



सत्यमेव जयते

**GOVERNMENT OF INDIA**  
**CIVIL AVIATION DEPARTMENT**

**INVESTIGATION REPORT**

**INCIDENT TO AIR INDIA AIRBUS A-320 A/C VT-ESI WHILE  
OPERATING FLIGHT AI-405 (VARANASI-DELHI) ON 07-09-2015**

**O/o Director Air Safety (NR), 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
ATC	Air Traffic Control
A/C	Aircraft
BRK	Brake
CAT	Category
DEL	Delhi
DGCA	Directorate General of Civil Aviation
ECAM	Electronic Centralised Aircraft Monitor
ENG	Engine
FADEC	Full Authority Digital Engine Control
HJR	Khajuraho
LH	Left Hand
MEL	Minimum Equipment List
MLG	Main Landing Gear
NORM	Normal
PAX	Passenger
PDR	Pilot Defect Report
PIC	Pilot -in - Command
PSI	Pound per square inch (a unit of pressure)
QAD	Quick Attach Detach
TEMP	Temperature
UTC	Coordinated Universal Time
VNS	Varanasi



**INCIDENT TO AIR INDIA AIRBUS A-320 AIRCRAFT VT-ESI WHILE OPERATING  
FLIGHT AI-405 (VARANASI-DELHI) ON 07-09-2015**

- a) Aircraft
- |              |   |                    |
|--------------|---|--------------------|
| Type         | : | Passenger aircraft |
| Model        | : | A320-231           |
| Nationality  | : | Indian             |
| Registration | : | VT-ESI             |
- 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-05
- f) Passengers on board : 147 PAX
- Extent of injuries : Nil
- g) Date & time of incident : 07.09.2015, 1424 UTC
- h) Place of incident : New Delhi
- (Geographical Co-ordinates) : (Latitude 28° 33.52' N; Longitude 77° 7.35' E)
- i) Last point of departure : Varanasi
- j) Point of intended landing : Delhi
- k) Type of operation : Scheduled commercial operation
- l) Type of flight : Domestic flight
- m) Phase of operation : Landing
- n) Type of incident : Emergency landing

**SYNOPSIS:**

Airbus A320 aircraft VT-ESI operating flight AI-405 (Varanasi-Delhi) on 07-09-2015 was involved in an incident of Emergency Landing at Delhi due ECAM warning during cruise "Hydraulic Green Pump Low Level and other associated warnings".

After landing on runway at Delhi , ground staff attending the emergency landing of the aircraft alerted the pilot that LH side main wheel was on fire and subsequently Pilot-in-Command carried out evacuation on runway. There were no injuries reported to any passenger or crew member. The incident occurred due leakage and spray of hydraulic fluid from flexible hose on hot brake assemblies of LH main wheel during landing roll of the aircraft.

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

## **1. FACTUAL INFORMATION:**

### **1.1. History of flight:**

1.1.1 On 7<sup>th</sup> Sept 2015, Air India Airbus –A320 aircraft, registration VT-ESI was scheduled to operate flight no. AI-406 in the sectors Delhi-Varanasi-Khajuraho and flight no. AI-405 in sectors Khajuraho -Varanasi-Delhi. The flight was under the command of ATPL holder along with Co-pilot also holding ATPL and there was an on-board AME for the transit inspection. There were 147 passengers on board.

1.1.2. The flight no. AI-406 took-off from Delhi for Varanasi at 0517 UTC and landed in Varanasi at 0620 UTC . The flight was uneventful with no snag reported. The aircraft then took-off from Varanasi at 0702 UTC and landed at Khajuraho at 0740 UTC .After operating the second sector (Varanasi-Khajuraho) pilot reported ENG 1 SENSOR FAULT. The same was rectified and the aircraft was released for service. The aircraft taxied out from Khajuraho at 0832 UTC for operating flight No. AI-405 (Khajuraho –Varanasi). Troubleshooting and rectification of leakage of hydraulic fluid by AME at Khajuraho:

