



AIR ACCIDENTS INVESTIGATION
INSTITUTE OF THE CZECH REPUBLIC
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CZ-14-587

FINAL REPORT

**Investigation Serious incident involving
of Airbus A319, registration mark OK-NEP,
in FIR Sofia and Istanbul on 9 September 2014.**

April 2015

This investigation has been carried out in accordance with the Regulation EU No 996/2010, Act No 49/1997 Coll., on civil aviation and Annex 13 to the ICAO Convention on International Civil Aviation. The sole objective of the investigation of an accident or incident under these Regulations shall be the prevention of accidents and incidents. It shall not be the purpose of such an investigation to apportion blame or liability. The Final Report, findings and conclusions therein concerning air accidents and incidents, and possibly systemic shortcomings endangering operational safety, are only of an informative nature and cannot be used otherwise than as a recommendation for the implementation of measures in order to prevent further air accidents and incidents with similar causes. The creator of the Final Report explicitly states that the Final Report cannot be used to determine blame or responsibility in connection with determining the causes of an air accident or incident and cannot be used for enforcing claims in the event of an insurance claim.

This report has been translated and published by the Air Accidents Investigation Institute to make its reading easier for English-speaking people. As accurate as the translation may be, the original text in Czech is the work of reference.

List of used abbreviations:

| | |
|----------|---|
| AAll | - Air Accidents Investigation Institute |
| A/THR | - Auto Throttle |
| ACMS | - Aircraft Condition Monitoring System |
| AMM | - Aircraft Maintenance Manual |
| AP | - Auto Pilot |
| APP | - Approach Control Office |
| ATCo | - Air Traffic Controller |
| ATPL (A) | - Airline Transport Pilot License Aeroplanes |
| ATS | - Air Traffic Services |
| BGS VOR | - VHF Omnidirectional Radio Range Burgas |
| CAB ALT | - Cabin Altitude |
| CAVOK | - Visibility, Cloud, and Present Weather better than prescribed values or condition |
| CPC | - Cabin Pressure Controller |
| CPT | - Captain |
| CVR | - Cockpit Voice Recorder |
| CSA | - Czech Airlines |
| CSAT | - Czech Airlines Technics |
| DFDR | - Digital Flight Data Recorder |
| E | - East |
| E/W D | - Engine and Warning Display |
| ECAM | - Electronic Centralized Aircraft Monitoring |
| ECS | - Environmental Conditioning System |
| FD | - Flight Director |
| FIR | - Flight Information Region |
| FSQ | - Flight Safety and Quality |
| ft | - Feet |
| hrs | - Hours |

| | |
|---------|--|
| hPa | - Hectopascal |
| HDG | - Heading |
| ILS | - Instrument Landing System |
| kg | - Kilogram |
| kt | - Knot |
| LBBG | - Burgas Airport, Bulgaria |
| LBSR | - FIR SOFIA, Bulgaria |
| LC | - Line Check of Pilot |
| LKPR | - PRAHA/Ruzyně Airport, Czech Republic |
| LTAA | - FIR ANKARA, Turkey |
| LTBB | - FIR ISTANBUL, Turkey |
| M | - Mach Number |
| MAY DAY | - Radiotelephony Distress signal |
| MEL | - Minimum Equipment List |
| METAR | - Aerodrome Routine Weather Report |
| MHz | - Megahertz |
| min | - Minut |
| MP | - Maintenance Procedure |
| MPS | - Meter per Second |
| N | - North |
| NIL | - None |
| NOSIG | - No Significant Change |
| OFV | - Outflow Valve |
| PAX | - Passengers |
| PFR | - Past Flight Report |
| PR | - Pressure |
| psi | - Pound per Square Inch |
| QNE | - Sea Level Standard Atmosphere Pressure |
| RWY | - Runway |
| SB | - Service Bulletin |
| SD | - Split Display |

| | |
|----------|--|
| SDAC | - System Data Analog Converter |
| s | - Second |
| SEL | - Selector |
| SIM | - Check of Pilot on Simulator |
| SSFDR | - Solid State Flight Data Recorder |
| SV | - Safety Valve |
| t | - Time |
| THR IDLE | - Thrust Idle |
| THSA | - Trimmable Horizontal Stabilizer Actuator |
| TL-PR | - Section Planes Technique - Operating |
| TSM | - Trouble Shooting Manual |
| TWR | - Aerodrome Control |
| TWY | - Taxiway |
| UDYZ | - Yerevan Airport, Armenia |
| UTC | - Co-ordinated Universal Time |
| V/S | - Vertical speed |
| VHF | - Very High Frequency |
| VRB | - Variable |
| WQAR | - Wireless Quick Access Recorder |
| Z | - UTC Indicator |

A) Introduction

| | |
|-------------------------|--|
| Operator: | Czech Airlines |
| Aircraft manufacturer : | Airbus Industrie |
| Model of Aircraft | A319-112 |
| Registration mark: | OK-NEP |
| Site of event: | FIR Sofia and FIR Istanbul, area Black Sea |
| Date: | 19 September 2014 |
| Time: | 22:56 UTC, next all times in UTC |

B) Synopsis

On 20 September 2014, CSA notified the Air Accidents Investigation Institute of a serious incident of the A319 aircraft, registration mark OK-NEP, which occurred in FIR Sofia and FIR Istanbul.

