BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile

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SAFETY INVESTIGATION REPORT

Accident to the Airbus AS350 - B3 registered HB-ZES on Wednesday 14 February 2024 at Niouc (Switzerland)

Time	Around 08:30[1]
Operator	Swift Copters SA/Eagle Valais
Type of flight	External sling load operation
Persons on board	Pilot
Consequences and damage	Pilot seriously injured, helicopter destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation. As accurate as the translation may be, the original text in French is the work of reference.	

ORGANIZATION OF THE INVESTIGATION

The helicopter pilot is a mandated investigator for the Swiss Transportation Safety Investigation Board (STSB[2]). The STSB proposed delegating the investigation to the BEA which accepted it. The final report final was sent to the STSB for an official consultation.

Collision with a high-voltage power line during an external sling load operation

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on the Helicom data recorder, statements and videos taken on the ground.

On the day of the accident, external sling load operations were programmed on three job sites. Each job site had an equipment pick-up area and an equipment put-down area. Two task specialists participated in this mission. When they were not on board the helicopter, the task specialists were in contact with the pilot via a radio connected to a headset (intercom).

The pilot took off at 08:03 from Sion aerodrome (Switzerland) and headed for the first job site at a distance of 5 NM south-east of the aerodrome. At 08:09, he had finished his work and headed to his second job site at a distance of 7 NM further east. Task specialist A was on board the helicopter while task specialist B was already on site. Task specialist B prepared the load, a metal walkway weighing around 250 kg, in the pick-up area and then headed towards the put-down area situated 350 m higher up, along a penstock.

[1] Except where otherwise indicated, the times in this report are in local time.
[2] The glossary of abbreviations and acronyms frequently used by the BEA can be found on its web site.

On arriving in the area (see **Figure 1**) at 08:15, the pilot contacted by radio, task specialist B who informed him of the presence of a power line. The pilot carried out a reconnaissance of the job site environment during which he flew over the high voltage power line that he identified. He then landed in the pick-up area. He set the engine selector to idle and then task specialist A disembarked and attached the load. The configuration chosen was a 30 m sling with 8 m extensions and two guide straps, the load was on the left-hand side of the helicopter.

As the time taken for task specialist B to get by foot to the put-down area was longer than planned (around ten minutes instead of the initially programmed two to three minutes), the pilot asked task specialist A to reorganise the equipment on board the helicopter and discussed with him the sequence of operations at the next job site. Then task specialist B advised by radio that he was ready.

Task specialist A disembarked again and set his radio to the internal frequency. At 08:28, the pilot set the engine selector to flight and started the vertical take-off, monitoring the load through the glass panels provided for this (see paragraph 2.5). Once the load had left the ground, he directly climbed to the put-down area. This flight path led him under the high voltage line at a high vertical speed. Task specialist B then warned the pilot over the radio; the pilot tried to stop the helicopter by pitching up. The main rotor blades struck the high voltage cables and severed two of them.

The pilot then immediately put the helicopter into descent, without releasing the load, with a high sink rate until reaching a steep wooded area. He then tried to descend into the trees, lowering the helicopter's tail boom first. The helicopter collided with the vegetation and became blocked in a nose-down attitude and banked to the right-hand side. The pilot, seriously injured during the impact, managed to release his safety harness and exit the helicopter unaided. He was then rescued by personnel on the ground.

2 ADDITIONAL INFORMATION

2.1 Site and wreckage information

The accident site was on a very steep wooded slope. The wreckage was lying on its right-hand side, the tail boom had separated from the airframe. The transported load was found close to the helicopter, still attached to the sling. The sling was no longer attached to the helicopter.

The examination of the wreckage found that at the time of the collision with the ground, the engine was providing power. No indication of a failure prior to the accident sequence was observed.

