FINAL INVESTIGATION REPORT ON AIR TURN BACK INCIDENT TO M/s AIR INDIA EXPRESS LTD, BOEING 737-800 NG AIRCRAFT, VT-AXW, FLIGHT IX-350 ON 09.02.2019 AT MUSCAT

GOVT OF INDIA
CIVIL AVIATION DEPARTMENT
O/O DIRECTOR AIR SAFETY
WESTERN REGION
NEW INTEGRATED OPERATIONAL OFFICE COMPLEX
SAHAR ROAD
VILLE PARLE (EAST)
MUMBAI-400099

INDEX

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GENERAL INFORMATION:

a)	Aircraft	Type	: Boeing 737
		Model	: Boeing 737- 800 NG
		Nationality	: Indian
		Registration	: VT-AXW
b)	Owner		: M/s Four Lions Aircraft LLC, Delaware, (USA)
c)	Operator		: M/s Air India Express ltd (India)
d)	Pilot in command		: ATPL holder
	Nationality		: Indian
e)	First Officer		: CPL holder
	Nationality		: Indian
f)	No. of Cabin Crew		: 04
g)	No. of Passengers		: 185 including 03 infants
h)	Date and time of Event		: 09.02.2019,Approx 23:24Z
i)	Last Point of Departure		: Muscat
j)	Point of Intended Landing		: Calicut
k)	Phase of operation		: Climb
l)	Type of Incident		: Pressurisation failure

(All timings in the report are in UTC, unless otherwise specified)

SYNOPSIS:

M/s Air India Express ltd, Boeing 737-800NG Aircraft, registration VT-AXW was involved in an air turn back incident on 09.02.2019 at Muscat while operating scheduled flight IX-350 from Muscat to Calicut. This flight IX-350 was planned for assessment check (training) of First officer by the Designated Examiner. The aircraft took-off from Muscat at 23:18 Z to Calicut. The PIC was the pilot flying and the First officer was the pilot monitoring. The flight was uneventful till FL 120. While climbing through FL120, crew got a Cabin ALT warning. Crew immediately descended to FL 100 and carried out the Non-normal procedures and checklist.

The cabin pressure started rising and pressurization failure warning came, crew decided for air-turn back to Muscat and carried out overweight landing. There were 06 crew (02 Flying crew + 04 Cabin crew) and 185 passengers including 3 infants on board the aircraft. Out of 185 (including 03 infants) passengers, four passengers complained of nose bleeding. All other persons on-board were safe. There was no damage to the aircraft.

This incident was caused due to non-adherence to SOP as First officer missed to put PACK switch in AUTO Mode, while Pilot in command missed to crosscheck the same while carrying out the BEFORE TAXI C/L & AFTER TAKE OFF C/L and subsequent improper handling of Pressurisation out flow valve.

DGCA ordered the investigation of the incident by appointing an Investigator-in Charge under Rule 13(1) of the Aircraft (Investigation of Accidents and Incidents) Rules, 2017. The cause of the incident is attributed to non-adherence to SOP and loss of situational awareness by the crew while carrying out the cockpit normal checklist.

1.0 FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT:

On 09.02.2019, M/s Air India Express ltd, Boeing 737-800 NG aircraft, VT-AXW was scheduled to operate flight IX-350 from Muscat to Calicut. The flight was under the command of PIC. There were 06 crew (02 Cockpit crew + 04 Cabin crew) and 185 passengers including 3 infants on board the aircraft. The previous sector (flight IX-337, Calicut to Muscat) was operated by the same pair of cockpit crew. Both sector (Calicut-Muscat-Calicut) flights were scheduled for the assessment check of trainee First Officer by

the Pilot-in-command (Designated Examiner). Previous sector operated as flight IX-337 from Calicut to Muscat was flown by First Officer as Pilot flying.

In the incident flight, PIC was the PF and F/O was the PM. After the briefing was completed and start-up clearance was obtained from ATC, packs were put to off by PM as per procedure before starting engines. Subsequently, BEFORE TAXI procedures and checklist was carried out by PM. While doing this, PM switched ON the isolation valve and switched off the APU BLEED SWITCH but did not put packs switch to AUTO position. PF, without cross verifying, assumed that PM completed the checklist and continued for taxi.

The Aircraft departed from Muscat and was airborne at 23:18Z. The after TAKE OFF procedures and check list, which are READ & DO items, were done by PM, however the PM again missed the PACK SWITCH at this time.

The flight was uneventful till Flight Level 120, however at 23:24:13 UTC, at 12,536 feet on baro-altitude, Cabin Altitude warning triggered. The flight was levelled off at FL130, requested clearance from ATC to descend to FL100. The descent was commenced and subsequently carried the Non Normal Check-List (MEMORY ITEMS) in case of Cabin Altitude warning.

However while performing memory checklist, after donning OXGYEN MASKS, the crew could not establish communication with ATC through the OXGYEN MASK microphone. Hence, the oxygen mask was removed and communication was made through the HAND MIC.

While descending to FL40, PIC observed PACK in OFF position, and same was made to AUTO position. However by that time, the Pressurization Mode was in manual mode as memory items (checklist) were carried out, therefore it created a little overpressure. Further the outflow valve was operated manually to open position for the cabin to stabilize. The pressurization could not be controlled. Hence, PIC decided to return to Muscat. The NON NORMAL LANDING DISTANCE was calculated for an overweight landing. Aircraft landed safely at Muscat at 23:55 Z.

1.2 INJURIES TO PERSONS:

Injuries	Crew	Passengers	Others
Fatal	00	00	00
Serious	00	00	00
Minor/ None	02+04	185(Including 03 infants)	00

Total passengers 185 passengers including 03 infants were onboard. Four passengers complained of nose bleeding (Pax. seated at 4D, 13F, 20B & 25B). After returning to Muscat, these four passengers were treated on-board by airport doctor and found fit to travel. No passengers were hospitalised. Few other passengers also complained of ear blockage and pain. Further all passengers were travelled on the delayed flight to Calicut.

