspection revealed an incorrectly installed pressure seal on the aft cargo door (with the inflation holes located on the outer side of the seal) which has caused excessive air leak and loss of cabin pressure. The insufficient cabin pressure is a serious risk for the flight safety of all occupants on board.

Based on the conducted interviews the note in the Aircraft Maintenance Manual for the correct position of the inflation holes has not been used by the staff in order to verify the correct position of the seal during installation, neither during the independent inspection.

Following interviews with the maintenance crew, both involved and not involved in the mishap but all experienced in the task of cargo doors seals replacement have been with the belief that there is no way to install the seal incorrectly if the 'LOWER DOOR' ink mark is placed as referred in the AMM and the seal is inserted to the retainer without any kinks. The alert by the Operator for recent cases of incorrectly fitted cargo door seals which have led to flight diversions has not affected involved staff's confidence in doing the job correctly even though they have been aware of it prior doing the job. Also, the task is rather frequently performed in the last years which, as stated by the staff, makes them less prudent to the details or if there is something wrong.

The task is set to be performed as Independent Inspection because it's originating from mandatory Safety Bulletin for which an Airworthiness Directive is due to be published. I.a.w. Doc. WD463 which has been the guiding document defining scope of tasks subject to duplicate inspections at the time of occurrence a core task of Airworthiness Directive related maintenance shall be performed as (formerly known) duplicate Inspection. This has not provided sufficient instructions to the 2nd inspector what exactly shall be the scope of his inspection.

A substitution test was performed by interviewing two B1 support staff with more than 10 years experience in the subject area (including the particular task) who have not been involved in the check of G-EZBV aircraft. Both stated that are aware of the AMM note that one should make sure the inflation holes are facing to the inner side of the door but they don't use it (the note) in order to verify correct seal position. Therefore skipping the subject AMM instruction is identified as a group norm within the maintenance staff common to the task/area (CRG).

Both fwd and aft cargo door seals have been subject to routine replacement within the 16YR base maintenance of G-EZBV in LTSF i.a.w. Airbus S.A.S. SB A320-52-1195 Rev.01. The applicable maintenance records are under LTSF Job card 1003815862-0010 and EZY AMOS WO 23530093.

On 7th Nov a heads up has been received by the Operator about flight diversions due to incorrectly installed cargo door seals in a non-LHT MRO with request the alert to be spread in LTSF as a precaution for the ongoing layovers. This has happened via e-mail to the respective Bay Managers and Project Engineers in charge. For the layover of G-EZBV the Bay Manager has forwarded the

alert by e-mail to the related Team Leader and the most experienced inspector in the cargo area who is the person performing the independent inspection outlined below. The e-mail alert has been complemented by verbal communication to the Team Leader and the experienced inspector acknowledged by both that they are aware of the situation.

The task has been scheduled to be accomplished from the start of the shift on 8th of November. Three persons have been assigned to perform it - one Level 1 (L1) mechanic as performer supervised by a Level 2 (L2) inspector and another L2 inspector tasked to perform an independent inspection. Staff records were reviewed.

The work has been done at the 2nd day after their last day off. As stated by all three staff referred above the 16YR base maintenance of EZY is rather 'light' in terms of workload for their work area (CRG). The staff themselves exclude any peer or time pressure which could have been a factor at the time of task execution including independent inspection.

The approved maintenance data has been available at the work place. As part of the maintenance records along with the LHT job card with detailed steps for signoff and EZY AMOS WO, an AMM extracts customized for the Operator has been attached with the applicable for the event revision #81. The needed tools have been available - a torque wrench with range 30-174 inlb EQ. #20071108 has been booked by the L1 mechanic from the tool crib, used and recorded in the job card. The torque wrench has valid calibration certificate until March 2023. The required materials have also been available - mod kit P/N 511195D02R01 issued with Batch #0222374513 from LTSE Store. The kit has been supplied by the Operator with EASA Form 1 tracking number D2227005491 issued by Airbus S.A.S., status "New". I.a.w. LHT's UK Supplement No. 142 materials with such certificate are eligible for installation on UK-registered aircraft.

The work has commenced with the forward door. The L1 mechanic has started with providing the access requirements - disconnecting the cargo door actuators, their bonding jumpers and electrical harness 4611VB. The first L2 inspector has started with replacement of the seal. After removing the old seal the L2 inspector has positioned the new seal for installation. He has used the ink mark "LOWER DOOR" at the section of the seal adjacent to the door's latching hooks as starting point for inserting the seal into the retainer. After the entire seal has been in place a detailed visual inspection has been done by the 1st L2 inspector with focus on seal's firm position into the retainer along its entire path and for lack of any deformations such as kinks or twists. Although the seal has been installed correctly with the inflation holes facing to the inner part of the door this has not been particularly verified by any of the two (L1 mechanic and 1st L2 inspector). The work on the fwd door has concluded with restoration of the access – reconnection of hydraulic actuators, their bonding jumpers and electrical harness 4611VB.

The two have then moved to the aft door. At that stage they have decided to switch and the L1 has started removing the old seal while the L2 has taken over the access requirements - disconnecting the door actuators, bonding jumpers and electrical harness 4613VB. The L2 has verified that the seal is positioned with the ink mark "LOWER DOOR" at the correct location. Upon completion of new seal's installation the L1 has noticed slight waviness of the seal at the aft lower corner. The L2 has thoroughly inspected the seal along its entire length including with the help of soft plastic scraper to ensure the seal has properly seated into the retainer. Both have concluded that this effect is probably due to the curvature of the door structure particularly in that corner (lower aft) typical for the A319 vs the more 'straight doors of A320/321. Same as with the forward door no verification has been performed for the position of the inflation holes of the seal. The work has concluded with restoration

of the access at the door-actuator interface and lubrication of both doors' seals. The L1 mechanic and the 1st L2 inspector have then signed off the performed steps in the job card and informed the 2nd L2 inspector that the work is done and ready for independent inspection.

Later on the 2nd L2 inspector has visited the worked areas in order to perform an independent inspection. He has started with the forward door paying attention to the correct seal fitment into the retainer, seal's shape and security of installation of the actuators attachment to the door both mechanical and electrical. He has not verified correct seal installation by checking the location of the inflation holes. He has then moved to the aft door inspecting with the same scope without checking the location of the inflation holes. He has been made aware by the 1st L2 about the waviness at the lower aft corner of the aft door but has not considered possible incorrect fitment of the seal. He has then signed off the independent inspection. The job card and corresponding AMOS WO have been closed by authorized B1 support staff on 15th November and the aircraft has been released to service on 17th November.

The second aspect relates to the actions of the of the flight crew of aircraft A319-111, registration G-EZBV, in case of lack of pressurisation during climb.

According to the information received from BULATSA, the explanations of the flight crew of flight crew of aircraft A319-111, registration G-EZBV and the one set out in paragraph 2.1.2 during the flight in the controlled airspace of Sofia Control, VBL sector, the aircraft correctly executed the instructions of the ATCO to climb after took off from LBSF.

When passing FL290 a message Cabin Altitude Warning is appeared on ECAM. The cabin altitude was rising rapidly to about 9000 ft resulting in low cabin pressure. The flight crew reacted to the visual indication and aural warning and stopped the climb. They also donned their oxygen masks, notified the ATC, declared MAYDAY, and made the decision to return to LBSF. The fact was that they set code 7700 on the transponder and started an emergency descent. During the descent the cabin pressure slowly recovered and at 10500 ft reached normal values. The pilots removed the oxygen masks and the aircraft landed normally at Sofia Airport without consequences for the crew.

It should be noted that the flight crew acted in accordance with the procedures prescribed by their aviation operator, which prevented the situation to escalate.

In view of the foregoing, it can be concluded that the serious incident under investigation was the result of a disruption of the technological process of the installation of the aft cargo door pressure seal during the base maintenance activities by the maintenance crew of Lufthansa Technik Sofia, which resulted in a significant cabin leakage.

4. Conclusion

4.1. Findings

As result of the investigation, the Commission made the following conclusions:

1. The aircraft A311-119, MSN – 03122, as manufactured by Airbus Industries, France.
2. The aircraft is registered with registration marks G-EZBV and is entered in the Register of Civil Aircraft of the United Kingdom.
3. The operator of the aircraft is „easyJet (EZY)“.

