Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Confederation

Schweizerische Sicherheitsuntersuchungsstelle SUST
Service suisse d'enquête de sécurité SESE
Servizio d'inchiesta svizzero sulla sicurezza SISI
Swiss Transportation Safety Investigation Board STSB

Final report no. 2418 by the Swiss Transportation Safety Investigation Board STSB

concerning the accident involving the Ultralight glider
Alisport Silent 2 Electro, D-MANS,

on July 22, 2021

La Mapas, community of Conthey (VS), Switzerland

Swiss Transportation Safety Investigation Board STSB
3003 Bern
Phone +41 58 466 33 00, Fax +41 58 466 33 01
info@sust.admin.ch
www.stsb.admin.ch

General information on this report

The sole purpose of an aviation accident or serious incident investigation is the prevention of accidents or serious incidents. It is expressly not the purpose of the safety investigation and this report to determine fault or liability.[1]

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

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. The relation between LT, CET and Coordinated Universal Time (UTC) is:
LT = CEST = UTC + 2 h.

Responsibility of the STSB and purpose of the investigation

The Swiss Transportation Safety Investigation Board (STSB) is not required to investigate incidents involving ultralight aircraft under the Ordinance on the Safety Investigation of Transport Incidents (OSITI; SR *742.161*). However, the STSB may nevertheless investigate such incidents if such an investigation is expected to provide findings for the prevention of further incidents. This final report was prepared to improve the recognition of hazards at accident sites by emergency services and contains three safety recommendations in this regard (cf. chapter 4.1) and one safety advice (cf. chapter 4.2).

[1] Article 3.1 of the 12th edition of Annex 13, effective November 5, 2020, to the Convention on International Civil Aviation of December 7, 1944, entered into force for Switzerland on April 4, 1947, as of June 18, 2019 (SR *0.748.0*).

Article 24 of the Federal Aviation Act of 21 December 1948, as at 1 September 2023 (LFG, 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 investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC, which entered 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 between Switzerland and the EU on Air Transport (Air Transport Agreement).

Article 2 paragraph 1 of the Ordinance on Safety Investigations in Transport of 17 December 2014, as at 1 September 2023 (VSZV, SR *742.161*).

Summary

Aircraft	Alisport Silent 2 Electro	D-MANS
Operator	Private	
Owner	Private	

Pilot	Swiss citizen, born 1959
Licence	Pilot's license for air sports equipment pilots, issued by the German Ultralight Flying Association (DULV) *Sailplane* Pilot *Licence* (SPL) according to the *European Union Aviation Safety Agency* (EASA), issued by the German Luftfahrt-Bundesamt (LBA).

Flying experience	**total**	656:15 h	**during the last 90 days**	44:42 h
	on type	unknown	**during the last 90 days**	42:05 h

Location	La Mapas, community of Conthey (VS), 6 km north-northwest of Sion airfield (LSGS), Switzerland		
Coordinates	587 985 / 123 700 (*Swiss Grid* 1903)	**Elevation**	1630 m AMSL[2]
Date and time	22 July 2021, 15:40 hrs		

Type of operation	Private
Flight rules	Visual Flight Rules (VFR)
Point of departure	Thun airfield (LSZW), Switzerland
Destination	Thun airfield (LSZW), Switzerland
Flight phase	Cruise flight
Type of accident	Loss of control

Injuries to persons

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

Damage to aircraft	Destroyed
Other damage	None

[2] AMSL: Above Mean Sea Level

1 Factual information

1.1 History of flight

On 22 July 2021, at 10:52, the pilot took off from Thun airfield (LSZW) in aerotow procedure with the single-seat ultralight glider registered as D-MANS. After a longer glider flight, at 15:37, he was in the Rhone valley north of the Sion airfield at an altitude of about 1700 m AMSL and flew at a short distance from the slope towards the west.

Shortly thereafter, an eyewitness observed that the nose of the glider moved upwards, followed by the initiation of a turn. After a rotation of about 90°, the glider then crashed in an almost vertical position. At 15:40, the impact occurred on a steep slope at 1630 m AMSL (cf. Figure 1). The pilot was fatally injured and the glider was destroyed.

