



Accident Investigation Final Report

On

9N-ALS H125 (AS350 B3e) Helicopter

Owned & Operated By Altitude Air Pvt. Ltd.

At near Barsungchet Mailungpakha Forest, Medhang-1, Nuwakot District, Nepal

On 8th September 2018



Submitted By

Aircraft Accident Investigation Commission, 2075

To

The Government of Nepal

Ministry Of Culture, Tourism and Civil Aviation

December, 2019 (Poush, 2076 B.S.)

Foreword

This report on the accident of 9N-ALS, H125 (AS350 B3e) Airbus Helicopter owned and operated by Altitude Air Pvt. Ltd., Nepal is based on the investigation carried out by the ‘Accident Investigation Commission’ constituted by the Government of Nepal on 9th September 2018. The responsibility of the Commission is to find out the cause of the accident and offer recommendations to prevent the recurrence of such kind of accident in the future to ensure a safer sky for all forms of aviation activities.

The Commission has compiled all available resources including technical information on the aircraft, relevant documents, existing rules and regulations, crash site examination, meteorological reports, Vision 1000 and VEMD analysis, V2 tracker details and interviews with company flight and ground crew, eye-witnesses and CAAN officials.

This report is prepared in accordance with the provisions of Civil Aviation (Investigation of Accident) Rules, 2071 B.S (2014 A.D) with the purpose of preventing future aircraft accidents and incidents. It is not the function of the Commission to apportion blame or determine civil and criminal liability.

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Synopsis

On 8th September 2018, an Airbus helicopter AS350B3e with registration mark 9N-ALS owned and operated by the Altitude Air Pvt. Ltd., Nepal was operating a charter flight as rostered to sector Kathmandu-Samagaon-Kathmandu. The helicopter took off from Kathmandu at 0112 UTC for Samagaon, Gorkha. The helicopter reached Samagaon at 0150 UTC. After, disembarking the passengers at Samagaon, it departed at 0157 UTC with six passengers on-board for Kathmandu (including five Nepali and one Japanese Citizen).

The helicopter was continually in contact with KTM APP. At 0215 UTC, it reported 35 miles from KTM at altitude 9500ft and ETA KT 0233. At 0217 UTC, ATC called the helicopter for traffic information and it replied 25 miles. Then after there was no communication between the helicopter and KTM APP. Another helicopter 9N-ALK was asked by APP Control to call 9N-ALS but there was no response. Later, other helicopters were also requested to call on both APP and Emergency Frequency (121.5 MHz) but there was no contact. Ahead of it, there was other helicopter 9N-AMS of the Altitude Air flying for the same destination. Both the helicopters took the same route almost direct on their way to Samagaon. But, on the return leg, the pilot of the other helicopter had opted to deviate from the normal route due to the deteriorating weather conditions and returning safely back to Kathmandu. But unfortunately, the ill-fated helicopter enters the cloud to follow the direct route to Kathmandu and crashed into a steep cliff at an altitude of 6840 ft. in a dense forest at about 2:20UTC. To intensify the search and rescue operation, three helicopters 9N-AMS, 9N-ALP, and 9N-ALK were sent for the rescue operation immediately at 08:00 to the potential crash site.

On the initial impact, the rotors have chopped some trees and uprooted one tree with a diameter of 2.5 ft. The main fuselage seems to have spun to the right and rested 20 meters from the initial impact point. The tail section behind the horizontal stabilizer is near to the impact point and the midsection of the tail section is lying near to the fuselage.

The accident cost the lives of one crew and five passengers. Only one female passenger survived in the crash. She was admitted to the hospital in Lalitpur. The helicopter was totally destroyed and there was no third-party damage.

The accident was notified to BEA and Airbus Helicopters, France by the Aircraft Accident Investigation Commission immediately after the accident.

Pursuant to Civil Aviation (Accident Investigation) rules 2071 B.S., the Ministry of Culture, Tourism and Civil Aviation, Government of Nepal convened four members Aircraft Accident Investigation Commission on 9th September, 2018 to probe into the circumstances and probable cause of the accident with the purpose of preventing recurrence of similar accidents in the future and enhancing flight safety. The Commission commenced its investigation on 10th September 2018. The Commission conducted crash site observation and analysis, analyzed weather factor, interviewed witnesses, reviewed documents, sent Vision 1000 and VEMD to BEA, France for further investigation and analyzed the data from V2 tracker.

The Accident Investigation Commission has concluded that the probable cause of the accident was the inadvertent entry of the PIC into IMC without analyzing the geographical configuration and the density of the cloud along the route he followed. Once PIC entered into

the cloud he lost his situational awareness of the terrain that leads to the collision with the dense forest and ended with the tragic crash.

The contributing factors which lead to the accident could be the PIC's decision to follow the same direct route back to VNKT in spite of the deteriorating weather conditions and PIC's inability to assess the weather.

The Commission has made five safety recommendations to the concerned agencies for the enhancement of safety and to prevent such accidents in the future. This report is submitted to the Ministry of Culture, Tourism and Civil Aviation, GoN on March 2019.

1. Factual Information

1.1 History of the Flight

The Aircraft with registration no. 9N-ALS was scheduled on 8th September, 2018 for charter flight as rostered to sector Kathmandu-Samagaon-Kathmandu.

Helicopter 9N-ALS had departed from VNKT at 06:57:44 LT (0112UTC) to drop and pick up some passengers from Samagaon. After, disembarking the passengers at Samagaon, the helicopter picked up 6 passengers and lifted off for VNKT at 0157 UTC with normal maneuver.

It had contact with KTM APP at 0215 UTC. At that time it reported 35 miles from KTM, AMSL 9500 ft and ETA KT 0233. At 0217 UTC, ATC called the helicopter for traffic information and it replied 25 miles. Then after there was no communication with the helicopter. Other helicopter 9N-ALK was asked to call 9N-ALS but there was no any response. Later other helicopters were also requested to call on both APP and Emergency Frequency (121.5 MHz) but there was no any contact.

