ÚZPLN

AIR ACCIDENTS
INVESTIGATION INSTITUTE
Beranových 130
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CZ-15-626

FINAL REPORT

Investigation of causes of a serious incident of ATR 72-500 aircraft, Registration mark OK-GFS, PRAGUE / Ruzyně Airport, On 17 September 2015.

Prague
November 2017

Glossary of Abbreviations Used in this Report:

°C	-	Degree Celsius (unit of temperature)
Ac	-	Altocumulus (cloud type)
ADU	-	Azimuth Display Unit
AGL	-	Above ground level
ALT	-	Altitude
AMM	-	Aircraft maintenance manual
AMSL	-	Elevation above mean sea level
ACU	-	Approach control unit
ATC	-	Air traffic control service
ATPL (A)	-	Air transport pilot license
ATS	-	Air traffic services
Base	-	Cloud base
BKN	-	Broken (amount of cloud: 5–7 oktas)
CAMO	-	Continuing Airworthiness Management Organisation
CAS	-	Calibrated airspeed
CAVOK	-	Visibility, cloud and present weather better than prescribed values or conditions
Ci	-	Cirrus (cloud type)
CPL (A)	-	Commercial pilot license
CPT	-	Captain (aircraft captain)
CSAT	-	Czech Airlines Technics
CVR	-	Cockpit voice recorder
CHMI	-	Czech Hydrometeorological Institute
ČSA	-	Czech Airlines
DVI	-	Detailed visual inspection
E	-	East (cardinal point)
EDDH	-	Hamburg Airport
FCOM	-	Flight Crew Operation Manual

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FL	-	Flight level
F/O	-	First officer
FSQ	-	Flight Safety and Quality
ft	-	Foot (unit of length – 0,3048 m)
GEO	-	Geographic dimension
GVI	-	General visual inspection
h	-	Hour (unit of time)
hPa	-	Hectopascal (unit of atmospheric pressure)
FRS	-	Fire rescue service
ILS	-	Instrument Landing System
IR	-	Instrument rating
JIC	-	Job instruction card
kg	-	Kilogram (unit of weight)
km	-	Kilometre (unit of length)
kt	-	Knot (unit of speed – 1.852 $km.h^{-1}$)
LC	-	Line check
LKPR	-	Prague Ruzyně Airport
m	-	Meter (unit of length)
MAG	-	Magnetic direction
METAR	-	Aviation routine weather report
MHz	-	Megahertz (unit of frequency)
min	-	Minute (unit of time)
MLW	-	Maximum landing weight
N	-	North (cardinal point)
NIL	-	None
NM	-	Nautical mile (unit of length – 1,852 m)
PBE	-	Personal breath equipment
QNH	-	Altimeter subscale setting to obtain elevation reading when on the ground

QRH	-	Quick reference handbook
RWY	-	Runway
s	-	Second (unit of time)
SCT	-	Scattered clouds (amount of cloud: 3–4 oktas)
CEST	-	Central European Summer Time
SIM	-	Pilot simulator training
SWY	-	Stopway
THR	-	Threshold
TMA	-	Terminal control area
TWR	-	Aerodrome control tower
TWY	-	Taxiway
UTC	-	Coordinated Universal Time
AAII	-	The Air Accidents Investigation Institute
V_{minLB0}	-	Minimum Low Bank speed 0 (V_{min} in clean configuration)
VHF	-	Very high frequency
WO	-	Work order

A) Introduction

Operator:	České aerolinie a.s.
Aircraft Manufacturer and Type:	Avions de Transport Régional – ATR 72-500
Registration mark:	OK-GFS
Location of Incident:	TMA LKPR
Date:	17 September 2015
Time:	18:05 CEST (16:05 UTC, hereinafter all times given in UTC)

B) Synopsis

On 18 September 2015, CSA informed the Air Accidents Investigation Institute of a serious incident of the ATR 72 aircraft, OK-GFS registration mark, which occurred in TMA LKPR.

Shortly after take-off from LKPR, the overheat alarm on the air conditioning control panel in the cabin went on and the temperature in the air conditioning ducting rose. Immediately afterwards, the senior cabin crew member informed the captain that there was smoke in the passenger cabin. The crew declared a “MAY DAY” emergency situation and landed at LKPR without further complications. No crew members or passengers were injured.

The cause of the incident was investigated by the AAII commission. The investigation team comprised of:

Investigator-in-charge:	Ing. Josef PROCHÁZKA
Commission member:	Ing. Viktor HODAŇ
	Ivo BARTOŇ, ČSA a.s., FSQ
	Ladislav MUSIL, ČSA a.s., FSQ

The Final Report was issued by:

AIR ACCIDENTS INVESTIGATION INSTITUTE
Beranových 130
199 01 PRAGUE 99

20 November 2017

C) This Final Report Consists of the Following Main Parts:

1. Factual Information
2. Analyses
3. Conclusions
4. Safety Recommendations
5. Annexes

1 Factual Information

1.1 History of the Flight

The commission based its description of the event on the statements of the crew, evaluation of operating aircraft recorder data (QAR), cockpit voice recorder (CVR) records, recorded radio communication between the crew, the ATS and the FRS commander.

1.1.1 Description of the Event

On 17 September 2015, the crew of ATR 72-500 aircraft, OK-GFS registration mark, was to perform a commercial flight from LKPR to EDDH. The crew's pre-flight preparation, pre-flight inspection and aircraft preparation were completed in a standard manner, free of any identified deficiencies which would prevent performance of flight. The aircraft captain was the pilot flying during this leg.

