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Schweizerische Unfalluntersuchungsstelle SUST Service d'enquête suisse sur les accidents SESA Servizio d'inchiesta svizzero sugli infortuni SISI Swiss Accident Investigation Board SAIB

Aviation Division

# Final Report no. 2124 by the Swiss Accident Investigation Board SAIB

concerning the accident involving the Schweizer 269C helicopter, registration HB-XYI

on 19 November 2009

Unterbärgetal, municipality of Burgdorf/BE

#### Ursache

Der Unfall ist darauf zurückzuführen, dass es anlässlich einer Aussenlandung bei Nacht mit einem Helikopter zu einem Kontrollverlust kam und der Helikopter anschliessend mit dem Gelände kollidierte.

Zum Unfall beigetragen haben:

- Ungeeignete Wahl einer Aussenlandestelle bei Nacht in Bezug auf die aktuell herrschenden Verhältnisse.
- Geringe Nachtflugerfahrung der Besatzung.
- Unzweckmässige Anflugverfahren auf einer Aussenlandestelle bei Nacht.
- Marginale technische Ausrüstung des Helikopters für Aussenlandungen bei Nacht.
- Minimale Definition der Ausbildungsschritte, Voraussetzungen und Bedingungen für die Tätigkeit als Fluglehrer auf Nachtflügen im Ausbildungshandbuch der Flugschule.

## General information on this report

This report contains the Swiss Accident Investigation Board's (SAIB) conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Art 3.1 of the 10<sup>th</sup> edition, applicable from July 2010, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the accident investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the German language.

All times in this report, unless otherwise indicated, are stated in local time (LT). At the time of the accident, Central European Time (CET) applied as local time in Switzerland. The relation between LT, CET and UTC is: LT = CET = UTC + 1 hour

# **Final Report**

Aircraft type		Schweizer	chweizer 269C Registration HE		tion HB-XYI
Operator		Heliswiss S	Schweizerische Heli	kopter AG, CH-3123 B	elp, Switzer-
Owner		land Heliswiss Schweizerische Helikopter AG, CH-3123 Belp, Switzer-			
Flight instruct	or	Swiss citize	en, born 1977		
Licence		Commercia the Federal	al pilot licence helico l Office of Civil Avia	opter CPL(H) JAR, first tion (FOCA) on 21 Dec	t issued by ember 2006.
Essential ratings		HU269, valid till 31 December 2009 FI(H), valid till 2 December 2011 NIT(H), first issued 18 May 2007			
Medical fitnes	s certifi-	Class 1 with restrictions (VDL: must wear spectacles), valid till 11 September 2010			
Flying hours	total on the acc	ident type	917:37 hours 276:57 hours	during the last 90 days during the last 90 days	141:00 hours 92:00 hours
Night flying	total		15:52 hours	during the last 90 days	2:40 hours
	on the acc	ident type	10:52 hours	during the last 90 days	2:40 hours
Instruction	total		274:52 hours	during the last 90 days	133:57 hours
	on the acc	ident type	223:16 hours	during the last 90 days	89:14 hours
Instruction/ night flying	total		0:55 hours	during the last 90 days	0:55 hours
Student pilot		Swiss citize	en, born 1968		
Licence		Commercia the Federal	al pilot licence helico l Office of Civil Avia	opter CPL(H) JAR, first ition (FOCA) on 2 July	issued by 1991
Essential ratin	gs	HU269, val	id till 4 April 2008		
		FI(H), valid till 6 February 2012			
		NIT(H), first issued 2 July 1991			
Medical fitnes	s certifi-	Class 1 wit March 2010	h restrictions (VDL: )	must wear spectacles)	, valid till 16
Flying hours	total		939:54 hours	during the last 90 days	101:49 hours
	on the acc	ident type	187:33 hours	during the last 90 days	0:55 hours
Night flying	total		22:01 hours	during the last 90 days	8:27 hours
	on the acc	ident type	7:51 hours	during the last 90 days	0:55 hours
Instruction	total		94:52 hours	during the last 90 days	41:50 hours
	on the acc	ident type	0:00 hours	during the last 90 days	0:00 hours
Instruction/ night flying	total		0:00 hours	during the last 90 days	0:00 hours

Location	Unterbärgetal, municipality of Burgdorf/BE			
Coordinates	610 625 / 209 140	Elev	ation 571 m	AMSL
Date and time	19 November 2009, approx. 19:55			
Type of operation	Night VFR / training flight			
Flight phase	Approach			
Accident type	Loss of control			
Injuries to persons				
Injuries	Crew	Passengers	Total number of occupants	Others
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	0	2	Not applicable
Total	2	0	2	0
Damage to aircraft	Severely damaged			
Other damage	None			

#### 1 Factual information

#### 1.1 History of the flight

#### 1.1.1 General

For the following description of the history of the flight, the recordings of radiotelephony traffic, the data from the flight instructor's portable GPS, radar data and the statements of the pilots were used. The flight took place at night under visual flight rules (night VFR). The flight was a training flight.

#### 1.1.2 Flight preparations

The flight was intended to be part of the essential night flying training for a higher licence (ATPL) for both pilots. The flight conducted in this form enabled the flight instructor and the trainee pilot to enter the flying time in their personal logbooks as night flying training.

The crew met for the planned night flight at Bern-Belp airport for a joint pre-flight briefing. The instructor had already prepared and refuelled the helicopter before-hand.

The flight planning was divided between the pilots. The tasks were carried out independently beforehand by the two crew members.