4. In accordance with the MRO, up to and including the base maintenance (16 YR-check) of the aircraft, all airworthiness maintenance activities have been performed by Lufthansa Technik Sofia holding a Part 145 approval - DE.145.0001.
5. The aircraft is equipped with two CFM56-5B5/P engines.
6. From the beginning of the operation until 17.11.2022, the day of the aviation occurrence, the aircraft has flown 41280:00 h and made 27836 landings.
7. On 17.11.2022, aircraft A319-111, registration G-EZBV, performed a relocation-ferry flight from Sofia airport to London Gatwick airport.
8. The flight (ferry) was the first of this aircraft after base maintenance.
9. The flight crew, Commander, and Co-pilots, possess the required qualification and medical fitness for flights in accordance with existing regulations.
10. From 5 to 16 November 2022, the scheduled activities related to basic maintenance (16 YR-check) have been carried out at the technical base of Lufthansa Technik Sofia.
11. During climb at FL290 a message Cabin Altitude Warning is appeared on ECAM. The cabin altitude was rising rapidly to about 9000 ft.
12. The flight crew reacted to the visual indication and aural warning and stopped the climb.
13. The flight crew donned their oxygen masks, notified the ATC, declared MAYDAY, and made the decision to return to LBSF.
14. The aircraft landed safely on runway 27. There were no consequences for the flight crew.
15. During the inspection carried out after the flight it was found that the Aft cargo door seal was incorrectly installed (the inflation holes are oriented towards the outer side of the aircraft and not towards the inner side).
16. An internal investigation of the reasons for the inappropriate installation of the seal was carried out by Lufthansa Technic Sofia and corrective action was taken.
17. There is no breach of the rules on working time and pre-flight rest periods of the flight crew.
18. The flight crew acted in accordance with the procedures prescribed by their aviation operator, which prevented the situation to escalate.
19. The meteorological conditions at the time of the air occurrence were of no effect to the serious incident.
20. The use of FDR recordings allows clarifying the flight parameters at all stages of the flight, from departure from Sofia Airport to landing back at Sofia Airport.
21. No CVR audition was performed.

22. There is no information that physiological factors or incapacitation affected the crew's performance.

23. The landing was performed normally at 18:14:05 with a vertical overload $N_y=1.3125$.

4.2. Causes

Based on the analysis performed, the Commission points out that the serious incident resulted from the following causes:

Root cause:

Disruption of the technological process of the installation of the aft cargo door pressure seal during the base maintenance activities by the maintenance crew of Lufthansa Technik Sofia, which resulted in a significant cabin leakage.

5. Safety Recommendations

5.1. Actions Taken by Lufthansa Technik Sofia

Lufthansa Technik Sofia has informed Air, Maritime and Railway Accident Investigation National Board in writing dated 18 November 2022 that the following safety measures will be implemented from 19 November 2022:

1. Aft cargo door seal refitted correctly in accordance i.a.w. AMM 52-32-18-400-000-A Rev.81 as referred on TFLB # 635403.
2. Safety Alert SA 2022-002 was created and published via Read & Sign. The document was sent also to MO6 and MO7, LTMIL and LTP.
3. 2. Call for a Management Learning Team (Safety Action Group) meeting i.a.w. IQM. 4190242.
4. As a temporary measure until the investigation is completed and all permanent measure implemented the SMT team is instructed to inspect and aircraft prior redelivery for correct installation of CGO door seals and to report via email to HoP. This measure has been started as of 18.11.2022.
5. Include the doors inflatable pressure seals replacement in the Critical Maintenance Task list Doc. 53961 as separate entry with the check for correct orientation of the inflation holes to be the subject of Independent Inspection.
6. Include the task of cargo doors seal replacement in the OJT's for L1 and L2 in CRG area.

5.2. Actions Taken by AIRBUS S.A.S.

Regarding the aviation event, the manufacturer has taken the following actions:

5.2.1. Aircraft Maintenance Manual (AMM) update

The following AMM tasks were reviewed after this incident:

- TASK 52-31-18-400-001-A Installation of the Door Seal related to the installation of the door seal on the forward cargo door.
- TASK 52-32-18-400-001-A Installation of the Door Seal related to the installation of the door seal on the aft cargo door.

The following amber **CAUTION** was present at the time of the incident:

“MAKE SURE THAT THE DOOR SEAL IS INSTALLED IN THE CORRECT POSITION. IF THE DOOR SEAL IS NOT INSTALLED IN THE CORRECT POSITION, IT WILL NOT BE POSSIBLE FOR THE AIRCRAFT TO KEEP THE PRESSURIZATION IN FLIGHT”.

To further insist on the operational consequences of a wrong seal installation, this AMM CAUTION will become a **WARNING** in the next scheduled AMM revisions. This WARNING will insist on the consequences of a wrong door seal installation: “**THE DOOR SEAL WILL NOT INFLATE CORRECTLY DURING FLIGHT, WHICH WILL CAUSE A LOSS OF AIRCRAFT PRESSURIZATION**”

5.2.2. Maintenance Briefing Note (MBN)

A specific Maintenance Briefing Note (MBN) “Forward & aft cargo door seal installation” was developed after this incident to provide technical context and maintenance recommendations to prevent cabin pressurisation issues following cargo door seal replacement. MBNs are part of a set of Briefing Notes that provide recommendations related to applicable standards, techniques, best practices, or human factors, in order to address identified threats and hazards that may affect maintenance performance. As highlighted in the MBN, even if the cargo door seal installation could be considered as straightforward, it is not regularly replaced. Therefore, attention to instructions, warnings, cautions and notes is key to ensure correct installation.

A copy of the MBN is provided in Annex 2. Maintenance videos are currently being developed and will be included in the Revision 02 of this MBN.

5.2.3. Operators Information Transmission (OIT)

An Operators Information Transmission (OIT) was also published to inform A320Family Operators about flight diversions or IFTB events experienced due to cabin pressurization issues in flight, following cargo door seals wrong installation.

AIRBUS recommended to all Operators to distribute this OIT to all of their applicable Maintenance and Engineering organizations and MRO facilities in order to raise the awareness of ground staff and mechanics on these issues.

OIT is provided in Annex 3.

5.3. Safety Recommendation

Taking into account the causes of the serious incident and the deficiencies found in the investigation, the Commission recommends that the following measures should be taken to ensure the flight safety:

BG.SIA-2024-01. Lufthansa Technik Sofia to include the doors inflatable pressure seals replacement on A320 Family aircraft in the Critical Maintenance Task as separate entry with the check for correct orientation of the inflation holes to be the subject of Independent Inspection.

BG.SIA-2024-02 Lufthansa Technician Sofia to include the task of cargo doors seal replacement in the on-the-job training for Level1 and Level 2 in CRG area.

The Investigation Commission reminds all organizations, to which flight safety recommendations are sent that, on the grounds of Article 18 of Regulation (EU) 996/2010 on Investigation and Prevention of Accidents and Incidents in Civil Aviation and Article 19, paragraph 7 of Ordinance No. 13 on the Investigation of Aviation Accidents are obliged to notify the Air, Maritime and Railway Accidents Investigation National Board in writing of the action taken on the recommendations made.

