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DIRECTORATE GENERAL OF CIVIL AVIATION

FINAL INVESTIGATION REPORT ON SERIOUS INCIIDENT TO M/S. GLOBAL VECTRA HELICORP LTD HELICOPTER, VT-AZT AT BOMBAY NORTH FIELD, MUMBAI, MAHARASHTRA

SERIOUS INCIDENT ON 19TH APRIL. 2012

REPORT SUBMITTED ON 25/09/2012.

OFFICE OF DIRECTOR OF AIRSAFETY (WESTERN REGION)
GOVERNMENT OF INDIA
MUMBAI OLD AIRPORT, MUMBAI-400029.

FINAL INVESTIGATION REPORT ON SERIOUS INCIDENT TO M/s GLOBAL VECTRA HELICORP LTD. HELICOPTER, VT-AZT, AT MUMBAI, ON 19.04.2012.

GENERAL INFORMATION:-

1.	Aircraft Type	: BELL
	Model	: 412 EP
	Nationality	: INDIAN
	Registration	: VT-AZT
2.	Name of the Owner/ Operator	: Global Vectra Helicorp Limited
3.	Pilot in command	: ATPL holder
	Extent to injury	: Nil
4.	Co-Pilot	: CHPL holder
	Extent to injury	: Nil
5.	Place of the Accident	: WI3 Unmanned platform (ONGC), Bombay
6.	Date and Time of Accident	: 19 Apr 2012 & approximately at 0932 IST
7.	Last point of Departure	: WI3
8.	Point of intended landing	: NQO (ONGC)
9.	Geographical location of site	: 19°35′00″N 071°19′30″E
10.	Type of operation	: Production Task
11.	Phase of operation	: Take off
12.	Type of accident	: Non Fatal

SYNOPSIS:-

Global Vectra Helicorp Ltd's helicopter Bell 412EP helicopter VT-AZT; S/N-36422 was engaged in routine production sortie at ONGC North Field, Mumbai offshore. On 19.04.12 during takeoff from WI3 while raising the collective the pilot felt some restriction to the upward movement of the collective lever and simultaneously the crew heard a popping sound. As more power was applied for takeoff, the aircraft took two rotational turns to the right, out of the deck, and then stopped turning. Helicopter proceeded to nearby NC deck where it made one more rotational turn to the right and a controlled landing was executed. Engine shutoff and subsequent activities were performed in the normal manner as per the procedures. Post flight inspection revealed that approximately 10 inches each of both the tail rotor blades were sheared off at the tips and there was skin damage on one main rotor blade.

The incident was immediately notified to the regulatory authority by GVHL and the same was investigated by inquiry officer under Rule 77C of aircraft rule 1937.

The probable cause of the serious incident was the pilot's error of judgment and inadequate proficiency to maintain directional stability in hover. The inadequate D value of helidecks for Bell 412 type of helicopter was the contributory cause.

1. FACTUAL INFORMATION:

1.1HISTORY OF FLIGHT: (All the timings are in IST)

Global Vectra Helicorp Ltd Bell 412EP Bell 412EP helicopter VT-AZT; S/N-36422 was engaged in production sortie at ONGC North Field in Bombay High, Mumbai offshore on 18.04.12, which culminated in night halt at NQO deck.

On 19.04.12, the preflight inspection was carried out and certified by type endorsed AME/ CA holder at 0630 Hrs. The pilot received weather report with information as - wind 330/16, QNH 1008 & temperature 27 deg C- from the radio officer at NQO deck.

The helicopter was accepted by the pilot at 0643 Hrs and was started-up for production sorties at 0705 Hrs with departure Fuel of 1540 Lbs. It was flown for 50 Minutes with 07 Landings and switched off at WIN platform at 0755 Hrs. After refueling at 0800 Hrs and compliance of Part 'A' of FAA AD 2008-10-03 (Visual Inspection of Tail Rotor Blades before each start) at 0803 Hrs by type endorsed AME/ CA holder the helicopter was accepted by the pilot at 0812 Hrs.

The helicopter departed at 0830 Hrs with departure fuel of 1300 Lbs, flown for 25 Minutes with 02 Landings and switched off at WIS platform at 0855 Hrs.

After compliance of Part 'A' of FAA AD 2008-10-03 at 0900 Hrs by the pilot and refueling at 0904 Hrs, the third leg of production sortie to NQO with en-route Rotor ON operations at NC and WI3 commenced at 0910 Hrs with departure fuel of 2080 Lbs..

While approaching WI3 deck it was felt that the wind was not as per the weather report received earlier and the co-pilot cross checked with the Radio Officer at WIN platform who responded with the phraseology "CALM 070/12 knots". There was no wind sock at WI3 to corroborate the direction of wind. The helicopter was landed at WI3 where four passengers disembarked.

During takeoff from WI3 while raising the collective, the pilot felt some restriction to the upward movement of the collective and simultaneously the crew heard a popping sound. The pilot checked the right side of the helicopter for anything

unusual and directed the co-pilot to check the left side. Nothing unusual was observed and pilot continued with the pickup.

As the helicopter lifted off the deck it started turning to the right and initially directional control could not be maintained. The Helicopter took two rotational turns to the right, out of the deck, and then directional control was regained and commenced forward flight.

The popping sound during takeoff was heard by the passengers on board, disembarked passengers and some other personnel posted at the off-shore platform. Once the helicopter was clear off the deck some metal pieces were found lying on the deck and some damage to crane cabin was also observed by personnel at the off-shore platform. They informed the matter to the radio officer at WIN platform and others concerned.

In the forward flight nothing unusual was noticed, all parameters were normal and no vibration was felt. However the pilot decided to get the helicopter checked by the type endorsed AME/CA holder who was available at WIN platform. The pilot requested the radio officer for clearance to land at WIN platform but it was denied as ATF transfer was in progress at WIN. Finally clearance was given by the radio officer for landing at NC platform which is adjoining WIN platform and the crew proceeded to NC platform. The approach was normal and nothing unusual was felt until the helicopter came to low hover at nearly zero forward speed where it had a tendency to turn to right. The helicopter made one rotational turn to the right. A safe landing was executed with caution. Engine shutoff and subsequent activities were performed in the normal manner as per the procedures. Post flight inspection revealed that approximately 10 inches each of both the tail rotor blades were sheared off at the tips and there was skin damage on one main rotor blade.

There were no injuries to the crew, passengers on board or personnel available at the off-shore platform.

1.2INJURY TO PERSONNEL:

Injuries	Crew	Passenger	Others
Fatal	nil	nil	nil
Serious	nil	nil	nil
Minor/nil	02	02	nil

1.3DAMAGE TO HELICOPTER:

Approximately 10 inches each of both the tail rotor blades were sheared off at the tips and there was skin damage on one main rotor blade.

