FINAL INVESTIGATION REPORT ON

ACCIDENT TO M/S ARYAN AVIATION PVT. LTD.

BELL 407 HELICOPTER VT-SVK

AT TIKOCHI VILLAGE ON 23rd AUGUST 2019.

K. Ramachandran
Investigator -In- charge

Amit Kumar
Investigator

FOREWORD

In accordance with Annex 13 to the Convention on International Civil Aviation Organization (ICAO) and Rule 3 of Aircraft (Investigation of Accidents and Incidents), Rules 2017, the sole objective of the investigation of an accident/serious incident shall be the prevention of accidents and incidents and not to apportion blame or liability. The investigation conducted in accordance with the provisions of the above said rules shall be separate from any judicial or administrative proceedings to 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 future accidents or incidents could lead to erroneous interpretations.

INDEX

GLOSSARY

AAIB	Aircraft Accident Investigation Bureau, India
ADC	Air Data Computer
AME	Aircraft Maintenance Engineer
AMSL	Above Mean Sea Level
ARC	Airworthiness Review Certificate
ATC	Air Traffic Control
AUW	All Up Weight
C of A	Certificate of Airworthiness
C of R	Certificate of Registration
CAR	Civil Aviation Requirements
CPL(H)	Commercial Pilot License - Helicopter
CVR	Cockpit Voice Recorder
DFDR	Digital Flight data Recorder
DGCA	Directorate General of Civil Aviation
FATO	Final Approach and Take-Off Area
FIC	Flight Information Centers
hrs	Hours
IAS	Indicated Air Speed
ICAO	International Civil Aviation Organization
MEL	Minimum Equipment List
MLG	Main Landing Gear
NM	Nautical Miles
PIC	Pilot in Command
SB	Service Bulletin
SDRF	State Disaster Response Force
SOP	Standard Operating Procedure
TAS	True Air Speed
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
VOR	VHF Omnidirectional Range
UTC	Coordinated Universal Time

FINAL INVESTIGATION REPORT ON ACCIDENT TO M/s ARYAN AVIATION PVT. LTD. BELL 407 HELICOPTER VT-SVK AT TIKOCHI ON 23rd AUGUST 2019.			
1.	Aircraft	Type	BELL 407 Helicopter
		Nationality	Indian
		Registration	VT-SVK
2.	Owner & Operator		M/s Aryan Aviation Pvt. Ltd.
3.	Pilot		CPL(H) Holder
	Extent of Injuries		Serious
4.	No. of Passengers on board		01 AME occupying co-pilot seat
	Extent of Injuries		Minor
5.	Date & Time of Accident		23rd August 2019 at 0830 UTC
6.	Place of Accident		Tikochi, Uttarkashi District
7.	Co-ordinates of Accident Site, AMSL		Lat: 31° 03’ 39” N Long: 77° 52’ 145” E.
8.	Last point of Departure		Arakot, Temporary Helipad
9.	Intended landing place		Chiva, Temporary Helipad
10.	Type of Operation		Non-Scheduled – Rescue/Relief Operations
11.	Phase of operation		En-route – Top of Descent.
12.	Type of Accident		Forced Landing due to Cable Hit

(All the timings in this report are in UTC unless otherwise specified)

SYNOPSIS

On 23rd August 2019, Bell 407 helicopter, VT-SVK belonging to M/s Aryan Aviation Pvt. Ltd. met with an accident while operating relief and rescue operations in Uttarkashi district of Uttarakhand State.

The helicopter was planned to operate Rescue & Relief Operations in Uttarkashi District due to Natural Calamity (Flood) in that area. Accordingly, the helicopter along with a pilot and an engineer reached Aarakot to operate flight between Aarakot & Chiva Village. Aarakot was the base from where the helicopter was supposed to carry flood relief materials to Chiva. The helicopter carried out two uneventful sorties between Aarakot & Chiva carrying flood relief materials.

During the third sortie while en-route, at an altitude of 6500 feet and about 2 Nm short of Chiva, the helicopter hit a cable. The right skid got severed from the front cross tube joint and hit the right Perspex. Broken pieces of perspex hit the Pilot's face & body. After hitting the cable, the helicopter tossed up in the air and started maneuvering abruptly. The helicopter became uncontrollable. Thereafter, the pilot managed to partially control the helicopter and started looking for a suitable place for forced landing. He could not find any suitable area as the helicopter was flying in a valley and below it was a flooded river. Pilot then lowered the helicopter and tried to land on boulders in the river bed. However, the helicopter impacted on one of the rocks on its belly and finally settled on those rocks. The pilot received serious injuries, however, the AME on board escaped with minor injuries. The helicopter sustained substantial damages, however, there was no fire.

Director General, AAIB appointed Sh. K Ramachandran, Assistant Director, AAIB as Investigator – In – Charge & Sh. Amit Kumar, Safety Investigator Officer, AAIB as Investigator to investigate into the probable cause(s) of the accident, vide Order No. INV.11011/5/2019-AAIB dated 27th August 2019 under Rule 11 (1) of Aircraft (Investigation of Accidents and Incidents), Rules 2017.

1. FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

On 22nd August 2019, the pilot received information from the company that he is required to operate rescue flights on 23rd August 2019 from Arakot to flood affected areas in Uttarkashi district due to cloud burst.

On 23rd August 2019, i.e. on the day of accident, at 0200 UTC, the helicopter had operated a medical/rescue flight from Sahastradhara to Balawat and back. There was no abnormality observed/reported by the pilot. The pilot was then briefed by the company for the rescue/relief flights to be carried out from Aarakot. At about 0600 UTC, the helicopter took-off from Sahastradhara helipad with a pilot and an AME on board for Arakot Helipad and landed at around 0635 UTC.

After landing at Arakot, the pilot took briefing from local authorities about the flight details, weather, load of various items to be carried, relief materials to be taken, the location of the helipads i.e. co-ordinates of the helipad, any passengers if required to be evacuated on return flight, etc. At about 0745 UTC, after obtaining clearance (ADC/FIC), the pilot took-off from Arakot for Chiva village for flood relief operations with an AME on board. The helicopter was carrying flood relief items like food, medicine, etc. The weather reported at that time was sunny, clear skies with visibility more than 5000 meters. The flying time from Arakot to Chiva Village was around seven minutes. Before the accidented flight, the helicopter had carried out two uneventful sorties between Arakot and Chiva Village. There was no abnormality observed/reported by the pilot. The pilot stated that during these shuttles they (Pilot & Engineer) were specifically looking for cables/obstructions in the flight path, forced landing area, electric cables, etc. However, they couldn't locate any cables on the route. The pilot stated that during the first sortie to Chiva from Arakot, he had maintained 8000 ft altitude (indicated). However, in the second & third sortie, he maintained 7500 ft altitude (indicated) because the altitude of Chiva helipad was around 5900 ft located in a closed bowl like terrain and approaching the helipad at 8000 ft and then carrying out a steep descent with low speed could get into vortices. The altitude of the mountains on both sides of the valley were around 9000 to 10000 ft.

During third sortie after taking off from Arakot for Chiva Helipad, there was no abnormality till top of descent. During descent at an altitude of about 6500 ft and about 2

NM short of Chiva, the right skid of helicopter hit a cable. As a result, the right-side skid severed from the front cross tube section and hit the right-side of the Perspex. The broken pieces of Perspex hit the pilot on his face and body. The right eye of the pilot started bleeding. Simultaneously, the helicopter tossed-up in the air for about 40 feet. Thereafter, there was abrupt change in attitude of the helicopter and it started pitching & rolling in uncertain pattern i.e. it started maneuvering abruptly and become uncontrollable. The pilot stated that it became difficult to control the helicopter, however, after sometime he got partial control of the helicopter and decided to carry out an emergency landing. There was no force landing field available in the valley ahead as there were high/steep mountains on both sides of the valley and below it was a river. The pilot, however, managed to find a location on the river bed which was full of rocks & boulders. The pilot flared the helicopter to land on one big flat rock, however, the helicopter impacted one of the rocks on its belly before sliding back and settling on the rocks. Immediately after settling, the pilot rolled the throttle to OFF and the Engineer applied the rotor brakes. The pilot then switched off all the CBs & switches. The AME and pilot evacuated the helicopter from the left (Co-pilot) side door as the right (pilot side) door was distorted & crushed by the impact of severed right skid.

The villagers and the SDRF team working in that area heard a loud bang noise and started rushing towards the helicopter. They reached the helicopter and rescued the pilot and engineer. Both of them were then taken to Arakot helipad by the SDRF team and from Arakot they were taken to Dehradun by State Government helicopter for medical treatment. The engineer escaped with minor injuries, however, the pilot received serious injuries and was hospitalized. The helicopter sustained substantial damages during the accident but there was no fire.

1.2 INJURIES TO PERSONS

Injuries	Crew	Passengers	Others
Fatal	NIL	NIL	NIL
Serious	01	NIL	NIL
Minor/ ~~None~~	NIL	01 (AME)	NIL

1.3 DAMAGE TO HELICOPTER

The helicopter was substantially damaged during the accident.

The damages are given below: -

1. Skid assembly was found severely damaged including damage to forward & aft cross tube, LH and RH skid tube assembly, Rocker beam assembly and flight step etc.
2. Both cockpit side doors were found cracked and partially crushed. Window Perspex were also found broken. Doors hinges were found distorted.
3. Both side cabin doors were found cracked and partially crushed. Cabin Door Window Perspex were also found broken. Door hinges were found distorted.

PICTURE 1: DAMAGED RIGHT SKID ASSEMBLY.

PICTURE 2: DAMAGED COCKPIT DOOR

4. Litter door was found cracked and partially crushed, door window's glass was also found broken. Hinges were found distorted.
5. Baggage compartment's door was found cracked and hinges were found distorted.

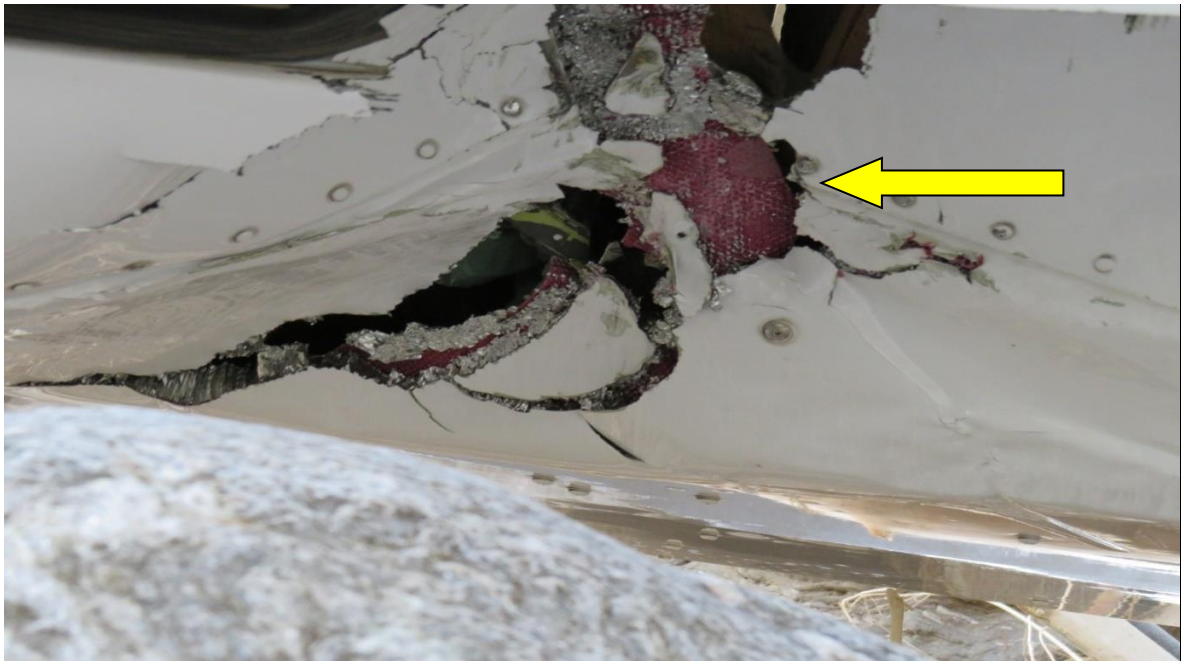
PICTURE 3: DAMAGED CABIN DOOR

PICTURE 4: DAMAGED BAGGAGE COMPARTMENT DOOR.

PICTURE 5: DAMAGED WINDSHIELDS

6. Forward, Intermediate and Aft sections were found severely damaged.
7. Fuselage structure was found severely damaged, which includes skin, fairing assembly of both side, shell assembly of lower cabin, aft cabin, cowlings, firewalls, longerons, roof beams and panel etc.

PICTURE 6



PICTURE 6 & 7: SEVERELY DAMAGED BELLY

8. Tail boom was found damaged with a deep dent on aft side. Tail boom aft side and TGB support assembly were found completely damaged.
9. Horizontal Stabilizer was broken in two pieces.
10. Lower part of Tail Boom Fin Assembly and Tail Skid Assembly were found crushed.

