

FINAL REPORT

**ACCIDENT
Occurred to the helicopter
AS350 B3 registration marks I-AMVV,
at Monte Miravidi, La Thuile (AO),
January 7th 2020**

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OBJECTIVE OF THE SAFETY INVESTIGATION

The Agenzia nazionale per la sicurezza del volo (ANSV), instituted with legislative decree No 66 of 25 February 1999, is the Italian Civil Aviation Safety Investigation Authority (art. 4 of EU Regulation No 996/2010 of the European Parliament and of the Council of 20 October 2010). **It conducts, in an independent manner, safety investigations.**

Every accident or serious incident involving a civil aviation aircraft shall be subject of a safety investigation, by the combined limits foreseen by EU Regulation No 996/2010, paragraphs 1, 4 and 5 of art. 5.

The safety investigation is a process conducted by a safety investigation authority for the purpose of accident and incident prevention, which includes the gathering and analysis of information, the drawing of conclusions, including the determination of cause(s) and/or contributing factors and, when appropriate, the making of safety recommendations.

The only objective of a safety investigation is the prevention of future accidents and incidents, without apportioning blame or liability (art. 1, paragraph 1, EU Regulation No 996/2010). Consequently, it is conducted in a separate and independent manner from investigations (such as those of Judicial Authority) finalized to apportion blame or liability.

Safety investigations are conducted in conformity with Annex 13 of the Convention on International Civil Aviation, also known as Chicago Convention (signed on 7 December 1944, approved and made executive in Italy with legislative decree No 616 of 6 March 1948, ratified with law No 561 of 17 April 1956) and with EU Regulation No 996/2010.

Every safety investigation is concluded by a report written in a form appropriate to the type and seriousness of the accident or serious incident. The report shall contain, where appropriate, safety recommendations, which consist in a proposal made with the intention of preventing accident and incidents.

A safety recommendation shall in no case create a presumption of blame or liability for an accident, serious incident or incident (art. 17, paragraph 3, EU Regulation No 996/2010).

The report shall protect the anonymity of any individual involved in the accident or serious incident (art. 16, paragraph 2, EU Regulation No 996/2010).

This report has been translated and published by ANSV for the English-speaking concerned public. The intent was not to produce a factual translation and, as accurate as a translation may be, **the original text in Italian is the work of reference.**

GLOSSARY

AMSL: Above Mean Sea Level.

ANSV: Agenzia nazionale per la sicurezza del volo, Italian safety investigation authority.

AOC: Air Operator Certificate.

BEA: Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation civile, French safety investigation authority.

BRIEFING: prior description of manoeuvres or procedures.

CAT: Commercial Air Transport.

CAVOK: visibility, clouds and present weather better than prescribed values or conditions.

CPL: Commercial Pilot Licence.

CRM: Crew Resource Management.

CVR: Cockpit Voice Recorder.

EASA: European Union Aviation Safety Agency.

FADEC: Full Authority Digital Engine Control.

FDR: Flight Data Recorder.

FI: Flight Instructor.

FT: Foot, 1 ft = 0.3048 meters.

GPS: Global Positioning System.

(H): Helicopter.

IR: Instrument Rating.

KT: Knot, nautical miles (1852 meters) per hour.

MTOM: Maximum Take Off Mass.

NM: Nautical Miles, 1 nm = 1852 meters.

OM: Operations (or Operational) Manual.

PIC: Pilot in Command.

SOP: Standard Operating Procedures.

SPO HR: Specialized Operations High Risk.

TRE: Type Rating Examiner.

UTC: Universal Time Coordinated.

VFR: Visual Flight Rules.

FOREWORD

The accident occurred on January 7th 2020, at 10:53 UTC (11:53 local time), at Monte (Mount) Miravidi, La Thuile (AO), and involved the helicopter AS350 B3, registration marks I-AMVV.

During a heliski flight, the helicopter took off from the Petit St Bernard pass with the pilot, the ski instructor acting as task specialist and 3 skiers on board, the latter 4 being disembarked at Monte Miravidi.

After disembarking and during the following take-off of the helicopter, one of the skiers (the ski instructor) got hooked to the utility basket of the helicopter, was lifted into the air and fell to the ground on the French side a few seconds after take-off, dying on impact.

ANSV was informed the same day of the accident by the helicopter operator.

Being the ski instructor fallen off on the French territory, the accident has to be considered as occurred on French territory, hence the BEA is competent for such investigation. However BEA, on the basis of the international and UE norms in terms of air safety investigations, has delegated ANSV to carry out the safety investigation and accredited its own representative, who was assisted by its own technical advisors, as required by the above-mentioned regulations.

All times in this investigation report, unless otherwise specified, are expressed in **UTC** (Universal Time Coordinated) time, which on the date of the event was local time minus one hour.

CHAPTER I

FACTUAL INFORMATION

1. GENERAL

The objective elements gathered during the safety investigation are outlined below.

1.1. HISTORY OF FLIGHT

At the end of a training activity on the ground aimed at instructing the alpine guides/ski instructors in the functions of task specialist in heliski flights, a group of alpine guides/ski instructors, who have attended the course, asked to carry out a heliski flight, with take-off from the Colle del Piccolo S. Bernardo and the release of the skiers on Monte Miravidi. After having transported the first 4 skiers and the GMH (helicopter operator) task specialist and having landed them on Monte Miravidi, the helicopter made a second leg to transport further 3 skiers and the ski instructor acting as task specialist. After having disembarked them on Monte Miravidi, during the following take-off of the helicopter with the pilot and the GMH task specialist on board, the ski instructor on land remained hooked by the arm to the utility basket of the helicopter, was lifted into the air and crashed to the ground, falling on the French side few seconds after take-off and dying on impact.

1.2. INJURIES TO PERSONS

Injuries	Crew	Passengers (disembarked)	Total of persons on-board	Other
fatal		1		
Serious				
Minor				not applicable
None	2	3		not applicable
Totals	2	4	2	

1.3. DAMAGE TO AIRCRAFT

The helicopter was not damaged.

1.4. OTHER DAMAGES

No damage to third parties was reported on the surface.

1.5. PERSONNEL INFORMATION

1.5.1. Flight crew

Pilot

Generalities: 51 years old, Italian.
Licence: CPL(H), valid.
Operational ratings: A109, A109 (IR), AS350/EC 130, FI, TRE AS350/EC130, Mountain Aerial Work, valid.
Non-operational ratings: R22, R44.
Authorisations: TRE AS350/EC130.
English proficiency level: Level 6.
Periodic checks: TR and OPC, 13 November 2019, CRM recurrent (17/6/2019).
Medical control: class 1, current.