During a commercial flight from LKPR to UDYZ at FL370 above the Black Sea, aircraft cockpit air pressure suddenly and significantly decreased. The crew prepared the cabin for emergency. Then, it completed an emergency descent to FL100 and landed at LBBG without any additional problems. There were no crew or passenger injuries.

The final report issued:

Air Accidents Investigation Institute of the Czech Republic
Beranových 130
199 01 Prague 99, Czech Republic
27 April, 2015

C) The report includes the following main parts:

1. Factual information
2. Analysis
3. Conclusions
4. Safety recommendations

1. Factual information

1.1 The Event History

1.1.1 Event description based on the crew's statements, flight data recorder data evaluation, radar records, and radio communication recording.

On 19 September 2014, crew of the Airbus A319, registration mark OK-NEP, was to complete a commercial flight from LKPR to UDYZ. The crew's pre-flight preparation and passenger boarding were completed in a standard manner. The pilot flying, during this leg, was pilot in command. The aircraft took off from LKPR at 21:21:08 and it was a night flight.

During the flight at FL370 at 22:56, approximately half through the flight, the crew registered a sudden significant cabin pressurization change and CABIN V/S increase (based on additional calculation, about +10,000 ft/min) without any prior signalling or warning. Shortly after that, the ECAM - CAB PRESS EXCESS CAB ALT warning came.

The system display (SD) showed an opened SV. The pilots put on their oxygen masks. At the specified time, the crew declared MAY DAY and initiated an emergency descent to FL100. After 25 s the ECAM warning came.

During the emergency descent initiation, emergency communication was already in progress. Based on radar identification, the SOFIA RADAR ATCo requested descent termination at 22:57 at FL 330 due to conflicting traffic at FL 310 approaching the descending A319 from the left. Due to this traffic, the pilot flying changed the heading by 30° to the left. During this manoeuvre, the crew only reduced its rate of descent and retracted the SPEED BRAKES. After about 30 s, the crew was cleared for continuing descent during which the SPEED BRAKES were extended when passing through FL 280. Per the flight data recorder analysis, the descent was delayed by this manoeuvre in period of by about 30 s. The subsequent descent was standard at the speed of 335 kt and average vertical speed of - 4,500 ft/min. During the descent, the crew registered cabin altitude of 16,800 ft. FL140 was passed through at 23:03. It was 6 min 25 s after the emergency descent initiation. At 23:06 the crew reported reaching FL 100. At this level the pressurization system operated normally. The crew requested clearance to proceed to the ARPEM point (FIR LTAA, heading about 150°). SOFIA RADAR allowed this. In response to SOFIA RADAR's inquiry at 23:07 about the intentions, the crew requested 1-2 minutes of waiting. At 23:10 SOFIA RADAR informed the A319 that if the A319 loses contact at its frequency, the A319 is supposed to establish contact on frequency 128.450 MHz (ANKARA CONTROL). The crew confirmed this information. At 23:13, the A319 crew informed SOFIA RADAR about their intention to land at LBBG. SOFIA RADAR confirmed this intention and instructed the crew to continue towards BGS VOR. The crew acknowledged this instruction. During the flight to the LBBG, the SOFIA RADAR ATS, BURGAS APP, and BURGAS TWR informed the A319 about the weather conditions, approach manoeuvre, and landing at LBBG. During this radio communication, the crew clarified its reason for landing at LBBG at 23:18 and requested technical assistance, not medical assistance. At 23:19, the crew reported "not emergency landing", at 23:30 "negative emergency" and at 23:37, they informed the ATS about their "normal landing". At 23:41, the crew reported "no special assistance, no emergency landing, normal landing". As the reason for landing at LBBG, the crew reported an aircraft pressurization problem at 23:42. In response to the ATS's inquiry, the crew only requested technical assistance at 23:47. The crew was vectored for ILS approach to RWY 22. The aircraft landed without any other problems at 23:53.

1.1.2 Event described by the cabin crew members

Approximately 1 hour 40 min after take-off, after service completion and cabin lights dimming for a night flight, the flight attendants identified intense and unpleasant pressure in their ears. The cabin lights came on at a 100%, the oxygen masks fell down, and the automatic announcement accompanied with the stationary oxygen system activation started. The captain's command was "attention crew, emergency descent". The flight attendants' next steps were in line with the procedures specified in the Operator Operating Manual.

After about 8 min after the masks fell down, the captain's command was "cabin crew, emergency descent completed". The flight attendants immediately checked the passengers' condition. Their health was OK. There was no need to provide the mobile breathing apparatuses or any other medical assistance. However, some passengers needed to be calmed down and explained the situation. They were primarily interested in potential fuselage damage, whether the aircraft was hit

by a missile, considering the ongoing conflict in Ukraine, whether both engines were working, whether a water landing would follow, where the aircraft actually was, and where Burgas was. The passengers located near the window emergency exits inquired in connection with the unusual noises caused by the air pressure change. Other passengers were disturbed by a burning smell in connection with the activation of a big number of chemical oxygen generators. They were also concerned about fire inside the aircraft. They were provided with individual care and they were also offered drinks. All the flight attendants stayed in the cabin of passengers until the approach before landing at LBBG. The whole situation was complicated by the fact that the majority of passengers only communicated in Russian. The flight ended without any additional problems.

