DATA SUMMARY

LOCATION

Date and time	**Tuesday, 11 November 2008; 10:30 local time**
Site	**Ibón de Miralles, Plan (Huesca)**

AIRCRAFT

Registration	**EC-KQI**
Type and model	**AS 350 B3**
Operator	**Heliswiss Ibérica**

Engines

Type and model	**TURBOMECA ARRIEL 2B1**
Number	**1**

CREW

Pilot in command

Age	**41 years old**
Licence	**Commercial Pilot License (Helicopter) (CPL(H))**
Total flight hours	**4,942:00 h**
Flight hours on the type	**2,112:00 h**

INJURIES

	Fatal	Serious	Minor/None
Crew			**2**
Passengers			**3**
Third persons			

DAMAGE

Aircraft	**Signficant**
Third parties	**None**

FLIGHT DATA

Operation	**Aerial Work – Commercial – Aerial Observation**
Phase of flight	**Approach**

REPORT

Date of approval	**23 March 2011**

1. FACTUAL INFORMATION

1.1. Summary of flight

The flight schedule for the morning of 11 November consisted of transporting three specialists by helicopter to various dams situated on the southwest slope of Monte Possets, at an approximate elevation of 7,500 ft (2,300 m), to measure water levels and the condition of the retaining walls.

The helicopter took off with the pilot, a Heliswiss Ibérica technician sitting in the forward LH seat to aid the pilot, and the three specialists who were in the rear seat.

The first dam they inspected was the Ibon de Miralles dam, which comprises the lower part of a mountain cirque and whose retention wall faces north (Figure 1).

On the day of the event, the sides of the cirque, the retaining wall and the surrounding area were covered by snow and the surface of the water was frozen (Figure 2).

The helicopter reached and flew over said dam a few minutes before 10:30. The pilot reconnoitered the area from the air before deciding to land on the wall of the dam. He made the landing approach from the outer to the inner part of the cirque until he was hovering just above the retaining wall. Until then the helicopter's flight had been controlled, according to the pilot's statement.

Before landing, the crewmember accompanying the pilot in the LH seat normally opens the door on his side to check the area and inform the pilot of any possible obstacles located beyond the pilot's visual range, as well as to provide him with a precise indication of the height of the skids above the ground. On this occasion the technician was unable to use this method to gauge their altitude accurately when he looked vertically downward.

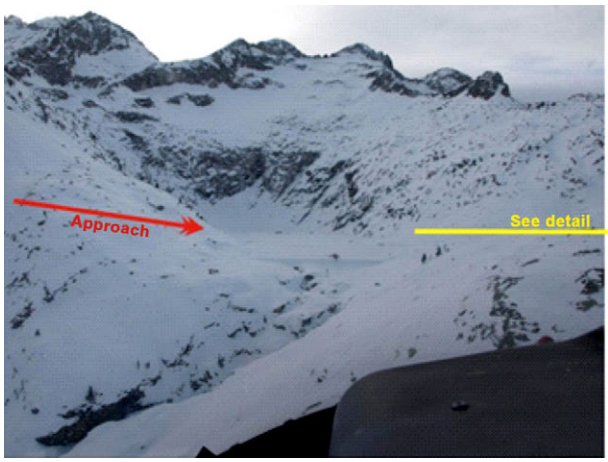

Figure 1. Aerial photo of cirque glacier and dam

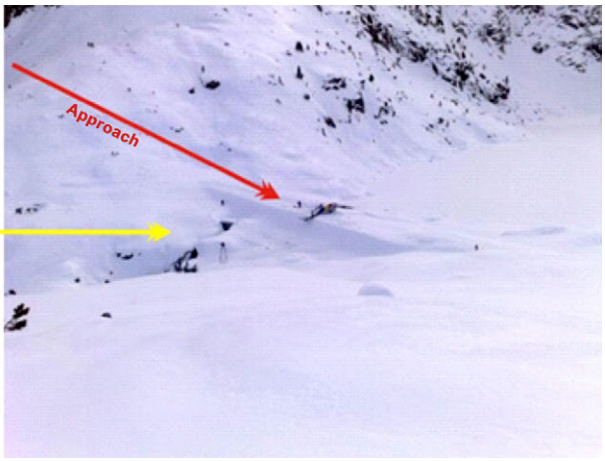

Figure 2. Close-up of wall and wreckage on day of event

In these conditions, the helicopter descended from a hovering position and with a left tilt, impacting the ground and subsequently rolling over onto that same side. The main rotor blades struck the snow-covered surface and the helicopter came to rest on its left side.

