الهيئة العامة للطيران المدني
GENERAL CIVIL AVIATION AUTHORITY

Air Accident Investigation Report

- Preliminary Report -

AAIS Sector Accident Case # 02/2014

Loss of Control Inflight [LOC-I]

Operator: Helidubai
Type: Eurocopter EC-130-B4
Registration: A6-DYR
Location: Heliport ZATL, Atlantis-Palm Jumeriah, Dubai
State of Occurrence: United Arab Emirates
Date of Occurrence: 22nd January 2014

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Investigation Objective

This Investigation was performed pursuant to the UAE Federal Act No. 20 of 1991, promulgating the Civil Aviation Law, Chapter VII, Aircraft Accidents, Article 48; in compliance with the UAE Civil Aviation Regulations, Part VI, Chapter 3; and in conformity with ICAO Annex 13 to the Convention on International Civil Aviation; and in adherence to the Air Accidents and Incidents Investigation Manual.

The sole objective of this Investigation is to prevent aircraft accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

Investigation Process

The Accident was notified to the General Civil Aviation Authority (GCAA) Air Accident Duty Investigator on 22nd January, 2014 at about 1145 UTC.

An Investigation Team was immediately dispatched to the accident site.

The Team coordinated with all authorities on site by initiating the accident investigation process according to prepared and previously exercised plans.

In accordance with ICAO Annex 13, the BEA[1] (Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile) were notified and appointed an Accredited Representative to the investigation and nominated Technical Advisors from the Original Equipment Manufacturer [OEM] of the airframe: Airbus Helicopter and the engine: Turbomeca.

The Air Accident Investigation Sector (AAIS) of the GCAA is leading the investigation, as the United Arab Emirates (UAE) is the State of Occurrence

[1] The BEA (Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile) is the French authority responsible for safety investigations into accidents or incidents in civil aviation.

Aircraft Data

The EC130 is a wide body variant of the AS350 B3 and was first flown on 24 June 1999. The EC130 features an enclosed tail fan rather than the traditional tail rotor found on the older AS350

EC130B4 General Characteristics

- Crew: 1 (pilot in left seat)
- Capacity: 6 passengers (2 at front and four at back)
- Length: 10.68 m (35 ft)
- Rotor diameter: 10.69 m (35 ft 1in)
- Height: 3.34 m (10 ft 11 in)
- Empty weight: 1,377 kg (3,036 lbs)
- Useful load: 1,050 kg (2,315 lbs)
- Max. takeoff weight: 2,427 kg (5,351 lbs)
- Powerplant: 1 × Turbomeca Arriel 2B1 turboshaft, 632 kW (847 shp)

Airbus Helicopter EC-130-B4

Figure 1: Airbus Helicopter EC130B4

Accident Synopsis

The final flight of each day was a positioning flight from the Atlantis Palm Heliport to the Helidubai operating base at Dubai International Airport [DXB]. The flight is operated without revenue passengers; the crew for this particular flight was the handling pilot and the other occupant was the helicopter landing officer [HLO][2].

The helicopter was positioned at the Heliport[3] on the helipad, The flight from the heliport to DXB is approximately fifteen minutes with positioning and traffic clearances.

The flight was airborne at 15:32:21 Gulf Standard Time [GST][4]

The helicopter picked up into a climb while rotating counter clockwise to the left. The climb was arrested at approximately 15-25 meters [50-75 feet] AGL, the helicopter then descended rapidly, pitched forward during the descent while in a continued counter-clockwise left hand turn prior to the Abnormal Heliport Contact [AHC] with the helipad and subsequent heavy landing.

The helicopter contacted the helipad in a rapid descent with the vertical loading exceeding 20g[5], there was extensive damage to the primary and secondary structure and the dynamic components.

Both the pilot and the passenger were incapacitated immediately following the helipad contact. The aircraft remained on the helipad for five minutes rotating down the heliport, until reaching a curb edge where the aircraft came to a full stop position.