1.1.3. The aircraft had departed from Khajuraho at 0832 UTC approx. and returned from take-off point due No.1 Engine Sensor Fault. The aircraft was parked in bay around 0842 UTC. The AME asked the pilot to shut down the engine and restart again as he wanted to confirm whether the snag was on both the channels. The engine was restarted and the fault reappeared again. The AME asked the pilot to shut down the engine and declared ‘grounding’ of the aircraft. Then he came out and went down to inspect the aircraft and found leakage from No.6 ‘brake assembly’. It was 0900 UTC approx. when the above leak was observed. Before that there was no leak as mentioned by AME in his statement. The passengers were



disembarked from the flight and he tried to rectify No.1 Engine Sensor fault. The fault got rectified and the same was confirmed by carrying out No.1 engine run up. No. 6 'brake assembly' was deactivated by disconnecting the flexible hose through QAD coupling. Leak check was carried out by AME as mentioned by him in his statement. There was no leak. The aircraft was released under MEL for the Khajuraho -Varanasi sector. Entries for task carried out at Khajuraho, made in 'Off-Job sheet' ( Routine Card/Inspection Discrepancy Sheet ) show that to rectify the leak of hydraulic fluid, the AME deactivated no. 6 'brake assembly' and the snag was carried forward under MEL 32-42-01A, CAT B. He has not mentioned in the Off-Job sheet that he had carried out a leak check after deactivating No. 6 'brake assembly' at Kajuraho. 02 quarts of hydraulic fluid was topped up of at Khajuraho. The aircraft departed from Khajuraho at 1138 UTC and landed Varanasi at 12:17 UTC. After landing at Varanasi, pilot reported 'AUTO BRAKE FAULT'. The fault was rectified by the on-board AME. The AME did not top up any hydraulic fluid at Varanasi as no leakage was observed. The aircraft was further released for operating flight no. AI-405 to Delhi.

1.1.4 The aircraft departed from Varanasi for Delhi at 13:06 UTC. While operating flight Varanasi-Delhi, Hydraulic Green low level warning appeared during cruise at 1333 UTC . The aircraft altitude was 34008 feet. The Green Hydraulic Fluid low level warning disappeared momentarily at 1336 UTC and reappeared again and continued for rest of the flight. The pilot declared emergency during approach and landed at Delhi Airport on runway 27 at 1424 UTC. On runway, ground personnel observed fire in left side main landing gear of the aircraft. Pilot-in-Command (PIC ) and ATC were informed about the fire through 'Follow Me' jeep. The Pilot-in-Command then instructed cabin crew to carry out emergency evacuation. Emergency evacuation was carried out on the runway itself. During evacuation there were no injury to any passenger or crew members. Later, maintenance personnel informed that there was no sign of fire or flame; it was only dense smoke.

**1.2. Injuries to Person** : NIL

**1.3. Damage to the Aircraft:** Damage to the aircraft was minor . During inspection on ground, LH forward belly fairing was found damaged. LH No. 4 flap track forward fairing was found damaged. Approximately 3" x 12" delamination occurred in LH translating sleeve. These damages were not related to the incident of smoke or fire on LH main wheel.



**1.4. Other damage** : NIL

**1.5. Personal information**

**1.5.1. Pilot –in- Command**

AGE : 39 Years/ Male  
License : ATPL Holder  
Date of issue : 09/05/2011  
Valid up to : 30/06/2020  
Category : Airplane  
Date of medical Exam : 15/05/2015  
Medical Exam valid up to : 14/05/2016  
Date of issue of FRTO license : 08/01/2013  
FRTO license valid up to : 07/01/2018  
IR rating and instructor rating : 20/06/2015  
Total flying experience during last 1 year : 760 Hrs  
Total flying experience during last 6 month : 374.26 Hrs  
Total flying experience during last 30 days : 74.26 Hrs  
Total flying experience during last 07 days : 9 Hrs  
Total flying experience during last 24 hours : 4.55 Hrs  
Duty time last 24 hours : 7.38 Hrs

**1.5.2. Co- Pilot:**

Age : 29 Years / Female  
License : ATPL Holder  
Date of issue : 04/02/2008  
Valid up to : 03/02/2018  
Category : Airplane  
Date of medical Exam : 15/07/2015  
Medical Exam valid up to : 14/07/2016  
Date of issue of FRTO license : 04/02/2013  
FRTO license valid up to : 03/02/2018  
IR rating and instructor rating : 29/07/2015  
Total flying experience during last 1 year : 710.33 Hrs

