FINAL INVESTIGATION REPORT

Incident to B787 of M/s AIR INDIA Registration VT- ANK, RH Pack Heat Exchanger Panel Missing on Arrival at Bangalore on 12.10.2013

1. Aircraft	Type	: Boeing
	Model	: B787-800
	Nationality	: Indian
	Registration	: VT-ANK
2. Owner		: Air India
3. Operator or hirer		: Air India
4. Date of incident		: 12.10.2013
5. Last point of departure		: Delhi Airport
6. Point of intended landing		: Bangalore Airport
7. Geographical location		: 13°11'56"N 077°42'20"E
8. Type of Operation		: Scheduled Commercial
9. Phase of Operation		: During landing
10. Injuries to persons		: None

SYNOPSIS:

Aircraft B-787-800 (MSN – 36282) Regn VT-ANK of M/s Air India was operating AI-803 from Delhi to Bangalore on 12.10.2013. Aircraft arrived into Bangalore at 0410 UTC. On Arrival during inspection by AME, it was observed that Right hand side heat exchanger access panel 196 KR was found missing. The Panel was found on Runway by BIAL airside safety officials and same was handed over to M/s Air India.

DGCA Hqrs appointed undersigned as Inquiry Officer as per DGCA Order Letter No AV15019/124/2013-AS dated 04.11.2013 and investigation was carried out.

1. FACTUAL INFORMATION

1.1 History of the flight:

On 12th Oct 2013, Air India aircraft B787-800 VT-ANK was scheduled to operate service AI-803 sector (Delhi to Bangalore). The flight was uneventful.

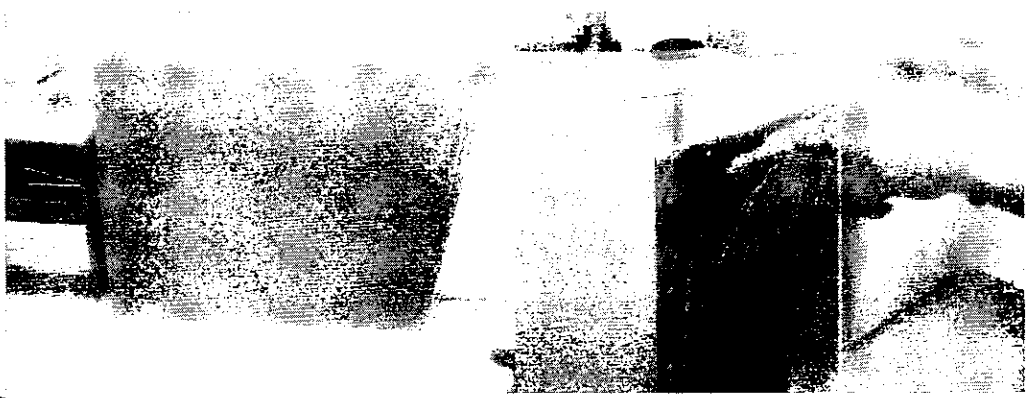
Aircraft arrived at Bangalore at 0410 UTC. During post flight walk-around inspection, the Right hand side Pack Heat Exchanger – Access Panel 196KR found missing by AME. Later, The Access Panel 196KR was found ahead of the touchdown point on the Runway by local BIAL airside Safety Officials and the same was handed over to Air India AME.

On inspection of the Panel, the scratch marks were observed on the Panel and some portion found de-laminated. The inspection of the Flaps and Wheel Well doors was carried out for any secondary damage, nil discrepancy was noticed. The Access Panel 196KR was installed after receipt from Delhi. Subsequently, the aircraft was released thereafter for flight.

1.2 Injuries to persons: NIL

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	Nil	Nil	Nil
SERIOUS	Nil	Nil	Nil
MINOR	Nil	Nil	Nil
NONE	07	146	0

1.3 Damage to Aircraft: Minor damage to right access panel #196KR.



Pic: Detached Pack Heat Exchanger – Right Access Panel 196 KR found on Rwy.

