सत्यमेव जयते

# FINAL INVESTIGATION REPORT

**ON SERIOUS INCIDENT OF EMERGENCY DESCENT DUE CABIN DE-PRESSURISATION BY M/s JET AIRWAYS LTD. AIRCRAFT VT-JBZ, B737 ON 05.01.2016.**


**OFFICE OF DIRECTOR OF AIR SAFETY (WESTERN REGION)**

**GOVERNMENT OF INDIA**

**OLD AIRPORT, MUMBAI-400029**

***FOREWORD***

This documentation is prepared based upon the evidences collected during the investigation, opinion obtained from the experts. Investigation has been carried out in accordance with Rule 13 (1) of Aircraft (Investigation Accidents and Incidents) Rules, 2012. The investigation is conducted not to apportion blame or to asses individual or collective responsibility. The sole objective is to draw lessons from this incident which may help to prevent future accident or incident.

# Contents

**FINAL INVESTIGATION REPORT ON SERIOUS INCIDENT OF EMERGENCY DESCENT DUE CABIN DE-PRESSURISATION BY M/s JET AIRWAYS LTD. AIRCRAFT VT-JBZ ON 05.01.2016.**

| | | | |
|---|---|---|---|
| **1** | **Aircraft** | Type | BOEING 737-900ER |
| | | Model | BOEING 737-96NER2 |
| | | Nationality | INDIAN |
| | | Registration | VT-JBZ |
| **2** | **Owner** | M/s JET AIRWAYS (INDIA) LTD. | |
| **3** | **Operator or Hirer** | M/s JET AIRWAYS (INDIA) LTD. | |
| **4** | **Type of Operation** | Scheduled Revenue Flight | |
| **4** | **Date & Time of Incident** | 05.01.2016/ 06 32 UTC | |
| **5** | **Flight No.** | 9W 70 | |
| **5** | **Last Point of Departure** | VABB (ChatrapatiShivaji International Airport, Mumbai) | |
| **6** | **Point of Intended landing** | VTBS ( Suvarnabhumi International Airport, Bangkok) | |
| **7** | **Geographical Location & Yangon Airport coordinates** | WAYPOINT SADUS, AIRWAY L301, YANGON AIRSPACE & N $16^0$54' 26.16", E $96^0$ 07' 59.66" | |
| **8** | **Phase of Operation** | Cruise | |
| **9** | **Type of Incident** | CABIN ALTITUDE WARNING | |
| **10** | **Passengers/Crew on Board** | 183 + 08 | |
| **11** | **Injuries to persons** | NONE | |

**SYNOPSIS**

B737 aircraft VT-JBZ while operating flight 9W70 sector Bombay-Bangkok was involved in incident on 05.01.2016. During cruise the aircraft was maintaining FL350 and experiencing light to moderate turbulence. Aircraft received a clearance from Yangon ATC to descend to FL310. While passing FL340, AUTO FAIL light illuminated on panel for air-conditioning system. The cockpit crew performed the air-conditioning AUTO FAIL Non Normal Checklist. As a part of Non Normal checklist, outflow valve control switch need to be open or close as needed to control the

cabin altitude and rate. Subsequent to this a rapid cabin depressurisation occurred. As a result oxygen mask of the entire aircraft deployed. The cockpit crew performed an emergency descent checklist and diverted to nearest airport that is Yangon International Airport. During emergency descent found maximum seat oxygen generators were utilised by passengers. Aircraft levelled off at FL100 and later on landed safely at Yangon International Airport. After landing there were no injuries reported by the passengers and crew.

The Director General of Civil Aviation ordered the investigation by appointing undersigned as an Inquiry Officer under Rule 13 (i) of the Aircraft Rules 2012 vide Order No. AV. 15019/01/2016-AS, dated 06.01.2016.

## 1. FACTUAL INFORMATION

### 1.1. History of Flight

On 5th Jan 2016, both the cockpit crew reported for duty on time and pre-flight briefing was done with latest NOTAMS and MET information en-route for undertaking the flight 9W-70 from Mumbai to Bangkok.

At 0410 UTC the airplane took-off from Mumbai International Airport (VABB) to operate a scheduled flight to Suvarnabhumi Airport (VTBS). There were 08 Crew Members and 183 passengers on board the aircraft. First Officer was Pilot Flying.

