

**FINAL INVESTIGATION REPORT ON ACCIDENT TO M/S
PAWAN HANS HELICOPTERS LTD MI-172 HELICOPTER VT-
PHF NEAR NAMSAL, ARUNACHAL PRADESH ON 06.08.2010.**

	Aircraft	Type	MI-172 Helicopter
		Nationality	Indian
		Registration	VT-PHF
2	Owner		Pawan Hans Helicopters Ltd. New Delhi.
3	Operator		Pawan Hans Helicopters Ltd. New Delhi.
4	Pilot- in –Command		Under Rule 160
	Extent of injuries		None.
5	Co-pilot		Under Rule 160
	Extent of injuries		None.
6	Flight Engineer		
	Extent of injuries		None.
7	Cabin Crew		
	Extent of injuries		Fatal.
8	No. of passengers on board		05.
	Extent of injuries		None.
9	Last Point of departure		Namsai, Arunachal Pradesh.
10	Intended place of landing		Tezu, Arunachal Pradesh.
11	Place of Accident		Sengsap Village, approx 7.5 KM East of Namsai (Lat: 27° 67.638N, Long: 095° 85.361E).
12	Date & Time of accident		06 August 2010;1108 IST approx.

All ‘time’ values are in Indian Standard Time (IST).

Synopsis

Pawan Hans Helicopters Ltd MI-172 helicopter VT-PHF departed from Itanagar at 0910 IST on route Itanagar-Dibrugarh-Namsai-Tezu-Hayuliang-Hawaii-Tezu-Namsai-Dibrugarh-Itanagar as per flight plan of 06.08.2010. Flight till landing

at Namsai was uneventful. The helicopter departed from Namsai for Tezu at 1105 IST and few minutes after departure the L.H. door opened and a cabin crew fell from the helicopter in a field of Sengsap village approx 7.5 KM in the East of Namsai Helipad. The pilot then reduced speed of the helicopter and asked a technician on board to close the door. After the technician closed the door with the help of flight engineer, the helicopter returned and landed at Namsai at 1115 IST for deplaning passengers. It again took off from Namsai at 1137 IST for search and rescue of cabin crew. The helicopter returned with the injured cabin crew and landed at Namsai at 1158 IST. The cabin crew was rushed to Namsai hospital where he was declared dead.

All other persons on board the helicopter escaped unhurt. There was no sign of pre/post impact fire and damage to the helicopter.

The accident occurred in day time. Subsequently the operator notified the occurrence to the DGCA. The occurrence was classified as accident and investigated under Rule 71 of Aircraft Rules 1937 by appointing Inspector of Accidents.

1. FACTUAL INFORMATION

1.1 History of Flight

1.1.1 Pawan Hans Helicopters Ltd had deployed two of its MI-172 helicopters at Itanagar to operate non-schedule flights for Government of Arunachal Pradesh. The helicopter VT-PHF was planned for flying on route Itanagar – Dibrugarh – Namsai– Tezu–Hayuliang–Hawai–Tezu–Namsai–Dibrugarh–Itanagar on 06.08.2010. The flight was planned for operation under Visual Flight Rules (VFR). ADC and FIC were duly obtained vide No.142 and 130-138 respectively. Meteorological information for enroute weather was obtained from ATC Dibrugarh. There was 1200 litres of fuel on board the helicopter at the time of departure from Itanagar. Endurance of the helicopter was 02:30 Hrs.

1.1.2 Aircraft Maintenance Engineer (AME) carried out the daily inspection as per schedule in the morning at Itanagar and found the helicopter serviceable. The Pilot-in Command and Co-pilot also carried out checks as per schedule and accepted the helicopter for day's flying. Twenty one (21) passengers boarded the helicopter at Itanagar. Passenger seating arrangement was random and no seat numbers were allotted to passengers. In addition to passengers, there were two Pilots, one Flight Engineer and one cabin crew on board the helicopter. A total of twenty five persons were there on board the helicopter when it departed from Itanagar for Dibrugarh. The cabin crew closed the door and informed the same to pilot over intercom. Then he provided safety briefing to the

passengers. After safety briefing, he occupied his assigned seat and put on his seat belt. The on-board technician was seated in the last row of seats on the right side. The helicopter took-off at 0910 IST from Itanagar (Naharlagun Heliport) for Dibrugarh. Sector altitude was 3500 feet. Planned cruising speed was 120 knots. Flight time from Itanagar to Dibrugarh was 55 minutes. The helicopter landed at Dibrugarh at 1005 IST. Fifteen (15) out of twenty one (21) passengers deplaned and no fresh passenger boarded the helicopter at Dibrugarh. The flight from Itanagar to Dibrugarh was uneventful.

