



सत्यमेव जयते

GOVERNMENT OF INDIA

CIVIL AVIATION DEPARTMENT

INVESTIGATION REPORT

**EMERGENCY LANDING INCIDENT AT MANGALORE
TO AIR INDIA AIRBUS A-320 A/C VT-ESE WHILE OPERATING
FLIGHT AI-681 (MUMBAI-COCHIN) ON 27-02-2017.**

O/o Dy. Director General of Civil Aviation(NR)

Air Safety Directorate , Safdarjung Airport,

New Delhi – 110003

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FOREWORD

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of various components. The investigation has been carried out in accordance with Annex 13 to the convention on International Civil Aviation and under Rule 13(1) of the Aircraft (Investigation of Accidents and Incidents), Rules 2012.

The investigation is conducted not to apportion blame or to assess individual or collective responsibility. The sole objective is to draw lessons from this incident which may help to prevent such future incidents.

ABBREVIATIONS

Abbreviation	Expanded form
AI	Air India
ALT	Alternate
AME	Aircraft Maintenance Engineer
ATC	Air Traffic Control
ATPL	Aircraft Transport Pilot Licence
CPC	Cabin Pressurisation Control
CPL	Commercial Pilot Licence
DFDR	Digital Flight Data Recorder
DGCA	Directorate General of Civil Aviation
ECAM	Electronic Centralised Aircraft Monitor
FL	Flight Level
MEL	Minimum Equipment List
PAX	Passenger
PDR	Pilot Defect Report
PIC	Pilot –in - Command
PRV	Pressure regulating valve
RWY	Runway
UTC	Coordinated Universal Time

**EMERGENCY LANDING INCIDENT AT MANGALORE TO AIR INDIA
AIRBUS A-320 A/C VT-ESE WHILE OPERATING FLIGHT AI-681
(MUMBAI-COCHIN) ON 27-02-2017.**

- a) Aircraft
- | | | |
|--------------|---|--------------------|
| Type | : | Passenger aircraft |
| Model | : | A320-231 |
| Nationality | : | Indian |
| Registration | : | VT-ESE |
- b) Owner/operator : Air India
- c) PIC : ATPL holder
- Extent of injury : Nil
- d) Co-pilot : ATPL holder
- Extent of injury : Nil
- e) No. Of crew : Cockpit crew-02, Cabin crew-04
- f) Passengers on board : 58 Passengers
- Extent of injuries : Nil
- g) Date & time of incident : 27.02.2017, 1338 UTC
- h) Place of incident : Mangalore
- (Geographical Co-ordinates) : (Latitude 12° 57'43" N; Longitude 74° 53'23" E)
- i) Last point of departure : Mumbai
- j) Point of intended landing : Cochin
- k) Type of operation : Scheduled commercial operation
- l) Type of flight : Domestic flight
- m) Phase of operation : Cruise
- n) Type of incident : Emergency landing

SYNOPSIS:

Airbus A320 aircraft VT-ESE was operating flight AI-681 (Mumbai - Cochin) on 27.02.2017. Departure from Mumbai was uneventful. During cruise, there was cabin pressurisation failure. The aircraft descended with ATC permission. Oxygen masks were

deployed. The aircraft diverted to Mangalore and made emergency landing. The landing was safe. There was no injury to any of the passengers or crew members on board the aircraft.

After landing at Mangalore, the aircraft was inspected for rectification by AME. During rectification, cabin pressure controller no.1, pack no.1 and flow control valve of Pack no.2 were replaced. Engines were given ground run to check the serviceability of the cabin pressurisation system; which was found satisfactory. The deployed oxygen masks were stowed. The aircraft was operated under MEL for a positioning flight to Delhi. At Delhi, flow control valve no. 1 and pressure regulating valve (PRV) no.2 were replaced. Thereafter the aircraft declared serviceable.

This incident has been investigated by inquiry officer under rule 13(1) of Aircraft (Investigation of Accidents and Incidents) Rule 2012.

The cabin pressurisation failure occurred due to malfunction of flow control valve no. 2 at higher altitude.

1. FACTUAL INFORMATION:

1.1. History of flight:

1.1.1 On 27.02.2017, Air India Airbus-A320 aircraft, registration VT-ESE was scheduled to operate flight no. AI-681 in the sectors Mumbai-Cochin. The flight was under the command of an ATPL holder along with a Co-pilot who held a CPL. There were 58 passengers on board. Weather was fine.