1.4 **Other Damage** : NIL

1.5 **Flight Crew Information:**

Details	Commander	First Officer	Dy.Chief Aircraft Engineer(1)
Age	46 Years	45 Years	45 Years
Date of issue	11.03.2010	19.01.1994	.....
Valid up to	11.03.2014	18.04.2014	24.07.2014
Category	ALTP	ALTP	LAME
Endorsement as PIC	23.10.2012	06.09.2013	.....
Date of Medical Exam	15.07.2013	23.10.2013	.....
Medical Exam validity	14.01.2014	22.04.2014	.....
Medical File Number	1-1108/1984-L2	1-158/1987-L2	.....
FRTOL License Number	3171	3413	.....
Valid up to	11.03.2018	16.10.2016	.....
Total Flying Experience	10,353 Hrs	15,353 Hrs	.....
Experience on Type	473 Hrs	91 Hrs	.....
Experience as PIC on Type	473 Hrs	NIL	.....
Last flown on Type	B787-8	B787-8	.....
Total flying experience in last 365 days	632 Hrs	620 Hrs	.....
Total flying experience in last 180 days	341 Hrs	200 Hrs	.....
Total flying experience in last 90 days	178 Hrs	91 Hrs	.....
Total flying experience in last 30 days	78 Hrs	77 Hrs	.....
Total flying experience in last 7 days	4:34 Hrs	10:25 Hrs	.....
Total flying experience in last 24 Hrs	02:18 hrs	05:15 hrs	.....
RTR (A)	5101	5367	.....
Validity	06.08.2047	04.11.2032	.....

1.6 **Aircraft Information:**

i. **Name of Owner**: M/s. Air India Ltd
ii. **Aircraft Registration**: VT-ANK
iii. **Aircraft Type** : B 787 -800
iv. **Registration No**. : 4378
v. **M5N No**. : 36282

vi. Year of Manufacture : 2012
vii. TSN : 1722 Hours
viii. CSN : 383 Cycles

1.6.1 Scrutiny of Records:

a) Sector log copies dated from 01.10.2013 to 14.10.2013 –
The following defects were observed from the sector log pages
i. MEL – R1 Cabin Air Compressor (21-51-01-02-02A) continued till 14.10.2013
ii. MEL – VOR L (ref. 34-31-04)
iii. STATUS MSG – Weather Radar Sys R, Ram Fan Back Up R, Ram Fan Prim R, Ram Fan Control R and Cabin Air Compressor R1.
iv. Defect observed on ground by arrival AME: PECs Right Load shed.

b) Transit checks documents dated from 09.10.2013 to 12.10.2013 -
From transit check documents, it is evident that 5 AME's signed off the transit check wherein they performed the General Visual inspection (GVI) from walk around inspection of all visible exterior areas of the entire airplane for obvious damage, fluid leakage, and obstruction, security and general condition. This particular panel is on the mid belly portion which AME to bend and inspect.

c) Work log sheet dated 09.10.2013 –
Maintenance personnel did not make any snag sheet entry about the removal of the subject panel 196KR. And also did not handover the work regarding the removal of the subject panel to the first & second shift in-charge and third shift AME.

d) Statements of all the involved personnel

1.7 Meteorological information: Not Applicable.

1.8 Aids to navigation: Not Applicable.

1.9 Communications: Not Applicable.

1.10 Aerodrome information: Not Applicable.

1.11 Flight recorders:

CVR: Not Applicable.
DFDR: Not Applicable.

1.12 Wreckage and impact information:
The detached Pack Heat Exchanger – Right Access Panel 196KR was found ahead of the touchdown point on the Runway. On inspection of the Panel, the scratch marks were observed on the Panel and some portion found de-laminated. There was no impact damage on the panel thereby indicate that the panel had fallen on the soft ground.

1.13 Medical and pathological Information: Not Applicable.

1.14 Fire: Not Applicable.

1.15 Survival aspects: Not Applicable.

1.16 Tests and research: Not Applicable.

1.17 Organisational and Management information:

M/s Air India Limited is a Schedule Operator and is the National carrier airline of India. Air India is an approved Maintenance Organization, under CAR 145 by DGCA.

