GOVERNMENT OF INDIA
MINISTRY OF CIVIL AVIATION
AIRCRAFT ACCIDENT INVESTIGATION BUREAU

FINAL INVESTIGATION REPORT ON ACCIDENT TO DHILLON AVIATION PVT. LTD. BELL 206 B3 HELICOPTER VT- DDA ON 26-04-2017 AT CHINTAGUFA HELIPAD, CHHATTISGARH.

Foreword

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 03 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an accident/incident shall be the prevention of accidents/incidents and not apportion blame or liability.

This document has been prepared based upon the evidences collected during the investigation, opinion obtained from the experts and laboratory examination of various components.Consequently, the use of this report for any purpose other than for the prevention of such future accidents/incidents could lead to erroneous interpretations.

INDEX

Final Investigation Report on accident to M/s Dhillon Aviation Pvt. Ltd. Bell 206 B3 Helicopter VT- DDA on 26-04-2017 at Chintagufa Helipad, Near Sukma, Chhattisgarh.

1.	Helicopter	Type	Bell 206 B3
		Nationality	Indian
		Registration	VT-DDA
2.	Owner		M/s Dhillon Aviation Pvt. Ltd.
3.	Operator		M/s Dhillon Aviation Pvt. Ltd.
4.	Pilot – in –Command		CPL (H)/ FATA Holder
	Extent of injuries		NIL
5.	Date & Time of accident		26-04-2017, 1230 UTC.
6.	Place of accident		Chintagufa Helipad, Chhattisgarh
7.	Last point of Departure		Chintalnar Helipad, Chhattisgarh
8.	Intended landing place		Chintagufa Helipad
9.	No. of Passengers on board		04
	Extent of injuries		Minor Injury to 01 passenger
10.	Type of Operation		Charter flight (Non-Schedule Operations)
11.	Phase of Operation		Landing
12.	Type of accident		Helicopter rolled over during touchdown
13.	Co-ordinates of accident Site		Lat 18° 14' 55.12'' N, Long 81° 14 ' 48.55'' E Elevation 764 feet.

(All timings in the report is in UTC)

1. FACTUAL INFORMATION:

1.1 History of Flight:

On 26th April 2017 Bell 206 B3 helicopter operated flight from Raipur to Sukma (took off from Raipur at 0150 UTC). The helicopter landed at Sukma at 0330 UTC. The flight was uneventful. The helicopter was again required to operate sectors Jagdalpur – Sukma – Dharmapenta – Chintalnar – Chintagufa – Jagdalpur in connection with conveyance of para military personnel. The helicopter was refueled and the total fuel on board was 278.46 kgs to operate these sectors.

For these sectors, the helicopter was under the command of a CHPL holder having approval under Foreign Aircrew Temporary Authorisation (FATA) to fly Indian registered helicopter. The operator received programme for transportation of personnel as above and the PIC filed the flight plan with FIC Kolkata for the following sectors:

- Jagdalpur to Sukma
- Sukma to Dharamapenta
- Dharamapenta to Chintalnar
- Chintalnar to Chintagufa
- Chintagufa to Jagdalpur

After obtaining requisite clearances, the helicopter took off from Jagdalpur at 0935 UTC for the first sector i.e. Jagdalpur to Sukma under the command of a pilot holding CPL (H) (FATA) on type along with a technician on board who continued to travel on all the sectors as passenger. The helicopter landed at Sukma and was supposed to carry 03 para military personnel to Dharampenta. However, as the helicopter was loaded with full fuel pilot decided to carry only one person to Dharmapenta.

After reaching Dharmapenta the passenger disembarked and the helicopter took-off again for Sukma for transporting remaining personnel. The pilot-in–Command (PIC) after carrying out the load calculations as per MTOW charts took off with 3 para military personnel for Chintalnar. The flight from Sukma to Chintalnar was uneventful and the helicopter landed at Chintalnar and one of the passengers disembarked.

The helicopter then took-off from Chintalnar with an additional passenger (total persons on board were 5) for Chintagufa after calculating the MTOW with 40 ^{o}C of OAT. The enroute flight was uneventful. The Chintagufa helipad is at an altitude of 764 feet above mean sea level which is little higher from the surrounding areas, so the PIC carried out reconnaissance at around 600 feet AGL. As per the procedures for landing on these make shift helipads, the PIC was supposed to wait for the ground signal in the form of lighting a smoke candle indicating that the helipad is clear to land from all aspects of safety and security. After getting the smoke signal the pilot then started descending by making circuit around the helipad and made a shallow approach to the helipad. The PIC has stated that he felt convection in the atmosphere.

The pilot was carrying out normal approach and descent. After making a right turn, the PIC came on finals from south/ south west and with a shallow approach in order to use less power. While hovering over helipad for touchdown and at about 3 feet above the ground, PIC felt an unexpected sudden yaw towards left and tried to correct it by applying right pedal. The helicopter then touched the ground and toppled to its right.

The engine was still running even after the helicopter hit the ground which PIC immediately switched off. The pilot and the passenger in front were then rescued from the front broken windshield. The passengers in the aft row were rescued from the left side. One of the passengers received minor injury, other than that there was no injury to any of the occupant. There was no fire during the accident. The helicopter was substantially damaged. The accident occurred in daylight conditions. There was no fire.

1.2 Injuries to Persons :

Injuries	**Crew**	**Passengers**	**Others**
Fatal	NIL	NIL	NIL
Serious	NIL	NIL	NIL
Minor	NIL	01	NIL
None	01	03	NIL

1.3 Damage to Helicopter:

The helicopter was substantially damaged and the details are as follows: (photographs are attached as Annex 1)

- Main rotor blades got separated along with hub from the mast.
- The main rotor pitch links were found broken.
- The main rotor mast got disengaged from the bottom attachment.
- The main gear box linkages and support attachments were broken and dislocated during impact. Flight Control servos were found stuck at the last position.
- Tail rotor drive shaft was found broken from its attachment near TGB & separated from tail boom.
- Right horizontal stabilizer along with tail boom near its attachment was found damaged.
- Cockpit plexi was found completely damaged.
- Right side cockpit and passenger doors were found completely damaged.
- The left passenger door was partially damaged, however the door plexi was completely broken.