1.1.2. The flight no. AI-681 took-off from Mumbai for Cochin at 1257 UTC. The departure was uneventful. At 1338 UTC when the aircraft was cruising at FL 390, 'air pack 1' overheat fault appeared followed by 'air pack 1' fault. There was an increase in cabin altitude. ATC was requested for a lower altitude. Before the descent could be commenced, there was rapid increase in cabin pressure altitude. May-Day was declared and emergency descent was commenced. ECAM action and paper checklist was carried out. Oxygen masks were deployed.

1.1.3. The aircraft diverted to Mangalore and made an emergency landing at 1403 UTC. The landing was safe. There was no injury to any of the passengers or crew members. There was

no damage to the aircraft and there was no damage to any equipment or person external to the aircraft.

1.1.4. At Mangalore, the aircraft was inspected by AME for rectification. During rectification, cabin pressure controller no.1 , pack no.1 and flow control valve of Pack no.2 were replaced. Engine run up was carried out to check the serviceability of the cabin pressurisation system and found satisfactory. The deployed oxygen masks were stowed. The aircraft was flown under MEL for a positioning flight to Delhi. At Delhi, flow control valve no. 1 and pressure regulating valve (PRV) no.2 were replaced. Thereafter the aircraft became serviceable.

1.2. Injuries to Person : Nil

1.3. Damage to the Aircraft: Nil

1.4. Other damage : Nil

1.5. Personal information

1.5.1. Pilot –in- Command

AGE : 32 Years/ Female

License :ATPL Holder

1.5.2 Co- Pilot:

Age : 30 Years / Male

License : CPL Holder

1.6. Aircraft Information:

Manufacturer	AIRBUS	
Type	A320-231	
Sr. No.	MSN 0431	
Year of manufacturer	1993	
Certificate of airworthiness, date of issue and validity	1994, 05.08.1993, ARC Valid till 04 January 2018.	
Category	NORMAL	
Certificate of registration	2504/3	
Owner	AIR INDIA LTD	
Maximum all up weight authorised	73,500 Kgs.	
Last major inspection	'1A' CHECK on 04 February 2017	
Last inspection	Weekly Inspection on 25 February'2017	
Airframe Hrs since new	59854.37 Hrs.	
Airframe Hrs since last C of A	373.04 Hrs.	
Engine Information	PORT ENGINE	STBD ENGINE
Manufacturer	IAE	IAE
Type	V2500-A1	V2500-A1
Serial No.	ESN V0094	ESN V0062
Hrs done since new	48369.60 Hrs.	49500.56 Hrs.
Hrs done since overhaul	2209.18 Hrs.	1867.27 Hrs.
Last major inspection carried out	LSV NO. 13, on 28 April 2016	LSV NO. 12, on 14 MAY 2016
Last inspection	'1A' Check on 04 February 2017	'1A' Check on 04 February 2017
Average fuel consumption	1400 Kg/hr approx.	1400 Kg/hr approx.
Average oil consumption	0.025qts/hr	0.020 qts/hr
Type of fuel used	JET A1	JETA1

There was no pre-departure snag on the aircraft.

1.6.1. Snag and rectification details of the flight:

Following snag rectification was carried out :

- Cabin Pressure Controller (CPC) no.1 was replaced.
- CPC no.1 & 2 were tested and found satisfactory.
- Pack Controller no.1 was replaced as per AMM 21-61-34-000/400-001A. A test was carried out and it was found satisfactory.
- During Pack 1 operation, Ram inlet actuator was suspected defective. It was replaced 21-61-51-000-001A & 21-61-51-400-001A.
- During Pack 2 operation, flow control valve found sluggish. The same was replaced as per AMM 21-51-51-000-001A & 21-51-51-400-001A .
- Pack 2 sense line checked for security and leak and found satisfactory.
- During engine run up on ground, cabin pressurisation was found satisfactory.
- Deployed oxygen masks were stowed back and the aircraft was flown under MEL for a positioning flight to Delhi.
- At Delhi, flow control valve no.1 and pressure regulating valve (PRV) no.2 were replaced.

1.6.2. Type of fuel used : JET A 1 (Aviation Turbine Fuel).

1.7. Meteorological information:

Weather at Mumbai during departure was reported as given below:

Cloud : FEW 200,
Wind : 250/ 05 kts
Visibility : 06 KM
O.A.T : 29 ° C
Precipitation : Nil
Turbulance : No.

Weather was fine and has not contributed to the incident.

1.8. Aids to Navigation : Not applicable

1.9. Communication : The aircraft was in two way communication with ATCs enroute.

1.10. Aerodrome Information: Mangalore airport has a table-top runway. Its ARP coordinates are : Latitude 12° 57'43" N; Longitude 74° 53'23" E. Rwy ends are named as 09/27. Elevation is 338 feet. Aerodrome features have not contributed to the incident.