The helipad ground crew where then able to shut down the engine and assist with removal of the incapacitated crew.

The accident sequence from lift off to engine stop was five minutes.

The was no post-accident fire.

[2] The HLO is not a crew member. The role is a ground support function for the Heliport
[3] A heliport is a small airport suitable only for use by helicopters. Heliports typically contain one or more helipads and may have limited facilities
[4] Greenwich Mean Time (GMT) is same as Coordinated Universal Time (UTC). To convert to Gulf Standard Time add plus 4 hours.
[5] g-force is a measurement of acceleration felt as weight/the vector sum of non-gravitational forces acting on an object

Accident Location

The Heliport is located adjacent to the Atlantis Hotel, Palm Jumeirah. The Helipad is the area with the blue demarcation

Heliport designation: ZATL/Coordinates lat/long: 25 07.66 N/055 86.62 E

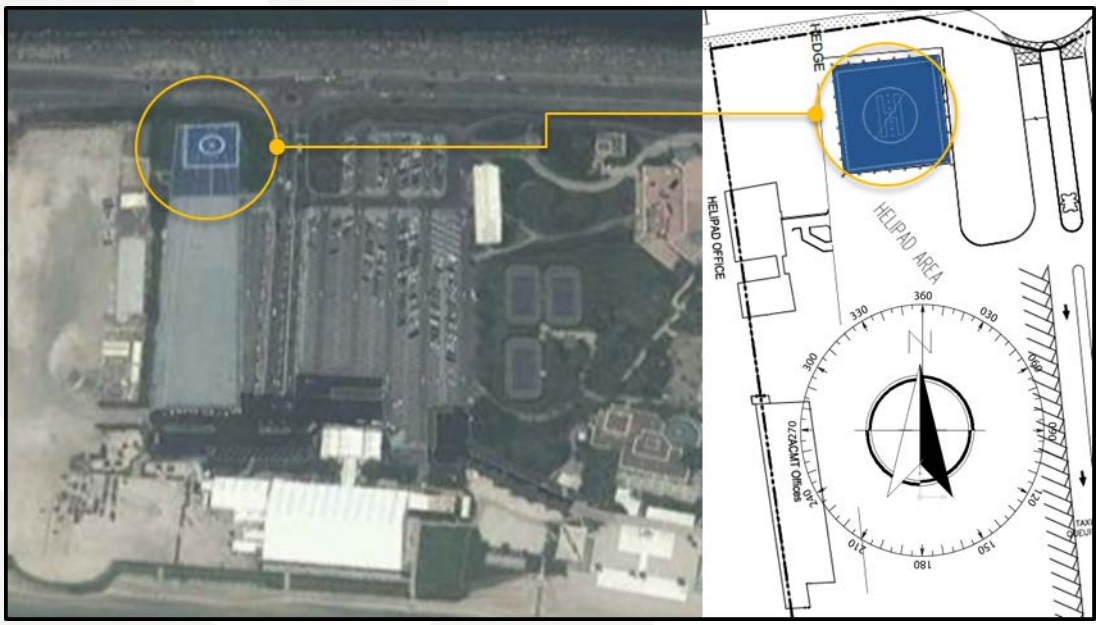

Figure 2: The Heliport Is Located Adjacent To The Atlantis Hotel, Palm Jumeirah, Dubai.