1.1.3 At Dibrugarh, 1710 litres of fuel was uplifted. After refueling, there was a total of 2600 litres of fuel on board the helicopter at the time of departure from Dibrugarh. The cabin crew followed laid down procedure for departure and the helicopter took-off from Dibrugarh at 1030 IST for Namsai with 06 passengers and 04 crew-members on board. Sector altitude was 2000 feet. Planned cruising speed was 120 knots. Flight time from Dibrugarh to Namsai was 25 minutes and the helicopter landed at Namsai at 1055 IST. Only 01 passenger disembarked and no fresh passenger boarded at Namsai. During disembarkation of passenger the rotors were turning. The flight from Dibrugarh to Namsai was uneventful. No fuel was uplifted at Namsai.

1.1.4 The helicopter departed from Namsai at 1105 IST for Tezu with 05 passengers and 04 crew-members on board. The visibility reported was 5000m. Flight time from Namsai to Tezu was 20 minutes. Two onboard passengers who witnessed the accident stated that cabin crew was trying to close the LH door after the helicopter had taken off. He was also seen pulling the cable attached on top end of the door with the help of one hand and turning the latch with other hand. Since he was unable to latch the door properly, he called the technician for help.

The onboard technician stated that the cabin crew stood up after removing his seat belt within a few minutes of departure from Namsai, and bent towards passenger door on the right side to his seat. He was trying to latch the door at the top of the door frame. On being called by the cabin crew, he went near the door and bent down on the door handle and found that the handle was in open position. The cabin crew was pulling in the cable of the door and asked him to look at the door handle. By this time the helicopter had already climbed 1000 feet and was further climbing.

While they were trying to close the door, it opened all of a sudden. The cabin crew who stood at the door holding the cable attached to top end of door fell outside. The technician also slipped outside but managed to grip

the door frame. The door was completely open and one leg of the technician was resting on the steps of door. One of the shoes and Airport Entry Pass of the technician also fell outside while he was hanging on the door. The passenger door had opened with a loud thud and the same was heard in the cockpit. The Pilot-in-Command thought that it was possibly a bird hit. Instantly, he could see in the Rear View Mirror that passenger door had opened. The door had opened at 1108 IST (approx.). The technician, by this time, managed to enter the helicopter and informed the accident to flight engineer. The flight engineer, in turn, conveyed the same to pilot. The pilot then reduced the speed of the helicopter and asked the technician to close the door. The flight engineer assisted the technician to close the passenger door. Thereafter, the helicopter returned to Namsai and landed at 1115 IST. All passengers were asked to deplane the helicopter. The helicopter engines were not shut down.

1.1.5 Authorities of ‘Lohit’ District Administration were informed about the accident as the Namsai town lies in the jurisdiction of Lohit District of Arunachal Pradesh. Ambulance was requested to be kept ready at the Namsai Helipad. The helicopter departed at 1137 IST for Search and Rescue of the fallen cabin crew. One of the passengers also accompanied the Search and Rescue team as he was acquainted with the area over which the accident had occurred. The passenger door closed normally and also there was no complain about malfunctioning of the door latch. Within few minutes of take-off, the pilot could spot a body lying in a field and a group of people by a roadside waving at the helicopter. The helicopter landed at a nearby safe place. The place of accident was near ‘Sengsap’ village and was 7.5KM East of the Namsai helipad. The flight crew came out of the helicopter and went near the injured cabin crew. With the help of some villagers they shifted him on bamboo stretcher to the helicopter and flew back to Namsai. The helicopter landed at Namsai at 1158 IST. The cabin crew was immediately rushed to Namsai Hospital in an ambulance where he was declared brought dead.

1.1.6 The accident occurred during day time at 1108 IST (local time). There was no damage to the helicopter and no injury to other occupants. There was no evidence of pre/post accident fire.

1.2 Injuries to persons:

Injuries	Crew	Passengers	Others
Fatal	01	Nil	Nil
Serious	Nil	Nil	Nil
Minor/none	03	05	

1.3 Damage to Helicopter:

There was no damage to the helicopter.

1.4 Other Damages:

There was no other damage.

1.5 Personnel information:

1.5.1 Pilot-in Command:

Age / Date of Birth : 57 years / 26.05.1953
Type of Licence : Rule 160.
Date of Issue : 01.09.2008
Valid up to : Not applicable
Date of Last Medical Examination : 12.04.2010
Medical Examination valid up to : 11.10.2010
Total Flying Experience : 6677:20 Hrs
Experience on Type : 144:35 Hrs
Total Flying Experience during last 90 days : 144:35 Hrs
Total Flying Experience during last 30 days : 46:30 Hrs
Total Flying Experience during last 07 days : 29:20 Hrs
Total Flying Experience during last 24 hours: 05:40 Hrs