1.4 Other Damages :

Nil

1.5 Personnel Information:

1.5.1 Pilot- in- Command

AGE	32 years
License	CPL(H) / FATA
Date of Issue (FATA)	16/09/2016
Valid upto	15/06/2017
Category	Rotorcraft
Endorsements as PIC on	Bell 206
Date of Joining Company	June 2016
Date of Endorsement as PIC on Bell 206	14/09/2016
Instrument Rating	Nil
Date of FRTOL issue	09/04/2016
Date of last Med. Exam	11/08/2016

Date of last Route Check	18/06/2016
Date of last Proficiency Check	20/11/2016
English language Proficiency	Proficient
Date of last CRM	05/07/2016
Date of last Monsoon training	07/07/2016
Total flying experience	2197:30 Hrs
Total Experience on type	538:50 Hrs
Total Experience as PIC on type	536:36 Hrs
Last flown on type	26/04/2017
Total flying experience during last 01 Year	317:18 Hrs
Total flying experience during last 180 days	188 Hrs
Total flying experience during last 90 days	38:30 Hrs
Total flying experience during last 30 days	06:42 Hrs
Total flying experience during last 07 Days	04:06 Hrs
Total flying experience during last 24 Hours	03:30 Hrs
Rest period before the flight	14 Hrs

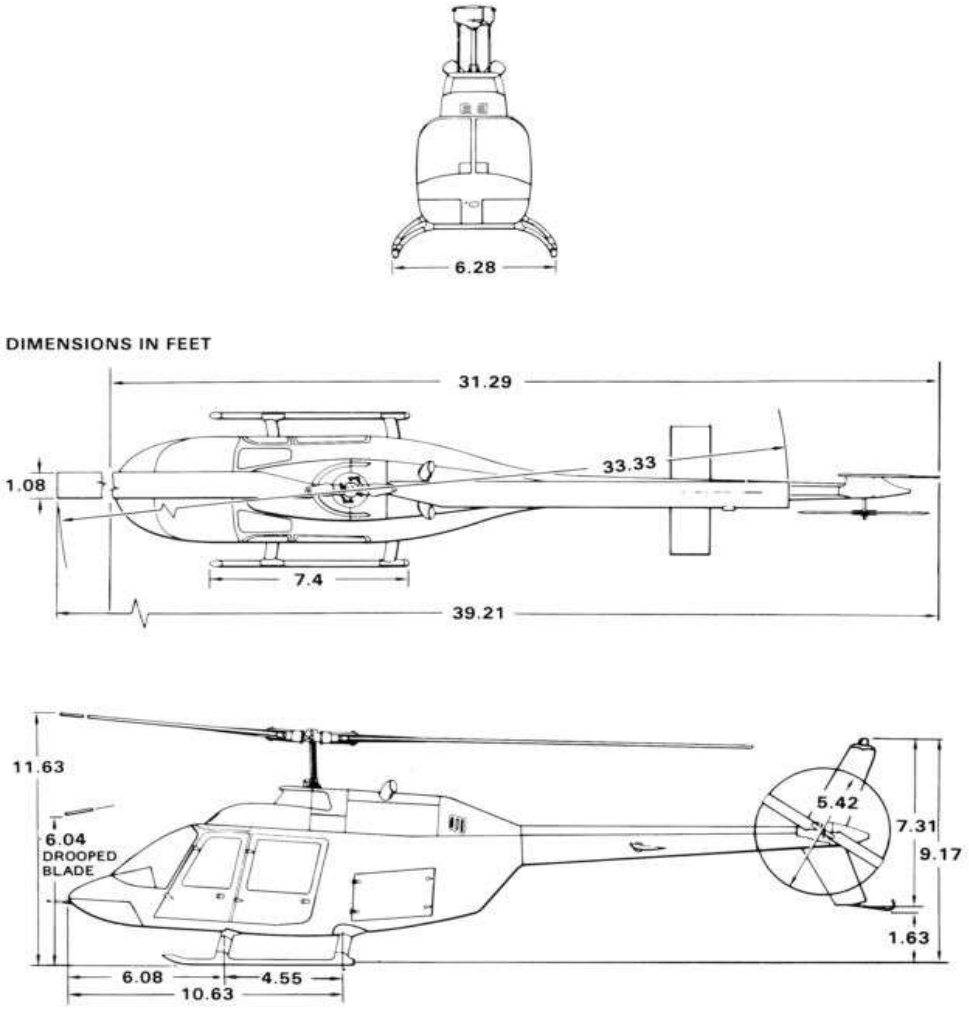
1.6 Helicopter Information:

1.6.1 Helicopter

Bell 206-B-III helicopter is a single engine helicopter certified in transport category with sub category Passenger, for day operation under VFR. The maximum operating altitude is 13500 feet density altitude and maximum take-off weight is 1451.5 Kgs.

The fuselage of the helicopter consists of three main sections: the forward section which extends from cabin nose to bulkhead aft of passenger compartment utilizes aluminium honeycomb structure and provides the major load-bearing elements of the forward cabin. The intermediate section which extends from the bulkhead aft of passenger compartment to tail boom attachment utilizes an aluminium semi-monocoque construction and provides a deck for engine installation, a baggage compartment and a compartment under the engine deck for heater and electrical equipment. The tail boom section is a full monocoque structure except for the forward 10 inches where the loads are redistributed by means of four intercostals load-carrying

members. The tail boom supports the tail rotor driveshaft, tail rotor, gearbox, vertical fin and horizontal stabilizer.



