AIRCRAFT ACCIDENT INVESTIGATION BUREAU

FINAL INVESTIGATION REPORT ON ACCIDENT TO M/s UNITED HELICHARTERS BELL 212 HELICOPTER VT-HGB AT (TUKAWADE) THANE ON 29/09/2013

GOVERNMENT OF INDIA
MINISTRY OF CIVIL AVIATION
AIRCRAFT ACCIDENT INVESTIGATION BUREAU
NEW DELHI INDIA

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In accordance with Annex 13 to the International Civil Aviation Organisation Convention and the Aircraft (Investigation of Accidents & incidents) Rules 2012, the sole purpose of this investigation is to prevent aviation accidents. It is not the purpose of the investigation and the associated investigation report to apportion blame or liability.

Safety recommendation shall in no case create a presumption of blame or liability for an occurrence

SYNOPSIS :

Governments of India vide notification no. AV.15013/5/2013-DG ordered investigation of the accident to Bell 212 helicopter VT–HGB belonging to M/s United Helicharters Pvt. Ltd. on 29/09/2013 by a Committee of Inquiry. The intimation of the accident was provided to ICAO, TSB Canada and NTSB USA as per the requirements of ICAO Annexure 13.

The helicopter departed from Juhu airport for Aurangabad at 07:47 IST with 05 persons on board. The flight plan was filed to fly the route under VFR conditions at 2000 feet AGL with endurance of 02:30 hours. As per ATC, the helicopter changed over the frequency from Juhu to approach control at 05 NM. Juhu ATC passed the ETA 09:30 IST to the control tower. At 09:18 IST, Juhu ATC received call from FIC stating, VT-HGB is not in contact. Later WSO, Mumbai informed to Juhu ATC that the helicopter had crashed near Murbad and the same information was passed to Operator at 1010 hrs. IST. At the same time, message was received that the helicopter crashed at 0820 hrs. IST. The location of accident was at around 49 NM from Juhu airport and 104 NM prior to Aurangabad.

The initial contact was made with the trees probably by the main Rotor Blades after which the Tail-Boom broke away on impact with a tree and later the cockpit got smashed after hitting with the ground. Engine along with MGB and Main Rotor Blades were found 20m further ahead of cockpit. The Engine, MGB and Main Rotor Blade wreckage was completely damaged & burnt. The other components were severely damaged and the pieces were scattered all around.

All the occupants received fatal injuries. The accident occurred in day light conditions. All the timings in the report are in IST (UTC + 5.30 hrs.) unless otherwise mentioned.

FINAL REPORT OF ACCIDENT TO M/s UNITED HELICHARTERS BELL 212 HELICOPTER VT-HGB
AT (TUKAWADE) THANE ON 29/09/2013

1.	Aircraft		
	Type	:	BELL 212 helicopter
	Nationality	:	Indian
	Registration	:	VT-HGB
2.	Owner	:	Gulf Helicopters Company
3.	Operator	:	United Helicharters (P) Ltd.
4.	Pilot – in –Command	:	CPL(H) holder
	Extent of injuries	:	fatal
5.	First Officer	:	CPL(H) holder
	Extent of injuries	:	Fatal
6.	Place of Accident	:	Tukawade (Thane)
7.	Geographical location	:	19°17′34″N 73°40′23″E
8.	Date & Time of Accident	:	25.09.2013 / 08:20 hrs. IST
9.	Last point of Departure	:	Juhu
10.	Point of intended landing	:	Aurangabad
11.	Type of operation	:	Passenger
12.	Passengers on Board	:	3
	Extent of injuries	:	fatal
13.	Phase of operation	:	Enroute
14.	Type of accident	:	Fatal/ Catastrophe

(ALL TIMINGS IN REPORT ARE IN IST UNLESS OTHERWISE MENTIONED)

1. FACTUAL INFORMATION.

1.1 History of the flight

Bell 212 helicopter VT-HGB belonging to M/s United Helicharters Pvt. Ltd was scheduled to fly from Juhu airport to Nagpur via Aurangabad. The pilots were informed on 26th September about the flight. They were also informed that they would be operating out of Nagpur for a period of about 30 days. The weather at the time of flight was fair. Visibility at Juhu, enroute and Aurangabad was 3 kms. and the flight was cleared under Special VFR.

Crew had undergone Pre-Flight Medical Examination (PFME) at 06:45 IST and the helicopter departed from Juhu at 07:47 IST with 05 persons on board. In addition to the cockpit crew, there was a helicopter pilot, an AME and a technician on board as passengers. There was 1600 Lbs. of fuel onboard. Helicopter was supposed to make halt at Aurangabad for refueling and then fly the sector from Aurangabad to Nagpur. Crew filed the flight plan from Juhu to Aurangabad to fly the route under VFR conditions at 2000 feet AGL with endurance of 02:30 hours.

As per ATC, helicopter changed over the frequency from Juhu to Approach Control at 05 NM. Juhu ATC passed the ETA of the helicopter as 09:30 IST to the Aurangabad control tower. At 09:18 IST, Juhu ATC received call from FIC stating, VT-HGB is not in contact. ATC made attempts to contact helicopter and crew but, was unable to get through. Later WSO, Mumbai informed Juhu ATC that helicopter had crashed near Murbad. The same information was passed to Operator at time 10:10 IST.

At the same time, message was received that the helicopter crashed at 08:20 hrs. IST. The location of accident was at around 49 NM from Juhu airport and 104 NM prior to Aurangabad.

At the crash site, it was observed that, during crash the first contact was made with trees at height of about approximately 10-12 meters. Later cockpit had hit the ground and was totally smashed. Engine along with MGB and Main Rotor Blades were found 20 m further ahead of cockpit. As per the

witnesses from Murbad, the helicopter was flying at low altitude near Saralgaon, Murbad area. As per them there was drizzle and less visibility at the time of accident.

Wreckage was spread in an area measuring around 120m in a straight line in East – West direction from the first point of impact. The width of the wreckage spread was 15m. The Engine, MGB and Main Rotor Blade wreckage was completely damaged and burnt, whereas other components were severely damaged and scattered in pieces. The helicopter has not struck the hill head-on nor made any contact with High Power Electricity Cables.