PICTURE 8: DAMAGED TAIL SKID ASSEMBLY

11. Tip of all three main rotor blades were found damaged.

PICTURE 9: DAMAGED MAIN ROTOR BLADES

12. Lower wire cutter was found severed and damaged.

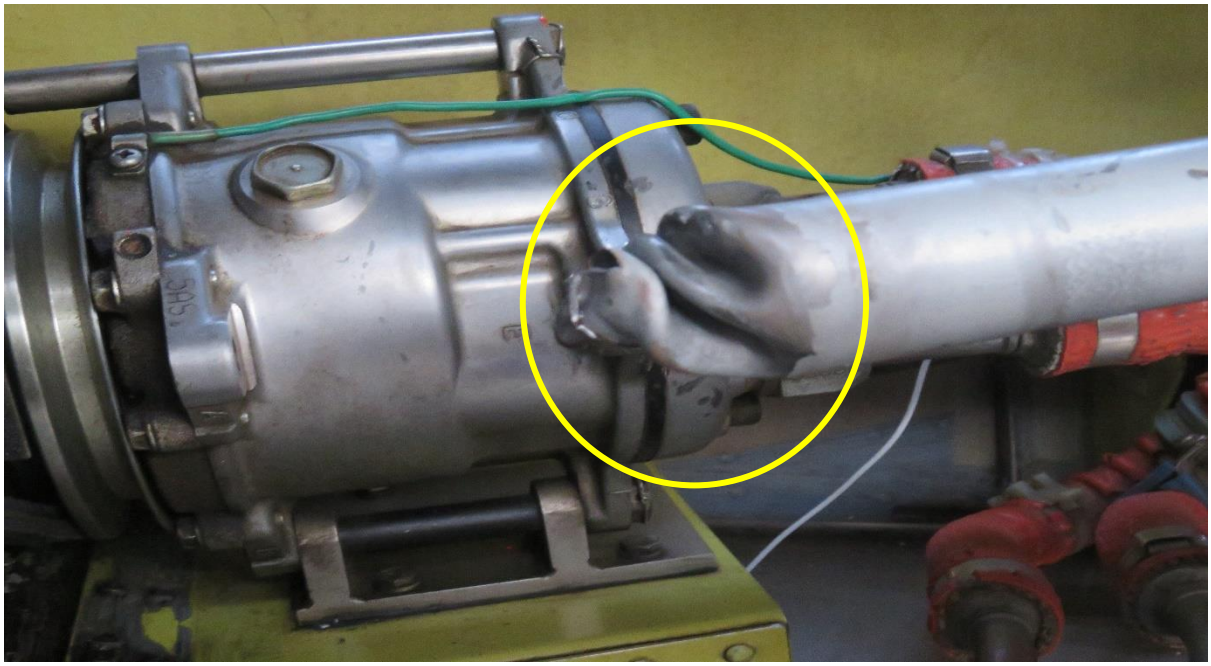
PICTURE 10: SEVERED LOWER WIRE CUTTER ASSEMBLY

13. Tail Rotor Blade Assembly was severely damaged.

PICTURE 11: DAMAGED TAIL ROTOR BLADE

14. Tail Gear Box Assembly was found detached from the platform.

15. Tail Rotor Drive system was found damaged.



PICTURE 12: DAMAGED TAIL ROTOR DRIVE SHAFT

1.4 OTHER DAMAGE

Nil

1.5 PERSONNEL INFORMATION

1.5.1 Pilot – In – Command

Date of Birth	26.09.1959
License	CPL(H)
Date of Issue	27.11.2007
Valid up to	26.11.2022
Category	Helicopter
Class	Single Engine Land
Date of Class I Med. Exam.	10.03.2019
Class I Medical Valid up to	04.10.2019
Date of issue FRTOL License	27.11.2007
FRTO License Valid up to	26.11.2022
Endorsements as PIC	Alouette-III/ Chetak & Bell 407 Helicopter
Total flying experience	6715 hrs. 50 min
Total flying experience on type	3352 hrs. 30 min
Last Flown on type	23.08.2019
Total flying experience during last 1 year	607 hrs. 55 min

Total flying experience during last 6 Months	256 hrs. 00 min
Total flying experience during last 30 days	25 hrs. 40 min
Total flying experience during last 07 Days	4 hrs. 50 min
Total flying experience during last 24 Hours	2 hrs. 10 min
Rest period before flight	48 hrs.
Whether involved in Accident/Incident earlier	No
Date of latest Flight Checks and Ground Classes	- Prof Check: 14 May 2019 - Hill Check: 17 Mar 2019 - Simulator Training & Critical Emergency: 06 Mar 2019. - CRM & ESC Training: 07 Jan 2019. - Specific Ground Training: 20 Jul 2019.

Pilot had served in the Indian Army for 19 years. He did his flying training on Aeroplane from Airforce Academy and Helicopter training from Helicopter Training School (Indian Air Force). In the Indian Army, he had flown Cheetah and Chetak Helicopters. Pilot had joined the company in the year 2016. He had already operated in Uttarakhand Hill Regions earlier. The pilot had undergone Hill Check of 45 minutes on 17th March 2019, sector Guptkashi – Sehastradhara on Bell 407 helicopter with a DGCA examiner.

Pilot has met the standards of Class-1 Medical, in the Medical Assessment done by DGCA on 3rd March 2019. However, Pilot was advised to wear corrective glasses while exercising the privileges of the License and always carry a spare set of spectacles while flying.

1.6 HELICOPTER INFORMATION

1.6.1 Bell 407 Helicopter Description

Bell 407 Model is a single engine, seven-place light helicopter. Standard configuration provides for one pilot and six passengers.

The fuselage consists of three main sections, the Forward Section, the Intermediate Section, and the Tail boom Section. The forward section utilizes aluminum honeycomb and carbon graphite structure and provides the major load carrying elements of the forward cabin. The intermediate section is a semi-monocoque structure which uses bulkheads, longerons and carbon fiber composite side skins. The tail boom is an aluminium monocoque construction which transmits all stresses through its external skins.

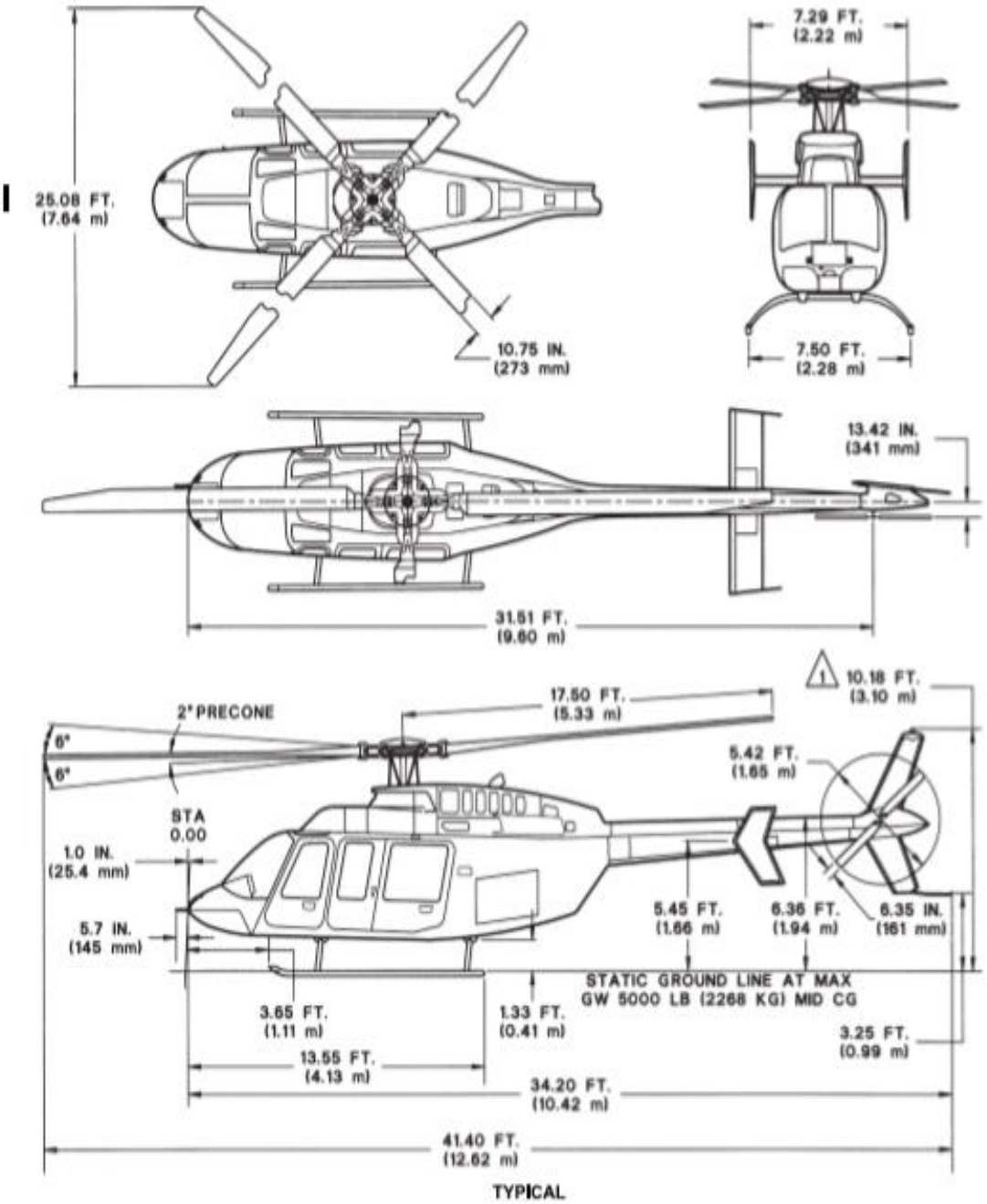
The helicopter is powered by a Rolls-Royce, Model 250-C47B engine.

The main rotor is a four-bladed, soft-in-plane design with a composite hub and individually interchangeable blades. The tail rotor is a two-bladed teetering rotor that provides directional control.

Basic helicopter landing gear is the low skid type.

Principal Dimensions

Principal exterior dimensions are shown in Pic 13 below. All height dimensions must be considered approximate due to variations in loading and landing gear deflection.



PICTURE 13: PRINCIPAL DIMENSIONS OF BELL 407 HELICOPTER

1.6.2 Helicopter VT-SVK General Information

Helicopter Model	BELL 407
Helicopter S. No.	53793
Year of Manufacturer	2007
Name of Owner	M/s Aryan Aviation Pvt Ltd
C of R	3839/3
C of A	5048/1
Category	Normal Passenger
C of A Validity	Unlimited
A R C issued on	27.08.2018
ARC valid up to	04.09.2019
Helicopter Empty Weight	1440 Kg
Maximum Take-off weight	2381 Kg
Date of Helicopter weighment	18.07.2018
Max Usable Fuel	446.54 Kg
Max Payload with full fuel	409.46 Kg
Empty Weight C. G	3.3267 meters aft of Datum
Next Weighing due on	19th Feb 2013
Total Helicopter Hours	4443.50
Last major inspection	300 Hrs/ 12 Month Inspection
Engine Type	Rolls Royce, 250-C47B
Engine Sl. No.	CAE 848075
Last major inspection	18.10.2018
Repairs carried out after last major inspection till date of incident	HMU replaced on 4th April 2019
Total Engine Hours Since New	2293.50 Hrs
Total Engine Hours Since (Overhaul)	274.40 Hrs
Aero mobile License	A.090/002/RLO(NR)

The Aircraft is registered in “Normal” category & Sub Division - “Passenger Aircraft”.

Last Certificate to Release to Service (C. R. S.) was issued on 24th July 2019 after Test Flight. CRS after carrying out 100 Hrs / 90 Days Inspection was issued on 19th July 2019. The C of A remains valid subject to validity of Airworthiness Review Certificate.

The Aircraft was holding a valid Aero Mobile License No. A.090/002/RLO(NR) at the time of accident. The Aero Mobile license was initially issued on 03.10.2008 and renewed on 09.03.2017.

Non-Scheduled Air Operator Permit (NSOP) No.13/2009 was issued on 03.04.2019 and was valid upto 07.04.2024.

The aircraft was last weighed on 18.07.2018 at Dehradun and the weight schedule was re-computed on 18.07.2018, which was duly approved by the office of Director of Airworthiness, DGCA, on 24.07.2018. As per the approved weight schedule the Empty Weight of the aircraft is 1440 Kgs and Maximum Take-Off Weight (MTOW) of the aircraft is 2381 Kgs. Maximum usable fuel quantity is 446.54 Kgs. Maximum payload with fuel tanks full is 409.46 Kgs. Empty weight CG is 332.65 centimeters aft of datum.