Total flying experience during last 6 months : 335.35 Hrs

Total flying experience during last 30 days : 84.06Hrs

Total flying experience during last 07 days : 22.26 Hrs

Total flying experience during last 24 hours : 6.58 Hrs

Duty time last 24 hours : 9.58 Hrs

**1.5.3. Maintenance Personnel Information:**

<b>Personnel Information</b>	<b>AME at Khajuraho &amp; Varanasi</b>	<b>AME At Delhi</b>
Date of Birth/Age	01.02.1968	04.11.1964
License type	B1	B1
Date of issue	31.03.2003	16.05.1994
Valid upto	30.03.2017	24.02.2016
Endorsement	CAT 'A' A320 FAMILY A/C CAT 'C' CFM 56-5B, IAE V2500	CAT 'A' A320 FAMILY A/C CAT 'C' CFM 56-5B, IAE V2500
Experience on type	13 YEARS	22 YEARS

**1.6. Aircraft information:**

**1.6.1. Technical information**

Manufacturer	AIRBUS INDUSTRIE
Type	AIRBUS A320-231
Sr. No.	MSN 0486
Year of manufacturer	1994
Certificate of airworthiness, date of issue and validity	ARC valid up to 09.09.2015
Category	PAX AIRCRAFT
Certificate of registration	ISSUED ON 24.02.2011

Owner	AIR INDIA LIMITED	
Maximum all up weight authorised	73500 Kgs	
Last major inspection	'3A' CHECK 04.08.2015	
Last inspection	PRE-FLIGHT CHECK, LAY OVER CHECK CARRIED OUT ON 06.09.2015	
Airframe Hrs since new	58640:38 AS ON 07.09.2015	
Airframe Hrs since last C of A	2791:11	
<b>Engine Information</b>	<b>No.1</b>	<b>No.2</b>
Manufacturer	IAE	IAE
Type	V2500-A1	V2500-A1
Serial No.	ENGINE-V0282	ENGINE-V0026
Hrs done since new	48115:25	43912:54
Hrs done since overhaul	1939:00	797:00
Last major inspection carried out	'3A' CHECK	'3A' CHECK
Last inspection	PREFLIGHT CHECK	PREFLIGHT CHECK
Average fuel consumption	1380 Kg/hr	1380 Kg/hr
Average oil consumption	0.030 qts/hr	0.030 qts/hr
Type of fuel used	JET A-1	JET A-1

**1.6.2. Snag and rectification details of the flight:**

Date	Flight No.	Sector	Defect reported by Pilot (PDR)	Rectification by AME(PDR)
07/09/15	AI-406	DELHI-VARANASI	SECTOR SNAG NIL	SECTOR SNAG NIL NOTED
07/09/15	AI-406	VARANASI - KHAJURAHO	ENG 1 SENSOR FAULT	ENG1 FADEC 1A&1B CB'S RESET C/O ENG 1 FADEC 1A&1B GROUND SCANNING C/O. NO FAULT RECORDED
07/09/15	AI-405	KHAJURAHO-KHAJURAHO	1) AFTER ENG START DURING TAXI ENG1 SENSOR FAULT. CAME BACK TO BAY	1) ENG1 FADEC 1A&1B CB'S RESET C/O ENG 1 FADEC 1A &1B GROUND SCANNING C/O. NO FAULT RECORDED



			<p>2) STARTED THE ENGI FOR PERFORMANCE CHECK &amp; AFTER OPENING THRUST GOT ECAM MSG 'ENGI SENSOR FAULT'. SWITCHED OFF THE ENGINE</p> <p>3) DURING POST FLT WALK AROUND BRAKE FLUID LEAKAGE WAS OBSERVED FROM WHEEL NO. 6</p>	<p>2) ENGI PB SENSE LINE TIGHTENED, ENGI FADEC 1A&amp;1B CB'S RESET C/O ENGI FADEC 1A&amp;1B GROUND SCANNING C/O. NO FAULT RECORDED</p> <p>3) NO.6 BRAKE ASSY DEACTIVATED UNDER MEL 32-42-01A CAT B</p>
07/09/15	AI-405	KHAJURAHO-VARANASI	BRAKE AUTO BRAKE FAULT	BSCU CH.142CB'S RESET C/O BSCU CH.142 TEST OK
07/09/15	AI-405	VARANASI-DELHI	<p>1. HYDRAULIC GREEN PUMP LOW LEVEL,</p> <p>2. ENGINE 1 SENSOR FAULT".</p> <p>3. STABILIZER JAM,</p> <p>4. DOOR KNOB STICKS IN OPEN POSITION,</p> <p>5. CABIN-COCKPIT INTERCOM U/S,</p> <p>6. LEFT MAIN WHEEL TEMP WENT UP TO 600 °C ON ALL FOUR WHEELS,</p>	<p>1.&amp;6. NO. 6 WHEEL BRAKE FLEXIBLE HOSE REPLACED. MAIN WHEEL NO. 1,2,5 AND 6 AND RESPECTIVE BRAKE ASSEMBLIES REPLACED. ALSO, ALL CABIN DOOR SLIDES AND RH OFF WING SLIDES ALONG WITH DOOR DAMPER REPLACED.</p> <p>2. NO.1 ENGINE EEC REPLACED. FADEC 1A &amp; 1B TEST CARRIED OUT AND FOUND OK.</p> <p>3. RHS THS ACTUATOR MOTOR REPLACED. THS ACTUATOR OPERATION FOUND SATISFACTORY.</p> <p>4. DOOR KNOB ADJUSTED. OPERATION, FOUND OK</p> <p>5. CIDS CB RECYCLED. COCKPIT-CABIN INTERCOM FOUND OK.</p> <p>ALSO LH FORWARD BELLY FAIRING, LH NO.4 FLAP TRACK FORWARD FAIRING AND LH TRANSLATING COWL WERE REPLACED.</p>