1.2 Injuries to Persons

INJURIES	CREW	PASSENGERS	OTHERS
FATAL	02	03	-
SERIOUS	-	-	-
MINOR/NONE	-	-	-

1.3 Damage to Helicopter

The helicopter was destroyed during the accident.

- The tail boom was broken with 90 degree gearbox intact.

- The tail rotor hub and blade assembly were lying together at some distance from the tail boom.

- Both the elevators were in completely distorted condition.
- The skid tubes and aft cross tube were found broken in 2-3 pieces. The forward cross tube was intact lying singly.
- The co-pilot door was in one piece lying on the ground with broken window.
- Both the passenger doors were completely broken into many pieces.
- All the flight control tubes, bell crank were found to be either bent, broken or distorted.
- The cockpit had completely collapsed along with all the instruments, equipments and collective, cyclic controls.

- The floor panel of the cabin was completely uprooted with all the passenger seats flung on the ground either in burnt or completely broken condition.

- The power plant (2 engine and 1 C. box) was found toppled as a combined unit along with the enclosed cowlings. The fire extinguishers were in discharged state.

- The main rotor transmission, main drive shaft, mast, main rotor hub, blades and stabilizer bar were all found attached together lying in farther most point from the tail boom.

1.4 Other Damage

NIL

1.5 Personnel Information

1.5.1 Pilot – in – Command

PIC was a retired officer from the Indian Army. He joined United Helicharters Pvt. Ltd. in July 2008, with 2200 hrs single engine helicopter experience from the Army. He was converted on Bell 212 and cleared as PIC on type on 10 Dec 2011 by DGCA Examiner. He was IR endorsed on 26/11/11.

AGE	:	52 years
License	:	CHPL
Date of Issue	:	03.12.2007
Valid up to	:	02.12.2017
Category	:	Helicopter
Class	:	Single Engine Land
Endorsements as PIC	:	Alouette III/Chetak, Bell 412-212
Date of endorsement of Bell 212	:	25.08.2008
Date of Medical Exam.	:	07.06.2013
Med. Exam valid upto	:	06.12.2013

RTR	:	Valid till 02.12.2017
Last flown on type	:	24.08.2013
Total instrument flying	:	193:20 Hrs Approx
Total flying experience	:	3703:10 Hrs Approx
Experience on type	:	1432:45 Hrs Approx
Experience as PIC on type	:	406 Hrs Approx

Total flying experience during last 01 Year	:	208:28 Hrs Approx
Total flying experience during last 180 days	:	36:29 Hrs Approx
Total flying experience during last 90 days	:	28:55 Hrs Approx
Total flying experience during last 30 days	:	28:55 Hrs Approx
Total flying experience during last 07 Days	:	0:20 Hrs Approx
Total flying experience during last 24 Hours	:	0:20 Hrs Approx

1.5.1.1 Recurrent Training

The details of the competency checks (Proficiency/Route) carried out for PIC by DGCA approved examiners for the last two years were as follows:

S. NO.	CHECK	DATE	PLACE
1	PC	12/08/2013	HATSOFF
2	PC	24/03/2013	HATSOFF
3	PC	17/08/2012	HATSOFF
1	RC	01/08/2013	SUVALI
2	RC	30/06/2012	YANAM
3	RC	10/12/2011	YANAM
4	RC	05/07/2011	YANAM
1	IR	15/12/2012	HATSOFF
2	IR	26/11/2011	VORY

He was not involved in any accident/serious incident earlier.

1.5.2 Co-pilot

Co-Pilot did his basic helicopter training at the HAL Rotary Wing Academy, Bangalore and flew single engine BELL 407 as a copilot in Pawan Hans Helicopter Ltd (PHHL). He joined United Helicharters Pvt. Ltd. (UHPL) in Jun2008 and had over thousand hours as copilot on Bell 212/412 (approx equal hours on both types). He was not IR rated and as per the company, his training for IR rating was in progress. His details are as under:

AGE	: 30 years
License	: CHPL
Date of Issue	: 26.06.2003
Valid up to	: 06.07.2018
Category	: Helicopter
Endorsements as PIC	: Bell 407
Date of Med. Exam.	: 01.01.2013
Med. Exam valid upto	: 31.12.2013
RTR	: Valid till 06.07.2018
Last flown on type	: 26.06.2013
Total flying experience	: 1727 Hrs Approx
Experience on type	: 451 Hrs Approx
Experience as PIC on type	: Nil

Total flying experience during last 01 Year	: 120:45 Hrs Approx
Total flying experience during last 180 days	: 11:00 Hrs Approx
Total flying experience during last 90 days	: 06:20 Hrs Approx
Total flying experience during last 30 days	: 06:20 Hrs Approx
Total flying experience during last 07 Days	: 00:20 Hrs Approx
Total flying experience during last 24 Hours	: 00:20 Hrs Approx

1.5.2.1 Recurrent Training

The competency checks (Proficiency/Route) for Co-Pilot for the last two years were carried out as follows:

S. NO.	CHECK	DATE	PLACE
1	PC	17/08/2013	HATSOFF
2	PC	16/04/2013	HATSOFF
3	PC	21/09/2012	HATSOFF
1	RC	13/10/2012	VORY – VOBZ
2	RC	12/11/2011	VAJJ – SHIRDI
3	RC	13/01/2011	VAJJ - PIPAVAV

He was not involved in any accident/serious incident earlier.

DGCA has intimated the operator after examining their request that Bell 212 and Bell 412 helicopters are variants as per the CAR Section 7 Series B Part X (Appendix H). It was also informed to the operator that Pilots of Bell 212 can undergo recurrent training on Bell 412 helicopter simulator.

1.6 Aircraft Information

Bell 212 helicopter is a single crew certified helicopter with a two-blade semi rigid main rotor and a two bladed tail-rotor. Airframe is a semi-monocoque structure with metal and fiber glass covering. Two longitudinal main beams and pylon support structure provide primary support. The helicopter has got skid with optional airframe mounted emergency pop-out floatation gear.