The pilot stopped the engine, cut the fuel and electrical power and the occupants evacuated the aircraft via the right-side door.

Given the impossibility of making radio or telephone contact with the operator's support personnel or with the radio station at the shelter on Viados Mountain, they started to descend the mountain on foot.

After the event, the ELT emergency beacon activated and sent a message to search and rescue services, though the identifying information corresponded to that of another aircraft that neither Spanish nor French search and rescue services was able to identify.

1.2. Personnel information

The helicopter pilot held a valid license and extensive experience on the helicopter type and in mountain operations. He knew the area of the flight and had engaged in work to inspect dams before.

The other crewmember helped in rigging external loads and in hooking them up to the helicopter. During flights he was seated in the LH seat and guided the pilot on landings.

1.3. Aircraft information

The aircraft had been purchased in the first quarter of 2008. It had a valid airworthiness certificate and it had been serviced in accordance with its approved maintenance schedule.

The skids on the aircraft had been outfitted with skis to facilitate landing on snow-covered surfaces. It was also equipped with a 406-MHz KANNAD 406 AF/AF(H) emergency locator transmitter (ELT), which included the following components:

- A transmitter
- A platform installed on the helicopter to which to attach the transmitter by means of velcro straps.
- An external antenna with a cable and connector.
- A remote control panel, installed on the instrument panel, with a cable and connector.
- And a digital memory module connected to the remote control panel.

1.4. Meteorological information

The weather conditions, as reported by the pilot, were as follows: wind calm, 2 °C ambient temperature, cloud cover at 13,000 ft, above the mountaintops which were clear. He stated that the ambient light in the area was lead-colored.

The landing area was snow-covered and its surface was frozen to a depth of approximately 5 cm.

1.5. Communications

The crew had a hand-held radio for ground-to-ground communications on the FM band and for air-to-ground communications on VHF, as well as cellular phones.

1.6. Landing area

The pilot chose as the approach and landing point an area along the central part of the dam wall toward its western end. The wall was 8.5 m wide and 98 m long. On the day of the event, the snow on the wall rose to two different heights, being greater on the left side of the helicopter's flight path (see Figure 2).

Near the wall, outside the dam and behind the wreckage, there was a metal tower and a tree alongside it. The snow-covered surface was also more irregular in that area due to the shape of the terrain and to water that was flowing in a stream.

1.7. Wreckage and impact information

The approach was made from outside to inside the cirque, concluding in a low hover. The helicopter rolled over on its left side, coming to rest perpendicular to the wall.

The left skid, its ski and the partially open front left door were partly buried in the snow. The damage exhibited by the main rotor blades and the driveshaft to rotors indicates that the helicopter was under power when it reached the ground. The way that the structural parts, cowlings and engine links were twisted and broken are consistent with the aircraft's left side impacting the ground.

1.8. Survival aspects

All of the occupants were suitably dressed for a temporary stay on the mountain, but not to travel over terrain covered in deep snow.

The alert was activated at 12:05, when an employee of the company that had contracted the helicopter notified the Civil Guard that it had been out of contact with the helicopter and its occupants for over an hour and a half.

At 13:30, the crew of the Civil Guard helicopter, which had joined the search team, located the occupants uninjured.

The Palma Search and Rescue Service (SRS) received an emergency message transmitted by a 406-MHz beacon at 11:14. The information received pertained to a French aircraft of unknown registry, even to the French search and rescue team, and which did not match the records for any aircraft registered with a 406-MHz emergency aviation beacon.