Figure 1: Aerial view of the accident site looking northeast, taken on the day of the accident.

1.2 Meteorological information

An area of high pressure extended from the British Isles to the Mediterranean. Warm and dry air reached Switzerland with weak northwesterly high-altitude winds. Shortly before the time of the accident, the following weather conditions were recorded at the nearby Sion airfield (LSGS):

Wind	260 degrees, 11 knots
View	over 10 km
Clouds	1/8 - 2/8 to 10 000 ft above ground level
Temperature / Dew point	28 °C / 16 °C
Barometric pressure (QNH)	1017 hPa (pressure reduced to sea level, calculated with the values of the standard atmosphere)

According to meteorological data and flight records of other gliders, thermal conditions were weak to moderate.

1.3 Aircraft information

Aircraft type	Silent 2 Electro
Manufacturer	Alisport SRL, Cremella, Italy
Characteristic	Self-launching, single-seat ultralight sailplane of composite construction
Building regulation	LTF-UL (Airworthiness Requirements for aerodynamically controlled Ultralight Aircraft)
Year of manufacture	2017
Maximum permissible mass	300 kg[3]
Mass and center of gravity	Mass and center of gravity were within the permissible range.
Engine	An electric motor of 22 kW power
Propulsion batteries	Two lithium-polymer (LiPo) batteries of 2.1 kWh capacity and 58 V voltage each, in series circuit
Relevant equipment	Automatic 406 MHz Emergency Locator Transmitter (ELT)[4] , oxygen system

The investigations carried out on the wreckage after the accident did not reveal any pre-existing technical defects that could have influenced or caused the accident.

1.4 Information about the pilot

The pilot had a valid Class 2 medical certificate, which had been issued on 4 November 2020. The autopsy of the pilot did not reveal any abnormal findings except for the fact that he had been under the influence of medication for a long time, which is attributed effects on the ability to drive and operate machinery.

1.5 Hazards at the accident site

A damaged high-voltage system of an electric drive can pose a life-threatening electric shock hazard.[5] Propulsion batteries also pose the risk of an explosive fire in the event of damage. Such a fire also releases highly toxic fumes and can cause oxygen cylinders to explode. Furthermore, a life-threatening hazard might be present due to the rocket propellant of a ballistic parachute system (BPS). [6]

In the present case, the existence or non-existence of the above-mentioned hazards was hardly, if at all, discernible for the arriving emergency services (cf. Figure 2). Information on aircraft equipment and appropriate self-protection measures were not available promptly at the accident site (cf. chapter 1.6). This could have led either to excessive risk to emergency services or to a delay in immediate life-saving measures, if such had been required.

---

[3] The value of 300 kg applies to aircraft without *Ballistic Parachute System* (BPS) such as the D-MANS. For aircraft with BPS, the maximum permissible mass is 313.5 kg.

[4] When triggered, a 406 MHz ELT transmits an aircraft-specific code that is stored in an international database (cf. also chapter 1.6.5).

[5] cf. article "High Voltage in Electric Aircraft" in the Swiss Fire Brigade Magazine, written by the Federal Office of Civil Aviation; last visited October 9, 2023.

[6] cf. final report no. 2148 of the STSB "on the potential risks of ballistic parachute systems (BPS) in aircraft to rescue and investigation crews".

Figure 2: Wreckage of the D-MANS as it appeared to the rescue forces arriving at the accident site. It cannot be identified that there was a risk of electric shock and that no ballistic parachute system was installed (photo by the Valais Cantonal Police).

1.6 Sources of information on hazards at accident sites

1.6.1 Rescue cards

Rescue cards are the most suitable for the work of emergency services at accident scenes. They are widely used for road vehicles.

In the present case, such a rescue card did exist, but only as an illustration in the flight manual of the Silent 2 Electro (cf. Figure 3). It was therefore not available to the emergency services in a timely manner and also did not contain any information on the presence or absence of a ballistic parachute system.