Pilot's flying experience: see table below.

	Total hours	Flight hours on type	IFR flight hours	Night flight hours
Latest 24 hours	1:57	1:57		
Latest 7 days	1:57	1:57		
Latest 90 days	72:23	72:23		

Professional history of the pilot/captain: see table below.

Type a/m	Activities flying	Job title	Authorisations	Company assignments
	1824:35	Captain	FI, TRE	FOM and CTM

1.5.2. Cabin crew

Task Specialist

Generalities: 42 years old, Italian.
Licence: CPL(H), valid.
Operational ratings: AS350/EC130, Mountain Aerial Work, valid. Task specialist, issued on 30 June 2019, valid.

Authorizations not valid: HU269, R44.
Periodic checks: CRM recurrent (17/6/2019).
Medical check: class 1, valid.

The task specialist, who holds a CPL (H), had carried out aerial work and CAT flights for the operator GMH in the previous months, and was on board as task specialist on the accident flight, a position he had held with the operator for about a year.

1.6. AIRCRAFT INFORMATION

1.6.1. General information

Lightweight three-blade multi-mission helicopter, metal construction, skid-steered undercarriage and capacity for up to six passengers plus pilot.

It installs a Turbomeca Arriel 2B1 turboshaft with 847 SHP, managed by FADEC and has a MTOM of kg2250. The main dimensions are shown in the figure below.

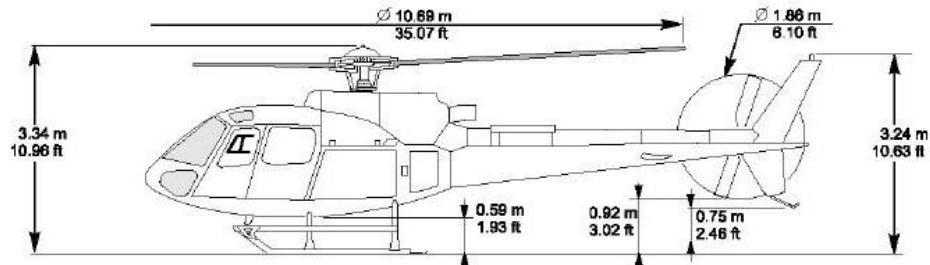


Figure 1: AS350 B3 dimensions.



Photo 1: I-AMVV helicopter (source GMH).

1.6.2. Specific information

Aircraft

Manufacturer: Eurocopter France (today Airbus Helicopters).

Model: AS350 B3.

Construction number: 4421

Year of construction: 2008.

Nationality and registration marks: I-AMVV.

Certificate of registration: No. 11785, date of issue 14 April 2008.

Operator: GMH Srl.

Owner: GMH Srl (now SKY Aviation).

Certificate of airworthiness: No. 15984/a, date of issue 7 April 2008.

Airworthiness review certificate: Aut. 0003-706(i)-0000-ITOOM, issue date 20 March 2019.

Total hours: 5035:36.

Hours since last inspection: 98:28 (150h/12M).

Hours since last maintenance: 12:02 (IP 100h).

Maintenance programme: YES.

Conformity of technical documentation with current regulations/directives: YES.

Engine

Manufacturer: Turbomeca.

Model: Arriel 2B1.

Engine position	S/N	Year of construction	Date of installation	Total hours (TSN)	Hours since last revision (TSO)	Hours since last scheduled maintenance	Hours since last unscheduled maintenance
1	AS25RT867			1533h52'		98h 28'	

Fuel

Authorised fuel type(s): Jet A1.

Type of fuel used: Jet A1.

Fuel in on-board tank: approx. 240 liters.

1.6.3. Additional information

Aircraft accessories and equipment

Flight tracking

The AS350 B3 I-AMVV installed on board a system, called "Bolero", essentially consisting of a high-sensitivity 50-channel GPS receiver, which transmits the following data every 10 seconds if the ground speed is greater than 10 m/s (36 km/h):

1. date and time, localized with respect to the position of the helicopter;
2. latitude and longitude, expressed in decimal degrees (DD);
3. ground speed in km/h;
4. *course* expressed in degrees relative to magnetic north;
5. altitude in meters above sea level.

This data is transmitted on the GSM band to the GMH Operations Centre and to GMH operators with a suitable receiver.

The presence of a *flight tracking* system on board the helicopter is required by the regional regulations governing heliski flight in Valle d'Aosta.

Heli utility basket

The helicopter installs a DART D350-607-041A metal material transport container on the left skid, produced by DART Aerospace, capable of transporting material up to a weight of 200lbs/91kg.



Photo 2: installation of the utility basket (source GMH).

Cargo mirrors

The I-AMVV helicopter is equipped with cargo mirrors positioned on the right side, which provide a wide rear view to the pilot both on the low right side of the helicopter and on the space below the central fuselage, usually used in central hook operations.

The installation of these mirrors is also possible on the left side, with the view through them only available to the occupant of the front left seat.



Photo 3: right and lower visibility via lateral and cargo mirrors.

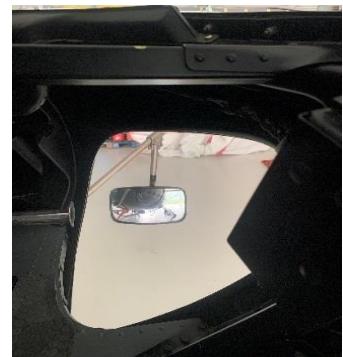


Photo 4: visibility on the right and lower side via cargo mirror.

For the left side, the visibility available to the pilot is instead provided by the windows on the front and rear door on the left side. Such visibility available does not allow the pilot to see the lower left side of the helicopter, on which the basket is installed.



Photo 5: heli left side visibility from the pilot seat.



Photo 6: heli left side and basket visibility from the left rear seat.

The view of this area of the helicopter is possible partially from the left front seat, almost completely from the left rear seat. The manufacturer Airbus Helicopters supplies as optional equipment also high visibility doors, both front and rear, which allow a better visibility of the left side by the pilot, usually used for central hook operations. Such installation does not allow to have sliding rear doors on board.



Photo 7: high visibility doors installation (source Airbus Helicopters).

1.7. METEOROLOGICAL INFORMATION

Meteorological information were provided by the Valle d'Aosta Regional Meteorological Office for the weather stations most representative of the orographic and weather conditions on Monte Miravidi at the time of the accident.

The conditions at the time of the accident were clear skies and unlimited visibility.

With regard to wind direction and intensity, data from the stations of La Thuile - La Grande Tête (2430 m), Morgex - Lavancher (2876 m), Monte Becca France (2300 m) and Monte Botsalet (2500 m) were taken into account as they are closer or more representative of the wind conditions present on Monte Miravidi.

