AIR ACCIDENTS INVESTIGATION
INSTITUTE
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No.: 425/05/ZZ
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FINAL REPORT

The investigation into a Serious Incident of Boeing 737-400, Registration Mark OK-TVR,Cabin Depressurization, on September 1, 2005

Prague
September 2006

A) Introduction

Operator: Travel Service, Czech Republic
Manufacturer and Model: Boeing B 737-400
Call Sign: GSM6142
Place of event: ca 100 NM NE LFBD
Date: 1th September 2005
Time: 06:40 (all times in UTC)

B) Synopsis

On 1 September 2005 ÚZPLN (Air Accidents Invstigation Institute CZ) recieved a report on a serious incident of Boeing 737-400. Based on the report an investigation into the cause of the incident got started.

The cause of the incident was investigated by a ÚZPLN commision consisting of:

Chairmen of Commission: Josef Procházka
Member of Commission: Luboš Střihavka
Member of Commission: Vladimír Vlk, Travel Service officer

The Final Report was issued by:
ÚSTAV PRO ODBORNĚ TECHNICKÉ ZJIŠŤOVÁNÍ PŘÍČIN LETECKÝCH NEHOD
Beranových 130
199 01 PRAHA 99
Czech Republik
September 1. 2006

C) The body of the report contains the following chapters:

1. Factual Information
2. Analyses
3. Conclusions
4. Safety Recommendations
5. Annexes (stored with copy No. 1 in ÚZPLN archive)

1. Factual information

1.1 Incident course

The flight was executed by an airplane of the Czech operator. The plane was leader to a foreign airline operator. The departure airport was Glasgow, Scotland. The scheduled arrival airport was Alicante, Spain. After travelling for around 1 hr and 34 min in stable horizontal flight at FL 330 there was a signal showing a loss of cabin pressure. The crew applied emergency procedures conforming to the operational manual. The passengers' oxygen masks were activated manually. After reaching a safe flight level, the crew found out that both of the „PACK" switches on panel P5-10 were at „OFF" position. The crew

readjusted the switches to working position „AUTO“. In this way the cabin pressurization system had been recovered. The plane then diverted to LFBD (Bordeaux) airport where it landed safely.

1.2 Injuries to person

Injury	Crew	Passengers	Other Persons
Fatal	0	0	0
Serious	0	0	0
Light/No injury	0/5	0/164	0

1.3 Damage to aircraft

NIL

1.4 Other Damage

NIL

1.5 Personnel information

Pilots:	CPT	F/O
Age:	55	36
Pilot licence:	valid	valid
Medical certificate:	valid	valid
Total flying hours:	13 200	1600
Flying hours on type:	as CPT 1 200	as F/O 1000
Flying hours as CPT:	7 500	

1.6 Aircraft information

Type:	Boeing B 737-400
Year of manufacture:	1989
Number of flights:	33 674
Total hours flown:	40 988 hr 34 min
Airworthines certificate:	valid
Registration certificate:	valid

1.7 Meteorological information

The flight was executed along a cold front. Enroute weather. Cloudy to broken Cu, Ac. Sometimes light turbulence and middle-heavy icing up to FL 140. In northern portion of the route possible isolated Cb in clouds up to FL 270 and up to FL 380 in southern part.

The meteorological situation had no effect on the incident.

1.8 Aids to navigation

NIL

1.9 Communication

No effect to accident.

1.10 Aerodrome information

Airports of Glasgow, Alicante and Bordeaux had no effect on the serious incident.

1.11 Flight recorders

DFDR flight recorders transcript and CVR transcript were used in looking into the cause of the incident.

1.12 Wreckage and impact information

The incident place was ca 100 NM NE LFBD, FL 330.

1.13 Medical and Pathological Findings

NIL

1.14 Fire

NIL

1.15 Search and rescue

No search was organized.