Given the high external temperature at LKPR (+31 °C), engine No. 2 in the "HOTEL MODE" was used to air-condition the passenger cabin. Cooling of the cabin was achieved without switching an increased airflow in the standard mode.

After starting and during taxiing, both engine parameters were in order according to the operating aircraft recorder data.

After a stop in the hold position on TWY B, the failure signalling light in the right arm of engine No. 2 air bleed went on in the overhead control panel (BLEED No. 2 FAULT). The crew switched off the engine No. 2 air bleed and decided to reset the engine No. 2 air bleed system no sooner than after take-off in the climb because of long taxiing time (18 min 40 s), high external temperature, and heavy loading following previous cabin cooling. System resetting is a standard function recovery procedure.

RWY 24 was used for take-off with flaps at 15 degrees at 16:02:23, while engine parameters corresponded to the take-off mode.

At ALT 1,760 ft the crew started making a turn to the heading of 340 degrees on the VENOX 2 M departure route and continued climbing up to FL 140. Having climbed to ALT 3000 ft, the crew switched off the engine No. 2 air bleed. System resetting was trouble-free. No lights signalling incorrect system functions went on.

Approximately at ALT 3800 ft, the "AIR" light on the crew annunciator panel (CAP) and the "TEMP SEL OVHT CABIN" light on the overhead control panel (OVERHEAD) went on. At the same time, the temperature in the air conditioning ducting rose. Shortly afterwards, at 16:05:36, at ALT 4140 ft, the senior cabin crew member informed the captain that there was smoke in the passenger cabin.

The captain decided to immediately return to LKPR. Climbing was interrupted at ALT 4520 ft and the aircraft started descending down to ALT 3000 ft. At this stage, the captain was hand-flying the aircraft, which made the crew busier. FL 140 was still set on ADU. The crew started carrying out procedures in case of "SMOKE ON BOARD". The crew performed the procedures only to a limited extent with crew members not wearing protective anti-smoke goggles because only the malodour of smoke gas from the passenger cabin could be smelt in the cockpit. During these procedures the captain turned the automatic control on.

The captain then took over the radio communication, reported "MAY DAY" to ATC and announced that they would keep ALT 3000 ft and turn to the right in order to

approach ILS RWY 24. ATC confirmed the emergency situation and issued instructions for radar vectoring for a shortened approach to RWY 24. The crew set emergency code 7700 on the secondary radar transporder.

As ALT 3000 ft was not set on ADU, the aircraft descended to ALT 2860 ft, while the airspeed dropped to 137 kt (V_{minLB0} 136 kt). The captain increased engine power and the aircraft started climbing with a vertical speed of approx. 560 ft/min and reached ALT 4420 ft. During this phase of flight, the first officer was performing actions in compliance with the “EMERGENCY SMOKE” and “AIR COND SMOKE” emergency procedures. Meanwhile, the aircraft captain inspected the situation in the passenger cabin. The senior cabin crew member informed the captain that no more smoke was generated in the cabin and the smoke intensity was being reduced. The captain instructed the senior cabin crew member to prepare the cabin for an emergency landing with the expected time of landing at LKPR within 10 minutes.

Emergency procedures were discontinued. Due to a decreased intensity of malodour in the cockpit, the captain also decided that both crew members would take off the oxygen masks and keep them ready. Afterwards, they switched the aircraft radioset (VHF) to standard headphone communication.

The air traffic controller issued an instruction for aircraft guiding to the final approach route and descent clearance to ALT 3000 ft. The crew was following instructions of the air traffic controller, while maintaining the airspeed within CAS 142–160 kt. At this stage, the cleared descent to ALT 3000 ft was set correctly on ADU. The captain carried out shortened preparation for approach to ILS RWY 24.

As he started approaching ILS, at a distance of 5.0 NM from RWY 24 threshold, the captain issued an instruction “FINISH PREPARATION” (Finish preparation for emergency landing) for the passenger cabin. The senior cabin crew member promptly advised the captain of their preparedness for landing. Approaching and landing took place with gust wind of 320°/14 kt with gusts of 20 kt. Stabilised approach parameters were observed.

The captain issued the command “BRACE FOR IMPACT”.

Landing was performed in a standard manner without any deviations from the piloting technique at 16:15:43.

At 16:16:22, having stopped the aircraft at TWY C level, the captain decided to keep the position on RWY 24 and called the senior cabin crew member via the intercom in order to verify the current situation in the passenger cabin. The senior cabin crew member confirmed that there was no more smoke, only the malodour could still be smelt in the passenger cabin. The captain immediately informed TWR of this situation, requesting taxiing to the stand for fast disembarking of passengers. TWR received the report and informed the crew that the FRS commander would be asked to present aircraft inspection results. While waiting for taxiing clearance, the captain issued the command “CABIN CREW AND PASSENGERS KEEP YOUR SEATS”.

Less than a minute later, the captain again asked TWR for taxiing clearance. TWR informed the captain that the fire-fighters had to carry out one more inspection and that he would be called following coordination. FRS emergency vehicles were still standing on TWY C. Approximately 15 s later, the crew received clearance for taxiing on TWY C, L and G to stand No. 60. Taxiing started at 16:18:31. The crew performed a checklist of tasks “AFTER LANDING”. While standing on RWY 24 and taxiing, the captain asked several times the senior cabin crew member about the development in the passenger cabin. He was repeatedly assured that the situation was good only with lingering malodour free of smoke.