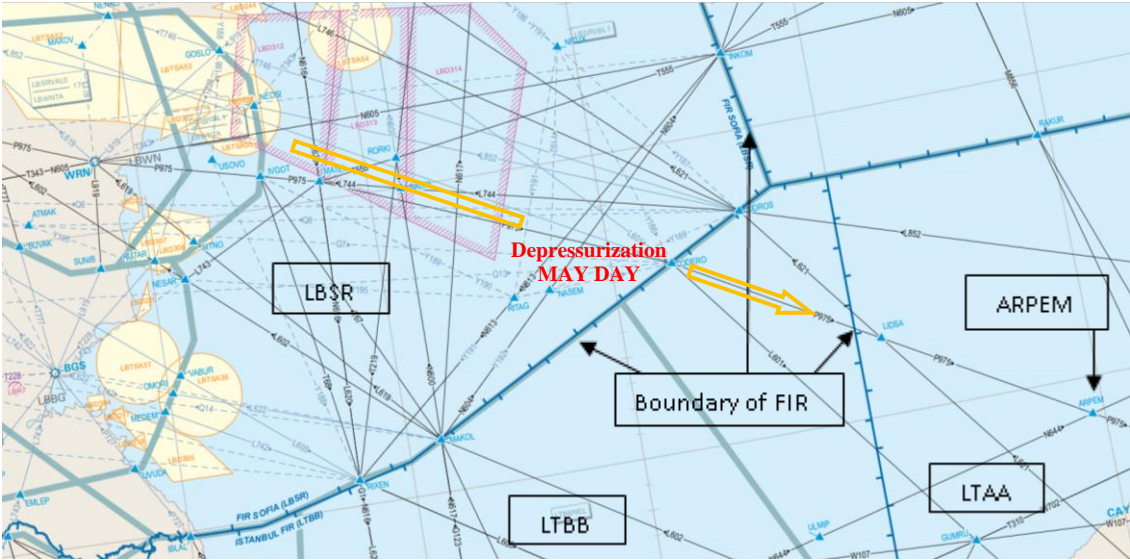


Fig. 1: Map of space of area occurrence with marked flight route

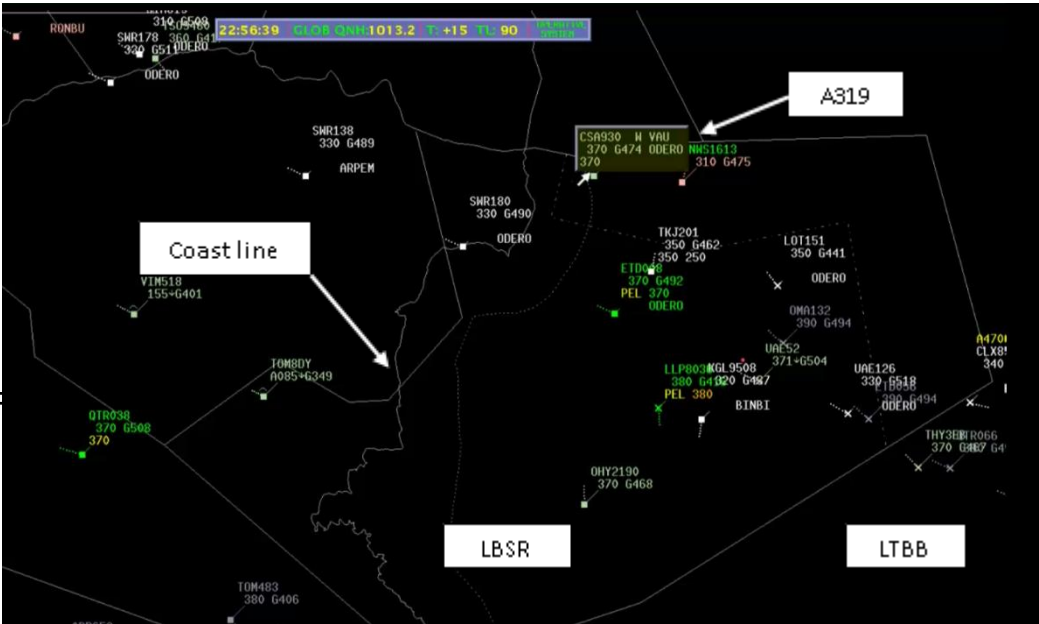


Fig. 2: Picture of screen of radar record in time 23:15, turn to BGS VOR

1.2 Injuries to persons

| Injuries | Crew | Passengers | Other people |
|------------|------|------------|--------------|
| Fatal | 0 | 0 | 0 |
| Serious | 0 | 0 | 0 |
| Minor/None | 0/5 | 0/94 | 0/0 |

1.3 Damage to aircraft

The aircraft was not damaged.

1.4 Other damage

NIL

1.5 Information about persons

1.5.1 Captain

Age / Gender: 44 years, man
Pilot license: ATPL(A), valid
Qualification: CPT A319/320, valid
Medical: First class, valid

Flight experience:

| Flying hours | Last 24 hrs | Last 90 days | Total |
|--------------------|-------------|--------------|-------|
| as CPT on A319/320 | 4:43 | 220:22 | 1 240 |
| as CPT | 4:43 | 220:22 | 5 348 |
| Total flying hours | 4:43 | 220:22 | 9 137 |

The captain's pre-flight rest lasted 11 hrs 40 min and the event took place after 3 hrs 05 min. of his service.

His last examination included LC on 7 June, 2014 and SIM on 31 May 2014.
He PASSED both examinations.