1.4 OTHER DAMAGE:

At the offshore platform following damages were observed:

1. Hole in the crane cabin top glass & side glass.

2. Obstruction light was damaged.
3. Scratches on the railing near the crane strobe light.

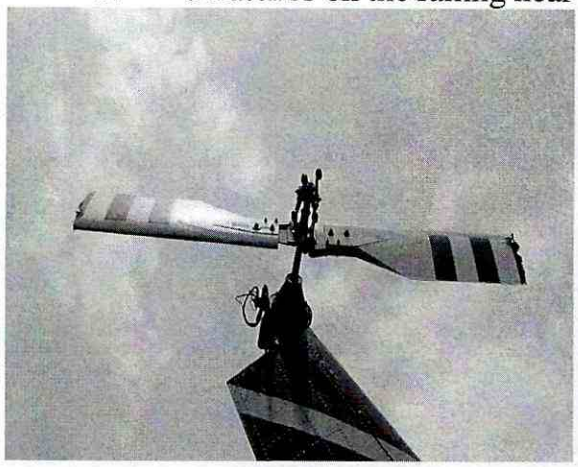

Fig. a

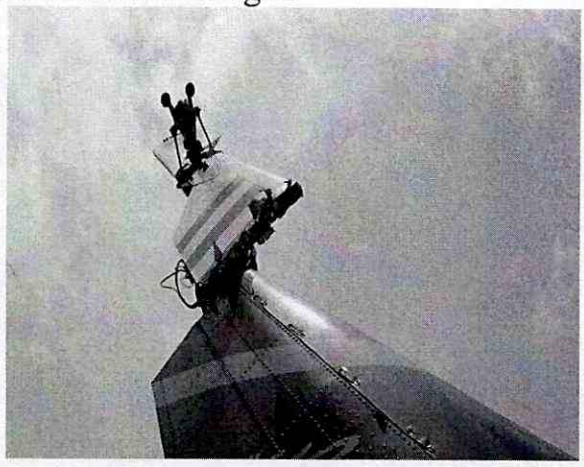

Fig. b

Fig. C

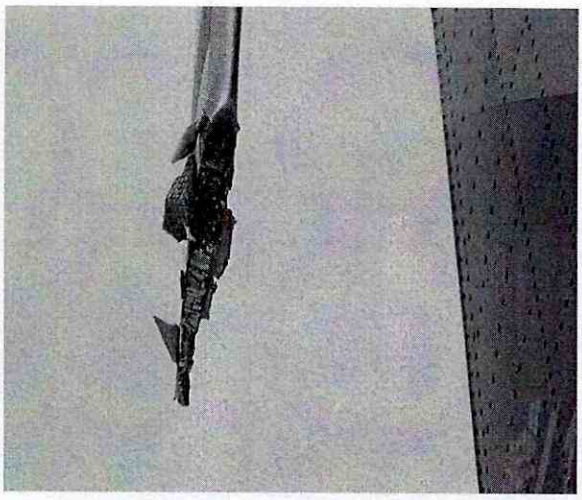

Fig. D

Fig. E

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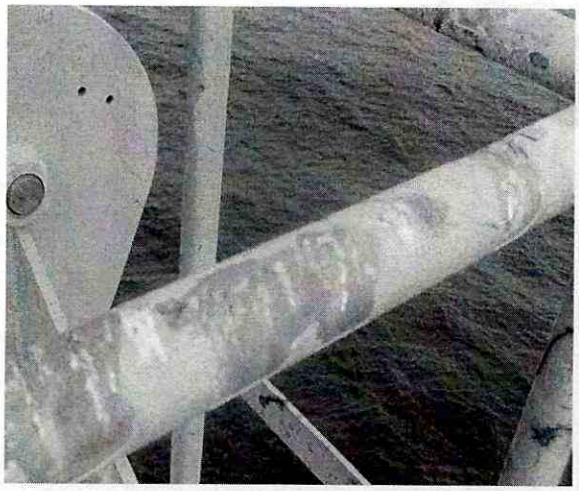

Fig. G

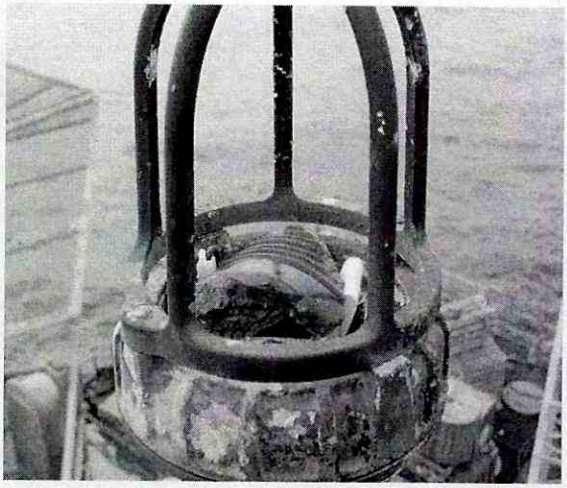

Fig. H

Fig. I

Fig. J

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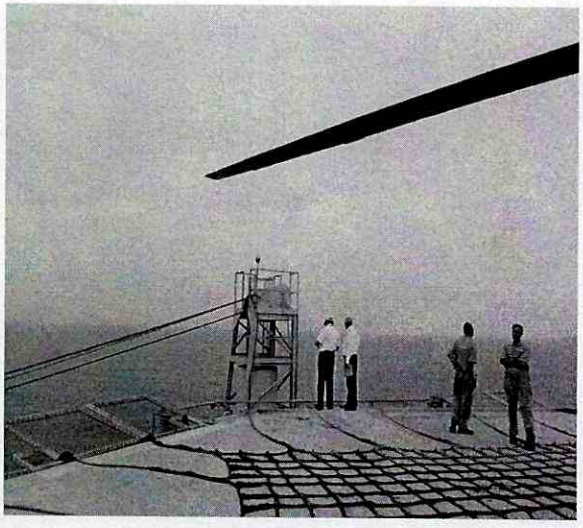


Fig. L

1.5 PERSONAL INFORMATION:

1.5.1 PILOT IN COMMAND

The pilot in command has more than 9600 Hrs of total flying experience and more than 7000 Hrs experience on Bell 412 helicopter. His proficiency test was carried out by DGCA approved instructor on 08.11.2011

Date of Birth	:	19.05.1957
Age	:	54 Years 11 Months
Details of license (Helicopter)	:	ATPL holder
Issued on	:	17.11.2010
Last Med. Exam.	:	14.03.2012
Total Flying experience	:	9626 Hrs
Total flying experience as PIC	:	6028 Hrs
Total flying experience on Bell 412	:	7148 Hrs
During last 90 days	:	142:35 Hrs
During last 30 days	:	42:35 Hrs
During last 7 days	:	12:00 Hrs
During last 24 hours	:	4:25 Hrs

1.5.2 CO-PILOT

The Co-pilot has more than 4000 Hrs of total flying experience and more than 1500 Hrs experience on Bell 412 helicopter. His proficiency test was carried out by DGCA approved instructor on 24.03.2012

Date of Birth	:	12.08.1961
Age	:	50 Years 08 Months
Details of license (Helicopter)	:	CHPL holder
Issued on	:	21.08.2011
Last Med. Exam.	:	06.03.2012
Total Flying experience	:	4051 Hrs
Total flying experience as PIC	:	1515.4 Hrs
Total flying experience on Bell 412	:	1582.1 Hrs
During last 90 days	:	72:05 Hrs
During last 30 days	:	72:05 Hrs
During last 7 days	:	13:50 Hrs
During last 24 hours	:	4:25 Hrs

1.6 HELICOPTER INFORMATION:

Bell 412 EP Helicopter VT-AZT bearing S/N: 36422 have a four bladed main rotor and two bladed anti-torque tail rotor. It is powered by two PT6T-3DF turbo shaft

engines. It is fitted with Skid type landing Gear and provided with floatation kit for emergency landing over water.

It was manufactured by Bell Helicopter Textron Canada, Ltd. in the year 2006. The helicopter is registered in India with Registration Certificate No.3571/2 in Cat "A" on 31.07.2007 with Owner as Cessna Finance Corporation, USA and Operator as Global Vectra Helicorp Ltd, India. Certificate of Airworthiness No. 2980 in Normal Category was issued on 30.07.2007 & C of A was revalidated up to 18.03.2016 on 26.03.2012. Its ARC number is AZT/2980/ARC 1st/ 2011/172 and it is valid till 28.03.2013. Its aero mobile station Licence No. is A-0004/004/WRLO-07 which is valid till 31.12.2012. Its Empty weight is 7562.60 Lbs and authorized Max. AUW is 11900 Lbs.