The general flight planning was carried out by the instructor, according to his own statements. On the flight plan, a take-off mass of 1879 lb, a HOGE power calculation of 2000 ft and the planned fuel of 40 U.S gal. were entered under the heading "Planning". Visibility of more than 10 km and wind at an altitude of 5000 AMSL with a direction of 230° and a speed of 20 kt were entered under the heading of "Meteo". A joint briefing was conducted after the arrival of the two crew members. At this time, visibility at Bern-Belp airport was still more than 10 km. The problematic situation of high atmospheric humidity, the forecast ambient and dewpoint temperatures for the night and the poor light conditions were addressed. At this stage the crew determined that each pilot could make a "no go" decision if he questioned the safe continuation of the flight at any time.

The joint decision was that the planned flight could in principle be carried out.

#### 1.1.3 History of the flight

On 19 November 2009 the flight instructor and his trainee pilot took off in the Schweizer 269 helicopter, registration HB-XYI, at 19:12 from Bern-Belp airport in the direction of departure point Hotel Echo Kirchberg.

The crew took their leave of the air traffic controller at 19:19. The flight continued in the direction of Kirchberg, where the first field landings were planned.

In the area of Krauchthal, the flight instructor took over the controls and flew in the direction of Unterbärgetal to show the trainee pilot the second planned field landing site. This landing site is located at an elevation of 571 m AMSL, corresponding to 1873 ft AMSL. The student pilot was familiarized with the reference points and altitudes for the intended approach through a reconnaissance circuit at an altitude of approximately 3500 ft AMSL. The instructor then flew the helicopter to the final approach and began the descent, in order to show the trainee pilot the approach axis. As discussed beforehand, the flight instructor initiated a go-around in the final approach phase at an altitude of approximately 2500 ft AMSL. After climbing to approximately 3000 ft AMSL, the trainee pilot took over the controls and the flight continued as planned towards Kirchberg.

Three approaches with subsequent landings were then carried out by the trainee pilot south-west of Kirchberg. According to the crew's statements, these took place as planned and were satisfactory.

On the flight towards Burgdorf/Oberburg, the pilots obtained the current weather report (ATIS) in Bern, which according to the trainee pilot's statements still reported a visibility of over 10 km. At 19:42, the flight instructor again made contact with Bern-Belp airport and informed the air traffic controller about the intention not to fly the helicopter back to the Bern base but to put it down overnight on the Längenberg, in the vicinity of Zimmerwald. This site is frequently used by the flying school as an alternative landing site if fog is expected to develop the following day in Bern-Belp.

After a change of heading toward the south-west, the flight instructor again took control of the helicopter in the area of Oberberg in order to demonstrate to the student pilot an initial approach to the second landing area in Unterbärgetal. According to the crew, the approach was made exactly in accordance with the procedures discussed and flown previously.



Figure 1 - Flight path of the last 5 minutes 1:50 000 (marked in red)

Blue approach: Red approach: Reconnaissance circuit Approach in the five minutes prior to the accident

The approach was initiated in the direction of Schleumen from an altitude of approximately 4000 ft AMSL, descending above the 2172 ft AMSL high "*Glööri*" ridge, in order to subsequently turn onto the base leg at the south-west end of Schleumen at approximately 3000 ft AMSL. At this altitude, a few vehicle head-lights could be discerned on the main road in the Unterbärgetal valley. Using the available light sources from the vehicles on the main road, the crew was able to determine some altitude references. The planned landing area was visually perceived as "black" meadow. The highest obstacles in the immediate approach area were at elevations of 644 AMSL or 2113 ft AMSL.



Figure 2 - Different flight paths of the two approaches - reconnaissance circuit and final phase

According to the trainee pilot, the fixed landing light was switched on after turning onto the base leg in order to check its effectiveness. Intense and pronounced reflections due to the high atmospheric humidity were noted. The elevation of the landing site was not known to the trainee pilot, according to his own statement. In this phase the crew decided to turn off the landing light and to continue the approach. Since the landing site was unknown to the trainee pilot and conditions were marginal, according to his account he began to have doubts about the impending approach and was considering a request to abandon the approach at this point. However, he trusted in the instructor's preparation and skill and decided not to express his contemplated decision to abort the flight.

The instructor decided to perform a steep approach due to the lack of light sources. The supposedly good visibility of the contours and surrounding height references prompted the pilots not to switch on the landing lights until the final approach. This final approach was initiated at approximately 19:54 with a rate of descent of 300 ft/min and at a speed of approximately 35 kt. Since no car head-lights were now visible along the main road during the final approach and since, according to the flight instructor, the necessary height references were absent, the landing light was switched on late.

After switching on the landing light, the crew realised that fog had formed at ground level, causing a loss of visibility. The instructor immediately turned the landing light off to prevent glare and then initiated a go-around. Owing to the absence of the required visual references, it was not possible to accurately estimate the height above ground anymore in this phase. According to the statement by the crew, the helicopter then made contact with the ground for the first time. HB-XYI then became airborne again for a few seconds and, according to the crew, moved uncontrollably around all axes. The flight instructor then managed to establish ground contact again after a loss of visibility and was able to set the helicopter was severely damaged in the process.

The main rotor was rotating after the landing and the engine was still running. These were disengaged and shut down respectively by the flying instructor. An inspection by the crew found that the emergency locator beacon had not been activated by the impact. The accident was reported by the crew themselves. The flight instructor and the student pilot communicated via the intercom system. The flight instructor was also wearing a helmet. Both crew members were able to exit the helicopter independently without injury. There were no indications of any of the crew suffering any health problems during the flight involved in the accident.

#### 1.2 Personnel information

1.2.1 Information on the flight instructor's flying experience

The flight instructor completed his basic training to acquire the night flying rating with Heliswiss AG. In the period from 16 April to 2 May 2007, he made six night flights, accumulating 5:42 hours with 44 landings.

His night flying experience extended over two years from the issue of the night flying rating on 18 May 2007 by the Federal Office of Civil Aviation up to the time of the accident.