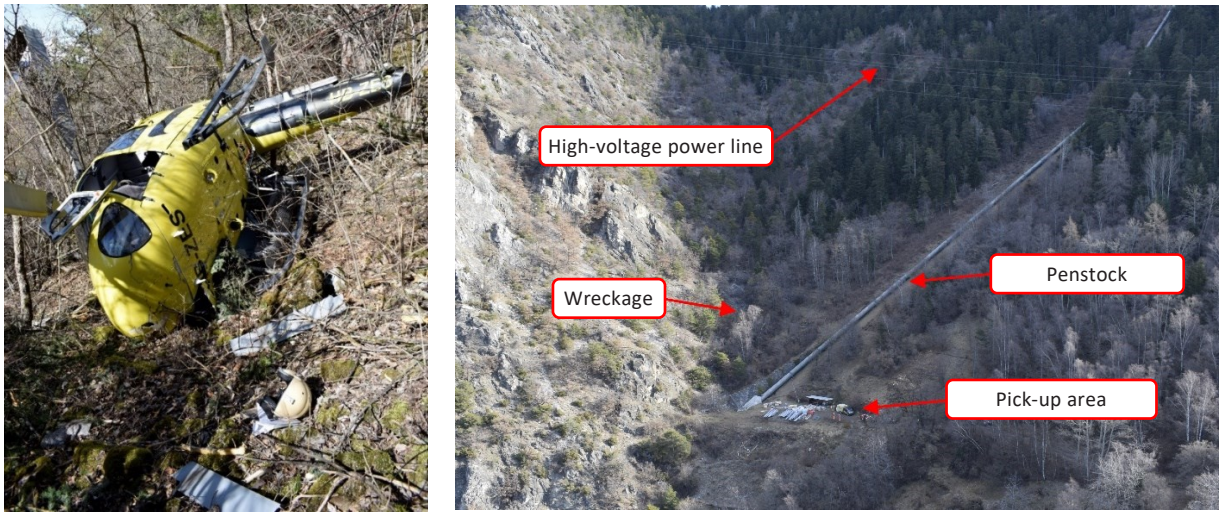

Figure 1: accident site (source: STSB, annotations BEA)

The blades showed signs of an impact with the power lines along with electric arc marks and heat damage.

Figure 2: detail of blades (source: BEA)

After the collision with the vegetation, the rupture of the drive shaft resulted in the free turbine overspeeding and the blade shedding protection[3] coming into play. The deformation of the containment ring sufficiently deformed the housing for it to open and release hot gases which may have contributed to a fire breaking out in the environment of the engine.

[3] Technical solution introduced by Safran Helicopter Engines in order to comply with the certification specifications which require a system to prevent the free turbine disk from bursting and pieces of the disk being expelled with high energy. This solution limits the stresses on the free turbine disc by mechanically breaking its blades at their root (fuse) above a certain overspeed threshold. Once this process has started, all the blades separate from the disc and are held in place by a reinforced containment ring.

The pilot evacuated the helicopter without activating the emergency cut-off valve. The heat damage was limited due to the engine shutting down probably following the unpriming of the fuel system due to the helicopter tipping over onto one side.

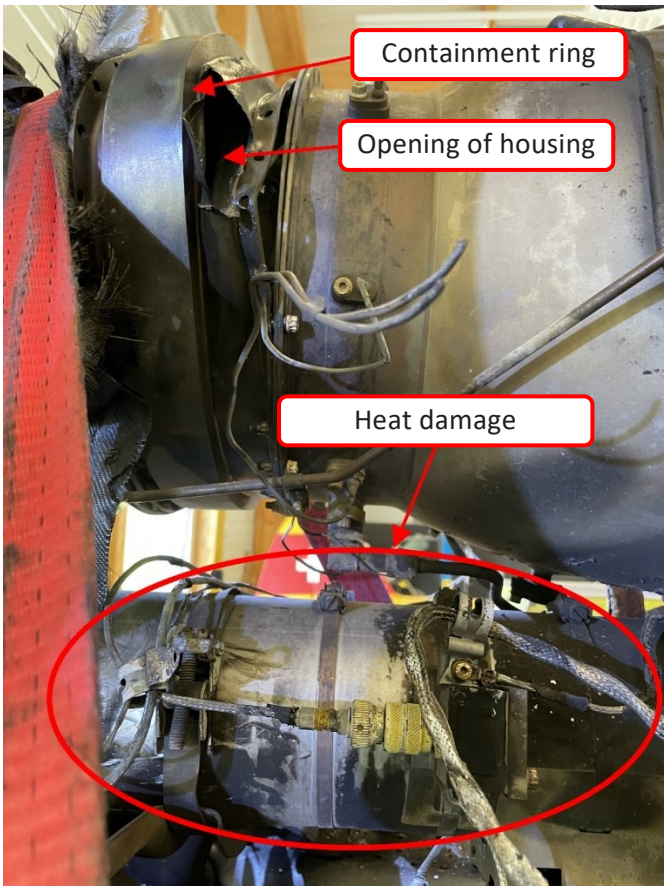

Figure 3: detail of engine (source: BEA)

2.2 Meteorological information

The 08:20 METAR for Sion aerodrome situated 10 NM west of the accident site indicated the following conditions:

- mean wind from 080°, 4 kt;
- visibility greater than 10 km;
- few clouds based at 8,000 ft;
- temperature 1°C;
- QNH 1,027 hPa.