Unfortunately the ill-fated helicopter enter the cloud to follow direct route to Kathmandu and crashed in a steep cliff at an altitude of 6840 ft. in a dense forest at about 08:05 local time.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Others
Fatal	1	5	0
Serious	0	1	0
Minor/None	0	0	0

1.3 Damage to Aircraft

The aircraft was substantially damaged and is beyond economic repair.

1.4 Other Damages

No damage was caused to private property and persons.

1.5 Pilot in Command Information

Sex	Male
Age and Date of Birth	45, February 2, 1973
Nationality	Nepalese
Marital Status	Married
CAAN License No.	ATPL (H) 020
Validity of License	March 31, 2023
Ratings	AS 350 B3e (Day Only)

	B/BA/B2/FXII
Total Flying Hours	8586 Hrs.
Time flown in a period of one calendar month (August)	48:02 Hrs.
Time flown since last 30 days	64:02 Hrs.
Time flown since last 7 days	18:09 Hrs.
Last date of annual review / check-ride	Dec 5, 2017
Proficiency Expiry	Dec 5, 2018

The PIC had 8586 Hrs. of flying experience prior to accident. As per his family members, he had no complain about the company and was happy with his duty, working environment, salary and other monetary aspects. He was honest for his job. According to company and CAAN, he had no record of past accident and incident during his flying career. He is very motivated and dedicated flyer in Altitude Air.

1.6 Aircraft Information

1.6.1 General

The aircraft involved in the accident was a single engine helicopter AS350B3e manufactured by Airbus Helicopters, France and is designed for light utility work with good altitude performance. The helicopter is equipped with three bladed main rotor and two bladed tail rotor, skid type landing gear, 6+1 seating capacity, right side control operated helicopter. The ill-fated H125 (AS350 B3e) helicopter with Serial No. 8264 was purchased, owned, operated and maintained by Altitude Air Pvt. Ltd. since 2016/09/21. The aircraft was built in 10 June 2016 and the aircraft had been in Altitude Air operation since September 27, 2016.

1.6.2 Aircraft

Type (Model)	Airbus AS 350B3e
Manufacturer	Airbus, France
Classification Aircraft Category	Transport (Passenger)
Registration	9N-ALS
Owner	Altitude Air Pvt. Ltd.
Operator	Altitude Air Pvt. Ltd.
Serial No	8264
Date of Manufacture	June 10, 2016
Validity of C of A	September 28, 2018
Aircraft empty weight	1294.33 kg
Maximum Take-off/Landing Mass	2250 kg
Total Time Since New of Airframe	1698:12 Hrs.
Aircraft Landings	5360 Landings
Last Aircraft Weighing Date	March 21, 2017

The helicopter arrived Nepal on 27/09/2016 with Flying Hours done 02:55 Hrs. The Altitude Air operated additional 1698:12 till 2018/09/07 in Nepalese territory.

1.6.3 Engine

Manufacturer	Turbomeca, France
Type	Turbomeca Arriel 2D
Engine Serial No	50905
Date of manufacture	February 26, 2016
Total Gas Generator Cycle	2708
Free Turbine Cycle	1095
Engine Fitted	April 01, 2016
Total Time since New	1698:12 Hrs.

This helicopter was analog (Conventional) type. It was equipped with a VEMD.

1.6.4 Aircraft Maintenance History

The aircraft was being maintained to an approved maintenance program in line with the NCAR Part M and NCAR 145 maintenance organization exposition of Altitude Air. All schedule inspections, service bulletin, alert service bulletin and airworthiness directives were found carried out and complied with in the specifies time limit by CAAN approved Maintenance program.

The Airline has issued valid Maintenance Statement on August 27, 2018.

New CRS has been issued on August 27, 2018. Some notable maintenance works done are:

1. 3 monthly inspection(battery Change)done on August 30, 2018
2. Ball end changed due axial play on August 30, 2018
3. 150FH/3M/6M/12M inspection done on August 27, 2018
4. 16 attachment screw heads of MGB suspension bar checked on August 27, 2018
5. Starter Generator Brush checks as per SB AS350.05.00.89 done on August 27, 2018.

From the maintenance record it is seen that aircraft was airworthy prior to the accident.

1.6.5 Performance Data

The last engine performance check, which was carried out in flight on date 17/08/2018 was recorded in aircraft technical log. The readings were 18 OAT (°C), 8220 Zp(ft), 96.6N1(%), 394 N2(RPM), 825TOT(°), 112TRQ(%) at 1673.00 Hrs. Recorded parameters are found within normal range. The history of the helicopter indicates that the engine had good performance. There is no any performance limitation noticed in helicopter at the speed, altitude, load and other factors during the accident time.

1.6.6 Flight and Navigation Instruments

The aircraft was equipped with the standard AS350 B3e base line flight and navigation instruments required for VFR operation It features one LCD (Liquid Crystal Display) dual screen Vehicle and Engine Multifunctioning Display (VEMD) displaying vital information, such as first limitation Indicator (FLI) as standard. The avionics of the AS350 B3e helicopter includes an altitude indicator, heading indicator, course deviation indicator, turn and balance indicator, transponder, emergency location transmitter, communication systems, navigation systems, landing assistance systems and global positioning system (GPS).

1.6.7 Aircraft Weight and Balance

The maximum take-off weight	2250 kg.
The aircraft empty weight based on 1 crew 6 Pax (Corrected)	1294.33 Kg
The weight of crew	85 Kg
The weight of passengers	355 Kg
The weight of cargo / Baggage	125 Kg
The weight of fuel	260 Kg
The total weight	2134Kg
<i>T/O /LND Centre of Gravity</i>	<i>3.231/3.222</i>

The AYW and the CG was within the limit. Hence, the weight and balance and AYW can be rejected as a contributing factor to this accident.