Helicopter	Bell 212
Registration Mark	VT-HGB
C of R No.	2773/5
C of A No.	2260
Airworthiness Review Certificate Validity	valid till 27-Feb-2014
Weight Schedule	Weighing due on 03-01-2015

Engine type	PT6T-3B
Engine serial no. (LH)	63550
Engine serial no. (RH)	63171
MSN of helicopter	31124
Year Of Manufacture	1980
Category	Normal (Passenger)
Max AUW	5080 KG
A/c Hrs. since new	23575:30
Engine Hrs. (Since Overhaul)	LH - 3107:50 RH - 4531:24
Last Major Inspection	600 Hours / 365 Days Schedule Inspection

The helicopter was equipped with ELT. Details of the Beacon (ELT) installed on the helicopter are as follows:

Beacon Id [15 Hex code]	:	346700078CFFBFF
Beacon Type	:	ELT
Protocol Used	:	Location Protocol
User Protocol	:	Standard Location-ELT (24-bit Address)
Beacon Manufacturer	:	ARTEX
Beacon Model	:	C406-2HM

As per the records available with the operator, following rectification actions were carried out for reported defects for the last one year.

DATE	DESCRIPTION
13-10-12	Replacement of txmn oil pressure transmitter as found defective
06-12-12	Replacement of #2 fuel pressure transmitter as found defective
22-01-13	Replacement of ADF receiver as found not working

03-03-13	Replacement of DME transceiver as for unserviceable
14-03-13	Replacement of T/R hanger assy as found having play
01-04-13	Replacement of #2 AFCU tube assy as found damaged
02-04-13	Replacement of CVR as not passing self test
08-04-13	Replacement of #1 DCCU as found defective

As there was no planned flying in near future, the schedule of flyable storage of the helicopter was carried out on 29.5.2013 at 23575:25 airframe hrs. The flyable storage maintenance schedule / inspection was repeated on the helicopter on 12.6.2013, 27.6.2013, 11.7.2013 and 25.7.2013. De-preservation of flyable storage was carried out on 8.8.2013 followed by 90 days/ 100 hrs. inspection on 10.8.2013. Flyable storage inspection was again carried out on 14.8.2013 at 23575:30 hrs. which was repeated on 28.8.2013, 11.9.2013 and 25.9.2013. On 28.9.2013 100 hrs. /120 days, 100 hrs./ 90 days, ELT functional check, 30 days, 7 days schedule inspections were carried out.

1.7 Meteorological Information

a) Juhu Met section obtains Weather information from Met office at Mumbai Airport. Meteorological briefing for the route Juhu-Aurangabad was obtained from MET section, Juhu at 0700 IST prior to the flight on 29-09-13. The weather at Juhu airport on 29th September 2013 was as under:

Time	07:30 IST
Wind direction/speed	Calm
Visibility	2500 m
Weather	Haze
Cloud	SCT 1000 FT SCT 1800 FT BKN 9000 FT
Temperature/Dew Point	26/25
QNH	1008 HPA
TREND	NO SIG

b) Local forecast for Mumbai & 100nms around, valid up to 290600 UTC is as under.

- Surface winds becoming 120/08 kts.
- Weather Haze, Temporarily showers
- Visibility 3000 m
- Clouds SCT 1500 ft, SCT 1800 ft.
- Warning Visibility likely to be 2000 m in showers between 282100 (UTC) and 290300 (UTC)

c) The details of the weather for Mumbai are as under :-

Time	0210 UTC	0240 UTC	0310 UTC
Wind	170/06 kts	170/05	130/05
Visibility	2500 m	2500 m	2500 m
Weather	Rain	Haze	Haze
Cloud	SCT 1000, SCT 2500, BKN 8000	Few 1200 ft, SCT 2500, BKN 8000	Few 1200 ft, SCT 2500, BKN 8000
Temperature	26°C	26°C	27°C
QNH	1007	1008	1008
QFE	1007	1007	1007
Trend	Temp. 1500 in rain	Temp.1500 heavy rain	Temp. 1500 heavy rain

d) The details of weather at Aurangabad on 29th September are as under:-

Time	0230 UTC	0300 UTC	0330 UTC
Wind	250/03 kts	270/02 kts	260/04 kts
Visibility	4000 m	4000 m	6000 m
Weather	Haze	Haze	-
Cloud	Few 2000,	Few 10000	Few 10000

	SCT 10000		
Temperature	23^{o} C	23^{o} C	24^{o} C
QNH	1010	1011	1011
QFE	942	943	943
Trend	-	-	-

1.8 Aids to Navigation

Helicopter was equipped with VHF, VOR, DME, ATC transponder, Radio Altimeter, GPS, ELT, Search and Rescue Beacon and ULB. All were serviceable prior to the accident flight. The helicopter was also equipped with BENDIX weather radar, RDS-81 type and working on 9345 MHz. There was no reported snag on the weather radar prior to takeoff. During flight the weather radar was not painting even when the selection of the gain was put to maximum.

Aerodrome is equipped with VHF for the navigation.

1.9 Communications:

There was two way communications between the helicopter and ATC. The crew had at no stage reported any difficulty in communication.

1.10 Aerodrome information:

Juhu Aerodrome is operated by Airports Authority of India and located at 281 deg/1.9 NM from Chhatrapati Shivaji International Airport, Mumbai. Aerodrome Reference Code No is 2 and the Aerodrome Reference Code Letter is B. Runway orientation is 08/26 and 16/34 with dimensions of 3716 feet x 50 feet and 2400 feet x 50 feet respectively. Juhu Aerodrome handles all helicopter operations, including private helicopter charters and VVIP operations out of Mumbai.

Elevation of the aerodrome is 20 ft from the mean sea level. The aerodrome can handle 6 helicopter operations at a time and currently handles about 100 helicopter operations a day. Ground lighting facility is not available on the aerodrome. Aerodrome is equipped with VHF for the navigation. All NSOP operations, VVIP operations are carried out from Juhu aerodrome.

1.11 Flight recorders:

The helicopter was equipped with the Cockpit Voice Recorder (CVR) Serial No. 000245922. The CVR was removed from the wreckage at Tukavade village (Thane). The details of the CVR are as follows.