The pilot indicated that the weather was good that day.

2.3 Flight preparation

The operator, Eagle Valais provides pilots, via internal software, with a flight preparation sheet giving information about each job site, as well as QR codes to direct the pilot to the flight-specific ”weight and balance” “weather” and “aeronautical information (DABS)” sheets.

Each job site is the subject of a separate paragraph, including the time at which the helicopter is expected, the name of the customer company and its contact person, the pick-up location, the put-down point, the equipment and any comments. Another QR code provides access to an extract of the chart of the job site's surroundings. The chart of the accident site is shown in **Figure 4**.

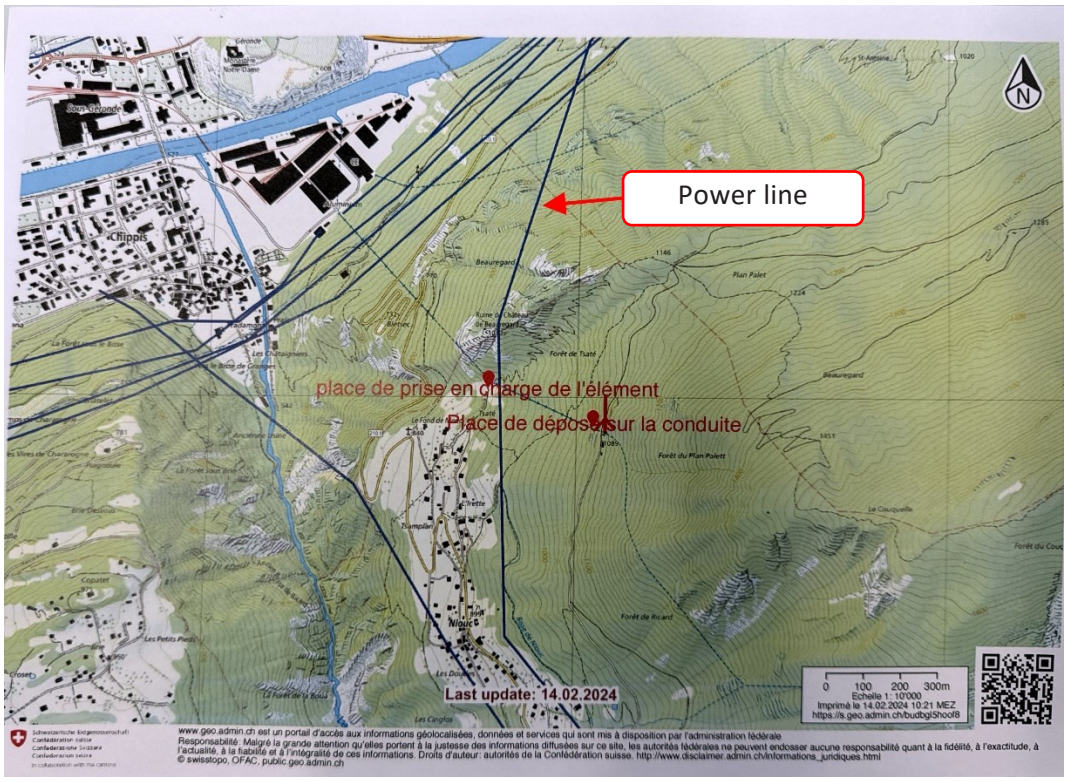

Figure 4: excerpt of chart from flight preparation documents
(Source: Eagle Valais, the "power line" label and arrow were added by the BEA)

The day before the flight, the pilot opened a tab for each job site on his tablet. He put the charts in chronological order and carried out a succinct study of the area and equipment required. He stated that he had seen the power line on the second job site.

