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Swiss Transportation Safety Investigation Board STSB

Final Report no. 2441

by the Swiss Transportation Safety Investigation Board STSB

concerning the accident of the helicopter Bell 505 Jet Ranger X, HB-ZWF,

on April 10, 2025

Petersgrat mountain landing site (LSVP), Municipality of Kandersteg (BE)

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General information on this report

The sole purpose of an investigation of an aircraft accident or serious incident is to prevent further accidents or serious incidents from occurring. It is expressly not the purpose of the safety investigation and this report to establish blame or determine liability.[1]

Should this report be used for purposes other than those of accident prevention, this statement should be given due consideration.

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

All information, unless otherwise indicated, relates to the time of the accident.

All times in this report, unless otherwise indicated, are stated in Local Time (LT), valid for the territory of Switzerland, which corresponded to Central European Time (CET) at the time of the [accident/serious incident]. The relation between LT, CET and Coordinated Universal Time (UTC) is:
LT = CET = UTC + 2 hour.

[1] Article 3.1 of the 13th edition of Annex 13, effective from 28 November 2024 to the Convention on International Civil Aviation of 7 December 1944, which came into force for Switzerland on 4 April 1947, as amended on 28 November 2024 (SR *0.748.0*).

Article 24 of the Federal Aviation Law of 21 December 1948, as amended on 1 January 2025 (CAA, SR *748.0*)

Article 1, point 1 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, which came into force for Switzerland on 1 February 2012 pursuant to a decision of the Joint Committee of the Swiss Confederation and the European Union (EU) and based on the agreement of 21 June 1999 on air transport between Switzerland and the EU (Air Transport Agreement)

Article 2, paragraph 1 of the Ordinance of 17 December 2014 on the Safety Investigation of Transportation Incidents, as amended on 1 January 2025 (OSITI, SR *742.161*)

Summary

Aircraft type	Bell 505 Jet Ranger X	HB-ZWF
Operator	Mountain Flyers 80 Ltd., Flugplatzstrasse 9, 3123 Belp	
Owner	Centaurium Aviation AG, Girardstrasse 61, 2540 Grenchen	

Examiner	Swiss national, born in 1987			
Licence	Commercial Pilot Licence Helicopter (CPL(H)) according to the European Union Aviation Safety Agency (EASA), issued by the Federal Office of Civil Aviation (FOCA)			
Flying experience	**Total**	3,503:29 h	**During the last 90 days**	127:26 h
	On the type involved in the accident	765:13 h	**During the last 90 days**	24:14 h

Pilot	Swiss national, born in 1991			
Licence	Commercial Pilot Licence Helicopter (CPL(H)) issued by the FOCA			
Flying experience	**Total**	516:30 h	**During the last 90 days**	7:22 h
	on the type involved in the accident	177:18 h	**During the last 90 days**	6:11 h

Location	Petersgrat mountain landing site (LSVP) , Municipality of Kandersteg (BE)		
Coordinates	629 639 / 146 262 (*Swiss Grid* 1903) N 46° 28’ 01’’ / E 007° 49’ 28’’ (WGS[2] 84)	**Altitude**	3,123 m/M
Date and time	on April 10, 2025 , 10:20		

Type of operation	Training
Flight rules	Visual Flight Rules (VFR)
Point of departure	Bern Airport (LSZB)
Destination	Bern Airport (LSZB)
Flight phase	Landing
Type of accident	Loss of control on ground (LOC-G)

Injuries

Injuries	Crew members	Passengers	Total number of occupants	Third parties
Fatal	0	0	0	0
Serious	1	1	2	0
Minor	1	0	1	0
None	0	0	0	Not applicable
Total	2	1	3	0

Damage to the aircraft	Destroyed
Third-party damage	None

[2] WGS: *World Geodetic System*, geodetic reference system: The WGS 84 standard was adopted for aviation by a resolution of the International Civil Aviation Organization *(*ICAO) in 1989.

1 Factual information

1.1 Flight preparation and history of flight

1.1.1 General information

The following description of the pre-flight history and the course of the flight is based on information provided by the flight crew and the recordings from the onboard navigation instruments.

This was a flight was conducted as a Recurrent Mountain (H) Proficiency Check (MOR), pertaining to landings at altitudes above 1,100 m AMSL[3] .

1.1.2 Pre-flight history

On the morning of the accident, the pilot performed the pre-flight inspection of the Bell 505 helicopter, registered as HB-ZWF, at Bern Airport (LSZB). He did not identify any defects on the helicopter.