1.3 DAMAGE TO THE AIRCRAFT: There was no damage to the aircraft

1.4 OTHER DAMAGE: NIL

1.5 PERSONNEL INFORMATION

1.5.1 PILOT IN COMMAND:

AGE	46 Years, Male
License	ATPL
Date of License Issue and Valid up to	Issued date : 26.05.2006 Validity : 25.05.2021
Category	Aeroplane
Class	Multi Engine Land
Endorsements as PIC	B 737-300/400/700/800 CESSNA 152A DUCHESS 76
Date of Joining Company	05.05.2009
Instrument Rating	B 737-800
Date of RTR Issue and Valid up to	Issued Date : 13.07.2012 Validity : 02.11.2053
Date of FRTOL issue & validity	Issued Date : 04.11.2012 Validity : 03.11.2022
Date of Medical Exam & validity	Exam date : 15.10.2018 Validity : 19.10.2019
Date of Route Check & validity	RC : 04.12.2018 Validity : 03.12.2019
Date of Last Proficiency Check	18.09.2018
Date of IR check	18.09.2018
Date of English language Proficiency & Valid up to	Level 06 Done date : 25.02.2011 Validity : lifelong
Date of last CRM	19.06.2018

Date of last Monsoon training	22.06.2018
Date of Dangerous Goods Awareness Training	18.05.2017
Date of last Refresher/Simulator	(CRM LOFT) 03.10.2018
Simulator Training for Critical Emergencies	03.04.2018 & 03.10.2018
Familiarity with Route/ Airport flown for last 12 months and since joining the company.	Flown in this sector on 10.11.2018 & 09.02.2019
Total flying experience	12450hrs
Total Experience on type	12200 hrs
Total Experience as PIC on type	4106:04hrs
Last flown on type	9 Feb 2019
Total flying experience during last 01 year	861:52hrs
Total flying experience during last 180 days	289:25hrs
Total flying experience during last 90 days	150:14hrs
Total flying experience during last 30 days	78:49hrs
Total flying experience during last 07 days	23:02hrs
Total flying experience during last 24 Hours	03:51hrs
Rest period before the flight	24hrs

The Pilot-in-command is working as TRI from date 05.08.2015 and DE from date 30.05.2017 with M/s Air India Express ltd training organization.

1.5.2 FIRST OFFICER

AGE	37 Years, Female
License	CPL
Date of License Issue and Valid up to	Issued date : 21.12.2009 Validity : 22.03.2020
Category	Aeroplane
Class	Single Engine/Multi Engine Land
Endorsements as PIC	CESSNA 172 Piper Seneca PA-34
Date of Joining Company	01.02.2018
Date of Endorsement as PIC on B 737-800 type	NA
Instrument Rating	B 737-800
Date of RTR Issue and Valid up to	RTR (A) : 13048 Issued Date : 20.01.2009 Validity : 14.08.2061
Date of FRTOL issue & validity	Issued Date : 21.12.2009 Validity : 20.12.2019
Date of Medical Exam & validity	Exam date : 02.05.2018 Validity : 17.05.2019
Date of Route Check & validity	NA (Trainee Copilot)
Date of Last Proficiency Check	24.09.2018
Date of IR check	24.09.2018
Date of English language Proficiency & Valid up to	Level 06 Done date : 30.04.2011 Validity : lifelong
Date of last CRM	08.03.2018
Date of last Monsoon training	NA
Date of Dangerous Goods Awareness Training	27.03.2018
Date of last Refresher/Simulator	24.09.2018 (IR/PPC)
Simulator Training for Critical Emergencies	08.09.2018 (FFS-8)
Familiarity with Route/ Airport flown for last 12 months and since joining the company.	09.02.2019 (Incident flight)
Total flying experience	572:22 hrs
Total Experience on type	122:22 hrs
Total Experience as PIC on type	NA
Last flown on type	09.02.2019

Total flying experience during last 01 year	128:08hrs
Total flying experience during last 180 days	128:08hrs
Total flying experience during last 90 days	128:08hrs
Total flying experience during last 30 days	46:11hrs
Total flying experience during last 07 days	11:58hrs
Total flying experience during last 24 Hours	03:51hrs
Rest period before the flight	48hrs

Both the crew had undergone pre-flight breath analyser check before operating the outbound flight to Muscat at Calicut as per the provision of CAR and both were found negative. There was no Flight Duty Time exceedance for both the crew as per the records available.

As per records, Pilot in command and First Officer was not involved in any incident/accident.

1.6 AIRCRAFT INFORMATION:

The details provided below are as on prior to incident flight.

Aircraft Registration	VT-AXW
Type of Aircraft	Boeing 737-800 NG
Aircraft Serial No.	36334
State of Manufacturing	United States of America
Manufacturing year	2008
Owner	M/s Four lions Aircraft LLC, Delaware, (USA)
Operator	M/s Air India Express ltd (India)
Certificate of Airworthiness number and issue date	4069 dated 20/06/2008
ARC number and Validity	DDG/BLR/ARC/5TH/4069 Valid up to 30/06/2019
Aircraft TSN / CSN	TSN :35599 Hrs /CSN : 12122cycles
Maximum All Up Weight authorized	79015 Kg
Minimum crew necessary	Two
Engine Type # 1 (LHS): # 2 (RHS):	CFM56-7B27, S/N: 894900 CFM56-7B27, S/N: 894621
Last weight scheduled carried out date	10-03-2018
Aero Mobile station licence and validity	A-013/006/ WRLO-08 valid up to 31.12.2019
Failed part/ component in flight	Nil