2.4 In-flight use of tablets information

The pilot used a tablet with a personal mount which he placed on his thigh. In flight, he used the Air Navigation Pro application. The tablet was safely stowed on the side during the approaches, take-offs and aerial work.

The Swiftcopters operations manual which is also the Eagle Valais operations manual recommends using a suction-cup mount or the helicopter's chart mount. Eagle Valais had installed a tablet mount on the left-hand side of the instrument panel from where it could be seen for all the flight phases. This installation complied with the recommendations of an STC that the company had not acquired. When, in 2022, the Federal Office of Civil Aviation (FOCA) asked for the documentation with respect to this mount, Eagle Valais decided to remove it to bring itself into compliance and then installed a mount which did not require an STC (as illustrated in Figure 5). The latter, which the pilot considered hampered his field of vision and according to him, risked falling on the pedals if it was incorrectly attached, was not used.

In 2023, OFAC published a recommendation (SAND[4]) on their web site concerning the attachment of tablets on board aircraft to recall good practices.

The application used displayed a chart indicating the obstacles, notably the power line situated in the job area. During the take-off of the accident flight, the tablet was stowed on the side in accordance with the pilot's habits.

Figure 5: mount used by Eagle Valais and removed by the pilot (source: BEA)

2.5 Helicopter information

The helicopter was equipped with a Helicom V2 unit recording the flight data. The data was downloaded and decoded. It was compared with the data from the acoustic signature of a video taken by a witness to the accident. The data did not reveal any sign of a sudden or progressive degradation of the helicopter drive systems (engine and rotors) before the collision with the power line.

The helicopter was equipped with a bubble door covered by an STC which allows the pilot to see his load and identify external visual references more easily during the aerial work. During this type of manoeuvre, the pilot leans over with his head in the bubble of the right-hand window to watch his load and uses the collective pitch lever by means of an extension (see **Figure 6**).

[4] Safety Awareness Notification Data, term used by OFAC to indicate a bulletin concerning safety and containing instructions and recommendations for the aviation community (https://www.bazl.admin.ch/bazl/fr/home/themen/sicherheit/gestion-de-la-securite-et-des-risques/safety-promotion/recommandations--sand-/foca_sand_2023-004.html).

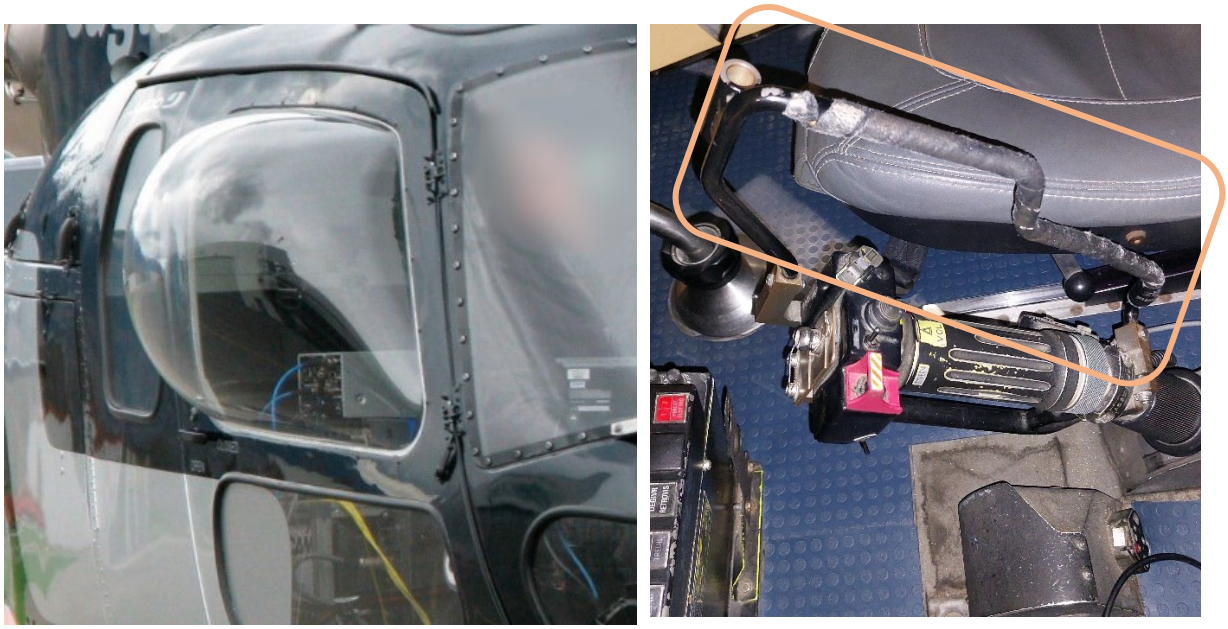

Figure 6: illustration of a bubble door and an extended collective pitch lever (source: Eagle Valais)

The helicopter was also equipped with two roof windows to ensure safety overhead the helicopter (see **Figure 7**).