The data provided indicates a wind direction from 320-345° and an intensity ranging from 10 to 30 knots, with gusts up to 43 knots.

1.8. AIDS TO NAVIGATION

Not provided in the area where the accident occurred.

1.9. COMMUNICATIONS

Not applicable.

1.10. HELIPAD INFORMATION

The temporary helipad located near the summit of Monte Miravidi and the border with France, is envisaged by the operator's OM as a "posa in quota" (high altitude release point), with coordinates 45°42'44"N 06°49'19"E and an altitude of 3083 m AMSL.

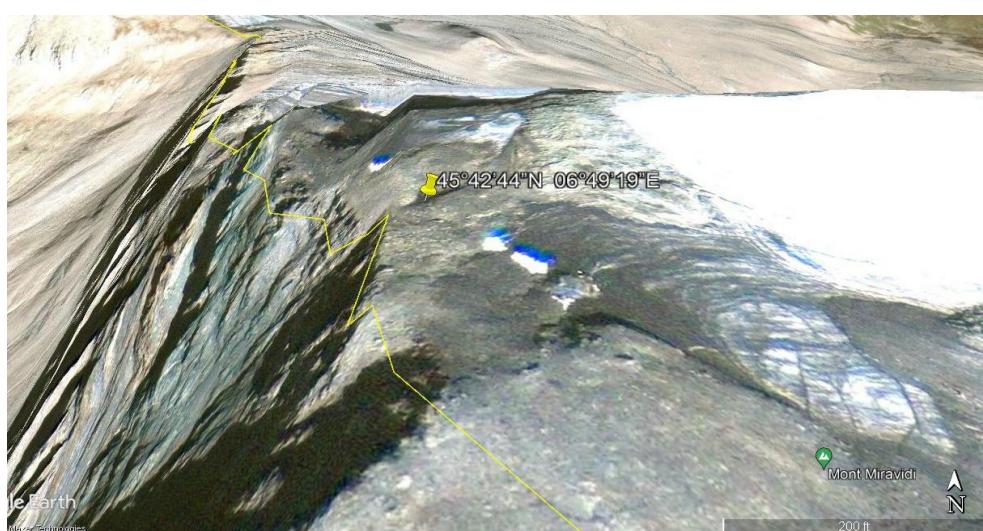


Photo 8: skiers' "posa in quota" point on Monte Miravidi (Google Earth Pro).

1.11. FLIGHT RECORDERS

The regulations in force do not request the installation of flight data recorders (FDR) and cockpit voice recorders (CVR) on board on such helicopters type.

As mentioned above, the I-AMVV was equipped with a GPS in-flight tracking system, called 'Bolero'. It was possible to retrieve the data of all the flights made on the day of the accident through the relevant service provider; in this context, the last two flight legs from the Colle del Piccolo S. Bernardo to the Maravidi and the return flight to the operator's base in Entrèves (AO) were selected.

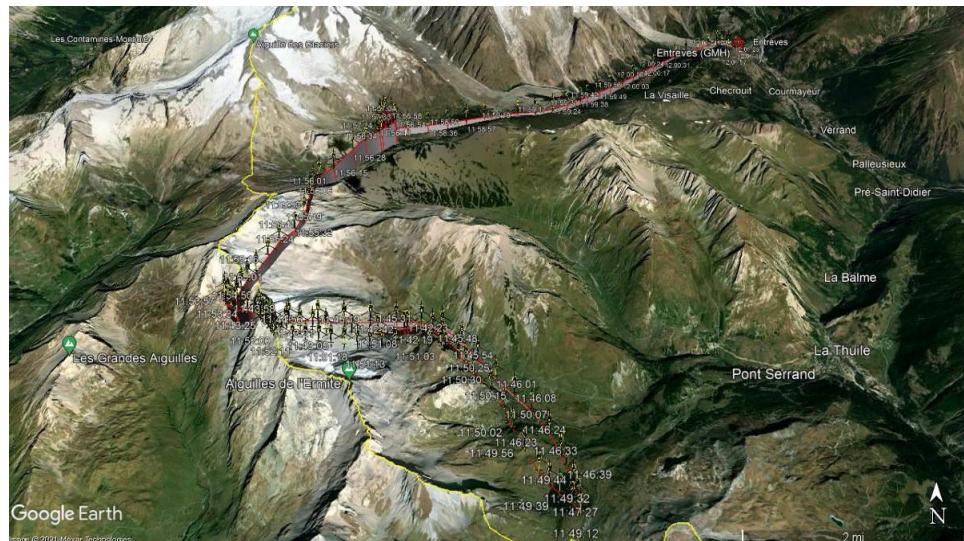


Photo 9: I-AMVV ground track relative to the two flights towards Monte Miravidi and back to the home base after the accident (Google Earth Pro).

The heights associated with the positions recorded in flight are not representative in some sections of the two selected routes, in the following image the helicopter positions are projected on the ground and the view is vertical.

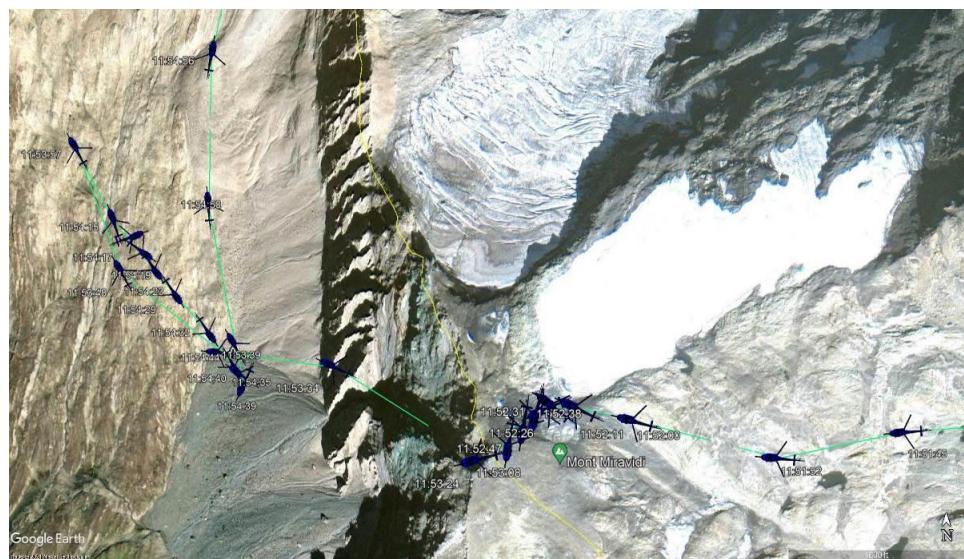


Photo 10: I-AMVV ground path related to the release of the second group of skiers, take-off and release of GMH task specialist on event site (Google Earth Pro)

1.12. HELICOPTER AND IMPACT SITE INFORMATION

This section contains information gained from the examination of the helicopter and accident site.

