

**FINAL INVESTIGATION REPORT**  
**Loss of Altitude during cruise of M/s Jet Airways B777-300ER aircraft**  
**VT-JEL on 08.08.2014**

- |                              |              |                                  |
|------------------------------|--------------|----------------------------------|
| 1. Aircraft                  | Type         | : Boeing                         |
|                              | Model        | : B777-300ER                     |
|                              | Nationality  | : Indian                         |
|                              | Registration | : VT-JEL                         |
| 2. Owner                     |              | : Jet Airways                    |
| 3. Operator or hirer         |              | : Jet Airways                    |
| 4. Date of incident          |              | : 08.08.2014                     |
| 5. Time of incident (UTC)    |              | : 0230                           |
| 6. Last point of departure   |              | : Mumbai Airport                 |
| 7. Point of intended landing |              | : Brussels Airport               |
| 8. Geographical location     |              | : Over Turkish airspace          |
|                              | Latitude     | - North 41:15.9                  |
|                              | Longitude    | - East 36:32.9                   |
| 9. Type of Operation         |              | : Commercial                     |
| 10. Phase of Operation       |              | : During cruising                |
| 11. Type of Incident         |              | : Loss of altitude during cruise |

**Synopsis:-**

On 08.08.2014, aircraft B777-300-ER Registration VT-JEL belonging to M/s Jet Airways was involved in loss of altitude incident during cruise over Turkish Airspace. The PIC was undergoing controlled rest as per the DGCA operations circular 8/2013 and the controls were with the First Officer. The PIC woke up to see that the aircraft had lost assigned altitude and was climbing through FL 320. The investigation was carried under Rule 13(1)

of, The Aircraft (Investigation of Accidents and Incidents) Rule 2012. The cause of incident was inadvertently carrying out level change while updating the heading in altitude window.

## **1. FACTUAL INFORMATION**

### **1.1 History of the flight:**

Jet Airways B777-300ER registration VT-JEL was operating 9W-228 on sector BOM-BRU on 8/8/2014. The aircraft got airborne at 2135 UTC from Mumbai. The incident occurred after the aircraft had flown for 04 hours 43 minutes. The aircraft was flying on westerly track which was between 230 and 300 degrees, the wind was approximately 240/45 kts. The Commander was under controlled rest during this period as per the DGCA Operation Circular 8/2013. At time 0218 UTC on waypoint CRM, (Lat 41:15.9 North & Long 36:32.9 East), While updating of heading 292 degree, in Turkish airspace the First Officer turned the altitude knob to 292 FL and pressed thereby causing the aircraft to descend. The Turkish ATC noticed the aircraft descent from FL340 to FL317. The loss of altitude was approximate 2251 ft. The ATC noticed the aircraft while descending below FL 320 and started calling about unauthorized descend. Subsequently, the First Officer pressed ALT HOLD and climbed back to FL320 Thereafter, the flight climbed to FL 320. The First Officer then woke up the Captain who was undergoing controlled rest. The commander saw 29200 feet on FMC when he woke up.

**1.2 Injuries to persons:** Nil

**1.3 Damage to aircraft:** Nil

**1.4 Other damage:** Nil

## 1.5 Personnel information:

Details	Commander	First Officer
Age	40	46
Date of license issue	ATPL-24-Jul-2003	CPL-07-SEP-2011
Valid up to	31-JUL-2015	06-SEP-2016
Category	CAPTAIN	FIRST OFFICER
Endorsement as PIC	23-JAN-2009	NA
Date of Medical Exam	28-OCT-2014	06-OCT-2014
Medical Exam validity	19-APR-2015	05-APR-2015
FRTOL License Valid up to	29-JUN-2018	06-SEP-2016
Total Flying Experience (Hrs)	12845:32	7388:00
Experience on Type (Hrs)	4785:00	4332:00
Experience as PIC on Type (Hrs)	4636:30	NA
Last flown on Type	08-FEB-2015	12-AUG-2014
Total flying experience in last 365 days (Hrs)	757:16	761:40
Total flying experience in last 180 days (Hrs)	311:17	368:59
Total flying experience in last 90 days (Hrs)	150:24	214:51
Total flying experience in last 30 days (Hrs)	49:17	56:11
Total flying experience in last 7 days (Hrs)	17:23	22:16
Total flying experience in last 24 Hrs	08:30	08:30
Rest before the incident flight	119 hrs 14 minutes	90 hrs 27 minutes
RTR (A) Validity	10-APR-2015	16-JUL-2032
Previous incident history	NIL	NIL



**1.15 Survival aspects:** Not applicable.

**1.16 Tests and research:** Not applicable.

**1.17 Organizational and management information:** Not applicable

**1.18 Additional information:**

The First Officer stated that the aircraft descended from FL340 without any pilot input until she arrested the descent AT FL317 using "ALT HOLD". She became aware of the loss of altitude when she was queried by ATC. The Capt stated that he was taking controlled rest and was asleep at the time of the incident. He was woken up when the aircraft regained FL320.