The main rotor assembly is a two-bladed, semi-rigid, see-saw type rotor with under slung mounting. The main rotor blades are all metal construction with an aluminium alloy honeycomb core, aluminium skins, spar and trailing edge strip. All the structural components are joined by means of metal-to-metal bonding.

The inboard rib of the aluminium horizontal stabilizer is attached to a spar with clamps and contains a fitting which secures stabilizer to tail boom with bolts. The vertical fin is installed with the leading edge positioned outboard (with reference to the aircraft longitudinal axis). The rubber bumper and the tail skid which absorbs shock in the event of a tail low landing are

bonded into the base of fin. The tail rotor gearbox fairing encloses the tail rotor gearbox and is attached to tail boom and vertical fin. The tail rotor hub and blade assembly consists of two blades and hub assembly. The blades are attached to the hub by two blade mounting bolts per blade which are inserted through spherical bearings. Spherical bearings are inserted in the blade root end, on the pitch change axis.

The low (standard) and high skid landing gear consists of two tubular aluminium alloy main skid tubes and two curved tubular aluminium cross tubes. Airflow type fairings are provided on the forward and aft cross tubes.

1.6.2 POWER PLANT

The helicopter is installed with Rolls Royce Model 250-C20J turbo shaft engine. The engine consists of a single-stage centrifugal-flow compressor, a single combustion chamber, a two-stage gas producer turbine, and a two-stage power turbine. The power plant assembly is mounted horizontally aft of the transmission and above the fuselage. The engine is supported by three bipod mounts attached to the service deck and is coupled to the transmission through the freewheeling unit and main driveshaft.

1.6.3 FLIGHT CONTROLS

The flight control system consists of push-pull control tubes and bell cranks actuated by conventional helicopter cyclic, collective and directional controls. The controls are routed beneath the pilot seat aft to the centre of the helicopter and up to the cabin roof through the control column which also serves as a primary cabin structure. Cyclic and collective controls are routed to the main rotor blades through the swash plate. The servo actuators on the cyclic and collective controls incorporate irreversible valves which prevent control force feedback. The directional controls are routed through the tail boom to the tail rotor. Fixed length control tubes and a minimum of adjustable tubes simplify rigging. All self-aligning bearings and rod ends are spherical bearings and require no lubrication.

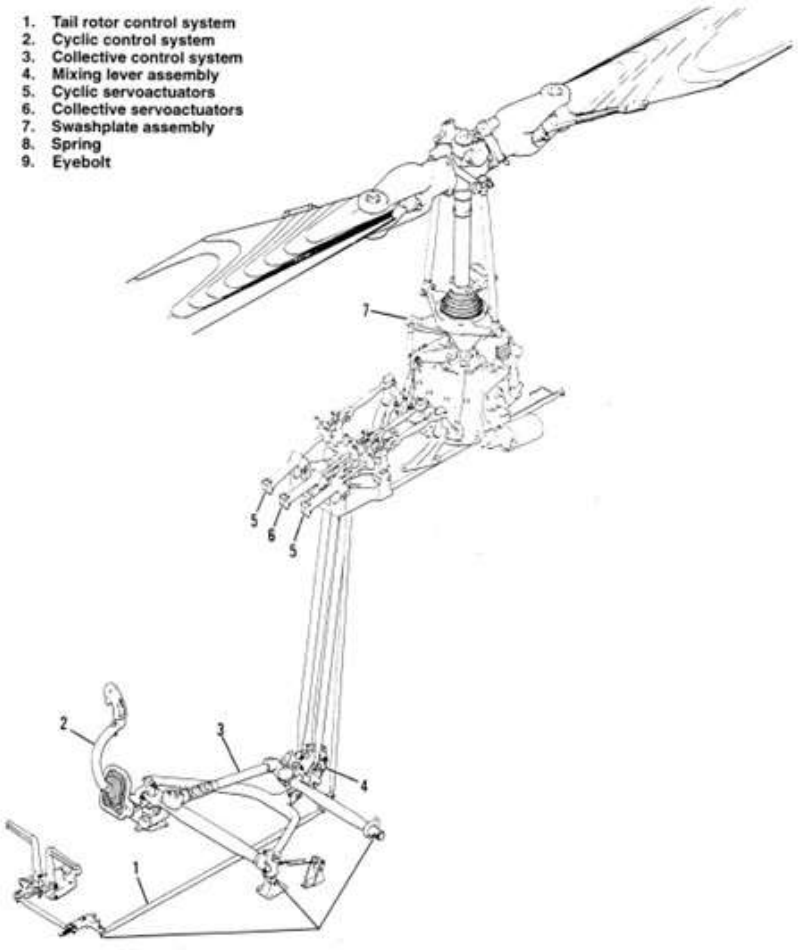
Co-pilot controls are provided as optional equipment for dual control capability and operations requirements. Dual control installation consists of

Co-pilot collective stick, cyclic stick and tail rotor control pedal assembly which are connected to the pilot controls via jackshaft tube, torque tube, control tubes, and bell cranks. Co-pilot collective and cyclic control sticks feature quick-disconnects for rapid removal or installation of control sticks. The Co-pilot controls were disconnected during the flight.

1.6.3.1 MAIN ROTOR CONTROLS

The main rotor cyclic and collective pitch flight controls regulate pitch, roll attitude and thrust. Control inputs from the cyclic and collective control sticks in the cockpit are transmitted by push-pull tubes and bell cranks to the hydraulic flight control actuators mounted on the front of the transmission. The actuators operate the cyclic and collective levers, which raise, lower, and tilt the swash plate. The swash plate converts the fixed controls to rotating controls and actuates alternating cyclic pitch inputs to the main rotor.