1.12.1. Accident location

The skier's fall occurred seconds after the helicopter took off towards the French side, particularly steep, and the impact against the rocks occurred in the area indicated by the red circle in the picture below.



Photo 11: fall area and trajectory, final position on the snowfield of the skier's body (Google Earth Pro)

1.12.2. Ground evidence and wreckage distribution

Not applicable.

1.12.3. Helicopter examination

Heli utility basket

A visual inspection of the basket was carried out to verify any possible hooking points between the skier's tracksuit sleeve and the basket itself.

The probable point of attachment is the front linkage of the basket closing system, which, however, does not show any deformation in its protruding parts.



Photo 12: Front and left-side basket closing system



Photo 13: Detail of left-side basket closing system

1.12.4. Impact dynamics

The helicopter took off from Monte Miravidi in a NW direction with a headwind. During the take off the ski instructor/task specialist on the ground got caught with his right arm on the basket placed on the left side of the helicopter, detached himself from the basket with the helicopter already in flight and whose vertical was in French territory. In the fall he hit the rocks and ended his fall on a snowfield below.

1.12.5. Event-related failures

Not applicable.

1.13. MEDICAL AND PATHOLOGICAL INFORMATION

No medical or pathological evidence was found on the crew that could have influenced the occurrence of the event.

1.14. FIRE

Not applicable.

1.15. SURVIVAL ASPECTS

The fallen skier was immediately spotted by the helicopter crew.

His death has been caused by multiple traumas following his fall onto the rocks below.

1.16. TESTS AND RESEARCH

Not applicable.

1.17. ORGANISATIONAL AND MANAGEMENT INFORMATION

The operator GMH Srl holds an OAC which authorizes it to conduct CAT and SPO HR operations in VFR with the AS350 B3 helicopter, operations which also include heliski flights, i.e. transporting skiers by helicopter.

A "CAT Montagna invernale" SOP and a *Guida di riferimento per attività di Heliski* are dedicated to this type of flights.

The SOP highlights as a risk area the embarkation and disembarkation of passengers with rotors in motion and that alpine guides (GA) must be trained to carry out assistance during such operations.

With regard to the figure of the task specialist¹, in the same SOP are described the tasks that these figures must perform, as required by EASA SPO.GEN.106 "Task specialist responsibilities":

- managing the group of skiers while waiting;
- open/close the helicopter doors;
- coordinating the embarkation/disembarkation of skiers and equipment;
- assisting the pilot.

This role, for heliski flights, is combined with that of alpine guides/ski instructors who accompanies the group of skiers during the descent.

The operator's OM (Part C) requires that the task specialists/ground assistants can assist in operations, to be trained and briefed directly by the pilots responsible for the task/flight.

The OM itself provides a safety briefing for all passengers and covers the procedures for embarking and disembarking.

Passengers shall be boarded, disembarked and placed in a safe position with regard to the helicopter by the GMH operator's staff or task specialist/assistant trained for such operations.

The training of this figure is reported in the OM (Part D) and includes an initial course on the helicopter type, consisting of a theoretical and a practical part. At the end of the course, GMH issues a certificate valid for 12 months, after which, in order to operate as a task specialist/flight assistant, it is necessary to attend recurrent training, also valid for 12 months.

¹ Such role correspond to the following definition in Annex I to EU Regulation 965/2012: "Task specialist means a person assigned by the operator or a third party, or acting as an undertaking, who performs tasks on the ground directly associated with a specialised task or performs specialised tasks on board or from the aircraft"

The syllabus of the course, as far as disembrakment operations are concerned, foresees for the task specialist/assistant, once he/she has received the consent from the pilot, to carry out the following actions:

- place the headset with microphone on the headset stand;
- unbuckle the seat belt and place it back on the seat;
- open the front door, step down carefully and close the door again;
- unload the equipment in the basket and place it on the ground, close the basket again;
- opening the sliding door;
- assisting passengers in disembarking, grouping them near the disembarked equipment;
- once passengers are secured, close the sliding door and move into view of the pilot for take-off clearance.

The *Guida di riferimento per attività di Heliski* above further details the activities that alpine guides/ski instructors who, as task specialists, accompany customers on heliski flights are required to carry out. They are considered as ground assistants and, as such, must be trained by the operator at the beginning of the eliski season. It is made clear that once disembarkation has taken place, passengers should remain stationary and in a stooped position near the equipment disembarked. The following image, taken from the same *Guide*, clearly identifies this area and the dangerous/banned areas.



Figure 2: excerpt from the GMH *Guida di riferimento per attività di Heliski*.

1.18. ADDITIONAL INFORMATION

Video recorded

The arrival of the helicopter at Monte Miravidi, the disembarkation of the occupants, including the ski instructor/task specialist, the boarding of the GMH task specialist present on the ground, the take-off of the helicopter, with the hooking of the disembarked ski instructor/task specialist by the arm, were filmed by two of the four other skiers previously transported from the Colle del Piccolo S. Bernardo to Miravidi.

Below a series of frames from the landing of the ski instructor/task specialist and the 3 skiers, to the take-off of the helicopter with the ski instructor/task specialist remained attached to the basket.





The images apparently show a continuous eye contact between the embarked task specialist and the ski instructor/task specialist on the ground during door closing operations and in the initial phase of takeoff.

Statements

Statements were taken from the pilot, the GMH task specialist, the GMH accountable manager and the instructor who held the ground-based recurrent qualification/training course as task specialist for heli-ski flights for alpine guides and ski instructors.

The most significant elements of the four testimonies are summarized below.

Pilot

- 18 years of experience in heli rescue services, previous job as alpine guide.
- CAVOK day, strong westerly wind.
- Two activities were planned: bringing technicians to check on a refuge hit by an avalanche and some heliski flights for a group of instructors who were undergoing annual training as task specialists for heli-ski flights, from the Colle del Piccolo S. Bernardo to Monte Miravidi.