### **1.6.3. Maintenance Procedure for Deactivation of Wheel Brake when there is a leak of Hydraulic Fluid:**

Procedure for deactivation of Main Wheel Brakes as per MEL 32-42-01A.

There are three procedures to deactivate a wheel brake:

- (A) Deactivation without removal of the wheel brake.
- (B) Deactivation with removal of the wheel brake system of the wheel brake.
- (C) Deactivation of the wheel brake with disconnection of flexible hoses from normal and alternate braking system if there is a leak.

**1.6.4.**The AME has carried out the procedure given at (C) ' Deactivation of the wheel brake with disconnection of flexible hoses from normal and alternate braking system if there is a leak'.

The procedure is as given below :

- (1) Depressurise the Green and Yellow Hydraulic reservoirs (Ref AMM TASK 29-14-00-614-001).
- (2) For one wheel brake only, remove the flexible hoses between the rigid MLG hydraulic pipes and the wheel brake, on normal and alternate braking system.
- (3) Remove the flexible hose (2) from the brake hydraulic self sealing coupling and from the flexible hose connection(5) (Ref. AAM TASK 32-11-12-000-001).
- (4) Clean the brake hydraulic self- sealing coupling and apply two or three turns of TAPE-WIDE SELF- ADHESIVE-FABRIC 20 mm(0.7874 in.) to 30 mm (0.1.1811 in.).

- (5) Remove the flexible hose (5) from the flexible hose (2) connection and from the union (7). (Ref. AMM TASK 32-11-12-000-001).
- (6) Remove the flexible hose (1) from the brake hydraulic self-sealing coupling and from the flexible hose (6) connection. (Ref. AMM TASK 32-11-12-000-001).
- (7) Clean the brake hydraulic self-sealing coupling and apply two or three turns of TAPE-WIDE SELF-ADHESIVE-FABRIC 20 mm(0.7874 in.) to 30 mm (0.1.1811 in.).
- (8) Remove the flexible hose (6) from the flexible hose (1) connection and from the union (8). (Ref. AMM TASK 32-11-12-000-001).
- (9) Install CAP-BLANKING on the related unions (7) and (8) to make sure that there is no leak.
- (10) Remove the bleed screw plug (3) from the related bleed screw (4).
- (11) Connect a HOSE-VINYL to the bleed screw (4) and put the other end in a container 5L ( 1.32 US GAL) that contains Phosphate Ester Hydraulic Fluid- General Power— (Material No. 02-ABA1).
- (12) Slowly loosen the bleed screw (4) to release the remaining hydraulic pressure from the wheel brake.
- (13) Tighten the bleed screw (4).
- (14) Disconnect the HOSE-VINYL.
- (15) Install the bleed screw plug (3) on the bleed screw (4).
- (16) Do the same procedure for other bleed screw, if applicable.

(17) Do a pressure test after the installation of the blanking caps to make sure that there is no leak.

(a) For the normal braking system deactivation, do the operational check of the normal braking system. (Ref. AMM TASK 32-42-00-710-001). Make sure that there is no leak.

(b) For the alternate braking- system deactivation, do the operational check of the alternate braking system. (Ref. AMM TASK 32-43-00-710-001). Make sure that there is no leak.