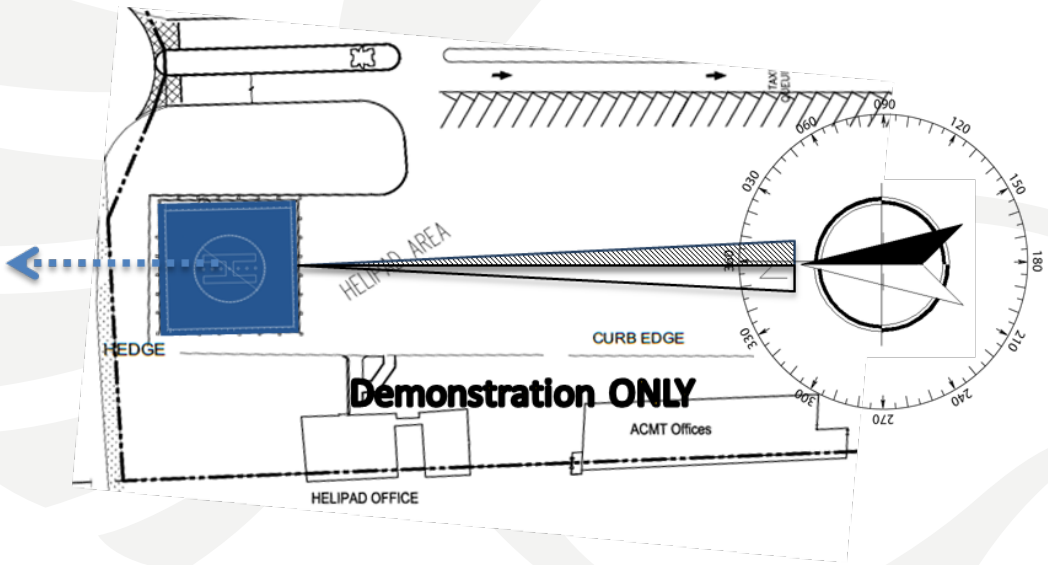

Figure 3: Heliport Approach And Departure Route

Accident Sequence – Timeline

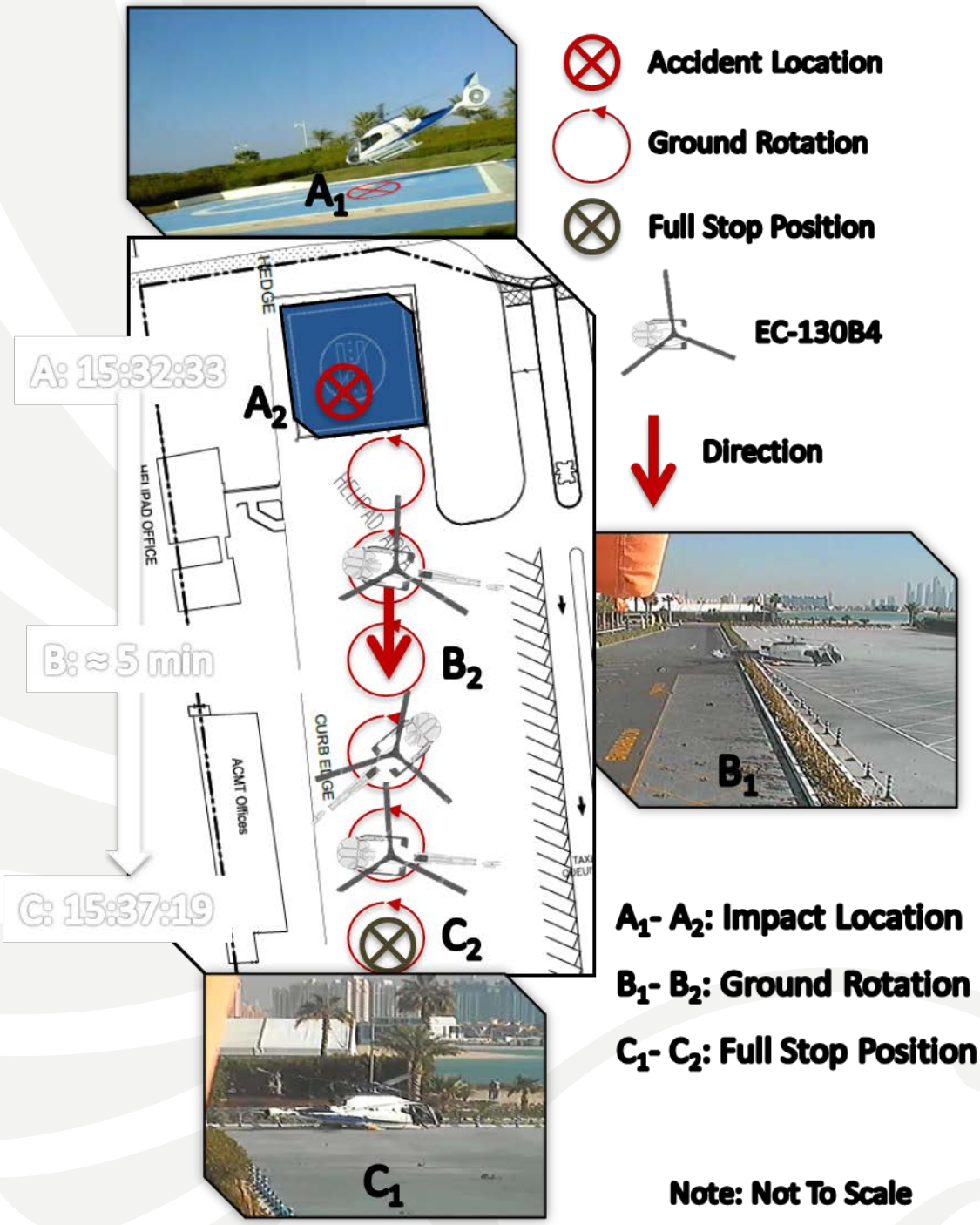

Figure 4: Heliport Accident Sequence

1. Factual Information

1.1 History of the Flight

Key events:

1. **15:32:21 [GST]: Lift off from the Heliport**
2. **15:32:33 [GST]: Loss of control and abnormal contact with the heliport**
3. **15:37:19 [GST]: Full stop position. Engine Stop.**
4. **15:38:00 [GST] and onwards: Pilot and passenger extraction/recovery**

The aircraft had operated six passenger tourist flights over Dubai prior to the positioning flight from the Atlantic Palm Heliport to the Dubai Air Wing Fixed Operating Base [FOB] at Dubai International Airport [DXB].

The final flight of the each day was a positioning flight from the Atlantic Palm Heliport to the operators' FOB at DXB. The flight is operated without passengers; on-board for this particular flight was the handling pilot and the other person onboard was the Helicopter Landing Officer [HLO].

The helicopter was positioned on the helipad on a heading of approximately 200°. The departure is normally a coastal departure along the Palm, inbound to DXB. The flight required lifting to a hover position, a pedal turn to a northerly heading and a standard climbing departure from the heliport.

Figure 5: Position On The Heliport Helipad Prior To The Flight

The flight was airborne at 15:32:21 Gulf Standard Time [GST][6]

The flight should take around fifteen minutes with positioning and traffic clearances.

On this particular flight the helicopter simultaneously picked up to a climb while turning counter-clockwise. The turn continued past the optimal northerly heading for departure, continued rapidly turning counter-clockwise with a turn rate which was

[6] Greenwich Mean Time (GMT) is the same as Coordinated Universal Time (UTC). To convert to Gulf Standard Time add plus 4 hours.

accelerating, increasing to approximately 180° per/sec. The helicopter was continuing to climb.

The climb was arrested at approximately 22m/[72ft] feet AGL, the helicopter then descended rapidly, pitched forward while in a continued counter-clockwise turn prior to the contact with the helipad.

The helicopter contacted the helipad vertically, in a level attitude, with minimal forward speed, nose down and with a rapid Rate of Descent [ROD], resulting in a hard landing.

Figure 6: Event Sequence Prior To The Abnormal Helipad Contact

The induced loads on the occupants, the primary and secondary structure, and the dynamic components exceeded 20g [vertical] deceleration.

Following the abnormal heliport contact the skids failed under static load, although the skids remaining attached to the airframe for the duration of the ground rotation phase.