- He wanted to use the opportunity to initiate specific training as a pilot for heliski flights in favor of the GMH task specialist, who was close to the minimum hours to start this specific flight training.
- The GMH task specialist was also a pilot, still inexperienced, while as task specialist he was prepared and experienced.
- In-flight reconnaissance of Monte Miravidi and landing at the Colle del Piccolo S. Bernardo, where the ground instructor and course attendees were located, awaiting for the end of the course lessons, normally held in the hangar of the operator; being the attendees French personnel coming from La Rosière, it was more convenient to carry out the training at the Colle del Piccolo S. Bernardo facilities.
- Not interfered with the ground instructor in order not to create confusion.
- At the end of the course, some of the skiers had expressed a wish to be taken to Monte Miravidi, a commercial activity agreed directly with GMH.
- First flight towards Monte Miravidi with the GMH task specialist on board and 4 skiers, the same task specialist provides the disembarkation and is asked to stay on ground, to reduce risks in the second flight, advised by radio to carry out only surveillance but to let the newly trained instructors carry out the disembarkation/embarkation operations.
- Second flight with three skiers seated at the back and the ski instructor acting as task specialist seated at the front, who had his gloves tied with a lanyard, warned by the pilot that they might interfere with the on-board controls, asked to undress them and put them aside.
- During the flight, comments on the course were made, stressing the importance of attending them.
- Landing on Monte Miravidi, disembarkment authorized, at the end of which he informs the GMH task specialist on ground from the previous flight to come aboard, they would have gone to another location to recover some technicians and return to the home base.
- The GMH task specialist comes aboard, connects to the intercom and says "Vai", so loud that he hears it even outside the intercom system, from that moment on the pilot no longer pays attention to the personnel on the ground, occupying a position on board the heli from which proper visibility of the left side it is not provided;
- The term "Vai" is not used at random, as in the summer during disembarkments from hover, there had been safety problems using different forms of communication, so it was agreed to use "Vai" as a phraseology.

- After the "Vai", the take-off and the transition to translational flight is made, after a while the GMH task specialist communicates via intercom that there was a person hanging from the basket and that he was not joking, while the helicopter had passed the mountain ridge, then the pilot tried to lower his altitude.
- After an indefinable amount of time, the GMH task specialist reported that the person (the ski instructor) had fallen, then the pilot turned the heli and saw his fall, with consequent several impacts against the rocks, and then saw the end of the fall in a channel between rocks, where the body continued to slide, before coming to rest on a snowfield.
- He then brought the helicopter into hover close to where the body laid, gave order to the GMH task specialist to disembark, gained some height and alerted the ground course instructor of the accident and its severity via radio.
- Returned to the GMH home base (after an intermediate stop where he had taken on board other personnel) and reported the accident to the local police (Guardia di finanza) station.
- Upon request, he went to the French Gendarmerie, where he was interrogated by the prosecutor, at the end of the interrogation, the latter allowed him to return home.
- Takeoff from Monte Miravidi was carried out headwind and towards the French side, there was a wind rotor below the top of the mountain, so he had decided to land 7-8 meters higher, on a flat area, where there was a more laminar wind flow and where it was easier to disembark the passengers.
- It had not snowed for several days so it was deemed as not essential to land close to the landing markers put by the operator on top of the mountain.
- A standard heliski flight with the AS350 B3 involves 4 skiers and one alpine guide/ski instructor/task specialist, with the latter usually seating on the left rear seat.
- When seated, the area close to the basket is not visible to the pilot, whereas the task specialist, who embarked before take-off, was in a proper position to have visibility in that area.
- He considered that the function of the task specialist on board was to supervise the embarking/disembarking activities and therefore his presence led him to focus his attention on the take-off and not on what was happening on the left side, as this would be redundant.
- The pilot did not hear what topics were covered during the ground course.

- The post-landing position of the skiers needs to be explained, and it is to stand in a group close to the helicopter, with hands on the ski packs.
- The ski instructor/task specialist goes out first, then closes the door, unloads the skies and put them in an appropriate position, opens the personnel doors, lets the passengers off, they place one hand on the ski pack; the ski instructor/task specialist closes the door and then stands in a position at 45° to the pilot.
- He believes that the critical factor was to consider the risk associated with the disembarkation/embarkation activity reduced, thanks to the presence of the GMH task specialist on board, without which he would have waited until he had the ski instructor/task specialist in sight before taking off.
- During take-off, he had not noticed an increase in lateral weight represented by the skier who had become hooked.

GMH task specialist

- In training at GMH as a commercial helicopter pilot, holding a limited amount of flight hours.
- On the morning of the accident, around 7:30/8:00, he was flying as a pilot with the I-AMVV on a CAT mission in Val Veny, then returned to the home base in Entrèves;
- Agreed with the pilot to take part in the flight as task specialist, to complete the training of the French ski instructors at La Rosière.
- With the pilot flying and him sitting in the back seat, the helicopter took off from Entrèves and landed at the Colle del Piccolo S. Bernardo, where they found the ground instructor and the sky instructors attending the course.
- At the end of the ground training, held in French by the ground instructor and partly by the I-AMVV pilot, it is decided to carry out some heliski flights.
- He climbed aboard for the first flight towards Monte Miravidi, where he disembarked together with the first group of 4 skiers, who moved down 10/15 m from the landing site, he remained on the ground equipped with a radio to perform some supervision on the forth coming activities.
- The pilot, the only person on board, took off towards the Colle del Piccolo S. Bernardo.
- The helicopter arrived again, with the ski instructor/task specialist sitting at the front and three skiers on the rear seats, not communicating with the pilot by radio, the four

people disembarked from the helicopter, one of them acting as leader, while he kept some distance from the helicopter, checking that everything was OK.

- Once they had disembarked, the person acting as leader closed the front door, unloaded their skis, tied them to the ground and closed the basket, he climbed into the helicopter making sure they were all crouched down on the lower left side near the heli skate, seated on the left rear seat and accompanied the rear door to the closed position.
- Then turned his head to connect the intercom cable, and as he climbed up on the heli, he nodded to the pilot as if to say: «We understand each other, understood, I got on and OK»; turned his head to look at how to connect the intercom, told the pilot OK by voice but not via the intercom.
- The pilot would take off immediately and quickly, he would look forward at the instruments, not communicating via intercom with the pilot.
- As they descended towards the French side, he relaxed in his seat and, turning his head, saw with his peripheral vision a red spot attached to the utility basket, turned his head and saw the ski instructor hanging from the utility basket.
- He fearfully informed the pilot that there was the ski instructor attached to the basket, as the helicopter picked up speed, he turned his head again but could no longer see the ski instructor hanged.
- He informed the pilot that the instructor was no longer hanged, the pilot turned towards the channel and both saw him fall and roll over the rocks for hundreds of meters until he came to rest in a snowfield.
- The pilot ordered him to disembark next to the fallen skier, he was disembarked about 15 m from the body of the skier and waited in that position for about 20/25 minutes, to be then picked up by another GMH helicopter, which took him to the Colle del Piccolo S. Bernardo.
- A French Gendarmerie helicopter subsequently arrived to recover the body of the ski instructor.
- Since a year he had been working as a coadjutor/task specialist for GMH, he had not attended a formal course, he trained as a pilot, as task specialist he observed the behavior of other task specialists.
- For heliski flights, he did not participate as task specialist because in this type of flights, such role is carried out by one of the alpine guides/ski instructors who are on board of such flights.