Having stopped and shut down aircraft engines at stand No. 60 at 16:21:27, the captain informed the passengers about the event with an apology for not being able to inform them earlier due to being busy solving the situation. He further reported to TWR that everything was in order and asked for connection with the FRS commander to find out about upcoming course of FRS rescue operation. The captain was then advised by the senior cabin crew member of fire-fighters who had boarded the aircraft and no buses being yet prepared for passengers, inquiring about how to proceed. The captain made a decision to start disembarkation of passengers to the airport area despite the absence of buses. At the same time, he asked the traffic officer from the Prague Airport Communications Centre for hastened arrival of buses. He also sent a brief report on the event to the Prague Airport Communications Centre and, having been asked by the traffic officer, confirmed that as far as he was informed, no passengers or cabin crew members required immediate medical assistance. The crew performed a checklist of tasks “PARKING”.

TWR contacted the captain, saying that he should switch to the frequency of 121,600 MHz if he wants to speak to the FRS commander. The FRS commander informed the captain of the presence of his team on board and his plan to examine the passenger cabin using a thermographic camera after the passengers disembark. After a while, the cabin attendant asked the captain whether a FRS member could enter the cockpit. Having entered the cockpit, a FRS member checked the cockpit with a thermographic camera with a negative output and inquired the crew about their condition. Only at that moment the captain found out that all the passengers were still on board and disembarkation had not started yet. At 16:28:30 (approx. 7 minutes after stopping at the stand), the senior cabin crew member issued an instruction for passengers to commence standard disembarkation and apologised for the inconvenience. The captain recorded the failure in the aircraft documentation. The captain was informed by the senior cabin crew member about the SCCM’s and cabin attendant’s departure for a preventive medical check. The captain and the first officer then went to the transit hall where the FSQ manager conducted a test for alcohol with a negative result, and they briefly described the course of the event.

1.1.2 Event described by the cabin crew members

Shortly after take-off, an increased air flow through air-conditioning outlets could be heard and felt. A few seconds later, both cabin crew members smelt malodour which they describe as burnt rubber or exhaust fumes. Malodour intensity was rising quickly. After a few more seconds, some smoke appeared, which was first thin, but was gradually thickening, and reducing visibility in the passenger cabin.

Both cabin crew members unfastened their seat belts (the “FASTEN SEAT BELTS” signs were still on after the take-off) and checked the passenger cabin, searching for the possible source of smoke and any fire. Passengers started showing signs of uneasiness and breathing difficulties. The temperature in the cabin was rising quickly, and hot air mixed with smoke was streaming directly from air-conditioning outlets. Bottom luggage bin panels were hot to the touch.

The senior cabin crew member informed the captain that there was smoke in the passenger cabin. Both cabin crew members used PBE for their protection, instructed the passengers to brace and breathe through some fabric (clothes, bolsters), and were handing out makeshift filters in the form of wet paper towels. The captain informed the cabin crew members of an emergency situation and issued an instruction to prepare the passenger cabin for emergency landing.

The situation began to improve after a while. Both cabin crew members took off PBE. They continued performing actions in compliance with the “CABIN EMERGENCY”

procedures and instructed passengers accordingly. Approximately half way through these procedures, the senior cabin crew member issued the command “FINISH PREPARATIONS”. On her way to her station, the cabin attendant was repeatedly cautioning passengers*: “FASTEN SEAT BELTS! Fasten seat belts!”*. The instruction “BRACE FOR IMPACT” was not issued, all the passengers, however, had already assumed the brace position earlier due to the light concentration levels of smoke in the lower part of the passenger cabin.

After the landing, the captain enquired via the intercom about the situation in the passenger cabin and subsequently issued a standard command to cancel the emergency situation.

After the stop at the stand, the senior cabin crew member received an instruction, probably from a FRS member, that the disembarkation of passengers was not possible and that they had to wait for buses to arrive. Several FRS members carried out the check of the passenger cabin. After the bus arrival, the passengers disembarked the aircraft.

1.2 Injuries to Persons

Injury	Crew	Passengers	Other persons (inhabitants, etc.)
Fatal	0	0	0
Serious	0	0	0
Light/No injury	0/4	0/59	0/0

1.3 Damage to Aircraft

The aircraft sustained no damage.

1.4 Other Damage

NIL

1.5 Personnel Information

1.5.1 Aircraft captain

Age/Gender:	39-year-old male
Pilot licence:	ATPL (A), current rating – CPT ATR 42/72/IR valid until 31 August 2016
Medical fitness certificate:	valid until 07 June 2016

Pilot – flying experience:

Hours flown	Over the last 24 hours:	Over the last 90 days:	Total
as CPT of ATR	0:37	62:27	5,077
as CPT	0:37	62:27	5,410
Total	0:37	63:42	7,510

The captain's pre-flight rest lasted 22 h and the event took place after 37 min. of his service.

The pilot completed last check in the extent of LC 15. April 2015 and SIM 24 June 2015 He PASSED both examinations.

1.5.2. First officer

Age/Gender: 42-year-old male

Pilot licence: CPL (A),

current rating – F/O ATR42/72/IR valid until 31 May 2016

– Saab 340/IR

Medical fitness certificate: valid until 31 March 2016

Pilot – flying experience:

Hours flown	Over the last 24 hours:	Over the last 90 days:	Total
as F/O of ATR	3:25	191:26	540
as F/O	3:25	191:26	2,535
Total	3:25	191:26	3,275

The captain's pre-flight rest lasted 24 h and the event took place after 37 min. of his service.