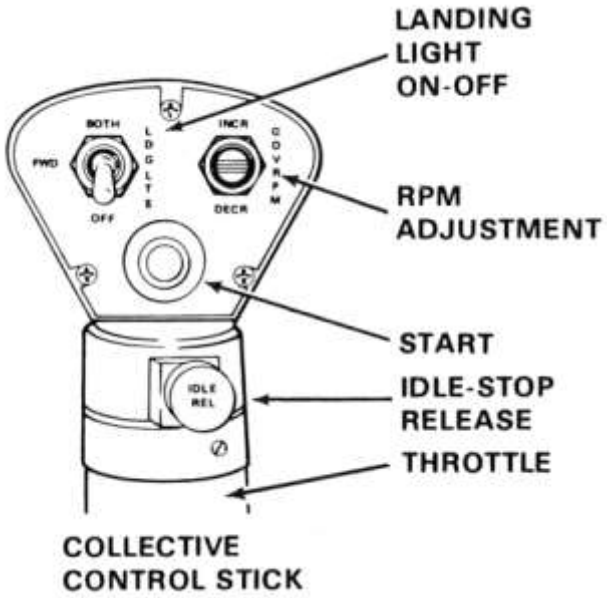
1.6.3.2 COLLECTIVE PITCH CONTROL



The collective pitch control system consists of a jackshaft assembly with a control stick, push-pull tubes, bell cranks and a hydraulic servo actuator connected to a control lever on the swash plate support. Movement of the control stick is transmitted through linkage and servo actuator to the main rotor pitch control mechanism, causing the helicopter to ascend or descend or to remain at constant altitude. The servo actuator has an irreversible valve to reduce feedback and to provide for use of controls in event of hydraulic boost failure. For helicopters with dual controls, the co-pilot collective stick is installed at left of co-pilot seat. A fully functioning twist-grip throttle control is included in the co-pilot collective stick. A quick-disconnect feature permits rapid removal of the co-pilot collective stick. A spring pin assembly is provided to ensure positive engagement of the stick. Switches are not installed on the co-pilot collective stick.

1.6.3.2.1 PILOT COLLECTIVE STICK

The pilot collective stick is installed at left of pilot seat. Stick extends upward and forward through a flexible cover. Stick incorporates a twist grip for operation of engine controls. Switches are installed on top of stick for starter, governor, RPM, landing light and idle stop released.

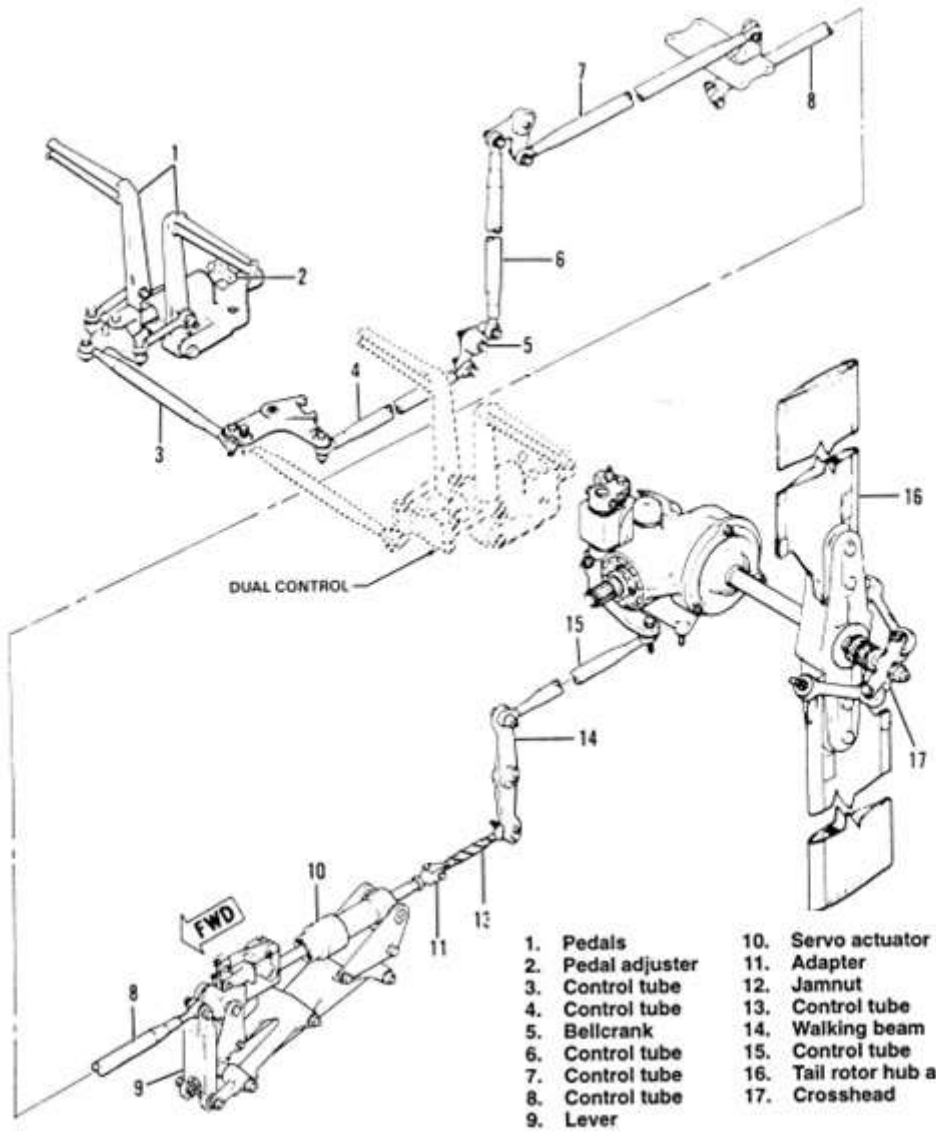


1.6.3.3 CYCLIC CONTROLS

The cyclic control system utilizes a linkage system to transmit movement to a swash plate, which actuates rotating controls of main rotor to control helicopter attitude and direction. Fore, aft and lateral control use

independent linkages from control stick to an intermixing bell crank. From this point on, linkage to swash plate horns cannot be considered separately. Two hydraulic servo actuators are incorporated to reduce effort required for control and to reduce feedback forces from main rotor. The cyclic stick extends upward and forward from the front of the pilot seat. Switches are installed on the stick grip for the intercom system and radio. The torque tube connects to the cyclic stick support.