Aircraft Take-off Weight	73125 Kg
Aircraft Landing Weight calculated	65635 Kg
Maximum Landing Weight	66360 Kg
Fuel On-board before Flight	10800 Kg
Major inspection was carried out from 13-01-2019 to 16-01-2019	PH79
Last ET schedule carried out	09-02-2019 Delhi

After completion of Daily Inspection schedule and Pre-departure schedule, aircraft was released to service on 09/02/2019 at Muscat for the sector (Muscat–Calicut) flight no. IX-350. The Scheduled Departure Time of the flight IX - 350 was 23:00 Z on 09/02/2019 and the aircraft took off at 23:18Z on 09/02/2019. Scrutiny of the maintenance records revealed that there was no relevant deferred snag for rectification and there was no active MEL invoked with regard to relevant aircraft systems while releasing the aircraft from Muscat. Before the incident flight, aircraft operated Calicut - Muscat (flight no. IX-337) sector by the same set of crew with nil snags. Before departure of the incident flight, aircraft was subjected to transit inspection. Aircraft take-off weight as per the Load & Trim sheet was 73125 kg and fuel on-board before departure was 10800 kg. As per the Load & Trim sheet, the Centre of Gravity was within limits. Aircraft was airworthy before the incident flight. Pilot Defect Report of the incident flight was as follows: ‘At approx 12000 ft. Cabin ALT warning horn & cabin altitude light came on. Aircraft descended to FL 100. Carried out NNCL checklist and landed back to Muscat. Checked non normal landing distance and did overweight landing.”

On Arrival after turn back at Muscat, Based on snag reported following tasks carried out.

i. Both #1 & #2 CPC BITE check carried out as per FIM and found nil faults. As a precaution both CPCs replaced as per AMM Post installation check carried out and found satisfactory.
ii. CVR replaced as per AMM
iii. Cabin Altitude Warning Switch (Both Switch) functional test carried out as per AMM and found satisfactory.
iv. Cabin Depressurization Conditional Inspection as per AMM carried out and found Satisfactory.

In view of above maintenance actions, aircraft was declared serviceable and released for normal flight.

Aircraft took off from Muscat as IX-350 (Delayed) at 10:18Z on 10.02.2019. Aircraft landed into Calicut at 13: 28 Z. There was no Pressurization snag in this sector. PCMCIA Card & DFDR was downloaded after arrival at Calicut by the engineering team.

As per PIC, during incident flight there was issue with Left side Pilot Emergency OXYGEN MASK Microphone, however PIC did not enter in Pilot defect report after landing at Muscat. He mentioned only "At approx 12000 ft. Cabin ALT warning horn & cabin altitude light came ON. Descended to FL 100. NNCL carried out and landed back at Muscat. Checked non normal landing distance and did overweight landing."

Further the same defect was mentioned by the new PIC of delayed flight IX-350 after arrival at Calicut as "Left side pilot emergency O2 System Boom MIC (OXYGEN MASK MICROPHONE) is not getting reset". Further the same was checked by the Aircraft maintenance Engineer at Calicut on 10.02.2019. The rectification was as: Capt side (P1) O2 Mask removed from stowage box and stowed as per AMM 35-12-85-910-801. Capt side Mask stowage box test carried out as per AMM 35-12-00-700-801. Found OK. Flight INPH (Interphone) sys operational test carried out as per AMM 23-51-00-710-801. OXYGEN MASK MICROPHONE operational test carried out as per 23-51-00-710-803. Both tests found satisfactory.

1.7 METEOROLOGICAL INFORMATION:

Meteorological report was available with the crew for briefing before flight. The aircraft took off from Muscat airport at 2318Z and landed back at 2355Z. The METAR obtained from Muscat airport for the date of incident from 2250Z to 2350Z are quoted as below:

Report time	23:50 Z(Landing)	22:50 Z(Take off)
Winds	Wind from 250°(west) at 5 knots	Wind from 260°(west) at 2 knots
Visibility	Visibility > 10 km (6 statute miles), clear skies and no weather significant to aviation	Visibility > 10 km (6 statute miles), clear skies and no weather significant to aviation
Temperature	19°C (66°F),	19°C (66°F),
Dew point	14°C (57°F)	14°C (57°F)
QNH	1017 hPa	1017 hPa
Expectations	No Significant changes expected	No Significant changes expected

Weather was not a contributory factor to the incident.

1.8 AIDS TO NAVIGATION:

Muscat airport is equipped with following Radio Navigation and necessary Landing Aids including markings, lightings, beacons, communication facilities etc.

VOR MCT_114.5
ILS LOC_108.9

Aircraft is equipped with navigation aids such as ADF, ILS, GPS, VOR, DME, ATC Transponder and Weather Radar. There were no known navigation aid difficulties reported by the crew.

1.9 COMMUNICATION:

Aircraft is equipped with Very High Frequency sets and a High Frequency set for communication. There was always two-way communication established between the ATC and aircraft.