1.18 Additional Information:

On 09.10.2013, Aircraft VT-ANK arrived at Delhi at Bay B-24 at 0940 Hrs Local Time from Frankfurt with following defects:

i. MEL – R1 Cabin Air Compressor. The MEL on "R1 Cabin Air Compressor" was invoked on 01/10/2013 under category C which is only valid for 10 days. The MEL however was extended for 3 more days.
ii. STATUS MSG – Weather Radar Sys R, Ram Fan Back Up R, Ram Fan Prim R, Ram Fan Control R and Cabin Air Compressor R1.
iii. Defect observed on ground by arrival AME: PECs Right Load shed.
iv. Aircraft was scheduled to operate AI-312 to Melbourne (Dep: 1300 Local Time) due to snag mentioned above, the aircraft declared AOG for rectification.

1.19 Useful or Effective Investigation Techniques: Not Applicable

2. Analysis:

Aircraft Engineer (1) carried out the Arrival Checks and Transit Checks on dated 09.10.2013, on aircraft VT-ANK partially and then he was shifted to a/c VT-ANL for Melbourne departure. Superintendent Service Engineer assisted Aircraft Engineer (1) for the Routine Checks.

Dy.Chief Aircraft Engineer (1) requested Manager Service Engineer (1) for manpower. Manager Service Engineer(1) informed Dy.Chief Aircraft Engineer(1) to take Superintendent Service Engineer and Service Engineer –II(1).

Superintendent Service Engineer requested Dy.Chief Aircraft Engineer (1) to identify the panel to be removed. Dy.Chief Aircraft Engineer(1) identified the RH Heat Exchanger Access Panel 196KR to be removed on aircraft VT-ANK to Superintendent Service Engineer and Service Engineer –II(1).

While removing the screws of Panel 196KR, Superintendent Service Engineer and Service Engineer –II (1) found that the head of two screws were rounded-off. Superintendent Service Engineer informed Manager Service Engineer (2) on mobile to get component overhaul division person to take out those two screws. Most of the screws of the panel were removed except for four screws, two on forward (just loosened) and two on aft side of the panel. The removed screws were handed over by Superintendent Service Engineer in a poly bag to Manager Service Engineer (1).

Service Engineer – II(2) came on the aircraft, Superintendent Service Engineer and Service Engineer –II(1) identified to Service Engineer – II(2) the two screws which had to be removed. Service Engineer – II (2) removed the two rounded head screws by easy out. As per Service Engineer – II(2) after he removed the two screws, there were four screws remaining on the panel, two in the forward and two in the aft side of the panel.

As per Manager Service Engineer (1), he handed over the screws to Manager Service Engineer (3) of Second Shift, and also made an entry in the Second Shift work allocation sheet. Manager Service Engineer (3) denied having received any screws or hand over about the screws and claimed that in the work allocation sheet there was no entry about the screws when he took over the shift.

The panel 196KR was not required to be removed and neither the same was recorded by the Dy.Chief Aircraft Engineer (1). This was a verbal instruction given by Dy.Chief Aircraft Engineer(1), who later denied. However it is very clear that the facilitation work was carried out by Component Overhaul division Service Engineer – II(2).

Dy Chief Aircraft Engineer (Avionics) reported in the Second Shift and replaced RH Ram Fan Controller as rectification of the Ram Fan snag.
Aircraft Engineer (2) reported in the First Shift of 10.10.2013. He completed the remaining part of Transit Checks schedule and did the departure of VT-ANK to Chennai (AI-439) at 0655 local time on 10.10.2013.

Aircraft arrived in Delhi from Chennai at 1330 local time on 10.10.2013 and departed to Sydney/Melbourne at 1502 local time on 10.10.2013. Dy.Chief Aircraft Engineer (2) carried out Transit Checks and Departure. Aircraft returned from Melbourne and arrived at 2140 Local time on 11.10.2013, Dy.Chief Aircraft Engineer (2) carried out Transit Checks and Pre-departure Checks.

Aircraft departed to Bangalore (AI-803) at 0635 Local time on 12.10.2013 and the Departure was done by Sr. Aircraft Engineer. Aircraft arrived at Bangalore at 0940 LT on 12.10.2013. Dy.Chief Aircraft Engineer (3) noticed Right Heat Exchanger Panel 196KR missing from the aircraft during Arrival Checks. Later, The Panel 196KR was found on the Runway by BIAL, Air Safety officials.

From the sector log page of dated 01.10.2013, aircraft was released under MEL on CAC R1 Ref. 21-51-01-02-02A CAT 'C' at 2025 Hrs Local time (which is valid till 11.10.2013). This MEL was valid for 10 days, however subsequently the extension was given by regional office without forwarding and taking concurrence from DGCA headquarters as per the procedure.