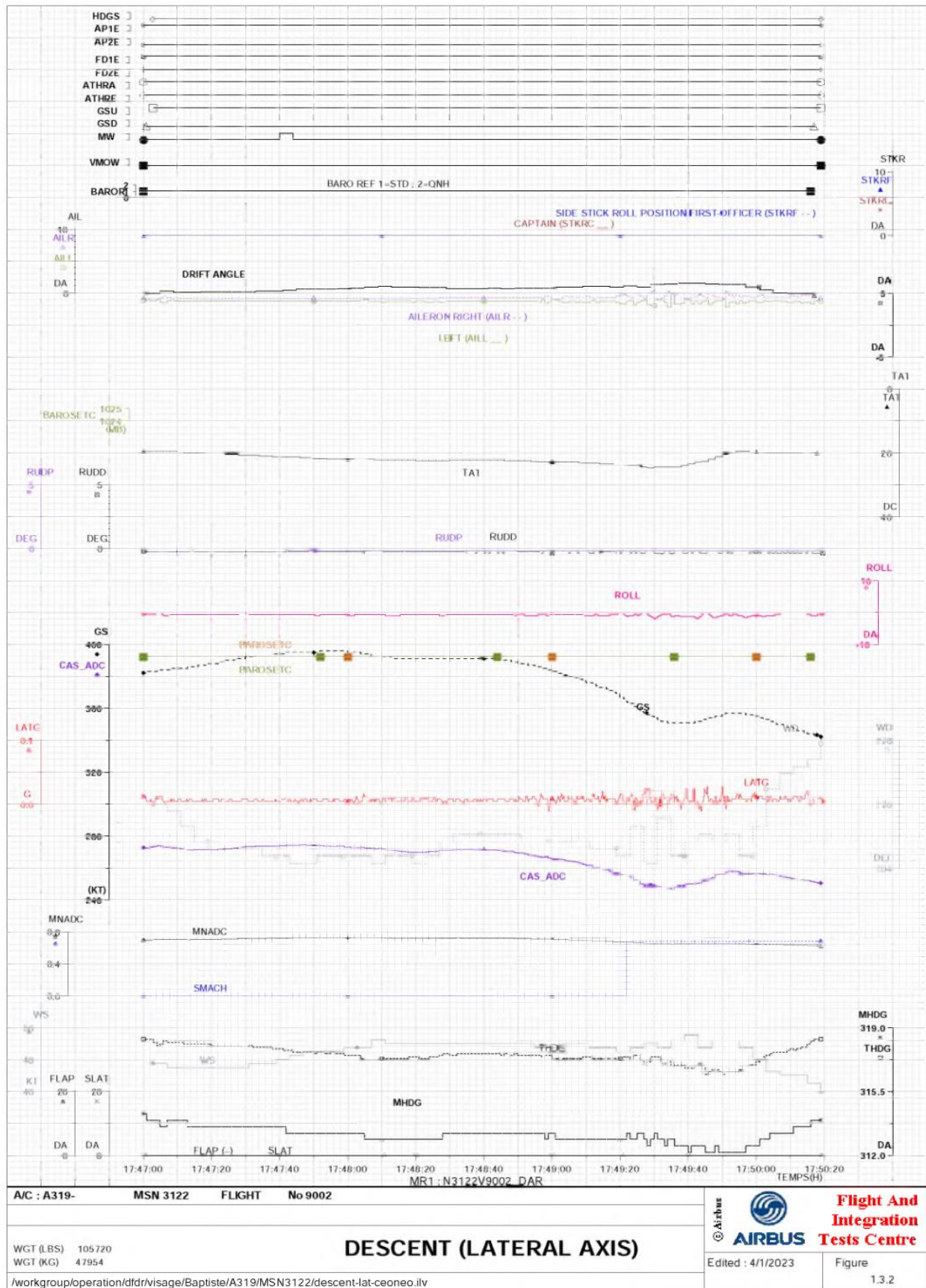
AIR, MARITIME AND RAILWAY ACCIDENTS INVESTIGATION NATIONAL BOARD

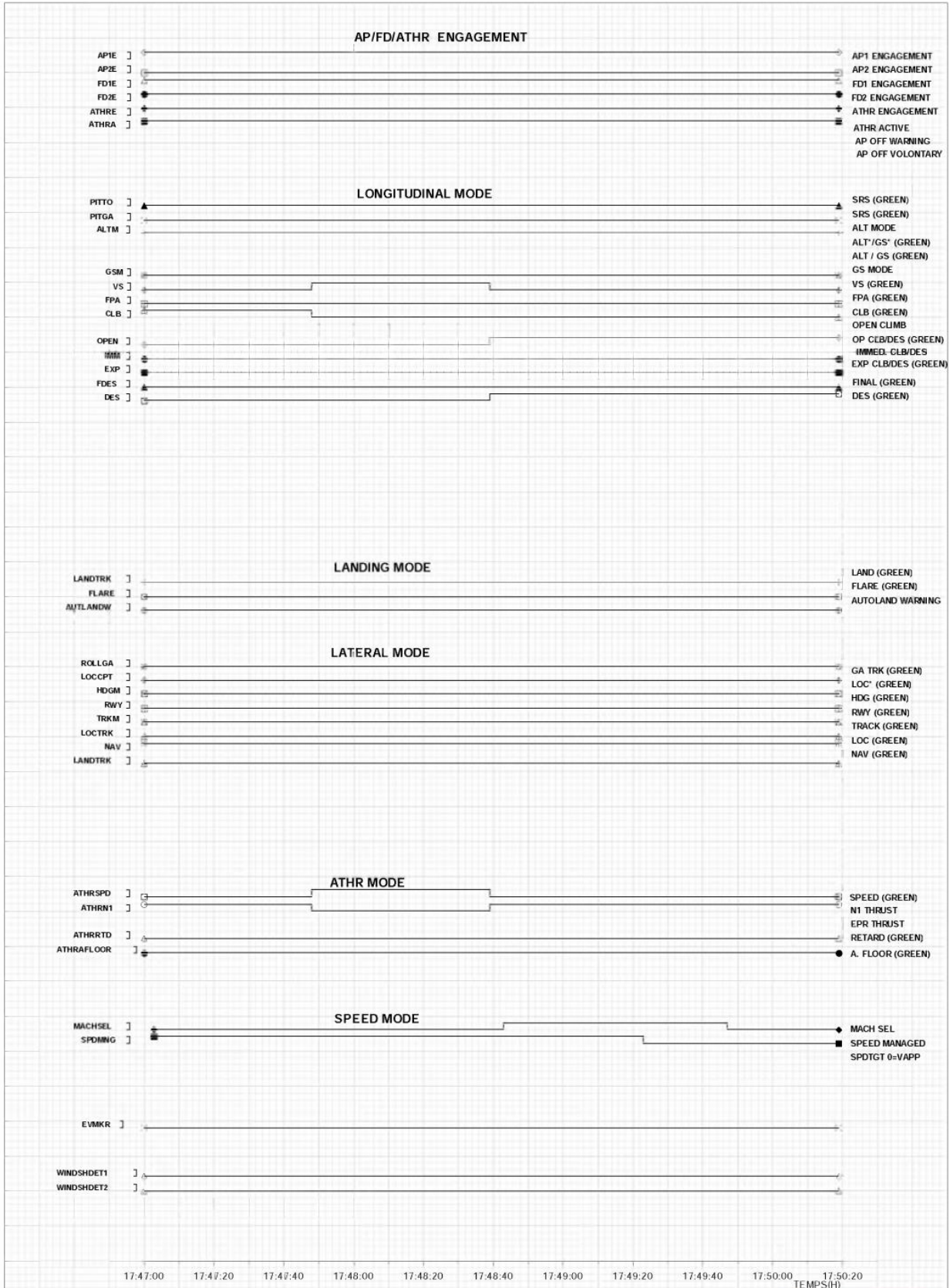
COMMISSION ON INVESTIGATION OF THE SERIOUS INCIDENT