During the induction training in 2001, for type endorsement of ATR-72-500 Route Check of 24/02/2001; she was assessed not satisfactory and more training required. However during familiarization flight of 10/03/2001 was lacking judgment to be on glide slope. After 2 hrs of simulator again during route check of 7/04/2001 found satisfactory.

The training records of First Officer were examined to ascertain any deficiency. However it was found that there was no deficiency reported by the examiner and all the route check since 2006 were found assessed as satisfactory. Refresher training for IR/LR renewal from 2009 found to have no adverse remark and the performance assessed is found to be satisfactory.

This indicates that the first officer had no previous history of any deficiency during any assessment after receiving endorsement on B737-NG and B777.

**1.19 Useful or effective investigation technique:**

1. Boeing analysis report of B777 flight 9W-228 BOM-BRU of 08.08.2014 is attached.
2. Simulator Investigation of Flight 9W-228, sector VABB- EBBR dated 08th August 2014 was carried out on 05th December 2014. This simulator exercise was carried out in the presence of Inquiry Officer.

## 2. ANALYSIS:

Jet Airways B777-300ER registration VT-JEL was operating 9W-228 on sector BOM-BRU on 8/8/2014. The aircraft was flying on westerly track which was between 230 and 300 degrees, the wind was approximately 240/45 kts. The Commander was under controlled rest during this period. While updating of heading 292 degree, in Turkish airspace the First Officer turned the altitude knob to 292 FL and pressed thereby causing the aircraft to descend. The Turkish ATC noticed the aircraft descent from FL340 to FL317. The ATC noticed the aircraft while descending below FL 320 and started calling about unauthorized descend. Subsequently, the First Officer pressed ALT HOLD and climbed back to FL320 Thereafter, the flight climbed to FL 320. The First Officer then woke up the Captain who was undergoing controlled rest. The commander saw 29200 feet on FMC when he woke up.

Jet Airways provided the flight data, QAR data, and FMC BITE to M/s Boeing and asked to reproduce pilot input to MODE CONTROL PANEL at the relevant time based on the data.

M/s Boeing stated that - the FMC BITE analysis did not reveal anything that could be correlated with the reported un-commanded descent in cruise.

From the Boeing analysis report of the QAR and DFDR revealed that the following events took place:-

“The airplane was flying level at FL340 (The MODE CONTROL PANEL altitude target window was also at FL340) with LNAV and VNAV mode engaged. At approximately 02:18:20 UTC, the MODE CONTROL PANEL Altitude was adjusted from FL340 to FL370, FL290 and then FL292 within 4 seconds. The QAR signal FMF\_SEL\_CRUISE\_ALT signal shows a change from FL340 to FL292 approximately 10 seconds later, which indicates that the MODE CONTROL PANEL Altitude knob activated. The airplane responded per design, and began a cruise descent toward FL292. In addition, an EICAS ALTITUDE ALERT CAUTION was not present in the flight data. This annunciation would show if the aircraft descended more than 200 feet from FL340 (assuming that the MODE CONTROL PANEL Altitude remained at FL340). The data showed that the heading was 285 Magnetic (291 True) degrees at this time.

The airplane continued to descend from FL340 for approximately 1 minute and 45 seconds. When descending through FL318 the autopilot momentarily entered V/S (Vertical Speed) mode and then transitioned to the Autopilot ALT mode. This is consistent with the flight crew pressing the MODE CONTROL PANEL V/S button, then the ALT button. Approximately 2 seconds later, the MODE CONTROL PANEL altitude was adjusted from FL292 to FL320 but there was no MODE CONTROL PANEL Altitude knob press, so the FMF\_SEL\_CRUISE\_ALT signal remained at FL292. The autopilot leveled at FL317. Approximately 35 seconds later, the MODE CONTROL PANEL altitude was changed from FL320 to FL340, but the MODE CONTROL PANEL Altitude knob was not activated. Approximately 10 seconds later, the VNAV mode was armed, and the AFCS immediately engaged in VNAV ALT mode at FL317, the target FMC altitude synched from FL340 to the current altitude of FL317, and the MODE CONTROL PANEL speed window closed.

Approximately 13 seconds later, the FMF\_SEL\_CRUISE\_ALT signal rose from FL292 to FL340, consistent with the MODE CONTROL PANEL ALTITUDE knob being pressed. The airplane started to climb toward FL340. Upon climbing through FL320 the MODE CONTROL PANEL altitude knob was dialed down from FL340 to FL320 and the SEL button pressed, and the airplane then returned to level flight in the VNAV PTH mode. While the airplane was leveling it exceeded FL320 by 200ft and an altitude alert caution warned the pilots that the airplane had departed the MODE CONTROL PANEL altitude of FL320. The data showed that the flight continued normally thereafter.

This event does not appear to be similar to the condition reported in the FTD (Fleet Team Digest FTD Article 777-FTD-22-12001). In the past, MODE CONTROL PANEL window jumps have always been single jumps, and therefore only in one direction (increasing or decreasing, never jumping back and forth as in the subject event). Further, to date, there have been no window jumps followed by activation of the select knob.

Boeing is unable to identify an aircraft system failure that caused this descent. The available data does not the need to perform any additional aircraft maintenance in response to this event.”