1.5.2 Co-Pilot

Age / Date of Birth : 57 years / 11.07.1953
Type of Licence : Rule 160
Date of Issue : 08.06.2007
Valid up to : Not Applicable
Date of Last Medical Examination : 01.04.2010
Medical Examination valid upto : 30.09.2010
Total Flying Experience : 6548:00 Hrs
Experience on Type : 1042:00 Hrs
Total Flying Experience during last 90 days : 116:15 Hrs
Total Flying Experience during last 30 days : 75:20 Hrs
Total Flying Experience during last 07 days : 22:15 Hrs
Total Flying Experience during last 24 hours: 05:40 Hrs

1.5.3 Flight Engineer:

Age : 55 years /25.07.1955.
Total Flying Experience : 6064:40 Hrs
Total Flying Experience on Type : 4711:00 Hrs
Total Flying Experience during last 90 days : 92:40 Hrs
Total Flying Experience during last 30 days : 18:25 Hrs
Total Flying Experience during last 07 days : 18:25 Hrs
Total Flying Experience during last 24 hours: 05:40 Hrs

1.5.4 Cabin Crew

Age : 46 years/01.01.1964
Date of Last Refresher course : 12 & 13.09. 2009
Date of Skill Test : 12.11. 2009
Date of Crew Resource Management course : 29.11. 2009

The cabin crew was provided approved ab-initio training and was permitted by Director General of Civil Aviation in December 2006 to perform duties of cabin attendant (cabin crew) on MI-172 helicopter operated by M/s PPHL.

1.6 Aircraft Information:

1.6.1 MI-172 Helicopter VT-PHF bearing serial No. 356C06 was manufactured by M/s Kazan Helicopters, Russia on 31.10.1996. The helicopter was weighed on 07.07.2006 at manufacturer's plant at Kazan, Russia. Empty weight for land operations that included weight of unusable fuel, oil tanks full, radio navigation equipments including CVR, FDR, ELT, ULB(03), transponder, fire extinguisher(03), Dust Protection Device (DPD), 26 passenger seats, KO50 heater, first aid and physician kit, flight manual & other documents was 7843.39 Kgs. Maximum fuel capacity was 2615 litres (2027 Kgs). Weight of two pilots, a flight engineer and a cabin attendant was 340 Kgs. Maximum commercial weight permitted with fuel and oil tanks full and four crew members was 1789.61 Kgs. Maximum all up weight authorized was 12000.00 Kgs. Seating capacity of the helicopter was for 26 passengers. A minimum of 04 crew (02 pilots, one cabin crew and 01 flight engineer) were necessary for operation of the helicopter.

1.6.2 The helicopter has been duly entered in the register of India with effect from 26.12.1996 and allotted with registration VT-PHF endorsed in the certificate of registration No.2801. It was registered in 'NORMAL' category with subdivision as 'PASSENGER'. Certificate of Airworthiness was issued on 26.12.1996. Last certification for airworthiness was done on 27.08.2009 and was valid up to 28.08.2011.

1.6.3 The helicopter is fitted with (TV3 117VM type) 02 turbo shaft engines. Aircraft and engine logbook showed the following in brief:

Total Airframe Hours of the Helicopter since new : 6832 : 37 Hrs.
No. of Landings : 10913 landings.
L.H Engine Sl. No. : 7087883302112.
L.H.Engine Hours since new : 3693: 17 Hrs.
R.H.Engine Sl No. : 7087883100016.

R.H.Engine Hours since new	: 4338: 19 Hrs
Last Major Servicing with date	: 300 Hrs servicing at 765:05 Airframe Hrs on 11.07.2010.
Next major servicing due date	: 500 Hrs servicing at 962:07 Airframe Hrs on 04.10.2010.

1.6.4 Scrutiny of the maintenance documents showed that last Modification embodied was DGCA/MI-172/01 and was complied on 07.08.2006. No modification was due on any system/subsystem of the helicopter.

1.6.5. As per maintenance documents no servicing/inspection was due to be carried out on the helicopter on 06.08.2010. Daily inspection was carried out by the AME and the flight crew of the helicopter in the morning before departure from Itanagar and the helicopter was found serviceable for flight. All inspection/servicing were carried out by appropriately licensed/approved personnel.

1.6.6 As per passenger manifest, only twenty one (21) passengers were on board the helicopter when it departed from Itanagar with 1200 litres of fuel for Dibrugarh. Fifteen (15) of them disembarked at Dibrugarh. No fresh passenger boarded from Dibrugarh. Similarly one (01) passenger disembarked at Namsai but none boarded from there. At the time of accident there were five (05) passengers on board the helicopter. Load and Trim Sheet was not filled up to ensure that the Centre of Gravity of the helicopter remained within the specified limit throughout the flight.

1.6.7 Type of fuel used was Aviation Turbine Fuel (ATF). There was 1200 litres of fuel on board the helicopter at the time of departure from Itanagar. Corresponding endurance was 02 hrs 30 minutes. On reaching Dibrugarh leftover fuel was 890 litres. 1710 litres of fuel was uplifted at Dibrugarh. After refueling, there was 2600 litres of fuel on board. No refueling was carried out at Namsai.