The pilot completed last check in the extent of LC 20. July 2015 and SIM 07. June 2015 He PASSED both examinations.

1.6 Aircraft Information

1.6.1 General Specifications of the Aircraft

ATR 72-500 twin-engine turboprop top-wing monoplane airliner accommodating a crew and 60 passengers.

Type/model: ATR 72 / ATR 72-500
Registration/license plate: OK-GFS
Manufacturer: Avions de Transport Régional
Serial number: 679
Year of manufacture: 2001

Total hours flown:	36,467
Number of cycles:	29,830
Certificate of airworthiness inspection:	Valid until 20 December 2015
Statutory insurance:	Valid until 30 11 2015

1.6.2 Power Unit

Two Pratt & Whitney Canada units and 6-blade Hamilton Standard propellers were used for powering the aircraft.

Engine No. 1 – type:	PW127F
Serial number:	EB0079
Total number of usage hours:	31,787
Total number of usage cycles:	26,113

Engine No. 2 – type:	PW127F
Serial number:	EB0096
Total number of usage hours:	29,485
Total number of usage cycles:	23,980

The aircraft was used for regional and short passenger transportation. The maximum landing weight was set to 26,047 kg.

The last periodic maintenance of aircraft prior to the incident was performed on 15 September 2015 within the WEEKLY + LINE CHECK scope.

No operations were performed during the above stated weekly check requiring access into the areas concerned – i.e. under the passenger cabin floor and the left air-conditioning pack.

1.6.3 Operations performed in the areas concerned prior to the incident

The last access into the concerned areas prior to the incident took place during inspection 1C + 2Y carried out from 20 January 2015 through 17 March 2015 at SAMCO Aircraft Maintenance, Maastricht Airport, the Netherlands.

No specified procedures were performed on the pneumatic system during the said inspection.

Cleaning of the heat exchangers in the air-conditioning system was carried out under inspection 1C + 2Y. In order to access the inner part of the heat exchanger, it is necessary to dismantle the compensation bellows that was the cause of hot air leakage in the incident.

At the moment of discovery of the heat exchanger compensation bellows defect of the left air-conditioning zone in the process of aircraft inspections, after the detection of smoke and higher temperature in the passenger cabin, the total flown hours of the bellows had been 1,300 at 973 cycles.

1.6.4 Operations performed after the detection of smoke in the passenger cabin after the flight

When performing the steps in accordance with WO 7081248, leakages were detected in the sealing gaskets of the compensator of the pneumatic pipeline on the left side under the passenger cabin floor. There were four gaskets found in the compensator which were out of good working order (see positions 50 and 60 in the figure below). The air leakage from this area into the space under the passenger cabin floor was determined as the primary origin of the smoke emergence in the cabin where the smoke was generated due to the hot air leaking from the pipeline (the air temperature up to 200 °C) and affecting the dust present in the given area. This air drawn in by the left recirculation fan placed also in the same area was subsequently distributed into the passenger cabin.