(18) Make sure that there is no signs of overstrain damage on band clamps that connect the hydraulic pipes to the MLG.

(19) Make sure that there is no signs of damage at the mounting locations between the two ends of the hydraulic pipes and the MLG.

(20) Do a leak check at the blanking caps after each flight during the permitted repair intervals.

(21) Do a detailed visual inspection of the adjacent brake hose and harness to make sure that there are no signs of chafing, damage or leak. Do this inspection after each flight during permitted repair intervals.

**1.6.5.** As per AMM Chapter 29-00-00-790-001-A , page 8, Sub-task 29-00-00-864-050-A, Para C (2), any hydraulic system component which is leaking more than the prescribed limit, it requires either repair or replacement as necessary.

**1.6.6.** As per AMM Chapter 29-00-00-790-001-A , page 9, Para 3 (C) "System Leak Limits", the total leak rate for the Green, the Blue or the Yellow system must not be more than 100 drops per minute.

1.6.7. The AME did not install CAP-BLAKINGS on the quick release or QAD coupling of no.6 brake assembly as the same were not available at Khajuraho. He did not bleed out the left over hydraulic fluid in no.6 brake assembly, as required by the maintenance procedures as VINYL-HOSE was not available.

1.6.8. Preventive maintenance action:

After the incident on 07.09.2015, a call out was issued for 'one time check' to remove all Green/Yellow hydraulic flexible hoses of all brake assemblies during 'A' Check and send them to Accessory Overhaul shop for pressure testing to 1.5 times the operating pressure of 3000 psi. Flexible hoses checked during 'A' check were found satisfactory.

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

1.7. **Meteorological information:** Weather was reported fine, and not considered to be a factor for the incident.

1.8. **Aids to Navigation** : Not applicable

1.9. **Communication** : The aircraft was in two way communication with Delhi ATC.

1.10. **Aerodrome Information:** The aircraft requested for emergency landing and all emergency services were provided to cater for any emergency. The aircraft landed on RWY 27 at 1424 UTC. After evacuation of passengers, it was towed to Stand No: 91 at around 1520 UTC. Fire fighting personnel approached aircraft immediately to extinguish the reported fire in L H side main landing gear.

1.11. **Flight Recorder:**

1.11.1. The aircraft taxied out from Khajuraho at 0832 UTC for operating in sector Khajuraho-Varanasi and returned back to bay at 0842 UTC approx. due No.1 Engine Sensor fault. Digital flight data recorder print shows that left and right 'brake pedals' were pressed between following times at Khajuraho:

08:41:39 UTC to 08:42:15 UTC;

08:42:31 UTC to 08:42:43 UTC;

08:45:43 UTC to 08:46:11 UTC;



08:46:19 UTC to 08:47:19 UTC;

08:47:35 UTC to 08:47:51 UTC.

After the aircraft was parked in bay the AME carried out a walk around inspection of the aircraft at 0900 UTC approx. and found that hydraulic fluid was leaking from No.6 main wheel brake assembly. There is no record of application or pressing of 'brake pedal' between 0900 UTC and 11;37:00 UTC.

**1.11.2.** Record of pressing 'brake pedals' is found again between the following times:

11:38:11 UTC to 11:38:47 UTC (aircraft taxied out to operate Khajuraho-Varanasi Sector);

At 11:39:39 UTC :aircraft took-off from Khajuraho for Varanasi;

At 12:17:47 UTC :aircraft landed at Varanasi;

At 12:19:55 UTC:aircraft came to rest in bay at Varanasi.

**1.11.3.** The aircraft took-off from Varanasi at 1306 UTC for Delhi. The DFDR data of the flight AI-405 for the sector Varanasi –Delhi of 07.09.2015 shows that after departure of aircraft from Varanasi there was no immediate indication of the 'Green Hydraulic System Low Level'. The indication and warning appeared at 1333 UTC when the aircraft was cruising at 34008 feet . The 'Green Hydraulic System Low Level' warning momentarily disappeared and reappeared at 1336 UTC. Thereafter the warning remained throughout the cruise till the aircraft landed at Delhi.