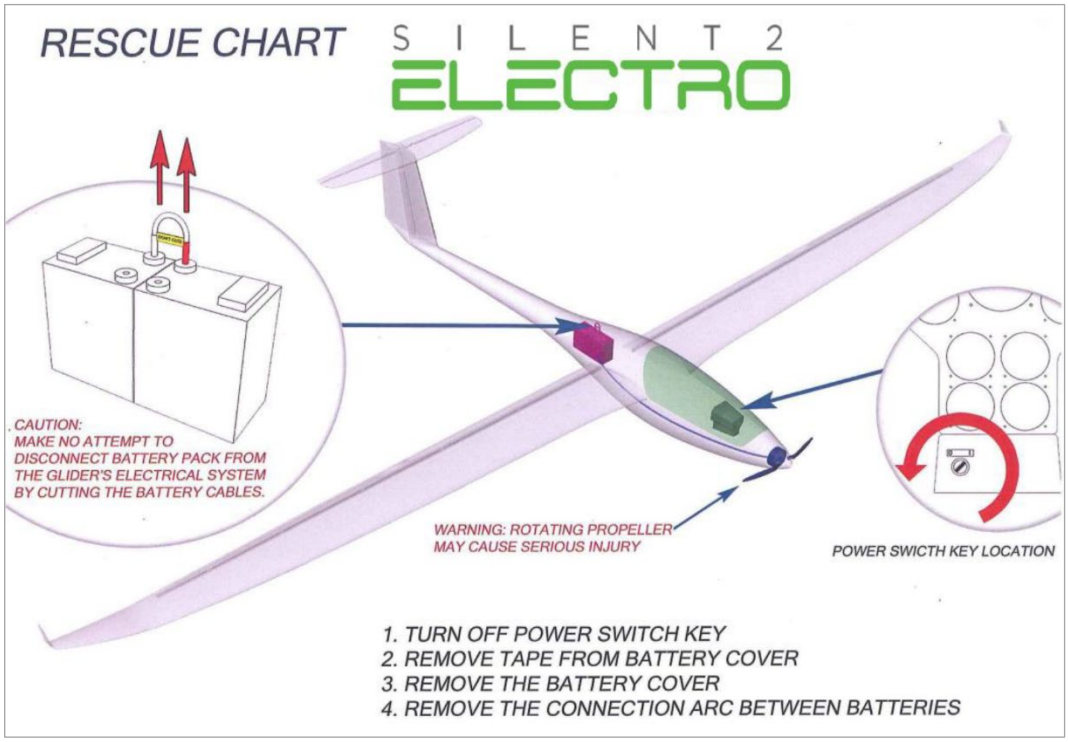

Figure 3: Illustration of the rescue card in the flight manual of the Silent 2 Electro.

1.6.2 Labels and markings

Labels and markings on aircraft provide a simple method for quickly informing emergency services. However, the absence of labels and markings does not necessarily indicate the absence of a hazard, such as a ballistic parachute system. Existing labels and markings may also no longer be recognizable due to the accident.

In the present case, there were no labels or markings on the exterior of the aircraft.

1.6.3 National Aircraft Registers

National aircraft registers may contain information relevant to search and rescue services. The Swiss aircraft register, for example, contains information on any automatic emergency locator transmitter (ELT) or ballistic parachute system (BPS). It also offers the possibility of depositing a rescue card and is publicly accessible.[7]

In the present case, the German register with data for D-MANS was not publicly accessible, and the Swiss register did not contain rescue cards for aircraft of the same type.

1.6.4 ATC flight plans

When filing ATC flight plans, some information relevant to search and rescue (SAR) is mandatory, including information on the number of occupants, the color scheme of the aircraft or the emergency equipment. Optionally, any other information can be listed. [8]

In the present case, the pilot had not filed an ATC flight plan, which was also not mandatory and was the usual handling for glider flights.