Sofia

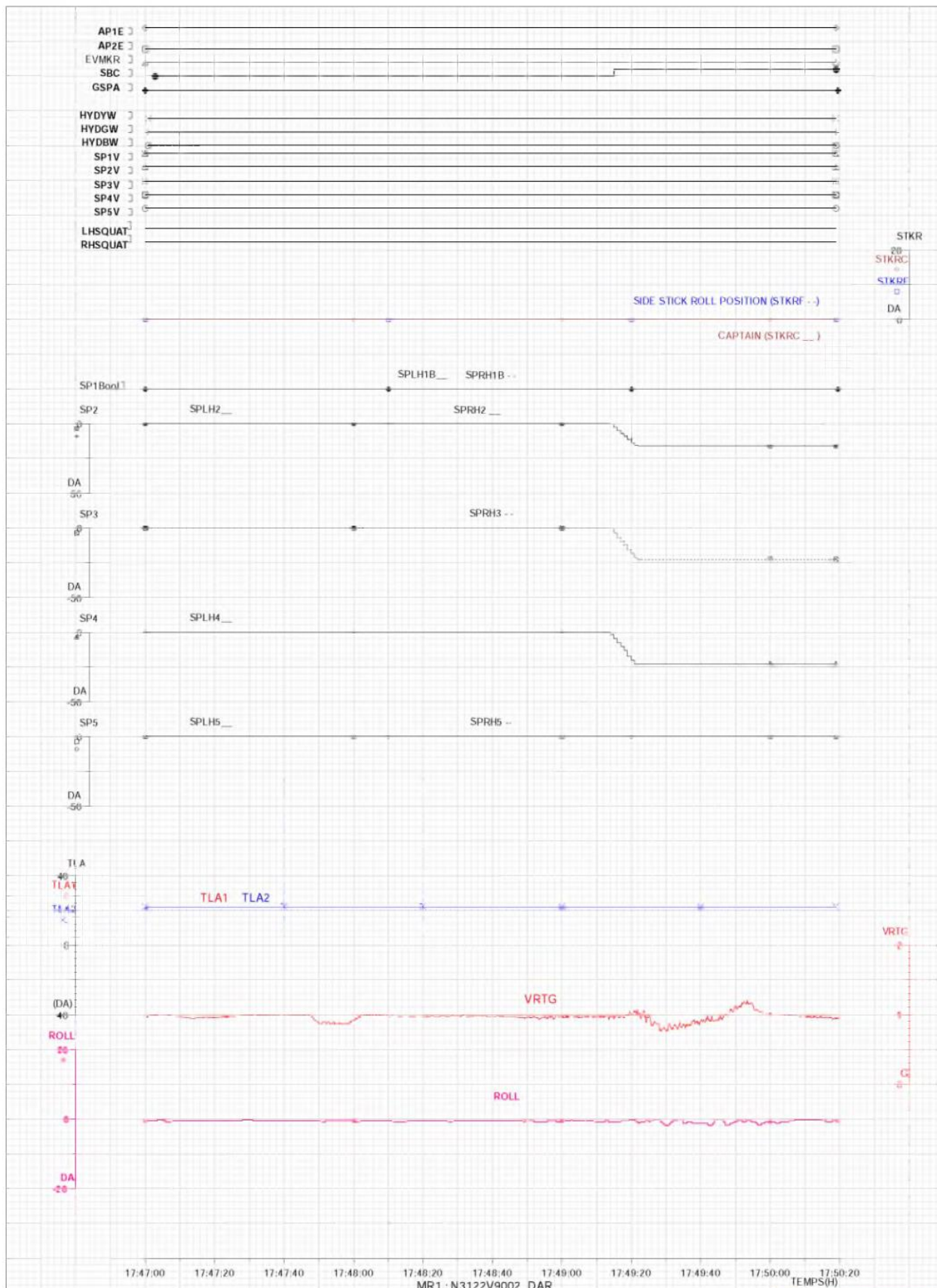
March 29, 2024

ANNEX 1

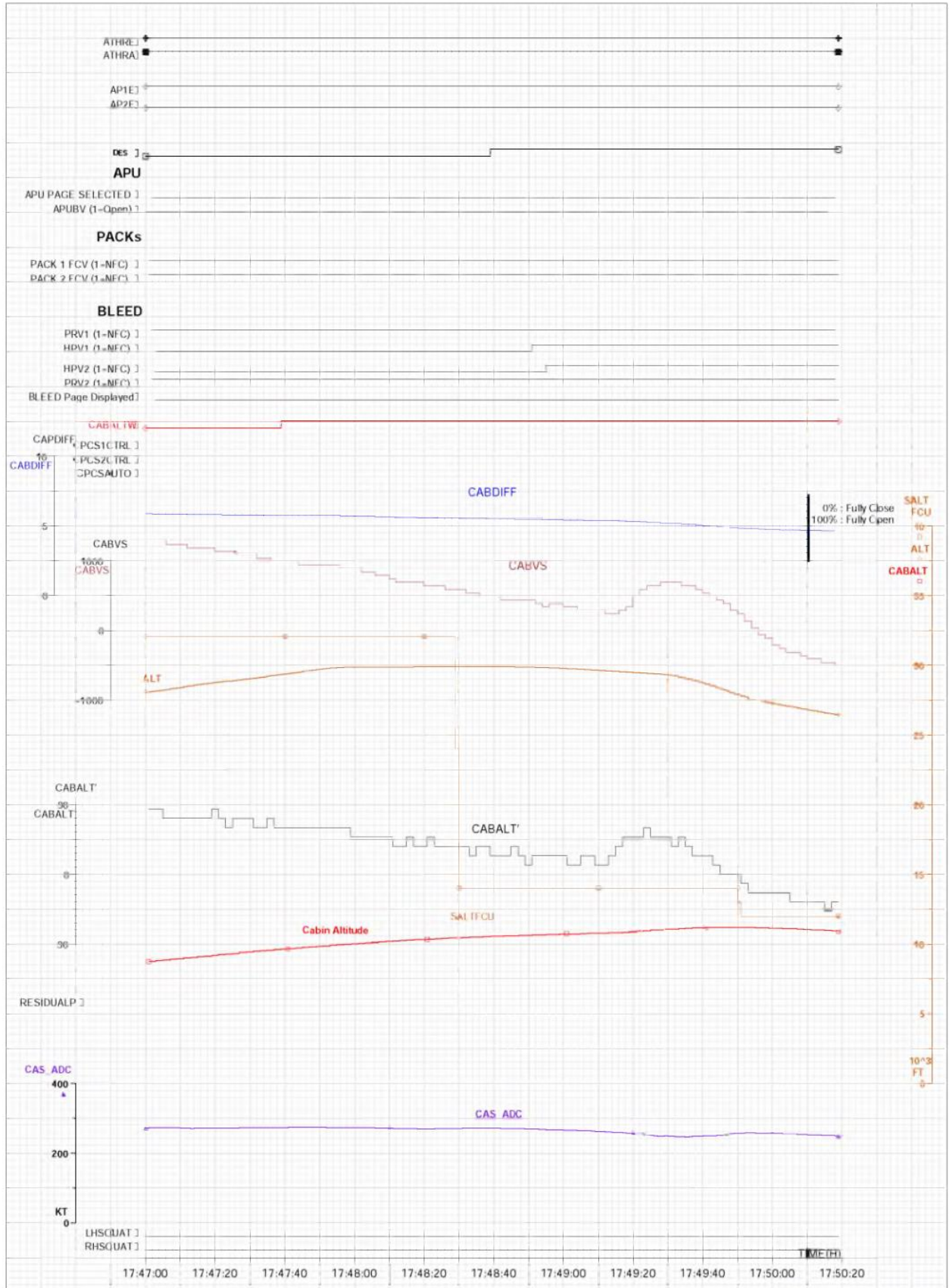





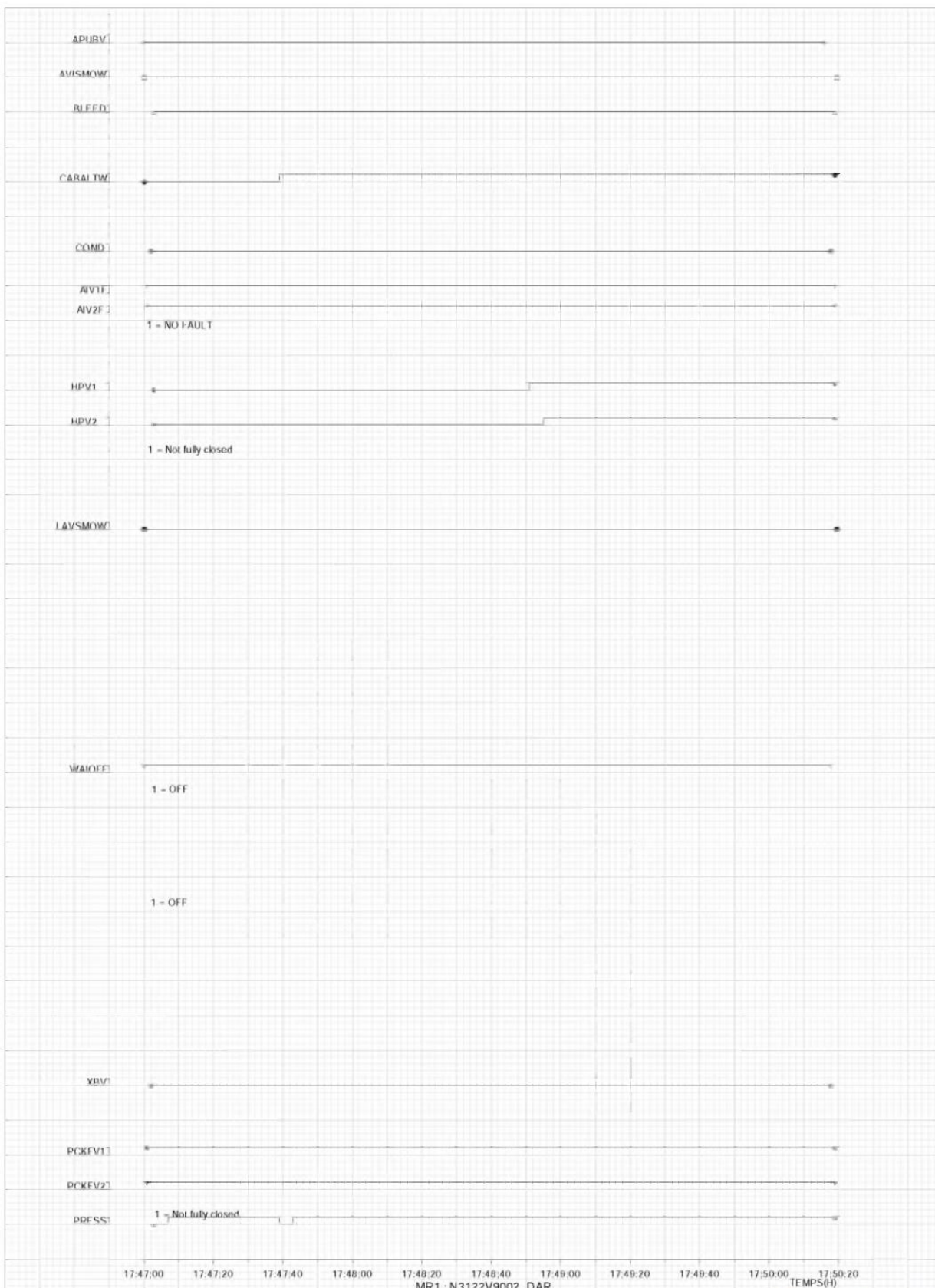