1.6.3.4 TAIL ROTOR CONTROLS



The tail rotor (anti-torque) control system includes control pedals, pedal adjuster, push-pull tubes, bell cranks, and a pitch control mechanism mounted through the tail rotor output shaft. Actuation of pedals causes pitch

change of tail rotor blades to offset main rotor torque and provides directional control of helicopter. Control pedals are linked to pilot control pedals by means of control tubes and a bell crank.

1.6.4 THE HELICOPTER

The helicopter having Manufacturer Serial number 4526 was manufactured in the year 1999. It was owned by an individual as per the Certificate of Registration No. 3253/3, under Category 'A' which was issued on 12-07-2005 and was operated by a Non Scheduled Permit Number 05/2005. The certificate of Airworthiness Number 2662 was issued with a minimum operating crew as one.

ARC No. DD/BPL/2017/01 was valid up to 14-02-2018. The Aero mobile Licence No. L-14012/104/2009 RLD(NR) was valid up to 30-06-2017. It had logged approximately 6198 airframe hours as on 26th April 2017. The helicopter and its engine were being maintained under continuous maintenance as per maintenance programme consisting of calendar period based maintenance and Flying Hours / Cycles based maintenance. The last major inspection i.e. 300 hrs/ 12 months inspection was carried out at 5982:55 airframe hours on 26-09-2016. Subsequently all lower inspections, after last flight inspection and pre-flight checks were carried out as and when due before the accident. The last inspection carried out on helicopter was 100 hours / 12 months inspection on 20-01-2017.

On 24.04.2017 Turbine Assembly was changed as per maintenance schedule and subsequently a check flight was carried out at Raipur wherein no abnormality was observed. After this, the helicopter had flown for around 5 hours carrying out 8 landings prior to the accident landing. As per the PDR (Pilot Defect Report) earlier on 23.02.2017, "Fuel Pump Warning Light" snag was reported which was rectified after replacement of the booster pump which was found faulty.

The helicopter was last weighed on 27-07-2016 and duly approved by DGCA. All the concerned Airworthiness Directive, Service Bulletins, DGCA

Mandatory Modification on this helicopter and its engine have been complied with as & when due.

1.6.5 THE ENGINE

The helicopter was fitted with RR250C20J type of engine manufactured by Rolls Royce and bearing serial number CAE-270934. The Engine had logged 4665:08 engine hours and 4291 cycles since new as on 26th April 2017. The last major inspection was carried out on 26-09-2016 at 4450:03 engine hours followed by 100 hours /12 months inspection on 20-01-2017 at 4629:28 engine hours. The engine Overhaul was carried out on 22-05-13 at 3499:55 engine hours and had flown 1165:15 hours and 973 cycles since overhaul.

1.7 Meteorological Information:

There is no meteorological office at Jagdalpur and other areas of operation including Chintagufa. However as per the SOP made by the operator for helicopter operations, following procedure was followed for obtaining weather:

- PIC will check the weather before start of a flight by looking in the direction of the destination and ascertaining prevailing weather conditions like visibility, clouds, etc.
- If weather conditions are within minima for VFR operations, flying will be undertaken.
- If required weather at the destination shall be ascertained by telephone/VHF radio.
- If the weather at any stage is found to be unsuitable for continuing flight the pilot will promptly return to Jagdalpur after giving RT call.
- General weather could be obtained from either Mumbai Met/ Raipur ATC.

Current and appropriate prevailing weather was obtained from Raipur and area forecast from nearest IMD by the PIC. As per him the weather at the time of landing at Chintagufa was fine with visibility more than 5 Km, clear sky and winds calm. As per him, he experienced some thermal convection (though helicopter in control) while approaching the Chintagufa helipad which as per him was usual while operating in that area. The video taken by some personal

manning the helipad during that time showed the smoke direction which revealed that there was cross wind (left to right).

1.8 Aids to Navigation:

The helicopter is only VFR cleared and is equipped with ADF, VOR, DME, ATC Transponder and GPS. Helicopter was flying using Jeppesen Map, Ground references and GPS.

1.9 Communication:

Chintagufa helipad is an uncontrolled helipad. As such at the time of landing, helicopter was not in contact with any ATC unit. As per the procedure the CRPF personnel manning the helipad lighted the smoke candles in order to communicate to the pilot that the helipad is clear for landing. The CRPF personnel were available near the helipad at the time of landing and after the accident the PIC informed the company on telephone regarding accident.

1.10 Aerodrome Information:

Chintagufa Helipad is one of the temporary helipads used for helicopter operations for ferrying para military personnel deputed in the area. The helipad is at about 25 NM from Sukma and about 67 NM from Jagdalpur Heliport. It

fulfilled all the requirements for a temporary helipad such as markings and signage visible from the air.

The co-ordinates of the helipad are 18^{o}14' 55.12" N, 81^{o} 14' 48.55" E, with elevation as 764 feet. The dimensions of the helipad are 40 meters x 45 meters with hard top surface (concrete). The area around the helipad had a shallow slope in the south direction.

1.11 Flight Recorders:

Cockpit Voice Recorder (CVR) and Digital Flight Data Recorder (DFDR) were neither fitted nor required as per existing Civil Aviation Requirements.

1.12 Wreckage & Impact Information:

The helicopter during touchdown impacted ground in a little left bank position. It toppled to its right with main rotor blades impacting the ground in running condition. Thereafter, the right side of the fuselage impacted the ground with severe damages. Finally it was lying on its right on the helipad. On examining of the wreckage it was observed that all the damaged parts of the helicopter were confined to the main wreckage area and there was no evidence of disintegration of any part in air during flight.