1.16 Tests and research

Operator’s graphic and analogue means were used to verify flight parameters. ČSA a.s. (Czech Airlines) means were used to copy CVR recording on an audiocassete.

The Criminology Institute, Prague, of the Czech Republic made a CD ROM copy of debuget record.

The commission verified the possibilities of resetting L and R PACK switches using a nonstandard way (by head or shoulder) in the B737-400 OK-TVR cabin.

1.17 Organizational and management information

NIL

1.18 Additional information

On 1st September 2005, after emergency landing in Bordeaux, the captain reported the serious incident caused by a loss of pressure in flight to his company operator by phone at extension 24 Hour ENGINEERING.

At FL 330 the captain manually activated passengers oxygen masks and started emergency descent. After coming to FL 130 the crew found out that the two switches (L and R pack) were not in the positioin ensuring the cabin pressurization and air condition and reset the switches to „AUTO“ position. The air condition system was recovered at once and the plane force-landed at the Bordeaux airport.

A technical analysis was made. Based on the analysis, CAA CZ agreed with a technical flight to Prague applying item MEL-35-2. Since the captain confirmed that the two pressurizing switches were „OFF“ at the moment of depressurization, it was not necessary to take further steps to find the incident cause before the flight to Prague. The flyover was executed at FL 190 with the air condition units „ON“ without passengers. The crew recorded no loss of pressure in the cabin. Immediately upon arrival to Prague on September 1, 2005 the DFDR and CVR were taken out to read the data and detail revise of the situation, which was done in the presence of the investigation commision.

After the operator had completed all the neccesary work, the plane was freed for operation.

1.19 Investigation Methods

The investigation into the serious incident was conducted in accordance with Annex 13.

2. Analyses

2.1 Incident History

- The airplane took off from Glasgow at 05:16:34 and climbed to FL 330 to fly to Alicante, Spain.
- On this level the left air-condition unit was switched off at 06:40:35 and right unit at 06:40:39 in accordance with DFDR. There was no manipulation with the units during the flight before this serious incident occurred.
- The four-second time interval may have been due to the fact that this parameter is recorded every four seconds, so the left unit switch-off was recorded in an interval antecedent to the right unit switch-off. The time space between the two switch-offs could have been from 0 to 8 sec.
- About 4 min after the air condition units had turned out, the automatic sound signal was activated showing a loss of cabin height.
- At 06:44:11 the crew started emergence descent to FL 100. The descending was over at 06:50:38.
- At 07:03:54 (after 23 min from the switch-off) the air condition units were turned on again, so the pressurization system recovered to normal.
- The plane diverted to the Bordeaux airport where it landed safely.
- After landing the captain told the operator what had happened.
- The case was consulted with the operator‘s technical department who also gave the order to switch off CVR.
- The captain, in accordance with his statement, disallowed his a manipulation with the switch-off climatization units.
- F/O allowed, in accordance with his statement, that he could turned out switches when went to a toalet by his head or shoulder, but inadvertenly.
- Construction of these switch-offs prohibitives to changeover from „AUTO“ positon to „OFF“ by head (that headphones on) or shoulder. Change over mechanizm lever pulled out first. Next it was possible to changed over this lever to required fixed position (selfguarded construction).
- Only the time of 30 minutes from the movement the crew left the cabin after landing in Bordeaux is recorded on CVR. Only French radio communications legible between ATS and other aircraft is legible of the record.
- The tests carried out at home airport eliminated a technical defect as the cause of the incident.

2.2 Analyses of statemants

The Statements of a Crew - September 1st 2005

CPT said: *After around one and half hours´flight as the F/O went to the toalet the automatic signalization showed a loss of pressure in the cabin. CPT put on the mask and continued „Memory Items“. F/O was back at once. After descending to FL 130 and then FL 100, the crew found out that the L and R Pack were at „OFF“ position. After turning them on, the air conditioning began to work properly.*

There is no mention in the statement about the crew manipulating with the air condition system.