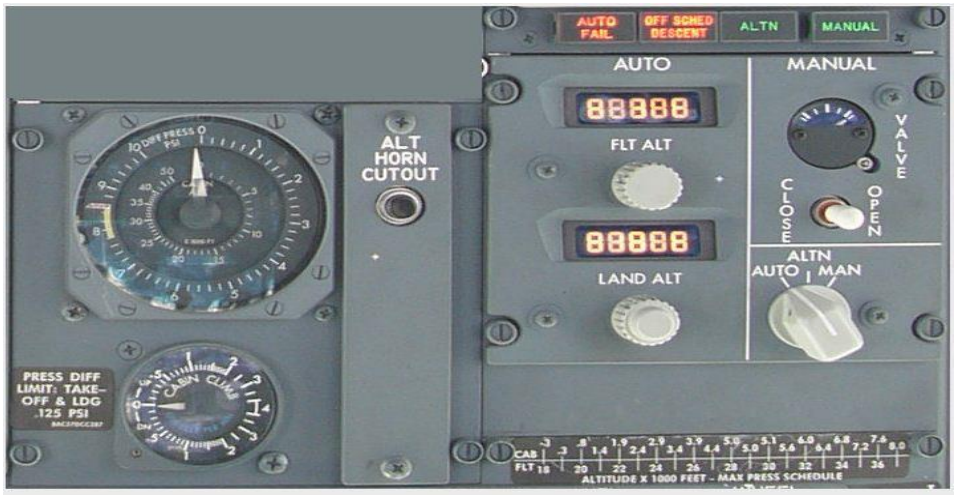
About 2hrs 10 min of flight, aircraft was maintaining FL350 and experiencing light turbulence in Yangon Airspace. The airplane had difficulty to contact Yangon ATC due to VHF coverage range.

At time 0620 UTC, the position of the airplane during cruise was waypoint SADUS on airway L301.

The flight at FL350 experienced light to moderate turbulence hence requested Yangon ATC to descend to FL310. At about 0628 UTC aircraft received the clearance from Yangon ATC to descend to FL310. Following the clearance from Yangon ATC airplane commenced descend to FL310.

At time 06 29 UTC, while passing FL340, AUTO FAIL master caution light illuminated for air-conditioning. PIC took over the controls of the airplane and First Officer performed Pilot Monitoring Duties. The cockpit crew started to perform the

air-conditioning AUTO FAIL Non Normal Checklist. As per checklist Pressurisation Mode Selector was put to ALTERNATE.




*Digital Cabin Pressure Control System (DCPCS)*

After putting on ALTN mode the AUTO FAIL light did not extinguish, the Pressurisation Mode Selector was further put to MANUAL mode as per checklist.

As a part of Non Normal checklist, outflow valve control switch need to be open or close as needed to control the cabin altitude and rate. While using the MAN mode it is stated in FCOM procedures to use outflow valve control switch selector momentarily to modulate the outflow valve to avoid large and rapid pressurisation changes. While operating outflow valve control switch, **CABIN ALT warning horn** and light illuminated. Recall actions for CABIN ALT HORN carried out by cockpit crew.

Passenger Announcement was made by cockpit crew regarding rapid descent and MAY DAY call was given to Yangon ATC. Aircraft started descent to FL110 on ATC instructions.

Cabin Crew were informed by that time and all the oxygen masks were deployed.

As per cabin crew statements they heard a loud bang sound near R2 door followed by deployment of all the oxygen mask. Seat belt sign was ON because of turbulence.

Considering the distance to planned destination and fuel consumption at FL110 flying crew decided to land at nearest suitable airport that is Yangon.

Flying crew informed Yangon ATC about their intention to land at Yangon Airport. Outflow valve was opened at circuit altitude as per Non Normal Checklist.

Aircraft landed safely on RWY21 at Yangon airport.

### 1.2. Injuries to Persons

No Injury was reported to Crew and Passengers.

### 1.3. Damage to Aircraft

There was no damage to the aircraft.

### 1.4. Other Damage

There was no other damage reported.

### 1.5. Personnel Information

| Details as on 05.01.2016 | PIC | First Officer |
|---|---|---|
| Age | 30 | 29 |
| Date of Licence issued | 13.11.2013 | 22.06.2007 |
| Valid up to | 12.11.2020 | 22.06.2017 |
| Category | ATPL | CPL |
| Endorsement as PIC | P1 B737-700/800/900 | P2 B737-700/800/900 |
| Date of Medical Exam | 17.02.2015 | 24.12.2015 |
| Medical Validity | 16.02.2016 | 23.12.2016 |
| FRTOL Validity | F9507-09.05.2021 | 21.06.2017 |
| Total Flying Experience | 6350 Hrs | 3431.56Hrs |
| Experience on Type | 6132.19 | 493.49 |
| Experience as PIC on Type | 1291.10 | - |
| **Recent Flying Experience** | | |
| Total flying experience in last 365 days | 820:53 | 496:12 |
| Total flying experience in last 180 days | 433:10 | 339:23 |
| Total flying experience in last 90 days | 188:27 | 214:07 |
| Total flying experience in last 30 days | 39:37 | 61:02 |

| | | |
|---|---|---|
| Total flying experience in last 7 days | 13:54 | 15:24 |
| Total flying experience in last 24hrs | 03:42 | 06:35 |