The flight instructor/examiner and the pilot then met to prepare for the planned flight. The first part of the flight consisted of a Licence Proficiency Check (LPC) on the type B505 for the regular assessment of the pilot's competencies for licence revalidation, including a landing and engine shutdown to pick up a passenger in the Kandergrund (BE) region. The second part of the flight consisted of a recurrent proficiency check regarding landings in mountainous terrain above 1,100 m AMSL, with planned landings below 2,000 m AMSL in the region west of Kandersteg (BE) on the Obere Allme and mountain landings above 2,000 m AMSL at the designated mountain landing sites Blüemlisalp (LSYB) and Petersgrat (LSVP). The crew discussed the meteorological data, the center of gravity position—which was within permissible limits—and the performance calculation. The latter indicated a mass reserve of approximately 95 kg for a hover flight out of the ground effect (Hover Out of Ground Effect – HOGE) at the time of the accident.

1.1.3 History of flight

At 9:05 a.m., the crew took off from Bern Airport (LSZB) in the HB-ZWF, following the designated helicopter departure route towards the west. En route to the planned off airfield landing site in the Kandergrund (BE) region, the exercises required for the LPC were carried out. The flight concluded with an off airfield landing and the shutdown of the turbine. A debriefing was conducted, after which the LPC was assessed as successfully completed.

After a short break and the boarding of a passenger, the flight continued at 9:50 as a MOR check in the direction of Kandersteg. The landings on the Obere Allme and a subsequent landing at the Blüemlisalp mountain landing site were completed without incident.

At approximately 10:12, the crew departed from Blüemlisalp toward the Petersgrat mountain landing site. After a flyover approaching from the north, they made an initial approach in a north-northwesterly direction (see Figure 1 , Position ❶), followed by a landing (Position ❷).

This landing was performed without forward speed from a hover. After a brief settling of the skids—which were equipped with anti-sink protection (*Bear Paws*) at the rear—the helicopter was fully unloaded onto the snow. This was followed by a debriefing of the approach with the rotor still running. The crew reported that the chosen approach was affected by terrain-induced wind turbulence and that the final phase of the approach prior to hovering was too low and too slow. The crew

[3] AMSL: *Above Mean Sea Level*

therefore decided to practice a second approach to the Petersgrat. This was executed in a northeasterly direction (position ❸). During the final approach, the crew considered using the so-called no-hover landing technique, which involves progressively reducing the airspeed to a walking pace, with the intention of touching down in the landing zone at minimal forward velocity. According to statements from both pilots, the second approach was stable, flown at the correct approach angle, and at an appropriate speed. At 10:20, the landing was carried out at a low forward speed (walking pace) and without prior hovering onto the snowfield of the Petersgrat, approximately 75 meters northwest of the position of the first touchdown point (position ❹).