2.1 Findings:

1. Dy.Chief Aircraft Engineer (1), AME, identified the Panel 196KR to Service Engineers Superintendent Service Engineer and Service Engineer –II(1) in the First Shift on 09.10.2013 which he wanted to be removed.
2. Dy.Chief Aircraft Engineer(1) denied having instructed the Service Engineers to open the subject Panel 196KR, the statements of Superintendent Service Engineer and Service Engineer –II(1) confirmed that Dy.Chief Aircraft Engineer(1) had instructed them to open the subject Panel 196KR.

3. Dy.Chief Aircraft Engineer(1) has stated in the investigation that he had not worked on VT-ANK in the First Shift which was contrary to the statements of Superintendent Service Engineer and Service Engineer –II(1).
4. After instructing and identifying the Panel 196KR on VT-ANK to Superintendent Service Engineer and Service Engineer –II(1) in the First Shift of 09.10.2013, Dy.Chief Aircraft Engineer(1) did not follow-up with Service Engineers to find out the status on the removal of subject Access Panel 196KR.

   Dy.Chief Aircraft Engineer (1) did not instruct any Service Engineer to normalize the subject Panel 196KR in the Second Shift nor did he hand over the incomplete work to Third Shift. Also, he did not inform the Shift In-Charge regarding the incomplete work on the subject panel.
5. Scrutiny of VT-ANK Transit Checks schedule snag sheets of 09.10.2013 revealed that Dy.Chief Aircraft Engineer (1) did not make the snag entry about the removal of RH Heat Exchanger Access Panel 196KR. As no snag sheet entry was made, the Panel 196KR remained only on four screws instead of 47 screws and no further work was carried out on the Panel 196KR.
6. Dy.Chief Aircraft Engineer (1) was in the First Shift of 09.10.2013 and continued in the Second Shift and was allocated on multiple aircraft.
7. Component Overhaul division Service Engineer – II(2) who removed the two rounded head screws has stated that the Panel 196KR was on four screws after removing the two rounded head screws, this corroborated with observation of the recovered Panel 196KR.
8. The removed screws from the Panel 196KR were handed over by Superintendent Service Engineer to Manager Service Engineer (1) in a poly bag. These screws were not further handed over properly to the Second Shift Manager Service Engineer (3) and Manager Service Engineer (4), St. No. 10469.
9. The Shift In-Charge of First Shift Asst.General Manager (2) was not aware of the Panel 196KR being removed on VT-ANK; thereby there was no hand over to the Shift In-Charge of Second Shift.
10. Dy.Chief Aircraft Engineer (Avionics) reported in the Second Shift and replaced RH Ram Fan Controller as rectification of the Ram Fan snag.
11. It is observed that the Panel 196KR was not required to be removed, as there was no work to be carried out at that panel location for the faults as mentioned in technical log book of the aircraft.
12. On 11.10.2013, DDG (WR) has granted 3 days extension for the MEL telephonically (Valid till 14.10.2013). From the Airworthiness Procedures Manual Chapter 6 Para 5.3, it states that "when MEL has been invoked and could not be revoked within time period stipulated for a particular category due to unavoidable circumstances, the continuing Airworthiness Manager in extreme exigencies may approach RAO which in turn shall forward such request with proper justification and recommendation to HQ's." In this case the above procedure is not been followed.
13. The detached Access Panel 196KR P/N: 492Z2102-4 was inspected in the shop, from which the following things have been revealed:

    i. The arrival AME, Dy.Chief Aircraft Engineer (3) at Bangalore reported that three screws were on the aircraft at locations marked 2, 3 and 4 as shown in Annexure-Exhibit No. 1.
    ii. There was evidence of four screw holes on the recovered panel being elongated and cracked at locations No. 1, 2, 3 and 4-Ref Annexure -Exhibit No. 2, 3, 4, 5, 6, 7, 8, 9 & 10.
    iii. These elongated four screw hole locations matched with the statement made by Component Overhaul division Service Engineer Service Engineer – II(2) regarding the screws remaining on the panel after he removed the two rounded head screws.

iv. The panel was in place with only four screws at locations No. 1, 2, 3 and 4 as in Annexure- Exhibit 2.