### 1.6. Aircraft Information

| | |
|---|---|
| Aircraft Registration | VT-JBZ |
| Type of Aircraft | BOEING 737-900ER |
| Airframe Serial No. | 36539 |
| Manufacturing Year | 2008 |
| Engine Type | CFM56 |
| Engine Serial No. | LH: 897477<br>RH: 896466 |
| Last C of A done | 28.05.2012 |
| C of A validity | 27.05.2017 |
| Airframe Hours | TSN: 28080:45<br>CSN: 12785 |
| Engine Hours | LH: TSN/CSN 25086/12031<br>RH: TSN/CSN 23161/15545 |
| Last Layover Inspection date | 04.01.2016 at BOM |

The pressurisation system of the aircraft consists of following main assemblies. Air-Conditioning packs, an outflow valve, an overpressure relief valve and a negative pressure relief valve. Two Cabin Pressure Controllers (CPC) controls the cabin rate, of which one at a time actively control the outflow valve. The second CPC served as a redundant system.

The operating and indication panel system of the digital cabin pressure control system is a part of overhead panel in the cockpit. Indication for the cabin altitude and differential pressure, the cabin rate of climb indicator (Maximum 4000 ft/min) and the outflow valve position indicator are installed.

The aircraft departed from VABB with a MEL 33-20 for the logo light system. There were no operational procedure to be followed by the crew members and MEL did not have any impact during incident.

### 1.7. Meteorological Information

The significant weather fixed time forecast chart provided by IMD Chennai for FL100 to FL450valid 06 00 UTC on 05 Jan 2016 provides insight into the en-route weather conditions for the duration of flight.

Jet streams of at FL380 with wind speed up to 140 knots are forecasted approximately 5 degrees latitude north of the intended flight path.

Clear Air Turbulence (CAT) of moderate intensity was forecasted between FL300 to FL450 along areas in vicinity of Jet stream.

Winds at the flight plan altitude of FL310 were forecasted to be westerly at approximately 80 knots.

At the time of occurrence, daylight prevailed as well as Visual Meteorological Conditions at the altitude of the airplane and at Yangon (Diversion airfield).

### 1.8. Aids to Navigation

All on board navigation equipments were functional and the crew obtained the RADAR vectors from Yangon approach for diversion to Yangon airport. **Yangon Airport is equipped with ILS (DME collocated with glide path) and localizer. Other navigation aids installed include DVOR, DME and NDB and were to be functional.**

### 1.9. Communication

The crew were having difficulty to communicate with Yangon ATC on VHF both before and after cabin altitude warning. Various other airplanes helped in relaying messages between the airplane and Yangon ATC. The Yangon airport is facilitated with the following communication facilities.

| Service designation | Call sign | Channel | Hours of operation | Remarks |
|---|---|---|---|---|
| MINGALADON APPROACH | MINGALADON APPROACH:EN | 119.700 MHZ | H24 | NIL |
| MINGALADON TOWER | MINGALADON TOWER:EN | 118.100 MHZ | H24 | NIL |

| | | | | |
|---|---|---|---|---|
| MINGALADON GROUND | MINGALADON GROUND | 121.900 MHZ | H24 | NIL |

## 1.10. Aerodrome Information

Details of Yangon Airport

| | |
|---|---|
| City /Country | Yangon/Myanmar |
| IATA/ICAO Code | RGN/VYYY |
| Latitude | N $16^0$54’ 26.16” |
| Longitude | E $96^0$ 07’ 59.66” |
| Elevation | 110ft |
| Longest Runway | 11200ft |
| Precision Approach | One or more chart for the airport support precision approaches. |
| Fuel Type | JET A1 Fuel is available |
| Usage Type | Airport open to the public |
| Repair Facility | Minor Airframe/Engine repairs are available |

## 1.11. Flight Recorders

The aircraft was equipped with Digital Flight Data Recorder (DFDR) and Cockpit Voice Recorder (CVR)

### 1.11.1 CVR Analysis

When AUTO FAIL light for air-conditioning illuminated, PIC took over the controls and First Officer read the AUTO FAIL Non Normal Checklist.

According to checklist instructions, Pressurisation Mode Selector valve moved to ALTN (Alternate).