Figure 7: detail of glass panels of HB-ZES (source: Eagle Valais)

The helicopter was equipped with a crashworthy seat. The vertical acceleration was probably not sufficiently high during the accident to cause the deformation of the energy absorption system of the seat. The seat back, higher than on old-generation seats, better protected the pilot and limited back injuries.

The helicopter was not equipped with an obstacle warning system (such as a FLARM *power* with an Alps database). The pilot indicated that he had flown with this system in other helicopters and in his opinion, an aural and visual warning would have very probably been transmitted. The BEA contacted FLARM, however no simulation was carried out in the scope of the investigation. As a consequence, the investigation was not able to determine if carrying equipment of this type would have meant that the pilot would have been warned before the collision with the power line.

2.6 Power line information

The line in the accident area is a 65,000 V high voltage line. It is composed of six 29 mm-diameter conductor cables made of an aluminium-steel alloy strung between pylons, with a guard wire at the top.

It is correctly referenced and shown on the charts used to prepare the flight. Based on the pilot's statement and observations made on site, when in the pick-up area, the power line is difficult to see from the helicopter cockpit as situated overhead.

The helicopter struck and severed two conductor cables situated at a height of around 84 m.

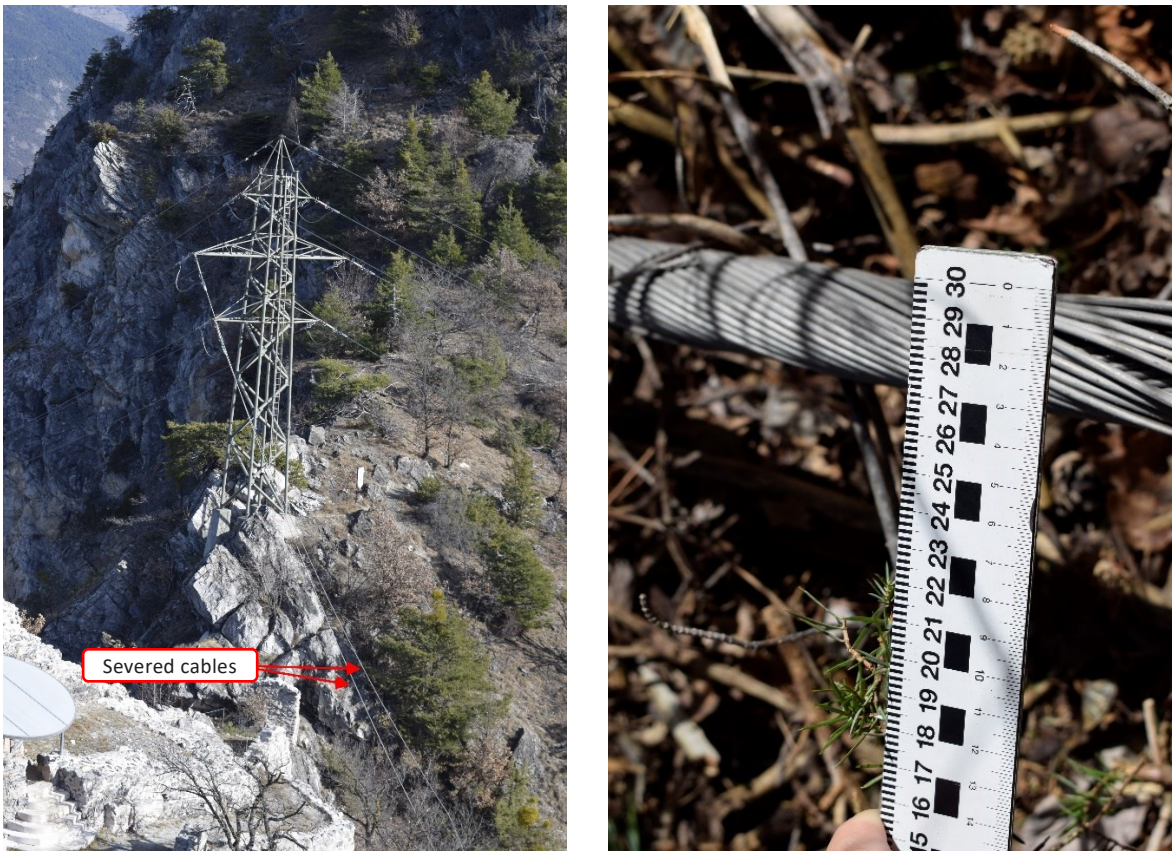

Figure 8: left photo: pylon with two severed conductors, right photo: detail of conductor (source: STSB, annotated by the BEA)

2.7 Pilot information

The 46-year-old pilot held helicopter and aeroplane pilot licences ATPL(H) and ATPL(A), along with IR and FI ratings.

A former military pilot, he joined the operator two and a half months before the day of the accident as operations director. He was also a Swiss army reservist and worked as a mandated investigator for the STSB.

On the date of the accident, he had logged 8,362 helicopter flight hours, including 2,500 hours on the AS350 B3. He had logged 3,000 HESLO flight hours including 2,000 hours on the AS350. His recent experience was 65 flight hours, including 32 hours on the AS350 B3 in the three months preceding the accident flight. He had also logged approximately 4,000 aeroplane flight hours.

The following information comes from his statement:

- on the day of the accident, he was rested and was not under pressure to carry out his work;
- on arriving in the area, he carried out a reconnaissance passing overhead the power line;
- while waiting on the ground, as the delay grew longer, he started thinking about the organisation of the next job and started losing focus on the current one;
- he was not late for the next job and was not under time pressure;
- when he was given the green light to take off, he did not carry out a mental briefing recalling in particular, the obstacles and emergency procedures;