The crew were both incapacitated from injuries resulting from the rapid vertical deceleration.

The loss of the aircraft Fenestron tail rotor control occurs as the aircraft was engaged in a counter-clockwise rotation following the heavy landing; subsequently as the aircraft was under power, the aircraft then began uncontrolled rapid counter-clockwise rotation[7].

The Fenestron tail rotor assembly separated from the tail boom early in the ground rotation phase following numerous collisions with curb structures adjacent to the heliport.

[7] Note: There is no evidence to date indicating loss of tail rotor effectiveness prior to the heavy landing.

The rotor blade tips contacted the surrounding terrain and structures damaging the blades. The throttle remained at the FLIGHT detent position[8].

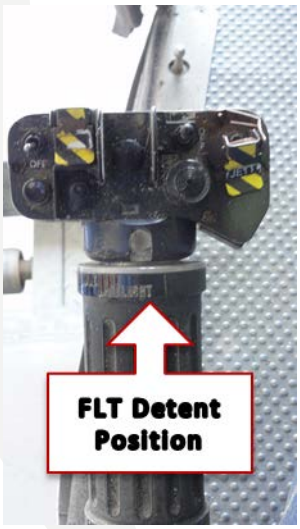

Figure 7: Collective/Throttle Position

The aircraft remained on the helipad with the engine running and the damaged rotor blades continued turning while the helicopter was moving down the heliport extended centreline. The helicopter made approximately fifty rotations on the helipad prior to contacting a retaining wall which arrested the rotation. The aircraft remained in that position with the engine running and the damaged rotor blades turning.

The heliport ground crew where then able to shut down the engine and assist with removal of the incapacitated crew.

There was significant fuel loss from the fuel tank drain which was damaged following the heavy landing.

The was no post-accident fire.

[8] During flight, the twist grip throttle on the accident helicopter is normally positioned in the flight detent position, where the Electronic Engine Control Unit (EECU), and Full Authority Digital Engine Control (FADEC), control engine rpm.

1.2 Injuries To Persons

Both the pilot and the HLO sustained Serious Injuries[9] in the accident and were airlifted to hospital from the scene.

Further information on the type of injury, crew protection and the cabin survivability will be in the Accident Final Report

Iniuries	*Crew*	*Passengers*	*Others*
Fatal	0	0	0
Serious	1	0	1
Minor	0	0	

Table 1: Injuries to Persons

1.3 Damage To The Aircraft

The aircraft was extensively damaged due to the rapid descent and abnormal contact with the heliport, followed by the uncontrolled rotation of the helicopter on the heliports' extended centreline.

Figure 8: Helicopter At The Full Stop Position

1.4 Other Damage

There was extensive damage to the heliport periphery, and the eastern edge of the helipad extended area [southern section] and the adjacent car park.

[9] The definition of Serious Injuries can be referenced in ICAO Annex 13/Chapter 1

1.5 Personnel Information

The Pilot had a valid GCAA CPL #52874 and a valid medical certificate at the time of the accident.

Note: The aircraft operator has the HLO stationed at the Heliport on a daily basis to assist the tour operator with the aircraft handling and passenger movements.

1.6 Aircraft Information

Aircraft Data

- Type: Eurocopter EC130B4
- Registration: A6-DYR
- Manufactured: 2005
- Engine: One Turbomeca Turbo shaft Arriel 2B1 (847 SHP
- MSN: #3990
- T/O Fuel [kg]: 140
- T/O Weight [kg]: 1895
- MTOW [kg]: 2427

Engine : Turbomeca Arriel 2B1 turboshaft

The engine examination did not indicate any pre-existing faults. The Vehicle and Engine Management Display [VEMD] indicated that the engine was rotating and delivering power at the time of the event.

All of the appropriate documentation concerning the aircraft airworthiness has been verified.