- At the time of the accident, he had accumulated about 500/550 hours of total flight time, including about 300 hours as PIC, during which he had performed sightseeing flights and CAT flights.
- On the AS350 B3, the pilot sees the left side poorly; he cannot see it with mirrors, but only by turning his head.

GMH accountable manager

- Located in Aosta, informed by the pilot a few minutes after the event.
- GMH carried out heliski activities in several places, including La Thuile, where the accident occurred.
- Standard heliski missions are made with a ski instructor/task specialist and 4 skiers on board.
- Every year GMH carries out courses or recurrent courses to train as task specialists the alpine guides/ski instructors who will accompany skiers on heliski flights (according to regional regulations, they have to be alpine guides or ski instructors).
- The ground course carried out before the accident had been conducted on the Colle del Piccolo S. Bernardo, in favor of participants coming from La Rosière.
- The course was carried out by an experienced alpine guide, qualified as a trainer, belonging to the Heli Guides company, which commercializes heliski flights.
- At the end of the ground course, some of the attendees involved, had asked to be brought to Monte Miravidi.
- Regional Law No 15/1988, which regulates heliski flights in Valle d'Aosta (alpine guides or ski instructors are the only persons authorized to accompany heliskiers), does not request a training for such task specialist, whereas EASA regulations do.
- GMH had drafted and published an internal manual and guide to regulate this training, documents that were shared with the ENAC inspectors.

Ground instructor

- A ground instructor with many years of experience, every year he holds this course on behalf of GMH for ski instructors/alpine guides to qualify them as task specialists/heli-ski operations managers.

- On the morning of 7 January 2020 he carried out the qualification course, initially only in theory, then with practical demonstrations with the arrival of the I-AMVV helicopter on the Colle del Piccolo S. Bernardo.
- As part of the practical knowledge and activities carried out in the course, particular attention is given to the boarding and disembarkation of passengers.
- For disembarkation, the manager/task specialist is instructed, once the helicopter has landed, to ask the pilot for permission to disembark, then disembark, remove the equipment from the utility basket, place it parallel to the side of the helicopter at approximately 1.5 m, close the utility basket, open the rear door, disembark the passengers, place them at the side of the helicopter with their respective equipment previously disembarked, grouped and seated/kneeled, and then place themselves in sight of the pilot through the front door windows as confirmation of the completion of disembarkment activities and that take-off is cleared.
- The flight on which the accident occurred was the last scheduled flight for the group of skiers who had requested to be brought to Monte Miravidi.
- He was informed of the accident by the I-AMVV pilot via radio, and contacted the La Thuile rescue centre, which in turn contacted the French rescue service, whose helicopter arrived at the scene about 45 minutes later.
- He joined the other skiers on Monte Miravidi, making sure they descend along a route that avoided passing close to the site of the accident.

1.19. USEFUL OR EFFECTIVE INVESTIGATION TECHNIQUES

Not applicable.

CHAPTER II

ANALYSIS

2. GENERAL

The evidence gathered during the investigation, described in the previous chapter, are analyzed below.

The objective of the analysis is to establish a logical link between the evidence and the conclusions.

2.1. FLIGHT EXECUTION

As seen, the two heliski flights were requested by the group of ski instructors and alpine guides at the end of the ground training course as task specialists and were therefore not planned in advance.

The pilot had the necessary qualifications and authorizations to conduct heliski flights, the task specialist had undergone theoretical training and had been carrying out this task on the ground and onboard for about a year, as well as working as a pilot for the same operator.

Both had attended CRM courses, the latest of which, a recurrent training, was attended by both on 17/6/2019.

The data available from the flight tracking system (Bolero) indicate a normal flight from the skiers' pick-up point on the Colle del Piccolo S. Bernardo to the release point on Monte Miravidi, and the footage recovered from the skiers waiting on topo of the same mountain confirms a flight and landing without any abnormalities.

The landing operations of the second group of skiers took place with the GMH task specialist on Monte Miravidi, at a safe distance from the helicopter and in sight of the pilot during the landing.

The operations of opening the doors, removing skis from the basket, closing the basket and disembarking the three skiers sitting in the back were carried out by the ski instructor/task specialist seated on the front seat of the helicopter during the flight.

After the ski instructor/task specialist and skiers had disembarked, the GMH task specialist boarded and sat in the left rear seat.

The disembarked personnel positioned themselves on the left side of the helicopter, while the ski instructor/task specialist closed the door, assisted from inside the helicopter by the GMH task specialist.

With the ski instructor/task specialist on the ground (positioned so as to be in sight only of the GMH task specialist), still in an upright position and with his arms raised, the helicopter took off; at this moment the right sleeve of the ski instructor/task specialist's suit remained hooked on the basket, probably to the forward hook on the basket's opening/closing system. From the available images and based on the testimony given by the GMH task specialist, the ski instructor/task specialist remained hooked for a few seconds as the helicopter, with a north-west heading, switched from hover to forward flight.

His subsequent fall occurred when the helicopter was in forward flight and its vertical was in French territory.

Considering the landing and release point of the skiers and the wind conditions present on Monte Miravidi, the direction in which the helicopter took off towards the north-west was the most suitable, as the helicopter found itself in a headwind condition.

2.2. AIRCRAFT

The helicopter did not show any failures or malfunctions during the accident flight.

As seen, the data acquired by the flight tracking system during the flight from the Colle del Piccolo S. Bernardo to Monte Miravidi allowed the reconstruction of the ground trajectory held by the helicopter, while only a few points recorded provided AMSL altitude data consistent with the flight profile and the underlying orography.

The visibility available to the pilot of the left side, where the skiers and the ski instructor/task specialist disembarked were positioned, is very limited, as a consequence not only by the fact that the pilot is seated on the right side, but also by the helicopter architecture and by the lack of a system able to allow the pilot a wider visibility on that side of the helicopter, visibility instead available for the lower right and central side thanks to a *cargo mirrors* equipment.

The possible installation of the *cargo mirrors* on the left side of the helicopter would not have allowed any visibility of the left side by the pilot on board, seated on the front and right side.

The eventual installation of the high visibility doors, even if allowing a minor limitation from the pilot towards the left side of the helicopter, would not have allowed the rear sliding doors, certainly necessary to facilitate the operations of embarkation/disembarkation.