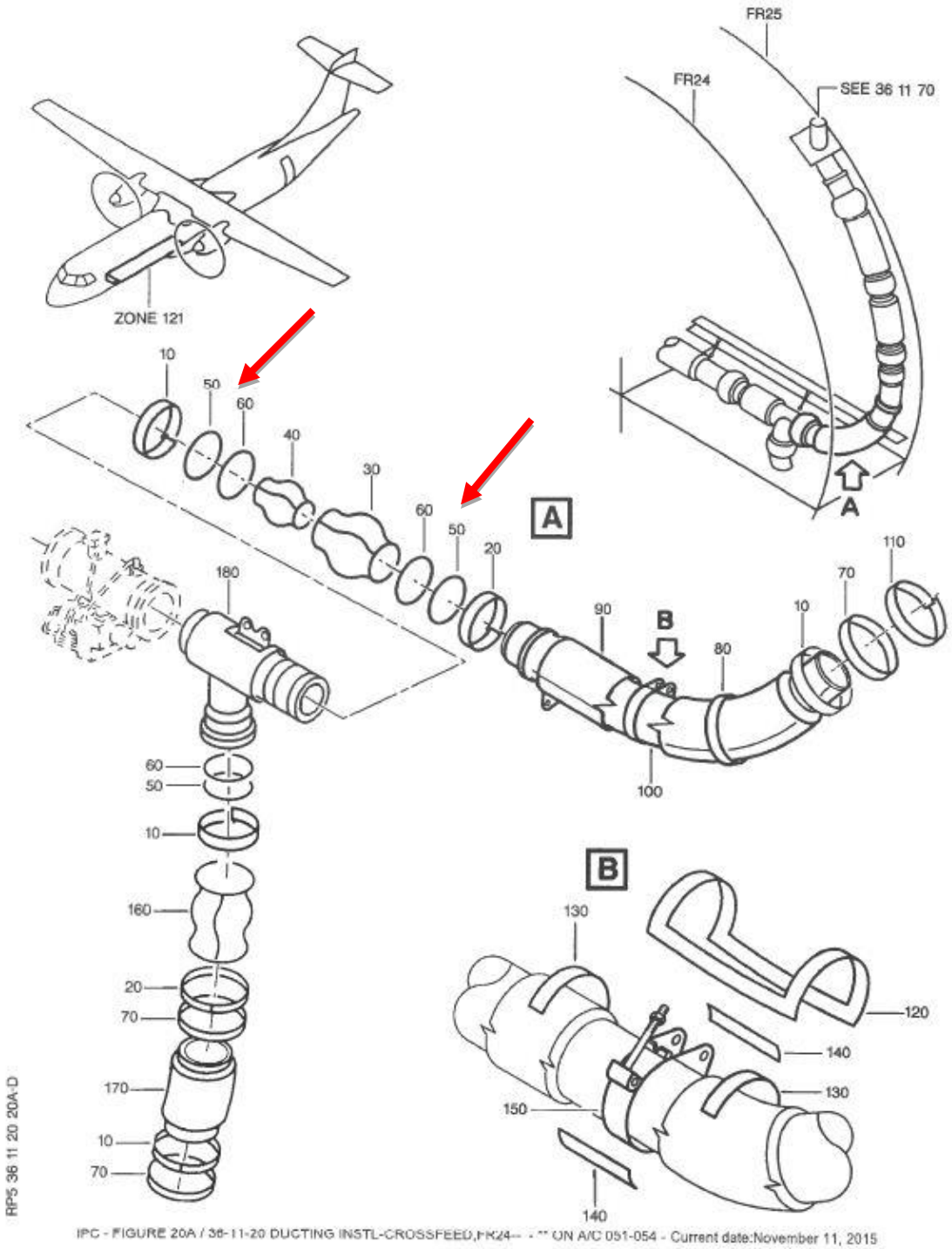

Fig. 1 Damaged gaskets of the compensator

During performance of the steps in accordance with WO 7081248, damage to the rubber-textile compensation bellows in the left a/c pack (see position 110 in the figure below) was further detected.

As a result of the air leakage from this bellows the controls regulating the temperature in the relevant air-conditioned zone were not functioning properly. The air leakage from the damaged bellows was determined as the primary cause of the rising temperature indication in the air-conditioning pipeline.

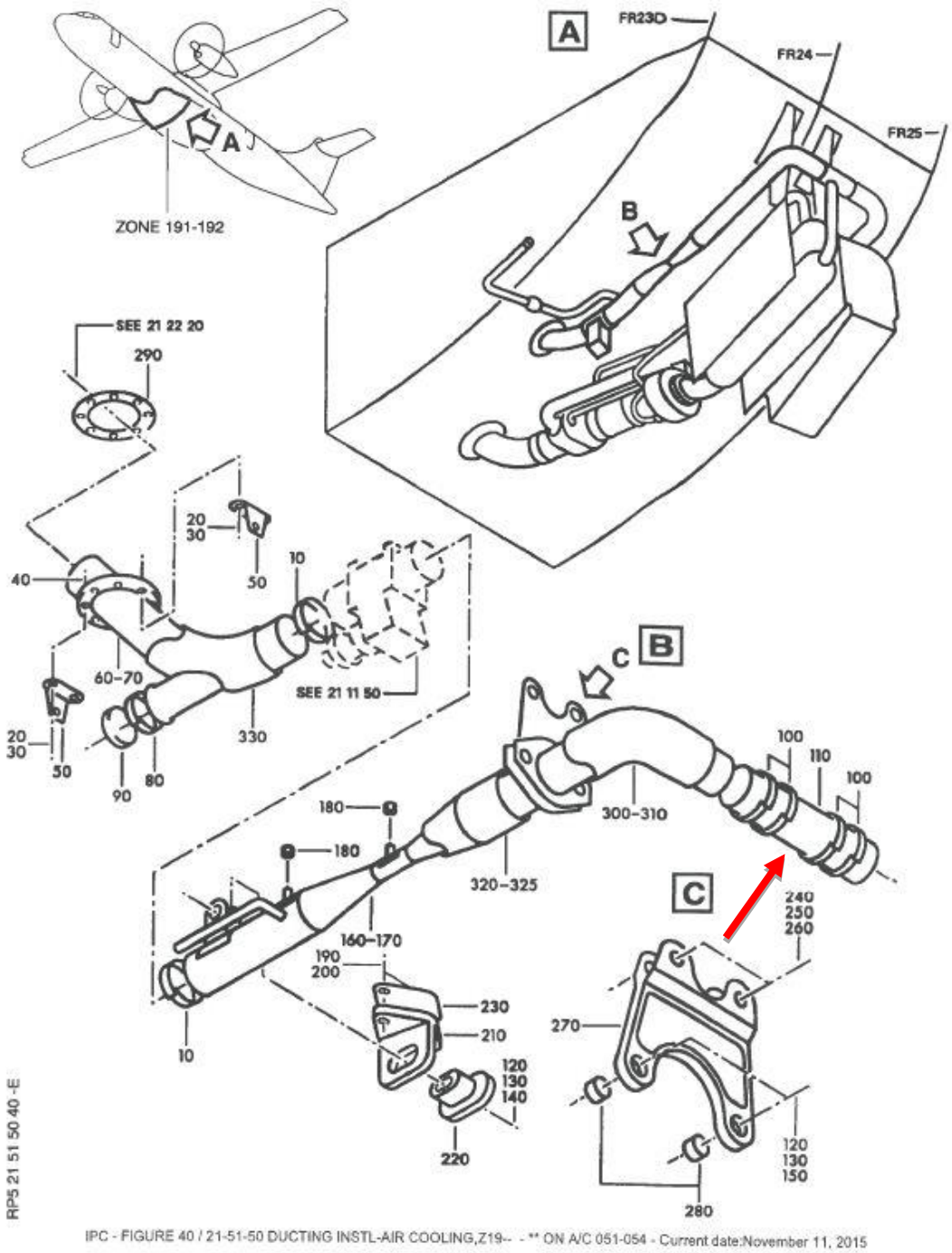

Fig. 2 Damaged rubber-textile compensation bellows

As the next step, three pieces of PBE used by the crew upon the occurrence of smoke in the passenger cabin were replaced.