1.6.5 Emergency locator transmitter

The 406 MHz ELT[9] of aircraft transmits a code containing information on the registration mark and, if equipped for this purpose, on the geographical position of an aircraft involved in an accident. [10] However, although technically possible, it does not contain any information on the presence of a ballistic parachute system or other hazard sources.

In the present case, an code transmitted by the ELT was already available two minutes after the impact, which contained information on the registration mark and the position of the D-MANS.

---

7 The Swiss Aircraft Register can be accessed at https://app02.bazl.admin.ch/web/bazl/de/#/lfr.

8 In September 2023, the EU published an amendment to Commission Implementing Regulation (EU) No. 923/2012, which includes the following addition: "SERA.4005 Content of flight plan (a) A flight plan shall include all information considered relevant by the competent authority as regards the following: [...] (14) emergency and survival equipment, including ballistic parachute recovery system [...]".

9 ELT: Emergency Locator Transmitter. The 406 MHz ELT are part of Cosmicheskaya Sistyema Poiska Avarijnich Sudov-Search And Rescue Satellite Aided Tracking (COSPAS-SARSAT), an international and satellite-based search and rescue system for the detection and localization of emergency transmitters (cf. cospas-sarsat.int).

10 At the suggestions of the FOCA, several states approached COSPAS-SARSAT in spring 2023 regarding ELT coding; the *report to the COSPAS-SARSAT Council JC-37* of June 2023 states: *"Information about an installed BPS should be inserted and [...] transmitted when coding the ELT. This will allow the important information [...] to be transmitted to the RCC* (*Rescue* Coordination *Center*)." COSPAS-SARSAT also noted that *"The Panel noted general agreement that, while concerns about the safety of rescuers are understandable, aviation incidents by their nature can present multiple sources of danger to rescuers and that BPS-related information should instead be stored in national and international registers [...]."*

1.7 Comparable incident

The investigation of an accident involving a Silent 2 Electro, registered as G-CIYA, in the United Kingdom led the AAIB[11] investigating authority to issue several safety recommendations to alert emergency responders at accident scenes to the presence or absence, as well as the hazards, of ballistic parachute systems. [12]

One of these recommendations concerns the creation of an information system containing the relevant data on ballistic parachute systems of all aircraft operating in the national territory. This information will be made available for the attention of rescue services and accident investigators.

Among them is a recommendation to create an information system that allows first responders and accident investigators to identify if an aircraft operating in the UK is equipped with a Ballistic Parachute System (*"introduce an information system, for aircraft operating in the UK that allows first responders and accident investigators to identify if an aircraft is equipped with a Ballistic Parachute Recovery System"*).

[11] AAIB: *Air Accidents Investigation Branch*

[12] Cf. AAIB Bulletin 7/2016 on the Silent 2 Electro accident, G-CIYA, dated October 19, 2015.

2 Analysis

2.1 Technical aspects

There are no indications of pre-existing or in-flight technical defects that could have influenced or caused the accident.

The aircraft's ELT, triggered by the impact, transmitted the coordinates of the accident site without delay thanks to a connection to a GPS[13] receiver, thus enabling the emergency services to arrive quickly.[14] However, the ELT signal did not contain any information on the presence or absence of a ballistic parachute system or on other hazard sources relevant to the emergency services. Although this is technically possible and would provide the required information without delay, no use has been made of this possibility to date. The STSB therefore issues a safety recommendation (cf. chapter 4.1.1.4).

2.2 Operational aspects

The course of flight close to the slope and the observations of the eyewitness suggest that the accident was due to a loss of control as a result of flying below the minimum speed in a turn, stalling the aircraft. Subsequently, the short distance to the terrain did not allow a recovery to the normal flight attitude.

2.3 Medical aspects

The pilot was under the influence of medication which impaired his ability to react and act. The extent to which this circumstance contributed to the accident was not further clarified for the purpose of the investigation (see preamble on page 2).

2.4 Aspects of occupational safety at accident sites

It is essential for the safe work of emergency services to provide unhindered access to information regarding hazards such as those emanating from high-voltage systems of electric drives or rocket propellants of ballistic parachute systems. It is not only a matter of knowing about the presence of such hazards for the purpose of self-protection, but also of knowing when they are not present, so that rescue work is not unnecessarily delayed.