1.5.2 Captain/Pilot-in-Command

Age / Gender: 44 years, man
Pilot license: ATPL(A), valid
Qualification: CPT A319/320, valid
Medical: First class, valid

Flight experience:

| Flying hours | Last 24 hrs | Last 90 days | Total |
|--------------------|-------------|--------------|--------|
| as CPT on A319/320 | 0:00 | 134:21 | 5 574 |
| as CPT | 0:00 | 134:21 | 10 207 |
| Total flying hours | 0:00 | 134:21 | 12 299 |

The captain's/PIC's pre-service rest lasted more than 5 days and the event took place after 3 hrs 05 min. of his service.

His last examination included LC on 27 June 2014 and SIM on 27 April 2014.
He PASSED both examinations.

1.6 Aircraft information

1.6.1 Information on airframe

Airbus A319-112 is two engines low wing jet airliners

| | |
|----------------------------------|------------------|
| Type/model | Airbus, A319-112 |
| Reg. Mark: | OK-NEP |
| Manufacturer: | Airbus Industrie |
| Serial Number: | 3660 |
| Year of manufacture: | 2008 |
| Time since new: | 20 137 hrs |
| Cycles since new: | 10 766 |
| Airworthines Review Certificate: | Valid |
| Insurance Certificate: | Valid |

1.6.2 Power plant

Aircraft was powered by two engines CFM International.

| | |
|----------------------|-----------|
| Engine No. 1 type: | CFM 56-5B |
| Serial Number: | 697954 |
| Year of Manufacture: | 2008 |
| Time since new: | 20 137 |
| Cycles since new: | 10 766 |

| | |
|----------------------|-----------|
| Engine No. 2 type: | CFM 56-5B |
| Serial Number: | 697956 |
| Year of Manufacture: | 2008 |
| Time since new: | 20 137 |
| Cycles since new: | 10 766 |

1.6.3 Aircraft operation

The aircraft was used for short and mid-distance passenger transportation. The maximum landing weight was set to 62,500 kg.

From 5 September to 19 September 2014, the aircraft was inspected after 6 years of operation per 4C, IL, and R1.

During the inspection, no aircraft pressurization system works or tests took place. The following works were completed in the aft technical bay in which the SVs are located:

- Inspection of the rear pressure bulkhead AFT face (MP items 535101 – 01-1-300 and 535121-01-1-000), on which the SVs are located.
- Inspection of THSA (MP items 551001-01-1-300 and 274100-01-1-000, etc.).
- CVR Datalink provision has been installed – new cables per SB 23-1491.
- Galley attachment detailed visual inspection (aft galley has not been removed).

The last maintenance was completed on 19 September 2014 in the range of a WEEKLY CHECK and LINE CHECK. The total flight time was 20,134 hrs and 10,765 cycles were completed. The aircraft flew 2 hrs 05 min. from this maintenance to the event and completed one take-off.

Upon completion of the last inspection and maintenance, the aircraft was released to operation and it had been operated in line with MEL 21-63-03A (Hot Air Pressure Check Valve Closed).

1.6.4 Works at LBBG after the landing

After the landing, the CSAT mechanics inspected the SVs, OFV, and their immediate surrounding areas per TSM 21-31-00-810-809.

Those inspections revealed no damage or any other failures that could have caused such a significant cabin pressure decrease.

1.6.5 Works at LKPR after the landing

On 21 September, 2015 at 16:41:50, the aircraft took off from LBBG to complete a technical flight to LKPR. Just after landing, the failure elimination continued per TSM 21-31-00-810 808-A, 21-31-00-810-809-A, 21-51-00-810-809-A, and 31-54-00-810-931-A. Upon completion of these works, both SVs were replaced per AMM 21-31-52-400-001 and the OFV was replaced per AMM 21-31-51-400-001. To determine the event causes, the SSFDR and CVR recorders were removed per 23-71-35-400-002 and 31-33-55-400-002 to complete their evaluation.

Since the oxygen masks were used in the passenger cabin, new PAX O2 generators were installed per AMM 35-21-41.

1.6.6 Evaluation of the SVs technical condition and functionality

| | |
|----------------------|---------------------|
| Name: | Safety Valve |
| Manufactured by: | Nord-Micro |
| Type designation: | 9024-15704-03 |
| Serial number: | 0832245 and 0832246 |
| Year of manufacture: | 2008 |
| Time since new: | 20,137 hrs |
| Cycles since new: | 10,766 |

Both valves were installed in the aircraft during its production. They never failed during their operation.

After their removal from the aircraft, they were returned to the manufacturer together with a detailed description of the event course. The manufacturer verified their operation in laboratory conditions. Both valves worked reliably and in line with the technical requirements and they were found "No Failure Found". During the function tests, the valves did not open at values below 8.4 psi.

Upon their disassembly, a small amount of fluid was identified inside the pneumatic regulation, which controls the valve. It was water with biggest probability. Based on this fact, the valve bodies and gaskets were subject to a detailed inspection. No body cracks or gasket damage was founded during the inspection. The valve manufacturer stated that the only way how the fluid might have got inside into the valve control section through the static pressure ports only. The valves were installed on the bulkhead separating the AFT galley hermetic area that is inside the aircraft's heated and air-conditioned cabin and the non-hermetic AFT technical bay in which the static pressure ports are located as well.