Aircraft had logged 4443.50 hours till the date of accident. Last scheduled inspection carried out on the aircraft was inspection operation 100 Hrs/ 90 Days at 4424:20 airframe hours on 19th July 2019. The aircraft had logged 19:30 hrs since last scheduled inspection. Pre-flight inspection was carried out by the pilot before the first flight on the day of accident. Prior to the accidented flight, the aircraft had flown for 02:10 hrs with 07 landings on the day of accident.

As on date of accident, the aircraft engine had logged 2293.50 Hrs. Last scheduled inspection carried out on the engine was 150 Hrs inspection at 2274:20 engine Hours on 19th July 2019.

The Main Rotor Blades installed on the Helicopter had logged 4443.50 hrs since new as on date of accident.

All concerned Airworthiness Directives, mandatory Service Bulletins and DGCA Mandatory Modifications on this aircraft and its engine have been complied with as on date of event.

Scrutiny of the Technical Log Book revealed that, there was no snag pending on the aircraft prior to the accidented flight. The last snag recorded was on 26th March 2019 and the snag was “Hydro Mechanical Unit (HMU) Metering Valve Fault”. The rectification action carried out was “Defective HMU was removed and Serviceable HMU was installed on the engine” on 1st April 2019.

1.7 METEOROLOGICAL INFORMATION

There was no Meteorological (MET) office situated at Arakot and nearby areas where the helicopter was operating. Pilot obtained MET information from Dehradun & Saharanpur prior to the flight. As per Pilot's statement, the weather at that time was sunny with clear skies and visibility was more than 5000 meters.

1.8 AIDS TO NAVIGATION

No navigational aids were available at Temporary helipads other than a letter "H", marked on the helipad at Arakot and Chiva, so as to be visible from the air. However, the flying & location of the helipad was ascertained by on board Garmin GPS (Global Positioning System) set.

1.9 COMMUNICATIONS

The temporary helipads were uncontrolled. As such at the time of accident, the helicopter was not in contact with any ATC unit. The local authorities informed the company about the accident.

1.10 AERODROME INFORMATION

Both Helipads at Arakot as well as Chiva were temporarily made to carry out rescue and flood relief operations. The helipads were used to supply flood relief items to the flood affected areas and also for ferrying passengers mostly people who required immediate medical attention. No Navigational/Landing Aids were available other than 'H' marking which were available on both Arakot & Chiva helipads for visible signage from the air.

PICTURE 14: AARAKOT HELIPAD WITH VALLEY

The co-ordinates of the Arakot & Chiva helipads are 31° 02' 29" N, 077° 49' 46" E with elevation of approx. 4300 feet and 31° 05' 32" N, 077° 53' 52" E with elevation of approx. 5600 feet respectively. The helipads are surrounded by hills and have only one direction for landing and take-off. The valley starts immediately after the helipad.

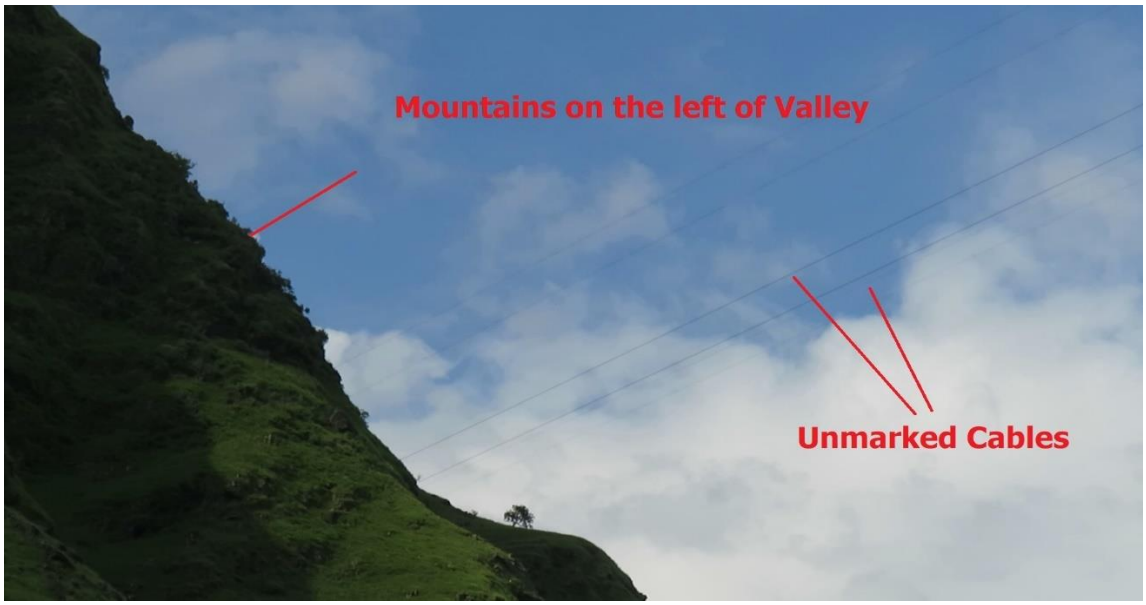
1.11 FLIGHT RECORDERS

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

1.12 WRECKAGE AND IMPACT INFORMATION

On top of descent, the helicopter hit a cable spanning across the valley. The front portion of Right skid severed from the front cross tube section and hit the Pilot side plexiglass. After hitting the cables, the helicopter tossed up in the air and became uncontrollable. The helicopter started maneuvering abruptly. As there was no suitable area for forced landing, the pilot decided to forced land on the river bed which was full of rocks and big stones. He lowered the helicopter and tried to land on a big flat stone.

However, the helicopter impacted on one of the big stones on its belly which was found punctured and crushed at the point of impact. The helicopter then slided slightly backwards during which the tail rotor got stuck to a hard surface and stopped rotating. The helicopter finally settled on the rocks in the nose up condition.



PICTURE 15: THE HELICOPTER HIT THESE CABLES SPANNING THE VALLEY

As the main rotors were still rotating, it hit the surface on the slope due to which the tip of the main rotor blades was damaged. One of the broken pieces of blade tip was found 50 meters away from the helicopter wreckage. Helicopter's skid was damaged due to impact with rock. As the tail rotor got stuck on the hard surface while the main rotor blades were still rotating, the power transmission shaft (Tail Rotor Drive Shaft) got twisted and disengaged (Refer Picture 12). Meanwhile, pilot rolled the throttle to OFF position after settling and the Engineer on board applied the rotor brakes. Then both Pilot and Engineer came out of the helicopter from the LH door. Refer Para 1.3 for details of the helicopter damages.

PICTURE 16: THE FIRST POINT OF IMPACT ON ROCK

PICTURE 17

PICTURE 17 & 18: FINAL RESTING POSITION OF THE HELICOPTER

The left rudder pedal was found pushed inside. All the controls were found in serviceable condition, i.e. there was no discontinuity observed. The load (Relief Material) in the cabin was found stacked in the aft cabin above the rear passenger seat.

The helicopter wreckage was confined to its final resting position and there was no evidence of disintegration of any part in the air.

PICTURE 19: PIECE OF MAIN ROTOR BLADE TIP

PICTURE 20: LOAD (30 BAGS OF RELIEF MATERIAL) IN CABIN

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

The pilot had undergone pre-flight medical (Breath Analyser Test) at Sahastradhara before operating first flight of the day as per requirement of CAR Section 5, Series F, Part III. The test was negative i.e. the pilot was not under the influence of alcohol. After the accident, the pilot was admitted to a hospital in Dehradun on 23.08.2019 where he underwent treatment before being discharged on 26.08.2019, i.e. he was hospitalized for more than 48 hours.

1.14 FIRE

There was no fire.

1.15 SURVIVAL ASPECTS

The accident was survivable. After the helicopter settled on the rocks, then both Pilot and Engineer came out of the helicopter from the LH (Co-pilot Side) door as the RH (Pilot side) door was blocked by the severed right skid.

1.16 TESTS AND RESEARCH

Nil

1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION

1.17.1 The helicopter was operated by an operator holding Air Operator Permit (AOP) No. 13/2009 for Non-Scheduled Air Transport Services which was valid till 07.04.2024.

As per the AOP, the operator has a fleet of 06 aircraft which includes 02 Bell 407 helicopters, 01 Airbus AS365N2 Dauphin & 01 AS 355 N helicopters and 02 Stemme S6RT Motor Gliders. As per AOP, these aircraft were permitted for Commercial Air Transport in Passenger category only.

It carries out its own maintenance as CAR 145 approved organization.

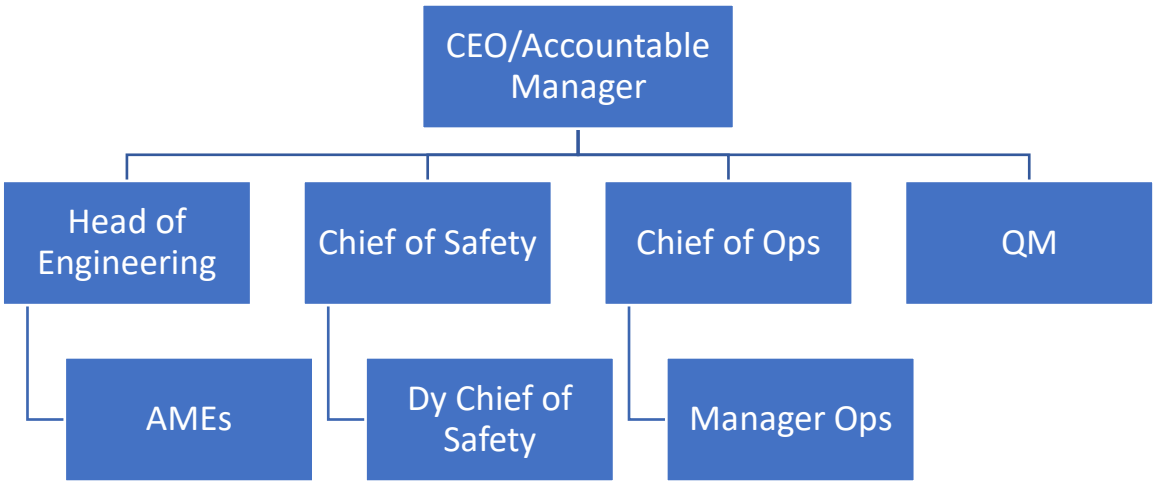
1.17.2 Operations Manual of the Organisation.

The operator has formulated an Operations Manual which was approved by DGCA on 27th March 2017.

In the following paragraphs, relevant portion of the Operations Manual (OM) of the Aircraft Operator are discussed to understand the standard procedures in place and to corroborate with this accident.

1.17.2.1 Organisation Structure

As per the organization structure of the operator, the Chief Executive Officer (CEO) reports to the Board of Directors for conduct of Company activities and planning. Operations is looked after by Chief of Operations (COO), who is directly responsible to the CEO. The COO is assisted by the Chief Pilots (Helicopters and Gliders) and Head of Training. Chief of Flight Safety reports directly to the CEO, who is also the Accountable Manager.



PICTURE 21: THE ORGANIZATION CHART LAYOUT OF THE OPERATOR

1.17.2.2 Authority, Duties and Responsibilities of Pilot in Command (PIC)

Some of the salient Duties and Responsibilities of PIC are appended below: -

The PIC shall:

(a) Maintain familiarity with relevant Indian and international air legislation and agreed aviation practices and procedures.

(b) Maintain familiarity with such provisions of the Company Operations Manual as are necessary to fulfil his functions.

(c) Be responsible for safe operations of the helicopter and safety of its occupants and cargo when the rotors are turning.

(d) Ensure that all operational procedures and checklists are complied with, in accordance with the Operations Manual and the aircraft flight manual.

(e) Ensure that the pre-flight inspection has been carried out.

(f) In an emergency situation that requires immediate decision and action, take any action he considers necessary under the circumstances. In such cases he may deviate from rules, operational procedures and methods in the interest of safety. This requirement shall be the responsibility of the PIC or the pilot to whom the conduct of the flight has been delegated.

(g) Before commencing take-off be satisfied that, according to the information available to him, the weather at the heliport and the condition of the FATO intended to be used should not prevent a safe take-off and departure, and before commencing an approach to land be satisfied that, according to the information available to him, the weather at the heliport and the condition of the FATO intended to be used should not prevent a safe approach, landing or missed approach, having regard to the performance information contained in this Operations Manual.

(h) Take all reasonable steps to ensure that the helicopter mass and balance is within the calculated limits for the operating conditions.

(i) Confirm that the helicopter's performance will enable it to safely complete the proposed flight.

(j) Ensure that the documents and manuals, required to be carried, are carried and remain valid throughout the flight or series of flights and be produced, when requested, to a person authorized by the Authority.

1.17.2.3 The Adequacy and Performance of the Available Visual and Non-Visual Ground Aids

The company helicopters will undertake operations from aerodrome/heliport and temporary helipads. The landing sites shall be provided with at least following visual aids: -

- At least one wind direction indicator/smoke
- Helicopter landing area identification marking 'H'
- All available ground features will be used for navigation.
- Any available ground radio station.