The Helicopter is maintained by Global Vectra Helicorp Ltd, Mumbai. 3000 hrs/05 Yrs airframe inspection schedule was carried out at 2499.7 A/F Hrs. on 02.02.2011 and Last 100 Hrs/90 Days inspection was carried out at 3745.8 A/F Hrs on 17.04.2012. Airframe Hours at the time of incident was 3753.2 Hrs. After carrying out Post flight inspection & Desalination wash, Certificate of release to service in respect of the helicopter was issued on 18.04.2012 and the Helicopter performed production sorties on the same day which culminated in night halt at the off-shore platform. Before releasing the helicopter for the first sortie on 19.04.2012 the Preflight inspection was carried out by type endorsed AME/CA holder and subsequently FAA AD 2008-10-03 was carried out by type endorsed AME/CA holder and Pilot when the helicopter was switched off for refueling at different locations. No abnormalities of the tail rotor blades were observed during any of these inspections.

Flying details of the helicopter, its engine and combining gar box are documented in different log books and the brief is as follows:

Airframe Hours

I)	Total Hours since new	: 3753.2 Hrs.
II)	Hours since last C of A renewal	: 103.6 Hrs.
III)	Hours since last 100hrs/90 days Inspection	: 7.4 Hrs

1 Engine Hours:

I)	Engine type	: PT6T-3DF
II)	Engine Serial No	: CP-PS-TH-0783
III)	Hours since new	: 3753.2 Hrs.
IV)	Hours since last O/H	: New Engine

2 Engine Hours:

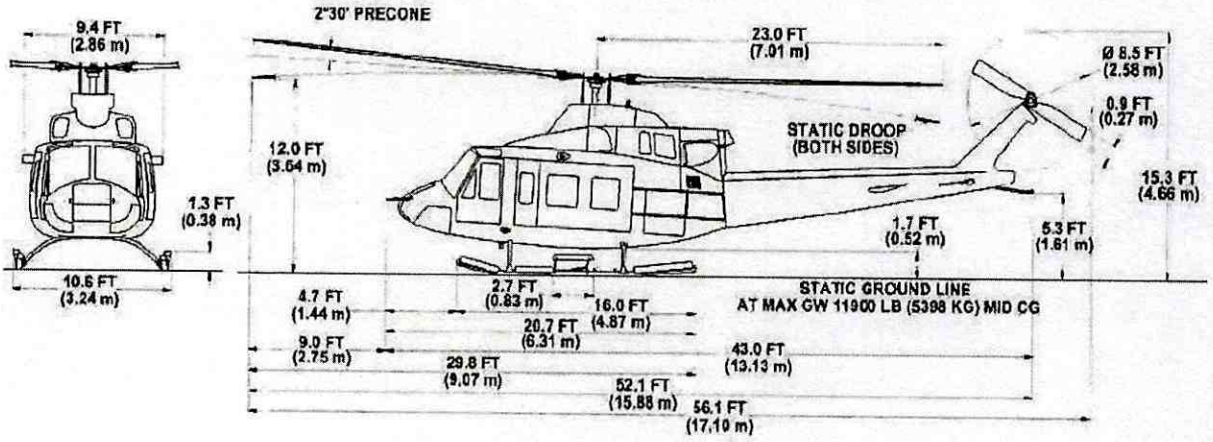
I)	Engine type	: PT6T-3DF
II)	Engine Serial No	: CP-PS-TX-0128
III)	Hours since new	: 4842.2 Hrs.
IV)	Hours since last O/H	: 344.2 Hrs

CGB Hours:

I)	Engine type	: PT6T-3D
II)	Engine Serial No	: CP-GB-TJ-0062
III)	Hours since new	: 11020.6 Hrs.
IV)	Hours since last O/H	: 2667.4 Hrs

As per weight schedule Max authorized AUW 11900 Lbs and Takeoff weight at the time of incident was 10376 Lbs

Helicopter's dimension. (D value 17.1 meter)



1.6.1 TAIL ROTOR:

Tail rotor system of Bell 412 EP helicopter consist of a tail rotor drive, 42 degree gear box, tail gear box & tail rotor assembly. The tail rotor assembly comprises of tail rotor hub assembly & two tail rotor blades.

1.6.2 EMERGENCY PROCEDURE-TAIL ROTOR FAILURE:

Tail rotor failure is indicated by uncontrollable turns towards the right. The rate of turn will be dependent on the amount of loss of tail rotor thrust.

1.6.3 STANDARD TAKE-OFF PROCEDURE:

a. Bring the helicopter to hover. Note the cyclic position to determine if the aircraft is properly loaded. Check the hover power and determine the reserve power available.
b. Check takeoff path clear.
c. Smoothly ease the cyclic stick forward. Use collective to maintain height using 10% above hover power, not exceeding 100 % torque.
d. Use rudder pedal to maintain heading and a straight path throughout the takeoff leg.
e. As translational lift is gained maintain attitude so as to remain within safe height-velocity chart.

Tail-wind condition:

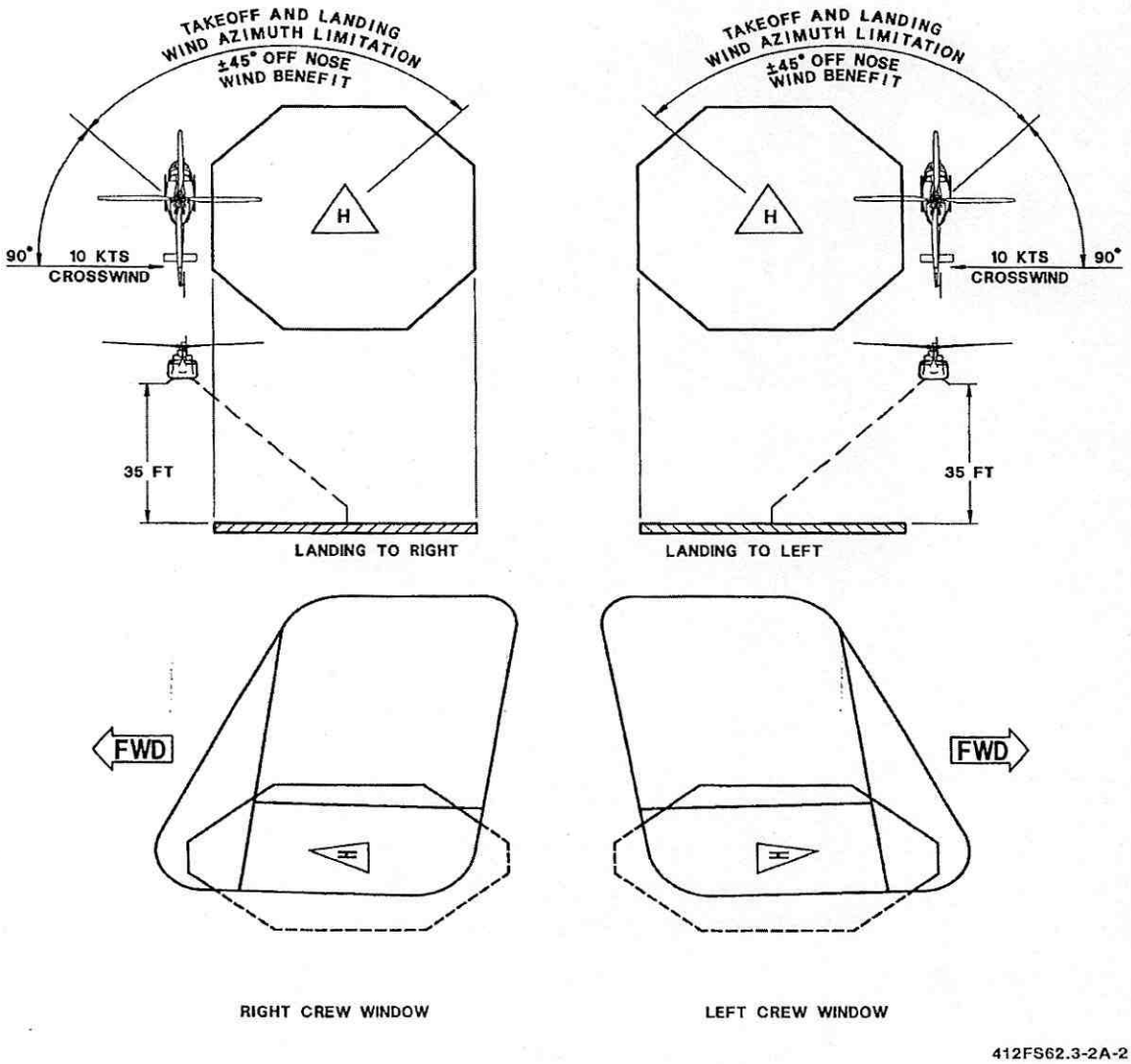


Figure 2A-2. Decision Points (TDP or LDP) Sight Pictures

1.7 METEOROLOGICAL INFORMATION :

Weather was good with clear sky & good visibility, Temperature 27 degree Celsius & wind speeds 12 knots.