Air India, a scheduled airline has got facility to download the type of CVR installed on the helicopter as the same is installed on the fleet of Air India narrow body aircraft. The main four channels have got the audio recording and there is an additional channel for recording the rotor rpm. The Air India software was being utilized for playing the four audio channels as they are flying fixed wing aircraft.

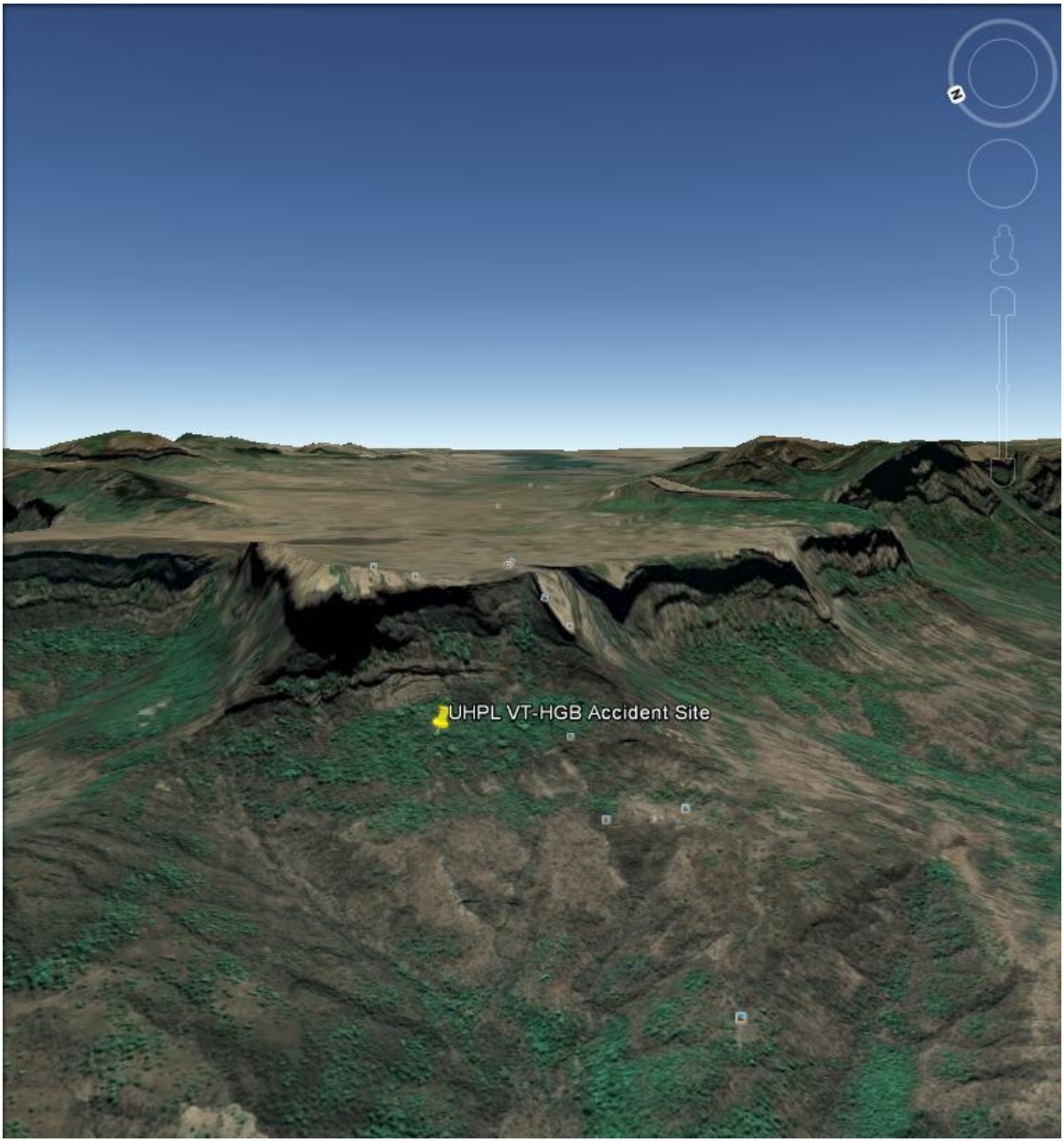
The CVR was brought to Air India CVR lab at Mumbai by the Committee of Inquiry investigating into the causes of accident. It was decided by the Committee that the downloading be carried out and the rotor rpm can be read later, if required, at other facility. The download was carried out for all the four different channels as well as all the four combined channels. It was observed that channel no. 1 and 4 were found without any recording whereas channel no. 2 and 3 were having almost the same (audio) recording. The recording was for half an hour and was clearly audible. The audio files were taken on CD.

Neither there was any requirement of Flight Data Recorder (FDR), nor was any installed on the helicopter.