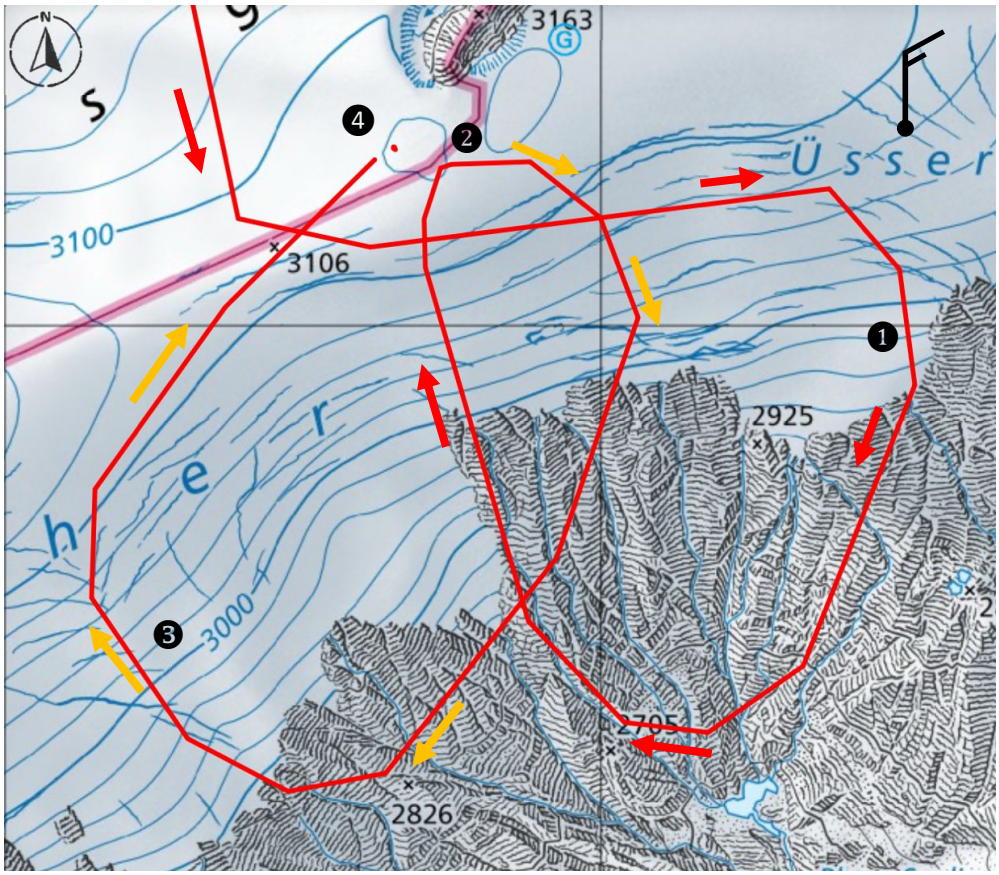

Figure 1 : Depiction of the final segment of the flight path of HB-ZWF. ❶ represents the trajectory of the first approach to Petersgrat, followed by a landing from a hover ❷. The trajectory of the second approach is shown as ❸, followed by the landing and the final position of the wreckage ❹. Source of the base map: Swisstopo, processed by the STSB.

Shortly after the skids touched the snow surface, the right skid sank into the snow. The helicopter then began a rapid and accelerating rolling motion to the right around its longitudinal axis (dynamic rollover). At this point, the flight instructor took control of the helicopter and attempted to stop the rolling motion by applying full left cyclic input and rapidly lowering the collective pitch lever. These actions were unsuccessful. Within 3 seconds, the recorded bank angle changed from approximately 1.7° to the left to approximately 31.8° to the right (see Figure 2).

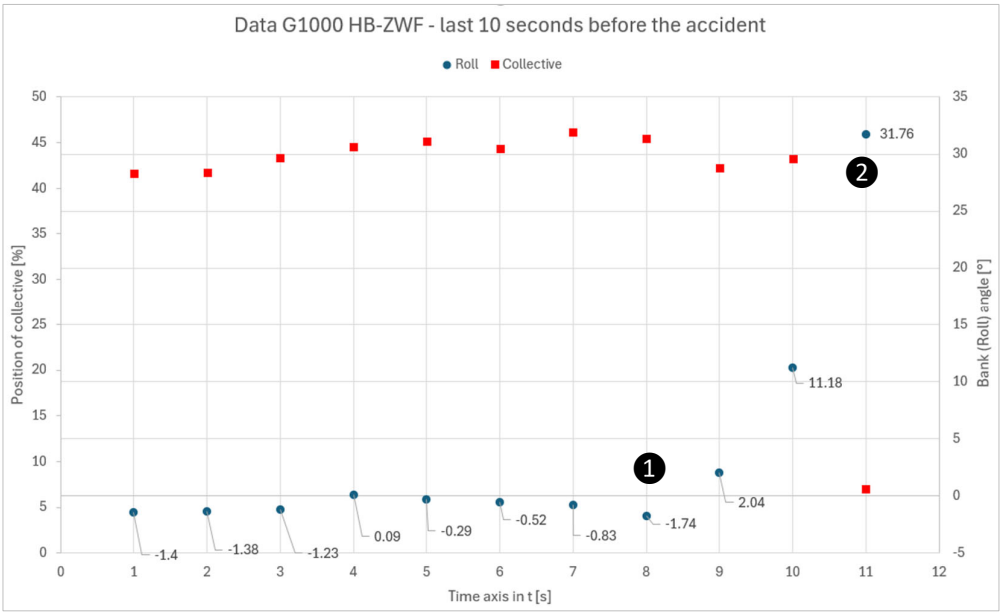

Figure 2 : Excerpt of the last 10 seconds before the accident from the recordings of the onboard navigation instruments. The bank angle in degrees is shown with blue dots; the position of the rotor blade pitch (collective) in % is shown with the orange dotted line. At ❶, the bank angle begins to change; ❷ corresponds to the last recorded data point for the bank angle.

During the unique rollover to the right and the subsequent impact of the rotor system with the ground, parts of the rotor blades, the center section of the left landing gear, and the left side of the cabin were damaged. The flight instructor and the passenger seated in the middle of the rear passenger row each sustained serious injuries to their left arms. The pilot shut down the turbine, helped the two injured individuals exit the helicopter, and then notified emergency services.

The Emergency Locator Transmitter (ELT) was activated by the impact. A small amount of operational fluids leaked out. No fire broke out.

1.2 Findings at the scene of the accident

The helicopter came to rest on its right side. Both left doors were destroyed. The tail boom was torn off at the upper two bolted connections to the fuselage. The right horizontal stabilizer was also torn off, and the tail boom behind it was slightly bent.