The weather as per the IMD Website for that day as depicted below:

Forecast:

Valid At	Wind Direction	Wind Speed/Gust (10m)	Wind (60m)	Wind Sea	Swell Direction	Swell Height	Swell Period	Sig Height	Max Wave	Sunrise/ set
18/0600	NW	13/17	18	1.0	SSW	0.5	10	1.1	1.7	0624
18/1200	NNW	9/13	13	0.4	SSW	0.5	10	0.6	0.9	-
18/1800	NW	11/15	15	0.7	SSW	0.5	10	0.9	1.4	1903
19/0000	NW	15/20	21	1.3	SSW	0.4	10	1.4	2.1	-
19/0600	NNW	16/21	22	1.4	SSW	0.4	10	1.5	2.3	0623
19/1200	NNE	12/16	17	0.7	SSW	0.4	10	0.8	1.2	-
19/1800	N	8/12	11	0.2	SSW	0.4	10	0.4	0.6	1903
20/0000	WNW	16/21	22	1.4	SSW	0.4	12	1.5	2.3	-
20/0600	NE	13/17	18	0.8	SSW	0.4	12	0.9	1.4	0622
20/1200	E	14/18	20	0.9	SSW	0.4	12	1.0	1.5	-
20/1800	VAR	7/11	10	0.2	SSW	0.4	12	0.4	0.6	1904
21/0000	NW	11/15	15	0.7	SSW	0.4	12	0.8	1.2	-
21/0600	NNW	11/15	15	0.7	SSW	0.4	12	0.8	1.2	0622
21/1200	N	9/13	13	0.3	SSW	0.4	12	0.5	0.8	-
21/1800	NW	10/14	14	0.6	SSW	0.4	12	0.7	1.1	1904
22/0000	NW	20/25	28	1.8	SSW	0.4	13	1.8	2.7	-
22/0600	NNW	18/23	25	1.6	SSW	0.4	13	1.6	2.4	0621
22/1200	NNW	16/21	22	1.4	SSW	0.4	13	1.5	2.3	-
22/1800	NW	13/17	18	1.0	SSW	0.4	13	1.1	1.7	1904
23/0000	NW	17/22	24	1.5	SSW	0.4	13	1.6	2.4	-
23/0600	NNW	17/22	24	1.5	SSW	0.4	13	1.6	2.4	0620 / 1905

1.8 AIDS TO NAVIGATION:

The flight was conducted under VFR rules.

1.9 COMMUNICATION:

The helicopter was fitted with VHF COMM transceiver equipments for two way RT communication. Throughout the duration of flight there was regular communication between Pilot & Co-Pilot & Radio Officer at the off-shore platform.

1.10 OFFSHORE PLATFORM INFORMATION:

The elevation of the WI3 platform is 95 ft, Co-ordinates are:-
Lat - 19 deg, 35 Min, 26 Sec N,
Long. - 071 deg, 16 Min, 39 sec E.

Platform information is as follows:

Information	**NC Deck**	**WI3 unmanned P/F (Incident place)**	**WIN**
D value	13.5 meter	14.7 meter	25 meter

Lightings	Yes Available and working	Yes Available and working	Yes Available and working
Net on helideck	Yes available	Yes available	Yes available
Extended safety net	Yes available	Yes available	Yes available
Markings	Yes available	Yes available	Yes available

Fig. M

Fig. N

1.11 FLIGHT RECORDERS:

Flight Recorders : The helicopter is equipped with a Cockpit Voice Recorder (CVR) and a Flight Data Recorder (FDR). Both were downloaded and analyzed.

CVR:

From CVR transcript it is clear that around 0932 IST (**Relevant time 1840-2407**) after takeoff from the WI3 aircraft got rotated while captain was unable to arrest the turn. Meanwhile, they heard the popping sound at the time of takeoff at WIN deck, when H/c was rotating.

Wind which was earlier 330/16 knots was changed to calm 070/12 knots as confirmed by the co-pilot and Radio Officer. All the parameters were normal. The crew decided to land at WIN platform where the AME was positioned. They ask the same to Radio Officer, who did not clear it to land at WIN deck as it was occupied by the ATF barrel. Then they made landing at NC deck which was adjacent to WIN platform. The wind was now changed to 066/8-9 knots as confirmed by Radio Officer. The crew was not aware of the incident till they finally landed at NC deck.

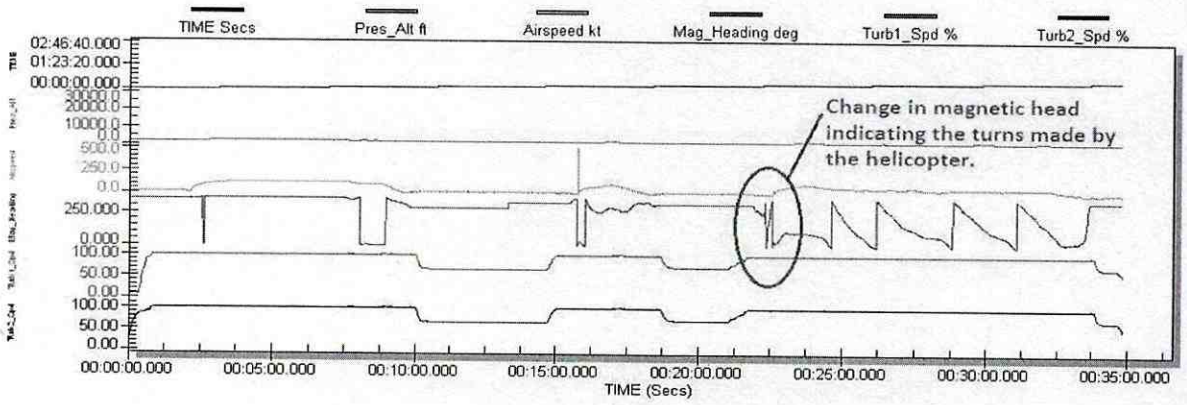
DFDR:

Relevant part of DFDR reading:

TIME	Pres_Alt	Mag_Heading	Airspeed	Coll_Pitch	Long_Cycl_P	Lat_Cycl_P	Rotr_Pedl	Rotor_Speed	Turb1_Spd	Turb2_Spd	Turb1Q	Turb2Q
Secs	ft	deg	kt	%	%	%	%	%	%	%	%	%
21:46.9	192	313.33	17.5	-0.16	9.8005	23.738	3.86	98.74	99.43	99.43	13.11	11.92
21:47.9	192	313.154	14.5	-0.18	9.7055	23.6865	4.805	98.62	99.43	99.43	12.86	12.14
21:48.8	192	313.066	13.5	-0.06	9.642	23.8155	4.085	98.74	99.43	99.32	12.5	9.62
21:49.8	192	313.154	15.5	-0.12	9.9585	23.738	3.485	98.74	99.43	99.43	2	17.19
21:50.9	208	313.33	15.5	2.175	15.032	22.1935	-1.12	98.62	99.43	99.32	10.04	8.37
21:51.9	192	313.066	17.5	14.7	27.1755	17.4305	-4.435	98.51	99.32	99.09	9.87	9.84
21:52.9	160	312.451	15.5	23.205	33.105	13.5945	-9.98	98.05	98.86	98.41	21.02	13.2
21:53.8	160	312.539	14	28.745	29.078	9.3975	-15.595	97.7	98.3	98.52	27.59	25.78
21:54.8	144	311.836	12.5	30.29	22.578	5.716	-18.015	98.51	99.09	99.32	28.45	30.58
21:55.9	160	310.254	10	35.925	18.6145	1.964	-26.38	98.51	99.32	99.2	26.7	24.7
21:56.9	144	305.684	0	43.105	16.7125	10.994	-33.205	98.16	98.98	98.52	51.01	34.41
21:57.9	144	295.84	12	47.21	14.969	10.5815	-36.41	97.47	98.07	98.41	47.16	40.76
21:58.8	144	280.635	7	47.1	4.283	-1.6245	-43.96	97.82	98.64	98.52	46.24	42.92
21:59.8	144	273.34	0	43.93	7.549	18.5635	-54.51	97.01	99.2	98.07	35.96	29.97
22:00.9	144	275.01	0	48.83	9.483	22.271	-59.075	99.08	100.16	98.75	47.02	36.18
22:01.9	144	278.789	0	49.025	2.9515	11.483	-70.73	96.9	97.61	98.3	42.67	40.81
22:02.9	144	283.447	0	49.145	-6.7185	15.886	-74.39	98.39	99.32	98.75	53.12	48.32
22:03.9	144	281.953	7.5	48.775	-7.6385	9.1145	-75.37	97.82	98.64	98.64	46.66	39.04
22:04.8	144	279.228	8.5	48.565	-3.0725	12.049	-82.195	98.16	98.86	98.86	46.83	40.7
22:05.8	160	277.119	11	48.62	3.3635	14.7525	-84.04	97.82	98.64	98.52	48.13	42.67
22:06.9	160	272.021	0	48.795	4.6635	15.937	-84.53	97.93	98.75	98.52	44.08	41.39
22:07.9	160	268.33	0	48.27	3.332	13.311	-87.32	97.93	98.75	98.86	43.56	43.14
22:08.9	160	267.363	0	48.1	0.4785	15.0875	-94.525	97.93	98.75	98.75	45.05	43.67
22:09.8	176	265.693	8	47.44	6.249	14.4695	-93.51	97.93	98.86	98.64	47.24	43.64
22:10.8	160	261.826	0	46.675	16.395	11.1745	-97.165	97.7	98.52	98.75	36.71	44.53
22:11.8	176	258.135	10.5	46.09	11.893	12.101	-96.07	97.82	98.98	98.41	41.45	45.83
22:12.9	192	251.543	0	48.29	0.7005	12.127	-94.675	98.05	98.52	98.98	41.95	42.36
22:13.9	176	244.687	0	50.3	6.3445	13.414	-96.94	98.16	98.98	98.52	46.97	45.03
22:14.8	176	240.82	0	49.72	25.3685	7.1315	-97.395	97.47	98.3	98.3	47.38	44.69
22:15.8	192	240.117	7.5	49.8	16.9345	10.608	-89.81	97.82	98.64	98.52	45.22	41.92
22:16.8	192	247.851	8	48.99	15.5075	19.902	-89.885	97.82	98.64	98.86	46.11	47.05
22:17.9	208	262.178	0	48.275	17.3465	16.555	-93.96	97.82	98.98	98.52	46.47	39.12
22:18.9	208	278.877	0	48.465	18.0125	21.009	-97.845	98.05	98.64	98.98	48.55	42.25
22:19.8	224	301.641	0	46.845	4.759	20.0825	-112.7	97.82	98.64	98.52	47.19	48.44
22:20.8	208	337.236	0	46.17	-1.8045	15.86	-120.32	98.05	98.64	98.98	38.54	40.45
22:21.8	208	2.373	0	48.37	1.3665	16.272	-120.925	97.82	98.75	98.41	39.06	45.03
22:22.9	192	34.629	0	53.79	-4.2775	23.5585	-120.73	98.05	98.86	98.75	42.97	49.79

From above data it is observed that, the helicopter approached the deck with the heading 313^0 with an average airspeed of 15 kts. At an relevant time from 21:54:8 to 21:59:8 i.e. in 4 seconds helicopter heading changed from 311^0 to 273^0 i.e. almost 40^0.

Graphs (from DFDR readings):

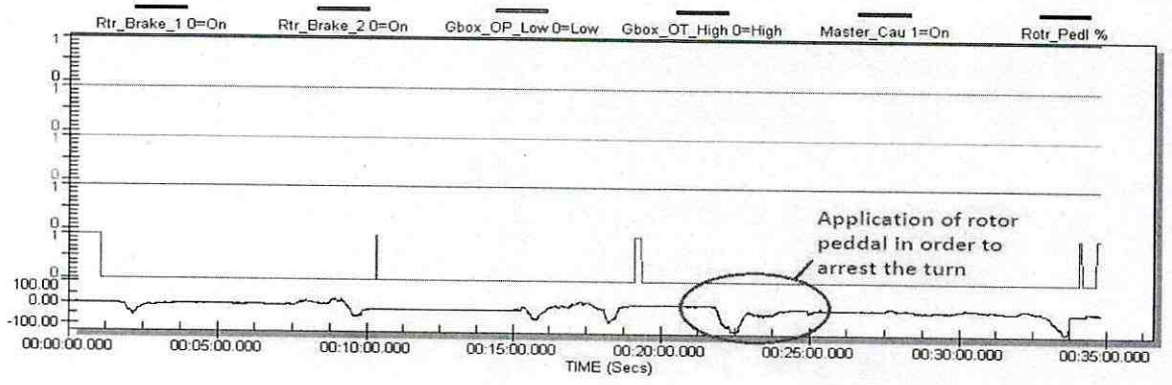


As shown in circle in above DFDR data.

