SAFETY & INVESTIGATION BOARD
PAKISTAN CIVIL AVIATION AUTHORITY

AIRCRAFT ACCIDENT INVESTIGATION REPORT

AP-BHK (Metro)

M/s. ROYAL AIRLINES (PVT) LTD

SKIDDING OFF THE RUNWAY AT JINNAH INTERNATIONAL AIRPORT, KARACHI

Brief Description

1. Royal Airlines (Pvt) Ltd Aircraft Metro III AP-BHK was on a training Flight carrying two pilots and one observer on 07th August, 2006. The PIC was Capt. Mazhar-Uz-Zaman and under training Pilot (First Officer) was Capt. Maratib Ali Zafar.

2. The takeoff was normal and the exercise to be carried out was circuits & landings and ILS. During its First touch and go landing at about 1950 Hours (PST), the aircraft immediately after touchdown at about 1200-1300 feet down the runway started veering off to the left. Co-pilot tried to control the drift but could not control this mild drift with the help of Nose Wheel Steering.

3. The PIC cautioned the Co-pilot twice to control the Aircraft, subsequently PIC took over the controls from the Co-pilot. He initially tried to use the nose wheel steering without success. Later on he tried to use the differential power technique. The Aircraft responded by straightening out in the Katcha but it struck a Main Hole approximately six inches high in the Katcha adjacent to Runway and close to taxiway 'F' at approximately 3000 feet down the Runway. The severe damage was caused to the nose landing gear, oleo and nose wheel well area.

1. **Authority Ordering Inquiry**

Director General, Civil Aviation Authority, Memorandum reference No.HQCAA/1901/309/SIB/ dated 18th August 2006.

2. **Composition of the Investigation Team**

a)	Investigator Incharge:	Wg Cdr (R) Syed Aftab Hussain Flight Inspector Pilot (Hel) Flight Standards Directorate
b)	Technical Member:	Engr. Afaq Zia Airworthiness Surveyor Office of Controller of Airworthiness CAA, JIAP, Karachi.

3. **Terms of Reference**

To investigate the incident under which the Royal Airlines (Pvt) Ltd Aircraft Metro Reg. No.AP-BHK skidded off the Runway and sustained severe damages on 07th August 2006.

4. **General Information**

a)	Date & Time of incident	07th August 2006 at about 1450 UTC, 1950 PST.
b)	Place of incident	Runway 25(R) JIAP
c)	Type of Mission	Training
d)	Duration of Mission	One hour
e)	Stage of Flight	Landing Roll on Runway
f)	Airfield and Time of Takeoff	JIAP, At about 1940 PST, 1440 UTC
g)	Owner of the Aircraft	Royal Airlines (Pvt) Ltd
h)	Type of Aircraft	Metro III Commuter Aircraft 19 seator
i)	Type of Brakes	Hydraulic Disc type (without Anti Skid)
j)	Landing Gear	Tricycle retractable having two tubeless tyres on each Landing gear.

5.	**Damages**	Nose oleo / Landing Gear and Lower portion of the Nose area.
6.	**Aircraft was fit to fly before the incident**	Yes
7.	**Date of Daily Inspection and Maintenance release**	07th August, 2006 / 20-05-2006 Valid up to 19-08-2006
8.	**CG of Aircraft**	Within Limits
9.	**Fuel Imbalance**	Within Limits

10. **CREW**

a)	PIC	Capt. Mazhar uz Zaman
b)	Duty	PIC (Training Instructor)
c)	Where seated	Left seat
d)	Flying Experience	Approximately 13000hrs
e)	Medical	Valid
f)	Lic / Ratings	Valid
g)	Flight / Duty Time	Within Limits
h)	**Co Pilot**	
i)	Duty	U / T First Officer
j)	Where seated	Right seat
k)	Flying Experience	Approximately 2000hrs
l)	Medical	Valid
m)	Lic / Ratings	Lic valid was under training for the type rating.
n)	Flight / Duty Time	Within Limits

11.	**Weather Forecast**	Clear (Refer to exhibit)
12.	**Is weather runway condition a factor**	No
13.	**Is serviceability of Nav Aids a Factor**	No

Analysis of the Event

1. **Operational Factor**

Aircrew was qualified to undertake the Mission, the mission was authorized, No crew fatigue or Alcohol consumption was found. No weather or Runway contamination was reported. The Runway lighting / Navigation equipment was serviceable.