Following this the AUTO FAIL light remained illuminated. The checklist further instructs that in this case, the Pressurisation Mode Selector to be set to MAN

(Manual). Further the checklist instructs to move the outflow valve switch to open or close positions as needed to control the cabin altitude and rate.

The crew announced the cabin altitude as 5000ft at this time and they were descending. Based on this situation they decided to open the outflow valve.

The outflow valve control switch (spring loaded to centre) was held in open position for a few seconds by the first officer.

As per CVR readout it appears that First Officer kept the outflow valve control switch to open position for longer period of time which might have resulted into loss in cabin pressure.

Approximately 8 seconds after this action the cabin altitude warning (Oral and visual) occurred.

The cockpit crew discontinued the AUTO FAIL Checklist.

PIC instructed the First Officer to ask Yangon ATC for emergency descent. In response the First Officer transmitted "Yangon, Jet Airways 70, Emergency descent".

First officer performed the cabin altitude warning and rapid descent quick actions.

First Officer Read the Cabin altitude as 6000ft. The airplane was descending and passing FL170 approximately. The Pilot decided to continue the descending.

On PICs insistence, the First Officer performed the cabin Altitude warning horn checklist again to ensure no steps were missed.

First Officer advised PIC that since the cabin altitude was going below zero and the differential was reaching maximum, the outflow valve need to be opened.

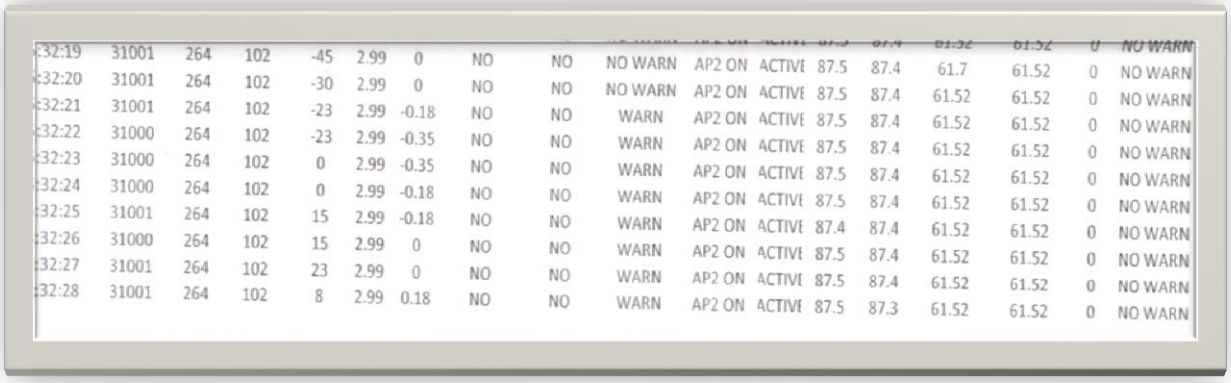
PIC made PA to remove the mask.

Thereafter weather and runway in use information received from Yangon ATC and aircraft landed safely at Yangon Airport.

### 1.11.2 DFDR Analysis

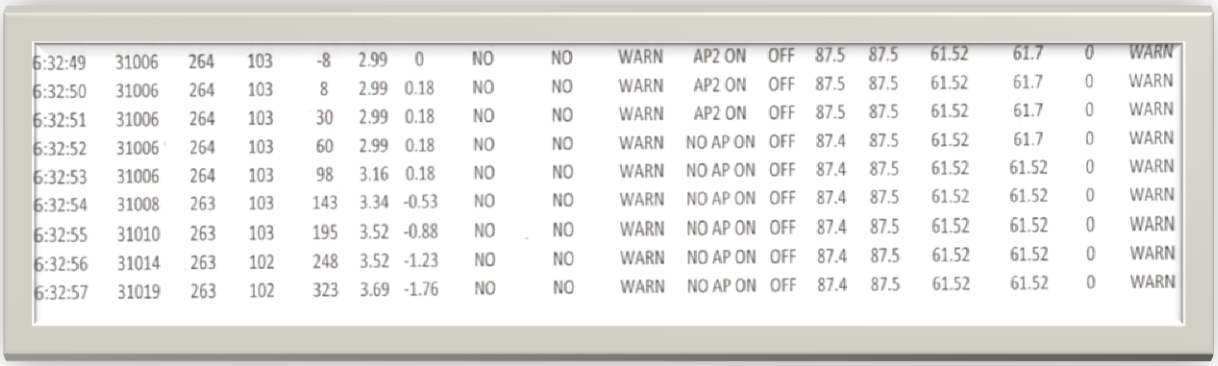
| Time in UTC | Altitude in fts | Details |
|---|---|---|
| 06 29 18 | 33725 | Auto Fail Mater Caution light appears for air-conditioning. |
| 06 32 21 | 31001 | Cabin altitude warning came ON. Which indicates cabin altitude exceeds 10000ft. |