TIME	Pres_Alt	Mag_Heading	Airspeed	Coll_Pitch	Long_Cycl_P	Lat_Cycl_P	Rotr_Pedl	Rotor_Speed	Turb1_Spd	Turb2_Spd	Turb1Q	Turb2Q
Secs	ft	deg	kt	%	%	%	%	%	%	%	%	%
22:03.9	144	281.953	7.5	48.775	-7.6385	9.1145	-75.37	97.82	98.64	98.64	46.66	39.04
22:04.8	144	279.228	8.5	48.565	-3.0725	12.049	-82.195	98.16	98.86	98.86	46.83	40.7
22:05.8	160	277.119	11	48.62	3.3635	14.7525	-84.04	97.82	98.64	98.52	48.13	42.67
22:06.9	160	272.021	0	48.795	4.6635	15.937	-84.53	97.93	98.75	98.52	44.08	41.39
22:07.9	160	268.33	0	48.27	3.332	13.311	-87.32	97.93	98.75	98.86	43.56	43.14
22:08.9	160	267.363	0	48.1	0.4785	15.0875	-94.525	97.93	98.75	98.75	45.05	43.67
22:09.8	176	265.693	8	47.44	6.249	14.4695	-93.51	97.93	98.86	98.64	47.24	43.64
22:10.8	160	261.826	0	46.675	16.395	11.1745	-97.165	97.7	98.52	98.75	36.71	44.53
22:11.8	176	258.135	10.5	46.09	11.893	12.101	-96.07	97.82	98.98	98.41	41.45	45.83
22:12.9	192	251.543	0	48.29	0.7005	12.127	-94.675	98.05	98.52	98.98	41.95	42.36
22:13.9	176	244.687	0	50.3	6.3445	13.414	-96.94	98.16	98.98	98.52	46.97	45.03
22:14.8	176	240.82	0	49.72	25.3685	7.1315	-97.395	97.47	98.3	98.3	47.38	44.69
22:15.8	192	240.117	7.5	49.8	16.9345	10.608	-89.81	97.82	98.64	98.52	45.22	41.92
22:16.8	192	247.851	8	48.99	15.5075	19.902	-89.885	97.82	98.64	98.86	46.11	47.05
22:17.9	208	262.178	0	48.275	17.3465	16.555	-93.96	97.82	98.98	98.52	46.47	39.12
22:18.9	208	278.877	0	48.465	18.0125	21.009	-97.845	98.05	98.64	98.98	48.55	42.25
22:19.8	224	301.641	0	46.845	4.759	20.0825	-112.7	97.82	98.64	98.52	47.19	48.44
22:20.8	208	337.236	0	46.17	-1.8045	15.86	-120.32	98.05	98.64	98.98	38.54	40.45
22:21.8	208	2.373	0	48.37	1.3665	16.272	-120.925	97.82	98.75	98.41	39.06	45.03
22:22.9	192	34.629	0	53.79	-4.2775	23.5585	-120.73	98.05	98.86	98.75	42.97	49.79
22:23.9	224	76.289	0	51.86	1.7155	3.075	-120.47	97.47	98.52	97.95	48.05	51.57
22:24.9	192	107.842	0	55.355	10.783	2.9665	-120.7	97.47	98.18	98.64	42.14	55.48
22:25.8	208	151.963	0	42.16	4.315	-1.3485	-120.66	97.93	98.86	98.41	50.1	46.91
22:26.8	208	176.396	0	37.68	-7.6385	1.0055	-120.81	97.82	98.07	98.86	38.59	48.3
22:27.8	192	196.787	0	45.34	-13.1235	2.935	-120.845	97.7	98.52	98.64	55.2	54.53
22:28.9	240	228.428	0	54.76	-0.5995	9.3715	-120.92	97.59	98.18	98.52	50.6	47.46
22:29.9	256	262.705	0	47.89	44.1705	12.9765	-120.845	97.7	98.41	98.64	48.16	52.09
22:30.8	256	290.478	0	51.455	17.5365	9.1515	-120.205	97.13	98.18	98.07	49.9	56.25
22:31.8	272	313.945	0	52.17	16.871	-0.3215	-120.32	97.24	98.18	97.61	55.01	40.81
22:32.8	288	338.203	0	52.345	15.095	3.2955	-120.62	98.16	98.07	98.86	44.5	51.26
22:33.9	288	355.693	0	51.92	28.8245	-6.1185	-119.34	97.36	98.41	97.95	45.91	46.08
22:34.9	304	10.459	0	52.325	11.037	6.1535	-114.59	97.47	98.07	98.52	51.98	51.12
22:35.8	288	25.752	0	52.285	10.3395	-2.6975	-115.075	97.93	98.64	98.64	47.96	47.35
22:36.8	240	38.057	34.5	52.42	-11.887	-1.5465	-115.23	97.47	98.18	98.64	49.52	47.22
22:37.8	224	44.209	33.5	52.27	-20.131	-10.5925	-110.515	98.05	98.75	98.64	47.58	46.61
22:38.9	224	34.189	32	52.405	-27.899	-8.092	-90.11	97.59	98.18	98.64	48.3	52.79
22:39.9	224	24.082	36.5	51.765	-27.8355	0.052	-80.985	98.28	98.75	99.32	39.06	50.38

Helicopter heading changing twice in a rotational motion while the forward speed of the H/c is zero. Also the rotor pedal application was up to its maximum level during this period.

Graphs (from DFDR readings):



1.12 DEBRIS & IMPACT INFORMATION:

Approximately 10 inches of both the tail rotor blades were sheared off at the tips and there was skin damage on one main rotor blade. Some metal pieces were found lying on the WI3 deck.

1.13 MEDICAL & PATHOLOGICAL INFORMATION:

There was no injury to any of the crew members, passengers or personnel on the offshore platform.

1.14 FIRE:

There was no fire during any stage of the incident.

1.15 SURVIVAL ASPECTS:

The helicopter made a normal approach and nothing unusual was felt until the helicopter came to low hover at nearly zero forward speed where it had a tendency to turn to right. The helicopter took one rotational turn to the right and with caution a safe landing was executed. The engine shutoff & subsequent activities were performed in the normal manner as per the procedures.

1.16 TEST & RESEARCH:

No material failure or maintenance deficiency was observed. Sudden stoppage inspections in accordance with Bell – 412 Maintenance Manual were carried out. The operator has contacted the manufacturer i.e. Bell Helicopter Textron and all the recommendations given by the manufacturer were also complied with. Overhaul evaluation of Tail Gear Box, 42 degree Gear Box and hanger bearing assemblies were carried out and found satisfactory. Both tail rotor blades and tail rotor hub were scrapped.

1.17 ORGANISATIONAL & MANAGEMENT INFORMATION:

Global Vectra Helicorp Limited an ISO 9001-2000, 14001-2004 & OHSAS 18001-1999 certified company is the largest private sector helicopter operator in India.

The offshore division is dedicated to providing logistics services to the Oil & Gas industry majors like Cairn Energy in Sri Lanka, ONGC, Gujarat State Petroleum Corporation (GSPC), Reliance Industries Limited (RIL), Transocean, Baker Hughes, British Gas Exploration and Production India Limited (BGEPIL) under the long term contract, with a share of 53% in the offshore helicopter market in India.

Polarcus, Fugro, CGG, Results Marine & Western Geco have been GVHL's major Seismic partners for whom the company has flown on the East and West Coast of India in the recent past.

GVHL has established its sub bases at Delhi, Bhubaneswar, Vizag and Ita Nagar. GVHL fleet comprises 23 helicopters at present. A breakup of the same is as follows:-

Type of Helicopter	:	**Number**
BELL 412	:	14
AW 139	:	03
AS 350 B2/B3	:	04
EC 135 P2+	:	01
EC 155 B1	:	01
Total	:	23

1.18 ADDITIONAL INFORMATION:

1.18.1 CAP 437: Standards for Offshore Helicopter Landing Areas:

Table 1 D-Value, 't' Value and other Helicopter Type Criteria

Type	D-value (metres)	Perimeter 'D' marking	Rotor diameter (metres)	Max weight (kg)	't' value	Landing net size
Bolkow Bo 105D	12.00	12	9.90	2400	2.4t	Not recommended
EC 135 T2+	12.20	12	10.20	2910	2.9t	Not recommended
Bolkow 117	13.00	13	11.00	3200	3.2t	Not recommended
Agusta A109	13.05	13	11.00	2600	2.6t	Small
Dauphin AS365 N2	13.68	14	11.93	4250	4.3t	Small
Dauphin AS365 N3	13.73	14	11.94	4300	4.3t	Small
EC 155B1	14.30	14	12.60	4850	4.9t	Medium
Sikorsky S76	16.00	16	13.40	5307	5.3t	Medium
Agusta/Westland AW 139	16.63	17	13.80	6800	6.8t	Medium
Bell 412	17.13	17	14.02	5397	5.4t	Not recommended
Bell 212	17.46	17	14.63	5080	5.1t	Not recommended
Super Puma AS332L	18.70	19	15.60	8599	8.6t	Medium
Bell 214ST	18.95	19	15.85	7938	7.9t	Medium
Super Puma AS332L2	19.50	20	16.20	9300	9.3t	Medium
EC 225	19.50	20	16.20	11000	11.0t	Medium
Sikorsky S92A[1]	20.88	21	17.17	12020	12.0t	Large
Sikorsky S61N	22.20	22	18.90	9298	9.3t	Large
EH101	22.80	23	18.60	14600	14.6t	Large

When it was asked to operator for their SOPs for the operations on deck having D value less than that of the H/c.