1.10. AERODROME INFORMATION:

Airport Name: Muscat International Airport
ICAO Code: OOMS
IATA Code: MCT
Coordinates: N 23 35 34.29, E 058 16 54.47
Aerodrome Elevation: 47.77 ft
Runway: 08L/26R, 08R/26L
Lowest take off Minima RVR 800M
Lighting spaced at 60M: light intensity High (LIH) uniformly spaced at 60 M
Visual Approach slope Indicator System: PAPI 08 L

PAPI 08L	PAPI26R
Left side of RWY	Left side of RWY
Wing bar of 5 units	Wing bar of 5 units
Approach angles 3.00 degrees	Approach angles 3.00 degrees
MEHT 65 Ft	MEHT 65 Ft

Runway Dimensions:
08L/26R 4000M X 60M
08 R/26 L 3584M X 45 M

Declared distances:

R/W	TORA(M)	TODA(M)	ASDA(M)	LDA(M)
08L	4000	4000	4000	4000
26R	4000	4000	4000	3840
08R	3584	3644	3584	3164
26L	3584	3644	3584	3584

Threshold Elevations:

	THR	Elevations
Northern R/W	THR 08L	25.2 ft
	Displaced THR 26R	19.0 ft
Southern R/W	Displaced THR 08R	47.6 ft
	THR 26L	25.2 ft

Runway strength: PCN 60/F/A/X/U

Hours of Operation: 24 hours

Alternates: Dubai & Abu Dhabi

Fire Category: 9, Cat 10 is available on request

Weather Minima: Lowest Landing Minima: RVR 800 (M), DH 60(M) for 08L/26R & 08R/26L runways

1.11 FLIGHT RECORDERS:

1.11.1 COCKPIT VOICE RECORDER:

P/N	980-6022-001
S/N	62239

The CVR was downloaded and readout could be obtained. Recording from the start of the flight and preparation for flight was available. The CVR confirmed the crew did the cockpit preparation and carried out take-off data calculation. PIC obtained clearance from MCT-Delivery after which aircraft was handed over to MCT-Ground. The PIC discussed the expected Taxi routing to the Take-off R/W, with the F/O, and went on to request the Pushback and Start clearance from MCT Ground, which was approved. The Pre-flight Check List was called out and completed. The Before Start Procedure Check List was called out. The PIC briefed the Departure and mentioned that the Non-Normals (NNs) were briefed in the first sector. After a delay of few minutes caused by the bunching of passengers in the cabin who remained to be seated, the Cabin doors were closed and the Before Start C/L was completed.

The pushback was commenced at 23:03Z during which both engines were started normally. On completion of the Push back the Grounds man was asked to Disconnect and

the Chocks OFF time was given as 23:02Z. After disconnect the FO asked "Captain APU?" The PIC replied "Yeah". Presumably the APU was switched OFF. The PIC called out, "Flaps 5, engaged, Rudder check". Then he went on to brief the F/O about R/T vigilance and discipline. After the Ground Man reported that the Disconnect was complete, the PIC once again called out Rudder Check and then, called for the Taxi C/L. After the completion of the taxi C/L, taxi instructions were obtained and Cabin and Galley were secured.

The Before Take-off C/L and procedure, holding at Take-off clearance were called out and partially accomplished. Control was changed to Tower for further taxi instruction. At the end of taxi to intersection Y7, the ATC cleared the aircraft for an immediate takeoff from 26R, intersection Y7. After airborne, communication changed to Radar 121.9, while passing through 1500 ft for 3000 ft. ATC then cleared the aircraft to climb to FL150 on a heading of 040 degrees. The PIC called out, "040 set, flaps up, no light, After Take-off procedure and C/L(After take-off checklist was called out, Queries raised & completed by F/O in 4-5 seconds); standby for V-NAV". This was acknowledged by the F/O who said, "Start switches can go OFF". The After Take-off Checklist was reported completed at 23:20 Z. After which ATC cleared the aircraft direct to IMURU and a climb to FL250. With Seat Belts sign selector in the Auto mode, the appropriate Passenger announcement was monitored at 23:23 Z. At 23:24:11 Z the Cabin Altitude warning horn got activated and stayed on for the next 10 seconds. During this time the F/O recognized the warning and called it out and the PIC requested ATC for a Level off at FL 130. After that the F/O reported that the Cabin was climbing, and the PIC requested the ATC for a descent to 10000 ft. At 23:25:10 Z the PIC called out the Cabin Altitude Non-normal Procedure. Before formally reading the NNCL it was decided that the Oxygen masks would not be needed as the aircraft was descending to 10000 feet. After a brief clarification to the ATC about the nature of the Non-Normal situation and a heading change as instructed by the ATC, Oxygen masks were donned by crew as a Memory Item before the NNCL reading commenced. However, the crew had a problem in communication both, IntraCockpit and with the ATC. The NNCL dealing with control of the Cabin altitude and supplementary oxygen was called out and read three times through the respective crew oxygen mask in about six minutes. The crew further requested ATC to descend to lower level and levelled at 5000ft. As there was traffic on runway to takeoff, ATC controller informed the crew about the delay and clarification on the situation. Crew acknowledged and replied that they will be holding at 5000ft for carrying out the checklist. Further crew carried out the non-normal checklist. During the same time, PIC realized the Pack switch was OFF and asked the F/O “Why did you put it OFF”. He immediately turned it ON. Further crew continued the checklist and completed it as per procedures. On completion crew requested clearance for landing. On obtaining positive clearance from ATC crew carried landing on 26R.The remaining segment of flight after the incident was examined and found to be normal.

1.11.2 DIGITAL FLIGHT DATA RECORDER

P/N	980-4700-042
S/N	18033

The DFDR was analysed with all relevant parameters available. There was recorded parameter of Baro Altitude, Cabin ALT warning, Master caution and pack flow. However there was no recording in the DFDR related parameter like Cabin Altitude, Rate of climb of Cabin Altitude, Outflow valve position.