1.12 Wreckage & Impact Information

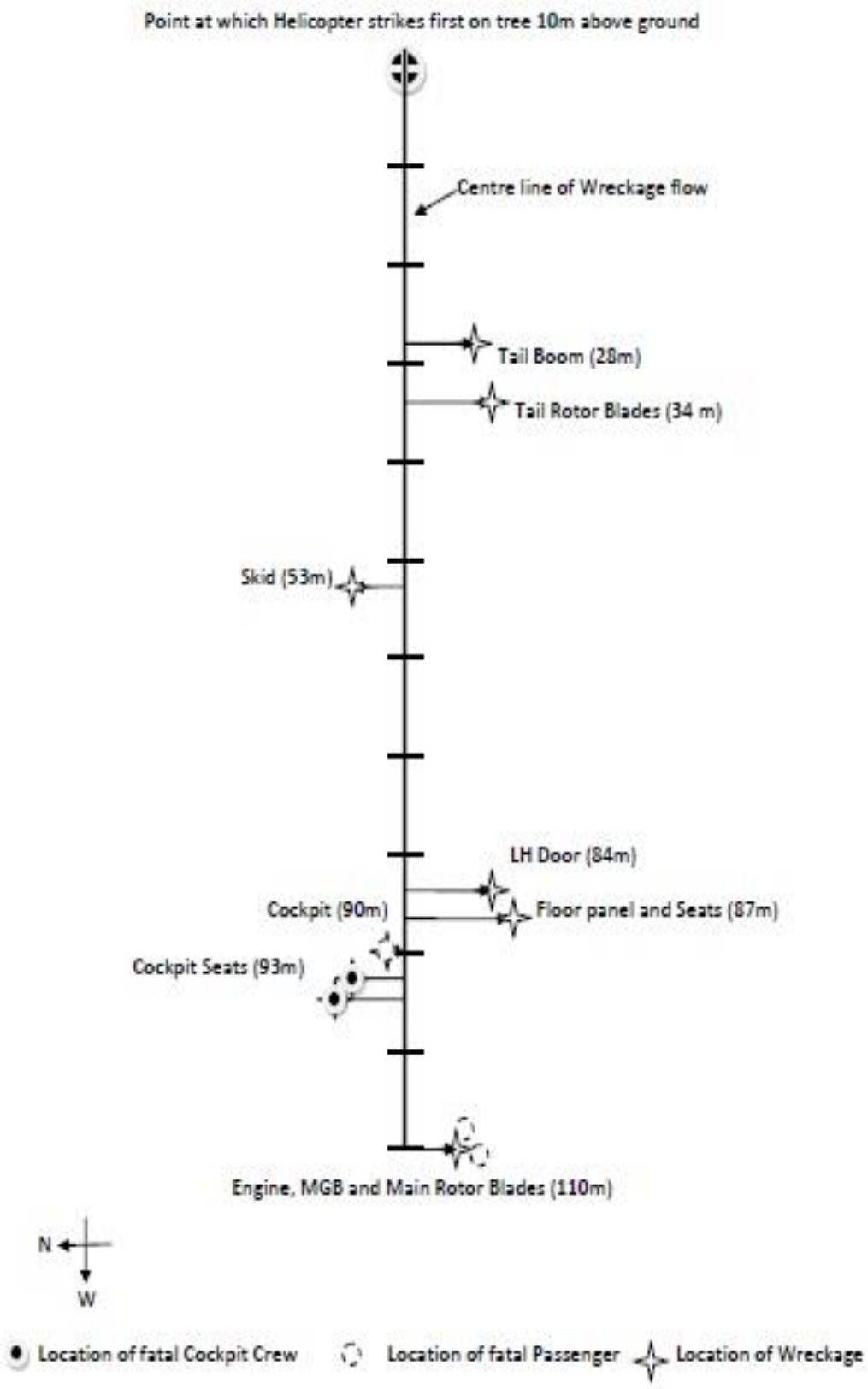
The wreckage was located approximately 85 kms North-East of Mumbai (track 076°) in Murbad district on the slopes of a forested hill. The slopes interspersed with number of rock covered nallahs. The wreckage was spread over approximately 150m. The initial contact was made with the trees probably by the main Rotor Blades after which the Tail-Boom broke away on impact with a tree. The residual forward velocity took the remaining parts consisting of the cockpit & passenger cabin, fuel tank, main gear box assembly and the twin engines further ahead. On contact with the rocky ground surface, it caught fire aided by the ATF spill. The following were the indications on the instruments:

1. Altimeter found at the crash site indicated 5300 barometric altitude with kollsmon window set to 1010 Hpa. The departure airport QNH provided by MET department was 1008 Hpa.
2. ATC transponder found to be set in OFF mode with squawk code set to 7310.
3. Helicopter active communication frequency was found to be set on 123.92 and other radio communication frequency was found to be set 120.90 in OFF mode.
4. Helicopter NAV/DME frequency found to be set on 116.50.
5. Helicopter VSI reading was found to be showing 600 ft/min climb.



PHOTOGRAPH OF THE WRECKAGE SITE TAKEN FROM GOOGLE EARTH

WRECKAGE PLOT



1.13 Medical & Pathological Information

Pre-flight Medical examination of both the cockpit crew members alongwith the breath-analyzer test was carried out. They were found fit to fly and the breath-analyzer test was negative.

1.14 Fire:

The helicopter caught fire after it impacted with the rocky surface which was aided by the ATF spill.

1.15 Survival aspects:

Both the crew and the three passengers received fatal injuries. The post-mortem report indicates the cause of death to be because of 'polytrauma due to multiple fractures with sudden cardio-respiratory arrest'.

The accident was not survivable.

1.16 Tests and research:

NIL

1.17 Organizational and Management information

United Helicharters Pvt. Ltd. (UHPL)

UHPL (earlier UB Air in 1993) started its operations in 2003. It is a current NSOP holder with AOP 1/2003 valid till 31 Aug 2014. During 2013, the Company had eight pilots and three helicopters i.e. one Bell 412 & two Bell 212. UHPL is also certified by DGCA of India to maintain the helicopters under CAR-145/CAR-M. The CEO of the company is from finance background. The Chief Pilot of the Company is a non-flying pilot though he has got very good experience of helicopter flying.

The Company did not have any permanent contract for the leasing of helicopters from April, 2013. The flying was very limited. UHPL was the only

Operator flying Bell 212 helicopter. There was limited flying and as per the company there was no DGCA approved examiner available on type of helicopter. Bell 212 has been accepted as a variant of the Bell 412 by DGCA and the recurrent checks were carried out at HATSOFF, Bangalore whenever an external examiner was not available.

The HATSOFF simulator complex at Bangalore consist of a “mothership” with a rolled-on/rolled-off (RO/RO) platform and four cockpit modules which include Bell 412 cockpit module. The “mothership” encompasses a common platform comprised of Motion system, six degrees-of-freedom; Vibration platform; Visual display system, projectors & CAE MedallionTM-6200 image generator. The flight training device (FTD) is a “docking station’ to which any of the RORO cockpit modules can be attached, effectively converting the module into a Level 6-equivalent FTD. The docking station has its own three-channel 150 x 40 degree visual system.

The office of DAW has carried out spot checks and DGCA has carried out surveillance as per the surveillance program in the year 2012 & 13. There was no class I findings and action was taken on all the observations / findings made by the surveillance teams. In addition Cairn Energy (P) Ltd. has also audited the operator in October 2012. The audit report appreciated the existence of satisfactory SMS in the organisation.