The lack of appropriate onboard systems for rear vision of the left side of the helicopter severely limited the pilot's ability to visually verify the position, with respect of the helicopter, of the disembarked personnel.

The utility basket, installed on the left side of the helicopter, has a closing system with two protrusions, on the forward one, very likely occurred the engagement with the sleeve of the instructor's suit.

Such protrusions of the basket closing system pose a risk to personnel on the ground operating in close proximity to the helicopter. Therefore, it would be desirable for the manufacturer to modify the closing system such that these protrusions are removed to improve the safety of personnel involved in ground operations.

2.3. HUMAN FACTORS

As seen, both crew members had attended CRM courses, the last of which, a recurrent one, was attended by both only 6 months before the accident.

It is clear from the statements of both crew members that there was a misunderstanding between the two, with the pilot believing that he had received confirmation that he could take off.

The phraseology used, "Vai", to which the pilot refers, is not actually contained in the documentation issued by the GMH operator to regulate heliski flights and tasks to be performed by the task specialist, but was the result of an agreement among the operator's crews.

Both crewmembers agreed that the strong attenuation of the ambient noise inside the cabin, which occurred when the rear sliding door was closed, contributed to the pilot's belief that the positioning of personnel on the left side of the helicopter was such as to allow take-off.

The architecture of the helicopter does not make the space to the left of the helicopter visible to the pilot (seated on the right) except to a small extent and only by turning his head to the left and back, so that he can see a limited area of the left side of the helicopter through the windows of the left doors.

A better view is available to the task specialist, especially when he is seated, as in the event in question, in the left rear seat.

The take-off therefore took place without the pilot having the disembarked personnel in sight, following the latter's assumption that he had received the OK for take-off from the task specialist.

The procedures adopted by the operator for disembarkation operations during heliski flights, foresee that the ski instructor/task specialist on the ground, once the actions aimed at disembarking materials and passengers and their correct positioning have been carried out, moves in such a way as to be visible to the pilot, thus confirming that he can proceed with take-off.

From the available video footage it is clear that the take-off took place with the ski instructor positioned next to the helicopter and close to the boarding door, before the latter could move into a position visible to the pilot.

Interviews with the crew also reveal a lack of clarity in the assignment and understanding of the roles to be played in the flight from disembarkation of the skiers to the recovery of technical staffs released at a hut earlier in the day.

The pilot considered that he had given appropriate instructions to the task specialist to supervise the disembarkation of the personnel on board, but not to intervene in the process, but only to check that they were carried out correctly.

Instead, the GMH task specialist felt that he should simply embark to go and recover the technical personnel previously left at the hut, leaving the management of the disembarkation operations to the ski instructor/task specialist who had been disembarked on Monte Miravidi.

This resulted in the pilot believing that the GMH task specialist should check the position of the disembarked personnel, while the task specialist believed that the completion of disembarkation and take-off clearance did not concern him.

The event may have been influenced by *complacency*, at least for the pilot, generated by the considerable frequency and repetitiveness of the embarkation/disembarkation operations in heliski flights; *complacency* that may have reduced the perception of the risk associated with the take-off phase after disembarkation of the three skiers and ski instructor/task specialist.

The task specialist's recollection of the door closing and takeoff operations are actually not consistent with what is seen in the video, in which eye contact between him and the task specialist on the ground is present until the early stages of takeoff.

With the helicopter rising a few feet, he loses eye contact with the task specialist on the ground and does not realize the latter's engagement to the basket, which he will instead accomplish moments later, with the helicopter already in forward flight and with its vertical in French territory.

2.4. ORGANISATIONAL FACTORS

The figure of the task specialist on board the helicopter was considered essential by the operator to help the pilot in the operations that take place on the ground in heliski flights.

The tasks to be carried out by this figure have been appropriately outlined in both the OM and SOP dedicated to heliski, as required by EASA regulations (SPO.GEN.106 "Task specialist responsibilities"), annual training is conducted for all personnel acting as ski instructors/mountain alpine guides/task specialists in heliski activities.

More generally, the procedures set forth in the OM and SOP dedicated to heli-skiing activity provide adequate reductions or mitigations of the risks associated with these operations, particularly with respect to disembarkation and embarkation operations, by providing a safe location for disembarked passengers and a clear indication to the pilot by the task specialist when take-off can be carried out safely, with respect to disembarked personnel.

The procedures do not describe the type of phraseology to be used between the task specialist and the pilot due to the fact that the two figures may not necessarily be in radio contact during the personnel embarkation/disembarkation phases and because, instead of verbal communications, the task specialist's postures and gestures are envisaged so as to make it clear to the pilot when the operations under his responsibility have been concluded and it is possible to take off.

The location of the skier's release point is close to the ridge of Monte Miravidi and requires, with north-westerly winds, a take-off that necessarily encroaches on French territory. The pilot had decided to land in a slightly different position from the one reported as the north-westerly wind was causing wind rotors in the landing area.

The location of the skiers' release point is not considered a contributory factor in the accident.

The chance to make an interference between the helicopter and specific clothing such as alpine ski suits is certainly always present.

As reported by the pilot, the latter during the flight from Colle S. Bernardo to Monte Miravidi had commented with the ski instructor/task specialist seated on the front seat, the potential danger posed by the glove closings worn by him.

However, the embarkation and disembarkation procedures, if properly applied and executed, do not allow for any entanglement of clothing with parts of the helicopter to actually pose a hazard to operations.

2.5. SURVIVAL ASPECTS

Not applicable.

CHAPTER III

CONCLUSIONS

3. GENERAL

This chapter sets out the facts established during the investigation and the causes of the event.

3.1. FINDINGS

- At the end of a ground course aimed at instructing alpine guides/ski instructors for heliski flights, some of these attendees asked the GMH operator to have some heliski flights to be released on Monte Miravidi.
- The accident occurred during the take-off from Monte Miravidi at 10:53 a.m., following the second flight to release the skiers to the mountain.
- The ski instructor/task specialist of the second group of skiers applied the correct disembarkation procedure, removal of the material from the basket and its closing, disembarkation of the other skiers from the rear of the helicopter, closing of the rear sliding door.
- The ski instructor/task specialist was hooked by one sleeve of his suit to the helicopter's basket, from which he disengaged a few seconds after take-off, crashing onto the rocks of the French side of Monte Miravidi.
- The pilot had the necessary aeronautical qualifications, CRM training and flight experience, and was qualified to carry out heliski flights.
- The GMH task specialist had the necessary theoretical and practical training, also from a CRM point of view.
- The helicopter did not show any technical problem in the flight of the accident and the planned maintenance was carried out in accordance with the applicable regulations.
- The utility basket installed on board is certified for use on the AS350 B3 helicopter and was correctly operated and maintained.
- There is no damage on the basket due to accidental hooking of the ski instructor/task specialist, there is a protruding hook on the basket which is part of the locking mechanism.