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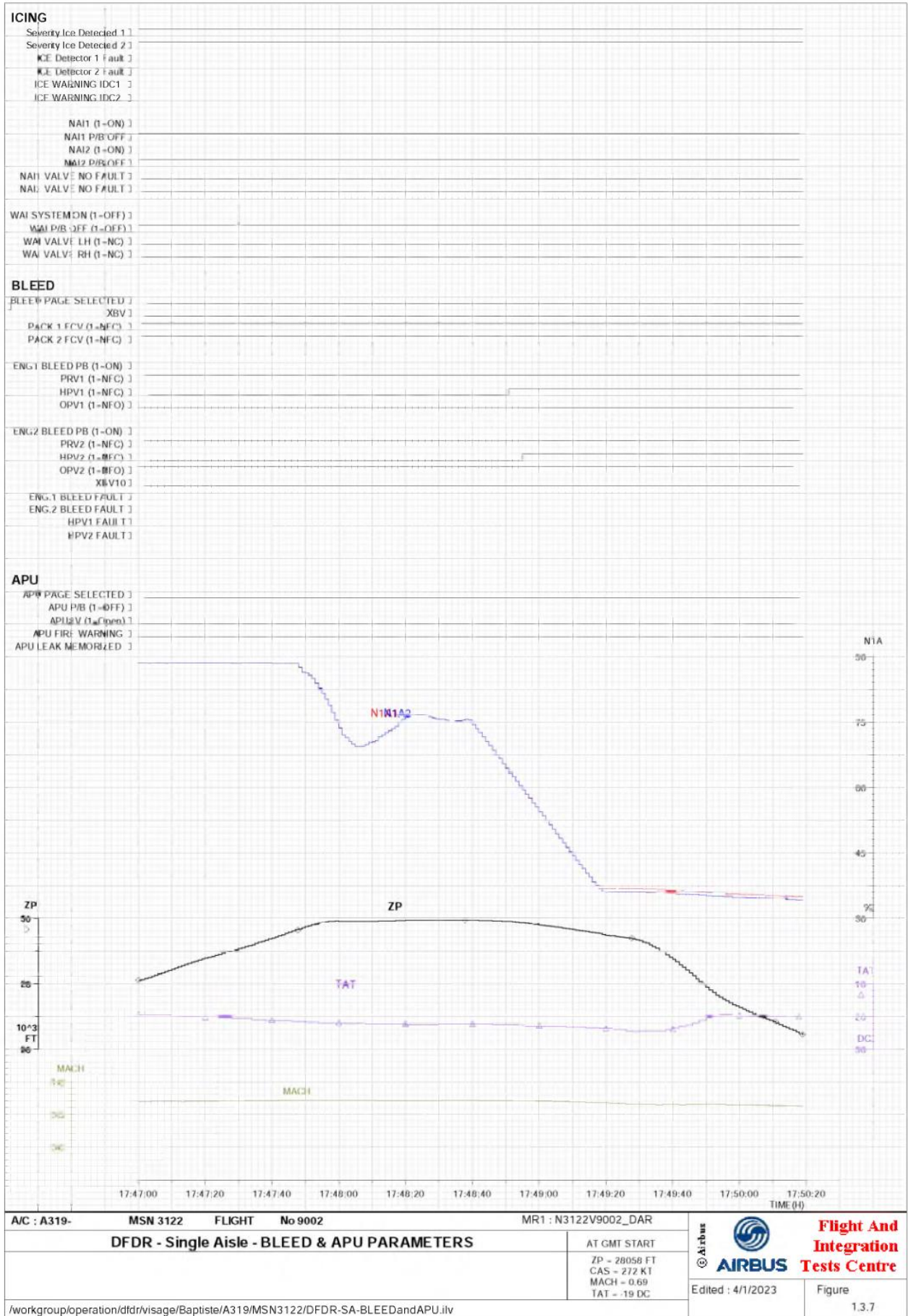
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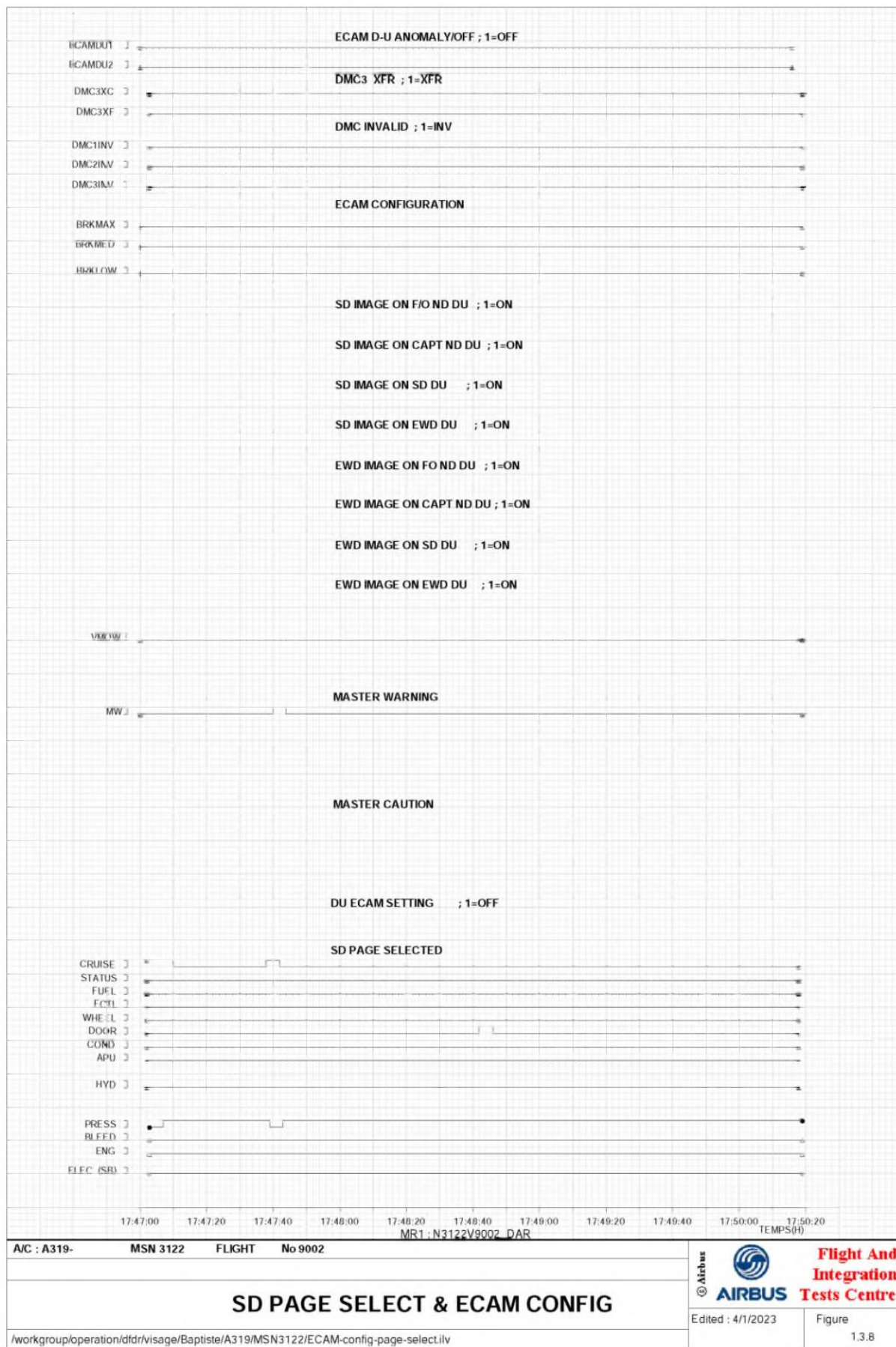