1.6.7 Evaluation of the OFV technical condition and functionality

| | |
|-------------------|---------------|
| Name: | Outflow Valve |
| Manufactured by: | Nord-Micro |
| Type designation: | 20790-03AC |
| Serial number: | 0873201 |

Year of manufacture: 2008
Time since new: 20,137 hrs
Cycles since new: 10,766

During a detailed inspection of the valve, a damage of the motor supporting the valve's operation only in the MANUAL mode was identified. This finding was evaluated as a minor defect with no impact on the event origin and its course. During the function test, the valve operated fully in line with the technical requirements.

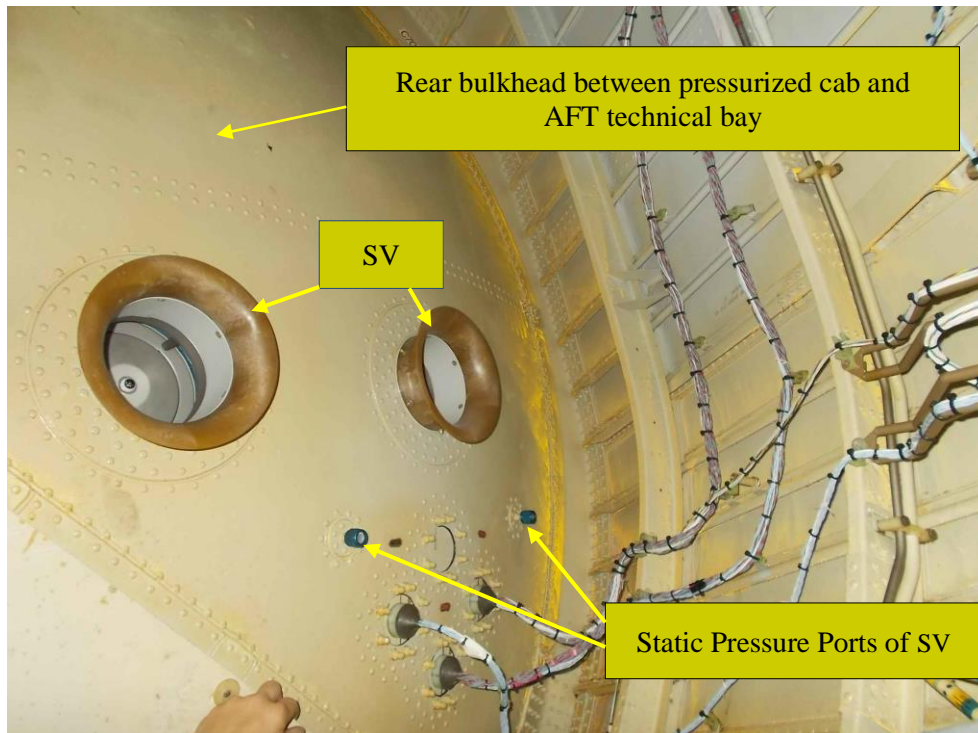


Fig. 4: Location of SV, view of the AFT technical bay

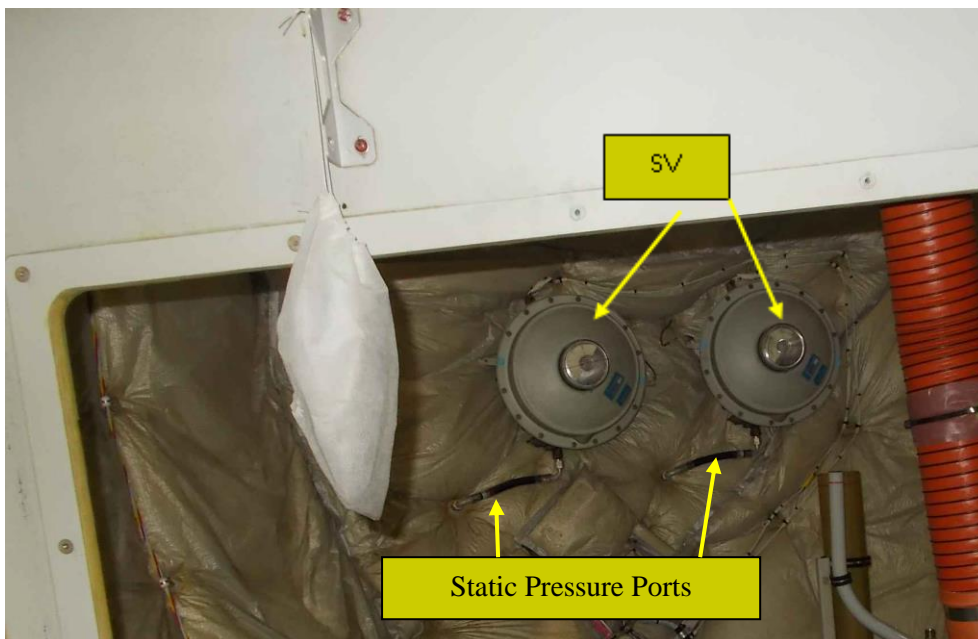


Fig. 5: Location of SV, view of the cab

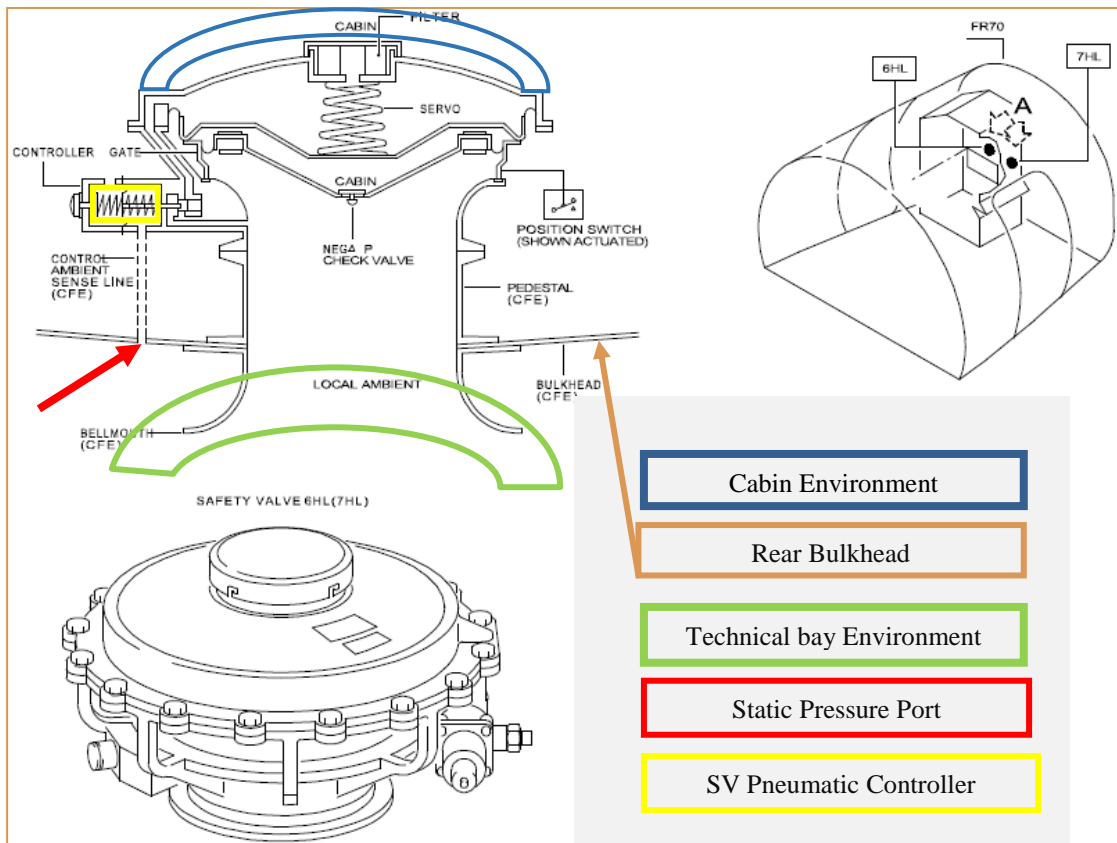


Fig. 6: Scheme of SV and their location in the aircraft

1.7 Meteorological information

Extraction from METAR report from airport weather stations Burgas (LBBG)