Engine Oil was found spilled on the helipad after impact. The main rotor head along with blades got separated and part of one of the blades from 3/4th

span of trailing edge (from tip) got sheared off. The main rotor mast, main gear box and its associated components were damaged due impact with ground. The upper portion of engine cowling and the engine exhaust was damaged.

The cockpit plexi was completely broken. The right side cockpit and passenger doors were crushed due impact. There was no damage to the tail rotor blades apart from slight damage to blade skin. There was no damage to vertical stabilizers. All the cockpit instruments, instrument panels and controls were found intact. There was no damage observed on the skids apart from paint peeled off from rear side of right skid.

1.13 Medical & Pathological Information:

The Pilot was subjected to Pre-flight Medical including Breath Analyser Test before the first flight of the day and no abnormality was observed. Breath Analyser test was negative (not under the influence of alcohol).

However, after the accident post-flight medical could not be carried out as there was no facility available at Chintagufa.

1.14 Fire:

There was no pre or post impact fire.

1.15 Survival Aspects:

The accident was survivable.

1.16 Test and Research: Nil

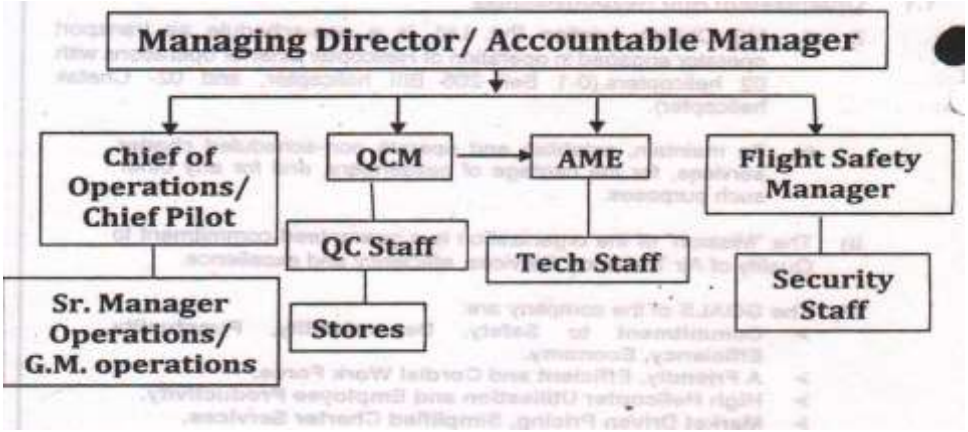
1.17 Organizational & Management Information:

The operator is having a Non- Scheduled Operating Permit (NSOP) No. 05/2005 and is valid upto 07-09-2018.

Though the main base of the operator is at Delhi, the helicopter service from Jagdalpur to various destinations in Chhatisgarh for conveyance of para military personnel is carried out as per the contract. The Standard Operating Procedure for carrying out these operations at Jagdalpur was duly approved by

DGCA. On the date of accident the operator had in-house CAR 145 maintenance approval.

The helicopter was operated by an FAA license holder under FATA issued by DGCA.

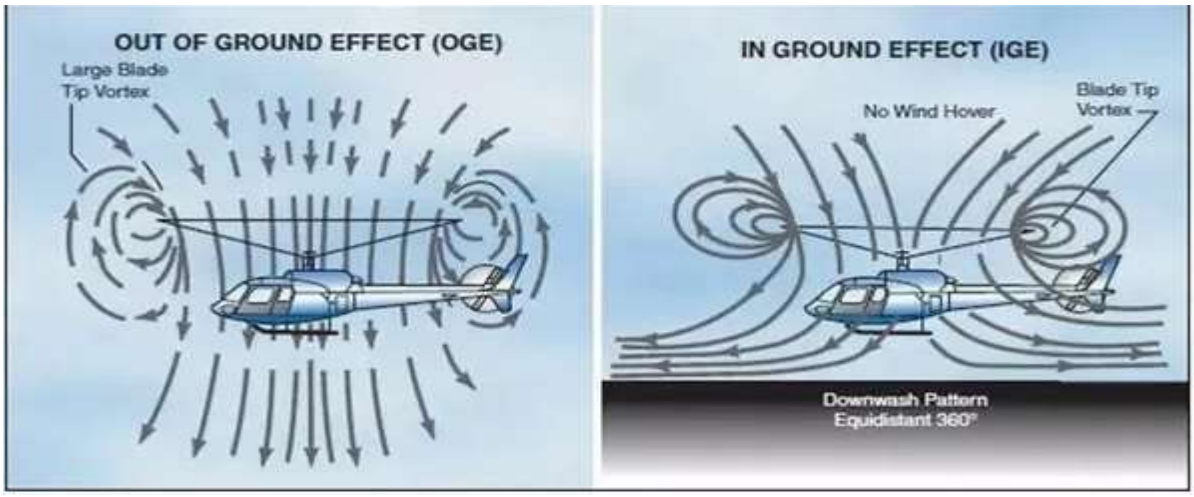


Organizational Chart of the operator

1.18 Additional Information:

1.18.1 In Ground Effect while landing

The movement of the main rotor blades through the air creates relative wind i.e. the air flows relative to the main rotor blades. Relative wind moves in a parallel but opposite direction to movement of the blade. There are two components of wind passing a rotor blade, a horizontal component caused by the blades turning plus movement of the helicopter through the air and vertical component caused by the air being forced down through the rotor blades plus any movement of the air relative to the blades caused by the helicopter climbing or descending.



When the helicopter is near the ground, this vertical component of air from the main rotor impacts with a hard surface (the ground), and give a

useful reaction to the helicopter in the form of more lift force. What happens is the air impacts with the ground and causes a small build-up of air pressure in the region below the rotor disk. The helicopter is then "floating" on a cushion of air. This means that less power is required to maintain a constant altitude hover and the helicopter is operating In Ground Effect (IGE). The height at which the helicopter is treated IGE depends on the type of helicopter, the slope and nature of the ground, and any prevailing winds.