**1.12. Wreckage & Impact information:** Not applicable

**1.13. Medical & Pathological information:** Not applicable

**1.14. Fire:** As per pilot's report, "After landing and parking on the runway, the ground staff near the aircraft alerted for left main wheel on fire on VHF (RT) through follow me jeep. After confirming twice, declared emergency and carried out evacuation". As the Aircraft Rescue and Fire Fighting vehicle was available in the vicinity of the aircraft , the fire was doused immediately. Later on, Air India maintenance personnel informed that it was only dense smoke and not fire as sign of fire or flame were not visible on left side wheel assembly.

**1.15. Survival Aspects:** The incident was survivable.

**1.16. Tests & Research:** The flexible hose of no. 6 'brake assembly' was tested for 'leak' on a hydraulic test rig facility of Air India at New Delhi . When a pressure of 150 PSI was applied, a pin hole leak was observed in the hose. With increase in pressure , the leakage of hydraulic fluid also increased. Hydraulic System pressure in A-320 aircraft is 3000 PSI.

**1.17. Organizational & Management information:** Not applicable

**1.18. Additional information:** Aircraft manufacturer ie, Airbus was consulted regarding the incident along with DFDR data, and their views are considered and as follows:

" During previous sector (Khajuraho-Varanasi) while landing at 12:15:40 UTC, NORM BRAKE FAULT and AUTOBRAKE FAULT triggered in flight. ALT BRAKING did not triggered whereas the braking function was available through alternate mode as the aircraft stopped at 12:19:50 and all the normal pressure remains null during the braking phase.

During takeoff from Varanasi (Varanasi – Delhi) at 13:05:50, the No. 6 normal braking pressure is no more coherent with the other braking pressure. During cruise, at 13:33:25, the low pressure green triggered and is followed by NORM BRAKE FAULT and AUTOBRAKE FAULT.

The most probable scenario is that the hydraulic leakage was still present during the last landing. Hydraulic was probably sprayed on the hot brakes and caused the fire or smoke. The scenario could be coherent with the DFDR analysis."

**1.19. Useful or Effective Investigation Techniques:** Nil.

## **2. ANALYSIS**

**2.1 Flight Crew and Aircraft operations:** The flight crew were appropriately qualified and were medically fit. Their licenses were valid beyond the date of the incident. Their Flight and Duty Time was within limit. Pilot declared emergency only during approach at Delhi due to Hydraulic Green System Low pressure and landed safely. Flight crew qualification and operations of the aircraft was not a contributory factor to the incident.



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

**2.3. Maintenance by AME:**

2.3.1. The aircraft departed from Khajuraho at 0832 UTC and returned to bay at 0842 UTC due No. 1 Engine Sensor fault. The AME had asked the pilot to shut down No.1 engine and restart it again in order to confirm the snag. The snag appeared again. The No.1 engine was then shut down. The AME declared grounding of aircraft and then went out for external inspection of the aircraft at about 0900 UTC at Khajuraho and observed hydraulic fluid leaking from wheel No. 6 brake assembly. It appeared to him that quick release or QAD socket on No. 6 brake assembly was leaking. He rectified the snag pertaining to 'No. 1 Engine Sensor fault' and deactivated No: 6 wheel brake by disconnecting the flexible hose from no.6 brake assembly and entries were made in 'Off-Job Sheet'. The aircraft was released under MEL 32-42-01A; CAT B. Both the above rectifications action were carried out between 0900 UTC and 1138 UTC.

2.3.2. AME had mentioned in his statement that he had carried out a leak check after deactivation of No.6 'brake assembly' and he did not found any leak. However, the DFDR data between 0900 UTC and 1138 UTC does not show any evidence that the brake pedals were pressed for checking the leak. Further, there is no mention of 'leak check' in the 'Off-Job sheet' prepared at Khajuraho. It implies that the AME did not carry out leak check after disconnecting the flexible hose from No. 6 brake assembly. He assumed that leak was only from No.6 'brake assembly' and accordingly he disconnected the flexible hose from No.6 'brake assembly' and deactivated the No.6 'brake assembly' for despatching the aircraft under MEL. The AME did not adhered to the maintenance procedures due complacency on his part.

2.3.3. The AME did not install CAP-BLAKINGS on the quick release or QAD coupling of no.6 brake assembly as the same were not available at Khajuraho. The left over hydraulic fluid in no.6 brake assembly was also not bled out, as required by the maintenance procedures as VINYL-HOSE was not available.

**2.4. Leak Test of Flexible Hose :** During 'leak test' of flexible hose of no. 6 'brake assembly' on a hydraulic test rig, it was found that it had developed a pin-hole leak and hydraulic fluid began to leak on application of 150 PSI pressure. Hydraulic System pressure in A-320 aircraft is 3000 PSI. Leakage at such pressure would be considerably high.