1.7 Meteorological Information

Due to unavailability of synoptic weather stations nearby the accident site, along the Samagaon, Gorkha-Kathmandu route, the exact weather condition of en-route and accident site couldn't be provided by Department of Hydrology and Meteorology (DHM) to the commission.

A well-marked low pressure area was situated over Madhya Pradesh and neighboring areas of India tilting southwestward with height and extending up to mid-tropospheric levels, i.e. 500 hPa between 5:45 NPT to 8:45 NPT. The axis of the monsoon trough at mean sea level lies near to its normal position. Under the influence of these systems, the moisture carrying easterly wind from the Bay of Bengal was dominant over the Nepal.

The streamlines analysis at 850 hpa depicted easterly to south-easterly wind over the central Nepal at 00 UTC. High altitude wind also showed predominance of easterly/south-easterly wind.

On the 08th of September between 0200 UTC to 0300 UTC (i.e., 07:45 NPT to 08:45 NPT), scattered to broken low/medium clouds were observed over central region of Nepal along with en-route from Gorkha to Kathmandu. Scattered to broken low/medium clouds persisted over Kathmandu, Nuwakot and southern part of Dhading and Gorkha districts between 0200 UTC to 0300 UTC.

METAR VNKT 080150Z VRB02KT 9999 FEW015 SCT030 BKN100 23/20
Q1016 NOSIG=
METAR VNKT 080220Z VRB02KT 9999 FEW015 SCT030 BKN100 23/20
Q1016 NOSIG=
METAR VNKT 080250Z VRB02KT 9999 FEW015 SCT030 BKN100 23/20
Q1017 NOSIG=
METAR VNKT 080320Z VRB02KT 9999 FEW015 SCT030 BKN100 25/20
Q1017 NOSIG=

The eyewitnesses and the PIREPs of 9N-AMS signify that Samagaon Valley was clear and the weather condition was "CAVOK" beyond 32 NM from VNKT. But, from 32NM to 15 NM from KTM he was reporting: "2 to 3 layers of OVC and embedded high rising Cb cells,

most mountain (hills) covered up, some lower passes just barely clear, Dhading area looked all thickly covered up."

1.8 Aids to Navigation

The flight was to be conducted strictly under visual flight rules. The aircraft was equipped with navigational aids as prescribed by FOR (H) including a GPS certified for supplementary navigation which was duly operational.

1.9 Communication

The aircraft was equipped with a VHF transceiver and a satellite phone onboard. It had contact with KTM APP at 0215 UTC. At that time it reported 35 miles from KTM APP., AMSL 9500ft and ETA KT 0233. At 0217 UTC, ATC called the helicopter for traffic information and it replied 25 miles. Then after there was no contact with the helicopter. Other helicopter 9N-ALK was asked to call 9N-ALS but there was no any response. Later other helicopters were also requested to call on both APP and Emergency Frequency (121.5 MHz) but there was no any contact.

1.10 Samagaon Helipad (Departure Point) Information

The departure point was the Samagaon Helipad. Samagaon is remote Himalayan village located in Manaslu Conservation area, Gorkha district north-west of Kathmandu. The Samagaon helipad elevation is 11800 ft. and coordinate is N28⁰ 36' 11", E 084⁰ 38' 38". The helipad at Samagaon is big, flat and cemented.

1.11 Accident Site

Accident site is steep forested terrain with more than 45% angled slopes with dense undergrowth. The site is 200 ft. below on the northern slope of a ridge, which runs from east to west. Access to the site is around 45 minutes, walk distance from the nearest landing site. Altitude is 6,840 ft. 28⁰⁰'19"N 85⁰¹'22"E.

1.12 Flight Data Recorder

The Aircraft was equipped with Vision 1000 and VEMD.

1.13 Wreckage and Impact Information

The wreckage is found within the initial impact side. On the initial impact the rotors have chopped some trees and uprooted one tree with a diameter of 2.5 ft. The main fuselage seems to have spun to the right and rested 20 meters from the initial impact point.

Tail section behind the horizontal stabilizer is near to the impact point and the mid-section of the tail section is lying near to the fuselage.

1.14 Medical and Pathological Information

1.14.1 Medical History of PIC

PIC was examined for medical conditions during his training. After starting his career as a pilot, he was evaluated by CAAN regularly as per the existing guidelines. His last medical was completed on March 28, 2018. His medical examination did not reveal any medical conditions and was deemed fit to continue his flying privilege. His medical examination also did not reveal any past medical illness.

1.14.2 Medical Forensic Findings

Postmortem examination of PIC was conducted in Department of Forensic Medicine, IOM. Detail postmortem report of External Examination and Internal examination of PIC is attached in appendix.

External examination revealed contusion over forehead, laceration over right temple, left cheek, contusions over both cheek, chin, neck and head. There were multiple abrasions over right chest, right shoulder, and anterior abdomen. There were multiple abrasions, lacerations over both upper limbs and both lower limbs.

Internal examined revealed contusions over both frontal lobes and sub-arachnoid hemorrhage over both frontal & parietal lobes. Sternum and 1st to 10 ribs were fractured. Pleural cavities contained blood stained fluid. Right lung was contused and left lung was contused & lacerated. There were no internal injuries to abdomen. There were abrasions over back, buttock and punctured wound over left buttock. There was fracture of first thoracic vertebrae, sacroiliac joints and right femur.

This suggested BLUNT FORCE INJURIES TO THE HEAD, CHEST AND PELVIS as likely cause of death.

Viscera from stomach with contents, kidney and liver were tested by thin layer chromatography (TLC) for insecticides (organo-phosphorous, organo-chlorine, carbamate, pyrethroid), ethyl alcohol, methyl alcohol and phosphine gas. The sample was negative for all chemicals analyzed.