In July 2007, the flight instructor flew with the HeliClass Company in Los Angeles/USA. His log book entries during this period include 7:30 hours of night flying. Within this block, two flights on 14 July 2007 of 2:30 hours between 08:15 to 11:15 were entered as night flights in the logbook, whereas the four landings were recorded under the heading "*Day*".

In relation to the scope of the night flying training in America, the instructor provided the following information: "These [the flights] were really sightseeing flights at night over Los Angeles. The training did not include any field landings or special light conditions. The artificial light over the city predominated over the natural night lighting. We climbed to approximately 1,000 feet above ground and were therefore above any obstacles. The meteorological conditions were essentially always the same; during the day it was often hazy and at night it cleared up."

After this phase, his records indicated 13:12 hours of night flying experience. On 11 November 2009, after an interruption from night flying of more than two years, he made a checkflight at night with Heliswiss AG's chief flight instructor.

The flight time was 1:45 hours. The instructor provided the following information about the flight mission: "The mission was to prepare two landing sites during the day. On this day I was at these landing sites and checked them. The mission was to conduct a night training flight with the chief flight instructor (in the role of a student pilot) with two different field landing sites."

One of the field landing sites was Unterbärgetal, the location of the subsequent accident. The second was in the region to the east of Jegenstorf. Several night landings had been carried out at both these locations.

Up to the flight involved in the accident, the flight instructor had 14:57 hours of night flying experience.

The flight involved in the accident on 19 November 2009 had a duration of 55 minutes. This was the first training flight as a flight instructor at night.

#### 1.2.2 Information on the trainee pilot's flying experience

At the time of the accident the trainee pilot was in possession of a flight instructor's rating for helicopters, but did not have a valid type rating for the type on which the accident occurred.

His 23:41 hours of night flying experience extended over 18 years from the issue of the night flying rating on 2 July 1991 by the Federal Office of Civil Aviation up to the time of the accident and was spread across six helicopter types.

He received his basic night flying training in 1991 in Rialto, California, USA.

At the time of the accident, he had logged a night flying experience of 22:46 hours and 144 landings.

During the years from 1999 to 2008 he worked as a REGA doctor at various bases and was involved in several night flight missions. This experience cannot be counted towards his flying experience. However, he stated that *"from my Rega assignments I was aware of the use of a movable landing light."* 

1.2.3 Person responsible for training at the SwissHelicopterTraining Organisation

The designated person responsible for training at the flying school was also the managing director and chief flight instructor of the flying school concerned and is considered to be a very experienced flight instructor. As a part-time job, he is an instructor in flight instructor courses and therefore has direct contact with prospective flight instructors.

To ensure a structured introduction to the activity of instruction, each aspiring instructor<sup>1</sup> must complete a personal training programme. The instructor involved in the accident had completed this programme, which does not include night flying training.

According to JAR FCL 2, in order to be able to perform flight instruction activities at night, an additional check flight must be made at night with a designated flight instructor. According to statements made by the chief flight instructor, the flight instructor performed his assigned tasks well during this check flight. He rated the latter's flying skills as very good. For the subsequent activity as a night flight instructor, the chief flight instructor imposed the following restrictions:

- No emergency procedures are to be practised.
- During night flying instruction, approaches are to be made only to those field landing sites known to the flight instructor.
- The lighting conditions for a field landing must be such that the landing site is clearly identifiable.

#### 1.3 Aircraft information

1.3.1 General information

Registration	HB-XYI
Manufacturer	Schweizer Aircraft Corp, USA
Aircraft type	269C
Characteristics	Single-engine multi-purpose helicopter with three seats. Fully articulated main rotor with three blades, conventional torque balance with exposed tail rotor, landing skids
Year of manufacture	1991
Serial number	S1538
Owner	Heliswiss Schweizerische Helikopter AG, Bern Aerodrome, CH-3123 Belp, Switzer- land

<sup>&</sup>lt;sup>1</sup> Restricted privileges according to JAR FCL 2.320B

Operator	Heliswiss Schweizerische Helikopter AG, Bern Aerodrome, CH-3123 Belp, Switzer- land
Engine	LYC HIO-360-D1A, serial number RL-9376-51A, manufactured by Lycom- ing Textron Company
Equipment	VHF COM /VHF NAV, King KX-155 Navigation GPS: Garmin GPS-90 ATC Transponder: King KT-76A ELT, KANNAD 496 AF-H 1 fixed headlight An artificial horizon was not fitted.
Operating hours	Airframe: 7655:55 hours (TSN) <sup>2</sup>
	Engine: In the maintenance record, under time since new (TSN) "UNK" is entered. 716:25 hours (TSO) <sup>3</sup>
Certificate of Registration	Issued by FOCA on 7 May 2007 / No. 7
Certificate of Airworthiness	Issued by FOCA on 7 May 2007 / valid until revoked
Last Airworthiness Review	Carried out on 9 September 2009, valid till 3 July 2011
Certification	In private use: VFR day / VFR night
	VFR day
Maintenance	The last 600-hour airframe inspection and 100-hour engine inspection were certified on 19 November 2009 by Swiss Helicopter Maintenance.

According to the crew, there were no technical defects on helicopter HB-XYI.

- 1.3.2 Night flying equipment
- 1.3.2.1 Technical Communication 02.050-40

On 16 June 2003, the Federal Office of Civil Aviation issued a Technical Communication directive (TC-D) (see Annex 1) which regulates the minimum equipment for night VFR flights. Under point 3. "Lighting and use of lighting equipment", the TC requires:

"(...)

A landing light. (...) " •

 <sup>&</sup>lt;sup>2</sup> (TSN) time since new
 <sup>3</sup> (TSO) time since overhaul

The helicopter was certified for night flight. The night flight equipment of HB-XYI included the following elements:

- A fixed landing light
- "Night lighting kit (with strobe beacon) (standard lights and anti-collision beacons are required for night flying)
- Utility light"
- 1.3.2.2 Night flight limitation according to the HB-XYI Pilot's Flight Manual

The following limitations on night flying are imposed in Section II, para. 2-2. Flight Limitations of the PFM.