1.9. Crew statements

The pilot reported that the approach was on a southerly course from the outside the cirque glacier to the inside. He reached the landing position without any problems but lost all external references as he initiated the descent, deciding then to abort the maneuver and take off, which is when the helicopter rolled.

The technician stated that he opened the door once the helicopter started hovering prior to landing. He leaned his head toward the skid but could not readily determine the height of the skids above the snow.

1.10. Whiteout phenomenon

A whiteout is an optical atmospheric phenomenon in which the observer appears to be engulfed in a uniform white glow resulting from the lack of contrast between a cloudy sky and unbroken snow.[1]

In said phenomenon, neither shadows nor the horizon nor clouds are distinguishable. All sense of depth and orientation is lost and only very dark and nearby objects can be seen. A whiteout occurs when there is a smooth blanket of snow under uniformly overcast skies in daylight conditions.

Canada's AIP (Aeronautical Information Publication), Section Air 2.12.7, describes how the brain perceives light as colors, brightness, shadows, etc. A common feature of all these elements is that they are modified by the direction of the light and by any changes in intensity. For example, when shadows are produced on one side, the light is

[1] As defined by the American Meteorological Society.

automatically assumed to come from the other side. Nature provides visual cues that aid in discerning objects and estimating distances. If those cues disappear, objects and obstacles become hard to recognize. Such is the case with a snow-covered surface when both objects and background exhibit a uniform white color. If in addition the sunlight is made diffuse by passing through a cloud layer, it is reflected equally in all directions, resulting in shadows disappearing into the uniform surface. The ground is thus stripped of all visual references, leaving the eye unable to clearly discern the surface or the relief of the terrain.

Pilots are often unaware that they are encountering this phenomenon, which makes a whiteout an extremely dangerous visual flight condition.[2]

When hovering under whiteout conditions, the pilot can lose all sense of depth and orientation and be unaware of the small, uncontrolled movements that may be made by the helicopter which place it at risk of impacting the ground. Under these conditions the recommended course of action is to take off using instruments.

In Spain, the conditions necessary for phenomena of this type are rare. The operator did not have a procedure for avoiding or exiting from whiteout conditions under visual flight.

1.11. Tracking of the programming of the ELT beacon installed on the helicopter

The manufacturer's manual for installing, operating and inspecting the Kannad 406 AF-H ELT describes among its components a dongle that is installed in the connector that joins the remote control panel to the ELT transmitter. The dongle is programmed with information on the aircraft in which it is installed.

The purpose of the dongle is to transfer identifying information from the aircraft to the ELT transmitter while connected to it if the ELT beacon's switch is in the armed (ARM) position (which places the unit in standby so that it activates in the event of an accident). On the ground, the ELT transmitter can be removed in the event of a fault or for maintenance, and a new identification code can be programmed into it.

The operator purchased the helicopter directly from the manufacturer, removed the ELT transmitter and sent it to an authorized shop to be programmed with the identifying data for EC-KQI. The dongle, which was left installed on the helicopter, was not programmed with the data for EC-KQI, and thus retained the identifying data that had been input previously. When the ELT transmitter was re-installed on the helicopter and the ARM switch was activated, the dongle sent its information to the ELT transmitter,

[2] Canada's Transportation Safety Board addresses the dangers of whiteouts in its report on the investigation into the accident of a Bell 212 helicopter, C-GMOH, which occurred on 30 October 2004 (Report Ref. A04C01990).

replacing the data for helicopter EC-KQI that had been programmed into the transmitter.

The manufacturer informs that prior to the delivery of an helicopter to a new owner, this one must give the helicopter new identification data to encode in a due manner the emergency locator transmitter Kannad. In case the new identification is not known before the aircraft delivery, the manufacturer downloads in the dongle only maintenance data which does not transmit a warning signal during flights performed by manufacturer flight crews.

The investigation also revealed that another operator that had contracted the same maintenance shop had encountered the same problem, which it managed to discover and solve by programming the proper identifying data into the dongle. The maintenance shop reported that it would inform those operators with which it works and which may be affected by this problem of the need to program the correct data into the dongles.