They stated the unpublished SOPs as follows:

Bell 412 OPERATIONS TO UNMANNED HELIDECKS

Helideck with D' value '17.12' or more: Max AUW (5700 Kgs or 11900 lbs)

WHERE THE MINIMUM REQUIREMENT OF MIN D VALUE SPECIFIED IN CAP 437 ANDIN THE FLIGHT MANUAL FOR PERFORMANCE CLASS 1 OPERATION FOR BELL 412 HELICOPTERS.

Helideck with a lower than stipulated 'D' value

(Less than '17.12') : Safety to be used by reducing the RTOW to OEI hover limits. The RTOW/RLW is predicated on OEI Max Gross Weight Graph for Hovering at Take off power (Reference BHT-412-MD-4, Figure4-5)

RTOW/RLW figures in 'Nil' winds will be:-

Temperature (Deg C)	RTOW/RLW(Lbs)
20	11000
25	10800
30	10400
35	10200
40	10000

In Strong headwinds, an additional allowance of up to 400 Lbs, may be given by the pilot at his discretion, provided the head wind component is more than 10Kts and the prevailing winds do not impact adversely in the available OFS (obstacle free surface) of the helidecks.

1.8.2. Operational detail:

Statement of pilot:

The pilot in command has more than 9600 Hrs of total flying experience and more than 7000 Hrs experience on Bell 412 helicopter. His proficiency test was carried out by DGCA approved instructor on 08.11.2011

As per pilot:

PIC was detailed as PIC to fly VT-AZT on 18 Apr 2012 to carry out ONGC North Field production culminating into night halt and morning production.

On the 18 Apr 2012, production task was carried out as per production log sheet. The flight was uneventful. During the flight it was observed that the controls did not appear to be harmonized especially rudder position seemed unusual. This was discussed with AME and he clarified that it was not possible to check it offshore.

On the morning of 19th April 2012 a chit was received from Radio Officer, NQO Deck (as per the normal practice) with information as: - Wind 330/16, QNH 1008, and temp27 and programme for NQO satellite decks. The H/C was started and production landings were carried out as per task allotted and switched off at WIN platform for refueling.

The H/C was started and preceded to WIS for refueling. Third leg of production commenced at 0910 hrs and the program was for NC, WI 3, and NQO. While approaching for WI 3deck; it was felt that wind was not from the earlier given direction of 330. The Co-Pilot was asked to check up the wind from the RO. The RO at WIN responded with phraseology of "CALM 070 12 KNOTS. The said phraseology was not understood and appeared to be at variance with the prevailing wind. The words were repeated by RO. There was no wind sock at WI 3 to corroborate the wind which was so far was in the range of 300-330 15/16 knots. The obstruction was well away to the right (4'0 clock direction). PIC went down and opened door for passengers to deplane. Four passengers disembarked and were seen off. The lead passenger gave thumbs up and went down the staircase.

During the pickup at WI 3, whilst coming up on collective, PIC felt as if upward movement of the collective was restricted. Meanwhile PIC heard a popping sound and directed the co-pilot to check on his left side of the platform to see if the skid had got entangled with the deck net. Having checked myself on the right PIC found nothing unusual, PIC continued with the pickup.

As the helicopter lifted off the deck it started turning to the right and initially directional control could not be maintained. PIC soon regained control of helicopter after 2 turns out of the deck & commenced forward flight. In the forward flight, nothing unusual was observed and all parameters were normal as well as no vibrations were felt. However, PIC wanted to get the helicopter checked up by our AME stationed at WIN platform. We were cleared to land at the NC platform which is adjoining WIN platform. We carried out normal approach and nothing unusual was felt till we came to low hover at nearly zero forward speed where the helicopter had tendency to turn to the right and with caution, we executed a safe landing. After landing we observed that tail rotor was broken at the tips. Subsequently we came to

know that /wind was changing and helicopters in the south field were reporting changing wind of 140/ 10 knots.

Statement of co-pilot:

The Co-pilot has more than 4000 Hrs of total flying experience and more than 1500 Hrs experience on Bell 412 helicopter. His proficiency test was carried out by DGCA approved instructor on 24.03.2012

As per co-pilot:

On 18 April 2012, PIC and F/O were tasked as per flying program to fly to North Field on helicopter VT-AZT for Production flying on 18th and 19th Apr with night halt at North Field. After obtaining Meteorological and ATS clearance, they departed Juhu at 1515 hrs on 18 Apr with five passengers and takeoff weight was 11217 lbs.

Thereafter the rest of the flying to North Field and subsequent production flying was normal and without any incident. They finally switched off at NQO Platform for night halt at 1825 hrs.

After a restful night halt at NQO platform, the Production flying on 19 April 12 were commenced at 0705 hrs. The weather as given by the Radio Officer at 0700 was Wind: 330/ 16 knots QNH 1008 and Temperature: 27 deg C. Subsequently at 0910 his, the helicopter re-commenced Production flying post refueling and first landed at WIN (NC deck) platform before proceeding to WI 3 deck.

On approaching WI 3 deck in the 330 deg direction, the Captain felt that winds were not in conformity to the reported winds and asked F/O to recheck winds from the WIN RO. On checking, WIN RO replied that winds were 'calm to 070/ 12 knots'. Since these were quite in variance to the earlier reported winds, Captain once again asked me to re-check the winds. WIN RO again replied that the winds now were 'calm to 070/ 12 knots'. However since these could not be independently verified in the absence of wind sock on WI 3 deck and being very close to landing, Captain continued in the 330 deg direction and carried out a landing on the deck. After landing, Captain got out of the helicopter and opened the passenger door for passengers to disembark. Four passengers disembarked from the helicopter and two passengers remained in the helicopter for onward trip to NQO deck. Captain escorted the disembarked passengers to the steps (on the right side of the helicopter) and after closing the right door, the Captain re-entered the helicopter.

After pre-take off checks, the Captain initiated a takeoff. As they were taking off, we heard a distinct 'popping' sound. The Captain asked me to check if the skids

were not entangled with the rope net on the deck and on visual examination, nothing unusual was found on the left side of the helicopter. Thereafter the helicopter started turning to the right and by the time we completed the first turn, the helicopter was clear of the deck. After another turn, the helicopter settled down in to a normal flight. No vibrations or anything unusual was felt and all parameters were normal.

Thereafter they decided that since the company AME, were on the WIN deck, which was two miles away, it would be prudent to land there and have the helicopter checked. At that point of time, WIN deck was not available as load was being offloaded there by crane. After obtaining clearance from WIN, the helicopter was landed on the attached NC deck and switched off. After switching off, they observed that the tips of both tail rotor blades were sheared off and also there was a superficial dent on one of the main rotor blades. No other damage or distortion to any other part of helicopter was visible.

1.9 Useful or effective investigation technique : NA

2. ANALYSIS:

2.1 HELICOPTER:

The helicopter had valid certificate of airworthiness and was maintained as per the approved maintenance schedule. The Certificate of release to service in respect of the helicopter and engines was issued by type endorsed AME/CA holder. The AUW and CG of the helicopter was within the specified limits.

The helicopter had completed 3753.2 Hrs since new & 103.6 Hrs since renewal of C of A.3000 hrs/05 Yrs airframe inspection schedule was carried out at 2499.7 A/F Hrs. on 02.02.2011 & Last 100 Hrs/90 Days inspection was carried out at 3745.8 A/F Hrs on 17.04.2012. Before releasing the helicopter for the first sortie on 19.04.2012 the Preflight inspection was carried out by type endorsed AME/CA holder and subsequently FAA AD 2008-10-03 was carried out by type endorsed AME/CA holder & Pilot when the aircraft was switched off for refueling. No abnormalities were observed during any of these inspections.

In view of the above the maintenance and serviceability of the helicopter cannot be considered as a contributory factor to the incident.