191930Z 02001MPS CAVOK 16/11 Q1023 NOSIG

192000Z VRB02MPS CAVOK 15/12 Q1023 NOSIG

192030Z VRB01MPS CAVOK 15/11 Q1023 NOSIG

192130Z 25002MPS CAVOK 14/11 Q1023 NOSIG

192200Z 25002MPS CAVOK 14/12 Q1023 NOSIG

192230Z 26002MPS CAVOK 14/12 Q1022 NOSIG

192300Z 25002MPS CAVOK 13/12 Q1022 NOSIG

192330Z 26002MPS CAVOK 13/11 Q1022 NOSIG

200000Z 25002MPS CAVOK 13/11 Q1022 NOSIG

1.8 Aids to navigation and visual aids

NIL

1.9 Communications

Connection was realized on frequencies Sofia RADAR 134,7 MHz, Burgas APP 125,1 MHz and Burgas TWR 118.0 MHz.

1.10 Aerodrome information

LBBG is public international aerodrome 135 ft above sea level. Aerodrome reference point has geographic coordinates N 42°34.2', E 27°30.9'. Selected physical characteristics of RWY.

| Marking of RWY | GEO Bearing | Dimensions of RWY | Surface of RWY and TWY |
|----------------|-------------|-------------------|------------------------|
| 04 | 040° | 3200 x 45 m | concrete |
| 22 | 220° | 3200 x 45 m | concrete |