DFDR Analysis:

UTC	**Description**
23:06:10 Z	Both engines were started normally.
23:18:33 Z	Aircraft airborne with both PACKS OFF & both Engine Bleed ON with gross weight of 73403 kg
23:19:15 Z	Flap retracted at 1272 ft.
23:19:20 Z	Flap retracted fully at 1410 ft.
From take-off to 12536 Feet Altitude both PACKS were OFF &both Engine Bleed were ON.	
23:24:13 Z	At 12536 feet Baro Altitude, Cabin Altitude warning triggered (with both PACKS OFF & both Engine Bleed ON.) and it was continued till while returning to Muscat at 23:29:53Z, at 8709 feet Baro Altitude.
23:24:39 Z	Aircraft reached at 13146ft. After that aircraft started to descend.
23:29:54 Z	At 8709 feet Baro altitude, Cabin Altitude warning went off.
23:38:10 Z	At 4895 feet Baro altitiude, both PACKS were made ON with both Engine Bleed ON while returning to Muscat.
23:49:14 Z	Aircraft touched down and landed Safely with a gross weight of 72059 kg.

1.12 WRECKAGE & IMPACT INFORMATION: NOT APPLICABLE

1.13 MEDICAL AND PATHOLOGICAL INFORMATION:

Both the crew had undergone pre-flight breath analyser check before operating the outbound flight to Muscat at Calicut as per the provision of CAR Section 5 Series F Part III and both were found negative.

1.14 FIRE: There was no fire

1.15 SURVIVAL ASPECTS: Not applicable

1.16 TESTS & RESEARCH: Not applicable

1.17 ORGANIZATIONAL & MANAGEMENT INFORMATION:

M/s Air India Express is a wholly owned subsidiary of Air India, operating as a separate AOC for schedule operations. This low cost arm of Air India is headquartered in Kochi, Kerala. Air India Express is low cost international airline, providing convenient connectivity to short/medium haul international routes in the Gulf and South East Asia at affordable rates. Air India Express operates an impressive fleet of 25 Boeing 737-800 Next Generation (NG) aircrafts.

1.18 ADDITIONAL INFORMATION:

1.18.1 AIR CONDITIONING / PRESSURISATION SYSTEM OF BOEING 737-800 NG AIRCRAFT

The air conditioning system provides temperature controlled air by processing bleed air from the engines, APU, or a ground air source in air conditioning packs. Conditioned air from the left pack, upstream of the mix manifold, flows directly to the flight deck. Excess air from the left pack, air from the right pack, and air from the recirculation system is combined in the mix manifold. The mixed air is then distributed through the left and right sidewall risers to the passenger cabin. Conditioned air comes from either the airplane air conditioning system or a preconditioned ground source. Air from the preconditioned ground source enters the air conditioning system through the mix manifold.

Air Conditioning Pack: The flow of bleed air from the main bleed air duct through each air conditioning pack is controlled by the respective pack valve. Normally, the left pack uses bleed air from engine No. 1 and the right pack uses bleed air from engine No. 2. A single pack in high flow is capable of maintaining pressurization and acceptable temperatures throughout the airplane up to the maximum certified ceiling. The APU is capable of supplying bleed air for two packs on the ground, or one pack in flight. Most external air carts are capable of supplying adequate bleed air for two pack operation. Do not operate more than one pack from one engine.

Airflow Control With both air conditioning pack switches in AUTO and both packs operating, the packs provide “normal air flow”. However, with one pack not operating, the other pack automatically switches to “high air flow” in order to maintain the necessary ventilation rate. This automatic switching is inhibited when the airplane is on the ground, or inflight with the flaps extended, to insure adequate engine power for single engine operation. Automatic switching to “high air flow” occurs if both engine bleed air switches are OFF and the APU bleed air switch is ON, regardless of flap position, air/ground status or number of

packs operating. With the air conditioning pack switch in HIGH, the pack provides “high air flow”. Additionally, an “APU high air flow” rate is available when the airplane is on the ground, the APU bleed air switch is ON and either or both pack switches are positioned to HIGH. This mode is designed to provide the maximum airflow when the APU is the only source of bleed air.

OPERATION OF AIR CONDITIONING PACK SWITCH

OFF – pack signalled OFF.
AUTO – with both packs operating, each pack regulates to low flow • with one pack operating, operating pack regulates to high flow in flight with flaps up • when operating one pack from APU (both engine BLEED air switches OFF), regulates to high flow.
HIGH – pack regulates to high flow • provides maximum flow rate on ground with APU BLEED air switch

1.18.2 FCOM / STANDARD OPERATING PROCEDURE

a. Before start procedure for B 737-800 NG

Taxi and Take-off briefings to be completed by F/O. The pilot who will do the take-off does the taxi and take-off briefings.

As part of the take-off briefing for the first flight of the day and following a change of either flight crew member, cabin altitude warning indications and memory item procedures must be briefed on airplanes in which the CABIN ALTITUDE and TAKEOFF CONFIG lights are not installed, or are installed but not activated. The briefing must contain the following information:
Whenever the intermittent warning horn sounds in flight at an airplane flight altitude above 10,000 feet MSL:

1. Immediately, don oxygen masks and set regulators to 100%
2. Establish crew communications.
3. Do the CABIN ALTITUDE WARNING or Rapid Depressurization non-normal checklist.

Both pilots must verify on the overhead Cabin Altitude Panel that the cabin altitude is stabilized at or below 10,000 feet before removing oxygen masks.

b. **Engine Start procedure**

Air conditioning PACK switches ..... OFF F/O
Start sequence..... Announce C
Call “START ___ ENGINE” C
ENGINE START switch ..... GRD F/O
Verify that the N2 RPM increases. C, F/O