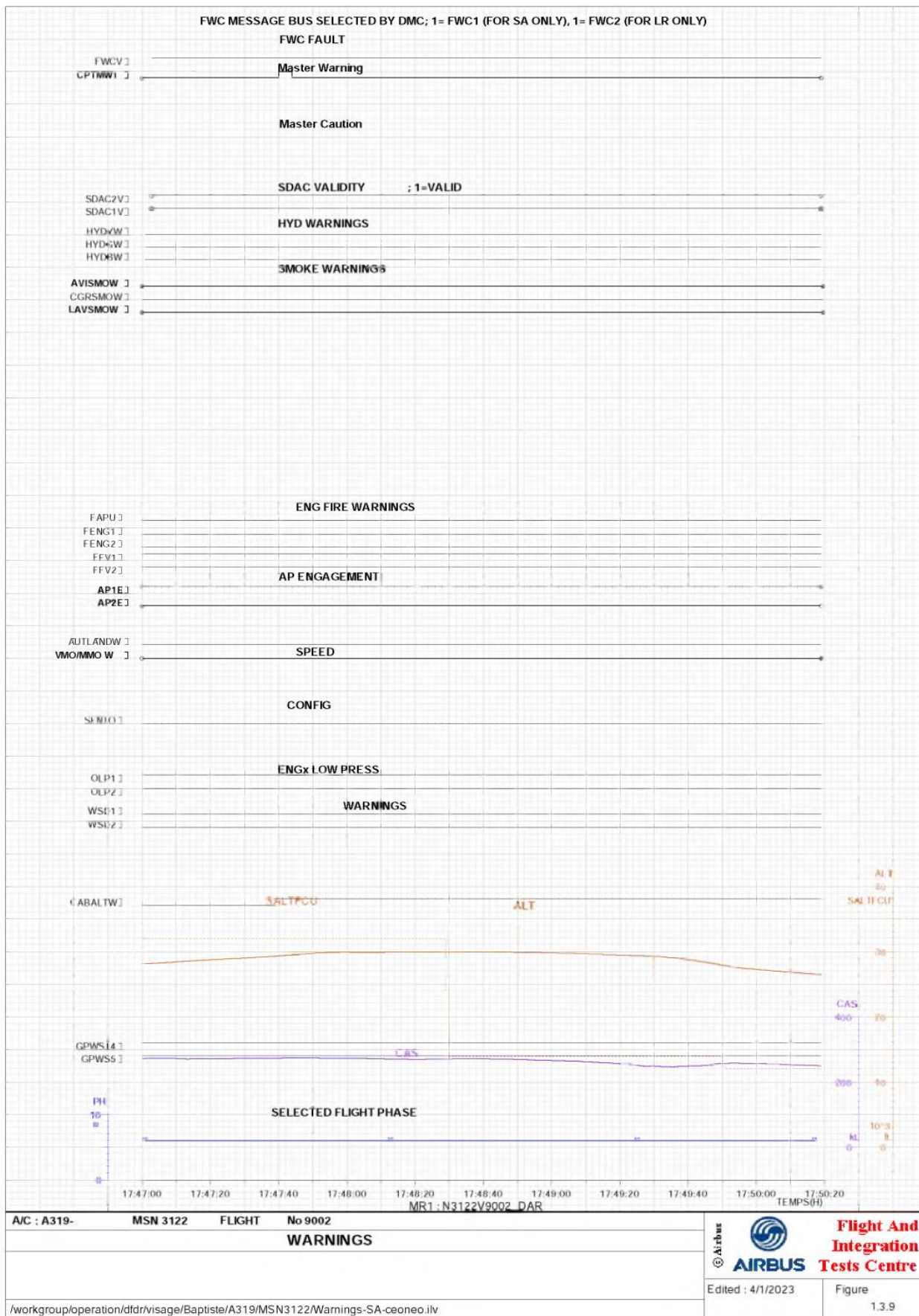
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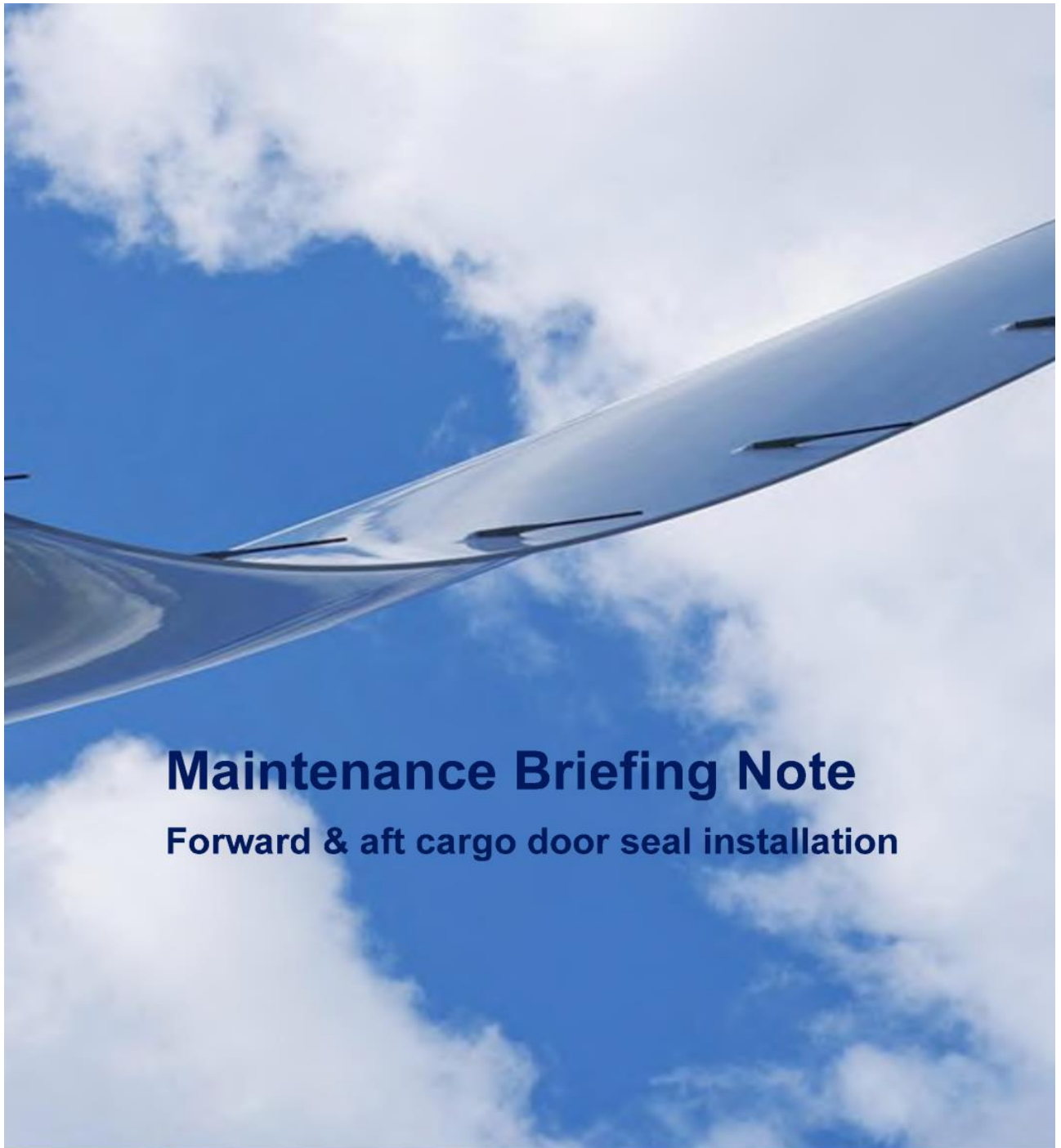
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AIR CONDITIONNING- DISCRET STATUS				
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ANNEX 2



Maintenance Briefing Note

Forward & aft cargo door seal installation

Date: April 2023
Issue: 1

AIRBUS

Forward & aft cargo door seal installation

WHAT HAPPENED?

An A319 operator declared a May-Day to the ATC and performed an emergency descent to destination airport due to slow cabin depressurization after take-off. The aircraft landed uneventfully.

Before this event, the cargo door seals were replaced in the frame of the mandated (AD 2021-0049) cargo & bulk door seal replacement as per SB A320-52-1195 (applicable to CEO aircraft, respectively SB A320-52-1196 applicable to NEO aircraft).

WHY IT HAPPEN?

The forward and aft cargo doors are equipped with a pressurized rubber seal with inflation holes facing the inner side of the cargo door.

During its replacement, the forward cargo door seal was installed inadvertently in the wrong position, with the inflation holes not facing the inner side of the door. Because of this wrong orientation of the seal holes, the seal did not serve its purpose and caused the depressurization of the cabin in flight.

Similar events, sometimes associated with the following symptoms, have already been reported to Airbus :

- Abnormal/high cabin V/S and/or abnormal increase of cabin altitude
- In-Flight Turn Back due to "CAB PR EXCESS CAB ALT" warning during climb or cruise
- Loud bang during climb caused by sudden loss of air pressure
- Oxygen masks deployment in cabin in some cases

Subsequent Safety investigations confirmed the incorrect installation of the cargo door seal with inflation holes pointing in the wrong direction.

The vast majority of these cases were reported by A320 Family operators. Few cases occurred on other aircraft programs for which the cargo door seals are thicker and are thus more difficult to install incorrectly.

HOW IS THE CARGO DOOR SEAL DESIGNED TO OPERATE?

The seal surrounds the whole door inside the seal retainer of the structure. When correctly installed, the inflation holes face the inner side of the cargo door.

When the aircraft is pressurized during flight, the inflated seal ensures the tightness of the cargo door.



**Correct installation:
Inflation hole facing the inner side of the door**

2 Forward & aft cargo door seal installation
April 2023

Forward & aft cargo door seal installation

RECOMMENDATION

Even if the cargo door seal installation could be considered as straightforward, it is not regularly replaced. Attention to instructions, warnings, cautions and notes is key to ensure correct installation.