1.12. Information note issued by manufacturer Eurocopter regarding the encoding of Kannad emergency locator transmitter

The information note N° 2058-I-25 issued by Eurocopter on 15th October 2009, and addressed to all helicopters made by this operator, gives detailed information to the new owner so he can follow steps to obtain a correct encoding of the connection dongle and therefore of the ELT Kannad, with the object to avoid the decoding of ELT´s for all cases in which the helicopter has been delivered with maintenance data.

2. ANALYSIS AND CONCLUSIONS

2.1. Operational aspects

In the valley where the helicopter was flying, and given the white light conditions present, the entire surface near the water in the dam satisfied the conditions for a whiteout phenomenon, due to the snow cover on the slopes near the water, the frozen surface of the water and the snow atop the wall, all of which combined to make a uniformly white surface. At the tops of the mountain sides there were rocky outcroppings visible that interrupted the uniformity in the highest parts of the slopes.

The wind in the area and the capabilities of the helicopter allowed for an approach either in the direction taken by the pilot or from inside the cirque outward so as to land on the wall. The advantage of the second option lay in that it offered the pilot external visual references, such as the metal tower, the nearby tree and the irregular surface of the snow-covered surface, as described in Section 1.6 of this report.

The operator technician started to open the door once the helicopter was hovering, by which time the pilot may have already been affected by the whiteout phenomenon. As a result, the technician was unable to help the pilot regain stability of the helicopter.

The pilot reported that the approach to the hover point did not pose any problems. It was not until he reached that point that he realized he could not control the height above the snow-covered ground. Since he was also unable to maintain the helicopter stable, he decided to take off. It was then that the helicopter rolled over onto its left side.

The loss of control of the helicopter described above could have taken place when the pilot lost the external references that aided him in judging the distance to the snow-covered surface and in keeping the helicopter stable. The loss of external references could have resulted from the whiteout conditions that enveloped the pilot.

The helicopter could have rolled over due to the torque produced as the helicopter, which was moving uncontrollably to the left, was stopped when its left skid and ski impacted snow that was at a higher level.

The rotors were under operating power at all times, consistent with the damage described in Section 1.7 of this report.

Recent years have seen a significant increase in the amount of aerial mountain activities besides aerial work, such as the use of helicopters for sport tourism or in support of civil protection services. Knowledge of the whiteout phenomenon on the part of operators and crews would facilitate the fast identification of said phenomenon.

2.2. ELT beacon

Given the elevated number of false alerts sent by emergency beacons and received by search and rescue services, it is vital that all messages be properly verified. The new COSPAS SARSAT system together with the implementation of 406-MHz beacons lets search and rescue services identify the aircraft issuing the message and allows for faster verification of any alert.

Therefore, so as to enable search and rescue services to properly identify and assess the nature of the emergency, beacons must issue appropriate signals, meaning they must be correctly configured and programmed.

In this case, search and rescue efforts were not undertaken due to the confusion arising from the identification of the aircraft. Moreover, the investigation revealed that programming errors could affect other operators that have similar emergency beacons installed on their aircraft and that these problems might not be easy to detect. As a

result, a safety recommendation is issued to Spain's National Aviation Safety Agency (AESA) that it inform operators of the installation and operational characteristics of these devices so as to provide search and rescue services with correct information in the event of an activation.

3. CAUSES

The accident was caused when the loss of external references caused the pilot, who was engulfed in whiteout visual conditions, to lose control of the helicopter's stability.

4. SAFETY RECOMMENDATIONS

REC 07/11. It is recommended that the National Aviation Safety Agency (AESA), in the requirements for the issue of authorizations to aerial work operators, include specifically crews training on the spatial disorientation phenomenon and, particularly to those operators intending to perform activities in periodically or permanent snowed mountains, training on "whiteout" phenomenon.

REC 08/11. It is recommended that the National Aviation Safety Agency (AESA) use the Review Airworthiness (RA) procedures, either conducted by AESA itself or by duly authorized Continuous Airworthiness Management Organizations (CAMO+), to ensure that a check is made of the Emergency Locator Transmitter (ELT), which must be operative and correctly coded.