Directorate General of Civil Aviation (DGCA)

The Directorate General of Civil Aviation (DGCA) is the Regulatory Authority in the field of Civil Aviation in India. It is responsible for regulation of air transport services to/ from/ within India and for enforcement of Civil Air Regulations, Air Safety and Airworthiness Standards. Section 4 of the Aircraft Act, 1934 empowers the Central Government to make rules and Section 5A of the said Act empowers the Director General to issue directions for securing the safety of aircraft operations. Rule 29C of the Aircraft Rules 1937 enables DGCA to lay down standards and procedures not inconsistent with the Aircraft Act, 1934. In accordance with rule 133A of the Aircraft

Rules, 1937, the Director General may issue, inter-alia, Civil Aviation Requirements not inconsistent with the Aircraft Act, 1934 and the rules made there under.

DGCA CAR, Section 7 – Flight Crew Standards Training & Licensing, Series B, Part XIV deals with the recurrent training requirements for helicopter pilots. Para 2.2 Recurrent Checks, (b) (i) Simulator Training, of the CAR requires that At least 5 hours of instrument flying training shall be carried out by a pilot, holding instrument rating on a specific to type flight simulator within two years. In case a specific type simulator is not available instrument flying training may be carried out on type of helicopter on which the pilot holds a current instrument rating and Para 2.2 Recurrent Checks, (b) (ii) 'Simulator Training for critical emergencies' of the CAR requires that "At least 5 hours of mandatory practice of critical emergencies in simulator such as engine failure, system failure, tail rotor failure etc. which cannot be practiced or simulated in actual flying shall be carried out by a pilot on specific type of flight simulator once in two years. The satisfactory simulator test report shall be submitted to the Directorate General of Civil Aviation along with application for renewal of pilot licence."

The foreword to the Surveillance Program of DGCA covers the following:

> "DGCA has developed a system of surveillance to ensure continuing organizational, as well as individual, professional competency of licence/ rating/ certificate/ approval holders, continuing capacity to maintain a safe and regular operation by air operators and service providers. Surveillance aims to identify and correct non-compliance behaviors and unsafe practices before they cause any accident or incident. DGCA surveillance activity covers all participants in Civil Aviation System. Normally, all activities of each organization/ operator is inspected within a period of one year."

Further as per the the Regulatory Audit Policy contained in the Manual of Regulatory Audit of DGCA, the organisations who are operating 3 aircraft will be audited every alternate year.

1.18 Additional Information:

Search & Rescue

The Search & Rescue service in India is organized in accordance with the Standards and Recommended Practices of ICAO Annex 12 by the Airports Authority of India in collaboration with the Ministry of Defence. In addition, various other departments of the Central and State Governments are available for search and rescue missions when required.

ELT make ARTEX 'C' 4062 HM was installed on the helicopter on 11 Apr'13. ELT had 121.5 MHZ and 406 MHZ as operating frequencies. It was observed by the Go team that the ELT flashlight was glowing/ blinking. The ELT was intact and not damaged but the ELT antenna was not available in the wreckage. The ELT signals were not received by the authorities concerned.

1.19 Useful or effective investigation techniques:

NIL

2. ANALYSIS

2.1 Serviceability of the Helicopter

The helicopter was operated under Non-Scheduled Operator's Permit No. 01/2003 which was valid at the time of accident. The Certificate of Airworthiness was valid. The helicopter was being maintained as per the maintenance program consisting of calendar period/ flying Hours or Cycles based maintenance approved by DGCA. All major inspections and subsequent all lower inspections (Preflight checks, Service Checks, Weekly Checks) were carried out as and when due before the accident.

All the concerned Airworthiness Directive, Service Bulletins, DGCA Mandatory Modifications on this helicopter and its engine had been complied with as on the day of accident. The defect records were scrutinized and there was no defect pending on the helicopter prior to the flight. No Minimum Equipment List (MEL) was invoked prior to the accident flight.

As there was no planned flying in near future, the schedule of flyable storage of the helicopter was carried out on 29.5.2013 at 23575:25 airframe hrs. The flyable storage maintenance schedule / inspection were repeated on the helicopter on 12.6.2013, 27.6.2013, 11.7.2013 and 25.7.2013. De-preservation of flyable storage was carried out on 8.8.2013 followed by 90 days/ 100 hrs. Inspection on 10.8.2013. Flyable storage inspection was again carried out on 14.8.2013 at 23575:30 hrs which was repeated on 28.8.2013, 11.9.2013 and 25.9.2013.

Though the above maintenance actions were as per the approved maintenance program, but the prolonged storage (4 months) of the helicopter and its subsequent release to flight without carrying out a flight test in the monsoon season was not prudent as proved by the subsequent events. Even the DGCA circular regarding operations during monsoon requires a positive confirmation of the serviceability of the weather Radar which cannot be confirmed without a flight.

On 28.9.2013, 100 hrs /120 days, 100 hrs./ 90 days, ELT functional check, 30 days, 7 days schedule inspections were carried out.

The CVR readout has the following transmissions by the crew to the engineer on board:

- "Radar should give us something where are we entering."
- "It is not painting yar."
- "…… your radar is not working weather radar."
- "From start it was not working."
- "It was not painting. It is not painting at all."

The CVR readout of the flight reveals that the Weather Radar was not working during the flight.

2.2 Crew Qualification & Proficiency

Both the crew held valid license and were qualified on type. The PIC was IR rated. The Co-Pilot was not IR rated. The PIC had a total flying experience of 3703:10 hrs out of which 1432:00 hrs were on Bell 212 helicopter. The Co-Pilot had 1727:00 hrs of which 451:10 hrs were on Bell-212. The simulator training and checks on simulator were carried out on Bell 412. DGCA has accepted Bell 412 and Bell 212 as variant for the purpose.