For cargo door seal replacement on A320 Family aircraft, refer to the AMM:

- 52-31-18 FWD cargo door
- 52-32-18 AFT cargo door

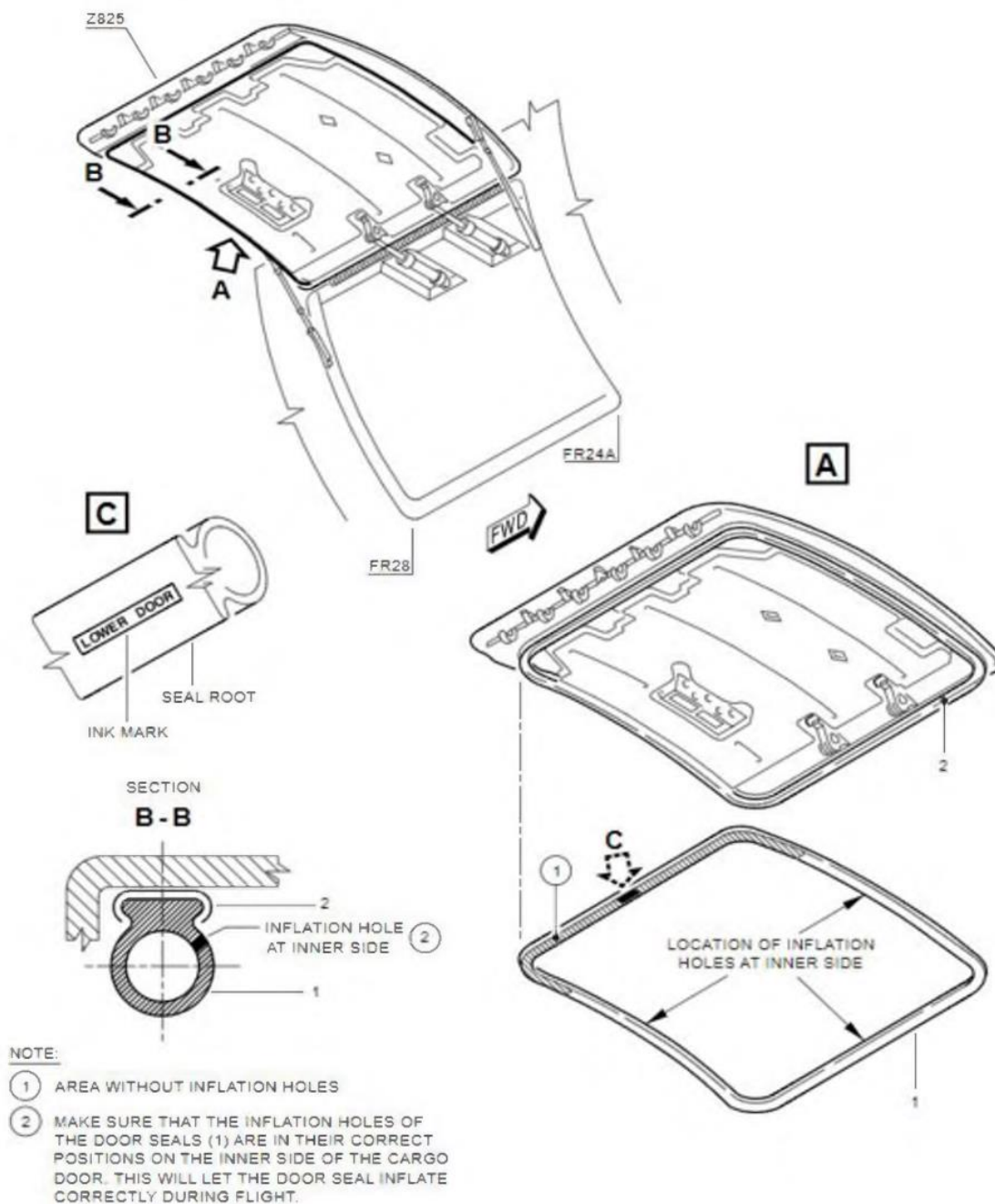
The AMM provides the necessary instructions for correct installation of the cargo door seals. The AMM procedure shall strictly be followed :

- A **CAUTION** indicates that cargo door seals have preformed corners which shall be installed before the straight parts to prevent wrinkles.
- Dedicated figures (see next page) illustrate the correct position of the seal (1), the inflation holes and the markings.
- An installation **STEP** requires to always make sure that the inflation holes of the door seal (1) are in their correct position on the inner side of the cargo door.
- A **CAUTION** indicates to **MAKE SURE THAT THE DOOR SEAL IS INSTALLED IN THE CORRECT POSITION. IF THE DOOR SEAL IS NOT INSTALLED IN THE CORRECT POSITION, IT WILL NOT BE POSSIBLE FOR THE AIRCRAFT TO KEEP THE PRESSURIZATION IN FLIGHT.**

To further insist on the operational consequences of a wrong seal installation, this AMM **CAUTION** will become a **WARNING** in the next scheduled AMM revisions. This **WARNING** will insist on the consequences of a wrong door seal installation: **THE DOOR SEAL WILL NOT INFLATE CORRECTLY DURING FLIGHT, WHICH WILL CAUSE A LOSS OF AIRCRAFT PRESSURIZATION**

- A visual inspection of the door seal is required after installation to make sure that it is compressed along its length and that the inflation holes of the door seal (1) are in their correct position on the inner side of the cargo door.

Forward & aft cargo door seal installation



A320 fwd cargo door seal installation

ANNEX 3

Maintenance Briefing Notes

This Maintenance Briefing Note (MBN) is part of a set of Briefing Notes that provide recommendations related to applicable standards, techniques, best practices or human factors, in order to address identified threats and hazards that may affect maintenance performance.

This MBN is intended to enhance the reader's awareness about safety, but it shall not supersede the applicable regulations and the Airbus or airline's maintenance documentation. Should any deviation appear between this MBN and the Airbus or airline's maintenance documentation, the latter shall prevail at all times.

This MBN provides recommendations on Maintenance and Engineering issues/information.

Even though it is left to each Operator's discretion whether to distribute this MBN, or to distribute the information contained in this MBN, to all of their applicable Maintenance and Engineering organizations for information, Airbus strongly recommends such distribution to relevant stakeholders in the interest of safety promotion.

Any commercial use of this MBN is strictly excluded.

Airbus Customer Services values your opinion and invites you to participate in a quick survey about this Maintenance Briefing Note.

Your feedback

For suggestions regarding the Maintenance Briefing Notes

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OPERATORS INFORMATION TRANSMISSION - OIT

SUBJECT: ATA 52 – CARGO DOORS SEALS INSTALLATION

AIRCRAFT TYPE: A318, A319, A320, A321

OUR REF.: 999.0040/23 Rev 00 dated 21-JUN-2023

OIT CATEGORY: **Advice**

NOTICE: This OIT provides recommendations on Maintenance and Engineering issues/information. It is left to each Operator's discretion whether to distribute this OIT, or to distribute the information contained in this OIT, to all of their applicable Maintenance and Engineering organizations for information or application of the recommendation.

REFERENCED DOCUMENTS:

Ref.1: MBN Forward & aft cargo door seal installation, Rev.01 01/APR/2023

Ref.2: SB A320-52-1195 & A320-52-1196

Ref.3: AMM Task 52-31-18-400-001-A, Task 52-32-18-400-001-A and Task 52-33-18-400-001-A

Ref.4: TFU 52.30.00034 (A320Fam Cargo Compartment Doors Seal Adaptation for Halon Leakage Improvement)

Ref.5: ISI 00.00.00437 (A320 Family Systems Ageing global ISI)

1. PURPOSE

To inform A320Fam Operators about flight diversions or IFTB events experienced due to cabin pressurization issues in flight, following cargo door seals wrong installation.

A Maintenance Briefing Note (MBN) Ref.1 is available in AirbusWorld to provide technical context and maintenance recommendations to prevent such events.

AIRBUS recommends to all Operators to distribute this OIT to all of their applicable Maintenance and Engineering organizations and MRO facilities in order to raise the awareness of ground staff and mechanics.

2. BACKGROUND

Some operators reported events of IFTB or diversion due to slow cabin depressurization after take-off or cabin pressurization issues with the following symptoms:

- Abnormal/high cabin V/S and/or abnormal increase of cabin altitude,
- "CAB PR EXCESS CAB ALT" warning during climb or cruise,
- Loud bang during climb caused by sudden loss of air pressure,
- Oxygen mask deployment in cabin in some cases,

The root cause is incorrect installation of the cargo door seal(s) with inflation holes located in the wrong direction.

OIT ref: 999.0040/23 Rev 00

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Date: 21-JUN-2023

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3. DESCRIPTION

Before the reported events, AIRBUS was advised that the cargo door seals had been replaced. Further to the issuance of the mandated retrofit, as per SB Ref.2, an increase in such events has been reported. Cargo doors are equipped with a pressurized rubber seal with inflation holes facing the inner side of the cargo door.

During replacement, the cargo door seal must be installed in the correct position, with the inflation holes facing the inner side of the fuselage. In case of the wrong orientation of the seal holes, the seal will not serve its purpose and cause the inability to pressurize the cabin or lead to cabin depressurization.

AMM tasks Ref.3 provide all necessary instructions for correct installation of the cargo door seals (see Figure 1 for illustration). Best practices are also highlighted in articles Ref.1, Ref.4 and Ref.5.