- the operator's procedures did not specify radio exchanges before take-off, between the pilot and the task specialist outside the helicopter, to allow the latter to ensure a safe take-off by indicating the obstacles;
- he did not regain awareness of the presence of the high-voltage line before the radio message from his task specialist situated at the load put-down point;
- after colliding with the cables, he felt strong vibrations. He had difficulty maintaining control and "guided the helicopter" into the vegetation while trying to hold a nose-up attitude;
- he was flying with a helmet, with the visor up and the chin strap fastened.

2.8 Task specialist information

Task specialist A had been employed by Eagle Valais for five years.

On the day of the accident, he worked on the first job site to set down a "big bag" and then boarded the helicopter to join the second site, where he descended with the rotor still turning to unload the equipment from the helicopter. He was in contact with the pilot via the intercom. At the time of the collision with the power line, he had his back to the helicopter. Alerted by the noise, he witnessed the helicopter's emergency landing and then went to the scene to provide assistance. When he arrived at the accident site, the pilot was lying on his back ten metres below the helicopter, without his helmet. He then called the emergency services and helped the construction workers administer first aid.

Task specialist B had been employed by Eagle Valais for eighteen months. He had a total of two years' experience as a task specialist.

On the day of the accident, he went directly to the second job site to prepare the load and give instructions to the customer before walking to the load put-down point. Halfway between the pick-up area and the put-down area, he heard the arrival of the helicopter. He informed the pilot via the intercom of the load pick-up and put-down points, as well as the presence of the high-voltage power line. When he arrived at the put-down point, he notified the pilot and then watched as the helicopter took off, straight towards the line. He then warned the pilot, who attempted to stop the helicopter by a nose-up input, but was unable to prevent the rotor from colliding with two of the power line cables. He witnessed the helicopter's emergency landing in the vegetation, then coordinated with task specialist A, who called for help while he himself notified the operator's operations department.

2.9 Operator information

Eagle Valais, a commercial subsidiary of Swift Copters SA, a member of the HBG Group, is a helicopter transport operator specialising in aerial work in alpine environments. It operates a fleet of four AS350 B3s.

The reference documentation (operations manual) is that of Swift Copters. This manual requires, in particular, an analysis to be carried out on the ground taking into account obstacles (power lines, cables, masts) and then an aerial reconnaissance on arrival, also taking into account obstacles (lines, trees, masts).