1.17.2.4 Mountain Operations

Mountain or hill flying refers to operations to / from a helipad which is at or above 4000 feet AMSL and with surrounding terrain above 4000 feet AMSL within a 10 Nm radius. Mountain/hill operations require special training and skill development due to the intricacies, peculiarities and hazards associated with mountain operations. Pilots have to develop skill and knowledge to undertake these operations through ground and flight training and through exposure to such elements with experience pilots.

All pilots involved in hill/mountain operations shall be specially checked and cleared before being detailed for these operations. The details of training required is given in detail in CAR Section 8, Series H, Part II. All pilots operating in mountain environment are to be familiar with the contents of the CAR and ensure adherence.

Mountain Operations Peculiarities:

The foremost challenge in helicopter flying is management of inertia and momentum.

The inertia increases with altitude as the TAS increases relative to IAS, while the helicopter control ability to manage the inertia reduces with altitude. This factor needs to be understood by all pilots operating in reduced density altitudes.

Helicopter operations Mountain flying is associated with various aviation hazards, requiring special skills and procedures required for operating in mountaineous terrain. Some of the main hazards/peculiarities are: -

(a) Valley fog,

(b) Clouding,

(c) False horizon,

(d) Turbulence and mountain waves,

(e) Icing conditions,

(f) Severe up draughts and down draughts

(g) Unpredictable weather.

(h) Limited visibility in low light due hill shading

(i) Sudden and unpredictable weather changes

(j) Reduced power margin

(k) Higher TAS leading to greater helicopter inertia

(l) Reduced control response

(m) Blade stall

(n) Reduced turning/manoeuvre area in valleys

(o) Wires spanning the valleys

(p) Limited force/precautionary landing options

(q) Reduced range of electronic and navigation aids.

Golden Rules:

(a) Check weather before flight,

(b) Fly in VFR conditions,

(c) Maintain safe vertical clearance above the terrain as laid down,

(d) Carry topographic maps of the area with routes marked very prominently,

(e) Know the topography,

(f) When in doubt turn back,

(g) Fly the flight plan track, for ease of search and rescue,

(h) Know your machine and do not exceed the limits of both man and machine.

(i) Note possible force/precautionary landing areas as flight progresses.

(j) Meticulous flight planning to obviate loss of electronic nav aids.

(k) Calculation of power requirement both at departure and destination, catering for sudden change of altitude and operating environment.

(l) Learn from the experience of others.

General requirements:

(a) Hill Flying will be restricted to VFR operation only.

(b) The pilot engaged in hill operation must have thorough knowledge of topography, general weather pattern presence of mountain waves and planning of entry and exit procedures.

(c) A pilot having at least 250 hrs of hill flying experience on helicopter will be considered experienced in hilly operations.

1.18 ADDITIONAL INFORMATION

1.18.1 DGCA Civil Aviation Requirements (CAR) & Circulars

1.18.1.1 CAR Section 4 Series B Part II - Minimum Safety Requirements for Temporary Helicopter Landing Areas.

DGCA has issued a CAR which provides for the minimum safety requirement considered necessary for helicopter landing areas located outside an aerodrome, for temporary use by helicopters engaged on chartered/ private flight operation. Copy of the CAR is enclosed as Annexure 'I'.

Para 3.3 & 3.5 of the CAR states: -

"Before undertaking any such flight, the helicopter operator and/ or his pilot must satisfy himself by his physical inspection on ground/ air and/ or obtaining required information from District authorities that surroundings are free from obstacles and the site suitable for operations of type of helicopter being operated and there is sufficient open space to force land, if necessary."

and

"*Helicopter operator through their Accountable Manager shall be responsible for the safety of helicopter operations, passengers and people on ground*."

It is pertinent to highlight that no physical inspection of the temporary helipads on ground/air at Aarakot (before departing from Sehastradhara) & Chiva was carried out by the operator/pilot before commencing the relief/rescue operations. As per the statement of the pilot, after arrival at Aarakot, the pilot took briefing from the local authorities about the flight details, weather, load of various items to be carried out, number of pax can be carried, flight time etc. Pilot specifically asked the local authorities about the cables and its marking, however, the pilot was not informed properly about the location of cable obstructions and whether they are marked, i.e. the pilot didn't have any information about obstacles (cables) or forced landing area, before operating the

rescue/relief flight. However, he stated that, after reaching Chiva Helipad, he carried out High Recce followed by low Recce before touchdown.

The pilot further stated that during the earlier two sorties they (Pilot & AME) were looking out for any obstacles, force landing fields, rope way cables (which they couldn't locate), high- & low-tension cables, which they located at number of places.

Para 4 of the CAR provides "Site Requirements" like minimum size requirement of the area, Markings, Wind Direction, Safe Area, etc. which needs to be met in order to perform safe operations from temporary helipads. These requirements are also part of the Operations Manual of the Operator. However, temporary helipads at Aarakot & Chiva did not meet with these requirements other than the 'H' marking which was available on both helipads.

1.18.1.2 Operations Circular No. 7/2013 - Utilisation Of Helicopters in Disaster Management.

DGCA had issued an Operation Circular which provides instructions/guidelines for utilisation of helicopters in Disaster Management (DM) to be followed by Requisitioning Authority (RA)/ State Governments, DGCA, Operators and other stake holders participating in Disaster Management (DM). The circular was issued after the flash floods in Uttarakhand in the year 2013 where Civil/Military registered helicopters were operated for relief operations. Copy of the Circular is enclosed as Annexure 'II'.

Some of the salient guidelines are discussed below: -

Para 2 gives guidelines for RA and State Governments to know the Limitations of Helicopters to be able to deploy them efficiently for best results for DM.

Para 5 gives guidelines for RA/State Governments to understand the Affects of Disasters on Flying Operations i.e. how each disaster affects the flying activities in a different manner but some common aspects are given.

In Para 7, Suggested Role and Responsibilities of RA / State Governments are recommended.

It was recommended to include requisition and management of aviation assets as an integral part of DM scheme. It was also recommended to formulate procedures and

modalities for requisitioning and chartering civil aircraft during disaster and to formulate a detailed working plan based on these recommendations/guidelines.

Para 8 gives Role of DGCA for ensuing safety of aircraft operations and as a facilitator. It is mentioned that DGCA would provide all assistance to the RA/ State Govts to ensure quick response along with optimum and safe utilization of all aviation assets during DM.

It also mentions that DGCA will Provide Flight Operations Inspectors (FOIs) during the calamity to be collocated with State DMA and at site of disaster to assist in: -

- Ensuring safety of helicopter operations and flying during adverse conditions. Flight safety would be top priority at all times.
- Assist in preparation of landing grounds/ helipads, safety and security of helicopters, landing grounds, etc. so that people do not crowd helicopters leading to inadvertent accident/incident.
- Disseminating information to all operators and pilots about weather in different valleys, routes and in different regions, conditions of existing helipads and landing grounds, security and aids available at various locations, etc.

……

Para 9 gives Role of Operators and tasks to be performed by them.

It is mentioned that, on specific instructions from the Ministry of Civil Aviation, 'Aid to State Govt. / RA' would be given 'Priority' over all other commercial activities. On the requisition, the helicopter(s) and ground party would be moved to the disaster site at the earliest by the shortest route.

It is also mentioned that during DM, the operator will

- Undertake all flights within the realms of pilot's and helicopter's abilities, without jeopardizing safety,
- Ensure crew composition as per severity of weather, terrain, task, landing areas, security and safety concerns.
- Work in coordination with other operators as per instructions of DGCA FOI delegated on site or co-opted with State DMA, Strictly follow rules for VFR and IFR flights, etc.

The Rescue/Relief operations were started by the local authorities after the natural calamity (Flood) at Uttarkashi District of Uttarakhand. Temporary helipads were

made by the local authorities for rescuing people and to supply relief materials to the affected areas.

The operator was approached for these operations after one of the helicopters belonging to a NSOP had met with a fatal accident while carrying out relief operations in that region on 21st August 2019 i.e. 02 days prior to this accident.

The Rescue/Relief operations were carried out from the temporary helipads which did not meet the minimum safety requirements as per DGCA CAR Section 4 Series B Part II. No guidelines/SOP were made by the local/state authorities for conducting these flights. Further, there was no co-ordination between DGCA, local/State Authorities and operator for conducting these Rescue/Relief operations. Hence, there was not adequate information available with the operator to safely conduct these operations in that area.

During the preliminary investigation carried out by the investigating team of the accident site and surrounding areas, it was observed that there were number of cables at various locations in the valley. These cables were difficult to locate from a distance unless they were properly marked/painted. These cables were not marked by the local authorities which was a potential hazard for conducting flights in the valley.

1.18.1.3 CAR Section 2, Series 'X', Part- II – Weight & Balance Control of Aircraft.

This CAR provides the requirement of frequency of weighment and preparation of weight schedule and also the requirement about display or carriage of the weight schedule on board besides the manner of distribution and securing the load in the aircraft.

Relevant Part of CAR is reproduced below: -

- Para 9. Computation of Centre of Gravity

"9.1 For all flights, it shall be the responsibility of the Pilot-in-Command to ensure that the aircraft is satisfactorily loaded with respect to the total load, the distribution of the load and proper securing of the load in aircraft (lashing of the load). The distribution of the load shall be such that the C.G. position will remain within the specified limits at the time of take-off, during the progress of the flight and at the time of landing."

……

……

9.4 Every operator including scheduled, non-scheduled, State Government and private aircraft operator shall prepare load and trim sheet for aircraft where the manufacturer has provided necessary documentation for the purpose. The load and trim sheet shall indicate the composition and the distribution of the total load carried on board the aircraft as well as the calculated C.G. position for "take-off and landing" configurations before the commencement of the flight. Such load sheets shall be prepared and signed by the Pilot-in-Command or persons duly trained in accordance with CAR Section 8 Series 'D' Part I and responsible for supervising the loading of aircraft. In case the load and trim sheet is prepared by a person other than the Pilot-in-Command, the same shall be submitted to the Pilot for his scrutiny and signatures before the commencement of the flight. One copy of the load sheet shall be carried on board the aircraft and one copy shall be retained by the operator for record purposes for a period of altleast four months from the date of issue."

- Para 12. <u>Instructions For Safe Loading</u>

"12.1 Specific seats shall be allotted to all passengers boarding at originating stations of flights so that centre of gravity of the aircraft can be calculated accurately and the C.G. is kept within the permissible limits.

12.2 During loading, it must be ensured that aircraft cabin floor loading limitations are not exceeded.

12.3 The load must be securely tied so that there is no possibility of the load shifting in flight and disturbing the calculated C.G. position.

12.4 The load must be tied at the specified places provided in the aircraft and the tying ropes must be of sufficient strength to withstand the loads imposed on it in flight.

12.5 While placing cargo in the passenger cabin during mixed version(passenger cum freight) operation, the load must be placed ahead of the passengers in the cabin, the load must not block "emergency exit" meant to be used by the passengers during " emergencies ". "

1.18.1.4 CAR Section 8, Series 'D', Part- I – Load and Trim Sheet – Requirements Thereof & Training of Concerned Personnel.

The CAR provides the requirements for load and trim sheets, necessary training of the personnel engaged in its preparation and their approval by DGCA.

Relevant Part of CAR are stipulated below: -

- Para 15. Load and Trim Sheet Requirements

…..

"15.3 The operator shall ensure that the loading and distribution is in accordance with the requirement of the Aircraft Rules and any special direction issued by the DGCA in conformity with the Rules.

15.4 It will be the responsibility of the operator to ensure that the weight of the aircraft at the time of take-off does not exceed the RTOW.

15.5 Each operator is responsible for the preparation and accuracy of the load/trim sheet.

15.6 The load/ trim sheet must be prepared in duplicate and signed for each flight by Personnel of the operator who have the duty of supervising the loading of aircraft and preparing the load and trim sheet except that the same is not required for each subsequent shuttle/ leg of a helicopter flight provided:

(a) only passengers and their personal baggage are carried in each such shuttle/ leg; and

(b) the pilot-in-command calculates and ensures that the maximum AUW for the prevailing density altitude is not exceeded; and

(c) the sequence of loading and passenger seating is specified in the Flight and Operations Manual and is being followed for the flight.

15.7 The load and trim sheet must be signed by the pilot-in-command unless the load and trim sheet is sent to the aircraft by electronic data transfer."

The helicopter was engaged in Flood Relief Operation and operated between sector Arakot – Chiva – Arakot. The helicopter carried Flood Relief Materials in the cabin.

The helicopter operated two sorties i.e. 04 flights between Arakot & Chiva before the accidented flight/sortie.

The Load & Trim was prepared for the first flight (Aarakot to Chiva) only. The Load & Trim was not prepared for subsequent flights/legs including the accidented flight.