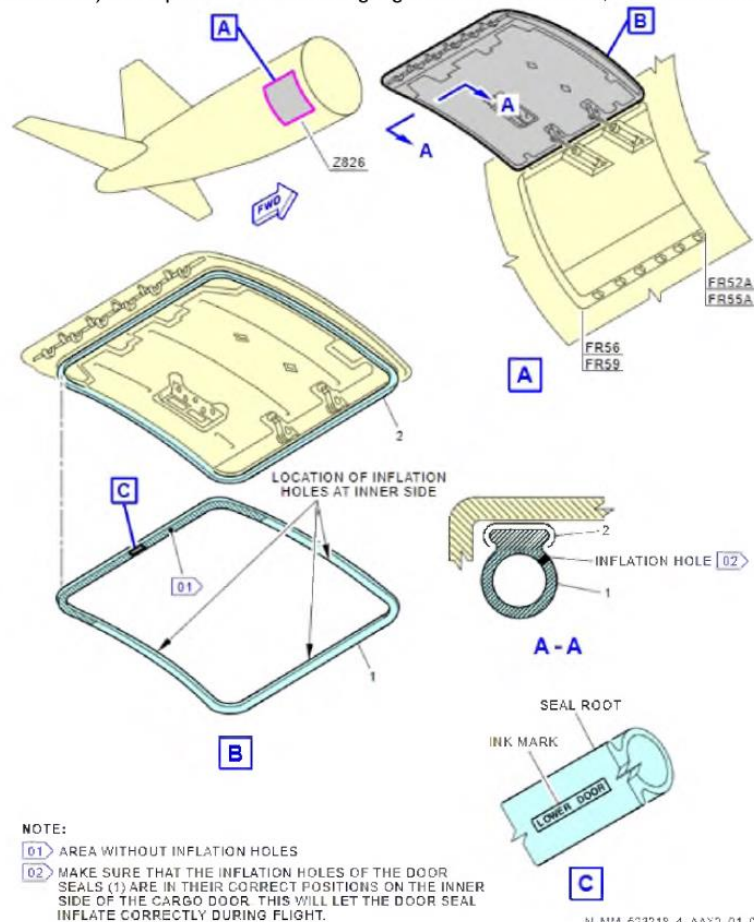


Figure 1: Aft Cargo Door Seal Installation (extract from AMM Figure 52-32-18)

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The Maintenance Briefing Note (MBN) Ref.1 is attached to this OIT and available through the AirbusWorld path below:

AirbusWorld > Content Library > Maintenance and Engineering > Safety Enhancement > Maintenance Briefing Notes

4. FOLLOW UP

No specific follow-up is foreseen.

5. CONTACTS

Questions about the technical content of this OIT are to be addressed to Airbus Customer Services through [TechRequest](#) on Airbus World, selecting Maintenance & Engineering Domain, Engineering Support Section and ATA 52-30.

Best Regards,

Franck OUNDJIAN
SENIOR DIRECTOR ENGINEERING STRUCTURE
CUSTOMER SERVICES

ANNEX 4

ATC-Aircraft communication transcripts.

17:37:54:

ATCO Tower EZY9002, cleared for take-off RWY27, wind 150 degrees, 3 knots. Airborne frequency 123.7.

Flight crew Take-off from 27, 123.7, EZY9002.

APP**17:38:35:**

Flight crew Sofia Approach EZY9002, OGOTA 2T, passing 3500, climb level 240.
ATCO APP EZY9002, Good evening, Sofia Approach. Identified.

17:42:36:

ATCO APP EZY9002 track UTEKA, climb Flight Level 280.

Flight crew UTEKA, climb Flight Level 280, EZY9002.

17:44:13:

ATCO APP EZY9002, contact Sofia Control 131,225. Goodbye.

Flight crew 131,225, EZY9002. Goodbye.

ACC**17:44:30:**

Flight crew Radar, EZY9002, climb level 280, UTEKA.

ATCO Control EZY9002, Good evening, Sofia Control. Identified.

17:46:00:

ATCO Control EZY9002, climb flight level 320.

Flight crew Climb flight level 320, EZY9002.

17:47:21:

ATCO Control EZY9002, what is your requested level today?

Flight crew 380, EZY9002.

ATCO Control

Roger.

17:47:40:

Flight crew EZY9002, we are levelling off flight level 300. (Background alarm sound)

ATCO Control EZY9002, Roger. Clear to maintain 300.

17:48:16

Flight crew (unintelligible).....

17:48:20

Flight crew EZY9002, we request descend level 100.

ATCO Control EZY9002, Copied your request. Descend flight level 140 initially.

Flight crew Descend Flight level 140, EZY9003.

17:49:37:

Flight crew MAYDAY, MAYDAY, MAYDAY. EZY9002, we are pressurization issue. We are descending FL140. Currently on route to UTEKA.

ATCO Control EZY9002, copied your emergency, descent 120, state intentions when able.

Flight crew Descend 120, say again the last, EZY002.

ATCO Control 9002, report intentions when able.

Flight crew ... probably go back to Sofia, EZY9002

17:50:37:

Flight crew EZY9002, request back to Sofia.

ATCO Control EZY9002, confirm request to land at Sofia?

Flight crew Affirm.

ATCO Control EZY9002, turn left heading 130.

Flight crew Left heading 130, 9002.

17:52:14:

ATCO Control EZY9002, proceed to point RUBIV, Romeo-Uniform-Bravo-India-Viktor.

Flight crew Romeo-Uniform-Bravo-India-Viktor, EZY9002.

17:52:40:

ATCO Control EZY9002, contact approach on 123.7

Flight crew 123.7, 9002. Thank you, Bye bye.

APP

17:53:19:

Flight crew Approach, EZY... MAYDAY EZY9002, descending FL120 inbound RUBIV.

ATCO APP EZY9002, Good evening, Sofia Approach, Identified. Copied Mayday. Expect vectoring ILS-Z Approach RWY 27.

Flight crew ILS 27 copied, 9002.

17:55:03:

ATCO APP EZY9002, do you prefer to descent now lower or do you prefer to descent after a few minutes.

Flight crew Standby.

Flight crew Yeah, If possible, we can descend flight level 100. Would that be ok EZY9002?

ATCO APP EZY9002, descend to altitude 10 thousand feet QNH 1005.

Flight crew Descend to altitude 10 thousand QNH 1005, EZY9002.

ATCO APP EZY9002, revision. Descent to altitude 10 and ... 10 thousand 5 hundred feet, 10 thousand 5 hundred feet due Terrain. Expect lower after 20 miles.

Flight crew Roger, that's Copied. Descend to 10 thousand 5 hundred, EZY9002.

17:57:42:

Flight crew EZY9002 We are off oxygen now, we've got the situation of the cabin pressure under control, but we still need to return to Sofia, but we are cancelling our MAYDAY

ATCO APP EZY9002, roger. Mayday cancelled. Still returning to Sofia. Maintain present heading. Continue as cleared. Later on, expect vectoring.

Flight crew Continue as cleared, EZY9002.

18:00:53:

ATCO APP EZY9002, when convenient for you, please, say if you have dangerous goods on board, report fuel tankage and souls on board.

Flight crew Please, Standby.

18:01:18:

Flight crew EZY9002, we have no dangerous goods, 2 POB and 7.3 tons on board

ATCO APP EZY9002, copied. Just to confirm 2 people on board, 2

Flight crew Affirm. Just us 2, EZY9002.

ATCO APP Roger.

18:01:51:

ATCO APP EZY9002, descent to altitude 8000 feet, QNH 1005.

Flight crew 8000 feet, QNH 1005, EZY9002.

18:02:35:

ATCO APP *EZY9002, expected track distance 33 miles, expect 10 miles final.*

Flight crew That's copied, thank you. EZY9002.

18:03:02:

Flight crew EZY9002, do you want us to maintain on heading or do you want us direct to RUBIV?

ATCO APP *EZY9002, maintain present heading expect right turn to final after 14 miles.*

Flight crew That's copied, maintaining the heading, EZY9002.

ATCO APP *EZY9002, descend to altitude 7500 feet.*

Flight crew Descend to altitude 7500 feet, EZY9002.

18:04:50:

ATCO APP *EZY9002, turn right 5 degrees*

Flight crew Right 5 degrees, EZY9002.

18:05:32:

ATCO APP *EZY9002, descend to altitude 6500 feet.*

Flight crew Descend altitude 6500 feet, EZY9002.

18:06:21:

ATCO APP *EZY9002, I'll take you through the centreline to lose the altitude normally. Expect final right turn after 4 miles.*

Flight crew Copied. EZY9002.

18:06:58:

ATCO *EZY9002, turn right heading 300, descend to altitude 5500 feet, cleared ILS-Z RWY 27.*

Flight crew Right 3 hundred, down descend 5 thousand 5 hundred, cleared ILS RWY 27, EZY9002.

18:09:09:

Flight crew EZY9002, request further descent.

ATCO APP *EZY9002, descend to altitude 3600 feet. Report when established.*

Flight crew 3600 feet, wilco, EZY9002.

18:09:43:

Flight crew EZY9002, established.

ATCO APP *EZY9002, position 9 miles and a half to go, contact TWR 118.1, Goodbye.*

Flight crew 118.1, EZY9002, bye bye.

TWR

18:10:07: Flight crew TWR, hello again, EZY9002, ILS inbound.

ATCO Tower *EZY9002, hello Sofia TWR. Cleared to land RWY 27, Wind 210 degrees 3 knots. After landing vacate via C.*

Flight crew Cleared to land RWY 27. Vacate C. EZY9002.

18:15:03:

ATCO Tower *EZY9002, vacate via C to the apron next left on J expect Follow-me car.*

Flight crew Left on C, J, Follow-me, EZY9002.

ATCO Tower *9002, via C to the apron and expect Follow-me car.*

Flight crew Via C to the apron then expect Follow-me, EZY9002