1.6.8 There was no pending snag observed in the helicopter before commencing flight from Itanagar on 06.08.2010. Further, no snag developed on any system/subsystem including passenger door of the helicopter during the flight from Itanagar to Dibrugarh, Dibrugarh to Namsai, Namsai to Namsai (Tezu bound helicopter returned to Namsai due accident) and Namsai to Itanagar.

1.6.9 Helicopter Main Entrance Door is located on the port side (left hand side) between frame No. 1 & 3 of central part. Overall dimensions are:-

Height : 1405 mm.

Width : 825 mm.

The door opening, designed to receive the door, has frame type attachment with door sealing rubber laid around the contours of the attachment. The door is suspended on two hinges and cables are used to hold the door in its open position. The door is fitted with door locking mechanism provided with inner and outer handles. The outer handle has a lock to fit a key. It can be opened from outside when button is depressed and the door opening handle is turned down all the way through. The door is equipped with a door emergency jettison mechanism for an emergency exit from the helicopter and two door emergency jettison handles-inner and outer. The door has steps to facilitate embarking and disembarking of passengers and it acts as a ramp.

To open the door from inside the cabin, the button on the door handle is depressed and the door handle is turned all the way to 'OPEN' position followed by turning a 'latch' on top of door frame to 'OPEN' position. Thereafter, the door is applied an outward push and the attached cables are released slowly till they are fully support the door.

When the door handle is in open position, a micro switch, mounted in upper door frame, completes circuits and a 'Centralised Advisory Caution Light' of orange colour flashes in front of the pilot-in-command and also a 'Door Open' warning light of orange colour appears in top attachment frame in the cockpit behind his pilot seat (L.H. seat).

To close the door from inside the cabin, the attached cables are pulled in till the door is fully received in the door frame. Then the button on the door handle is depressed and the door handle is turned all the way to 'CLOSE' position, followed by turning the latch on the top of door frame to 'CLOSE' position. When the door handle is in 'CLOSE' position, the micro switch breaks circuits for the 'Centralised Advisory Caution Light' and 'Door Open' warning light of orange colour and both warnings disappear in the cockpit indicating that door is closed.

1.7 Meteorological Information:

1.7.1 The routes covered by helicopter services in Arunachal Pradesh lay interior and away from Controlled Aerodromes. In such circumstances Pilot relied on self briefed meteorological report. As per his submission, he obtained weather information from following sources:

- India Meteorological Charts from Internet and nearest India Meteorological Department (IMD) observatories/stations.
- Nearest Civil Airports (Dibrugarh).
- Nearest Air Force Meteorological Stations.
- Arunachal Pradesh Government officials present at helipads.

He further submitted that weather provided by above sources was reliable and fairly accurate in planning the flight in that sector.

1.7.2 The helicopter landed at Dibrugarh at 1005 IST . Meteorological Report of Dibrugarh Airport (VEMN) at 1000 IST (0430 UTC) on 06.08.2010 is reproduced below :

WIND 120 / 03 KTS, VIS 3000M , WETHER HZ,
 CLOUD
 SCT 2000 FT (600 M), FEW 2500 FT (750 M), CB TO SW O,
 BKN 10,000 FT (3000 M), T 29 °C, DP 26 °C,
 QNH 1008 HPA 2977 INS
 QFE 995 HPA 2938 INS
 TREND F/C NO SIGW

1.7.3 The helicopter took-off from Dibrugarh at 1030 IST. Meteorological Report of Dibrugarh Airport (VEMN) at 1030 IST (0500 UTC) on 06.08.2010 is reproduced below :

WIND 000 / 00 KTS, VIS 3000M, WEATHER HZ,
 CLOUD
 SCT 2000 FT (600 M), FEW 2500FT (750 M), CB TO SW O,
 BKN 10,000 FT (3000 M), T 29 °C , DP 25 °C ,
 QNH 1008 HPA 2977 INS
 QFE 995 HPA 2938 INS
 TREND F/C NO SIGW

Wind was calm. There was no significant change in weather. As per pilot's self meteorological briefing, visibility at Namsai was 05 kilometre. The accident occurred near Namsai in daytime at 1108 IST (local time).

1.8 Aids to Navigation:

The helicopter was flying for onward journey on route Itanagar-Dibrugarh-Namsai-Tezu-Hayuliang-Hawai. Dibrugarh is an airport and is equipped with VOR, DME, NDB, ILS, PAPI lights and Wind Socks. All navigational aids were serviceable. Rest of the destinations planned for flying on 06.08.2010, including Namsai were all helipads and provided with only Wind Socks.

The helicopter was equipped with VOR, DME and ADF for navigation. All the navigational aids on the helicopter were serviceable.