In all sorties operated by the helicopter for relief operations, it carried loads (Bags containing relief materials) which were loaded in the cabin. During the inspection of the helicopter wreckage after the accident, it was observed that the loads were stacked at the aft part of cabin i.e. above rear passenger seats (Refer Picture 20). The loads were not securely tied. This ought to be done to ensure that there is no possibility of the load shifting in flight and disturbing the calculated C.G. position.

1.18.2 Weight & Balance of the Helicopter

As per the RFM (Rotorcraft Flight Manual) of the helicopter, useful load consists of usable fuel, engine oil, crew, passengers, baggage and cargo. Combinations of these items, which have most adverse effect on helicopter center of gravity, are known as most forward and most aft useful loads.

Whenever cargo and/or baggage are carried, these useful loads may be different for each flight, and weight and balance must be computed each time to ensure gross weight and center of gravity remains within limits throughout flight.

Standard most forward and most aft useful loads are combinations of fuel, crew and passenger loading only. These loads, in conjunction with empty weight center of gravity chart, allow passengers only (no baggage or other cargo) to be carried within appropriate weight limitations without computing center of gravity for each flight.

<u>First Sortie</u>

The load & trim was prepared only for the first flight/leg i.e. from Arakot to Chiva wherein 250 Kgs of relief material (25 bags of 10 kgs each) was carried with AME occupying the co-pilot seat.

As per the Load & Trim sheet prepared, All Up Weight (AUW) of the helicopter at the time of take-off was 2077 Kgs (including 227 kgs of fuel), wherein standard weights of passenger (AME) and Flight Crew member have been taken as per the CAR on the subject.

Centre of Gravity was calculated to be 3104.32 mm aft of datum (1401 mm forward of the forward jack point center line) which was within limits (Refer Pic 22 below).

Second Sortie

Load & Trim was not prepared for the second sortie. However as per passenger manifest, the helicopter carried 200 kgs of relief material (20 bags of 10 kg each) along with 01 passenger (other than AME & Pilot) for Arakot – Chiva sector.

Third Sortie (Accident Flight)

Load & Trim was not prepared for the third/accidented sortie also. However, as per passenger manifest, the helicopter carried 300 kgs of relief material (30 bags of 10 kg each) which was also verified by the investigation team during the preliminary investigation at accident site.

Computation of approximate C.G location of the accidented flight was carried out using standard procedures of RFM as per the following: -

Weight Calculation

- Empty Weight – 1440 Kgs (As per Weight Schedule)
- Pilot - 85 kgs (Standard)
- Passenger (AME) occupying co-pilot seat - 75 kgs (Standard)
- Load in cabin (Relief Material) - 300 Kgs (30 bags of 10 kgs each)
- Fuel – 170 Kgs (Approximate value after two sorties)

Total/ AUW – 2070 Kgs

Moment Calculation

In order to calculate moment, 300 kgs of load in the cabin was distributed as 60 Kgs to each of 5 passenger locations (2 – Mid passenger & 3 – Aft Passenger locations).

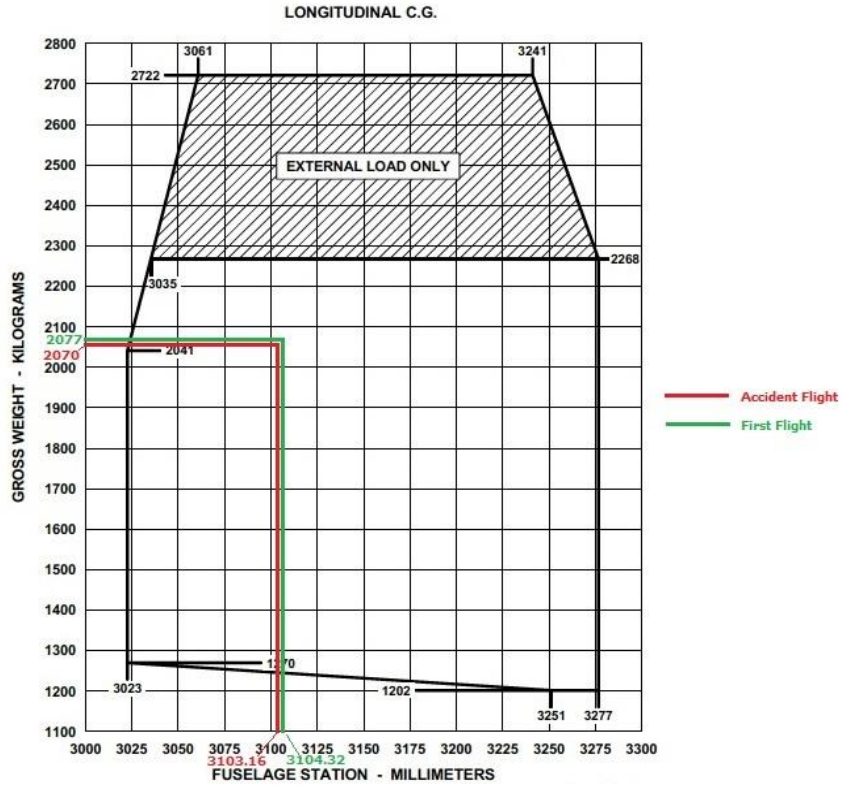
- Empty Weight – 4790548.80 Kg.mm
- Pilot – 140340 Kg.mm
- Passenger (AME) – 123830 Kg.mm
- Load in Cabin – (2 * 138680 + 3 * 196600) = 867160 Kg.mm
- Fuel – 501670 Kg.mm

Total Moment – 6423548.8 Kg.mm

C.G Calculation

C.G for the flight = Total Moment/Total Weight = 6423548.8 Kg.mm/ 2070 Kg = 3103.16 mm

Hence, the approximate C.G location for the accidented flight was 3103.16 mm aft of datum which was within limits (Refer Pic 22 below).



PICTURE 22: GROSS WEIGHT CENTER OF GRAVITY LIMITATION CHART

During the onsite investigation, it was observed that the loads were not uniformly distributed. Also, as the loads were not securely tied, these could have moved during flight thereby disturbing the calculated C.G.

1.19 USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

Nil

2. ANALYSIS

2.1 SERVICEABILITY OF THE HELICOPTER

2.1.1 General Maintenance

The helicopter was manufactured in the year 2007. The helicopter was having a valid Certificate of Registration (C of R) at the time of accident. It was holding a valid Indian Certificate of Airworthiness (C of A) under category Normal, Sub-Division

Passenger/Aerial and valid for lifetime. Airworthiness Review Certificate was valid at the time of accident. The helicopter had logged 4443:50 Airframe hours till the day of accident. The last scheduled inspection was carried out on 19th July 2019. There was no snag reported by the pilot before the accidented flight.

All concerned Airworthiness Directives, mandatory Service Bulletins, and DGCA Mandatory Modifications on this aircraft and its engines were complied with as on date of event.

Scrutiny of the Technical Log Book revealed that there was no snag pending on the aircraft prior to this occurrence. The last snag recorded was on 26th March 2019. The snag was "Hydro Mechanical Unit (HMU) Metering Valve Fault". The rectification action was carried out satisfactorily and the helicopter was released for further flights.

2.1.2 Wreckage Examination

During the preliminary investigation carried out by the investigation team at the accident site revealed that the power transmission (from Main Rotor to tail rotor) shaft (Tail Rotor Drive Shaft) got twisted and disengaged. This indicates that the tail rotor which is driven by the main rotor blades by means of these shafts stopped rotating suddenly as it got stuck in rocks and boulders after impact while the main rotors were still rotating. Thereby, the drive shaft was under sudden torsional stress which resulted in its twisting and breaking. This concludes that the engine was delivering power at the time of accident. All helicopter controls were found in serviceable condition and there was no discontinuity observed.

2.2 WEATHER

The weather at the time of accident was fine. It was sunny with clear skies and visibility was more than 5000 meters.

Hence, it is concluded that the weather was not a contributory factor to the accident.

2.3 OPERATIONAL FACTORS

2.3.1 PILOT QUALIFICATION

The Pilot – In – Command was qualified to operate the flight. PIC had a total flying experience of about 6715:50 Hrs with 3352:30 hrs on type. His medical and all trainings

were current as on the date of occurrence. The PIC had sufficient experience in Hill flying and had flown in Uttarakhand region earlier. He fulfills all qualifications and recurrent training requirements for hill flying operations as per DGCA CAR.

2.3.2 PILOT DECISION MAKING AND HANDLING OF THE HELICOPTER

Before departure for Aarakot from Sahastradhara the pilot was briefed by the company about relief operations to be undertaken. After reaching Aarakot, the pilot had briefing session with the local authorities. As no physical inspection of the temporary helipads on ground/air at Aarakot (before departing from Sehastradhara) & Chiva was carried out by the operator/pilot before commencing the relief operations, the pilot was solely dependent on the information provided by the local authorities during the briefing. During the briefing, he did not acquire critical information such as obstacles (cables spanning across the valley), forced landing areas, etc for safe conduct of flights.

Even with lack of required information & also in the absence of some minimum safety requirements for Temporary Helicopter Landing Areas pilot decided to carry out relief operations in contravention of CAR Section 4 Series B Part II, the pilot decided to carry out relief operations.

The pilot took-off from Aarakot and after reaching Chiva Helipad, High Recce followed by low Recce was carried out to inspect the helipad from air before touchdown. He carried out two uneventful relief/rescue sorties before the accidented sortie. The Load & Trim was prepared for first flight (Aarakot to Chiva) only. In the first sortie, the pilot maintained 8000 feet altitude (indicated). However, in second & third sortie, he maintained 7500 feet altitude (indicated). The altitude of the mountains on both sides of the valley were around 9000 to 10000 ft. During these sorties, he was looking out for cables, forced landing fields, etc. but could not locate any cables other than electric wires.

During the third sortie while on top of descent, the right skid of the helicopter hit the cables and the front portion of right skid severed from the structure and hit the right side (Pilot side) plexi. The broken pieces of plexi hit the pilot on his face (Right eye) and body. The right eye of the pilot started bleeding. The helicopter tossed up in the air after hitting the cables. As the loads (Relief Materials) in the cabin were not tied & secured, the load shifted in flight which could have disturbed the C.G. position and also, due to

sudden change in aerodynamic shape, the helicopter started maneuvering abruptly & became uncontrollable.

Thereafter, the pilot managed to partially control the helicopter and started searching for a suitable area for forced landing. There was no forced landing area available in the valley which had high/steep mountains on both sides and a flooded river below. Pilot located an area on the river bed which was full of big stones & Rocks and decided to land on one of the big rocks. The pilot flared the helicopter in order to land on one of the big flat rock, however, it impacted one of the adjacent rocks and finally settled in a pitch up condition. Pilot switched off the throttle and the rotor brakes were applied by the engineer.

In view of the above, it is opined that although the pilot managed to control the helicopter and force land in adverse situations; the decision of carrying out the relief/rescue operations without acquiring critical information which was essential as per the laid down requirements was a contributory factor to the accident. Not ensuring that the loads in the cabin are tied, secured and lashed also contributed to the accident.

2.3.3 The Rescue/Relief Operations

The Rescue/Relief operations were started by the local authorities after the natural calamity (Flood) stuck at Uttarkashi District of Uttarakhand. Temporary helipads were made by the local authorities for rescuing people and to supply relief materials to the locals.

These temporary helipads (at Aarakot & Chiva) did not meet the minimum safety requirements as per DGCA CAR Section 4 Series B Part II.

There was no specific guidelines/SOP made by the local/state authorities for conducting rescue/relief flights. These were recommended in the Operations Circular No. 7/2013 for Utilisation of Helicopters in Disaster Management which was issued by DGCA after the flash floods in Uttarakhand in the year 2013 when Civil/Military registered helicopters were operated for relief operations. Further, there was no co-ordination between DGCA, local/State Authorities and operator for conducting these Rescue/Relief operations.

The operator was approached for these operations after one of the helicopters belonging to a NSOP met with a fatal accident while carrying out relief operations in that region.

Prima Facie, it was widely reported that the ill-fated helicopter had hit the cables and caught fire before hitting the terrain.

During the preliminary investigation carried out by the investigating team of the accident site and surrounding areas, it was observed that there were a number of cables at various locations in the valley. These cables were difficult to locate from a distance unless they were properly marked/painted. Even after the fatal accident, these cables were not marked by the local authorities which was a potential hazard for conducting flights in the valley. Also, there was no information available with the local authorities about the location and height of these cables which could have given some awareness to the pilots/operators to plan their operating altitude accordingly.

In view of the above, it is opined that in the absence of specific guidelines/SOP and co-ordination between DGCA, Local Authorities and operator for conducting these relief/rescue flights from a temporary helipad which did not met the specified requirement led to inadequate information available to safely conduct these operations in that area.

The cables spanning the valley at various locations which were not marked by the local authorities was a potential hazard and contributed to the accident.

2.3.4 Weight & Balance of the Helicopter

As per the requirement of DGCA CAR on the subject, the load & trim sheet must be prepared and signed for each flight with the exception that the same is not required for each subsequent shuttle/ leg provided that only passengers and their personal baggage are carried in each such shuttle/ leg.