- "Night flight is prohibited if the following equipment has not been installed: landing, navigation, instrument, and anti-collision lights.
- Limit night flight operations to VFR conditions.

<u>NOTE:</u> Maintain orientation through visual reference to ground objects, solely as a result of ground lights or adequate celestial illumination."

1.3.2.3 Additional equipment on the Schweizer 269C

According to the manufacturer there are various options for fitting the Schweizer 269C with a movable searchlight (see Annex 4 - Table 9-3 "Optional Equipment and Compatibility" and Figure 37 "Manually Operated Searchlight Installation Kit").

The movable searchlight can be operated manually from the cockpit.

1.3.3 Fuel

The Schweizer 269C helicopter was operated with AVGAS 100 LL grade fuel. The crew stated that there were approximately 40 US gal. of fuel on board before the flight. Calculations indicate that there were approximately 25 US gal available at the time of the accident.

#### 1.3.4 Calculation of mass

The helicopter was weighed on the day before the accident flight. The crew used the form available on the flying school's flight preparation website for the weight calculation. The newly determined empty mass had not yet been entered in the form at this time. According to the crew's flight preparation documents, the take-off mass of the helicopter on take-off from Bern-Belp was 1879 lbs.

A re-calculation using the new mass figure resulted in a mass of approximately 1900 lbs on take-off from Bern-Belp. The difference of approximately 21 lbs between the flight plan and the recalculation is attributable to the new weighing.

The maximum take-off mass for the Schweizer 269C helicopter is 2050 lbs.

At the time of the accident, the mass of the helicopter was approximately 1800 lbs.

Both the mass and centre of gravity were within the permitted limits according to the rotorcraft flight manual.

#### 1.4 Meteorological information

#### 1.4.1 General

The information in sections 1.4.2 to 1.4.5 excl. 1.4.2.3 was provided by MeteoSwiss.

- 1.4.2 Meteorological information for flight planning
- 1.4.2.1 Aviation weather forecast

Aviation weather forecast for Switzerland, valid from 12:00 to 18:00 UTC, see Annex 2.

1.4.2.2 GAFOR und GAMET

At the time of the accident there was no longer a valid GAFOR.

The GAFOR with validity 12:00 – 18:00 UTC is appended in Annex 3.

The GAMET with validity 18:00 – 24:00 UTC is appended in Annex 3.

1.4.2.3 Aerodrome weather reports (METAR)

For the flight planning period, the following aerodrome weather reports (Meteorological Aviation Routine Weather Report – METAR) were valid for the departure airport of Bern-Belp (LSZB):

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LSZB 191620Z VRB01KT CAVOK 08/07 Q1025 NOSIG=

LSZB 191650Z VRB01KT CAVOK 07/06 Q1025 NOSIG=

LSZB 191720Z VRB01KT 9999 SCT140 07/06 Q1025 NOSIG=
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In clear text, this means: on 19 November 2009, shortly before the 16:50 UTC issue time of the aerodrome weather report, the following weather conditions were observed:

Wind	Variable at 1 kt
Meteorological visibility	10 km or more
Clouds	No clouds below 5000 ft
	No significant weather phenomena, e.g. fog or mist.
Temperature/dewpoint	7 °C / 6 °C
Atmospheric pressure	1025 hPa, pressure reduced to sea level, calculated using the values of the ICAO standard atmosphere
Short-term forecast	No significant changes expected in the next 2 hours.

1.4.2.4 Terminal aerodrome forecast (TAF)

For the flight planning period and the time of the planned flight, the following terminal aerodrome forecasts (TAF) were valid for the departure airport of Bern-Belp (LSZB):

LSZB 191425 1915/1924 VRB03KT CAVOK BECMG 1919/1921 3000 MIFG NSC BECMG 1921/1924 0800 FG=

In clear text, this means: at 14:25 UTC on 19 November 2009 the following forecast was issued for Bern-Belp airport (LSZB).

15:00 UTC to 24:00 UTC

Wind Direction variable at 3 kt

Meteorological visibility 10 km or more

No cloud below 15,000 ft AGL <sup>4</sup>
Between 19:00 UTC and 21:00 UTC
Reduction in visibility to 3000 m with patches of shallow fog
No significant clouds
Between 21:00 UTC and 24:00 UTC
Reduction in visibility to 800 m with fog

1.4.3 General meteorological situation

"A flat area of high pressure centred over the Adriatic Sea determined the weather in Switzerland. Dry and very mild air masses were reaching Switzerland with moderate south-westerly high-altitude winds."

1.4.4 Weather at the time and location of the accident

The following information on the weather at the time and location of the accident is based on a spatial and chronological interpolation of the observations of different weather stations.

Clouds	1/8 at 7000 ft AMSL, 5-7/8 at 15,000 ft AMSL
Weather	Damp mist
Visibility	Approximately 5 km
Wind	No wind
Temperature/dewpoint	8 °C / 7 °C
Atmospheric pressure	QNH LSZH 1026 hPa QNH LSGG 1025 hPa QNH LSZA 1030 hPa
Hazards:	None detectable

#### 1.4.5 Aerodrome meteorological reports

At the time of the accident (approximately 18:55 UTC) the following aerodrome weather reports (Meteorological Aviation Routine Weather Report – METAR) were valid for the nearest airport Bern-Belp (LSZB):

LSZB 191820Z 10002KT 9999 FEW060 BKN160 07/07 Q1025 NOSIG=

#### LSZB 191850Z VRB01KT 9000 FEW060 BKN140 07/07 Q1025 BECMG 5000 MIFG=

LSZB 191920Z 12004KT 9000 FEW060 BKN120 07/07 Q1025 BECMG 5000 MIFG=

In clear text, this means: on 19 November 2009, shortly before the 18:50 UTC issue time of the aerodrome weather report, the following weather conditions were observed:

Wind	Direction variable at 1 kt
Meteorological visibility	9 km
Cloud	1-2 eighths at 6000 ft AAL <sup>5</sup> 5-7 eighths at 14,000 ft AAL

<sup>&</sup>lt;sup>4</sup> ft AGL feet above ground level

<sup>&</sup>lt;sup>5</sup> ft AAL: feet above aerodrome level

	Temperature/dewpoint	7 °C / 7 °C
	Atmospheric pressure	1025 hPa, pressure reduced to sea level, calcu- lated using the values of the ICAO standard at- mosphere
	Short-term forecast	Over the next 2 hours, a reduction in visibility to 5 km and the formation of patches of shallow fog were expected.
1.4.6	Astronomical information	
	Lighting conditions	Night
	Sunset	16:50 UTC
	End of civil twilight	17:24 UTC
	Last new moon	16 November 2009
	Moonset	18:34 UTC

#### 1.4.7 Observations

According to the crew's statement, after switching on the landing light during final approach it was ascertained that patches of fog had formed at ground level.

#### 1.5 Wreckage information

The landing gear and the central structure were severely deformed as a result of the helicopter's hard impact. The rear cross-member of the landing gear exhibited considerable downward bending.



Figure 3 - Bent landing gear

The tail rotor shaft exhibited serious deformation/torsion and was fractured in the area of the central structure/tail boom attachment.





The rotor protection sheet was detached from the tail boom as a result of the impact.

The tail rotor blades suffered deformation at the leading edges.

#### 1.6 Organisational and management information

- 1.6.1 Swiss Helicopter Training
- 1.6.1.1 General

SwissHelicopterTraining (SHT) is the helicopter flying school of the SwissHelicopterGroup, which is composed of a number of Swiss helicopter operators. Within this approved flight school (Flight Training Organisation - FTO) three flying schools carry out their training activities.

#### 1.6.1.2 Operation Manual

No special conditions were defined in the flying school's training manual to act as a flight instructor for night flight training. The following information was provided under the heading Staff Training:

#### "Part D: Staff Training

#### 4.0 Competence of Flying Staff

#### 4.0.1 Procedures for Training and Checking

Records and forms submitted by the FIs have to be accurate and complete. All training personnel must be aware of the training objectives. Training personnel are chosen and trained very carefully. It is essential that they are fully aware of their responsibilities and the training objectives to be reached, and the importance of achieving and maintaining the highest standards.

All instructors should do their best to establish a good working relationship with each student to create a comfortable and cooperative learning environment. (...)

4.0.2 Planning of Training

The HT is responsible for the planning of all required training and checking. The training and checking schedule is arranged with the FI s."

- 1.6.2 HeliClass, Los Angeles, USA
- 1.6.2.1 General

HeliClass is a helicopter flying school based at Van Nuys airport, California, USA, north of Los Angeles.

During the investigation, it was not possible to establish contact with the flying school in November 2010 as it was apparently no longer active. The relevant training records for the night flight training of the pilots concerned were requested from the competent authority in America. None were received.

#### 2 Analysis

#### 2.1 Technical aspects

2.1.1 General

There is no evidence for any technical defects which might have caused or influenced the accident.

- 2.1.2 Night flight equipment facilitate
- 2.1.2.1 Landing light

The helicopter was equipped with a fixed landing light which impeded the crew's ability to illuminate the landing area during a reconnaissance flight. Illumination of the terrain should reasonably be performed with a movable spotlight.

A swivel-mounted landing light is very useful in order to carry out a well-planned approach in a helicopter at night with a subsequent field landing. The intended landing site can thus generally be illuminated from a safe altitude during the reconnaissance to assess the landing zone, any obstacles, weather phenomena, etc. In the present case, it would very probably have been possible to identify the patches of fog earlier.

In the helicopter manual for the Schweizer Model 269C helicopter, various landing light systems area described as options under "Optional equipment".

2.1.2.2 Federal Office of Civil Aviation (FOCA) Technical Communication

The minimum equipment required for helicopter night flights in Technical Communication TC 02.050-40 does not take sufficient account of the requirements for field landings.

For safety reasons, the Technical Communication should make a distinction between helicopters and fixed-wing aircraft with regard to lighting and operation of lighting equipment. The technical design of a landing light for field landings at night could then be defined in more detail. It seems appropriate for the Technical Communication or possibly the design regulations to be worded more precisely and to be revised.

The installation of an artificial horizon would also be reasonable for night flights.

#### 2.2 Human and operational aspects

#### 2.2.1 General

The flight mission planned by the crew, with field landings on the terrain, was too demanding and not appropriate given the current level of training and experience of the two crew members. In addition, the minimal technical equipment of the helicopter for such a night flight had a negative effect and made the execution of the flight more difficult.

#### 2.2.2 Flight preparations

The flight preparations carried out for the planned flight were only partially suitable for the given conditions. This was limited primarily to an assessment of the meteorological conditions. However, they lacked, for example, written documentation for the preparation for the two field landings, from which, for example, the elevation of the landing site, the possible approach axes, planned altitudes, obstacles, etc. would have been apparent. Nor could any clear night flight procedures be elicited from the crew during the investigation. The elevation of the second landing site was not known to the student pilot. This eliminated the possibility of drawing attention to a descent of the helicopter below the minimum height during the approach. The crew were, however, aware that they only had a low power reserve for the landing and a possible go-around.

#### 2.2.3 Execution of the night flight

This was the first night training flight for the flight instructor. He had approached the subsequent accident site in Unterbärgetal at night during his check flight.