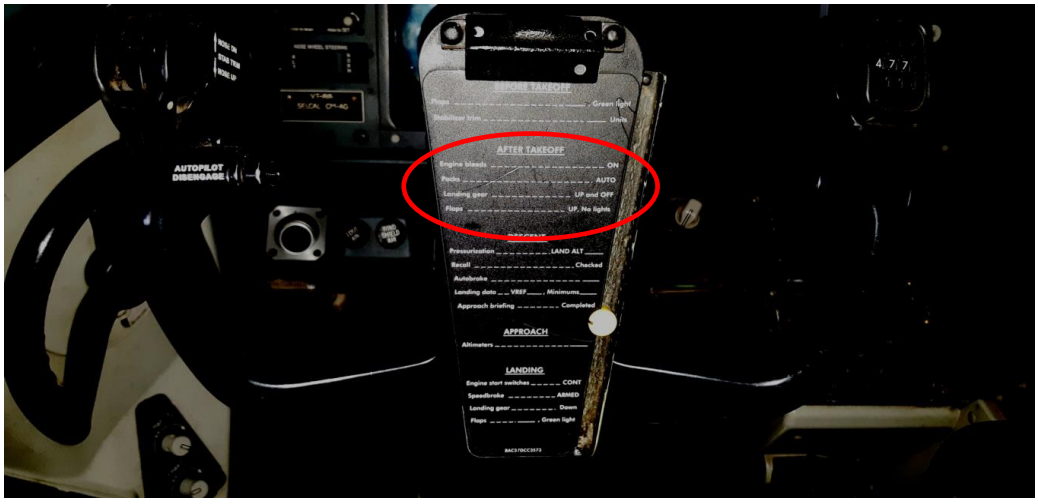
c. **Before Taxi Procedure**

Start the Before Taxi Procedure after the engines are stable at idle.
GENERATOR 1 and 2 switches ..... ON F/O
PROBE HEAT switches ..... ON F/O
WING ANTI–ICE switch ..... As needed F/O
ENGINE ANTI–ICE switches ..... As needed F/O
PACK switches ..... AUTO F/O
ISOLATION VALVE switch ..... AUTO F/O
APU BLEED air switch.....OFF F/O
APU switch .....OFF F/O
ENGINE START switches ..... CONT F/O
Engine start levers ..... IDLE detent C

As per FCOM, Pilot flying to call “AFTER TAKEOFF CHECKLIST” and Pilot Monitoring to do the AFTER TAKEOFF CHECKLIST

d. **Normal checklist appended on control column**

Standard/ Normal procedure checklist is also affixed on the control column of aircraft VT-AXW for ready reference of the crew. The After Take-off procedure clearly reflects the Packs to be in AUTO. Refer figure# 1 below.



Figure# 1 depicting standard/ normal procedure affixed on control column

e. NNCL in case of Cabin Altitude warning

CABIN ALTITUDE WARNING or Rapid Depressurization

CABIN ALTITUDE (If installed and operative)

Condition: One or more of these occur:
- A cabin altitude exceedance
- In flight, the intermittent cabin altitude/configuration warning horn sounds or a CABIN ALTITUDE light (if installed and operative) illuminates.

1 Don oxygen masks and set regulators to 100%.

2 Establish crew communications.

3 Pressurization mode selector . . . . . MAN

4 Outflow VALVE switch . . . . . Hold in CLOSE until the outflow VALVE indication shows fully closed

5 **If** cabin altitude is **uncontrollable**:

Passenger signs . . . . . ON

PASS OXYGEN switch . . . . . ON

►►Go to the Emergency Descent checklist on page 0.1

■ ■ ■ ■

▼ Continued on next page ▼

Emergency Descent

Condition: One or more of these occur:
- Cabin altitude cannot be controlled
- A rapid descent is needed.

1 Announce the emergency descent. The pilot flying will advise the cabin crew, on the PA system, of impending rapid descent. The pilot monitoring will advise ATC and obtain the area altimeter setting.

2 Passenger signs . . . . . ON

3 **Without delay**, descend to the lowest safe altitude or 10,000 feet, whichever is higher.

4 ENGINE START switches (both) . . . . . CONT

5 Thrust levers (both) . . . . . Reduce thrust to minimum or as needed for anti-ice

6 Speedbrake . . . . . FLIGHT DETENT

If structural integrity is in doubt, limit speed as much as possible and avoid high maneuvering loads.

7 ⚠ Set target speed to Mmo/Vmo.

8 **When** approaching the level off altitude:

Smoothly lower the SPEED BRAKE lever to the DOWN detent and level off. Add thrust and stabilize on altitude and airspeed.

▼ Continued on next page ▼

▼CABIN ALTITUDE WARNING or Rapid Depressurization continued▼

6 **If** cabin altitude is **controllable**:

Continue manual operation to maintain correct cabin altitude.

When the cabin altitude is at or below 10,000 feet:

Oxygen masks may be removed.

7 **Checklist Complete Except Deferred Items**

Deferred Items

Note: Use momentary actuation of the outflow valve switch to avoid large and rapid pressurization changes.

Descent Checklist

Pressurization . . . . **Move outflow VALVE switch to OPEN or CLOSE as needed to control cabin altitude and rate**

Recall . . . . . Checked

Autobrake . . . . . ___

Landing data . . . . . VREF ___, Minimums ___

Approach briefing . . . . . Completed

Approach Checklist

Altimeters . . . . . ___

▼ Continued on next page ▼

1.18.3 FLIGHT CREW TRAINING ORGANIZATION

For 167 Commanders and 152 First Officers endorsed on B737 aircraft, the following numbers of Instructors and Examiners are available with flight crew training organization of M/s Air India Express ltd:

Sr No.	Designation	Strength	Remark
01	Designated Examiner (DE)	07	6 DE among the 07 DE who have concurrent Approval as TRI (A)
02	TRI (A)	16	6 TRI (A) among the 16 TRI (A) who have concurrent Approval as DE.
03	TRI(S)	Nil	
04	LTC	27	

1.18.4 MISCELLANEOUS

From the CVR, in the previous out bound flight IX-337, Sector CCJ-MCT on even date, the trainee pilot had selected transponder selection to ALT OFF instead of ALT ON as required during ground movement. The same was corrected by PIC.