| | | |
|---|---|---|
| 06 32 52 | 31006 | AUTO PILOT ON status became NO AUTO PILOT ON |
| 06 33 19 | 30916 | Speed brakes applied |
| 06 33 34 | 29870 | Aircraft attained maximum rate of descend of 5933 ft/min |
| 06 33 42 | 29157 | AUTO PILOT status came ON |
| 06 37 15 | 19451 | Cabin altitude warning disappeared |
| 06 38 58 | 10083 | Master Caution light disappeared |
| 06 40 51 | 11005 | Aircraft reached FL110 |



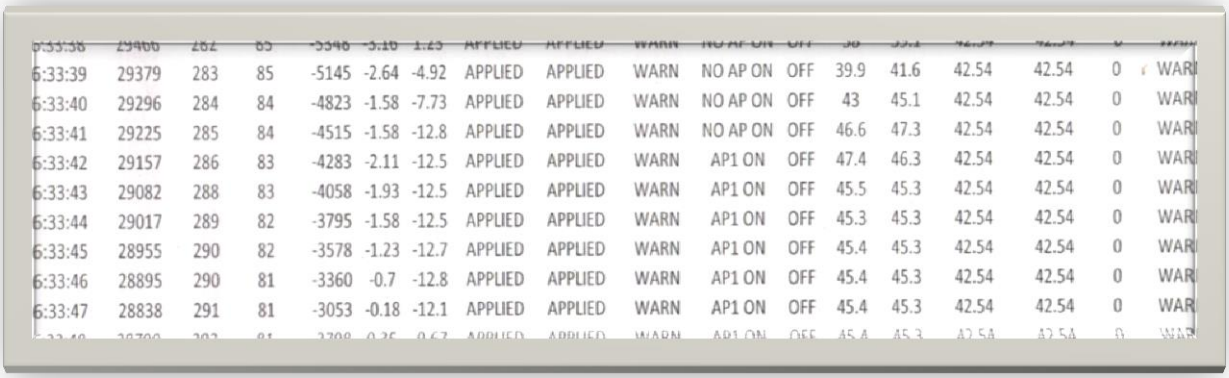
| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 32:19 | 31001 | 264 | 102 | -45 | 2.99 | 0 | NO | NO | NO WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.7 | 61.52 | 0 | NO WARN |
| 32:20 | 31001 | 264 | 102 | -30 | 2.99 | 0 | NO | NO | NO WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:21 | 31001 | 264 | 102 | -23 | 2.99 | -0.18 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:22 | 31000 | 264 | 102 | -23 | 2.99 | -0.35 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:23 | 31000 | 264 | 102 | 0 | 2.99 | -0.35 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:24 | 31000 | 264 | 102 | 0 | 2.99 | -0.18 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:25 | 31001 | 264 | 102 | 15 | 2.99 | -0.18 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:26 | 31000 | 264 | 102 | 15 | 2.99 | 0 | NO | NO | WARN | AP2 ON | ACTIVE | 87.4 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:27 | 31001 | 264 | 102 | 23 | 2.99 | 0 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.4 | 61.52 | 61.52 | 0 | NO WARN |
| 32:28 | 31001 | 264 | 102 | 8 | 2.99 | 0.18 | NO | NO | WARN | AP2 ON | ACTIVE | 87.5 | 87.3 | 61.52 | 61.52 | 0 | NO WARN |