From the simulator investigation of the flight, the following observations were made:-

The purpose of the exercise was to replicate in real time the above mentioned incident in the simulator and corroborate in order to authenticate a report from Boeing Company on the said incident. The crew performing the exercise was briefed on the said subject and the following was observed.

The airplane was positioned on the same route at same position to FL340 (The MODE CONTROL PANEL altitude target window was also at FL340) with LNAV and VNAV mode engaged. The MODE CONTROL PANEL Altitude was adjusted from FL340 to FL370, FL290 and then FL292 within 4 seconds and activated. The airplane began a cruise descent toward FL292 as designed. The EICAS ALTITUDE ALERT CAUTION did not occur. The heading was 285 Magnetic (291 True) degrees which corroborates Boeings report.

The airplane descended from FL340 for approximately 1 minute and 45 seconds. When descending through FL318 and during automatic flight the V/S and then ALT button was pressed. The MODE CONTROL PANEL altitude was adjusted from FL292 to FL320, there was no MODE CONTROL PANEL Altitude knob pressed. The autopilot leveled at FL317 consistent with aircraft design. The MODE CONTROL PANEL altitude was then changed from FL320 to FL340, but the MODE CONTROL PANEL altitude knob was not activated, the VNAV mode was armed, and the AFCS immediately engaged in VNAV ALT mode at FL317, the target FMC altitude changed from FL340 to the current altitude of FL317, and the MODE CONTROL PANEL speed window closed.

The MODE CONTROL PANEL ALTITUDE knob was thereafter pressed and the airplane started to climb toward FL340. Upon climbing through FL320 the MODE CONTROL PANEL altitude knob was changed down from FL340 to FL320 and the SEL button pressed, and the airplane then returned to level flight in the VNAV PTH mode. While the airplane was leveling it exceeded FL320 by 200ft and an altitude alert caution warned sound was heard.

The simulator findings and the DFDR analysis report submitted by Boeing are in concurrence with the observation made in the simulator exercise.

The training records of the First Officer was examined to find out training related deficiency during IR/LR refresher, Route check etc and found that no deficiency was



reported by the examiner after year 2001. This also is indicative of the fact that the mishandling was inadvertent.

During investigation it was also thought as to how this inadvertent flight level change or handling of control during the rest period could be addressed forthwith. The various flying pilots have stated that once the PIC is under controlled rest the first officer should desist from touching controls or effecting level change. Secondly, the cockpit being completely dark shall add to the fatigue at the end of flight. The PIC under controlled is akin to a situation as only one flight crew available in cockpit.

### **3. CONCLUSION:**

#### **3.1 Findings:**

1. Boeing was unable to identify any system failure resulting in an un-command change in altitude selection after activation of the select knob.
2. Hence all inputs are likely to be pilot selection.
3. The winds prevailing at 241/53 Kts this caused track to 292 deg.
4. The heading adjusting with the track bug 292 deg during the same time there is changes effected in the FMC with respect to altitude.
5. The Altitude knob was rotated from FL 340 to FL 370, FL 290, and then FL 292 in 4 seconds. This was corroborated on the simulator.
6. The airplane descended from FL 340 for approximately 1 minute and 45 seconds, while descending through FL 318 under automatic flight the V/S and ALT button were pressed. The aircraft autopilot leveled at FL 317.
7. The MODE CONTROL PANEL altitude was adjusted from FL 292 to FL 320 to FL 340 but no MODE CONTROL PANEL ALT Knob pressed. It was pressed later and then the aircraft stated to climb.
8. After ATC permitting FL 320 the knob was changed from FL 340 to FL 320 and SEL button pressed. Thereby leveling the aircraft at FL 320.
9. The PIC was sleeping under controlled rest provision throughout this control manipulation by First Officer. First Officer has denied the same.
10. The investigation in the incident proves that the manipulation of the controls by First officer was initially done inadvertently during the setting the

track bug at 292 deg in MODE CONTROL PANEL Altitude window. However, the altitude changed as the rate of descend was very gradual.

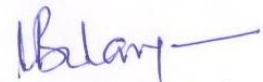
11. However, on being cautioned by Turkish ATC the First Officer did take the corrective and brought aircraft back to FL320 but denied having changed the altitude.
12. The first officer during the controlled rest of PIC is not required to carry out any altitude changes, First Officer did not feel any abnormal condition of dropping of altitude hence decided to correct the flight level by initiating climb without bringing to notice of PIC.
13. During the level burst there was no audio warning in the cockpit again indicating that the aircraft behaved as commanded.
14. The cabin crew presence during the one flight crew under controlled rest shall make the cockpit more alert. This also shall reduce the inadvertent action to certain extent.

### 3.2 Probable Cause:

The First Officer inadvertently fed the Altitude window on MODE CONTROL PANEL with the corrected track of 292 Degree and activated thereby causing the altitude of the aircraft to drop.

### 4. SAFETY RECOMMENDATIONS:

1. The co-pilot should be given corrective training on the flight automation systems.
2. Any other action deemed fit by DGCA HQ's.



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Dy. Director Air Safety (WR)