1.6.5 The steps and inspections performed on the aircraft prior to its release back into operation

This WO 1604736 was issued in order to perform inspection aiming at potential heat effect on the primary as well as the secondary structures of the aircraft including equipment and anti-corrosion medium applied in the area where the air leakages had taken place. The inspections performed in the area under the floor in the fuselage as well as in the landing gear pontoon:

- General visual inspection (GVI) of the aircraft fuselage section separated by the frames FR 23 D – FR 25 and stringers STGR 15LH – STGR 18RH was performed with the focus on the thermal damage/effect on the fuselage structures and equipment mounted in the given area (skin, stringers, floor beams, brackets, aircraft units, wiring, pipelines). The GVI did not reveal any thermal damage/effect in the monitored area.
- Dismantling and visual inspection of the insulation blankets in the concerned area focusing on finding the traces of overheating. The inspection did not reveal any thermal damage/effect in the inspected area.
- Visual inspection of the anti-corrosion Dinitrol coating focused on its potential thermal damage and/or potential effect caused by higher temperature. The inspection did not reveal any thermal damage/effect in the inspected area.
- Cleaning of the fuselage structure and its detailed visual inspection (DVI) focusing on thermal damage/effect of the coating system manifested by the change in colour. The inspection did not reveal any thermal damage/effect in the inspected area.
- Cleaning of the fuselage structure and its detailed visual inspection (DVI) focusing on thermal damage/effect of the coating system manifested by the change in colour. The inspection did not reveal any thermal damage/effect in the inspected area.
- Detailed visual inspection (DVI) of the dismounted access panels focusing on the thermal effects manifested on them (state and colouring) from both sides. The inspection did not reveal any thermal damage/effect in the inspected area.

None of the individual inspections revealed any thermal damage or effect in the stated areas such as would require performing further steps or procedures.

After completion of the above described operations, the pneumatic system tightness test was performed during the engine check in accordance with procedure AMM JIC 36-22-11-OPT-10000-002. No leakage was detected during the pneumatic system tightness test.

Neither leakages of working fluids, nor potential contamination of the air-conditioning system as the source of the smoke were detected through engine, fuel system, and hydraulic system inspections.

1.7 Meteorological Information

1.7.1 CHMI Weather Report

According to the CHMI Aviation Meteorology Department’s estimate, the weather situation at the place of the serious incident was as follows:

The situation:	A waved cold front was passing slowly through West Bohemia to east. Before the front very warm air was blowing into the Czech Republic from southwest.
Ground wind:	320–340° / 15–20 kt, gusts 25–32 kt
Visibility:	over 10 km
Weather:	Broken, no precipitation
Cloudiness:	SCT Ac base 9000 ft AGL, BKN Ci base above 10000 ft AGL
Turbulence:	moderate, mechanical-thermal
Zero isotherm level:	14000 ft AMSL
Ice:	NIL

1.7.2 METAR LKPR Report

Extract from the METAR report from the Prague Ruzyně weather station (LKPR):

Time	Wind direction/ Wind velocity	Weather:	Temperature/ Dew point	QNH	Regional QNH:
15:30	160° V130–190°/ 07 kt	CAVOK	31.0 / 11.0 °C	1,000 hPa	998 hPa
15:47	260° V200–300°/ 11 kt	CAVOK	30.0 / 13.0 °C	1,000 hPa	998 hPa
16:00	340° / 19 kt G 31 kt	CAVOK	28.0 / 14.0 °C	1001 hPa	998 hPa
16:30	320° / 17 kt	CAVOK	27.0 / 14.0 °C	1002 hPa	998 hPa

1.8 Radio Navigational and Visual Aids

The used standard equipment at LKPR was operational and in working order.

1.9 Communications

The recordings of the following radio correspondence between the crew and the air traffic control sites were secured:

- TWR LKPR on 118.100 MHz,
- APP LKPR on 127.525 MHz.

Further, there was communication established and led between the crew and the FRS commander on 121.600 MHz.

All of the recordings were comprehensible, intelligible and readable.

1.10 Aerodrome Information

LKPR is a public international airport. It is located 10 km to west from the Prague Castle. It bears no effect on the origin or course of the serious incident.

LKPR reference point:

Geographical coordinates:	N 50°06´03,0´´
	E 014°15´36,0´´
Altitude:	376.0 m

Selected physical properties of runways:

RWY designator	True and magnetic courses	RWY dimensions	Surface RWY and SWY
06	065°GEO 061°MAG	3,715 m x 45 m	Concrete
24	245°GEO 241°MAG	3,715 m x 45 m	Concrete
12	127°GEO 123°M AG	3250 m x 45 m	Concrete, antiskid
30	307°GEO 303°MAG	3250 m x 45 m	Concrete, antiskid
04	037°GEO 033°MAG	2120 m x 60 m	Asphalt concrete
RWY22	217°GEO 213°MAG	2120 m x 60 m	Asphalt concrete

Note: RWY 04/22 closed for take-offs and landings. Taxiing, parking and handling of aircraft permitted.

1.11 Flight Recorders and Other Means of Recording

The flight history evaluated from the Quick Access Recorder (QAR). The recording was intelligible and used after the evaluation phase in investigation of the causes of this serious incident.