- The weather conditions were clear skies, wind on the summit of Monte Miravidi with a direction of 320-345° and an intensity varying from 10 to 30 knots, with gusts up to 43 knots.
- The helicopter took off from the Colle del Piccolo S. Bernardo for an initial transport of the skiers to Monte Miravidi, a landing on it where the 4 skiers and the GMH task specialist disembarked.
- On the second flight on the previous route, 3 skiers and the ski instructor who acted as task specialist were taken on board.
- Once they had landed on Monte Miravidi, the ski instructor/task specialist disembarked from the front left seat, unloaded the materials contained in the utility basket, closed it, disembarked the other skiers sit in the back seats; after the GMH task specialist present on the ground climbed aboard and sat in the back left seat, he collaborated with the latter to close the rear sliding door.
- At the moment of take-off, the ski instructor/task specialist was still standing and with his arms raised, at 9 o'clock in relation to the pilot, in the same position in which he had carried out the previous operations.
- The helicopter took off from the apron with a north-west heading, with the ski instructor/task specialist hooked by the right arm to the utility basket, a hooking that lasted until the helicopter began the phase of translation flight towards the French side.
- The ski instructor/task specialist fell onto the rocks on the French side of Monte Miravidi, dying on impact.
- The pilot and GMH task specialist noticed his fall and followed him until he came to rest on a snowfield below.
- The pilot activated the rescue procedure and decided to disembark the GMH task specialist close to the deceased ski instructor/task specialist and decided to return to the GMH home base in Entrèves.
- No damages are present on the two protrusions of the basket closing system, as result of the engagement of the task specialist on the ground.

3.2. CAUSES

The accident was caused by the accidental hooking of the ski instructor's sleeve to the utility basket, with the subsequent release in flight and his fall onto the rocks on the French side of Monte Miravidi; the hooking was caused by an incorrect separation between persons on the

ground and the helicopter, during the take-off sequence carried out with the ski instructor close to the utility basket, not far enough away from the helicopter and not in sight of the pilot.

The following factors played a relevant role in causing the accident:

- an unclear definition of roles on board, which led the pilot to disregard the position of the personnel on the ground during take-off, believing that this function had been carried out and completed by the GMH task specialist on board;
- CRM principles not applied between the two crew members, which led to the misunderstanding between the pilot and the GMH task specialist regarding the possibility of taking off, once the latter had boarded the helicopter and the sliding door had been closed;
- the pilot's lack of visibility of the area close to the helicopter on the lower left, the area in which the skiers and ski instructor/task specialist were positioned at the time of take-off.

CHAPTER IV

SAFETY RECOMMENDATIONS

4. RECOMMENDATIONS

In light of the evidence gathered and the analysis performed, ANSV deems it necessary to issue the following safety recommendations.

4.1. RECOMMENDATION ANSV-8/001-20/1/A/22

Type of recommendation: -.

Motivation: the AS350 B3 is a helicopter which is very frequently used with a single pilot on board.

In the accident in question, in which the helicopter was used for heliski flights, the separation between the helicopter and the personnel disembarked from it was guaranteed by the correct application of the boarding/unboarding procedures which, as we have seen, need to be carried out by task specialist and pilot.

These procedures, if correctly applied, guarantee a safe separation of the personnel disembarked from the helicopter, while the latter is in the take-off phase.

The AS350 B3 helicopter can be equipped with "Cargo mirrors" on both sides of the helicopter, these allow adequate rear visibility only to the person sitting in front on the same side of the mirrors and are particularly useful in operations with cargo hooks and/or off-field landings.

The manufacturer Airbus Helicopters also provides as optional equipment the front and rear high visibility doors, able to improve the pilot's visibility of the left side of the helicopter; their installation prevent the helicopter from having sliding doors for the disembarkation of the occupants of the rear seats.

The same manufacturer Airbus does not supply, for AS350s helicopters, an equipment capable of giving a more complete rear view of the left side of the helicopter to the pilot sitting in the front right seat.

For the above considerations, plus the fact that the helicopter may be used in high risk operations (SPO HR), it is considered desirable to provide the pilot with a better and more complete rear visibility of the left side of the helicopter where, as in the case in question, personnel disembark and the utility basket is installed.

Such equipment would provide an additional safety net for the safety of operations, in addition to the aforementioned disembarkation procedures, which could be not correctly carried out and could be applied, it should be remembered, by personnel unrelated to the operator.

Addressee: EASA.

Text: ANSV recommends to request the manufacturer Airbus Helicopters to evaluate the possibility of implementing retro-vision systems that would provide the pilot with the fullest and widest possible view of the left side of the AS350 helicopter, currently only partially available.

4.2 RECOMMENDATION ANSV-9/001-20/2/A/22

Type of recommendation: -.

Motivation: the protrusions on the closing system of the utility basket D350-607-041A, manufactured by DART Aerospace, while not a cause in the I-AMVV accident, still pose a hazard to operators during operations conducted on the ground around the utility basket.

A closing system modified so that there are no potentially dangerous protrusions during such operations would be desirable. The same manufacturer has other basket models in its catalog for both the AS350 and other helicopters that feature an opening/closing system that has similar protrusions.

Addressee: EASA.

Text: ANSV recommends to request the manufacturer DART Aerospace to evaluate the possibility of modifying the closing mechanisms of its baskets, in order to remove protrusions potentially dangerous during ground operations around helicopters equipped with such products.

APPENDIX

In line with what is allowed by international and EU regulations on safety investigations (ICAO Annex 13 and EU Regulation No. 996/2010), the BEA agreed with the content of the final report prepared by ANSV, while it sent the following comment on the recommendation regarding the rear-view system for the left side of the helicopter, a comment not agreed by ANSV.

The BEA does not support the recommendation.

The basket installed on the left side of the aircraft is not an Airbus Helicopters installation but an STC supplied by DART (D530-607-041A).

The Safety Recommendation of this report to EASA asks Airbus Helicopters to evaluate the installation of a mirror to improve the visibility of the left side of the aircraft, which is only partially visible.

This Safety Recommendation is therefore directly associated with the use of this STC basket.

As Airbus Helicopters is not the owner of this definition, it is difficult to consider that it is their responsibility to propose a modification to monitor this installation.

Furthermore, although the mirrors dedicated to the transport of loads under the aircraft do not allow a complete visualization of the left side of the aircraft, they do allow to see the whole lower part including the skids on the ground and what would be near them (in this case the lower part of the person near the basket would be quite visible).