1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES: NIL

2.0 ANALYSIS :

2.1 OPERATIONAL ASPECTS:

For flight IX-350 on 09.02.2019, PIC was the PF and F/O was the PM for the incident flight. After the briefing was completed and start-up clearance obtained from ATC, PACKS were put to OFF by PM as per procedure before engine start. Subsequently, BEFORE TAXI procedures and checklist was carried out by PM. While doing this, PM switched on the isolation valve and switched off the APU BLEED SWITCH but did not put packs switch to AUTO position. PF, without cross verifying, assumed that PM completed the checklist and continued for taxi. This is the first event to miss the PACKS switch AUTO mode by the crew.

The Aircraft departed from Muscat at 23:02 Z and was airborne at 23:18 Z. The after TAKE OFF procedures check list, which are READ & DO items, were done by PM within approximately 4-5 seconds by fluent reading only which is evident in CVR, the PM missed to put PACK switch in Auto mode and PF missed to crosscheck the same. This was second lapse by the crew to put PACKS on auto mode.

The flight was uneventful till Flight Level120. At 23:24:13, at 12,536 feet on Baro Altitude, Cabin Altitude warning triggered. Flight was levelled off at FL130, informed ATC to descend to FL100 and the same was commenced immediately and subsequently carried the NNCL (MEMORY ITEMS) in case of Cabin Altitude warning.

Flight was levelled off at FL130, requested ATC to descend to FL100 and the same was commenced immediately and subsequently carried the MEMORY ITEMS. However during performing memory items, of removing the OXGYEN MASKS from the respective stowage box and don it, the crew communication could not be established with ATC through the OXGYEN MASK MICROPHONE. Hence, the oxygen mask was removed and communication was made through the HAND MIC. However, post landing at Calicut on 10.02.2019 the inspection was found satisfactory on OXYGEN MASK MICROPHONE, which reveals that OXGYEN MASK MICROPHONE stowage and don operation was not done properly while carrying out MEMORY items in the event of cabin altitude warning.

While descending to FL040, PIC observed PACK in OFF position, and same was made to AUTO position. However, by then Pressurization Mode was in manual mode as per memory items (checklist) carried out and therefore it created an overpressure. Further the outflow valve was operated manually to open position for the cabin to stabilize. The pressurization could not be controlled by the crew on manual mode due to lack of skill. Hence, PIC decided to return to Muscat. The NON NORMAL LANDING DISTANCE was calculated for an overweight landing. The Aircraft landed safely at Muscat at 23:55 Z.

The DFDR readout confirmed that both pack switch were in OFF position from the taxi phase. Aircraft had a normal take-off with flap 5. At FL 130, Cabin ALT light initiated and continued for 05 min 38 sec, till aircraft descended below 10000 ft. Aircraft continued to descend and at 5161 ft, both packs were selected in AUTO position.

Four passengers complained of nose bleeding, they were treated on board by airport doctor and found fit to travel. No passengers were hospitalised.

From the records available, flight duty time limitation was within limit and adequate rest was provided for both crews.

2.2 MAINTENANCE ASPECTS:

After completion of Daily Inspection schedule and Pre-departure schedule the aircraft VT-AXW was released with valid C of A and ARC, Nil snags and No active MEL invoked before the incident flight. The aircraft underwent the Major inspection PH 79 from 13-01-2019 to 16-01-2019 and Extended transit check on 09.02.2019 whereas no abnormalities/ deferred snags observed on Aircraft Air conditioning/ pressurisation system

Aircraft was airworthy before the incident flight. Pilot Defect Report of the incident flight was as follows: 'At approx 12000 ft. Cabin ALT warning horn& cabin altitude light came on. Descended to FL 100. NNCL Carried out and landed back at Muscat. Checked non normal landing distance and did overweight landing."

On Arrival at Muscat, Based on snag reported rectification was carried out accordingly following tasks carried out and was found satisfactory. However the # 1 & # 2 Cabin pressure controller suspected and replaced with serviceable unit. Aircraft normalised and released for service.

As per PIC, in incident flight there was issue with Left side Pilot Emergency OXYGEN MASK Microphone, however PIC did not enter in Pilot defect report after landing at Muscat. He mentioned only "At approx 12000 ft. Cabin ALT warning horn & cabin altitude light came on. Descended to FL 100. Carried out NNCL checklist. Landed back at Muscat. Checked non normal landing distance and did overweight landing."

Further the same defect was mentioned by the new PIC of delayed flight IX-350 after arrival at Calicut as "Left side pilot emergency O2 System Boom Mic (OXYGEN MASK MICROPHONE) is not getting reset". Further the same was checked by the Aircraft maintenance Engineer at Calicut on 10.02.2019 and was found satisfactory.

In view of above, Maintenance/ Aircraft system was not a contributory factor.

2.3 TRAINING ASPECTS:

M/s Air India Express Ltd has total 25 numbers of aircraft in their fleet. As per the standard laid down by FSD the required Designated Examiners are 10. However at present there are 7 Designated Examiners and 16 TRIs (A). Moreover the DE also doubles up as TRI for the training purpose. There are also 27 numbers of LTC for doing the routine checks of the line pilots.

However, the total pilot strength is steadily increasing due to new recruitment of pilots and probable leasing of the aircraft.

During the investigation it is strongly felt that the training should be an important pillar for enhancing the quality of flight operations and thereby increasing the operational efficiency. But the standard principle of “one man one post” is not adhered to, in the operations department. The DE role is distinctly different than the role of TRI. If the DE is functioning as a TRI then the check need to be done by some other DE. The training flexibility cannot be achieved when the DE strength itself is less than prescribed and the TRI in just one.