Blood sample was not provided so alcohol could not be analyzed.

1.15 Fire

There was no sign of in-flight fire. The fire is post-accidental fire.

1.16 Survival Aspect

The helicopter crashed in a steep cliff at an altitude of 6840 ft. in a dense forest. Five passengers out of six including PIC onboard died on the spot due to high velocity impact. Only one female passenger survived the crash. She was immediately rescued and admitted to the hospital in Lalitpur.

1.17 Tests and Research

A visual inspection of the crash site was done by the Commission. No laboratory inspection of the wreckage was conducted.

The helicopter was fitted with VEMD and vision 1000. The commission decided to send these components for further investigation to BEA, France.

1.18 Organization and Management Information

1.18.1 Altitude Air Pvt. Ltd.

Altitude Air is a private limited company formed under the company Act of Government of Nepal, registered by Department of Industry and MoCTCA. It has two types of helicopters- AS350 B3 and two Augusta Westlan (AW 119KX). Prior to this accident, it operated two helicopters AS350 B3e. It was established in the year 2071 BS. It obtained its Air Operators Certificate AOC #085/2016-01 on October 07, 2016 from the CAAN for helicopter charter air services which include transportation of passengers/cargo, sightseeing, and entertainment flight, search and rescue, medical emergency evacuation and other services on charter basis. There are total of three pilots, three engineers, four flight dispatcher, one QA Manager and two Safety Officer in the company. The flights as well as rotation are planned with 6 days work and 1 day rest, consistent with CAAN guidelines. The monthly, three- monthly and yearly flying hours for individual pilots are also within the limit stipulated by CAAN which is less than 100, 290 and 1000 Hours.

There is no any recorded accident till date.

The Company is headed by a Managing Director under whom the Director Operations, Flight Safety Manager, QA Manager, CAMO Manager, Officer Administration, Officer Finance, Maintenance Manager, Marketing Director comes. Chief Pilot/Line Pilot and Operations Manager/Flight Dispatcher come under Director Operations. The Manuals and Procedures are alsoas per the requirement.

1.18.2 Civil Aviation Authority of Nepal (CAAN)

The Civil Aviation Authority of Nepal (CAAN) is a government agency to regulate civil aviation in the country. Air Navigation Services Directorate, Civil Aviation Safety Regulation Directorate, Corporate Directorate, Aerodrome Operations Directorate, Tribhuvan International Airport Civil Aviation Office, Civil Aviation Academy are different directorates and department under CAAN. ATM department under Air Navigation Services Directorate is responsible for ATS and Meteorology service. The Flight safety standards department (FSSD) of CAAN is responsible for safety oversight of airline operators. The three main divisions under the Safety Department are Airworthiness Inspection Division, Flight Operation Division, Licensing and Examination Division, Air Navigation Services (ANS) Safety Department is responsible for oversight of the Air Traffic Services Operations and System.

1.18.3 Ministry of Culture, Tourism and Civil Aviation (MoCTCA)

The Ministry of Culture, Tourism and Civil Aviation is responsible for issuance of Airline Operating License and for the supervision of the CAAN. The Ministry constitutes an Air Investigation Commission for the investigation of aircraft accidents and serious incidents in the country pursuant to the Civil Aviation (Accident Investigation) Rules 2071 B.S.

1.19 Additional Information

1.19.1 Account of Friends and Company Personnel

The pilot was very experienced and highly respected. But, he also had a reputation amongst peers of trying to fly as many hours as he could and conducting missions in challenging conditions.

1.19.2 Account of eyewitnesses

The commission met the only eyewitness who is the survival of the accident in the hospital, Kathmandu where she was admitted for the treatment. The eyewitness accounted that the helicopter took off from Samagaon helipad with six passengers at normal condition. She witnessed that the weather at Samagaon was clear, no any wind or rain was observed. The helicopter flew in a normal cruise condition without any abnormal noise and any unusual attitude. The en-route weather was deteriorating, all around cloudy. The helicopter entered into cloud. There was no any unusual movement and sound inside the helicopter. The pilot seemed to be calm and normal. After a moment, she felt the helicopter was increasing the flight position heading into the cloud and followed by a big bang with huge terrible sound. The witnesses didn't notice any pre-accident fire. The eyewitness was unconscious at the time of the accident. She came to consciousness after some time of the accident. She found herself outside the helicopter in the land and fortunately found her phone and could make a phone call to the family member.

1.19.3 Details retrieved from V2 Tracker

The aircraft was fitted with a V2 Tracker. The tracker transmits the data either on satellite or cellular technology. The tracker updates the position every 15 seconds interval by default. The tracker provides the real time tracking and recorded data of Ground Speed, Track, Rate of Descend or Rate of Ascend, Altitude, Geographical position overlay, Weather overlay and Time. The Commission has analyzed the recorded data in detail to discover the track, speed, altitude, bank angle etc. to visualize the flight.

According to the data obtained from V2 tracker, the helicopter took off at 07:42:09 at 11574 ft. altitude from samagaon helipad coordinate 28⁰35'04" 84⁰38'32"E with normal cruise speed. The helicopter seems descending at normal rate with increasing cruise speed until 08:04:12 LT. At that time, the helicopter reached to altitude 7631 ft. at 141 kt. speed. From the V2 tracker, it is clear that up to last two minute before the crash, the helicopter seems to be accelerating but 30 second before crash, the pilots seems to check his rate of descend and changing course 30 degree to the right. After few seconds later, the helicopter ended with the tragic crash.

2. ANALYSIS

2.1 General

Analysis of the events has been carried out with the fact-based details available on mechanical, weather, operational as well as psychological and physiological factors. Several rounds of intensive discussions were held among the members and experts, especially on nature of flight, time pressure, human factors, errors, mistakes, complacency, noncompliance and violation of regulations, conditions of crash site, aerodynamics and other technical aspects.