The flight instructor had neither the necessary night flying experience nor the necessary training in order to safely carry out the envisaged training flight with field landings under the prevailing conditions. In addition, the crew had obviously realised that there was a significant possibility of fog formation.

Given the prevailing light conditions, the approach to the proposed field landing site in Unterbärgetal was inappropriate. There were no artificial light references in the entire valley. The lights of cars travelling on roads cannot be used as a reliable reference. The last new moon was on 16 November 2009. On 19 November 2009, the thin crescent moon had already set below the horizon at 19:34. The terrain was therefore no longer illuminated by the moon and the general natural lighting from the stars was very low. In its pilot's flight manual, the manufacturer of the helicopter states that orientation on night flights must be carried out using only visual references in the form of artificially illuminated objects on the ground or adequate stellar lighting.

From the flight preparation the crew was aware of the challenging weather situation on the day of the accident. They obviously realised that visibility was not optimal and that fog might form during the flight. The pilots decided during the flight to park the helicopter overnight on the Längenberg.

Before the flight, the crew agreed that they would mutually decide to abort the flight in the event of the deteriorating weather conditions. Consistent implementation of this good intention would have had a positive impact on the flight. The approach should have been aborted earlier.

#### 2.2.4 Training aspects

According to the approved training manual of Swiss Helicopter Training (SHT), at the time of the accident no special conditions were defined for the responsible flight instructor in relation to personal night flying experience for the exercise of a

night training flight . Only a check flight with the chief flight instructor was required before the first training flight.

After completion of the check flight, it was up to the chief flight instructor to assess whether the flight instructor could be deployed for the intended training activities.

It seems sensible to limit training activity in the initial phase to lighted aerodromes with. This restriction would certainly also take better account of the helicopter's minimal night flying equipment.

One measure taken immediately after the accident by Swiss Helicopter Training (SHT) was a revision of the operation manual, defining more precisely the preconditions and necessary night flying experience for an instructor (see Section 4.2).

#### 3 Conclusions

#### 3.1 Findings

- 3.1.1 Technical aspects
  - There are no indications of any pre-existing technical defects which might have caused or influenced the accident.
  - The helicopter was equipped with a fixed landing light. There was no artificial horizon installed.
  - The minimum equipment required for helicopter night flights in Technical Communication TC 02.050-40 does not adequately address the requirements for field landings at night.
  - The last 600-hour inspection and 100-hour engine inspection were certified by Swiss Helicopter Maintenance on 19 November 2009.

#### 3.1.2 Crew

- The crew were in possession of the necessary licences for the flight.
- At the time of the accident the student pilot was in possession of a flight instructor's rating for helicopters, but did not have a valid type rating for the type on which the accident occurred.
- There are no indications of the flight instructor or the student pilot suffering any health problems during the accident.
- The flight instructor had little night flying experience.
- This was the flight instructor's first night training flight in the capacity of a flight instructor.

#### 3.1.3 Operational aspects

- Both the mass and centre of gravity were within the permitted limits according to the rotorcraft flight manual. The helicopter had little reserve power for a landing and a possible go-around.
- The flight instructor had approached the accident site in Unterbärgetal at night during his check flight.
- The flight mission planned by the flight instructor, with field landings on the terrain, was too demanding and not appropriate given the current level of training of the two crew members.
- The flight preparations carried out for the planned flight were only partially suitable for the given conditions.
- The instructor did not follow clear night flight procedures.
- The elevation of the second landing site was not known to the student pilot.
- The approach should have been aborted earlier.

#### 3.1.4 Flying school

- Definition of the training stages, requirements and conditions for exercising the function of a night flight instructor were minimal.
- 3.1.5 General conditions
  - The flight took place at night.
  - Visibility was approximately 5 km in mist with local fog patches.
  - There was no wind.
  - The temperature was 8 °C and the dewpoint was 7 °C.
  - The light conditions at the site of the accident were marginal.

#### 3.2 Cause

The accident is attributable to the fact that during a field landing at night in a helicopter a loss of control occurred and the helicopter then collided with the terrain.

The following factors contributed to the accident:

- Inappropriate choice of a field landing site at night in relation to the prevailing conditions.
- The crew's limited night flying experience.
- Inappropriate approach procedures to a field landing site at night.
- The helicopter's marginal technical equipment for field landings at night.
- Minimal definition of the training stages, requirements and conditions in the training manual of the flight school for exercising the function of a night flight instructor.

#### 4 Safety recommendations and measures taken since the accident

#### 4.1 Safety recommendations

None.

#### 4.2 Measures taken since the accident

- 4.2.1 Flight Training Organisation (FTO)
- 4.2.1.1 Safety Bulletin

In a safety bulletin 1.2010, the following information and recommendations, including the following, were published by the flying school concerned in Safety Bulletin 1/2010.

#### "1. Hard Landing during Night Training Flight

The crew of two flight instructors were carrying out a night training flight in a Schweizer 300C. The flight instructor on the pilot's seat did not have a valid type rating and the intention was to gain night flying experience. It was a very dark night with no moon. It was decided to not necessarily make field landings but to do a navigation flight and, provided conditions were good, to carry out a few landings. The pre-flight briefing also included a discussion of the decision making process before the landing. Each pilot should have the right to call for a goaround if he felt uncomfortable with the approach or the landing site. Approximately ten minutes after take-off, the first possible landing spot was overflown. The landing spot was known to the instructor because he had landed during his night checkflight on that very spot. First, the crew continued to a spot in the vicinity of the highway where a few landings were carried out un-eventfully. Then they returned to the first landing spot that was situated in a valley, and made an approach there. Because the air was very moist and the landing light was dazzling, the flight instructor decided to use it only on short final. A road that was taken as a reference was unlighted and no cars were passing. When the flight instructor felt that he was low enough, he switched on the landing light. However, the helicopter was already very close to the ground and there were patches of fog in the valley and above the landing spot. When the landing light was switched on, the flight instructor was blinded by the dazzling glare of the light reflected by the fog and had to switch it off completely. Control of the helicopter was lost in the ensuing complete darkness. Although initiating a go around, the helicopter touched the ground and then spun in the air, crossed a creek with a few trees, then crossed back into the open field where it hit the ground hard but came to a halt in an upright position. There was extensive damage to the landing gear, the tail rotor drive shaft was severed and the tail rotor blades were broken due to ground contact."