**2.5. Poor Troubleshooting:** The hydraulic fluid leaked from the pin-hole of the flexible hose and got accumulated on the coupling of flexible hose and No. 6 brake assembly, thus giving an impression that No. 6 brake assembly coupling leaked. Further, the AME did not carry out leak-check at Khajuraho after disconnecting the flexible hose for deactivating No.6 'brake assembly'. Thus, pin-hole leak remained undetected and hydraulic fluid continued to leak through the pin-hole of flexible hose during the subsequent flights from Khajuraho to Varanasi and Varanasi to Delhi. As per AMM Chapter 29-00-00-790-001-A, page 8, Sub-task 29-00-00-864-050-A, Para C (2), any hydraulic system component which is leaking more than the prescribed limit, it requires either repair or replacement. 100 drops per minute is the maximum leak allowable for despatch of aircraft. Here, the leak was more than the limit prescribed. To compensate for the leak, 02 quarts of hydraulic fluid was topped up also. Had the pin-hole leak been detected in the flexible hose, the only way to rectify was either to replace the flexible hose or remove it completely by disconnecting it from both ends, followed by putting blanking on the QAD coupling of No.6 brake assembly and metallic hydraulic pipe. An aircraft cannot be dispatched with a leaking flexible hose which is bound to result in loss of hydraulic fluid during flight. It was a poor troubleshooting on the part of the AME. The authorisation of AME involved in the maintenance at Khajuraho was suspended with immediate effect by the concerned airline due improper maintenance action.

**2.6. Continuous leakage:** The AME has mentioned in his statement that there was no hydraulic fluid leak observed at Varanasi. However, the pin-hole leak remained in the flexible hose and leak of hydraulic fluid cannot be ruled out at Varanasi also. It might have gone unnoticed by the AME. Pin-hole leak remained undetected and hydraulic fluid continued to leak through the pin-hole of flexible hose during the subsequent flights from Khajuraho to Varanasi and Varanasi to Delhi.

**2.7. Circumstances leading to incident:** On application of brake during landing roll at Delhi, hydraulic fluid leaked out through the 'pin-hole' and got sprayed on hot main wheel brake assemblies on LH side giving rise to dense smoke. There were no signs of flame or fire in the LH wheel brake assembly as per Air India maintenance personnel. It was only dense smoke that emanated due leakage and spray of the hydraulic fluid on hot brake assemblies on LH side.



### **3. CONCLUSION:**

#### **3.1 Findings:**

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

3.1.2. FDTL for the flight crew was within limit.

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

3.1.4. The AME was licenced and authorise to perform the maintenance task on the aircraft.

3.1.5. It appeared to the AME at Khajuraho that hydraulic fluid was leaking from no.6 wheel brake assembly which was not the case.

3.1.6. There was pin-hole leak in the flexible hose which could not be detected by the AME. After disconnecting the flexible hose, the AME did not check the leak of hydraulic fluid by application of brake pedals. Troubleshooting was not in accordance with the Airbus recommended procedure.

3.1.7. The aircraft was released with leaking flexible hose from Khajuraho. Continuous leak of hydraulic fluid from pin-hole of the flexible hose lead to Hydraulic Green System 'low level' and 'low pressure' warnings during the flight in Varanasi- Delhi Sector.

3.1.8. The AME did not install CAP-BLAKINGS on the quick release or QAD coupling of no.6 brake assembly as the same were not available at Khajuraho.

3.1.9. The left over hydraulic oil in no.6 wheel brake assembly was also not bled out, as required by the maintenance procedures as VINYL-HOSE was not available.

3.1.10. During landing roll at Delhi, hydraulic fluid leaked from pin- hole aperture of the flexible hose and got sprayed on hot brake assemblies giving rise to smoke.

3.1.11. Non adherence to maintenance procedures by AME due complacency contributed to the incident.

3.1.12. The concerned airline had initiated corrective action against the AME. His authorisation was suspended with immediate effect.

**3.2 Probable cause of the incident:**

The smoke occurred due leakage and spray of hydraulic fluid from flexible hose on hot brake assemblies of LH main wheel during landing roll of the aircraft. Non adherence to maintenance procedures due to complacency on the part of AME contributed to the incident.