The air circulation patterns change when hovering is without ground effect or when it is in ground effect.

If a normal landing is preceded by a hover and the power is limited a loss of directional stability may be experienced due to lack of tail rotor authority. In this case, if we reach the maximum power a subsequent increase in collective will cause a droop in rotor RPM as a result of over pitching. In this condition the efficiency of the main and tail rotors will decay producing an increase in the rate of descend and a loss of yaw directional control.

1.18.2 Dynamic Rollover

A helicopter is susceptible to a lateral rolling tendency when closer to the ground while landing or take-off particularly if the pilot does not use the proper landing or take off technique while performing slope operations. This could occur if some factor causes the helicopter to roll, pivot around a skid or landing gear wheel, until its critical rollover angle is reached. If now the tilt is beyond this angle it will fall over (C.G beyond the pivot point) and main rotor thrust will continue the roll, called dynamic rollover making recovery impossible even if the full cyclic control corrections are applied.

In case, for example, during landing after a hover, the right skid contacts the ground and becomes pivot point, the helicopter will start rolling to the right even with full left cyclic applied, because the main rotor thrust vector and its moment is such that the helicopter will continue to roll towards the right (critical angle is reached) and it will fall over to right.

1.19 **Useful and Effective Techniques**: Nil

2 Analysis

2.1 Serviceability of Helicopter

The helicopter was manufactured in the year 1999. The Certificate of Registration, Certificate of Airworthiness and ARC was valid on the day of accident. The helicopter was flown with valid Aeromobile Licence and had logged 6198.00 airframe hrs as on date of accident.

The helicopter and its Engine were maintained as per continuous maintenance programme consisting of calendar period based or Flying Hours/ Cycles based maintenance as approved by DGCA. The last major inspection i.e. 300 hrs/ 12 months inspection was carried out at 5982:55 airframe hrs on 26-09-2016. Subsequently all lower inspections, after last flight inspection and pre-flight checks were carried out as and when due before the accident.

All the applicable Airworthiness Directive, Service Bulletins, DGCA Mandatory Modification on this helicopter and its engine have been complied with as & when due. Turn Around Inspections are carried out by the operator as per approved schedules and all the higher inspection includes checks/ inspection as per the manufacturer's guidelines.

On 24.04.2017 the Turbine Assembly was changed as per maintenance schedule followed by a check flight wherein no abnormality was observed. Thereafter, the helicopter had flown for around 05 hours carrying out 08 uneventful landings prior to the accident landing. All the flying was carried out on the day of accident i.e. on 26.04.2018. There was no defect reported on the helicopter before the accident.

The load and trim was prepared before the flight, all up weight & C.G. of the helicopter was found within the operating limits.

2.2 Weather

The weather at the time of accident was fine, clear sky, visibility more than 5 Kms. The outside air temperature was around 40^{o}C. At the time of landing, there were south-easterly winds (cross winds from left to right of the direction of flight of helicopter). During approach to the helipad, the pilot had felt changes in the flight attitude (pitch) indicative of thermal convection.

2.3 Damage as evidence

The main rotor drive shaft was found broken due to sudden stoppage of main rotor blades impacting with ground. A segment of tail rotor drive shaft was found bent & detached from the tail gear box adapter input and tail boom structure due to sudden stoppage of main rotor blades after impact.

The tail rotor pitch change control rod was also found broken and bent. The right side horizontal stabilizer was crushed due impact with ground but found attached to the tail boom structure.

All the damages were consequential and clearly indicated that there was power at the time of landing / touchdown and there was no disintegration of the helicopter inflight.

2.4 The flight operations - Pilot

The PIC was qualified to operate the subject flight. He was holding a valid license & FATA issued by DGCA and was qualified on the type of helicopter. The PIC had undergone all the trainings and ratings as per the requirements. The PIC had total flying experience of about 2200 hours out of which about 540 hours were on type. He had undergone class I medical examination on 11.08.2016 and was valid on the day of accident.

He had flown the same helicopter on the day of the accident prior to the accident flight and carried out a total flying of about 05 hours which was uneventful. He was quite familiar with the route as he was flying on this route for almost 01 year, since joining the company.

2.5 Circumstance leading to the accident

On the day of accident, prior to the accident flight, the helicopter had carried out 8 landings uneventfully. For the ninth flight the helicopter took-off from Chintalnar with 05 persons on board for Chintagufa. The All Up Weight for the flight was within limits. Chintagufa helipad is at an altitude of 764 feet above mean sea level and the helipad is little higher than the surrounding areas. The enroute flight was uneventful and on reaching overhead Chintagufa, the pilot carried out reconnaissance of the area, as per the procedure being followed by him, at around 600 feet AGL.

After getting the smoke signal from the helipad the pilot started descending by making circuit (right turn) around the helipad and considering the performance of the helicopter at high temperatures (outside temperature was about 40^{o}C) made a shallow approach to the helipad so that less power is required. While descending and approaching the Chintagufa helipad, though the pilot experienced some thermal convection, which was usual in that area, he could keep the helicopter in control.

There were cross winds (from North-West direction) i.e. from left to right of direction of flight of helicopter at the time of landing at Chintagufa. The shallow approach and descent was carried out with torque at 100%. Thereafter making right hand turn circuit with a slight right bank attitude, the pilot came on finals from south / south west direction (at 45^{o} to H mark on helipad). After reaching over helipad, the pilot levelled the helicopter for landing at around 3 feet above the helipad. The helicopter which was hovering “in ground effect” with limited power and high outside temperature experienced reduction in the tail rotor control effectivity thereby experienced loss of directional stability with sudden yaw towards left. The pilot immediately applied right rudder in order to correct it, in the meanwhile the aft portion of the left skid had hit the ground. As the helicopter was still in air with main rotor blades rotating, the helicopter bounced towards right whereby aft portion of the right skid hit the ground.