According to the operator's HESLO supplement, the pilot and the task specialist must carry out a full briefing on the ground before the start of the mission, covering, among other things, obstacles, flight route, procedures and communications. However, during the mission, the task specialist is no longer required to use the radio to call out obstacles during the positioning or aerial work phases.

According to the operations manual, part B, a departure briefing must be conducted before take-off, taking into account the wind, obstacles, environment and departure area.

The deputy Nominated Person Flight Operations for the SPO part, indicated that the accident flight was a routine, simple mission, where the pilot is in contact with the task specialist who provides standard guidance and communication is encouraged.

Task specialists are trained in-house. This includes a theoretical part covering, in particular, refuelling and helicopter preparation, and a one-week practical part with another task specialist. Task specialists then follow annual theoretical and practical refresher training. According to the operations manual, task specialists are not included in the recurrent CRM training.

After the accident, the operator organised classroom CRM training session for all task specialists.

3 CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation.

Scenario

As part of an aerial work mission, the pilot conducted a reconnaissance of the landing area, identified a high-voltage power line and then landed in the load pick-up area located below the power line. A task specialist attached the load with a 30-metre sling, while a second task specialist positioned himself at the load put-down area, higher up, at the same altitude as the high-voltage power line.

The pilot was experienced, this was a routine mission for him, and the presence of the high-voltage power line, easily identifiable on arrival, had not given him cause for concern.

As the wait on the ground continued, the pilot began to think about his next job and lost focus on the mission at hand.

Once he received the 'green light' from the second task specialist, the pilot took off immediately, without taking the time to conduct a departure briefing or consult a chart. He did not actively check for obstacles on his path and climbed directly to the load put-down point. The first task specialist, who remained on the ground, did not watch the entire take-off.

The flight path taken by the pilot brought the helicopter under the high-voltage power line. The second task specialist realised this and warned the pilot by radio. Upon receiving the message, the pilot attempted to stop the helicopter but was unable to avoid the collision. The damage caused by the collision with two cables made the helicopter difficult to control, and the pilot made an emergency landing, without releasing the load, on a wooded slope below the high-voltage line.

The pilot managed to land in the vegetation with a nose-up attitude, with the tail boom of the helicopter entering the vegetation first in the hope of absorbing the energy of the impact with the rear of the helicopter.

The helicopter was destroyed in the accident and the pilot, although injured, managed to evacuate the aircraft unaided. A fire broke out but quickly extinguished, probably due to the fuel system being unprimed when the helicopter tipped over onto its side.

Contributing factors

In the context of a routine flight, the following factors may have contributed to the collision with the power line:

- the absence of a before take-off briefing, allowing the pilot to focus on the current flight and remind himself about the wind, obstacles, type of take-off, limitations and emergency procedures;
- the absence of an active search for obstacles before entering hover;
- insufficient formalisation in the operator's operations manual of the role of the task specialist during take-off and communications between the task specialist and the pilot;
- the absence of a suitable tablet mount allowing a chart of the area to be continuously displayed in order to identify the listed obstacles.

Safety lessons

Participation of task specialist in take-off safety

The task specialist has an external view of the helicopter and an overall view of the helicopter with its load and the immediate environment. He can therefore play a key role in monitoring and reporting obstacles, thereby contributing to take-off safety.

This accident illustrates the importance for an operator to specify the role of the task specialist and to have robust working methods in place with respect to communication between the task specialist and the pilot, as well as the associated training. This subject is also addressed in the investigation report on the accident that occurred on 3 December 2018 involving the AS350 registered HB-ZCM[5].

Routine flight and safety checks

These checks consist of systematically ensuring safety over 180° and overhead prior to transitioning to hover, prior to take-off and prior to hover taxiing after lifting a load. In this case, these checks might have detected the line and prevented the accident. A routine flight performed by an experienced pilot may involve a risk of detachment. Briefings, even if not verbalised in single-pilot flights, allow the pilot to refocus on the task at hand and remind himself of the presence of potential obstacles.

Emergency landing in vegetation

The decision to make the helicopter tail boom enter the vegetation first may have helped to limit damage to the cockpit and injuries to the pilot.

The BEA investigations are conducted with the sole objective of improving aviation safety and are not intended to apportion blame or liabilities.

[5] Report only available in German.