- The aircraft was airworthy at the time of the accident.
- No Airworthiness findings have been indentified to date
- The structural and systems evaluation of the airframe and systems architecture does not indicate any pre-existing failures prior to the heavy landing/abnormal contact with the helipad or the subsequent uncontrolled ground rotation.

1.7 Meteorological Information

Meteorological data for Dubai International and Dubai World Central Aerodromes.

Data for OMDB and OMDW on the 22nd January 2014 at approximately 11:30 UTC [15:10 GST]:
DUBAI INTERNATIONAL METAR
MET Report: METAR OMDB 221100Z 32010KT 270V350 9999 FEW040 22/11 Q1019 NOSIG
MET Report: METAR OMDB 221130Z 30009KT 200V340 9999 FEW040 22/12 Q1019 NOSIG
MET Report: METAR OMDB 221200Z 30010KT 250V350 9999 FEW040 22/12 Q1019 NOSIG
DUBAI WORLD CENTRAL METAR
MET Report: METAR OMDW 221100Z 27008KT 9999 FEW040 22/12 Q1020 NOSIG
MET Report: METAR OMDW 221130Z 30009KT 270V330 CAVOK 21/12 Q1020 NOSIG
MET Report: METAR OMDW 221200Z 30010KT CAVOK 21/12 Q1020 NOSIG

Table 2: Meteorological Information

Fixed Base Meteorological Station [FBMS]:

There is no portable or fixed meteorological station at the Atlantic Palm Heliport[10], subsequently the wind strength and direction is determined by the handling pilot for each operation.

On the day of the accident the reported wind strength had been reported as light and variable at ground level, with up to 10 knots in the general location of MBZ 2[11] - Jumeirah A.

Figure 9: Windsock Deflection

[10] There is no GCAA requirement for a fixed meteorological station
[11] Mandatory Broadcast Zone/Area

The CCTV camera images indicate that the Wind Direction Indicator [WDI], a wind sock [12] in this case, was hanging vertically from the stanchion, fluttering in the ambient conditions.

Based on the international aviation standards for visually verifying wind strength and direction using the wind sock guide, the deflection from the vertical is as follows:

Knots	Deflection Degrees
3	0°
4	7.5°

Table 3: Wind Speed and WDI Deflection

Based on the CCTV camera information, the wind strength is 0-4 knots, with the wind direction variable.

1.8 Aids To Navigation

Not required

1.9 Communications

Under Investigation

1.10 Aerodrome Information

- The Heliport is approved for transport passenger operation compliant with GCAA CAR Part IV-CAR OPS 3,Operational Regulations [Helicopters].
- The Heliport is adjacent to the Atlantis Palm complex, the transport category flights are run as a scenic flight operation flying various circuits around Dubai city. The passenger pick up and deposition is at the Atlantis Palm heliport.

1.11 Flight Recorders

For this category of transport aircraft flight data recorders and cockpit voice recorders are not mandatory.

The requirement for cockpit cameras, under current international regulations also do not require video recording of the crew area.
The aircraft is equipped with two on-board digital engine recorders:

- Digital Engine Control Unit [DECU]
- The multifunction LCD Vehicle and Engine Management Display [VEMD]

The helicopter's Vehicular Engine Multi-functional Display (VEMD) was accessed to recover archived rotor data from the accident flight.

[12] A windsock is a conical textile tube designed to indicate wind direction and relative wind speed

These two units – DECU and VEMD - record specific engine and dynamic component operating parameters, for example the Nr - rotor rpm.

1.12 Wreckage And Impact Information

The accident sequence occurs in two phases.

Phase one: The helipad abnormal contact phase where the rapid descent and impact onto the helipad imposed high static loads onto the airframe and dynamic components resulting in several structural failures and rotor contact with the surrounding terrain.

The kinetic energy transfer caused the 20g seat fuse restraints to yield, which lowered the crews' seat position while absorbing the high deceleration loads.

The crew sustained serious injuries resulting from the helicopter impact.