v. VT-ANK operated six sectors after the work was done on this panel 196KR on 09.10.2013. The Panel 196KR was only on four screws instead of 47 screws thereby the entire load was being taken by these four screws. As these four screws were not fully tightened, the air load caused fluttering of the panel further leading to fatigue crack around the four screw holes. Finally at touchdown in Bangalore the panel liberated from the aircraft, with three screws remaining on the aircraft.

vi. The inspection of the recovered 196KR panel corroborated the statements of Dy.Chief Aircraft Engineer(3) and Service Engineers Superintendent Service Engineer, Service Engineer –II(1) and Service Engineer – II(2).

A. Dy.Chief Aircraft Engineer(1):

Dy.Chief Aircraft Engineer (1) was found responsible for the cause of the incident on VT-ANK as:

i. He did not make any snag sheet entry about the removal of the subject panel 196KR.

ii. He did not follow up further with the Manager Service Engineer(1) and Service Engineers - Superintendent Service Engineer and Service Engineer –II(1) after instructing and identify the panel to be removed.

iii. He did not hand over the work regarding the removal of the subject panel to the First and Second Shift Shift In-Charge and Third Shift AME.

B. Dy.Chief Aircraft Engineer(2):

During Transit and Pre-departure checks on a/c VT-ANK at Delhi of operating Flight AI-430 / AI-312 of 10.10.2013, sector MAA-DEL-SYD and AI-311 / AI-803 on 11.10.2013, Sector MEL-DEL-BLR, Dy Chief Aircraft Engineer(2) did not notice that the RH Heat Exchanger Access Panel 196KR was not properly secured.

C. Aircraft Engineer (2):

During pre-departure inspection of a/c VT-ANK operating Flight AI-439 of 10.10.2013 at Delhi, Aircraft Engineer (2) did not notice that the RH Heat Exchanger Access Panel 196KR was not properly secured.

D. Asst. General Manager(1) :

During Transit and Pre-departure inspection on a/c VT-ANK operating Flight AI-439/430 of 10.10.2013 at Chennai, Asst. General Manager (1) did not notice that the RH Heat Exchanger Access Panel 196KR was not properly secured.

E. Dy Chief Aircraft Engineer(4):

During transit and pre-departure inspection on aircraft VT-ANK operating Flight AI-312 of 11.10.2013 at Sydney and at Melbourne, Dy Chief Aircraft Engineer (4) did not notice that the RH Heat Exchanger Access Panel 196KR was not properly secured at Sydney and Melbourne.

F. Manager Service Engineer(1):

Manager Service Engineer (1) did not perform responsibility by not informing Dy.Chief Aircraft Engineer (1) about the removal status of the subject panel. As Manager Service Engineer (3) denied having received any screws physically or any handover verbally from Manager Service Engineer (1) and also claiming that the entry in the work allocation sheet about the screws handed over was not there when he took over, the Enquiry Committee was unable to establish whether Manager Service Engineer (1) handed over the removed screws properly.

G. Manager Service Engineer(3) :

Manager Service Engineer (3) was interrogated twice; initially he denied neither having received any screws physically nor any handover verbally from Manager Service Engineer (1). During second time he stands by his earlier statement and also stated that the 'note' entry in the work allocation sheet was not there when he took over.

As the veracity of Manager Service Engineer (1)'s statement and also whether the 'note' entry was made on 09.10.2013 or later cannot be established. It is unable to establish beyond reasonable doubt that Manager Service Engineer (3) received the handover regarding the panel screws properly.

3. Conclusion:

1. The RH Heat Exchanger Access Panel 196KR detached at the time of landing on Runway as the Panel 196KR was remaining on the aircraft with only four screws instead of 47 screws which were not fully tight.
2. The cause of the incident was due to Human Error and not adopting appropriated Standard Operating Procedures.

4. Safety Recommendations:

1. Action as deemed fit to be taken by DGCA HQ's.
2. The handing over team of engineering to ensure that correct briefing on off job sheet to be reflected for the work.
3. Shift In charge has to ensure that work is completed by the taking over team for completeness.
4. Appropriate instructions to regional office of airworthiness to follow the standard procedure while extending any MEL for the flights.

(Sanjay K. Bramhane)
Dy.Director Air Safety (WR)