The PIC was properly certified and qualified under CAAN regulations and Altitude Air training requirements. No evidence was found to indicate any pre-existing medical condition that might have adversely affected the pilot's performance during the accident flight. The helicopter's weight and balance condition is within flight manual permissible limit. Because of the location and nature of the crash site, it was not possible for the Commission to study all wreckages and the extension of the wreckages after the crash. The committee member visited the accident site on September 14, 2018. On the basis of the firsthand account of the witness and the crash site analysis, the probability that power plant, system, or structural failures or any other mechanical difficulty contributed to the accident is discounted. No discrepancies were noted and management of crew and aircraft is not considered causal in this accident.

As with many accidents, the end result depends on many factors. This analysis considers certain factors which may have had a bearing on the outcome and/or which could have prevented the accident. The probable factors of this accident mostly relate to human factor.

According to the wreckage analysis, eye-witness statement, timing of radio transmission and mishap, the aircraft was flying in a normal engine-run condition. The Commission has come to the conclusion that the engine and transmission system were operating normal at the time of the accident and any possibility of mechanical failure thus can be discounted. The Commission has concentrated largely on the physiological and psychological aspects of the accident.

The Commission sent the Vision 1000 and VEMD found from the wreckage to BEA, France for the further investigation. The report obtained from the BEA, France was essential to the commission to exclude the possibility of accident from the technical perspective.

The Commission studied the recorded data of V2 tracker with previous flights to understand the flying behavior of deceased captain and commission discovered the track, speed, altitude, bank angle etc. to visualize the flight and relate the flight with respect to weather, proficiency, practices and human factors. The commission identified PIC's lack of ability to assess the change of weather condition as one of the factor.

2.2 Methodology

The following were the measures followed by the Commission during the investigation to reach the conclusion on the probable causes of the accident.

- a) Detailed interviews and statements of the eye witness, concerned officials of the Altitude Air Company, ATS and other individuals who carried any information related to the accident.
- b) Post-crash material observations. Visual examination and assessment of wreckage. Photographs and videos were collected for detailed study.
- c) Study of the prevailing weather report at the time of mishap received from the DHM, tower, eyewitness and PIREP.
- d) Study of technical documents related to the maintenance and operational history of the aircraft.
- e) Study of personal files and information about the PIC.
- f) Study of helicopter aerodynamics, human factors, human psychology, human physiology and behaviors.
- g) Review of the CAAN regulations/requirements regarding helicopter operations and training requirements.
- h) Review of the Altitude Air Company Operation Manual, training requirements and bad weather flight procedure training.
- i) Analysis of the postmortem and medical report of the PIC.
- j) Analysis of flight parameters retrieved from the V2 tracker.
- k) Technical evaluation of Vision 100 and VEMD was done in BEA, France
- l) Critical analysis of all information gathered.
- m) Experts were consulted for human factors and other technical assistance.

2.3 Operational Aspects

The nature of helicopter services in Nepal is such that, all flights are non-scheduled flights. With regards to charter helicopter flights, the preparation time available is always very limited during the season. Different individuals have different capacities of coping up with time constraint and some tend to give up earlier while working under pressure. Therefore, in the aviation unit, the concerned departments and personnel must be active to monitor, educate and manage stress levels to bring about awareness within the institution. When under stress, one can never gauge his or her own working capacity. The Operation Director, Chief Pilot and Flight Operation Officer also should evaluate and cross-check with appropriate program of crew roster. Additionally, stating the plan, briefing, and contingency planning, cross-checking and monitoring to develop a team and coordination are the fundamentals of preparation for flight. The regular training and awareness program related to the safety is the important component of the operation.

In this mishap, the Commission has learnt that the ill-fated aircraft had reported 25 miles to reach KTM at 0217UTC, AMSL 9500ft but then the ill-fated helicopter was out of contact. The helicopter continued the normal route while the fellow helicopter from same company followed alternative route. In such situations, as mentioned above, the operations Manager or designated company personnel shall gather weather condition of en-route and destination airport/helipad and give a weather briefing to the flight crew before flights. In absence of such personnel, the whole responsibility and decision making authority lies on the part of pilot in command. Re-routing, delaying flights, changing altitudes or speed could be the

possible methods to avoid the effects of severe weather which a PIC can decide as per the SOP.

2.3.1 Training and Company Procedure

Study of the CAAN FOR–Helicopter 5th Edition, 2013 reveals that there is detailed procedure established by the Authority to ensure enough meteorological knowledge of weather phenomena and procedures for avoiding severe weather conditions.

The PIC has adequate experience of flying in the aircraft and mountainous terrain and the pilot had complied with all the training and procedures that were required, but also he continued the normal route while his fellow pilot took the alternate route as the en-route weather was deteriorating.

The Commission has totally discounted the training aspect during the investigative discussions as Altitude Air Company Operational Manual and SOP address the bad weather and CFIT checklist though the manual and procedure.

Although it is the responsibility of the pilot to judge the missions and he is the final authority as to the feasibility of a mission and whether it can be conducted in a safe and efficient manner, it is also a management responsibility to recognize mission safety as prime factor. The regular training and awareness program about the safety precautions need to be considered by the management.

The Commission did not notice any breach, non-compliance or violation of training prescribed by CAAN and Company Manual. The Commission learnt while interviewing the company pilots that all of the pilots are aware of the knowledge, training of bad weather, CFIT and CFIT checklist included in Company SOP which is a significant observation.