1.11 Flight recorders and other recording aids

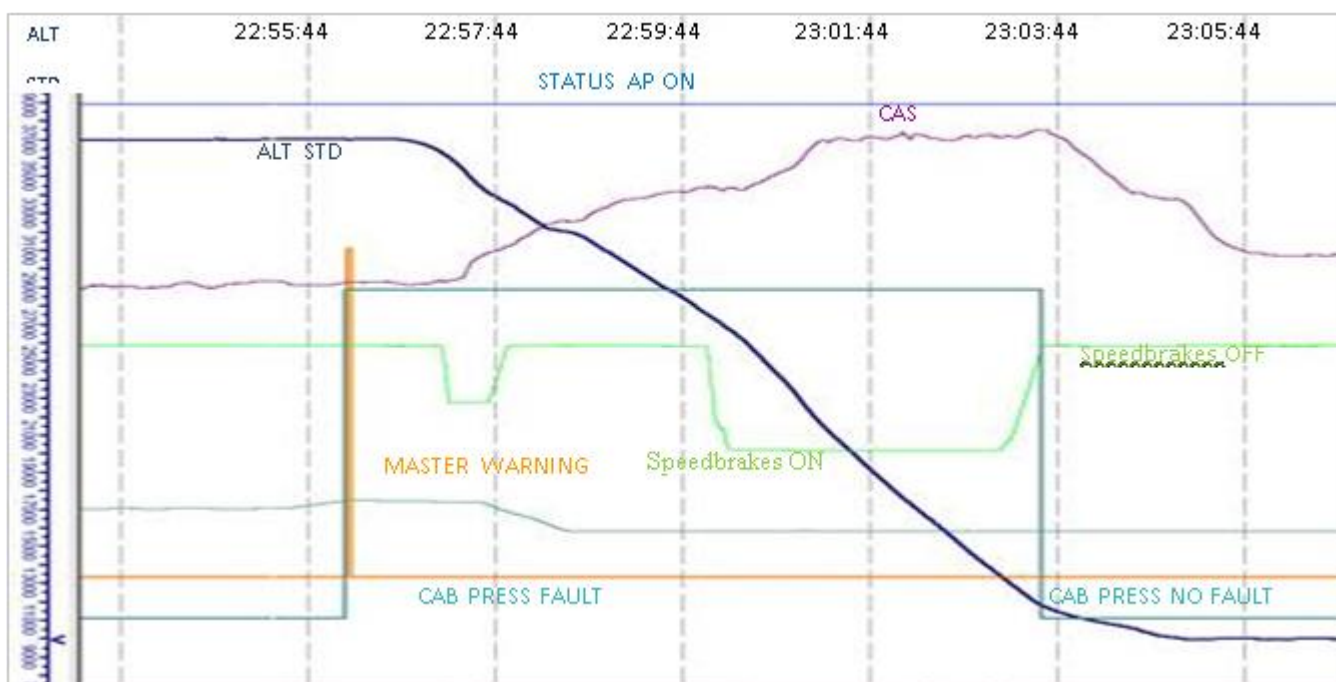
During the evaluation of the course of the flight and the description of change of relevant parameters concerning the event origin and course, the commission utilized the CVR data, on-board recording equipment WQAR, and the DFDR emergency recorder. Data records were perfectly usable.

The CVR data was evaluated; however, no data was available for the event time due to the period from the event origin to the landing at LBBG.

The WQAR and DFDR data was evaluated; however, the recorded parameters were not usable for the identification of the event origin and course. The aircraft manufacturer confirmed this fact as well.

To obtain information concerning the event origin and course, the commission got from the parameters obtained from the aircraft condition monitoring system (ACMS), ECS 19 Report, and data from the centralized fault display system (CFDS) through PFR.

1.11.1 Selected parameters from WQAR data evaluation



1.11.2 Event time sequence from the flight data record:

22:56:09 FL370, speed Mach 0.78, autopilot AP1 engaged, 1FD2, A/THR ON, indication of Master Warning + CAB PRESS FAULT
22:56:35 Communication via VHF1, THR IDLE, descent initiation with FL 100 set
22:57:51 Speed brakes retracted at FL 335, heading set to 096°, THR IDLE
22:58:21 FL 321, SELECT FL 240, THR IDLE, V/S – 3,120 ft/min
22:58:46 FL 314 communication via VHF1, SELECT FL 100
22:59:59 FL 275 Speed brakes were extended, V/S max – 6,360 ft/min at FL 228
23:03:34 FL117 Speed brakes retracted, Cabin Press – NO FALT
23:05:07 FL 100 reached
23:39:28 FL 100 left and the flight to LBBG continued
23:53:00 Landing at LBBG completed

1.11.3 Parameters obtained from ACMS

Relevant parameters relating to the event origin were obtained from ECS 19 Report, which is a report that, in the case of an aircraft non-standard configuration, automatically records pre-defined parameters per the type of configuration set at the event time "t" and "t -15 s"

The following table shows a summary of recorded parameters:

| Parameter | Time „t -15sec“ | Time „t“ |
|--------------------------|-----------------|-----------------|
| Altitude | 37011 ft | 36964 ft |
| System in control | 1 – CPC1 | 1 – CPC1 |
| CPC System fault | 2 - Operational | 2 - Operational |
| Cabin V/S | 00000 ft/min | 06350 ft/min |
| Cabin Differential Press | 079 (7,9psi) | 070 (7,0psi) |
| Cabin altitude | 07488 ft | 09744 ft |
| Outflow valve position | 007% open | 000% open |

1.11.4 Data obtained from CFDS

After the flight, the following data was obtained from the CFDS system via PFR:

- CAB PR EXCESS CAB ALT
- CAB PR SAFETY VALVE OPEN
- SDAC2: NO CPC1 ANALOG SIGNAL

1.12 Description area of Serious Incident

Beginning and Process of Serious Incident proceeded in the airspace of LBSR, LTBB, LTAA.

1.13 Medical and pathological information

NIL

1.14 Fire

NIL

1.15 Search and rescue

NIL

1.16 Tests and research

NIL

1.17 Organisational and Management Information

The subject aircraft operator held a valid aircraft operator license. The CSAT organization completing the subject aircraft maintenance and repairs was fully licensed for their completion.

1.18 Additional information

NIL

1.19 Useful or effective investigation techniques

The serious incident has been investigated according to L13 National Regulation (Investigation into Air Accidents and Incidents of the Czech Republic as per recommendation of ICAO – Annex 13).