1.11. Flight Recorder:

The aircraft is equipped with a DFDR. Departure from Mumbai and landing at Mangalore has been recorded. Also, information recorded in 'Maintenance Post Flight Report' shows the following warning messages :

<u>Time</u>	<u>Event</u>
1335 UTC	AIR PACK1 OVHT
1335 UTC	AIR PACK1 FAULT
1335 UTC	AIR PACK 1 OVHT
1337 UTC	PACK 1
1338 UTC	CAB PR EXCESS CAB ALT
1340 UTC	PACK 1

Maintenance Post Flight Report shows the following failure message :

<u>Time</u>	<u>Event</u>
1237 UTC	RADAR 2 ANTENNA
1239 UTC	AUDIO MANAGEMENT SYSTEM
1300 UTC	EGT SENS/HC/EEC2
1334 UTC	P1 FLOW CONTROL VALVE (TEMP CONTROL)

It can be seen that there is failure message for P1 FLOW CONTROL VALVE at 1334 UTC. Warnings for AIR PACK1 OVHT, AIR PACK1 FAULT, AIR PACK1 OVHT, PACK 1 and CAB PR EXCESS CAB ALT follow after that.

1.12. Wreckage & Impact information: Not applicable.

1.13. Medical & Pathological information: Not applicable

1.14. Fire: There was no fire.

1.15. Survival Aspects: The incident was survivable.

1.16. Tests & Research: The CPC no.1, Pack control no.1 and flow control valve no.2 were tested in 'shop' for their serviceability. Snag was confirmed only on flow control valve no.2. Snag could not be confirmed on CPC no.1 and pack control no.1. There was a failure message for flow control valve of pack 1 also. But the snag on the same could not be confirmed on ground.

1.17. Organizational & Management information: Not applicable

1.18. Additional information: Nil.

1.19. Useful or Effective Investigation Techniques: Nil.

2. ANALYSIS

2.1 Flight Crew and aircraft operations: The flight crew were appropriately qualified. Pilot declared emergency during cruise when there was rapid increase in cabin altitude due cabin pressurisation failure. The decision to divert and land the aircraft at Mangalore was appropriate. The pilot made a safe emergency landing. There was no injury to any of the aircraft occupants and also there was no damage to the aircraft. Thus flight crew qualification and operations of the aircraft is not considered a contributory factor to the incident.

2.2 Weather : Weather was fine. It did not contribute to the incident.

2.3. Maintenance of aircraft:

The aircraft was serviceable before departure from Mumbai. There was no pre departure snag. The cabin pressurisation failed during cruise ; which led to declaration of emergency and deployment of oxygen masks and the aircraft made emergency landing at Mangalore. During rectification, CPC1 was suspected to be faulty which was replaced. During testing of the CPC 1 & 2 , Pack control no.1 and flow control valve no.2 in shop, the snag could be confirmed only on flow control valve no.2. Flow control valve no.2 was also found sluggish during operational check at Mangalore. Although, there was a failure message for flow control valve of Pack 1, the same could not be confirmed during check in the shop.

2.4. Circumstances leading to the incident: Flow Control Valve No.2 was sluggish and was confirmed to be faulty. It implies that the aircraft was being served by only one pack for air conditioning. The aircraft was flying at high altitude of FL 390. There was a fault message for flow control valve no.1 also. However, the fault on flow control valve no.1 could not be confirmed during check in the shop. This kind of anomaly in serviceability of flow control valve is possible as environmental conditions are not the same at higher altitude (FL 390) and on ground. It implies that flow control valve no.2 malfunctioned and bleed through flow control valve no.1 was not sufficient to maintain pressurisation in the cabin at higher altitude. Insufficient bleed led to depressurisation of the cabin. Thus, it was malfunction of flow control valve no. 2 at higher altitude that led to aircraft cabin pressurisation failure.

3. CONCLUSION:

3.1 Findings:

3.1.1. The flight crew were appropriately qualified to operate the flight.

3.1.2. Weather was not a contributory factor to the incident.

3.1.3. There was a fault message for flow control valve no.1 . However, its fault could not be confirmed during check in the shop.

3.1.4. The flow control valve no. 2 was sluggish. It was found faulty during check in the shop.

3.1.5. Cabin pressurisation failure occurred due to malfunction of flow control valve no.2 at higher altitude. The occurrence was due to failure of component.

3.2 Probable cause of the incident:

Cabin pressurisation failure occurred due to malfunction of flow control valve no. 2 at higher altitude.

4. SAFETY RECOMMENDATIONS : Nil



(H.N. Mishra)

Deputy Director of Air Safety

Inquiry officer, VT-ESE,

O/o Dy. DGCA (NR)

Place : New Delhi

Date : 18.11.2017