F/O said: *He admited the posibility of grazing the two switches with his head, setting them to the OFF positron, as he went to the toilet as long as they were in intermediate position. However he is not aware this happened.*

The probability of switching over two switches simultaneously by head or shoulder is improbability.
The switch design prevents them from beány regent inadvertenly by head (with headphones on) or shoulder from „AUTO“ to „OFF“ position. The switch lever must be pulled out a little first and only then can be set to the new position fixed mechanically (so called self-guarded design).
Between L and R PACK there is another switch of the same size, an ISOLATION VALVE, that is half distance (ca 9 cm) in between. It is the same design as L and R PACK. This switch prevents by its location between L and R PACK and its dimensions their switched-over with head or shoulder simultaneously.

The Statement of CPT – September 2nd 2005

CPT said: *After one and half hours flight the F/O went to the toilet. During his absence a sound signal came on, indicating a loss of pressure in the cabin. CPT actuated the passenger masks manually. Before starting an emergency descent, the F/O returned to the cabin. After reaching FL 100, the crew found out that both of the PACK switches were at „OF“ possition. On turning them on, pressurization recovered to normal work.*

Question: How do you explain L and R PACK switching of in flight?

CPT said: *F/O asked for permission to go to toilet. Before he had left I asked him to switched off the recirculation fan. I cannot foreclose the posibility that the PACK switches, which are located under the FAN switches, were operated instead FAN switches. This situation came on ca 4 min after F/O had left his seat.*

Crew Statement on September 3th 2005

CPT said: *CPT wanted to have a smoke. He asked F/O, who was a non-smoker to leave. Before F/O had left, he turned out two switches. CPT supposed they were L and R RECIRC FANs. CPT asked „why two“. F/O signed or said „in order to prevent smoke coming in the cabin“. CPT did not make „CROSS CHECK“ to make sure which switches had been off actually. In the past, if CPT wanted to have a smoke, he had always turned out one recirculation fan only.*

F/O said: *CPT wanted to have a smoke in the cabin and F/O was non-smoker. CPT asked F/O to go to toilet. F/O agreed, handed over radiocommunication to CPT and left the cabin. He did not know what else could have happened before he left the cabin but he have thought that CVR will tell more.*

CPT: In his amplifying statements he said that F/O might have turned out L and R PACK on panel P5-10 by mistake. He said he was not aware of turning out the switches himself.

F/O: He was not aware of switching off L and R PACK according to his statement.

3. Conclusions

- The crew had valid rating and medical certificates.
- The weather was good for the flight.
- The aircraft was able to planing flight.
- CPT was a smoker.
- The crew wanted to prevent smoke coming to the passengers cabin.
- At FL 330 the L and R PACK switches controlling the left and right air-condition units were set to OFF position by mistake instead of switches controlling the left and right recirculation fans.
-.The crew than followed procedures conforming to the operator manual in case of depressurization.
-.The crew determined the cause of depressurization 23 minutes after switching off air-condition units on a safety level.
- CVR was switched off after more than 30 min from the time the crew left the cabin after landing.
- Time of record of CVR was 30 min.
- The crew did not switch off of CVR in accordance with an instruction of operator.
- It was not possible to prove, neither from analysis nor pilots´ statements, which crew member was to blame for manipulating with the switches.
- After one member of the crew had manipulated with the switches, the other member failed to make an obligatory CROSS CHECK.
- The CPT ordered F/O to leave his seat, was contrary to JAR-OPS 1.310, Operating manual part A page 8-141 and National Regulations L 6/I art. 4.5.1, 4.5.2, L 6/II art. 4.15.2, 4.15.3.

4. Safety recomendations

- Make the crews flying these airplane models familiar with the course of the serious incident.
- Other measures are up to the operator.

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Josef Procházka
Investigator in-charge

Praha September 1. 2006

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Pavel ŠTRŮBL
Director