CVR was evaluated and used in investigation of the causes of this serious incident. The CVR recording confirmed the statement provided by the crew and also the history of the situation. It has been ascertained from the recording that the F/O did not execute the switch-over of the radio communications system after the use of an oxygen mask in a correct manner. Hence the transmissions by the F/O when acknowledging the ATC notifications were rendered unintelligible.

1.12 Serious Incident Location Description

NIL

1.13 Medical and Pathological Information

Upon landing, the FSQ manager carried out breath tests for alcohol in both pilots with a negative result.

There were no crew or passenger injuries. Both the cabin crew members and majority of the passengers underwent prophylactic toxicological examination of blood samples with negative results. Based on the results, a supplementary treatment (O_2inhalation therapy) was performed in 4 passengers.

1.14 Fire

Origin and occurrence of fire were not proven.

1.15 Survival Aspects

No measures were taken in respect to survival aspects.

Other operations at LKPR during the serious incident:

- “Red alert” was declared at 16:06 for the rescue teams, the take-offs were cancelled, and the inward flights were converted into the hold mode,
- at 16:16 aircraft OK-GFS landed,
- at 16:23 the “Red alert” was revoked.

1.16 Tests and Research

NIL

1.17 Organisational and Management Information

The CSA is an authorised operator of commercial air transportation in accordance with the Air Operator Certificate CZ – 1 and CAMO under PART-M.

CSAT holds a valid licence for performing maintenance, repair and modification of civil aircraft and aircraft owned by CSA. CSAT is an approved maintenance organisation in accordance with PART-145.

1.18 Additional Information

During the FRS operation after the landing of the aircraft, distortions were occurring in the communication between the crew and the rescue operation commander via the ATC as well as in the direct communication with other FRS members, namely regarding the passengers disembarking the aircraft. Ultimately, this led to extending of the period necessary for the rescue operation to be completed.

1.19 Useful or Effective Investigation Techniques

The professional investigation of the serious incident causes followed regulation L13

2. Analyses

2.1 Basic Factual Information Analysis

Both, the flight as well as the cabin crew members were holders of valid licences and the required qualifications for performing the flight.

The air crew held valid medical certificates.

The aircraft had a valid airworthiness inspection certificate and valid legal insurance coverage, It was brought for the flight in operable condition, failure-free and with all valid certificates of inspections.

2.2 Analysis of the causes of technical failures

2.2.1 Cause of the “BLEED FAULT No. 2” signalling during taxiing for take-off

No technical failure of the system was the cause of the defect signalling during the taxiing but the circumstances regarding the passenger cabin air-conditioning at very high external air temperatures employing No. 2 engine in the “HOTEL MODE” led very likely to the false indication and failure alarm.

The pneumatic systems of the right-hand and left-hand sections of the aircraft are during the operation of both engines separated from each other and the failure “BLEED FAULT No. 2” signalling was not related to the later failure in the left-hand part of the pneumatic system. Resetting of the system was carried out in accordance with QRH which allows performing one reset procedure and to continue in the normal operation.

2.2.2 Cause of the rise of temperature and “TEMP SEL OVHT CABIN” signalling

The rise of the air temperature was caused by the hot air leakage from the damaged rubber-textile compensation bellows connecting the heat exchanger of the air-conditioning system with the air-conditioning pipeline which led to incorrect regulation of the temperature in the system and to rising of temperature in the air-conditioning system pipeline and to “TEMP SEL OVHT CABIN” signal.

2.2.3 Cause of the occurrence of smoke in the passenger cabin

The occurrence of smoke in the passenger cabin was caused by the hot air leakage (air temperature up to 200 °C) due to the faulty leak tightness of the pneumatic system compensator. The faulty tightness properties were caused by the damage of the rubber-textile gasket rings in the compensator in the left-hand branch of the pneumatic

pipeline under the passenger cabin floor. Here, due to the effect of the hot air stream, the present dust was whirled up. Subsequently, the dust was drawn in by the recirculation fan located also in this area. The said hot air mixed with the whirled dust was then distributed into the passenger cabin.

With an absolute certainty, the contamination of the pneumatic system with the working fluids or fumes of the exhaust gases can be eliminated as the cause of the smoke.

2.3 Crew solution of the failure

The crew, in compliance with FCOM/QRH, began to perform actions in accordance with the emergency procedure and continued until the sign “IF SMOKE PERSISTS”. Upon the check performed by the aircraft captain verifying that no more smoke is generated in the passenger cabin, the crew discontinued the emergency procedure action.

2.4 Cabin crew activity after detecting the failure

The cabin crew used PBE for their protection. In the initial stages, the cabin crew provided the passengers with makeshift protection and thus prevented their health from harm. The crew then proceeded in accordance with the standards of the operator in subsequent stages.

In preparation for the emergency, the cabin crew proceeded in accordance with the operator’s operational procedure CSA-MN-6 CCOM 2.4.2.1 Emergency procedures.

2.5 History of the flight after the failure occurrence

After the smoke was detected in the passenger cabin, the aircraft captain declared the state of emergency with the distress signal “MAY DAY”. The declaration of the state of emergency was appropriate and adequate to the situation. The crew set SSR transponder code 7700 (state of emergency).

The captain announced the emergency situation into the passenger cabin. Both, the flight as well as the cabin, crews proceeded in accordance with OM-A, 8.P.3 D) EMERGENCY PROCEDURES at all times.