**CABIN ALTITUDE WARNING CAME ON. WHICH INDICATES CABIN ALTITUDE EXCEEDS 10000FT.**



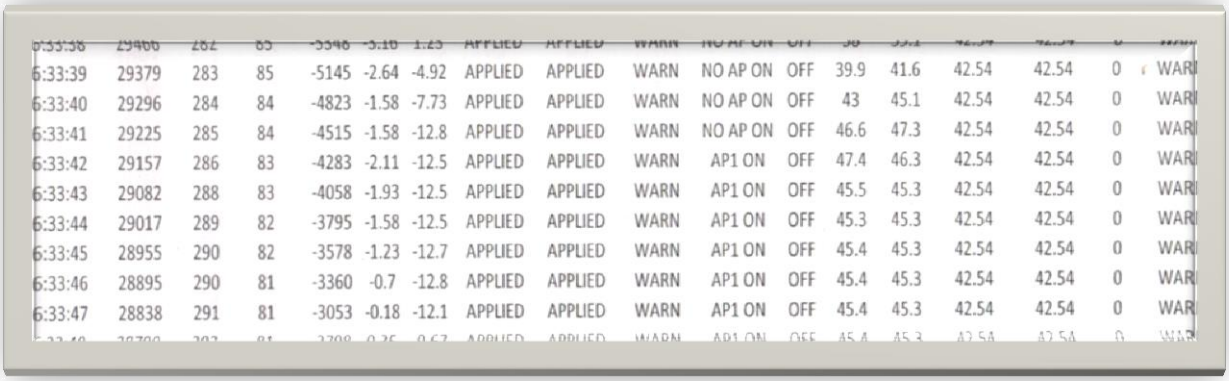
| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:32:49 | 31006 | 264 | 103 | -8 | 2.99 | 0 | NO | NO | WARN | AP2 ON | OFF | 87.5 | 87.5 | 61.52 | 61.7 | 0 | WARN |
| 6:32:50 | 31006 | 264 | 103 | 8 | 2.99 | 0.18 | NO | NO | WARN | AP2 ON | OFF | 87.5 | 87.5 | 61.52 | 61.7 | 0 | WARN |
| 6:32:51 | 31006 | 264 | 103 | 30 | 2.99 | 0.18 | NO | NO | WARN | AP2 ON | OFF | 87.5 | 87.5 | 61.52 | 61.7 | 0 | WARN |
| 6:32:52 | 31006 | 264 | 103 | 60 | 2.99 | 0.18 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.7 | 0 | WARN |
| 6:32:53 | 31006 | 264 | 103 | 98 | 3.16 | 0.18 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.52 | 0 | WARN |
| 6:32:54 | 31008 | 263 | 103 | 143 | 3.34 | -0.53 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.52 | 0 | WARN |
| 6:32:55 | 31010 | 263 | 103 | 195 | 3.52 | -0.88 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.52 | 0 | WARN |
| 6:32:56 | 31014 | 263 | 102 | 248 | 3.52 | -1.23 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.52 | 0 | WARN |
| 6:32:57 | 31019 | 263 | 102 | 323 | 3.69 | -1.76 | NO | NO | WARN | NO AP ON | OFF | 87.4 | 87.5 | 61.52 | 61.52 | 0 | WARN |

**AUTO PILOT ON STATUS BECAME NO AUTO PILOT ON**



| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:33:39 | 29379 | 283 | 85 | -5145 | -2.64 | -4.92 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 39.9 | 41.6 | 42.54 | 42.54 | 0 | WARI |
| 6:33:40 | 29296 | 284 | 84 | -4823 | -1.58 | -7.73 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 43 | 45.1 | 42.54 | 42.54 | 0 | WARI |
| 6:33:41 | 29225 | 285 | 84 | -4515 | -1.58 | -12.8 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 46.6 | 47.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:42 | 29157 | 286 | 83 | -4283 | -2.11 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 47.4 | 46.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:43 | 29082 | 288 | 83 | -4058 | -1.93 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.5 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:44 | 29017 | 289 | 82 | -3795 | -1.58 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.3 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:45 | 28955 | 290 | 82 | -3578 | -1.23 | -12.7 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:46 | 28895 | 290 | 81 | -3360 | -0.7 | -12.8 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:47 | 28838 | 291 | 81 | -3053 | -0.18 | -12.1 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |

**SPEED BRAKES APPLIED**



| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6:33:39 | 29379 | 283 | 85 | -5145 | -2.64 | -4.92 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 39.9 | 41.6 | 42.54 | 42.54 | 0 | WARI |
| 6:33:40 | 29296 | 284 | 84 | -4823 | -1.58 | -7.73 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 43 | 45.1 | 42.54 | 42.54 | 0 | WARI |
| 6:33:41 | 29225 | 285 | 84 | -4515 | -1.58 | -12.8 | APPLIED | APPLIED | WARN | NO AP ON | OFF | 46.6 | 47.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:42 | 29157 | 286 | 83 | -4283 | -2.11 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 47.4 | 46.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:43 | 29082 | 288 | 83 | -4058 | -1.93 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.5 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:44 | 29017 | 289 | 82 | -3795 | -1.58 | -12.5 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.3 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:45 | 28955 | 290 | 82 | -3578 | -1.23 | -12.7 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:46 | 28895 | 290 | 81 | -3360 | -0.7 | -12.8 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |
| 6:33:47 | 28838 | 291 | 81 | -3053 | -0.18 | -12.1 | APPLIED | APPLIED | WARN | AP1 ON | OFF | 45.4 | 45.3 | 42.54 | 42.54 | 0 | WARI |

**AUTO PILOT STATUS CAME ON**

### 1.12. Wreckage and Impact Information

There was no impact or wreckage.