The Bell 412 helicopter is a successor model to the Bell 212. Although the cockpit configurations of both the models are similar, the Bell 212 has a two bladed rotor system whereas the Bell 412 has four blades. Hence the effects of control movements of both the models are different. Further the autopilot system especially the coupler which is of importance in bad visibility along with number of up gradations of the cockpit instrumentation of Bell 412, suggest that the two models to be grouped separately and not as variants.

In the instant case it was observed that pilot had undergone training on Bell 212, (a model having Bell 412 as variant) and the papers forwarded for initial

endorsement. The licence was however endorsed with both the variants i.e. Bell 212/412. The endorsement of the variant should have been made only after undergoing variant training, as specified in the CAR. The recurrent training utilizing a variant can be carried out only after undergoing variant training and licence endorsed.

None of them were earlier involved in any serious incident or accident. The company has intimated that the flight was cleared under SVFR conditions.

2.3 Adherence to Procedures

Crew copied all the instructions given by the Air traffic Control. The route of the flight Juhu (Mumbai) to Aurangabad is a recognised ATS route, G450. The filing for 2000 AGL may have been influenced because the co-pilot was unrated and flying at higher levels would have entailed IMC necessitating an IFR flight plan.

It would have been more appropriate to file the VFR flight plan as per the level given in the Jeppesen chart.

2.4 Flight Planning

The pilots were detailed for the flight on 26 Sep 2013. They were briefed regarding the requirement to ferry the helicopter to Nagpur on 29 Sep 2013 and thereafter operate from Nagpur for 30 days.

The flight was planned to takeoff from Juhu at 0200 UTC due to the limited watch hours at Aurangabad and refusal by Aurangabad to extend the watch hours.

No special briefing regarding the routing was given as the flight was from one airfield to another i.e. from Juhu to Aurangabad. Routing followed is the ATS routing.

2.5 Weather

CAR section 4 Series E Part I Para 3.6.2.4 states that

> "3.6.2.4 Weather deterioration below the VMC.
> When it becomes evident that flight in VMC in accordance with its current flight plan will not be practicable, a VFR flight operated as a controlled flight shall:

a) request an amended clearance enabling the aircraft to continue in VMC to destination or to an alternative aerodrome, or to leave the airspace within which an ATC clearance is required; or
b) if no clearance in accordance with a) can be obtained, continue to operate in VMC and notify the appropriate ATC unit of the action being taken either to leave the airspace concerned or to land at the nearest suitable aerodrome; or
c) if operated within a control zone, request authorization to operate as a special VFR flight; or
d) request clearance to operate in accordance with the instrument flight rules.

The following are the relevant portion of the CVR transcript indicating that the crew was aware of poor visibility conditions immediately after take-off.

> "How is the weather?"
> "Give me wiper yar shortly."
> "Because here the clouding is there."
> "Now I can't really make out where are we are. Where are we are."

No action was taken by the crew as per the existing instructions/ procedures laid down in the subject CAR. The crew did not review the situation and nor had abandoned further flight due to the weather situation. It appears that the crew chose to fly in Instrument meteorological conditions, whereas the flight was to be conducted as per the visual flight rules. As seen from the CVR readout they were encountering clouds almost from the beginning. The crew displayed undue eagerness to press ahead with the flight as per the flight

plan in VFR despite poor visibility. At 0245 UTC and at a distance of 85 kms from Mumbai, the PIC decided to fly on Instruments.

2.6 Spatial Disorientation

Senses during Flight:

During the abnormal acceleratory environment of flight, the vestibular and proprioceptive systems do not respond vertically. Because of inertial forces created by acceleration of the aircraft along with centrifugal force caused by turning, the net gravitoinertial force sensed primarily by the otolith organs is not aligned with gravity, leading to perceptual misjudgment of the vertical. In addition, the inner ear contains rotational "accelerometers," known as the semicircular canals, which provide information to the lower brain on rotational accelerations in the pitch, roll and yaw axes. However, prolonged rotation (beyond 15-20 s) results in a cessation of semicircular output, and cessation of rotation thereafter can even result in the perception of motion in the opposite direction. Under ideal visual conditions the above illusions are unlikely to be perceived, but at night or in weather the visual inputs are no longer capable of overriding these illusory non-visual sensations. In many cases, illusory visual inputs such as a sloping cloud deck can also lead to misjudgments of the vertical and of speed and distance or even combine with the non-visual ones to produce an even more powerful illusion. The result of these various visual and non-visual illusions is spatial disorientation.

Effects of Disorientation:

Once an aircraft enters conditions under which the pilot cannot see a distinct visual horizon, the drift in the inner ear continues uncorrected. Errors in the

perceived rate of turn about any axis can build up at a rate of 0.2 to 0.3 degrees per second. If the pilot is not proficient in the use of gyroscopic flight instruments, these errors will build up to a point that control of the aircraft is lost, usually in a steep, diving turn known as a graveyard spiral. During the entire time, leading up to and well into the manoeuvre, the pilot remains unaware that he is turning, believing that he is maintaining straight flight.

In the present case, the crew had entered the severe poor visibility weather conditions. The following portion of CVR transcript

PF	OK now concentrate on instruments ha.
	I am on instruments
PNF	OK
	Reduce speed.
	Right is clear
	Now can we descent down a little.
PF	No, I will not
PNF	Just fly orbit……. You want to turn back?
PF	No
PNF	Your rate of descent … rate of descent … rate of descent
PF	Mine is OK
	I have controls
PNF	We are going down We are going down.
PF	We are not going down.. Hold on ..Leave the controls..

Almost immediately thereafter, as Spatial Disorientation had set in, it resulted in the crash. Further the following CVR transcript indicates that the PIC was not very much familiar with the track/ terrain.

"Am I steering correctly?"

"Is this my track?"

"What am I supposed to track now?"

"Have we crossed Thane now?"

2.7 Regulatory Oversight

The operator was carrying out operation of helicopter under NSOP and the maintenance of helicopter under CAR 145. Both these approvals were by DGCA and were valid on the date of accident. Scrutiny of records revealed that no regulatory audit of the Organisation was carried out in the year 2012 & 2013.