However, the helicopter was carrying loads (Flood Relief Materials) in the cabin and operated two sorties i.e. 04 flights between Arakot & Chiva before the accident flight/sortie. But the Load & Trim was prepared for first flight (Aarakot to Chiva) only and was not prepared for subsequent flights/legs including the accidented flight.

The approximate position of center of gravity of the accident flight was computed by the investigating team (refer Para 1.18.2) and it was found to be within limits.

However, during the inspection of the helicopter wreckage at the accident site, it was observed that the loads were found stacked in the aft section of cabin above the rear passenger seat which implies that the loads were not tied and secured before the flight.

This resulted in shifting of loads during the flight after the helicopter hit the cables, thereby disturbing the calculated C.G. position which led to the helicopter becoming uncontrollable.

2.4 ORGANISATION ASPECT

2.4.1 The operator was holding a valid AOP for Non-Scheduled Air Transport Services. As per the AOP, all the aircraft in its fleet including the accidented helicopter were permitted for Commercial Air Transport in Passenger category only. However, the helicopter was operating for flood relief/rescue operation where it had carried loads (Relief materials packets) in the cabin.

2.4.2 As discussed earlier, the operator was approached by the local/State authorities to carry out the relief/rescue operations after one of the helicopters belonging to another NSOP had met with a fatal accident just 02 days before while carrying out relief operations in that region.

The operator did not carry out any physical inspection of the temporary helipad area from ground/air before undertaking the flight to carry out the operations satisfactorily. Moreover, there was no specific guidelines/SOP made by the local/state authorities for conducting rescue/relief flights and the information provided by the local authorities to the operator which are required (as per CAR) to be known before commencement of these flights were also inadequate.

In view of the above, it is opined that the operator's decision of carrying out relief/rescue operations in that area without acquiring adequate information required to operate from temporary helipad area contributed to the accident. Also, the operator was aware of the fact that a fatal accident had already occurred in that area two days back.

2.5 CIRCUMSTANCES LEADING TO THE ACCIDENT

The pilot took-off from Aarakot for Chiva for rescue/ relief flights. During the third sortie while descending at an altitude of around 6500 feet, and 2 NM short of Chiva, the right skid of the helicopter hit the cables spanning the valley. The cables were not marked and it was difficult to locate as these were without any marking. The right skid severed from the front cross tube section and hit the right side (pilot side) plexi. The broken pieces of plexi hit the pilot on his face (Right eye) and body. The right eye of

the pilot started bleeding. The helicopter tossed up in the air after hitting the cables. As the loads (30 bags of relief material each weighing 10 Kgs) in the cabin were not tied and secured properly, these shifted in flight which disturbed the calculated C.G. position and also, due to sudden change in aerodynamic shape, the helicopter started maneuvering abruptly & became uncontrollable.

Thereafter, the pilot managed to partially control the helicopter and started searching for a suitable area for forced landing. However, he did not find any suitable forced landing area as there was no area identified to force land prior to commencing the flight. An identified suitable forced landing area could have helped the pilot to safely land the helicopter. Further, there was no space available ahead in the valley which had high/steep mountains on both sides and a flooded river below.

Pilot somehow located an area on the river bed which was full of big stones & rocks and decided to land on one of the big flat rocks. The pilot flared the helicopter and tried to land on the rock. However, the helicopter impacted one of the rocks before it settled on the rocks in a pitch up condition.

3. CONCLUSION

3.1 FINDINGS

1. The Certificate of Airworthiness, Certificate of Registration and Airworthiness Review Certificate of the aircraft were valid on the date of accident.
2. PIC was qualified to operate the flight.
3. There was no SOP/guidelines made by the local authorities for conducting the relief/rescue operations. Also, there was no co-ordination between DGCA, Local authorities and operator for smooth & safe conduct of these operations.
4. The temporary helipads (at Arakot & Chiva) used for rescue/relief operations did not meet requirements of DGCA CAR Section 4, Series B, Part II for Minimum Safety Requirements for temporary Helicopter Landing Areas.
5. Before undertaking the operations, the operator/pilot did not carry out physical inspection on ground/ air of the temporary helipad area and the information acquired by the operator/pilot was inadequate to carry out the operations safely as per the requirements of CAR Section 4 Series B Part II.
6. The helicopter carried out 02 sorties (4 flights) before the accidented flight. Load & Trim was prepared for first flight only. It was not prepared for other flights including the accident flight

which was required as per DGCA CAR Section 2, Series 'X', Part- II & Section 8, Series 'D', Part- I.

7. An approximate position of center of gravity of the accidented flight was computed by the investigation team and the center of gravity was found within limits.
8. The pilot was maintaining en-route altitude of 7500 feet for the accident flight.
9. The helicopter was carrying load i.e. Flood Relief Material of 300 Kgs (30 bags of 10 Kgs each) in the cabin. The loads in the cabin were not tied & secured due to which perhaps the load shifted after the helicopter hit the unmarked cables. The position of center of gravity was disturbed such that it resulted in helicopter maneuvering abruptly and becoming uncontrollable.
10. No forced landing area(s) were identified before conducting these flights. The pilot did not find any suitable area to carry out force landing in the valley ahead due to which he had to forced land on the river bed which was full of big stones & rocks.
11. The pilot flared the helicopter for smooth landing, however, it impacted one of the rocks on its belly first before settling on rocks in nose up condition.
12. Weather at the time of accident was fine with clear skies and visibility was more than 5000 meters.
13. The cables spanning the valley were not marked by the local authorities. These cables were difficult to locate with naked eye unless specifically marked/painted. Also, there was no information available about the height and location of these cables in the valley.
14. The operator was holding a valid AOP for Non-Scheduled Air Transport Services.
15. As per the AOP, all its fleet including the accidented helicopter were permitted for Commercial Air Transport in Passenger category only which do not permit his helicopters to operate these flights i.e. flood relief/rescue operation carrying loads (Relief materials) in cabin.

3.2 PROBABLE CAUSE OF THE ACCIDENT

The helicopter after hitting the unmarked cables during flight became uncontrollable due to sudden change in CG location and change in aerodynamic shape of the helicopter thus resulting into the accident.

Contributory Factors

1. Carrying out Relief operations from temporary helipad without acquiring adequate information about the area.

2. Cables were not marked.
3. Shifting of loads in the cabin as it was not securely tied.

4. SAFETY RECOMMENDATIONS

It is Recommended that: -

1. DGCA may advise all operators to mandatorily carry out physical inspection on ground/air of the temporary helicopter landing areas before undertaking flight, if there is no specific guidelines/SOP issued by the local authorities which is in line with requirements of relevant CARs/Circulars issued by DGCA from time to time.

2. DGCA should as part of their oversight function, enhance the surveillance and ensure that the following requirements laid down in the CAR/ Circulars are meticulously followed by the operator(s).
   - The State authorities have developed SOP/Guidelines on relief/rescue operations utilizing civil helicopter and ensure that it is in line with the laid down requirements of relevant CARs/Circulars issued by DGCA from time to time.
   - All operators (Operating Helicopters) formulate specific guidelines/Operating procedures for carrying out Relief/Rescue operations based on the limitations of the available fleet and the same to be incorporated in their Operations Manual.
   - The operator(s) issue instructions to their flight crew/ground staff to meticulously follow the laid down SOPs emphasizing on instructions for safe loading.

K. Ramachandran

(K Ramachandran)
Investigator – In – Charge

Amit Kumar

(Amit Kumar)
Investigator

Date: 06th May 2020

Place: New Delhi

ANNEXURE - I

GOVERNMENT OF INDIA

OFFICE OF DIRECTOR GENERAL OF CIVIL AVIATION

TECHNICAL CENTRE, OPP SAFDARJANG AIRPORT, NEW DELHI

CIVIL AVIATION REQUIREMENTS
SECTION 4 - AERODROME STANDARDS & AIR TRAFFIC SERVICES
SERIES 'B', PART II

21st December, 2005 **EFFECTIVE: FORTHWITH**

Subject: **Minimum Safety Requirements for temporary Helicopter Landing Areas.**

1. INTRODUCTION

1.1 Rule 78 of the Aircraft Rules, 1937 requires licensing of such aerodromes that are used as regular place of landing and departure by a scheduled air transport service or for a series of landings and departures by any aircraft carrying passengers or cargo for hire or reward. Further, sub rule (4) of the said rule stipulates that no person shall operate or cause to be operated any flight from a temporary aerodrome or an aerodrome which has not been licensed or approved, as the case may be, under these rules unless it meets the minimum safety requirements laid down by the Director-General.

1.2 Helicopters are, by design, able to use non-conventional operating sites. Helicopters offer significant advantage over the use of aeroplanes for passenger transport by being able to operate away from conventional aerodromes into and from ad hoc sites or specially designed heliports.

1.3 Heliport or helicopter sites are not required to be licensed unless they are to be used by a schedule transport service and/ or for public transportation involving series of landing and/ or hire and reward.

1.4 In pursuance to sub rule (4) of Rule 78 this part of the Civil Aviation Requirements lays down the minimum safety requirements for helicopters operating to/from temporary helicopter landing areas within the Indian Territory outside an aerodrome.

1.5 This CAR is issued under the provisions of Rule 133A of the Aircraft Rules, 1937.

2. Applicability

2.1 This CAR provides the minimum safety requirement considered necessary for helicopter landing areas located outside an aerodrome, for temporary use by helicopters engaged on chartered/ private flight operation.

2.2 The term temporary used here means a place not used by the same helicopter operator for landing and take off for more than 7 days within a consecutive period of 30 days.

2.3 These requirements do not apply to elevated heliports, e.g. on top of buildings, constructions, etc.

3. General Safety Requirements

3.1 This CAR does not absolve the helicopter operator from compliance of any other requirement that are laid down in relevant CARs for the operation and maintenance of the helicopter.

3.2 The site to be used for temporary helicopter operations should be a level piece of well-drained ground, either good grass or solid surface free from loose stones, debris. The Final Approach and Take off Area should be obstruction free.

3.3 Before undertaking any such flight, the helicopter operator and/ or his pilot must satisfy himself by his physical inspection on ground/ air and/ or obtaining required information from District authorities that surroundings are free from obstacles and the site suitable for operations of type of helicopter being operated and there is sufficient open space to force land, if necessary.

3.4 If the temporary helicopter landing area is situated within aerodrome traffic zone or aerodrome control zone of a public aerodrome, the flight shall be coordinated with the air traffic control at the aerodrome concerned. Pilots operating to these sites must comply with the aerodrome procedures when operating within the Aerodrome Control Zone. The details of the site like name of site, and grid reference shall be given to the air traffic services of that aerodrome.

3.5 Helicopter operator through their Accountable Manager shall be responsible for the safety of helicopter operations, passengers and people on ground.

3.6 Permission of owner of the site shall be obtained, before it is used for helicopter operation and the district authorities notified in advance. It is the responsibility of the owner or the person having control of such place to ensure that the land is used as per the applicable local regulations.

3.7 When such place is used by helicopters carrying VIP all instructions issued from time to time in this regard shall be complied with by the operator through his Accountable Manager/ Pilot

3.8 At least one 12 kg powder (DCP) fire extinguisher shall be available at the landing/ take-off area, clearly marked and situated so that it can be used quickly in case of fire. A first aid box shall be placed within easy reach and clearly marked. The box shall be maintained in accordance with the instructions and its contents shall be supplemented whenever used.

3.9 While manoeuvring the helicopter in a low hover, helicopter should be manoeuvred in such a manner that its centreline is not closer to any objects/building than 1.5 x Rotor Diameter or 30 metres, whichever is the greater.

3.10 Approach and departure shall be performed within sectors which as far as possible shall be in direct continuation of the take-off and landing directions, respectively. The sectors shall be without obstacles in the entire width and in a vertical distance of at least 35 ft from the approach and departure surfaces.

3.11 Approach and departure shall be performed in a way that forced landing can be carried out on a suitable emergency landing area at any time, unless a helicopter with one engine out of operation is capable of clearing any obstacle in the sector with a clearance of at least 35 ft.

3.12 Prior Operational authorization would be required from the DGCA, in case Air Taxi and/ or sightseeing flights are undertaken from such a place.

4. Site Requirements

4.1 Touch down and Lift off area (TLOF)

The minimum dimensions of the TLOF shall be 2 B X 2 B, where B equals the wheel base or the side base of the helicopter whichever is more, of the helicopter used (Ref Annexure – I). A TLOF shall be capable of supporting the weight of the helicopter intended to be used.

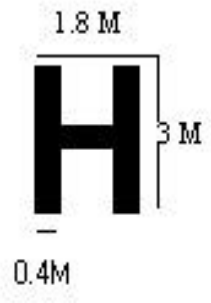
4.2 Final Approach and Take-off area (FATO)

TLOF shall be encompassed by a FATO. The minimum dimensions of the FATO shall be 1.5 A x 1.5 A, where A equals the maximum overall length of the helicopter used (Ref Annexure – I). This area shall be without obstructions. The surface shall be suitable for forced landings and free from loose objects, which may endanger the safe performance of the flight.