### 1.13. Medical and Pathological Information

No injury reported by any crew or passenger.

### 1.14. Fire

There was no fire.

### 1.15. Survival Aspects

The incident was survival and no injuries reported by crew and passengers.

### 1.16. Test and Research

NIL

### 1.17. Organizational and Management information:

## 1.18. Additional Information

### 1.18.1 Post Occurrence Maintenance

Post occurrence aircraft diverted to Yangon. At Yangon airport troubleshooting was carried out.

Both CPC BITE check carried out, found message OFV LRU FAIL in both the CPC. No AUTO FAIL light observed. Manual operation of outflow valve checked and found satisfactory.

Troubleshooting carried out as per Manufacturer's recommendation and Fault Isolation Manual. During troubleshooting following components were replaced.

- #1 & #2 CPC (Cabin Pressure Controller)
- Cabin Pressure Selector Panel
- Outflow Valve.

Post installation operational check of outflow valve carried out. No leak observed. Cargo doors gap check carried out and found satisfactory. Aircraft released to service with Manufacturer's concurrence.

The removed components during rectification action have been sent to OEM for shop investigation. As per shop investigation report no defects found in all the removed components.

### 1.18.2 Cabin Pressure Controller's memory readout

Operator has provided NVM (Non Volatile Memory) data of both the Cabin Pressure Controllers to aircraft manufacturer Boeing to analyze.

Boeing has reviewed the NVM data and responded to the operator.

As per NVM data it shows that same set of Fault Codes (FC) occurred on both the CPCs for incident flight leg.

The fault code FC 07 (Loop Closure Failure/OFV LRU Fail) occurred during cruise phase on CPC-1 (at flight altitude 33,937 ft) and during descent phase on CPC-2 (at flight altitude 33,502 ft). FC 07 produces the AUTO FAIL indication.

The next fault code FC 58 (Manual Switch Message) indicating manual control had been engaged (at flight altitude 30,991 ft).

Thereafter for fault code FC 17 (Cabin 10,000 ft Message Fail) occurred (at flight altitude 31,001 ft) indicating a Cabin Altitude greater than 10,000 ft.

Then for fault code FC 90 (CAB Press Switch Active) occurred, indicating the cabin pressure switch of the electronic actuator on the OFV is active (at flight altitude 31,001 ft).

The next fault code FC 18 (Cabin 13,500 ft Message Fail) indicating the cabin altitude exceeded 13,500 ft (at flight altitude 31,001 ft).

There were no CPC LRU fault codes logged in NVM on either controller.

After the AUTO FAIL light illuminated and manual mode was selected. The data suggest that the outflow valve was commanded open from 16 degrees to 75.6 (Coinciding with the cabin altitude greater than 10000 ft) degrees and to 59 degrees.

### 1.18.3 Cockpit Crew Statements extract

As per Cockpit crew statements at FL350 they were experiencing light turbulence hence requested Yangon ATC for FL310. Passing FL340 AUTO FAIL light illuminated. AUTO FAIL NNC carried out. AUTO FAIL light did not extinguish when PMS (Pressurisation Mode Selector) put on ALTN. PMS then put on MAN then cabin altitude warning horn/light illuminated. Recall actions for cabin altitude warning horn carried out. Passenger oxygen masks were deployed. Passenger and crew informed on PA regarding emergency descent. MAYDAY call given to ATC and started descent to 11000 ft. Cabin altitude warning and Emergency descent checklist completed.

Considering the fuel on board and distance to destination point, decision was made by cockpit crew to land at nearest airport that is Yangon. Descent and approach checklist was followed and aircraft landed safely.

In the statement cockpit crew did not mention about the operation of outflow valve switch which has to be operated momentarily to open or close as needed to control cabin altitude and rate.

### 1.18.4 Cabin Crew Statements extracts

There were 06 cabin crew on-board. As per their statements, the aircraft was experiencing light to moderate turbulence and seat belt sign was ON. All of sudden they heard loud bang sound followed by suction noise from aft galley. Within 10

seconds the oxygen masks of the entire flight deployed followed by automated announcement. It was freezing cold inside the cabin.

Once the aircraft levelled off, cabin crew took a round in the cabin along with oxygen bottle.

### 1.18.5 Procedure for handling Cabin Altitude Warning:

As per FCOM, the procedure is enumerated as below:

**Cabin Altitude**

**Condition: One or more of these occur:**

- **A cabin altitude exceedance**
- In flight, the intermittent cabin altitude/configuration warning horn sounds or a cabin ……..