2.8 Pilot Handling of Helicopter & Circumstances leading to the Accident

The flight plan was filed to fly the route under VFR conditions at 2000 feet AGL with endurance of 02:30 hours. At 0217 UTC the helicopter took off from Juhu with a compliment of two crew and three passengers. The helicopter took off in known bad weather due to the limited watch hours at Aurangabad and refusal of Aurangabad to extend the watch hours. As the VMC conditions did not exist in terms of visibility and cloud base, the flight was cleared as 'Special VFR'. From the CVR read out it is clear that:

- They experienced poor visibility right from the beginning.
- The pilot was not very familiar with the terrain.
- The radar was unserviceable.

The flight was continued in poor visibility and without adequate terrain clearance. The pilot tried to maintain ground contact, resulting in not having safe ground clearance. The last contact with the helicopter was at 0243 UTC (25mins 32secs after takeoff). The pilot encountered IMC conditions at 0245 UTC (approximately 27mins after takeoff) and decided to fly on instruments. At approximately 0248 UTC, complete Spatial Disorientation set in, resulting in the fatal crash.

3. CONCLUSIONS:

3.1 Findings:

1. The operator was carrying out operation of helicopter under NSOP and the maintenance of helicopter under CAR 145.
2. No regulatory audit of the Organisation was carried out in the year 2012 & 2013.
3. UHPL was the only operator in the Country flying Bell 212 helicopter.
4. There was no DGCA approved examiner available on type of helicopter.
5. The Company did not have any permanent contract for the leasing of helicopters from April, 2013. The flying therefore was very limited.
6. DGCA has intimated to the operator that Bell 212 and Bell 412 are variants as per the then CAR Section 7 Series B Part X (Appendix H). For the last two years Bell 412 simulator at HATSOFF was utilized for the training/checks.
7. The Certificate of Airworthiness and the Certificate of Registration of the helicopter was valid on the date of the accident.
8. The certificate release to service (CRS) was valid at the time of accident.
9. The defect records were scrutinized and there was no defect pending on the helicopter prior to the flight.
10. The helicopter was under flyable storage since 29.5.2013. De-preservation of flyable storage was carried out on 8.8.2013 followed by 90 days/ 100 hrs. Flyable storage inspection was again carried out on 14.8.2013 at 23575:30 hrs. and was repeated periodically till 28.09.2013. No flight check was conducted prior to releasing the helicopter for the positioning flight as this was not required as per the Company's approved maintenance schedule.

11. ELT functional check was carried out on 28.9.2013. The ELT antenna got detached during the accident from the ELT therefore, though the ELT was functional (blinking) but the signal was not transmitted /captured by the designated organizations.
12. The PIC was IR rated. The Co-Pilot was not IR rated.
13. The PIC and co-pilot were holding a valid license on the type of helicopter.
14. The licence of the PIC was endorsed as Bell 212/412 after undergoing initial type rating only on Bell 212. On the basis of this endorsement the PIC undertook all his Proficiency Checks from August 2012 on the Bell 412 simulator at HATS OFF without doing the variant training specified in CAR.
15. The PIC subsequently underwent the variant training on Bell 412 in March 2013 at HATS OFF.
16. None of the crew was earlier involved in any serious incident or accident.
17. The early take off of helicopter VT-HGB from Juhu had been necessitated by refusal of Aurangabad to extend watch hours in the morning thereby indirectly contributing to the accident.
18. The flight was cleared under SVFR conditions although the copilot was unrated and neither undergone SVFR capsule.
19. It appears that the crew had flown in Instrument meteorological conditions, whereas the flight was to be conducted as per the visual flight rules.
20. The CVR readout of the flight reveals that the Weather Radar was not working during the flight.
21. Though the two helicopters (Bell 212 and Bell 412) are considered as variants but the feel on the controls for a two bladed helicopters (Bell 212) and four bladed helicopter (Bell 412) is quite different, which may required different quantum of corrective actions in case of emergencies.

22. The flight was planned to takeoff from Juhu at 0200 UTC in known bad weather due to the limited watch hours at Aurangabad and refusal of Aurangabad to extend the watch hours.

23. No special briefing regarding the routing was given as the flight was from one airfield to another. Routing followed is the ATS routing.

24. It appears that the pilot was under mental compulsion to complete the flight as there was not much flying by the company in the recent past and fulfilling the flying contract from Nagpur for 30 days was very important from commercial point of view also.

3.2 Probable cause of the Accident:

The accident was caused due pilot continuing the flight in very poor visibility conditions with insufficient ground clearance and hitting the hill due to spatial disorientation. Non-functioning of the weather radar and non-familiarity of the pilot with the terrain along with lack of currency on the specific type contributed to the accident.

4. SAFETY RECOMMENDATIONS:

1. DGCA may carry out **regulatory audit** of the Operator.
2. DGCA may issue instructions that all the Non Scheduled Operators should have a **flying (current) professional atleast at one of the key post(s)** to have a better control on operations from safety point of view.
3. DGCA may consider grouping Bell 212 and Bell 412 **as two different models** for training/ currency. In such cases DGCA may also specify the minimum currency on each model including Proficiency Checks to enable aircrew to fly both models simultaneously.

4. DGCA may consider making it mandatory for pilots to undergo the ground training and part of the syllabus on a simulator facility followed by training on the actual helicopter **for the initial award of IR** to newly licensed pilots ***(including those with vast VFR experience)***. The quantum of training on simulator should be at least 50% of the total IR training syllabus.
5. Mechanism may be developed by AAI to ensure that the request of non schedule operators for **extension of watch hours** is favourably considered by the Airport Authorities.
6. DGCA may consider **imposing additional maintenance checks**, if considered necessary in view of the local operating environment while approving a Company's Aircraft Maintenance programme.
7. DGCA may issue instructions that the operators must ensure that **while operating in Special VFR conditions** both the crew are IR rated. If the co-pilot is not IR rated then (s) he should have undergone the Special VFR training. An unrated co-pilot may be permitted to fly only with an Examiner/Instructor.

R.S. Passi, Chairman
Committee of Inquiry

Capt. V.M. Satish Koikal, Member
Committee of Inquiry

K. Chandra Shekhar, Member
Committee of Inquiry

DATE 12.12.2014
PLACE NEW DELHI