4.3 Marking

A helicopter identification marking shall be provided within the TLOF area and shall consist of letter “H” white in colour. The legs of the 'H' should be 3 metres in length and 0.4 metres wide. The crossbar should be of the same width and separate the legs so that the overall width of the 'H' is 1.8 metres. The marking used shall be of such a nature and fixed in a way that it does not

constitute a risk to the flight or to any third party. The marking shall be as shown in the figure given below:



Helicopter Landing Area identification marking

4.4 Wind Direction Indicator

A wind direction indicator may be a wind sleeve, flag or continuous smoke source. It should be so situated so as to be visible from a helicopter in flight, in a hover or on the movement area and should indicate the wind conditions over the FATO in such a way as to be free from the effects of airflow disturbances caused by nearby objects or rotor downwash.

4.5 Safety area

The take-off and landing area should be surrounded by a safety area, the width of which should not be less than 10 m. Within the safety area no obstacle must be higher than 1 m. The surface shall be suitable for any forced landings, if required.

Note : A sketch of the TLOF, FATO and Safety area is at Appendix 'I'. A list of dimensions A & B of the most common Indian registered helicopter is at Appendix 'II'.

4.6 Approach and Take off climb surface

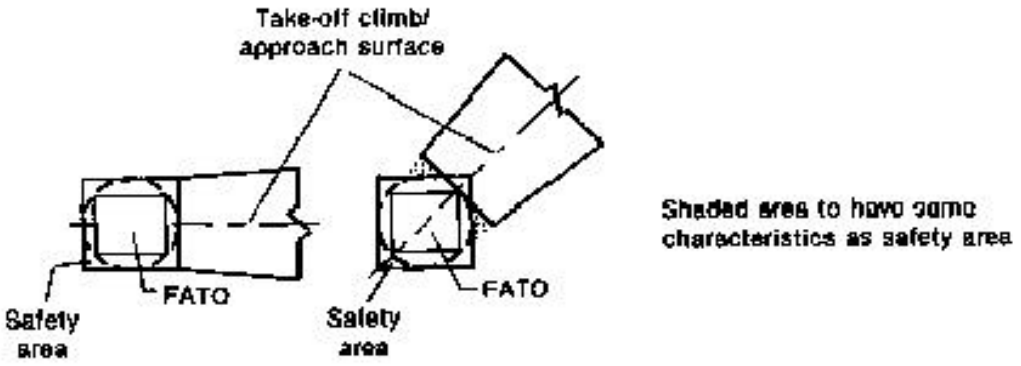
An Approach and Take-off climb surface in an inclined plane sloping upwards (8%) from the end of the safety area and centered on a line passing through the centre of the FATO, should be available for a distance of at least 245 meters.

The Approach and take-off climb surface should comprise:

a) an inner edge horizontal and equal in length to the minimum specified width of the FATO plus the safety area, perpendicular to the centre line of the take-off climb surface and located at the outer edge of the safety area; and

b) two side edges originating at the ends of the inner edge and diverging uniformly at a specified rate of 10% from the vertical plane containing the centre line of the FATO.

Note.- For landing area used by performance class 2 and 3 helicopters, it is advised that departure paths be selected so as to permit safe forced landings or one-engine-inoperative landings such that, as a minimum requirement, injury to persons on the ground or damage to property are minimized. Provisions for forced landing areas are expected to minimize risk of injury to the occupants of the helicopter. Such area can be determined on the basis of performance characteristics of the helicopter.



Final Approach & Take off Surface

5 Protection of site

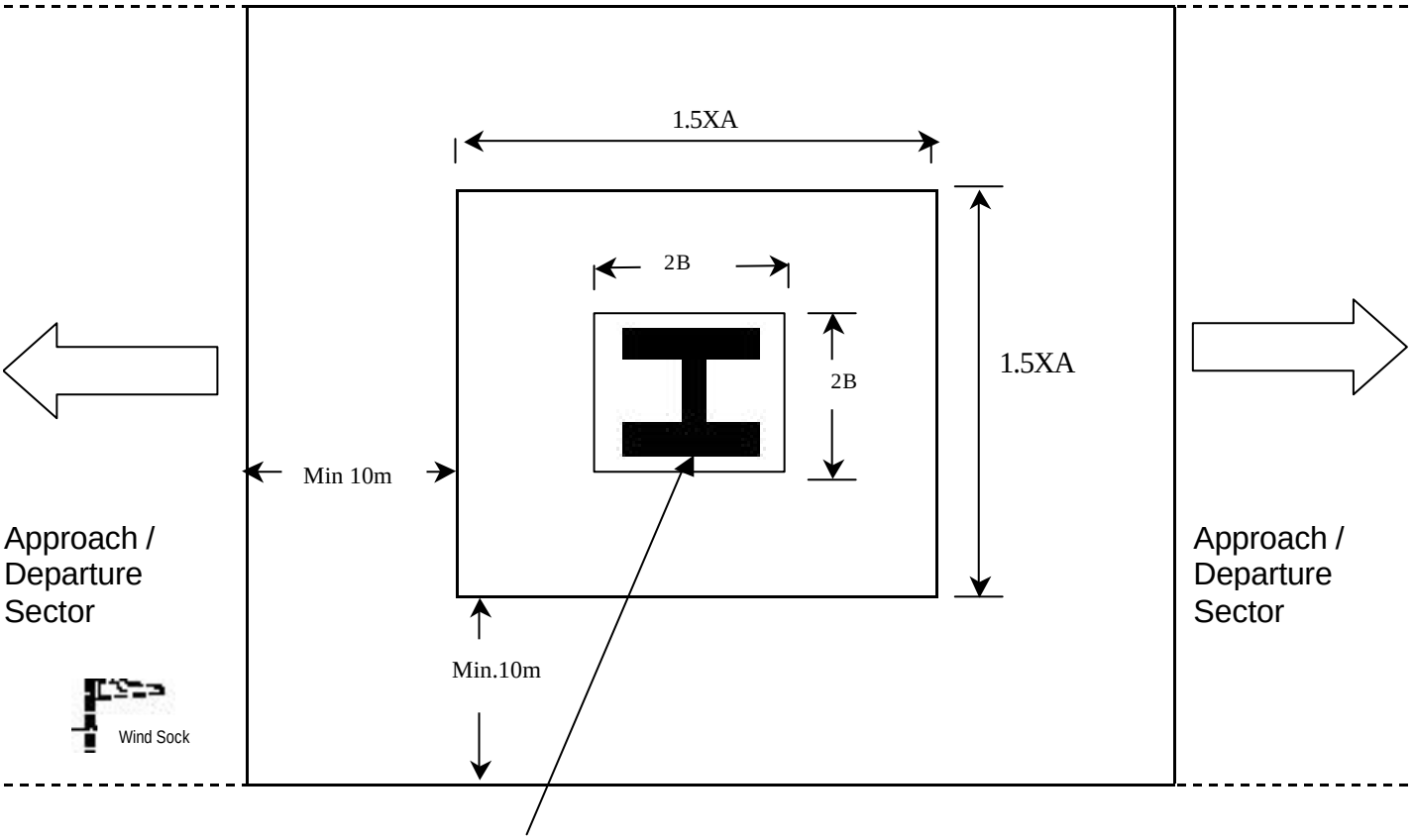
5.1 Before an area is used as take-off and landing area, operator shall take necessary measures to protect the site by cordoning, fencing with fragile material, etc. to ensure that no unauthorised persons, vehicles or stray animals enter into the perimeter of the safety area.

5.2 When sightseeing flights are carried out as part of a joint public event, e.g. a sporting event, a town festival, or the like, the event organizer is responsible to ensure that adequate safety measures are in place which should address the aspect of crowd control, security and separation of crowd from flying operations.

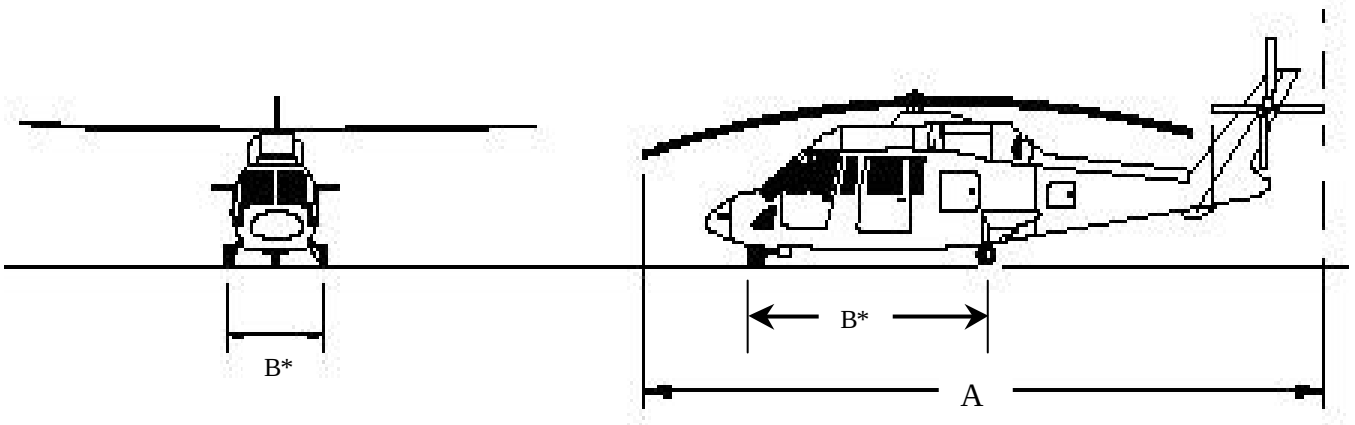
(K. Gohain)
Joint Director General of Civil Aviation

Appendix I

SKETCH OF LANDING/ TAKE-OFF AREA REQUIRED



Touch down and Lift off (TLOF) area sufficiently strong to support the weight of helicopter



*Whichever is more shall be taken as 'B' for the purpose of TLOF dimension.

Appendix II

DIMENSIONS OF SOME COMMON INDIAN REGISTERED HELICOPTERS

Type	Over all		Under carriage 'B'		
	Length 'A' (m)	Height (m)	Type	Length (m)	Width (m)
AS 355	12.99	3.15	skid	2.91	2.10
Bell 206 B3	11.91	3.16	skid	2.52	2.07
Bell 206 L3 & L4	12.95	3.13	skid	3.01	2.34
Bell 212	17.47	3.84	skid	3.68	2.68
BELL 230 HELICOPTER	15.30	3.65	Wheel/ skid	3.71	2.37
Bell 407	12.74	3.32	skid	3.01	2.28
Bell 412 EP	17.37	4.57	skid	2.40	2.53
BELL 430	15.30	4.02	Wheel/ skid	3.81	2.53
BELL 47	13.41	3.04	Skid	3.01	2.28
CHEETAH SA315	12.94	3.35	skid	3.29	2.37
ALLOUETTE III SA316B	10.17	2.96	wheel	3.50	2.59
DAUPIN AS 365N3	13.73	4.06	Wheel	3.64	1.89
EC135 T1	12.19	3.50	skid	3.2	2.01
ECUREUIL AS350	12.93	3.34	skid	1.43	2.28
EUROCOPTER EC 130	12.64	3.60	skid	3.2	2.40
SIKORSKY S76C	16	4.41	Wheel	5	2.44

ANNEXURE - II

GOVERNMENT OF INDIA
CIVIL AVIATION DEPARTMENT

OFFICE OF THE
DIRECTOR GENERAL OF CIVIL AVIATION
OPP. SAFDARJUNG AIRPORT, NEW DELHI – 110 003
TELEPHONE: +91-011-24635261
+91-011-24644768

FAX: +91-011-24644764

भारत सरकार
नागर विमानन विभाग
महानिदेशक नागर विमानन का कार्यालय
सफदरजंग एयरपोर्ट के सामने
नई दिल्ली - ११० ००३

Reference: No.: संख्या : **AV 22024/12/2013-FSD**
Dated: दिनांक : **14th August, 2013**

OPERATIONS CIRCULAR NO. 7/2013

Subject:- **UTILISATION OF HELICOPTERS IN DISASTER MANAGEMENT**

1. Introduction

1.1 During natural calamity / disaster, both aeroplanes and helicopters are requisitioned to provide aid by the **Requisitioning Authority (RA).** Aeroplanes generally fly between two airports where all aviation related facilities and security exist. However Helicopters operate from the disaster sites and temporary/ unprepared helipads in a hostile environment. It is for this reason that this **'Operation Circular' is specific to 'Utilisation of Helicopters in Disaster Management (DM)**'.