1.9 Communications:

Only Dibrugarh Airport is equipped with Very High Frequency (VHF) communication facility. Other helipads including Namsai mentioned in the flight plan of 06.08.2010 had no communication equipments.

The helicopter was equipped with Very High Frequency (VHF) and High Frequency (HF) communication sets. There was two way VHF communication between the helicopter and Dibrugarh ATC. The communication sets were serviceable.

1.10 Aerodrome Information:

Namsai Helipad is located in Lohit District of Arunachal Pradesh. It is located at Lat: 27° 67.638N, Long: 095° 85.361E at elevation 215m AMSL. The helipad is maintained by Government of Arunachal Pradesh having a passenger terminal with 03 rooms to cater for waiting hall for passengers, VIP lounge and terminal office. The boundary of the helipad is wire fenced which is broken at several places. Apron at Namsai is located in a plain field. It has markings for two helicopters. It can accommodate 01 helicopters of type MI-172 and 01 smaller helicopter at a time. There is a wind sock. Area surrounding the apron is free from obstructions. There is no refueling facility at Namsai. An employee of the Department of Supply & Transport (DST), Government of Arunachal Pradesh with designation 'Store Hand' is deputed at Namsai helipad. His job is to prepare manifest of passengers and cargo and hand over the same to pilot. He is not trained for any other role in helicopter operation.

1.11 Flight Recorders:

The helicopter is equipped with a Cockpit Voice Recorder (CVR) and a Flight Data Recorder (FDR). CVR is of magnetic tape type, part no. 78A-80, serial no. 755 and it can store last 02 hours 20 minutes of recording. Quality of recording of CVR was very poor. The previous sectors flown on 06.08.2010 including sector Namsai to Tezu, in which the accident occurred, were not recorded. Conversation recorded in CVR between pilot-in command and co-pilot belonged to post accident period and confirmed occurrence of the accident. There is no switch in the cockpit which could interfere with operation of the CVR.

FDR was of metal foil type. Its part no. is MLP-23-1 and serial no. 70313. It can store last 50 hours of recoding. Its serviceability was checked during pre-flight inspection for the first flight of the day by Technician and Aircraft Maintenance Engineer. It is also an item of check by Flight Engineer when outside ambient temperature is below 10⁰ C. It is not an item of check in pilot's checklist. Both CVR and FDR were installed during overhaul at Kazan in the year 2006 at manufacturer's facility. CVR and FDR were last monitored on 02.08.2010 and 10.06.2010 respectively. FDR was calibrated on 26th & 27th February 2010.

The Flight Data Recorder (FDR) records parameters in 04 groups :

- | | |
|-----------|--|
| Group I | <ol style="list-style-type: none">1. Pressure Altitude (Above Mean Sea Level)2. Indicated Air Speed3. Collective Pitch of Main Rotor4. Radio Height |
| Group II | <ol style="list-style-type: none">1. Gas Generator Speed (Left Engine)2. Left Engine Gas Temperature3. Y Axis Overload4. Angle of Pitch |
| Group III | <ol style="list-style-type: none">1. Gas Generator Speed (Right Engine)2. Right Engine Gas Temperature3. Position of Pedals4. Z Axis Overload |
| Group IV | <ol style="list-style-type: none">1. Main Rotor RPM2. Magnetic Heading3. X Axis Overload4. Lateral Deflection of Cyclic Control Stick |

Events Commands Parameters are recorded 02 Groups:

- | | |
|---------|---|
| Group I | <ol style="list-style-type: none">1. Shock Strut Compression2. Main Hydraulic System3. Auxiliary Hydraulic System4. Low Oil Pressure MGB5. Fuel remaining 300 litres6. Left Generator failure7. Right Generator failure8. Service Tank Pump failure9. Icing |
|---------|---|

10. Establishing Communication
11. Alert Altitude

- Group II
1. Fire in Left Engine Compartment
 2. Fire in Right Engine Compartment
 3. Fire in Gear Box Compartment
 4. Fire in KO50 Compartment
 5. Left Fuel Shut-off Valve closed
 6. Right Fuel Shut-off Valve closed
 7. Anti Icing System of Main and Tail Rotors ON
 8. External Load Release
 9. Left Engine Anti Icing ON
 10. Right Engine Anti Icing ON
 11. External Tank Pump failure

Passenger door warning is not included in the list of events recorded on FDR. The accident occurred at 1108 IST; whereas Flight Data Recording for the above parameters was available from 1137 IST onwards which was not relevant for the purpose of investigation of the accident. Parameters and events of all previous sectors flown on 06.08.2010 including sector Namsai to Tezu, in which the accident occurred, were not recorded. Recorded information on FDR belonged to 'post accident flight' period and did not reveal any useful information about the flight when accident occurred.