The rotor mast was fractured above the main gearbox. The main rotor, with most of its rotor blades detached, lay about 20 meters from the wreckage. A large fragment of a rotor blade was embedded in the snow immediately adjacent to the cockpit, with one end in contact with the cockpit windshield. A smaller piece of a rotor blade was found near the tail boom. Another piece of a rotor blade, approximately one meter in length, was found later several hundred meters to the northeast, toward Kanderfirn.

A section of approximately 20 cm from the mid-section of the left skid tube was missing. Both Bear Paws were rotated slightly inward; however, they could not be manually rotated on the skid tube.

The snowpack consisted of a breakable crust (see chapter 1.5.4).

Figure 3 : Final position of the HB-ZWF with damaged left skid ❶ (red circle); parts of the main rotor blade ❷.

1.3 Aircraft information

1.3.1 General information

The Bell 505 Jet Ranger X is a single-engine, five-seat turbine helicopter. The helicopter is equipped with a skid landing gear and a conventional tail rotor with non-hydraulically assisted control. Viewed from above, the two-bladed main rotor rotates counterclockwise, and its control is provided by hydraulically assisted control rods.

The helicopter was equipped with an Arrius 2R shaft-driven engine manufactured by Safran Helicopter Engines. The engine had a takeoff power of 522 shp ([4]).

The HB-ZWF was manufactured in 2020 and imported into Switzerland. The helicopter was equipped with a low skid-type landing gear featuring anti-sink protection (Bear Paws) mounted on both sides.

1.3.2 Recording devices

The helicopter was equipped with two multifunctional displays manufactured by Garmin. With this system, various flight and system parameters are recorded every second onto memory cards (Secure Digital Cards – SD cards). The SD cards could be read out after the accident. The position of the collective pitch lever is stored in a proprietary Bell file, which is encoded in binary format by the manufacturer[5]. Bell did not provide the data and cited technical difficulties as the reason. The avionics manufacturer provided the processed data to the STSB for the accident investigation at the end of April 2026, after he had received all the definitions of Bell coding.

1.3.3 Main Gearbox mounting and stabilization structure

On the Bell 505, the main rotor and the gearbox are connected to the airframe via the Pylon Support Structure. This uses a so-called “Live Mount” suspension to dampen rotor vibrations. The main rotor and the gearbox can move both up and down along the vertical axis as well as around the lateral and longitudinal axes (see Figure 4).

[4] shp: *shaft horsepower*, an Anglo-Saxon unit for measuring shaft power (1 shp equals 0.746 kW)

[5] The data are stored in the Central Maintenance Computer (CMC) log file and can be downloaded using a maintenance procedure. Subsequently, the data must be converted by the manufacturer into a readable format.

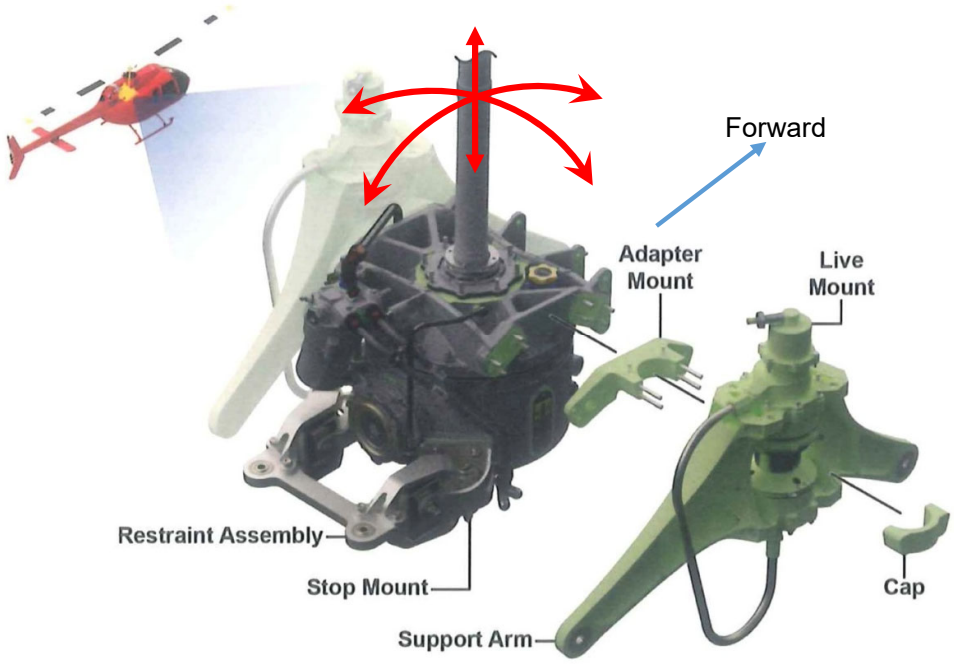

Figure 4 : Schematic representation of the gearbox's pylon support structure with Live-Mount vibration damping technology. The degrees of freedom are indicated by the red arrows. Source: B505 Pilot Ground and Flight Procedures, System description – Bell Helicopter Textron, edited by the STSB.