1. Don oxygen masks and set regulators to 100 %
2. Establish crew communications
3. **Pressurisation mode selector ……MANUAL**
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**

****

**11 Checklist complete Except deferred items**

**Deferred items**

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

**Descent checklist**

Pressurization**……Move outflow valve witch to OPEN or CLOSE as needed to control cabin altitude and rate**

## 1.19 Useful or effective investigation techniques:

NIL

## 2. ANALYSIS

### 2.1. Engineering and Maintenance aspects

Aircraft was airworthy before departure from VABB to VTBS.

Before departure aircraft was under MEL for Logo light which does not have any operational requirements.

Post incident aircraft was diverted to Yangon International Airport and landed safely.

At Yangon Airport troubleshooting was carried out. Manual Operation of outflow valve checked and same found satisfactory. For fault isolation both CPC replaced, cabin pressure selector panel replaced, outflow valve replaced. The removed items sent for shop investigation.

As per shop reports no defect found in removed items. Hence the faulty component is not the cause for cabin depressurisation.

As per CPC fault codes it is confirmed that outflow valve was commanded open from 16 degrees to 75.6 degrees. This sudden opening of outflow valve has resulted into cabin depressurisation.

### 2.2. Flight Operations aspects

The Captain and First Officer held a valid Indian ATPL/CPL endorsed with s Boeing 737 rating.

It appears from CVR recording that the outflow valve was kept open for longer period of time.

At the beginning of outflow valve operation, the cabin altitude was 5000ft. The cabin altitude aural warning was activated approximately 8 seconds after the operation started.

Since the Cabin altitude warning triggered when cabin altitude exceeds 10000ft, the cabin climbed at least 5000ft in 8seconds, it is inferred that the cabin rate of climb would have been very high. Crew did not report the cabin rate of climb, cabin altitude and the differential pressure value at this time.

When the cabin altitude warning came on, the airplane had levelled at FL310, PIC instructed First Officer to advice Yangon of emergency descent and he commenced the

emergency descent. At this time, the correct actions were to announce for cabin altitude warning quick actions and perform the actions.

The First officer made the radio call, but did not made MAY DAY in transmission. This resulted in the call not being acknowledged by any station. It is unclear if the transponder code was changed to 7700 to indicate emergency.

The First officer completed the cabin altitude warning quick actions. He initiated emergency descend quick actions before performing cabin altitude warning quick actions. Neither crew members checked if the cabin altitude was controllable before commencing emergency descend.

Jet Airways Operational Manual Part-A (Rev 11) chapter 11.5Emergency Descent states "In the event of aircraft depressurisation during flight, the crew must take immediate action as addressed by the respective FCOM /QRH with regards to critical actions, task sharing and standardised call outs".

The emergency descend MAY DAY call was made by PIC when airplane was descending passing approximately FL240.

PIC asks Non Normal checklist, without specifying the check list name. First officer started performing the cabin altitude warning or rapid depressurisation checklist.

First officer did not establish communication after wearing the oxygen mask, resulting in PIC not hearing and acknowledging to the cabin altitude warning checklist which was read by first officer.

The handover of radio communication operation was not standard. PIC started operating the radio passing FL240 till the airplane reach FL110.

The crew did not complete the AUTO FAIL non normal checklist which includes deferred checklist items for Descend Approach and Landing.
There was no direct instruction from the non normal checklist to perform the manual mode supplementary procedure.

As per the cabin crew statements they heard a loud bang sound followed by suction a noise. All other cabin crew emergency actions were satisfactory.

## 3. CONCLUSION

3.1 AUTO FAIL came ON in flight, the crew operated outflow valve in Manual Mode.

3.2 The Cabin Altitude warning generated as a consequence of crew action of keeping the outflow valve switch in the open position for longer period of time.

3.3 Cabin Altitude Warning or rapid depressurisation quick actions performed by the crew were not as per Non-normal checklist.

3.4 Cockpit crew lacked a clear understanding of the usage of outflow valve switch during manual mode operation.

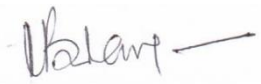
3.5 Declaration of emergency was delayed.

## 4. SAFETY RECOMMENDATION

4.1 Suitable corrective training for cockpit crew.

4.2 DGCA HQ may issue guidelines to reiterate the importance of adherence of procedure during manual mode operation to B737 pilots.

4.3 Training department of M/s Jet Airways Ltd. to reiterate the procedure of outflow valve usage during manual mode operation in training syllabus.



(Sanjay K. Bramhane)
Dy. Director Air Safety
Inquiry Officer: VT-JBZ
Date: 10.02.2017

---End of Report---