1.12 Wreckage and impact information:

The Cabin Crew fell from left hand side door of the helicopter on the way to Tezu from Namsai and received fatal injuries. At the time of his fall the helicopter was climbing and passing 1000 feet (304.8 metres). The site where he had fallen was a plain field of a village named Sengsap, located 7.5 kilometre East of the Namsai Helipad. The soil of the field was moist and soft. Although the door opened in flight; it was neither damaged nor deformed. Cables attached to the door were also not damaged. There was no damage to any other part of the helicopter.

1.13 Medical and pathological information:

The Cabin Crew was rushed in an ambulance to Hospital at Namsai where medical officer declared him 'brought dead'.

1.14 Fire:

There was no fire in this accident.

1.15 Survival aspects:

1.15.1 The helicopter returned and landed at Namsai at 1115 IST after the accident and passengers were deplaned. The helicopter departed for search and rescue of the fallen cabin crew at 1137 IST. One of the passengers accompanied the flight crew for search and rescue as he was familiar with the area. The pilot could spot some people who were standing in a field and waving at the helicopter. He spotted the fallen cabin crew lying in the field. The helicopter landed at a nearby safe place; with the help of some people, the crew members shifted the injured cabin crew to the helicopter on a bamboo stretcher. The helicopter then flew back to Namsai where an ambulance was waiting. The cabin crew was rushed to Namsai hospital where the doctors declared him 'brought dead'.

1.15.2 The jump seat of the cabin crew is located next to the door on the left side. Post accident examination of the jump seat revealed that its attachment with its mounting was intact and had no sign of damage. Seat belt was also attached to the jump seat and was serviceable. Seat belt of all the passengers seats were intact and did not bear any sign of damage. No passenger on board the helicopter was injured in this accident.

1.15.3 The technician who slipped out and was hanging at the door, managed to enter the helicopter. Cabin crew fell out of the flying helicopter from an altitude above 1000 feet and received fatal injuries.

1.16 Tests and Research:

1.16.1 During investigation, the door operation was checked 20 times and every time the door handle was moved down or up for 'opening' or 'closing' respectively, without experiencing any malfunction or trouble in door operation.

1.16.2 Door opening handle cannot be moved up or down without depressing the button pivoted on it. This is to prevent inadvertent operation of door handle. When the door handle is turned up all the way, two plungers protrude and travel inside two holes provided in the top of door frame. One of the holes is provided with a micro switch. Total travel of the plungers is 30mm. The plunger pushes a micro switch causing it to open-

circuit and warning light indication (orange/amber) in cockpit goes-off conveying 'door closed' to the pilot.

1.16.3 Cables attached to top end of the door (when door is closed) extend outside when the door opens. Anybody holding the cables attached to top end of the door is likely to fall outside with the opening of the door. The door opened suddenly and it was associated with a loud thud. The cabin crew fell outside at this moment only as he was holding the cable and standing at the door.

1.17 Organizational and Management Information:

Pawan Hans Helicopters Ltd (PHHL), a Public Sector Enterprise of Government of India provides helicopter services in the country. It has a mixed fleet of 42 helicopters consisting mainly of Dauphins, MI-172s, Bells and Ecureuils. A break-up of the different types of helicopter is given below :-

<u>Type</u>	<u>Numbers</u>
Dauphin 365 N	18
Dauphin 365 N3	12
MI-172	02
Bell-206 L4	03
Bell 407	04
<u>Ecureuil 350 B3</u>	<u>03</u>
Total	42

Its fleet of helicopters provide services on demand basis to state governments and government agencies. PHHL also caters for specialized services like VVIP/VIP movements, ferrying professionals to off-shore oil exploration rigs, survey of pipelines of oil refineries apart from usual air transport services. Its corporate office is located at Noida in Uttar Pradesh. It has established its sub-bases at Guwahati, Itanagar and Gangtok in order to provide helicopter services to state governments in North-Eastern region of India. Two of its MI-172 Helicopters were positioned at Itanagar to operate non-schedule flights for Government of Arunachal Pradesh.

1.18 Additional Information:

1.18.1 Closure of door is included in the checklist of cabin crew only. His responsibility was to close the door and inform the same to the pilot-in-command using intercom.

1.18.2 The operation of the L H door is not linked or integrated to any other system or sub-system of the helicopter. It is opened and closed manually by the cabin crew.

1.18.3 A slot with its edges at right angle is provided on top edge of the door to accommodate lower end of the 'latch' (red colour) provided on top of door frame. The slot is so designed that the 'latch' can enter and leave the slot through one way only. The latch will enter the 'slot' only if it moves from 'open' position to 'close' position. The latch is free to move beyond the 'close' position mark. If it moves beyond 'close' position mark before the door is closed, the lower end of the latch will butt with edge of 'slot' during latching of the door. And the latch will never be brought back to 'close' position for latching the door. For latching, the door has to be opened a little for correcting the position of latch.