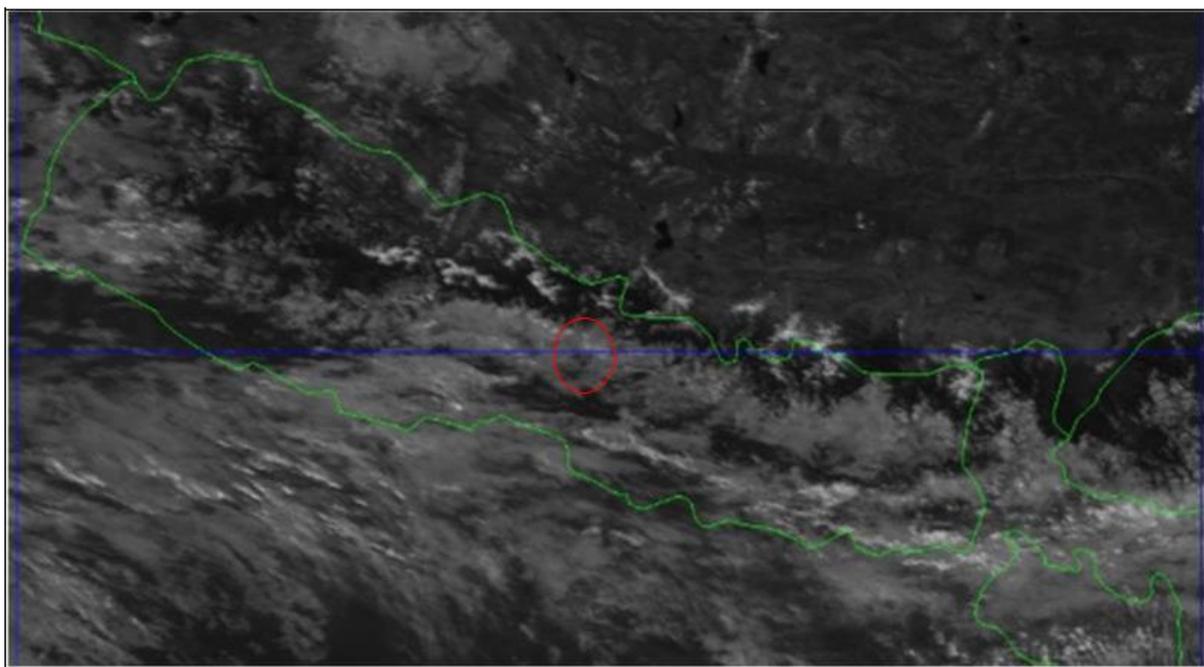
2.3.2 Flight and Navigation Instruments

The aircraft was equipped with the standard AS350B3e base line flight and navigation instruments required for VFR operation. It features one LCD (Liquid Crystal Display) dual screen Vehicle and Engine Multifunctioning Display (VEMD) displaying vital information, such as first limitation Indicator (FLI) as standard. The avionics of the AS350 B3e helicopter includes an altitude indicator, heading indicator, course deviation indicator, turn and balance indicator, transponder, emergency location transmitter, communication systems, navigation systems, landing assistance systems and global positioning system (GPS). The flight was a VFR flight and Commission studied the flight envelope in details from the V2 tracker. The Commission did not notice any remarkable flight and navigation instruments issue ruling out navigation and instrumentation failure as a probable cause to the mishap.

2.3.3 Weather Factor

Generally, the weather condition during September is post monsoon in Nepal and is not very good due to disturbances. Heavy rain and clouds are routine phenomena at this time of the season. There is always some kind of pressure on the pilot when flying during this season. Therefore, weather could not be the contributing factor in this accident although it cannot be ignored completely but the Commission determined that understanding of weather had the

most substantial impact on the flight, and ultimately is the leading cause of this mishap. PIREP of 9N-AMS, witness interviews, and the Commission's own observation of the crash site for an extended period revealed that weather at Samgaon valley was clear and the weather condition was CAVOK beyond 32 NM from VNKT. The Report from DHM showed developing cloud of weak monsoon. According to the first responders (Helicopter Pilots, Rescue Technicians, Medics), there were fair amount of cloud in the area where 9N- ALS crashed and long line technician could not be dropped off at the site for aerial rescue and recovery. A group of responder consisting of Mountain guides, Police and Army officers set on foot from the near Barsungchet Mailungpakha Forest, Medhang-1, Nuwakot District, Nepal.



Source:- Himawari-8, JMA

Note:-The encircled area in red is visually estimated crashed site.

2.3.4 Experience of PIC

The PIC did his higher secondary education in 1992 AD from Modern Indian School Kathmandu, Nepal. PIC completed his initial Commercial Pilot License #3486223 (FAA) from Ukraine in September 1994 and CAAN CPL (H) #026 was issued on September 1995. He had operational ratings on AS350 B3e (Day Only) B/BA/B2/FXII with total flying of 8586 Hrs. since 1994 to 2007 AD till the mishap. As per the evidences received from the company and CAAN, he had no record of past accident and incident during his flying career. There was no medical or psychological conditions reported in the examination.

The Pilot, age 45 had good reputation as a senior helicopter pilot. He had experience of flying both the twin and single engine Helicopters in the Mountains of Nepal and Afghanistan in his flying career of 23 years. He had experience of MI-2, MI-8, MI-17-IV-(MTV/AMT) also. In Afghanistan, he was working flying contracted helicopter to support the United States Army while working. He had professional skill of flying at high altitude in Everest Region, Aerial filming, open-door flying in Bhutan, Helicopter external cargo sling, bam by bucket and

human cargo sling operations in Switzerland. He was an amicable person highly regarded by his peers and coworkers for his easygoing nature. He was a person who easily lifted others' spirit.

Prior to his joining at Altitude Air, he flew for Heli Everest (2016-2017), Manang Air(2014-2015), Air Dynasty(2009-2014), Impro Air(2008-2009), Simrik Air(2006-2008), Asian Air (2002-2006), Cosmic Air(1998-2000) and Everest Air Pvt. Ltd. (1994-1997).

He seems to be flying up to maximum hours possible within the limit as specified by the procedure. In past four years he flew in four different helicopter companies which shows he's instability to remain in a same company for longer period.