For a variety of reasons, the approaches taken so far to provide such information have not been entirely convincing, as explained in section 1.6. It is obvious that a useful solution for emergency responders would be to create a database that provides the information needed for rescue and recovery operations for each aircraft in an easily accessible and timely manner.

The ideal solution would be an international database that includes all conceivable aircraft, regardless of their country of registration or their basis of certification. For this reason, the STSB is issuing a safety recommendation to the International Civil Aviation Organization (ICAO) (cf. section 4.1.1.2).

However, due to the current framework conditions, such as the aircraft registers that are exclusively kept and supervised on a national level, a comprehensive and international database is hardly feasible in the near future. Therefore, it seems

[13] GPS: *Global Positioning System*, Global Positioning System

[14] In another aircraft accident investigated by SUST (18.07.2021, D-EMPE, Gloggentürmli, municipality of Hospental (UR)), this GPS link was missing, which is why there were considerable delays in the search for the accident aircraft. The SUST will therefore issue a corresponding safety notice in the final report on this case.

reasonable in a first phase to additionally create a comprehensive and easily accessible database on a national level. For this purpose, the STSB issues another safety recommendation (cf. chap. 4.1.1.3).

In addition, in September 2023, it was stipulated at supranational level that ATC flight plans must contain information on the existence of a ballistic parachute system (see chapter 1.6.4). This means that relevant information is available to emergency services in a timely manner so that rescue and recovery operations are not unnecessarily delayed in the event of an accident involving an aircraft.

It is furthermore sensible to add detailed data about a ballistic parachute system or about other hazards to the ATC flight plan field no. 18 "Other information". This information is transmitted to the corresponding air traffic control units in other countries when the aircraft crosses national borders, which makes it easier for rescue teams and investigating authorities on site to obtain the necessary information. For this reason, the STSB issues a corresponding safety notice (see chapter 4.2.1).

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- There are no indications of pre-existing technical defects that could have influenced or caused the accident.
- The mass and center of gravity of the airplane were within the permissible range.
- The Emergency Locator Transmitter (ELT) triggered on impact and transmitted information on the aircraft's registration mark and position.

3.1.2 Flight Crew

- The pilot had the required credentials for the flight.

3.1.3 History of the accident

- The self-launching, electrically powered ultralight glider took off from Thun airfield (LSZW) in aerotow procedure.
- After a flight time of about five hours, the glider was north of the Sion airfield, flying west at a short distance from the slope.
- The aircraft suffered a loss of control and crashed from a low altitude into a steep slope. The pilot was fatally injured.

3.1.4 General conditions

- The weather was sunny, the thermal conditions were weak to moderate.

3.1.5 Rescue and recovery

- Frist responders at the accident scene lacked information about the hazards posed by the wreckage, which could have jeopardized or delayed rescue efforts.

3.2 Causes

In order to achieve its prevention purpose, a safety investigation authority must comment on risks and hazards that have had an impact in the incident under investigation and that should be avoided in the future. In this sense, the terms and phrases used below are to be understood exclusively from the perspective of prevention. Thus, the determination of causes and contributing factors in no way implies an attribution of blame or the determination of administrative, civil or criminal liability.

The accident, in which an ultralight glider suffered a loss of control and collided with the terrain, was due to flight below minimum speed in a turn and close to the terrain.

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

4.1 Safety recommendations

In accordance with international[15] and national[16] 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 Information for emergency services at accident sites

4.1.1.1 Safety deficit

Emergency services are increasingly exposed to various hazards at accident sites, such as rocket propellants from ballistic parachute systems or high-voltage systems from electric propulsion systems. An accident involving an ultralight glider with electric propulsion on 22 July 2021 showed that information on the existence or non-existence of such hazards can only be provided incompletely and not in a timely manner. However, this would be necessary in order not to endanger emergency services and not to delay life-saving measures.