Further there is no TRI(S) for the simulator; this further reduces the efficiency as the DE may have to do simulator training as well and it reduces the production flying to great extent. Hence it is desired that the total DE as per the laid down standard should be immediately proposed to DGCA for approval.

3.0 CONCLUSION:

3.1 FINDINGS:

3.1.1 The aircraft was fully airworthy before departure of the incident flight.

3.1.2 The crew has been provided adequate rest in last 24 hours and flight time limitations were within limit.

3.1.3 Cabin ALT warning horn came at approx. 12500 ft. Cabin was uncontrollable on manual mode due to lack of skill. Packs & BLEED configuration was crosschecked to be in the required configuration. NNCL carried out.

3.1.4 Based on PDR entry rectification was carried out as per Aircraft Maintenance Manual and was found satisfactory. As a precautionary measure # 1 and # 2 Cabin pressure controller was replaced with serviceable one.

3.1.4 PIC did not enter the defect/snag encountered during the incident flight with Left side Pilot Emergency OXYGEN MASK Microphone. The same was entered by the new PIC of delayed flight after landing at Calicut.

3.1.5 OXGYEN MASKS microphone stowage and don operation was not done properly while carrying out MEMORY items in the event of cabin altitude warning.

3.1.6 Four passengers complained of nose bleeding, they were treated onboard by airport doctor and found fit to travel. No passengers were hospitalised.

3.1.7 Aircraft take-off weight as per the Load & Trim sheet was 73125 kg and fuel on-board before departure was 10800 kg. The landing at Muscat was an overweight landing.

3.1.8 While carrying out “After Takeoff Checklist”, PACK position is announced to be in AUTO mode. However, the PM did not put the PACKS in AUTO mode and the same was not cross checked by the PF, thus not accomplishing the Standard Operating Procedures.

3.1.9 Packs were in OFF position during Climb and crew when realised had selected to AUTO position in returning while descending through 5000 feet.

3.1.10 The training department need to be augmented with requisite Designated Examiners (DE), TRIs so as to increase efficiency & flexibility in training. The practice of exercising dual position should be stopped forthwith.

3.2 CAUSES:

The cause of the incident can be attributed to non-adherence to SOP and loss of situational awareness while carrying out the cockpit normal checklist by the crew.

4.0 SAFETY RECOMMENDATIONS:

4.1 Any action deemed fit by DGCA HQ on the basis of findings made in the report.

SANJAY KISAN BRAMHANE

Digitally signed by SANJAY KISAN BRAMHANE
DN: c=IN, o=Directorate General of Civil Aviation (DGCA), ou=Government, postalCode=400099, st=Maharashtra, 2.5.4.20=c25b45539dd7803a3f5ece1903047ecff0ea8ae9b8b32844ebb514f21bb6c36a, pseudonym=7BAE5ED55AA7B175FC1F32355C282387523DAA1F, serialNumber=950A35C8EB932E4C33DF8EF96B169710FE8E15F3AE46EC62B006B3B822D915D3, cn=SANJAY KISAN BRAMHANE
Date: 2022.11.04 11:33:36 +05'30'

Rev date: 06.09.2022 Sanjay K Bramhane

Place: Mumbai Investigator-in-Charge

Abbreviations	
#	Number
ATPL	Air transport pilot licence
ARC	Airworthiness review certificate
AMM	Aircraft maintenance manual
ATC	Air traffic control
APU	Auxiliary Power Unit
ALT	Altitude
AOC	Air operator's certificate
ADF	Automatic direction finder
ASDA	Accelerate-stop distance available
C	Captain
C/L	Checklist
C of A	Certificate of Airworthiness
CPL	Commercial pilot licence
CCJ	Calicut
CPC	Cabin pressure controller
CRM	Crew resource management
CVR	Cockpit voice recorder
CAR	Civil aviation requirements
CSN	Cycle since new
DE	Designated Examiner
DGCA	Directorate General of Civil Aviation
DH	Decision height
DME	Distance measuring equipment
DFDR	Digital flight data recorder
ET	Extended transit
FCOM	Flight crew operating manual
FL	Flight Level
FRTOL	Flight Radio telephone operator's licence
FSD	Flight Standard Directorate of DGCA, India
F/O	First Officer
ft.	Feet
GPS	Global positioning system
INPH	Interphone
ILS	Instrument landing system
IR	Instrument rating
IMURU	One of waypoint near Muscat
Kg	Kilogram
LDA	Landing distance available
LHS	Left hand side
LOFT	Line oriented flight training
LTC	Line training captain
MCT	Muscat
MEL	Minimum equipment list
METAR	Meteorological terminal aviation routine weather report OR Meteorological

	aerodrome report
MIC	Microphone
MSL	Mean Seal Level
NA	Not Applicable
NG	Next Generation
NNCL	Non Normal Checklist
OEM	Original Equipment Manufacturer
O2 System boom mic	Oxygen Mask Microphone
O2	Oxygen
P1	Captain
P2	First-Officer
PAPI	Precision approach path indicator
PIC	Pilot in command
PCMCIA	Personal computer memory card international association
PDR	Pilot defect report
PF	Pilot flying
PM	Pilot Monitoring
PPC	Pilot proficiency check
P/N	Part Number
RHS	Right hand side
RC	Route check
RTR	Radio telephony restricted(Aeronautical)
R/T	Radio telephony
RVR	Runway visual range
RWY or R/W	Runway
SOP	Standard operating procedure
S/N	Serial Number
THR	Threshold
TRI	Type rating instructor
TRI (A)	Type rating instructor (Aircraft)
TRI(S)	Type rating instructor (Simulator)
TSN	Time since new
TODA	Take-off distance available
TORA	Take-off run available
UTC	Universal time coordinated
VOR	VHF (Very high frequency) Omni range