2. **Maintenance Factor**

The Aircraft was serviceable and had flown a mission before this flight without any discrepancy being reported. The aircraft history also does not indicate any problems with the brakes of the Aircraft. There was no fuel imbalance found in the aircraft. CG of the Aircraft was also within limits. Nose wheel steering, brakes, reverse thrust all were serviceable before the flight.

3. **Narrative of Event and Evidence**

The aircraft landed approximately 1200 feet down the runway in the black portion of the runway, where a lot rubber deposit's have been accumulated. Therefore, the tyre marks are not visible in this area. Immediately approximately 100 feet later i.e. 1300 feet down the Runway two left gear tyre marks are visible on the Runway slowly veering off towards the left side of the Runway. The Aircraft went to the paved surface of the Runway at about 1700 feet down the Runway, just before that the right hand inner landing tyre mark was also found on the Runway. At about 2100 feet down the runway Aircraft went into the Katcha. Between 2200 – 2300 feet down the runway the tyre marks show the sign of use of differential power by the PIC and the tyre marks are straightened out and the Aircraft was now parallel to the runway in Katcha. At about 3000 feet down the runway the Aircraft nose wheel hit a raised main hole (about 06 inches) high in Katcha. The Aircraft jumped over it went over taxiway foxtrot and stopped immediately after wards in Katcha about 50 – 100 feet from the taxiway facing towards the terminal building. The nose wheel well area, nose landing gear and oleo were severely damaged.

Two Left Landing gear tyres have marks of skid burn (Flat top) and they also got bursted. The right hand landing gear has similar pattern of skid burn as found on the left tyre but it does not have burst marks, skid marks were found right from 1300 – 3000 feet down the Runway which confirms jamming of the wheels. The Captain, Co-Pilot and the observer in the flight did not notice any abnormality with the Aircraft right from the startup, taxi, Takeoff and Landing.

4. **Analysis**

Royal Airline (Pvt) Ltd aircraft Metro III registered No. AP-BHK flew on 7th August, 2006 on a training flight. Capt. Mazhar-ur-Zaman was pilot in command with under training pilot (First Officer) Captain Maratib Ali Zafar.

The takeoff was normal. The aircraft made first touch and go landing at about 1950hrs (PST). Aircraft touched down at about 1200-1300 feet down the runway. Immediately after touch down aircraft started veering off to the left, Co-Pilot tried to control the aircraft with the help of nose wheel steering, however the aircraft kept drifting towards left. The Pilot-in-command cautioned the Co-pilot twice to control the aircraft and subsequently took over the control of the aircraft close to runway edge. Initially he also tried to straighten the aircraft with rudders and nose wheel steering and later on with differential power setting technique. By then the aircraft had already left the runway and was on katcha. Aircraft responded by straightening out in katcha and struck the main hole approximately six inches high adjacent to Runway and close to taxiway foxtrot. Aircraft after hitting the raised platform jumped over it and stopped after crossing 'F' taxiway. The aircraft sustained damage to the nose landing gear, oleo and nose wheel well area.

Aircraft after touch down started to veer to the left because of left tyre deflation. PIC Capt. Mazhar-uz-Zaman took over the control late and tried to straighten the aircraft. The main reason for damage to the aircraft was due to use of differential power technique and trying to bring the aircraft back on the runway. Had the aircraft been switched off or stopped with the help of brakes and use of thrust reversal, the aircraft would have stopped with no damage to the nose wheel area. Main damage to the aircraft was caused due to the pilots wrong action by using differential power and trying to bring the aircraft back on the runway. During this process the aircraft struck the raised platform and sustain damage.