Phase two: This phase of the accident sequence involves the engine power setting and the loss of the tail rotor effectiveness resulting in uncontrolled counter-clockwise high turn rate rotation on the helipad, across the length of the heliport.

Figure 10: CCTV following the initial impact with the helipad

Figure 11: Ground Rotation/Transition Down the Heliport

Figure 12: Full Stop Position/Rotor Turning, Crew Incapacitated

1.13 Medical And Pathological Information

- Both the pilot and the HLO were transported from the heliport to a hospital due to the serious injuries sustained.
- GCAA Car Ops requires that all crew are to provide an alcohol and drug test following an accident or incident. This was completed following the hospitalisation.

1.14 Fire

There was no fire

1.15 Survival Aspects

- The on-board Emergency Locater Transmitter [ELT], did not activate, the unit was removed from the accident aircraft and sent for further testing.

- Preliminary results to date indicate that the crash was consistent with the certification requirements contained in EASA CS-27/CS 27.561/**EMERGENCY LANDING CONDITIONS**

  (a) The rotorcraft, although it may be damaged in emergency landing conditions on land or water, must be designed as prescribed in this paragraph to protect the occupants under those conditions.

  (b) The structure must be designed to give each occupant every reasonable chance of escaping serious injury in a crash landing when:

- Crew and Passenger Seating:

  The deformation observed on the damping system of the high energy absorption seats are also consistent with a high energy vertical impact.

  Both occupied seat damping systems have been triggered to their maximum range: this occurs when the seat encounters up to or above 20g [z axis load] vertical deceleration.

The certification requirement for EMERGENCY LANDING CONDITIONS/CS 27.561/ General:

- Each occupant and each item of mass inside the cabin that could injure an occupant is restrained when subjected to the following ultimate inertial load factors relative to the surrounding structure: Downward – 20 g, after the intended displacement of the seat device.

1.16 Test And Research

On-going with manufacturer

1.17 Organizational And Management Information

Under Investigation

1.18 Additional Information

Refer to certification standards for survivability EASA CS-27/Emergency Landing Conditions/CS 27.561 General.

1.19 Useful Or Effective Investigation Techniques

Ongoing - To be determined

Additional Safety Information

All operators of Airbus Helicopter type EC-130B4 are advised of the Eurocopter Lettre-Service[Service Letter]/ **No. 1673-67-04:**

Addressed To:

- **All Pilots, for all types of helicopters fitted with a tail rotor with the main rotor rotating clockwise.**

SUBJECT:

- **Reminder concerning the YAW axis control for all helicopters in some flight conditions.**
- **The technical comments in this Service-Letter apply to main rotors rotating clockwise when seen from above.**
- **For rotors rotating anticlockwise, see Service-Letter No. 1692-67-04.**

GCAA Report Status Notification

A Final Report will be published within 12 months of the date of this accident. Additional Safety advisories will be published if immediate safety information is determined during the investigation

Time References

International civil aviation convention for occurrence reporting uses Greenwich Mean Time (GMT), also referred to as Coordinated Universal Time (UTC)

To convert to Gulf Standard Time add plus 4 hours to the UTC time

UTC	+ 4	= GST

Appendix 1 – Table of Abbreviations

AAIS	Air Accident Investigation Sector
AGL	Above Ground Level
ARC	Abnormal Runway Contact
ATPL	Airline Transport Pilots Licence
BEA	Bureau d'Enquêtes et d'Analyses
DECU	Digital Engine Control Unit
DXB	Dubai International Airport
EASA	European Aviation Safety Agency
ELT	Emergency Locater Transmitter
FOB	Fixed Operating Base
GCAA	General Civil Aviation Authority
GST	Gulf Standard Time
HLO	Helicopter Landing Officer
MBZ	Mandatory Broadcast Zone
ROD	Rate of Descent
UTC/GMT	Coordinated Universal Time
VEMD	Vehicle and Engine Management Display
ZATL	Heliport Designation