The control rods of the main rotor blades (pitch links) are connected via the swashplate to the hydraulic cylinders, which in turn are connected to the control levers in the cockpit. Unlike the main gearbox, the entire control system up to the swashplate is rigidly attached to the airframe.

The STSB observed on another B505 helicopter that when the main gearbox moves, the pitch links also move. This results in a change of the pitch angle of the main rotor blades (see Figure 5).

The manufacturer has confirmed the observed movements of the pitch links in connection with the type-specific flexible main gearbox mounting. The manufacturer determined the effects of these movements during flight tests and static tests and described them as minimal.

The manufacturer was unable to provide a more precise answer as to whether this is also the case when a skid is in contact with the ground, for example during take-off or landing. The manufacturer assumes that any necessary corrections by the pilots should be minor.

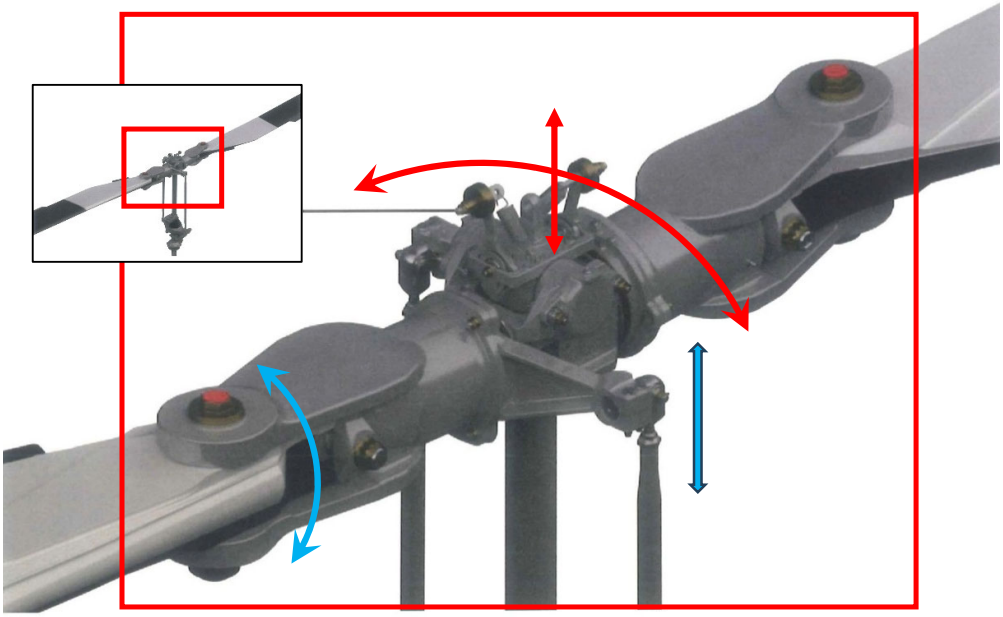

Figure 5 : Schematic representation of the rotor head. The blue arrows indicate the movements of the pitch links and the resulting change in the pitch angle of the rotor blades, which are induced by the movements of the main gearbox (red arrows). This change in the pitch angle of the rotor blades alters their lift. Source: B505 Pilot Ground and Flight Procedures, System description – Bell Helicopter Textron, edited by the STSB.

The manufacturer Bell confirmed that movements of the gearbox can induce control inputs.

According to the manufacturer, the control coupling is designed to ensure that the movement of the main rotor and gearbox does not generate control inputs that could cause the rotor system to enter an unstable state. In some cases, a compensating control input is generated to ensure stability. During the development and certification of the Bell 505, extensive analyses, pylon pull tests, and flight tests were conducted to validate this assessment. In the event of a rolling motion of the main rotor and gearbox, the manufacturer does not expect the pilot to need to make corrective control inputs. If so, these should be very minor.

The flight manual contains no information regarding this type-specific main gearbox mounting or its effect on the control characteristics and handling of the B505 helicopter.

1.4 Medical and pathological information

Neither the crew nor the passenger were wearing a pilot's helmet.

The flight instructor, who was seated in the front left seat, sustained a fracture of the left arm and a large open wound as a result of a broken rotor blade striking the left side of the cabin.