5. **Defect History**

NIL

6. **Maintenance Record**

The aircraft was inducted in Royal Airlines (pvt) Ltd on 16 Feb, 2006. According to the maintenance record of aircraft, two service checks and one Phase-I inspection was carried out on 20-04-06, 13-07-2006 and 21-06-2006 respectively according to the approved maintenance schedule. General condition and wear of tires and brakes are being checked in the service check. Similarly, these systems are also being checked in Phase-I inspection. Operation of these systems found satisfactory during these inspections, and no defect was noted in these systems since these inspections were performed. These items are also included in the daily inspection, and in the daily inspection carried out before this flight, condition of these systems were satisfactory, and was secured. On the same day, aircraft did a flight to Sui in the morning, in which operation of the brake system was satisfactory, and pilot of that flight did not feel any abnormality in the brake system (No pilot reported defect on that flight). Last C of MR was issued on 20-05-2006, which was valid till 19-08-2006.

7. **Modification Status**

Operator is on the mailing list of the manufacturer for the supply of technical literature. Latest revision of maintenance manual issued by the manufacturer is Rev 125 dated December 01, 2005 and is available with the operator. Similarly, no AD till dated has been issued on brake system. Last AD issued was AD 2003-19-10 dated 11-07-2003, which is regarding Fuel boost pump, and also found complied with. Record of latest SBs issued by the manufacturer is available with the operator and all applicable SBs are complied with according to the maintenance record of the Aircraft. Last SB issued was SB No. 32-047 dated 28-02-02, and found complied with. Latest Master index of SBs Issued by manufacturer was issued on 20-01-2005 and is also available with operator.

8. **CVR Recording**

CVR and DFDR were removed from the aircraft just after the incident. CVR recording was reproduced from the facility of PIAC. DFDR readout count not be taken as its facility is not available in Pakistan. According to the CVR recording, Takeoff, circuit flying and landing of the aircraft was normal, and it is also obvious from the conversation of pilot during landing. Landing speed was also within the limit, as instructor pilot mentioned it to trainee pilot. Before landing in approach phase, aircraft went two times below the glide slope (excessive rate of decent). First time it was pointed out by EGPWS callout "GLIDE SLOPE" and second time it was pointed out by instructor pilot. As mentioned earlier that the pilots were unable to notice any abnormality in the aircraft, which can be verified from CVR recording. After landing Instructor pilot is directing trainee pilot to touch the nose landing gear on ground with slow pace, as it was coming down rapidly. The actions taken by the pilots after aircraft started drifting towards left, as mentioned above can be verified from CVR recording.

9. **Areas could not be finalized**

DFDR readout and shop reports of Tires and brake assembly could not be finalized, as these facilities are not available in Pakistan. Data from these reports could have helped in reaching to some conclusion in this investigation. However, the DFDR is of old vintage therefore records only few parameters, considering that the flight was only of ten minutes duration and few parameters the DFDR was not sent for Decoding.

10. **Brake System Description**

SA 227BC Metro III is a small aircraft and equipped with very simple disc brake system (hydraulic brake). It consist of brake pedals, master cylinders with each pedal, hydraulic reservoir, shuttle valve, parking valves and the brake assembly itself, and it does not have anti skid system in it. Purpose of the shuttle valve is to disengage the other side of the brake pedals, when one has applied brake. Purpose of the parking valve is to keep the pressure trapped in the brake assembly, so that brakes remained applied for the purpose of the parking of the aircraft. This is done by applying the brakes and pulling the parking brake lever in the cockpit on the pilot side. Purpose of the master cylinder is to transfer the hydraulic pressure to the brake assembly, when brake pedals are pressed (brakes are applied). It is spring loaded cylinder and when brake pedals are released, it comes back to its original position by means of the spring force, releasing the pressure in the lines of brake system. The spring has uniform diameter across its length, which reduces the possibility to get stuck in any position. In case, the spring gets stuck, the hydraulic lines of brake systems are depressurized with the inertial force of brake assemblies. Maintenance manual mostly deals with the defects in brake system which results in loose brakes, hydraulic leak in brake system or air remain trapped in the hydraulic lines of brake system. It shows that mostly brake system suffers a problem which results in spongy brakes due to any problem in the system.

Findings

1. The mission was authorized.

2. No irregularity / violation s of CAA rules / regulations leading to the incident took place.

3. Captain Mazhar-uz-Zaman is an experienced pilot and a rated Instructor.

4. The incident took place because of the jamming of the Brakes/ which resulted in tyre brust during or immediately after the landing. The cause of jamming is attributable to one time malfunction of the brake system.