2. Analysis

2.1 Basic Factual Information Analysis

The flight crew held valid aircraft transport pilot licenses with valid adequate ratings.

The crew held valid first class medical certificates.

The aircraft had a valid airworthiness review certificate and valid insurance certificate.

2.2 Flight Crew Activities

The flight crew preparation for the flight was completed in a standard manner. Up to the event origin moment, the course of flight did not feature anything that would have indicated any aircraft pressurization system failure.

Once the event occurred, the crew completed an emergency descent in line with FCOM A320 (A320 Flight Crew Operating Manual). Per the ATC's request, the crew interrupted this descent for about 30 s. Per the radar record, the aircraft trajectory featured conflicting traffic at FL 310.

The commission did not investigate the reason of the ATC's decision to interrupt the descent of the A319 in distress in relation to the traffic at FL 310.

The total time of emergency descent from FL 370 to FL 100 was about 8 min. The crew continued at FL 100, heading 150°, to ARPEM for about 6 min. Then, it completed a left turn to BGS VOR, to heading 270°. During its approach to LBBG, the crew was vectored to ILS RWY 22.

2.3 Cabin Crew Activities

The cabin crew completed all the emergency situation procedures in line with the Aircraft Operating Manual.

All the cabin crew members stated that after they pulled the mask immediately after activation oxygen generator the oxygen supply was lower. Oxygen supply only became sufficient after a few seconds.

The passengers' stress load was probably caused by the unusual course of flight accompanied with an unknown smell caused by the oxygen generators activation, automatic "AirShow" screens closing, and fear of a potential terrorist attack. The situation was also complicated by the language barrier between the mostly Russian speaking passengers and the cabin crew.

Once the passengers were informed that the aircraft "only" featured a technical defect, they calmed down surprisingly quickly.

2.4 Likely cause of technical failure

From the take-off at 21:20 to 22:55:51, the flight was standard and without any failures. The aircraft flew at actual level 37,011 ft, CPC1 controlled the pressurization system, the cabin altitude was 7,488 ft, the pressure differential was 7.9 psi, the OFV was open to 7%, and the cabin altitude rate of change was 0 ft/min.

At 22:56:09 when the aircraft was at FL 370 probably the presence of fluid, which partially froze inside the SV pneumatic controller, affected its proper control function. Resultantly, one SV or both SVs suddenly opened. The pressurization system identified a rapid aircraft cabin pressure decrease and the MASTER WARNING lamp illuminated in the cockpit.

Simultaneously, this failure was identified in the cockpit by the following message:

- on ECAM - CAB PRESS EXCESS CAB ALT, meaning – exceeding the cabin altitude of 9,550 ft

Other messages were displayed then:

- on E/WD - SAFETY VALVE OPEN. It happens when the SV is not fully closed for more than 1 minute
- on SD - SV AMBER, meaning - opening of one SV or both SVs
- OFV GREEN, meaning – proper OFV function

The pressurization system controlled by CPC 1 responded to this change correctly by closing the OFV, which was shortly before that open to 7%.

Upon descending to FL100, the pressurization system resumed its standard operation, and the subsequent course of flight and landing at LBBG featured no other problems.

2.5 Presence of Fluid in the SV

The fluid identified in both SVs might have reached the valve control section as external contamination or air humidity condensate. Per the aircraft manufacturer's statement, the only option was the non-hermetic area air proceeding through the static pressure ports.

External contamination might have been caused as follows, for example:

- During works completed in the AFT technical bay.
- During aircraft external washing.
- During aircraft de-icing.

The air humidity condensate might have been caused by different temperatures in the aircraft hermetic and non-hermetic areas that the valves face during flights at high altitudes above the sea level.

A combination of the specified option may be considered as well.

2.6 Aircraft Operating Limitations

The specified aircraft maximum landing weight was 68,500 kg. Regarding the burned fuel amount (7,060 kg), both the aircraft weight and centre of gravity were within the limits.

None of the aircraft's operating limitations was exceeded.

2.7 Effect of meteorological conditions

The weather conditions were suitable for the completion of the scheduled commercial flight.

2 Conclusions

3.1 The Commission concludes as follows:

3.1.1 Aircraft flight and cabin crews

- had valid licenses and had valid adequate ratings,
- had valid medical certificates,
- were capable of completing the scheduled commercial flight,
- acted in line with the procedures stated in the Operator operating manual and used the emergency procedures specified in it.

3.1.2 Aircraft

- had valid airworthiness review certificate,
- had valid insurance certificate,
- its landing weight was below the maximum landing weight. No operating limitations were exceeded,
- during its flight at FL370, it experienced a sudden and significant cabin pressure change with CABIN V/S increase (per the calculations, about +10,000 ft/min) and without any prior indication or warning. It was caused by a spontaneous and faulty SV opening.

3.1.2 Meteorological Conditions

- had no effect on the event origin and course.

3.2 Causes

The cause of the serious incident was the spontaneous opening of one SV or both SVs without any prior indication. It is highly probable that this was caused by the presence of not fully specified fluid and its freezing in the SV control section. Upon the SV opening, the aircraft cabin pressure suddenly and significantly changed.

None of the considered options of the fluid getting inside the SV was demonstrably clarified.

4. Safety recommendations

No safety recommendation by AAll CZ.