The details were complemented by the following recommendations:

#### "Recommendations:

- Beware of dark nights with little or no ground references (black hole approach!). Especially car lights on roads make very unreliable references (move and disappear).

- Be especially aware of temperature/dewpoint spread – fog may build rapidly especially in valleys.

- Never attempt an approach without landing light. Landing light must be on during final approach."

#### 4.2.1.2 Operation Manual

The FTO's Operation Manual was amended and amended by the flying school for safety reasons as follows (Rev. 03/28.02.2010):

"Night Flying Restrictions

Before starting to conduct training flights with a student, a flight instructor must meet the following requirements:

- Checkflight by a F II
- 500 hours of instruction in helicopters
- 10 hours of night flying in helicopters

Before starting to conduct field landings at night or landings on unlighted airfields, the flight instructor shall meet the following requirements:

- 20 hours of night flying instruction with a student without field landings (lighted heliport/airfield to lighted heliport/airfield)
- Checkflight by F II appointed by the H/T

Field landings at night shall be conducted to known landing spots only."

Payerne, 28 February 2012

Swiss Accident Investigation Board

This final report was approved by the management of the Swiss Accident Investigation Board SAIB (Art. 3 para. 4g of the Ordinance on the Organisation of the Swiss Accident Investigation Board of 23 March 2011).

Berne, 3 April 2012

Bundesamt für Zivilluftfahrt (BAZL)
Office fédéral de l'aviation civile (OFAC)
Ufficio federale dell'aviazione civile (UFAC)
Federal Office for Civil Aviation (FOCA)
Maulbeerstrasse 9, 3003 Bern



#### Technische Mitteilung Richtlinie

TM 02.050-40

Gegenstand:	Mindestausrüstung für Sichtflüge bei Nacht
Gesetzliche Grundlagen:	Art. 14 VLL (SR748.215.1); Art. 6.8 VBR 1 (SR 748.127.1); Art. 3 VJAR-OPS 1 (SR 748.127.8) ; Anhang 4 VVR (SR 748.121.11)
Ausgabestand:	16.06.2003 (neues Layout : 31.01.2004)
Verfasser:	Prozess Lufttüchtigkeit und Register
Genehmigt :	Samuel Wenger, Prozessleiter

#### 1. Allgemeines

Für die Zulassung zu Nachtsichtflügen müssen Flugzeuge, Helikopter, Luftschiffe und Ballone nebst der nach den Lufttüchtigkeitsanforderungen und den Anforderungen im Baumusterzeugnis vorgeschriebenen Grundausrüstung auch die unter Ziffer 2 und 3 aufgeführte Ausrüstung aufweisen.

Für Motorsegler mit laufendem Motor gelten die Bestimmungen für Flugzeuge (analog zu Art. 3 VVR; SR 748.121.11).

#### 2. Übermittlungs- und Navigationsanlagen

2.1 Ein VHF-COM Sender / Empfänger mit midestens 760 Kanälen (25 kHz Kanalabstand im Frequenzbereich 118.000 bis 136.975 MHz). Mindestleistung Grossflugzeuge 16 W (Watt) Kleinflugzeuge, Helikopter, Luftschiffe und Ballone 5 W.

Zulassungsbasis: - TSO-C37 / JTSO-2C37 ( ) - TSO-C38 / JTSO-2C38 ()

#### 2.2 Ein Navigationssystem (ein VHF-NAV oder ein ADF oder ein GPS)

Die VHF-NAV Empfangsanlage mit Anzeigegerät muss im Frequenzbereich 108.000 bis 117.950 MHz, mit durchgehend in Abständen von 50kHz schaltbaren Kanälen ausgerüstet sein. Zulassungsbasis:

- TSO-C40 / JTSO-2C40 ( )

- TSO-C36 / JTSO-C36 ( )

Die ADF Empfangsanlage mit Anzeigegerät muss im Frequenzbereich 200 bis 1699 kHz ausgerüstet sein. -TSO-C41 / JTSO-2C41 () Zulassungsbasis:

Die GPS Empfangsanlage kann mit integrierter oder mit separater Anzeige verwendet werden. Zulassungsbasis: -TSO / JTSO-C129 ( )

#### 3. Beleuchtung und Lichterführung

Luftfahrzeuge müssen gemäss der Verordnung über die Verkehrsregeln für Luftfahrzeuge (VVR; SR 748.121.11, Anhang 4) ausgerüstet sein. Die Ausrüstung muss zusätzlich beinhalten:

- Einen Landescheinwerfer. Für Ballone einen Handscheinwerfer, der eine genügende Ausleuchtung des Landeplatzes erlaubt.
- Für Flugzeuge, Helikopter und Luftschiffe eine regulierbare Beleuchtungsanlage für alle Instrumente und Ausrüstungen, welche die Flugbesatzung für die Führung benötigt.
- Eine elektrische, bordnetzunkabhängige Handlampe am Arbeitsplatz jedes Besatzungsmitgliedes.

31.01.2004

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#### TM 02.050-40

#### 4. Gewerbsmässige Sichtflüge bei Nacht

Sollen Flugzeuge und Helikopter für gewerbsmässige Sichtflüge bei Nacht zugelassen werden, muss die Mindestausrüstung gemäss Art. 6.8 der Verordnung über die Betriebsregeln im gewerbsmässigen Luftverkehr (VBR 1) erweitert werden. Die Erweiterung der Mindestausrüstung von Luftfahrzeugen, die in einem JAR OPS Flugbetrieb eingesetzt werden, richtet sich nach den entsprechenden Anforderungen. Die Erweiterung der Mindestausrüstung von Luftschiffen und Ballonen wird im Einzelfall festgelegt.