The passenger, who was seated in the middle of the rear bench, also sustained a fracture of the left arm.

The pilot in the front right seat sustained minor injuries.

1.5 Meteorological information

1.5.1 General weather conditions

An extensive high-pressure system centered over the British Isles dominated the weather over Central Europe. A weak Bise wind brought dry and increasingly warmer air to Switzerland.

1.5.2 Weather at the time and location of the accident

The following weather data for the time and location of the accident are based on data from the Sackhorn weather station, located 6 km to the southwest with a similar exposure, as well as three other mountain stations[6] .

Weather /clouds	Sunny, with very clear cirrus clouds (more than 70% direct solar radiation in Blatten)
Visibility	70 km according to observations from the Jungfraujoch
Wind	North wind at 15 knots with gusts up to 25 knots
Temperature / dew point	- 4 °C / -15 °C[7]
Atmospheric pressure (QNH)	QNH[8] , LSGS: 1024 hPa
	QFE[9] and density altitude: 696 hPa and 2910 m/M
Hazards	None reported or apparent

1.5.3 Astronomical information

Position of the sun	Azimuth: 118°	Altitude: 34°
Light conditions	Day	

1.5.4 Information on the snowpack

At the accident site, the topmost layer of snow was described as hard, brittle, and fragile. Such a layer is referred to as a crust or breakable crust. This upper crust forms when snow crystals transform into a melt-freeze crust through warming and subsequently refreeze into an icy, hard surface. Sustained, stronger winds can trigger a similar transformation process under cold temperatures, resulting in a frozen, consolidated, and more or less load-bearing layer of snow and ice. The snow layer beneath the protective crust also undergoes changes but usually remains unconsolidated and loose.

1.6 Additional information

In Switzerland, two further accidents involving B505 helicopters occurred that were attributable to a dynamic rollover.

On September 9, 2019, the helicopter registered as HB-ZWR was involved in an accident while landing at the mountain landing site on the Vorab Glacier; the STSB published a summary report.

On March 12, 2024, the helicopter registered as HB-ZWC was involved in an accident during takeoff near Weinfelden; the STSB published Final Report No. 2430.

[6] These are the stations at Blatten, Jungfraujoch, and Eggishorn.

[7] Sackhorn station, extrapolated 50 m downward (remaining constant to 1 °C within the rounding); Jungfraujoch: -7 °C / -22 °C; Eggishorn: -2 °C / -14 °C.

[8] QNH: Pressure reduced to sea level, calculated using the values of the ICAO standard atmosphere

[9] QFE: measured air pressure at ground level

2 Analysis

2.1 Technical aspects

There is no evidence of pre-existing technical defects that could have caused or contributed to the accident.

The manufacturer stated that the observed movements of the pitch links, which are related to the model-specific flexible mounting of the main gearbox (see chapter 1.3.3), have only a minimal impact. The manufacturer was unable to provide a more detailed assessment of whether this is also the case when a skid is in contact with the ground, for example during takeoff or landing. The manufacturer assumes that any corrective inputs required by the pilots should be minor.

Based on this information, it is not possible to make a definitive assessment as to whether these characteristics could have played a contributing role in the occurrence of the accident.

Because this type-specific behaviour related to the main gearbox suspension is not described in the flight manual, it is not known to the pilots. From a preventive perspective, it seems sensible for B505 operators to be informed of these characteristics, which is why the STSB is issuing a safety recommendation (see Chapter 4.1.1).

Bell, the manufacturer of the proprietary data file, was unable to process the recorded data from the accident flight. The avionics manufacturer, Garmin, only decoded this data after Bell provided the corresponding proprietary encoding in April 2026. This data therefore only became available at the end of the present investigation. The STSB considers the unclear processes involved in processing the data and the resulting delays to be problematic in the context of conducting safety investigations and ultimately detrimental to safety. For this reason, a safety recommendation is being issued (see chapter 4.1.2)[10].

2.2 Human and operational aspects

Based on the first landing from hover and the helicopter's minimal sinking, the crew assessed the condition of the snowpack as stable.

After the first approach to the Petersgrat, the crew discussed flight elements to be improved for the next landing, including the approach angle and approach speed during the final approach. Ultimately, a no-hover landing technique was applied.