1.2 Helicopters have proved to be the most effective means of transportation, casualty evacuation, mass evacuation and means to provide 'relief' during a disaster, particularly in an inhospitable terrain and over hostile environment. This aspect was proved beyond doubt during the 2013 flash floods in Uttarakhand where almost eighty five (85) helicopters of Civil and Military registrations participated and were the only life-line in higher reaches of Himalayas. Helicopters with their ability to maneuver in restricted spaces, hover and act as an aerial platform saved almost 50,000 lives in Uttarakhand and were of immense help to the local administration and to the ground rescue parties.

1.3 The instructions given in this Circular are only a guideline to be followed by

RA/ State Govts, DGCA, Operators and other stake holders participating in DM. Each calamity/ disaster will have its own peculiarities and intensity and would require a specific response. What was applicable in Uttarakhand mountains during floods may not be applicable while providing aid and relief during an earthquake in the plains or other places.

2. Limitations of Helicopters

2.1 The RA and State Govts need to know the limitations of helicopters to be able to deploy them efficiently for best results for DM. The limitations of helicopters can be enumerated as follows:

a) Weather:

- Rain and Snow
- Visibility
- Turbulence
- Icing
- Strong and gusting winds.
- Thunderstorms.

b) Availability of landing spaces in hostile terrain/ environment.
c) Dusty and unprepared helipads.
d) Degradation of performance in high altitudes and in high temperatures.
e) Operations by 'Day' only.
f) Airspace management.
g) Number of helicopters available for the task as no dedicated helicopters are available for search and rescue, firefighting or winching, etc. under Civil registration.
h) **Carrying capacity** i.e. number of passengers and cargo, which depletes in high altitudes and in high temperatures conditions.
i) High maintenance vis-à-vis fixed wing aircrafts,
j) Pilot fatigue compounded by single pilot operations.

3. Helicopter Provisioning.

3.1 In addition to Civil registered helicopters, Indian Army, Indian Air Force, Indian Navy and Para-Military forces like BSF and CRPF also contribute their helicopter towards DM. Thus, DM site and area is a congregation of many 'Types' of helicopters, each with different characteristic and capabilities. Also, the rules governing flying operations for defence pilots and civil pilots are different. Therefore there is a need to integrate all operators participating in DM to be on one grid.

4. Disasters in India.

4.1 India is prone to numerous natural and man-made disasters, which could be :

a) Cloud burst, Floods and Landslides (Uttarakhand 2013, Assam 2012, Ladakh 2010 and Karnataka, Orissa, Kerala and Gujarat in 2009).

b) Earthquakes (Sikkim in 2009, J&K in 2007, Gujarat in 2000, Uttarakhand in 1999, Maharashtra in 1991 and HP in 1975)
c) Tsunami (A & N Islands, TN, AP and Orissa in 2004)
d) Cyclones (Orissa in1999, Gujarat in 2007, 2001 and 1998, Karnataka in 1993, Tamil Nadu in 2011, 2010, 2000, 1996 and 1993 and AP in 2007, 1998 and 1990)
e) Famines
f) Fires, both urban and jungle.
g) Manmade disasters like Bhopal Gas tragedy (1990), Rail accidents, terrorist attacks akin to 9/ 11 in the US, Radiations (Japan 2011), Building collapse and many more.

5. Affects of Disasters on Flying Operations.

5.1 Each disaster will affect flying activities and operations in a different manner but some common aspects are :

a) Break down of ‘surface transport’ affects logistic and aviation supply chain. Washing away of roads in Uttarakhand led to obstruction in transportation of fuel and logistics to forward helipads, leading to greater turnaround time and reduction in number of people evacuated.
b) Breakdown in telecommunications. It leads to lack of coordination between helicopter operators, between civil and defence/ para-military helicopters and between operators and State/ local administration.
c) Landslides, water logging, rubble, fire etc. result in non-availability of helipads to operate helicopters.
d) Restricted flying due to inclement weather (clouding and rain) and hostile environment reduces the window of opportunity to fly.
e) Lack of ground support near and over the disaster site.
f) Lack of control (aerial and on ground) in the disaster area.
g) Limited airspace on disaster site/ area and its availability to helicopters, since their number could be very large as in Uttarakhand.

6. Tasking of Civil Helicopters

6.1 As the State Govts realize and recognize the potential of helicopters, it is likely that more and more helicopters will be sought in future for disasters and the main tasks assigned to helicopters would be:

a) Casualty evacuation.
b) Evacuate stranded people, particularly women, children, old and feeble, to safe places.
c) Search and rescue (SAR).
d) Carry rations, supplies and drinking water.
e) Medical aid.
f) Firefighting.
g) Carry large, voluminous and heavy loads like bridges, bulldozers, etc.
h) Aerial reconnaissance by decision makers.
i) In some case, carriage of dead bodies.
j) Relief and rehabilitation after the calamity.

7. Suggested Role and Responsibilities of RA / State Govts.

7.1 Without interfering in the DM scheme or in the functioning of State Govts, following guidelines are recommended for all Stake holders :

a) Include requisition and management of aviation assets as an integral part of DM scheme. State's Aviation department could be a part of DM Authority (DMA).
b) **Ministry of Civil Aviation in their document 'Vision 2020'** had suggested construction of a helipad in the vicinity of all large and populated habitats. State Govts may like to consider this aspect for implementation and **construct helipads as per CAR Sec 4, Series 'B', Part 'V'** which can be used by helicopters during normal times for ferrying passengers, tourists, VIPs and Govt. officials. During disaster/ calamity, they would serve as a hub/ launch pad for helicopters aiding DM.
c) Regular maintenance of State Govt. airports and helipads. In Uttarakhand, Gaucher airstrip had to be prepared before IAF aircraft could land on it.

d) Update 'Helipad directory' to include permanent and frequently used helipads, both Govt. and Private. State Govts. May provide such data to DGCA.

e) Encourage/ ease construction of helipads in their States and simplify helicopter movement procedures for their regular use.
f) Consider construction of roof top helipads over high rise buildings, particularly over those buildings frequented by general public in large numbers or with high density dwellings, for evacuation during fire. Some Indian cities have already made it mandatory for buildings above certain height to have roof top helipads.
g) Ensure all State Govt. aviation assets are serviceable. Helicopters of some State Govts are unserviceable for prolonged periods, some over three years.
h) Maintain a directory of all helicopters and aeroplanes in the State, which could be called upon for immediate relief during a disaster.
i) Update telephone directory of all Govt., Defence, Para-military and private operators in their State along with AAI and helipad operators.
j) Formulate procedures and modalities for requisitioning and chartering civil helicopters and aeroplanes during disaster.
k) During DM, the RA/ State Govt. would be required to ensure the following :
    - Provide security to all aviation assets.
    - Ensure one point contact with civil and defence operators for tasking aviation resources.
    - Draw priorities for tasking the sparse assets.
    - Smooth logistics support to keep machines flying.
    - Coordinate with DGCA, AAI, BCAS and Defence authorities to ensure coordination at all levels and uninterrupted flying operations.
    - Coordination with all stake holders and operators.
    - Ensure even handed policies to avoid misuse by unscrupulous elements.
    - Compile daily flying effort and results achieved.
    - Provide administration back-up to air and ground crew operating for DM.

7.2 State Govts would formulate a detailed working plan based on the above guidelines.

8. Role of DGCA

8.1 Since DGCA is a 'regulatory authority' and not part of NDMA or State DMA, its role is confined to ensuing Safety of aircraft operations and as a facilitator. Notwithstanding that, DGCA would provide all assistance to the RA/ State Govts to ensure quick response alongwith optimum and safe utilization of all aviation assets during DM. Some aspects which DGCA can facilitate are :

a) Smooth and quick mobilization of civil registered aviation resources to the site of disaster.

b) Advice State Aviation Cells to integrate aviation resources in their DM Scheme.

c) Provide Flight Operations Inspectors (FOIs) during the calamity to be collocated with State DMA and at site of disaster, to assist in the following :

- Interaction with State Government.
- Ensure optimum utilization of aviation resources and airspace management.
- Ensure safety of helicopter operations and flying during adverse conditions. Flight safety would be top priority at all times.
- Assist in preparation of landing grounds/ helipads.
- Logistic support to helicopters operating from forward helipads.
- Rest and relief of pilots, in coordination with operators.
- Proper maintenance of helicopters.
- Safety and security of helicopters, landing grounds, etc. so that people do not crowd helicopters leading to inadvertent accident / incident.
- Proper briefing of pilots before take-off.
- Debriefing of pilots after the sortie.
- Priority of work
- Assist operators to get ATS clearances, if required.
- Provide SAR to IAF and Army, if required.
- Disseminating information to all operators and pilots about the following:
  - Weather in different valleys, routes and in different regions.
  - Conditions of existing helipads and landing grounds.
  - Security and aids available at various locations.
  - Movement of IAF and Army resources.
  - Location of ground / rescue parties.
  - Location of persons who need assistance.
  - Site of accident, if any, and relief to be rushed in.
  - VIP movement and restrictions, if any.

8.2 **DDG-FSD will be the single point contact in DGCA Headquarters,** when civil registered helicopters participate in DM. He/ she will **be assisted by Senior most FOI(H)** who will ensure mobilization of aviation assets, detailing FOIs to disaster site, mediating between operators and compiling daily reports.

9. Role of Operators.

9.1 It is expected that 'Operators' would rise to occasion during a calamity/ disaster and support the RA/ State Govt whole heartedly and scrupulously. Some of the tasks to be performed by Operators would be :

a) On specific instructions from the Ministry of Civil Aviation, 'Aid to State Govt. / RA' would be given 'Priority' over all other commercial activities. On requisition, move the helicopter(s) and ground party to the disaster site at the earliest by shortest route.

b) During DM :

- Undertake all flights within the realms of pilot's and helicopter's abilities, without jeopardizing safety.
- Ensure crew composition as per severity of weather, terrain, task, landing areas, security and safety concerns.
- Proper maintenance in field conditions.
- Rest and relief to air and ground crew.
- Work in coordination with other operators as per instructions of DGCA FOI delegated on site or co-opted with State DMA.
- Ensure FDTL compliance. DGCA may be approached to extend FDTL in exceptional cases.
- Seek DGCA assistance to utilize services of other operator's air and ground crew.
- Strictly follow rules for VFR and IFR flights.
- Provide assistance to other operators, if required.
- Provide assistance to IAF and Army, if required
- While tasking, give due consideration to pilot's :
  - Capabilities and clearances.
  - Emotional stability for evacuating casualties and dead bodies.
  - Single pilot ops capabilities in difficult terrain, over hostile areas and in inclement weather conditions.
- **Ensure ethical conduct by all company personnel. Flying during DM is not an 'Opportunity' but an 'Aid'**.
- Demobilize when released by RA/ State Govt.

9.2 As responsible entities, Operators need to further define their roles themselves during DM and ensure compliance.

9.3 Since a majority of pilots flying civil helicopters in India have military background, they would well be **advised to draw a judicial and rational**

balance between 'Flight safety' and 'Mission accomplishment'. Flight safety would remain of paramount importance and the pilots should :

a) Know capability and limitation of and their machines.
b) Stretch themselves and their machine only up to a certain limit and not beyond. It is always better to live another day to save more lives than take an irrational step in the heat of the moment.
c) Follow local SOPs, routings and other instructions meticulously. The airspace over the disaster area is shared by numerous helicopters and aircraft. Thus it is important to abide by clearances obtained and coordination done on ground before the sortie.

9.4 **Lessons from Uttarakhand DM**. During the floods in Uttarakhand, four (4) helicopters, three (3) civil and one (1) of IAF, and twenty (20) lives were lost due to avoidable accidents. Proper selection of helipad, adhering to security instructions, not flying in bad weather, not stretching the capabilities of the helicopter and proper hill training of the pilots would have ensured an accident free operation.

10. Helicopter Hubs/ Bases

10.1 Numerous helicopter bases may be required to be established in aid of a DM. FOI co-opted with State DM will ensure :

a) Distribution and movement of resources between different bases as per tasks envisaged.

b) Security of all bases.
c) Establishment of all maintenance and administrative facilities at all the bases.
d) Coordination with military helicopters.
e) Flight planning and its execution in coordination with other bases.
f) Adequate stocking and replenishment of FOL and other supplies in all bases.
g) Provide SAR in case of an air accident.

11. Reports and Returns

11.1 All operators will ensure the following:

a) Proper record of all sorties launched in aid of disaster management is maintained. It will consist of:

- Number of sorties launched
- Number of hours flown.
- Numbers of passengers evacuated/air lifted.

- Load carried.
- Any special task undertaken.

b) Information will be given to FOI in the State DMA every day and to DGCA Hqrs. every 7th day on each Monday.

12. Conclusion

12.1 Above instructions are not exhaustive and would require modification and interpretation by the FOIs co-opted with State Govts and by the State DMA as per ground realities and degree / intensity of disaster.

12.2 All Operators should **carry out the assigned tasks to the best of their ability within the realms of "Flight Safety" and also within human, machine and weather limitations.**

Sd/-
(Lalit Gupta)
Deputy Director General
for Director General of Civil Aviation