**4. SAFETY RECOMMENDATIONS :**

A refresher training covering troubleshooting ,rectification and human factors may be imparted to the AME.



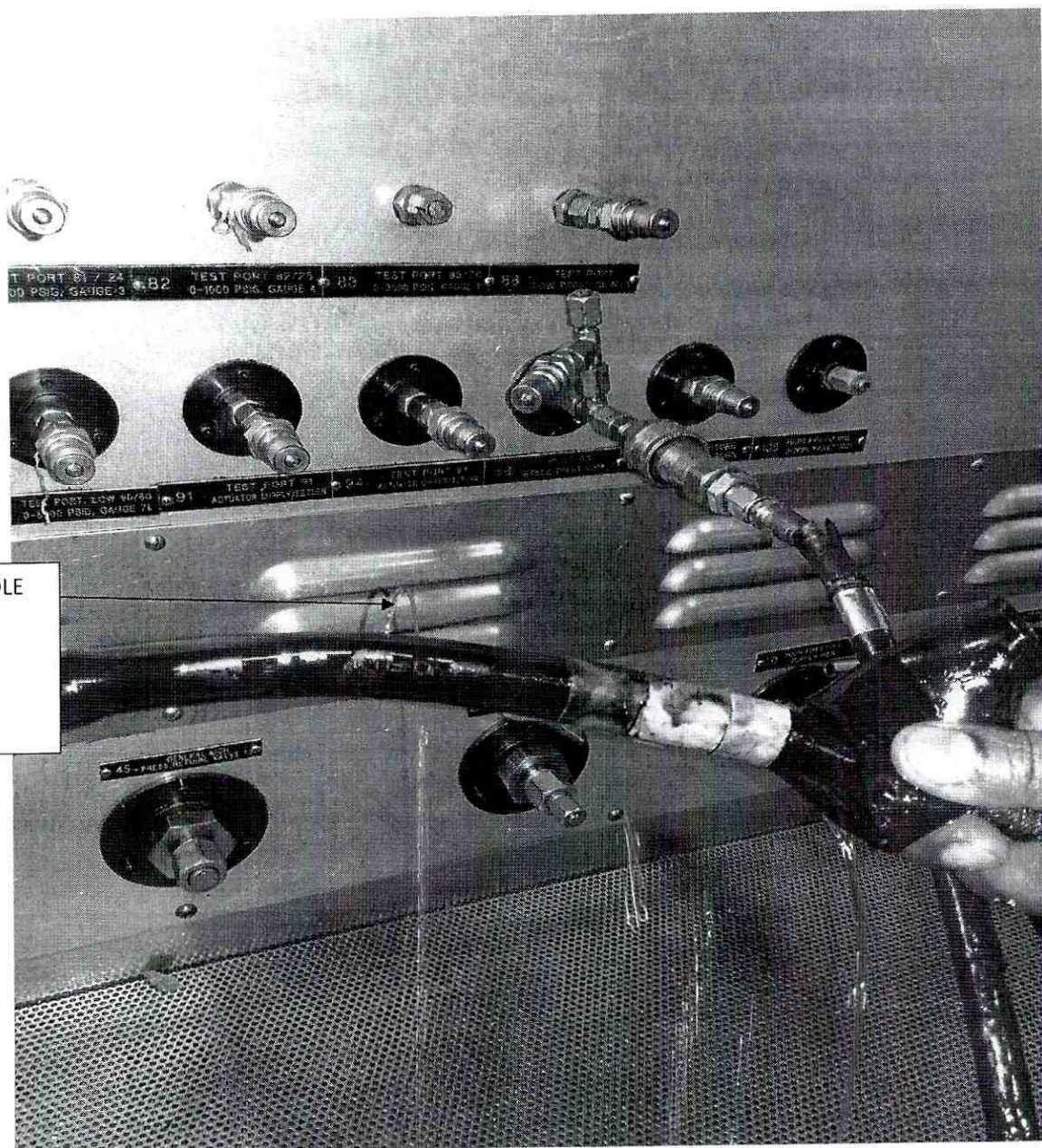
(H.N. Mishra)

Deputy Director of Air Safety  
Inquiry officer, VT-ESI,  
DGCA (NR) Delhi

Place : New Delhi

Date : 14.07.2016





PIN-HOLE  
LEAK  
FROM  
HOSE

The flexible hose was subjected to 'leak test' on a Hydraulic Test Rig. It began to leak at 150 PSI pressure.