The sinking of the right skid during landing took the crew by surprise. This led to a dynamic rollover, which could not be stopped despite the flight instructor's immediate intervention. The fact that, due to local conditions in the area of the second landing site, the snowpack—intermixed with crusted snow—collapsed beneath the right landing gear contributed significantly to the occurrence of the dynamic rollover and thus to the accident. Although a no-hover landing is certainly one of the possible techniques for off-airfield landings, particularly when landing on snow[11] , this

[10] EASA had previously addressed a similar issue—prompted by safety recommendation IRLD-2025-001 from the Irish Air Accident Investigation Unit (AAIU)—regarding data for accident investigations derived from mandatory flight recorders (Cockpit Voice Recorders - CVR and Flight Data Recorders - FDR) as specified in the certification standards for large aeroplanes (> 5,700 kg, CS-25) and large helicopters (> 3,175 kg, CS-29). In contrast, the safety recommendation issued in this report concerns avionics data that is not explicitly recorded for safety investigation purposes; this applies to all categories of aircraft.

[11] A no-hover landing is used, for example, when heavy snow spray is expected and there is a risk of losing visual references (whiteout). The pilot thus flies "ahead of the swirling snow" to the touchdown point and has sufficient visual references until touchdown.

landing maneuver is demanding and carries different risks than a landing without forward speed from hover.

Assessing the characteristics of the ground at the planned landing site is of utmost importance. Such an assessment is often difficult or even impossible when ice or snow covers an invisible underlying surface. The properties of a snowpack or ice crust can vary significantly over very short distances due to exposure (solar radiation and wind) and the underlying ground.

It is also possible that the helicopter was caught by a gust of wind from the front left quadrant. This could have caused a rapid increase in lift or an *"*inflow roll*"* effect, which might have further exacerbated the developing dynamic rollover situation. The phenomenon was described in the Final Report No. 2430 of the STSB.

The fact that the pilots did not sustain head injuries in this accident is solely attributable to fortunate circumstances. It is in any case both advisable and safety-conscious practice to wear a pilot's helmet. The STSB has already highlighted the importance of wearing pilot's helmets in several reports and issued a safety recommendation[12] . Therefore, the STSB refrains from issuing a further safety recommendation in this case.

[12] The STSB issued Safety Recommendation No. 402 on this topic in the final report on the accident involving helicopter HB-XQS on March 5, 2006.

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- The helicopter was certified for operation under Visual Flight Rules (VFR).
- Both the mass and the center of gravity of the helicopter were within the limits specified in the Rotorcraft Flight Manual (RFM) at the time of the accident.
- The investigation revealed no evidence of pre-existing technical defects that could have caused or contributed to the accident.
- The main gearbox was installed on a pylon support system that allows for induced changes in the pitch angle of the main rotor blades. The B505 flight manual contains no information regarding the changes in the pitch angle of the main rotor blades induced by the main gearbox suspension.
- The Emergency Locator Transmitter (ELT) was activated.

3.1.2 Flight crew

- The pilots held the necessary licences for the flight.
- There is no evidence of any health impairments affecting the pilots during the accident flight

3.1.3 History of the accident

- The training flight departed at 09:05 from Bern and proceeded without incident until the second landing at the Petersgrat mountain landing site.
- The mass reserve at the time of the accident was approximately 95 kg in hover flight outside the ground effect.
- During the landing with a forward speed at a walking pace, the right skid suddenly broke through the snowpack, causing the helicopter to roll onto its right side within 3 seconds.
- The crew was unable to stop the rollover (dynamic rollover).

3.1.4 General conditions

- The helicopter was equipped with a low landing gear and anti-sink protection (Bear Paws).
- The wind was gusting at 15 to 25 knots from the front-left quadrant.
- The snowpack consisted of a breakable crust.

3.2 Cause

In order to achieve its objective of prevention, a safety investigation authority shall express its opinion on risks and hazards that have been identified during the investigated incident, and which should be avoided in the future. In this sense, the terms and formulations used below are to be understood exclusively from the perspective of prevention. The identification of causes and contributing factors does not, therefore, in any way imply an assignment of blame or the determination of administrative, civil, or criminal liability.

The accident, in which the helicopter rolled onto its right side during landing, is attributable to the fact that the crew was unable to stop the developing dynamic rollover in time.

The following factors, or a combination thereof, contributed to the accident:

- Landing with a forward speed at walking pace on a snow surface interspersed with a breakable crust, which gave way under the right skid.
- Moderate wind coming from the front-left quadrant.

4 Safety recommendations, safety advice and measures taken since the accident

4.1 Safety recommendations

In accordance with international[13] and national[14] legal bases, all safety recommendations are addressed to the supervisory authority of the competent state. In Switzerland, this is the Federal Office of Civil Aviation (FOCA) or the supranational European Union Aviation Safety Agency (EASA). The competent supervisory authority must decide on the extent to which these recommendations are to be implemented. Nonetheless, any agency, organisation, and individual is invited to strive to improve aviation safety in the spirit of the safety recommendations expressed.