5. The excessive damage caused to the aircraft was due to the presence of the raised main hole adjacent to the Runway, close to the Taxiway Foxtrot. This happened due to late take over of controls by PIC and subsequently wrong actions by PIC in which instead of switching off the aircraft in Katcha tried to bring the aircraft back on runway by using differential power.

6. The reason for wheel brake jamming and subsequent tyre burst could not be determined due to lack of available facilities inside the country.

Finalization

The incident is finalized as:

1. Aircrew – Poor handling of the emergency – avoidable.
2. Maintenance – One time malfunction of Brake assymbly – unavoidable.

Recommendations

1. The Airport Management may be asked to look into the possibility of flushing the main holes with the ground all along the Runway / Taxiways.

2. The Aircraft AP-BHK should undergo an intensive taxi checks after rectification before undertaking any flight.

3. The Instructor pilots may be asked to be more vigilant in the cockpit and during training be given such condition/emergencies to replicate.

4. The initial training of pilots should be conducted on simulator.

ENGR. AFAQ ZIA
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Civil Aviation Authority,
Karachi Airport.

CAPT. S. AFTAB HUSSAIN
Flight Inspector Pilot
(Helicopter)
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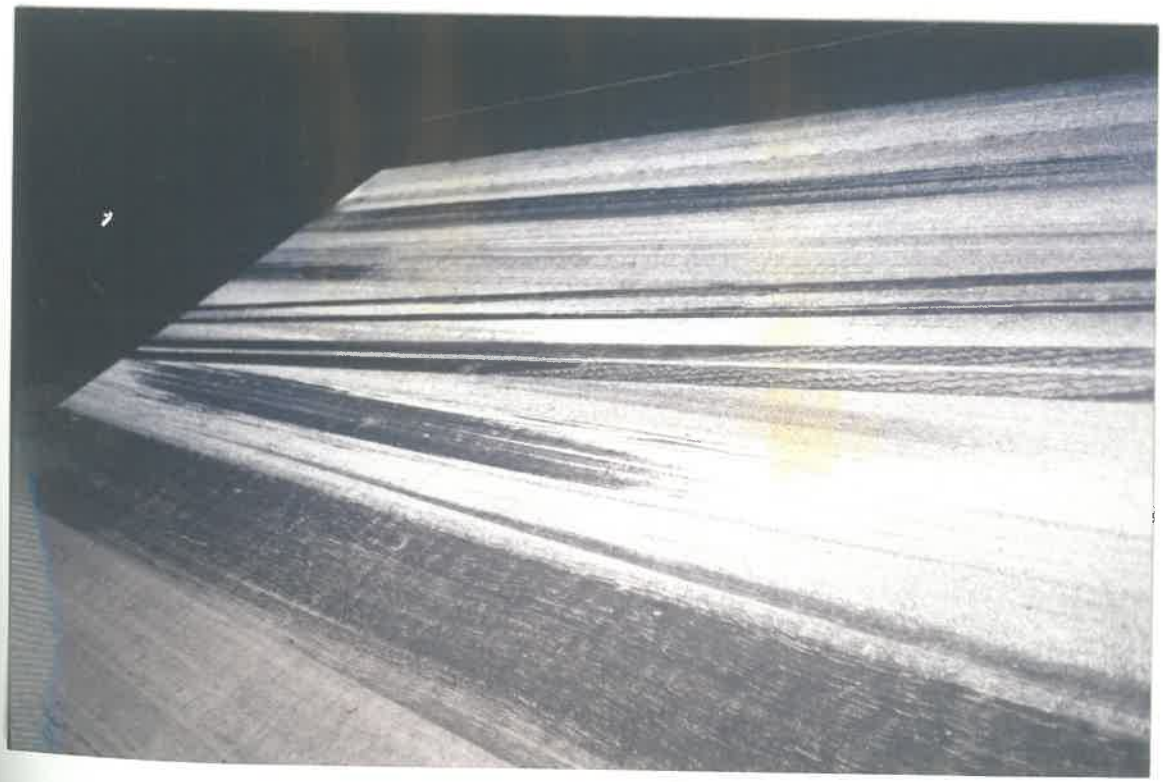


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