2.2 Operational:

As per the pilot statement he observed that the rotor pedal controls did not appear to be harmonized especially rudder position seemed unusual. Which he reported informally to the AME post dinner on 18.04.2012. The AME c/o the checks he did

not find any abnormalities. However neither crew nor AME made any entry in to the tech-log book.

Helicopter made 7 landings in the morning prior to incident and no abnormalities were reported by the crew. Post incident the controls were checked and found satisfactory at GVHL hanger Juhu.

2.3 Recorders:

CVR:

From CVR transcript it is clear that around 0932 IST after takeoff from the WI3 aircraft got rotated while captain was unable to arrest the turn. Meanwhile, they heard the popping sound at the time of takeoff at WIN deck, when H/c was rotating.

Wind which was earlier 330/16 knots was changed to calm 070/12 knots as confirmed by the co-pilot and Radio Officer. All the parameters were normal. The crew decided to land at WIN platform where the AME was positioned. They ask the same to Radio Officer, who did not clear it to land at WIN deck as it was occupied by the ATF barrel. Then they made landing at NC deck which was adjacent to WIN platform. The wind was now changed to 066/8-9 knots as confirmed by Radio Officer. The crew was not aware of the incident till they finally landed at NC deck.

From CVR it is clear that the crew were new to these platforms. They had no clue of the obstruction as they entered in to ONGC contract & started operation for Neelam, Panna, and BLQ from 16.04.2012. They faced difficulty in identifying the designated landing platform.

DFDR:

From DFDR reading it was observed that helicopter landed at the deck with the heading 313^0 and an average air speed of 15 kts. At a relevant time from 21:54:8 to 21:59:8 i.e. in 5 seconds H/c heading changed to 273^0 from 310^0.Further helicopter made two turns with zero air-speed indication at a relevant time from 22:14:8 to 22:34:8.

The wind direction which was earlier 330/ 16 kts got changed to the 070/ 12 kts. The pilot made the approach towards the deck with magnetic heading 3130. Helicopter remains on the deck up to 2.5 minutes for disembarking the passengers. While takeoff pilot tried to align the helicopter towards the wind direction as the wind was changed to 070/ 12 kts.

From DFDR reading it is observed that at the relevant tine 21:59:8 the helicopter magnetic heading turns from 313 deg. to 273 deg. Almost 40 degree Within 5 seconds towards the obstacle. Also the D value of the deck is 14.7 meter which is

smaller than the D value of the helicopter. The D value of the H/c is 17.13 meter. When helicopter made a 40 degree turn it hit the crane structure, as the deck size is smaller than the D value of the H/c. The smaller size of the deck caused obstacle to come well within inside the helicopter D value.

As reported by PIC that he told copilot to check whether the skid has got entangle in the rope net during lift off which was not the case. The helicopters with landing skid are always prone to get entangled and cause serious hazard at helidecks. One accident in KG Basin was investigated b y DGCA and the recommendations were made not to permit helicopter with skid to land on helidecks with rope net.

From DFDR it is also observed that the pilot tried to arrest the helicopter turn by applying the rudder pedal to the maximum. But, he was unable to arrest as the tail rotor of the helicopter got sheared after heating the structure and lost its effectiveness.

2.4 WEATHER:

Weather was good with clear sky & good visibility, Temperature 27 degree Celsius & wind speeds was 12 knots. Weather was not a contributory factor.

2.4 ORGANISATION & MANAGEMENT:

The helicopter was maintained by Global Vectra Helicorp Ltd. Mumbai which is holding NSOP for performing commercial air operations of helicopters, approval for maintenance of Bell 412 helicopters under CAR 145 and CAMO approval. The maintenance and serviceability of the helicopter was satisfactory.
The contract for production flying was operationally flying effected from 16.04.2012. This is the first time GVHL is engaged in the production flying by ONGC. Previously ONGC has utilized GVHL only for crew change purpose.

ONGC has been meticulously demanding the higher standard for safety and operation in the helicopter flying. However they have failed to notice or ignored the fact that BELL 412 has D value 17.13 m and can operate only on helipad with equivalent D value (as per CAP 437). They have permitted the B 412 to operate in production flying has severely compromised the safety.

The CVR and DFDR clearly indicate that it was a mere fortune that this particular T/O did not result in fatal accident. The operation of GVHL on all helidecks with D value not suitable to BELL 412 type of H/C operation should be stopped henceforth.

Further, as reported by PIC that he told copilot to check whether the skid has got entangle in the rope net during lift off which was not the case. The helicopters with landing skid are always prone to get entangled and cause serious hazard at helidecks. One accident in KG Basin was investigated by DGCA and the

recommendations were made not to permit helicopter with skid to land on helidecks with rope net.

3. CONCLUSIONS:

3.1 FINDINGS:

3.1.1 The helicopter had a valid C of A & it was being maintained airworthy as per approved maintenance schedule.

3.1.2 The helicopter was fully serviceable when it was offered at Juhu Base on the 18th of April 2012 and again on the morning of 19 Apr 12 at WIN Platform the AME certified it serviceable.

3.1.3 The weather was fine with winds 330/16 and 27° C as reported by Radio officer. The helicopter had flown the first few landing without any problems. They had got airborne after refueling from WIN Platform.

3.1.4 The crew had informally told the AME that he felt some restrictive movements from the rudder pedals during the flying that was done on the afternoon of 18 Apr 12. Hence the AME spent sometimes during the early night hours on 18 Apr 12, checking the controls of such possibilities but found none. However neither crew nor AME made any entry in to the tech-log book.

3.1.5 The Certificate of release to service in respect of the helicopter & engines was issued by type endorsed AME/ CA holder.

3.1.6 The Proficiency Check of the Pilot & the Co-Pilot was carried out by DGCA approved examiner on 08.11.2011 & 24.03.2012 respectively.

3.1.7 The D value of the deck was smaller than the D value of the Helicopter. The required D value of the deck for Bell 412 operation is 17 meter. The existing D value of the deck is 14.7 meter.

3.1.8 The ONGC has awarded the contract for the first time to GVHL for production flying meant to carry personal to various unmanned platform.

3.1.9 Picking up the helicopter for a hover is a critical flying maneuver and total attention is required and that was precisely the fact forgotten by the operating crew.

3.1.10 As per crew they were not aware about the offshore deck conditions like D value, T value and obstacles.

3.1.11 Pilot try to aligned the helicopter with wind direction and turned the helicopter towards left leads tail rotor hitting the structure.

3.1.12 Helicopter heading changed 40^0 in 5 seconds from 313^0 to 273^0. The obstacle was at that position.

3.1.13 The AUW and CG of the helicopter was within the specified limits.

3.1.14 The helicopter had flown two sorties earlier ii the day without any abnormalities.

3.1.15 Before starting the operation to the new platform the GVHL did not carry out any audit/check of the unmanned decks for the safe operation.

3.2 PROBABLE CAUSE:

The probable cause of the serious incident was the pilot's error of judgment and inadequate proficiency to maintain directional stability in hover. The inadequate D value of helidecks for Bell 412 type of helicopter was the contributory cause.

4. SAFETY RECOMMENDATIONS:

4.1 The crew should be subjected to corrective training comprising of performance & technical refresher.

4.2 The crew to undergo 5 training sortie for stabilized approach, landing and takeoff from the helidecks.

4.3 The GVHL shall c/o an inspection of all helidecks as a part of contract & submit DGCA the list of helidecks which are not suitable to BELL 412 D value & non-adhering to safety standard.

4.4 The flying operations to helidecks which are not capable of BELL 412 'D' values should be stopped immediately and skid helicopter shall also not be allowed to fly at those helidecks that has rope net.

4.5 Air safety directorate to conduct the audit of all helidecks in phase manner to declare the H/D unfit vis-à-vis type of H/C.

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