The STSB shall publish the answers of the relevant federal office or foreign supervisory authorities at http://www.sust.admin.ch to provide an overview of the current implementation status of the relevant safety recommendation.

4.1.1 Description of the main systems in the helicopter flight manual

4.1.1.1 Safety deficit

During a landing on a glacier, a B505 helicopter tipped over due to a dynamic rollover. One crew member and one passenger were seriously injured. Another crew member sustained minor injuries.

On the Bell 505, the main rotor and the gearbox are connected to the airframe via the pylon support structure, which uses a so-called live-mount suspension to dampen rotor vibrations. The main rotor and gearbox can move both along the vertical axis (up and down) and around the lateral and longitudinal axes.

The control rods of the main rotor blades (pitch links) are connected via the swashplate to the hydraulic actuators, which in turn are connected to the control levers in the cockpit. Unlike the main gearbox, the entire control system up to the swashplate is rigidly attached to the airframe.

The STSB observed on another B505 helicopter that when the main gearbox moves, the pitch links also move with it. This results in a change in the pitch angle of the main rotor blades.

The helicopter's type-specific behavior in connection with the characteristics of the main gearbox suspension is not described in the Rotorcraft Flight Manual (RFM), which is why pilots are unaware of this potential occurrence.

4.1.1.2 Safety Recommendation No. 614

Transport Canada Civil Aviation (TCCA), the Canadian Civil Aviation Authority, should take appropriate measures to ensure that the manufacturer Bell supplements the publications for operators of the B505 helicopter with information regarding the systems and characteristics mentioned in the safety deficit.

[13] Annex 13 of *the International Civil Aviation Organization* (ICAO) and Article 17 of Regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC

[14] Article 48 of the Ordinance on the Investigation of Incidents in the Transport Sector (VSZV) of December 17, 2014, as of January 1, 2025 (VSZV, SR *742.161*)

4.1.2 Recordings of the onboard avionics

4.1.2.1 Safety deficit

During a landing on a glacier, a B505 helicopter tipped over due to a dynamic rollover. One crew member and one passenger were seriously injured. Another crew member sustained minor injuries.

The helicopter was equipped with two multifunctional displays from the manufacturer Garmin. Various parameters are recorded every second onto SD cards, in some cases in a binary-coded file. The binary coding of the file is based on proprietary programming by the manufacturer Bell. The position of the collective pitch lever is stored in this very file. The manufacturer of the proprietary file, Bell, was unable to process the recorded data from the accident flight. The avionics manufacturer provided the processed and decoded data to the STSB for the accident analysis at the end of April 2026, after having received all decoding specifications from Bell.

A rapid evaluation of flight and system parameters enables, for example, national safety investigation authorities to confirm or refute initial assumptions and steer the investigation in the right direction. This allows for a timely determination of whether more in-depth investigations need to be conducted in a specific area to identify a potential systemic problem.

4.1.2.2 Safety Recommendation No. 615

The Federal Aviation Administration (FAA), in cooperation with aircraft and avionics manufacturers, should take appropriate measures to ensure that, for example, in addition to the FDR, any additional recorded data available from the systems are made available to safety investigation authorities in a timely manner and in an easily readable, standard electronic format.

4.1.2.3 Safety Recommendation No. 616

Transport Canada Civil Aviation (TCCA), in cooperation with aircraft and avionics manufacturers, should take appropriate measures to ensure that, for example, in addition to the FDR, any additional recorded data available from the systems are made available to safety investigation authorities in a timely manner and in an easily readable, standard electronic format.

4.1.2.4 Safety Recommendation No. 617

The European Union Aviation Safety Agency (EASA), in cooperation with aircraft and avionics manufacturers, should take appropriate measures to ensure that, for example, in addition to the FDR, any additional recorded data available from the systems are made available to safety investigation authorities in a timely manner and in an easily readable, standard electronic format.

4.2 Safety advice

The STSB may publish general relevant information in the form of safety advice[15] if a safety recommendation in accordance with Regulation (EU) No. 996/2010 does not appear appropriate, is not formally possible, or if the less prescriptive form of safety advice is likely to have a greater effect.

None

4.3 Measures taken since the accident

The measures taken, of which the STSB is aware, are mentioned below without comment.

None

This final report was approved by the Commission of the Swiss Transportation Safety Investigation Board (STSB) (Art. 10(h) of the Ordinance on the Investigation of Transportation Incidents of December 17, 2014).

Bern, September 8, 2026 Swiss Transportation Safety Investigation Board

[15] Article 56 of the Swiss Ordinance on the Safety Investigation of Transport (OSITI) of 17 December 2014, Incidents as at 1 January 2025 (OSITI, SR *742.161*)