2.4 Accident Sequence

The Aircraft with registration no. 9N-ALS was scheduled on 8th September, 2018 for charter flight as rostered to sector Kathmandu-Samagaon-Kathmandu. Helicopter 9N-ALS had departed from VNKT at 06:57:44 LT (0112UTC) to drop and pick up some passengers from Samagaon. After, disembarking the passengers at Samagaon, the helicopter picked up 6 passengers and lifted off for VNKT with normal maneuver.

It had contact with KTM APP at 0215 UTC. At that time it reported 35 miles 9500ft and ETA KT 0233. At 0217 UTC, ATC called the helicopter for traffic information and it replied 25 miles. Then, after there was no contact with the helicopter. Other helicopter 9N-ALK was asked to call 9N-ALS but there was no any response. Later other helicopters were also requested to call on both APP and Emergency Frequency (121.5 MHz) but there was no any contact.

2.4.1 Preflight Events

A recollection of the events prior to the flight is necessary in order to understand the working procedure within the company. The ill-fated Aircraft took off from Kathmandu at 06:57:44 to drop and pick up some passengers from Samagaon and reached at 07:35:28 following along the path Tribhuvan International Airport, Teaching Hospital, Grande Hospital, Ringni, Ree Gaon, Jagat to Samagoan. After, disembarking the passengers at Samagaon, the helicopter picked up 6 passengers and lifted off at about seven minutes later for Kathmandu at 07:42:09LT (0157 UTC) with normal maneuver.

2.4.2 Flight route and Flight Analysis

On that day, the two helicopters 9N-ALS and 9N-AMS of the same company were flying to the same destination. Both helicopters took the same route almost direct on their way Kathmandu to Samagaon. But, on the return leg the pilot of the other helicopter 9N-AMS had opted to deviate from the normal route due to the unusual and deteriorating weather conditions towards normal route, and returned safely back to Kathmandu through the safe alternate route. But unfortunately the ill-fated helicopter enter the cloud to follow direct route to Kathmandu. That counted as a violation of the clause no. 9.5.37 "VFR Flights En-Route", of Part A- General, Operations Manual of Altitude Air. The clause state that flying in IMC by

Helicopters certified for VFR should be strictly prohibited. The PIC should take appropriate action to fly safely out of that situation. The deceased PIC violated the SOP and continued to the direct route back to Kathmandu under IMC condition and crashed in a steep cliff at an altitude of 6840 feet in a dense forest at about 08:05 LT.

2.5 Human Factors Analysis

PIC was a simple person who had a very easy going nature. He was regarded as a very competent pilot by his peers and juniors. There were no reports to suggest that he had any risk taking behavior and was considered a safe pilot. He was very friendly and cooperative person.

As per his family members, he had no complains about the company and was happy with his duty, working environment, salary. He was fairly secured financially. He was honest for his job. He is very motivated and dedicated flyer in Altitude Air. The PIC in last four years he flew in four different helicopter companies which show his instability to remain in a same company for longer period. There was no specific reason for frequent job changes.

According to company and CAAN, he had no record of past accident and incident during his flying career. There was no medical or psychological conditions reported in the examination.

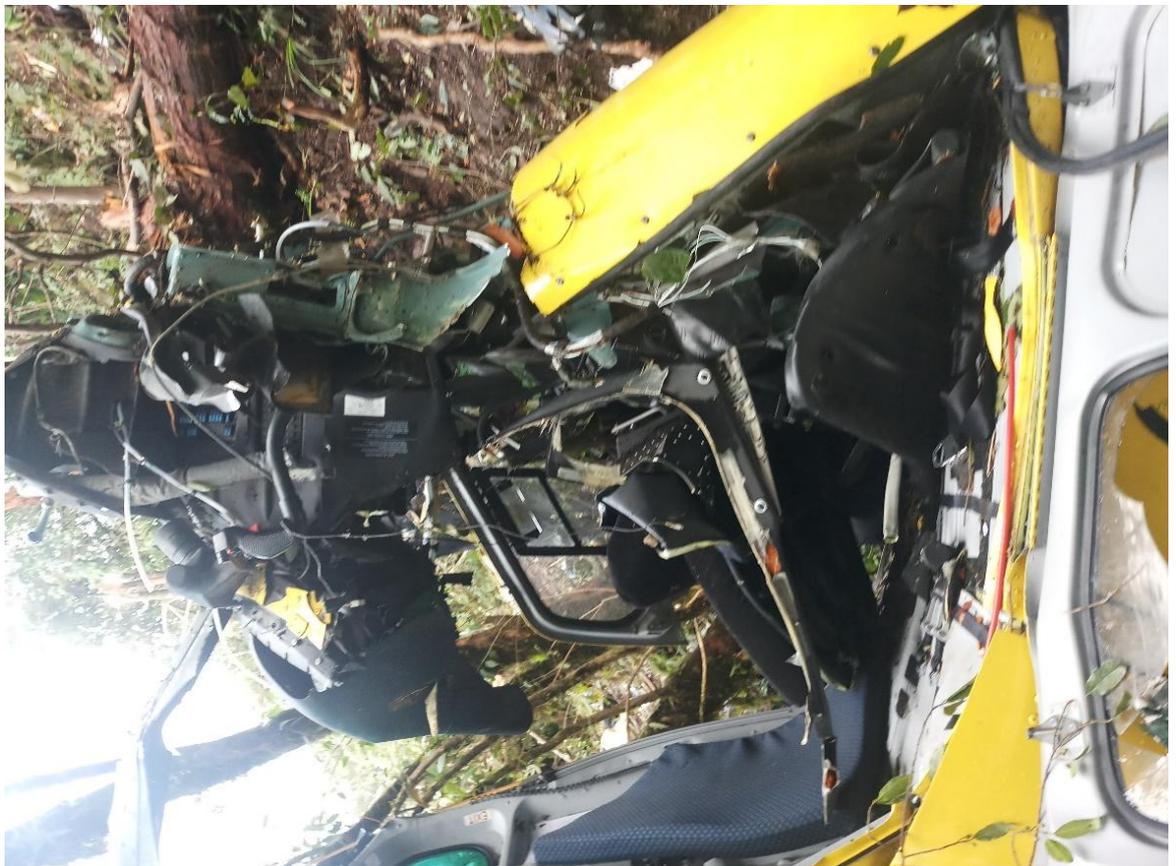
He had adequate rest at home prior to this flight with official rest period of minimum nine hours, suggesting that there was no fatigue. His work schedule was managed well by his company. The flight record did not reveal any cumulative fatigue.