With 100% torque and applied right rudder, the helicopter continued to roll towards right around the right skid as pivot point (rolling towards right). The critical rollover angle was reached wherein the C.G of the helicopter moved beyond the pivot point (right skid). With the moment created by the main rotor horizontal thrust vector, helicopter continued its roll towards right, causing the main rotor blades hitting the ground prior to the helicopter main structure impacting the ground. The cross winds (from left to right) had assisted in helicopter rolling to the right.

3. CONCLUSION

3.1 Findings

1. The Certificate of Registration, Certificate of Airworthiness & Certificate of flight release of the helicopter was valid on the date of accident.
2. The helicopter and Engines were being maintained under continuous maintenance programme approved by DGCA.
3. The PIC was having valid FATA issued by DGCA, his medical was current and fulfilled all other regulatory requirements of employment.
4. The Pilot had total flying experience of about 2200 hrs out of which about 540 hrs were on Bell 206-B3 helicopter.
5. With 05 persons on board the helicopter, its All Up Weight and CG were within prescribed limits.
6. On the day of accident, prior to the accident flight, the helicopter had carried out 8 landings uneventfully.
7. The accident flight to Chintagufa helipad which is at an altitude of 764 feet above mean sea level was uneventful till overhead Chintagufa. The pilot as per the procedure carried out reconnaissance of the area at around 600 feet AGL, before carrying out approach.
8. Once a ground signal was given and the helipad was clear to land, the approach was initiated with helipad to the right of helicopter approach
9. Considering the performance of the helicopter at high temperatures (outside temperature was about 40^{o} C) the pilot made a shallow approach to the helipad so that less power is required.
10. As per the evidence available there was cross winds from left to right of the direction of flight of helicopter.
11. During approach to the helipad, the pilot felt changes in the flight attitude (pitch) indicative of thermal convection
12. The approach to the helipad was made at 45^{o} to the H mark on helipad.
13. The shallow approach and descent was carried out with torque at 100%.
14. Thereafter making right hand turn circuit with a slight right bank attitude, the pilot came on finals from south / south west direction (at 45^{o} to H mark on helipad).
15. After reaching over helipad, the pilot levelled the helicopter for landing at around 3 feet above the helipad.
16. The helicopter which was hovering “in ground effect” with limited power and high outside temperature experienced reduction in the tail rotor control effectivity thereby experienced loss of directional stability with sudden yaw towards left.
17. The pilot immediately applied right rudder in order to correct it, in the meanwhile the aft portion of the left skid had hit the ground.

18. As the helicopter was still in air with main rotor blades rotating, the helicopter bounced towards right whereby aft portion of the right skid hit the ground.
19. With 100% torque and right rudder applied, the helicopter continued to roll towards right around the right skid as pivot point (rolling towards right). The critical rollover angle was reached wherein the C.G of the helicopter moved beyond the pivot point (right skid).
20. With the moment created by the main rotor horizontal thrust vector, helicopter continued its roll towards right, causing the main rotor blades hitting the ground prior to the helicopter main structure impacting the ground.
21. The cross winds (from left to right) had assisted in helicopter rolling to the right.

3.2 Probable cause of the accident:

The accident occurred during leveling of the helicopter, very close to the ground prior to touchdown because left skid abruptly touched the ground causing a right roll which got aggravated due application of right pedal resulting in a dynamic rollover as the tail controls were ineffective for helicopter being “in ground effect” causing substantial damage to the main rotor blades and helicopter structure.

For a touchdown from the right direction, the thermals existing at that time caused sudden yaw to the left.

4 Safety Recommendations

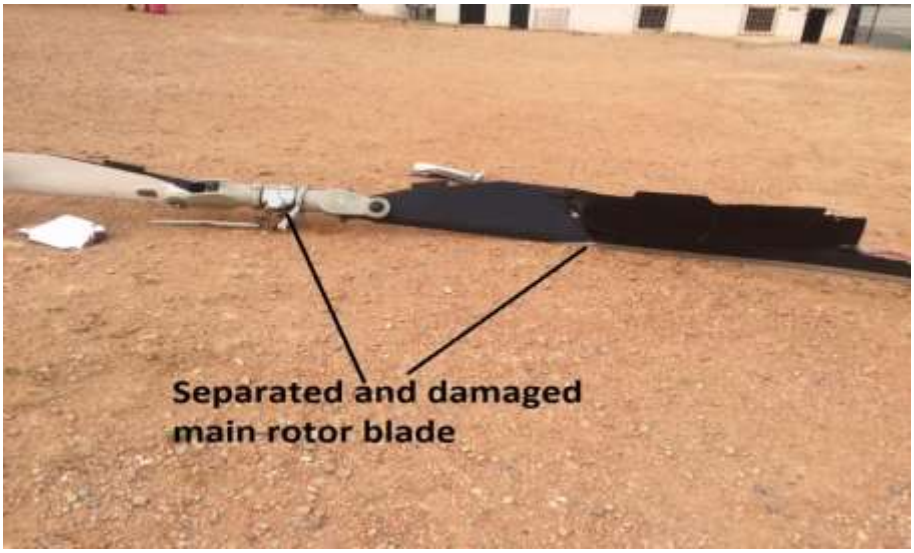
NIL

12/4/18
(R S Passi)
Chairman

(Capt. Irshad Ahmed)
Member

K. Ramachandran 12/4/18
(K. Ramachandran)
Member

Date: 12th April 2018
Place: New Delhi


Separated and damaged
main rotor blade


Main rotor Mast was damaged
Damaged Engine
Exhaust
Engine Cowling upper portion
damaged


Pitch Link Rods were found broken


Tail Drive Shaft found broken and seperated from the tail boom
Segment of tail drive shaft found seperated and bent


Right horizontal stabilizer dmaged due impact


Main Gear Box fully damaged
Flight Control Servo damaged during accident


Tail drive shaft (Segment) detached from tail gear box input adapter and found bent at center