4.1.1.2 Safety Recommendation No. 596

The International Civil Aviation Organization (ICAO), in cooperation with its member states, should provide a database for emergency services so that they can be aware of the hazards posed by all aircraft involved in accidents without delay.

4.1.1.3 Safety Recommendation No. 597

The Federal Office of Civil Aviation (FOCA) should, until the implementation of Safety Recommendation No. 596, provide a database for emergency services so that they can obtain information about the hazards posed by all aircraft involved in accidents in Switzerland without delay, irrespective of their country of registration.

4.1.1.4 Safety Recommendation No. 598

The Council of the International COSPAS-SARSAT Programme Agreement should, in cooperation with the states party to the agreement, make efforts to ensure that information, among other things, on the presence or absence of a Ballistic Parachute Systems (BPS) is included into the coding of aircraft 406 MHz Emergency Locator Transmitters (ELT).

[15] 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.

[16] Article 48 of the Swiss Ordinance on the Safety Investigation of Transport Incidents (OSITI) of 17 December 2014, as at 1 February 2015 (OSITI, SR 742.161).

4.2 Safety advice

The STSB may publish general relevant information in the form of safety advice[17] if a safety recommendation in accordance with Regulation (EU) No. 996/2010 does not appear to be appropriate, is not formally possible, or if the less prescriptive form of safety advice is likely to have a greater effect.

4.2.1 Information for emergency services at accident sites

4.2.1.1 Safety deficit

Emergency services are increasingly exposed to various hazards at accident sites, such as rocket propellants from ballistic parachute systems or high-voltage systems from electric propulsion systems. An accident involving an ultralight glider with electric propulsion on 22 July 2021 showed that information on the existence or non-existence of such hazards can only be provided incompletely and not in a timely manner. However, this would be necessary in order not to endanger emergency services and not to delay life-saving measures.

4.2.1.2 Safety Advice No. 57

Subject: Information in ATC flight plans for the benefit of search and rescue (SAR)

Target group: All operators of aircraft

ATC flight plans contain information relevant to search and rescue (SAR), including, for example, information on the number of occupants, the color scheme of the aircraft or the emergency equipment. Optionally, any other information can be added.

After an accident involving an aircraft, an ATC flight plan provides various information that is important for search and rescue in a timely and easily accessible manner. Accordingly, emergency forces can be informed about possible hazards, and life-saving immediate measures are not unnecessarily delayed.

It is therefore obvious that filing an ATC flight plan is beneficial for flight safety and is reasonable for every flight, irrespective of the aircraft type or the planned flight. For example, for glider flights without previously known specific flight route, a point in the intended direction of flight can be entered in the field "Route" of the ATC flight plan.

In order to provide the emergency services with the most detailed information possible in the event of an emergency, it is necessary and sensible to include corresponding information on a ballistic parachute system or on other hazard sources such as an electric propulsion system in field no. 18 "Other information" of the ATC flight plan. This information should include specific details such as for example the manufacturer and type of the ballistic parachute system (example: "RMK/ BPS installed, type Galaxy GRS6-600").

4.3 Measures taken since the accident

With regard to the data transmitted by aircraft on the 406 MHz ELT (see chapter 1.6.5), the FOCA made the following statement:

[17] Article 56 of the Swiss Ordinance on the Safety Investigation of Transport Incidents (OSITI) of 17 December 2014, as at 1 February 2015 (OSITI, SR 742.161)

"Immediately after the D-MANS accident, the FOCA submitted a motion to COSPAS-SARSAT proposing to the Joint Committee that ballistic parachute systems be recorded in the rotating fields of the SGB (Second Generation Beacon) ELT protocols. The opposition of one of the four founding members of COSPAS-SARSAT prevented the motion from being implemented. However, the final report stated that the international emergency transmitter database IBRD would be supplemented with a "BRS"[18] field."

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

Berne, 28 May 2024 Swiss Transportation Safety Investigation Board

18 Ballistic Recovery System (BRS) is synonymous with Ballistic Parachute System (BPS).