1.18.4 Flight path of search & rescue phase of helicopter was plotted as vectors to obtain distance of site of accident from Namsai helipad. Necessary data for this purpose was obtained from FDR read out.

1.19 Useful or effective investigation techniques:

Nil

2. ANALYSIS

2.1 Pilot and Operational Factors:

2.1.1 Weather

Pilot had a self briefed meteorological report. Wind was calm and visibility was 5 KM for most of the route except near Dibrugarh where it was 3 KM. The sector of accident flight i.e. Namsai-Tezu had a visibility of 5 KM and thus clear to have operation under VFR. However for the operation conducted near Dibrugarh with visibility 3KM, the pilot should have obtained Special VFR permission from Dibrugarh ATC to enter and leave that zone.

From above it can be inferred that even though the weather is not a contributory factor to the accident, the pilot has violated the Rules of Air.

2.1.2 Crew qualification

The Pilot in Command was 57 years old and his medical certificate was valid on the day of accident. He was authorized by Ministry of Civil Aviation, Government of India under 'Rule 160' to fly helicopters. He had a total flying experience of 6677:20 Hrs.

The Co-pilot was 57 years old and his medical certificate was valid on the day of accident. He was authorized by Ministry of Civil Aviation, Government of India under 'Rule 160' to fly helicopters. He had a total flying experience of 6548 :00 Hrs.

The flight engineer was 55 years old and had a total flying experience of 6064:40 Hrs.

Cabin crew was well trained in his profession and was approved by DGCA in December 2006 to work as cabin crew on MI-172 helicopter. He had undergone refresher courses, Skill Test and CRM course to keep him updated about his duties and responsibilities on board the helicopter.

Further it was observed that the requirements of flight duty time limitation (FDTL)/flight time limitation (FTL) was not violated by any of the flight crew as per existing provision.

It is evident from above deliberations that the operating crew were properly qualified to undertake flying duties. Crew qualification is not the contributory factor to the accident.

2.1.3 Flight Planning

ADC and FIC No. were obtained for the flight. Flight level for each sector to be flown on 06.08.2010 was planned. The flight was planned under visual flight rules (VFR).

The helicopter had departed from Itanagar with 1200 litres of fuel on board. The endurance was 02 hours 30 minutes. 310 litres of fuel was consumed in 55 minutes of flying from Itanagar to Dibrugarh and leftover fuel on board was 890 litres. 1710 litres of fuel was uplifted at Dibrugarh. Thus total fuel on board was 2600 litres at the time of departure from Dibrugarh. Flying time for the sector Dibrugarh-Namsai is 25 minutes and that of Namsai-Tezu is 20 minutes. In general, 400 litres of fuel is consumed per hour of flying. Comparing the fuel consumption in the sector Itanagar-Dibrugarh, it was evident that there was sufficient fuel on board for the sector and Namsai-Tezu. Thus the helicopter never starved for fuel in any of the sectors flown on 06.08.2010. Therefore, the flight was well planned and flight planning was not a contributory factor to the accident.

2.2 Airworthiness/Aircraft factors:

2.2.1 Serviceability of Helicopter:

The helicopter was inspected by an approved Aircraft Maintenance Engineer and the flying crew. There was no pre-departure or pre-flight snag. There was no snag during flight in any of the sectors flown on 06.08.2010. The helicopter was free from snag.

The helicopter had completed 6832:37 airframe hours as on 05.08.2010, a day before the date of accident. Last major servicing of 300 Hrs was carried out at 6765:05 Airframe hours on 11.07.2010. Next major servicing of 500 hours was due at 6962:07 Airframe hours and was planned to be carried out on 04.10.2010. Therefore the helicopter was not due for any scheduled major maintenance or servicing on the day of accident. No modification was due on the helicopter on the day of accident.

2.2.2 Centre of Gravity:

At the time of the accident, there were only 05 passengers and 04 crew members on board, which was much below its capacity of 26 passengers. All up weight of the flight was much below the maximum authorized all up weight. As per passenger manifest and fuel upliftment record, the helicopter was not over loaded. However load and trim sheet was not prepared to calculate the movement of the centre of gravity for any of the sectors including the sector Namsai-Tezu in which the accident occurred.

It can be concluded that centre of gravity doesn't appear to be the contributory factor of the accident. The pilot did not fill up the Load and trim sheet which is a disregard of the laid down mandatory Rules and Regulation.

2.2.3 Door Function:

Door closing and locking mechanism were not found to be malfunctioning during test and research of this investigation. Further, the technician closed the door in air after the accident and then opened and closed during search and rescue operation and during return of the helicopter to Itanagar. Every time the door closed and locked without malfunctioning. Door handle never malfunctioned on any of these occasions. There was no damage or elongation of holes in the top end of door frame. Also there were no scratch marks near the surface

surrounding these holes. The door was not jettisoned either. It appears the functioning of the door is not the contributory factor of the accident. The door could not be latched as the latch has travelled beyond CLOSE position before attempting to close the door. This appears to be the contributory factor of the accident.