#### 5. Verschiedenes

5.1 Die Geräte unter Abschnitt 2 müssen vom BAZL in der Zulassungsklasse 1, 2 oder 3 zugelassen sein oder eine JTSO Zulassung besitzen.

Für Ballone dürfen nicht zugelassene tragbare GPS verwendet werden.

5.2 Die Anforderungen betreffend Immunität gegen FM-Interferenzen gemäss ICAO Annex 10 sind in der TM 20.000-11 festgelegt.

5.3 Die unter Ziffer 2, 3 und 4 erwähnten Ausrüstungen und deren Einbau müssen den anerkannten Luftfüchtigkeitsanforderungen entsprechen (GPS Systeme müssen fest eingebaut sein). In Ballonen können die Übermittlungs- und Navigationsanlagen als portable Geräte verwendet werden.

5.4 Eine Liste der zugelassenen Geräte kann gegen Gebühr beim BAZL, Prozess LT, Registerbüro bezogen oder im Internet <u>http://www.aviation.admin.ch</u> eingesehen werden.

\*\*\* ENDE \*\*\*

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#### Anhang

#### Flugwetterprognose vom 19.11.2009, 12 - 18 UTC

Flugwetterprognose fuer die Schweiz fuer Donnerstag 19. November 2009, gueltig von 12 bis 18 UTC Herausgegeben von der MeteoSchweiz

Allgemeine Lage:

Ein flaches Hochdruckgebiet mit Zentrum ueber der Adria bestimmt das Wetter in der Schweiz. Mit maessigen suedwestlichen Hoehenwinden gelangen trockene und sehr milde Luftmassen zu uns, ueber dem Mittelland hat sich auf etwa 2500 ft/msl eine Inversion ausgebildet, welche sich am Nachmittag abschwaecht.

Wolken (Menge, Basis, Obergrenze), Sicht, Wetter:

Alpennordseite, Wallis und Graubuenden: Im Mittelland zunaechst noch ausgedehnte Nebel-, gegen Westen hin auch tiefe Hochnebelfelder. Obergrenze im Osten um 2000 ft/msl, im Westen 2500 bis 3200 ft/msl. Im Laufe des Nachmittags weitgehend Aufloesung. Darueber und in den uebrigen Regionen heiter. Am Nachmittag vor allem in der westlichen Landeshaelfte einige Ci/Cs. Sicht nach Nebelaufloesung im Mittelland um 7 km, sonst ueber 10 km.

Alpensuedseite: Im Suedtessin 3-5/8 mit Basis um 3500 ft/msl, weitere Aufloesung am Nachmittag. Sonst meist heiter. Sicht im Suedtessin zunaechst um 8 km, sonst ueber 10 km.

Wind und Temperatur Alpennordseite

HOEHE	GRAD/KT	TEMP	
GROUND	variabel m	nit 2-5	kt
05000FT	230/020	PS12	
10000FT	250/025	PS02	
18000FT	230/030	MS16	
30000FT	240/025	MS44	
39000FT	240/015	MS61	
53000FT	280/015	MS65	
FT	/	MAXIMALWIND	
42000FT	TROPOPAUSI	E MS63	
11000FT	NULLGRADGRENZE		

Gefahren

Unfallbericht HB-XYI.doc

im Mittelland zu Beginn noch teils schlechte
Sichtverhaeltnisse und tiefe Basis
am Jura und den noerdlichen Voralpen entlang etwas
Suedwestwindturbulenz

Wetterentwicklung bis Mitternacht

Allmaehlich im Mittelland wieder Neubildung des Bodennebels mit Obergrenze 2000-2500 ft/msl, sonst keine wesentliche Aenderung.

Fuer Flugvorbereitungen konsultieren Sie bitte die Routenvorhersage GAFOR Schweiz auf der Telefonnummer 0900 162 120 (zu 1.-/Minute) =

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## SCHWEIZER AIRCRAFT CORP. Model 269C Helicopter

## Optional Equipment Pilot's Flight Manual

Equipment	Part No.	Notes and Non-compatibilities	
Lighting Group:		* Denotes supplemental publication	
Night flying kit, 12-volt	269A4838-5	Not compatible with:	
	- D	Night flying kit 269A 4838-9	
Night flying kit, 24-volt	269A4838-7		
Night flying kit, 24-volt	269A4838-9	NOTE: Night Flying kit 4838-9 effects 269C Helicopter serrial numbers 0120 and subsequent aircraft.	
Utility light, 12 or 24-volt	269A4191		
Strobe light, 12-volt	269A4935-3		
Strobe light, 24-volt	269A4935-1	NOTE: Must have 24-volt power source	
Searchlight, 12-volt	269A4333-3	Not compatible with:	
		SX-10 light269A4334Searchlight, 4335-1Searchlight4335-13Searchlight4335-45	
Searchlight, 12-volt	269A4333-21		
Searchlight, 12-volt	269A4333-27	×	
Searchlight, 24-volt	269A4333-29	NOTE: Must hve 24-volt power source.	
Scarchlight, 24-volt	269A4333-39	NOTE: Must have 24-volt power source.	
Searchlight, 24-volt (SX-10) with dual alternators	269A4334	Not compatible with:	
		Searchlight269A4335-1Searchlight4335-1Searchlight4335-4	

#### Table 9-3. Optional Equipment and Compatibility

Reissued: 21 September 1988

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#### MODEL 269 SERIES ACCESSORIES AND KITS



Figure 37. Manually Operated Searchlight Installation Kit, 269B and 269C

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