PIC was a social drinker and he didn't smoke. He had no addictions to drugs. The blood samples were also negative for any substance abuse.

From his past flying records, it is clear that he was experienced and reputed pilot who was eager on that day to complete the missions, in spite of adverse conditions.

2.6 Wreckage and Impact Analysis

Because of high speed Impact, Helicopter parts scattered up to 50 meters from the spot of the main wreckage. Trees in vicinity were also hit based on aerial surveillance carried out during the visit to the site. Crash site is in the dense forest with no normal route or access and as such, it was difficult to speculate if parts were further away.



2.7 Report from BEA, France

The Vision 1000 and VEMD was sent to BEA, France for the further investigation. The extracted and viewable images from Vision 1000 was analyzed. The VEMD read out ie. Flight data and Engine data was analyzed. The following are the main points obtained from the report.

1. The accident flight was the flight number 2268.
2. The flight duration was equal to 1hr 11 min.
3. One failure has been detected during this flight and concern the "INVALID COL PITCH".
4. The "INVALID COL PITCH" failure is triggered by the VEMD when the signal coming from the collective pitch/anticipator potentiometer is considered as invalid by the FADEC or not received by the VEMD for more than 200 ms.
5. This failure occurred most probably at the end of the flight and is probably the consequence of the aircraft impact.
6. No over limit has been recorded during this flight and all the previous 8 recorded engine power check were good.

According to the report from BEA, one failure was recorded at the end of the flight and was associated to the collective pitch anticipator potentiometer which is probably the consequence of the aircraft impact.

3. Conclusions

3.1 Findings

- 1) The flight was operated by solo pilot who was properly trained and certified in the aircraft in accordance with the rules and the regulations of the CAAN. The Pilot's proficiency check was carried out on December 05, 2017.
- 2) There were six passengers including one crew onboard the mishap aircraft. Five out of six passengers and a crew perished due to the high velocity impact.
- 3) PIC had current medical examinations and there were no medical conditions reported that might have adversely affected the PIC's performance or judgment during the mission.
- 4) There were no psychological factors to influence PIC's performance or judgment.
- 5) The PIC had adequate rest for the flight and there was no evidence of suffering from fatigue.
- 6) PIC had not been involved in any accident or incident before.
- 7) The aircraft was maintained as per the CAAN requirements. No maintenance work was found to be overdue and all maintenance records had been maintained properly.
- 8) The logbook and log-cards were maintained in proper order and the aircraft was properly released for flight.
- 9) Preflight briefing and proper crew coordination was conducted.
- 10) The aircraft was operating within performance limitations as per its Flight Manual.
- 11) The weight and CG were within prescribed limits.
- 12) There was no evidence of failure of the aircraft's flight controls, systems, structure, or engine prior to the main rotors impacting the vertical granite rock face.
- 13) There is no evidence or likelihood of instrumentation or navigation failure.
- 14) There was no evidence of unlawful interference.
- 15) The aircraft was substantially damaged upon impact.
- 16) The weather was good at the Departure point, Samagaon Helipad.
- 17) The en-route weather was adverse. Cloudy conditions was witnessed at the accident site at the time of mishap.
- 18) Relevant pathological examination report of the blood of PIC was free of traces of sedatives or any prohibited drugs.
- 19) The mishap helicopter impacted a vertical granite rock face at 6824 ft. AMSL. The location of crash site is a steep rocky cliff that is not easily accessible.
- 20) It was revealed that the PIC was skillful and experience in flying.
- 21) The PIC violated the SOP and continued to the direct route back to Kathmandu under IMC condition.
- 22) The PIC lacked the situational awareness in flight while intending hasty arrival to Kathmandu and didn't follow the safe procedure. His decision-making and understanding of weather pattern was observed poor.
- 23) The accident was CFIT. The helicopter was under control of PIC till the last moment.
- 24) Alternate route weather was good enough to continue flight. It was witnessed by another pilot of next flight following the mishap Helicopter.

3.2 Probable Cause

The probable cause of the accident was the inadvertent entry of the PIC into IMC without analyzing the geographical configuration and the density of the cloud along the route he followed. Once PIC entered into the cloud he lost his situational awareness of the terrain that leads to the collision with the dense forest and ended with the tragic crash.

3.2 Contributing Factors

The contributing factors which lead to the accident could be the PIC's decision to follow the same direct route back to VNKT in spite of the deteriorating weather conditions and PIC's inability to assess the weather.

4. SAFETY RECOMMENDATIONS

The Accident Investigation Commission recommends the following to help prevent similar accidents in the future.

4.1 Altitude Air and all helicopter operators

1. The operator should ensure regular standard training and awareness programs for weather analysis and assessment for the helicopter Pilots.
2. The operator should further strengthen and ensure safety culture in the company through training and awareness program.
3. The operator should ensure retention of required skilled and trained manpower.

4.2 CAAN

1. CAAN should ensure the availability of required skilled manpower before issuing AOC to the company.
2. CAAN should further strengthen the effective safety oversight and strict enforcement.

Appendices

Appendix-I:	Abbreviations
Appendix-II:	Weather Report
Appendix-III:	V2 Track Data Record
Appendix-IV:	Technical Report from BEA, France