The captain commenced descent anticipating vectoring for shot approach at RWY 24 from ALT 3000 ft. He notified the ATC of this intention. He then proceeded with hand-flying of the aircraft (the automatic control had still not been activated after the take-off) with the anticipation of a quick emergency return to the airport. The F/O was performing the actions in accordance with the emergency procedures. The crew failed to follow the SOP by not altering the values of FL on ADU from FL 140 to ALT 3000 ft. Hand-flying contributed to an increase in the workload for the crew and thus decreased their SITUATIONAL AWARENESS. The automatic control was connected when performing the MEMORY ITEMS where the “HDG” and “IAS” modes were activated. Having reached ALT 3000 ft. the captain switched the automatic control to the VS mode and set the climb rate at approx. 500 ft/min. The value of FL 140 was still set on ADU. No capture and flight stabilisation took place at ALT 3000 ft but the aircraft continued in the climb. The crew did not respond to the arisen situation. During

the climb the speed was reduced to minimum which was noted by the aircraft captain and adjusted by increasing the power. When the aircraft was climbing through ALT 4400 ft, the ATC issued an instruction to the crew to descend to ALT 3000 ft and to turn into course in the heading of 110 degrees. This clearance was this time correctly set on ADU and the flight returned into standard operating mode.

By performing the ABNORMAL PROCEDURES the crew eliminated the smoke entering the passenger cabin. The crew carried out an immediate return to the take-off aerodrome. The state of emergency was terminated by safe landing.

The aircraft was guided to a short final 6 NM ILS RWY 24, approach and landing was performed in a standard manner.

The crew was proceeding in accordance with the operator's operational procedure as given in FCOM/QRH and CSA-MN-1 (OM-A) and managed to respond to the failure well.

The infringement of the standard operational procedure (SOP) affected the development of the flight after the failure occurrence. The crew corrected the deviations occurred and was able to return to the standard mode of flight operation.

It follows from the CVR recording evaluation that the F/O did not, after having used the oxygen mask, perform the switch-over of the radio communications system in a correct manner. Therefore the first officer's transmissions of acknowledgements of the ATC notifications were rendered unintelligible.

2.6 Incident history after the landing

After the landing, the aircraft stopped on RWY 24. The aircraft captain contacted the senior cabin crew member in order to obtain an evaluation of the situation in the passenger cabin. Upon receiving information that in the passenger cabin only the malodour could be smelt and that it was possible to taxi, the captain decided to continue in taxiing towards the stand with the immediate emergency passenger evacuation not being necessary. He notified TWR of this decision with a request for taxiing to the stand with a speedy disembarkation of the passengers.

The aircraft was holding at RWY for the FRS to perform inspection. During the hold the emergency situation in the passenger cabin was revoked by the standard command "CABIN CREW AND PASSENGERS KEEP YOUR SEATS". The crew perceived the waiting time for the inspection to be concluded as a long delay (2 min 9 s).

After the revocation of the emergency situation during the hold and taxiing, the aircraft captain was monitoring the development of the situation in the passenger cabin through the senior cabin crew member.

One of the factors in the hold before the taxiing commencement was blocking of the TWY C with fire-fighting vehicles and the following delay in the communication between the aircraft crew and the rescue operation commander via TWR.

The information from the rescue operation commander at 121.600 MHz about performing the inspection of the cabin after the disembarkation of the passengers was incorrect. The passenger cabin inspection performed with the aid of thermographic camera was carried out whilst the passengers were still on board.

After parking at stand No. 60, the malodour in the passenger cabin could still be smelt. The aircraft captain issued an instruction for the disembarkation of the passengers to commence even without the provided buses. The disembarkation was very likely declined by one of the FRS members as it follows from the statement of the senior

crew member that until buses were provided, the disembarkation of the passengers was not permitted. The arrival of buses was delayed due to the traffic in the aerodrome service area. Thus a 7 minute delay was caused in commencement of the passenger disembarkation. The aircraft captain was not informed about the stated situation. The passengers disembarked the aircraft in a standard manner and nobody was injured.

2.7 Weather Impacts

Weather conditions had no impact on the event origin and course.

3. Conclusions

3.1 The AAII Commission concludes as follows:

3.1.1 Cabin crew

- held valid operating licenses and had valid adequate rating,
- held valid medical certificates,
- were capable of completing the scheduled commercial flight,
- declared “MAY DAY” signal which was revoked upon landing at LKPR,
- responded to the emerged situation at the occurrence of smoke and rising of the temperature in the passenger cabin with the subsequent return back to LKPR in accordance with the the operator’s operational procedure under FCOM/QRH and CSA-MN-1 (OM-A),
- at the return to LKPR did not follow and comply with the standard operational procedure,
- was not correctly notified of the passengers’ disembarkation which was in contradiction with the captain’s command to disembark.

3.1.2 Aircraft

- had a valid airworthiness inspection certificate,
- its insurance coverage was current,
- did not infringe on any operational limitation.

3.1.3 Meteorological Conditions

- at LKPR were suitable.

3.2 Causes

The cause of the serious incident was the leakage caused by damage/wear and tear of the rubber-textile gaskets in the leaking pneumatic pipeline compensator on the left-hand side under the passenger cabin floor and damage to the rubber-textile compensation bellows connecting the left-hand air conditioning system branch heat exchanger with the system pipeline.

4 Safety Recommendations

As a preliminary safety measure Safety Bulletin 08/15 was issued by the operator of the ATR 72 type of aircraft.

To perform inspection and replacement of the gaskets in the compensators of the pneumatic pipelines in the area under the passenger cabin floor in this type of aircraft at the next closest suitable ground time.

5 Annexes

NIL