2.3 Circumstances leading to accident

After take-off from Namsai, the technician had seen that the cabin crew removed his seat belt and left his seat and bent towards the door. He was seen pulling the door cables and trying to move the latch. He also called the technician to help him. The technician saw that door handle was in 'OPEN' position

It appeared that the cabin crew could not latch the door before take-off from Namsai because the latch might have moved beyond the 'CLOSE' position mark. He had only locked the door by turning the door handle to 'CLOSE' position. For this reason, there was no 'door warning light' in the cockpit before take-off. Whether he had intimated the pilot-in-command on 'intercom' about door closure could not be confirmed independently as Cockpit Voice Record of the sector was not available. After take-off, the cabin crew probably decided to latch the door by opening it a little bit for correcting the latch position. That is why he turned the door handle to 'OPEN' position and called the technician for help while he himself kept pulling the door cable. In his attempt to open the door a bit, the door opened fully by the thrust of ram air due to forward speed of the helicopter. As the cabin crew was holding the door cables; he fell outside along with opening of the door. The technician also slipped out but managed to enter the helicopter.

3. CONCLUSION

3.1 Findings:

3.1.1 Pre-flight inspection was conducted on the helicopter in the morning of 06.08.2010 at Itanagar, by approved aircraft maintenance engineer and the helicopter was accepted by the pilot.

3.1.2 The helicopter did not have any pending snag. Also no snag developed during flight on 06.08.2010. The helicopter was airworthy and serviceable.

3.1.3 No major scheduled servicing/inspection was due on the day of accident; and no modification was due for embodiment on the helicopter on 06.08.2010.

- 3.1.4 Flight crew were properly qualified to undertake flying duties. Crew qualification is not the contributory factor to the accident.
- 3.1.5 Cabin Crew was trained for his duties and responsibilities in cabin during helicopter operation.
- 3.1.6 The flight was planned under Visual Flight Rules (VFR). However visibility around Dibrugarh airport was 3 KM and did not meet requirement for operation under VFR. Special VFR permission should have been obtained by flight crew. Even though weather is not a contributory factor to the accident, the pilots disregarded laid down regulations.
- 3.1.7 There was sufficient fuel on board the helicopter. There was no starvation of fuel in any of the sectors flown on 06.08.2010. Flight was well planned and flight was conducted as per flight plan.
- 3.1.8 Load and Trim sheet was not prepared by the flight crew to check movement of centre of gravity.
- 3.1.9 The door is opened and closed manually. The opening and closing mechanism of door is not linked to any other system/sub-system of the helicopter. The door handle and latching mechanism of the door were fully serviceable and did not malfunction during the accident.
- 3.1.10 The door will not open if either of the two closing mechanism (one latch at the top of door frame and another a door- handle provided on the door itself) are in 'CLOSE' position.
- 3.1.11 The door could not be latched as the latch has travelled beyond CLOSE position before attempting to close the door.
- 3.1.12 In an attempt to latch the door after take-off, the cabin crew took help of on board technician.
- 3.1.13 The door could not be latched because the 'latch' had moved beyond 'CLOSE' position.
- 3.1.14 There was no sign of damage of 'holes', plungers and latch. The door did not open forcibly.
- 3.1.15 The door was not jettisoned either.
- 3.1.16 The cabin crew opened the door a bit to correct the position of latch for latching the door at top end of door frame. Thrust of ram air due forward motion of the helicopter opened the door fully.

3.1.17 The cabin attendant fell outside along with opening of the door as he was holding the cable attached at the top end of the door.

3.1.18 Door warning is not listed among events for being recorded in Flight Data Recorder (FDR).

3.1.19 Cockpit Voice Recorder (CVR) and Flight Data Recorder (FDR) did not have recordings of the sector in which the accident occurred. Both had recordings of post accident period.

3.1.20 Quality of recording of CVR was very poor.

3.1.21 Data monitoring is very cumbersome with the present CVR and FDR equipment.

3.2 Probable cause of the accident:

Accident occurred due to falling of the cabin crew from the helicopter while he was attempting to close the forward left hand passenger door in flight.

4. SAFETY RECOMMENDATIONS

4.1 Action as deemed fit may be initiated against flight crew/operator in view of finding No. 3.1.6.

4.2 In view of finding No. 3.1.19 and 3.1.20 action may be initiated against organisation.

4.3 In view of finding No. 3.1.21, feasibility may be explored to replace the existing CVR and FDR in MI-172 helicopter with new generation solid state CVR and solid state FDR.

Place: Kolkata
Date: 23 June 2011

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