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Swiss Transportation Safety Investigation Board STSB

Final Report No. 2350

by the Swiss Transportation Safety Investigation Board STSB

Concerning the serious incident (airprox)

between the business jet Falcon 2000EX, CS-DLB,
operated by NetJets under radio call sign NJE050N

and the glider Arcus, HB-3442,

on 15 October 2017, 12:42 UTC,

3 NM west of Amriswil (canton of Thurgau)

General information on this report

This report contains the Swiss Transportation Safety Investigation Board's (STSB) conclusions on the circumstances around and causes of the investigated serious incident.

In accordance with Article 3.1 of the 10th edition of Annex 13, effective from 18 November 2010, to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Aviation Act (LFG, SR 748.0), of 21 December 1948 (as of 1 January 2019), the sole purpose of an investigation into an aircraft accident or serious incident is to prevent further accidents or serious incidents from occurring. Legal assessment of the circumstances and causes of aircraft accidents and serious incidents is expressly excluded from the safety investigation. It is therefore not the purpose of this report to establish blame or to determine liability.

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

The German version of this report constitutes the original and is therefore definitive.

Unless otherwise indicated, all information relates to the time of the serious incident.

All of the times mentioned in this report, unless otherwise indicated, are given in coordinated universal time (UTC). For the region of Switzerland, Central European Summer Time (CEST) was the local time (LT) at the time of the serious incident. The relationship between LT, CEST and UTC is:

LT = CEST = UTC + 2 h

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Final Report

Summary

Aircraft 1

Owner	NetJets Europe, Sociedade Unipessoal, Lda Edificio Cristal, Rua Calvet Magalhães, 245 Bloco B, 2774-550 Paço de Arcos, Portugal
Operator	NetJets Transportes Aereos, S.A., Edificio Cristal, Rua Calvet Magalhães, 245 Bloco B, 2774-550 Paço de Arcos, Portugal
Manufacturer	Dassault Aviation, France
Aircraft type	Falcon 2000EX
Country of registration	Portugal
Registration	CS-DLB
Flight number	NJE050N
Radio call sign	Fraction zero five zero November
Flight rules	Instrument Flight Rules (IFR)
Type of operation	Commercial
Point of departure	Munich Airport (EDDM), Germany
Destination	St. Gallen-Altenrhein Regional Airport (LSZR)

Aircraft 2

Owner/operator	Segelfluggruppe Cumulus, Amlikon-Flugplatzstrasse, 8514 Amlikon-Bissegg
Manufacturer	Schempp-Hirth Flugzeugbau GmbH, Germany
Aircraft type	Arcus
Country of registration	Switzerland
Registration	HB-3442
Flight rules	Visual Flight Rules (VFR)
Type of operation	Private
Point of departure	Amlikon Airfield (LSPA)
Destination	Amlikon Airfield (LSPA)

Location	3 NM west of Amriswil (canton of Thurgau) at an altitude of approximately 5,000 ft AMSL ¹
Date and time	15 October 2017, 12:42:08 UTC
Air traffic service	Zurich Lower approach control unit, sector for the airports Friedrichshafen and St. Gallen-Altentrhein (ARFA) ²
Airspace	Class E
Closest proximity of the two aircraft	Horizontal 660 m (0.35 NM), vertical 40 m (131 ft)
Stipulated separation minima	Separation between IFR traffic; separation of IFR and VFR traffic not stipulated
Airprox category	ICAO ³ Category B

Investigation

The serious incident occurred on 15 October 2017 at 12:42 UTC and was reported in the form of an air traffic incident report (ATIR) on 17 October 2017. After preliminary enquiries, which are standard for this type of serious incident, the investigation was opened on 20 October 2017.

The STSB reported the serious incident to the Portuguese authorities. The country assigned an authorised representative.

Information available as the basis for the investigation included:

- Radio communication recordings;
- Radar data;
- Statements made by the flight crew.

This final report is published by the STSB.

Synopsis

At midday on 15 October 2017, the Arcus glider, registered as HB-3442, was gliding back to Amlikon Airfield. The glider's Flarm collision warning device was switched on; however, its Mode S transponder was not. At approximately the same time, the twin-jet Falcon 2000EX business aircraft, registered as CS-DLB, was flying from Munich Airport to St. Gallen-Altentrhein. CS-DLB was equipped with a Traffic Alert and Collision Avoidance System (TCAS).

Under supervision of the Zurich ARFA approach control unit, CS-DLB was approaching the Instrument Landing System (ILS) of runway 10 at St. Gallen-Altentrhein. Flying the base leg at an altitude of 5,000 ft AMSL and in Class E airspace, the flight paths of CS-DLB and HB-3442 crossed in opposite directions. The closest horizontal and vertical distances between the two aircraft were approximately 660 m and 40 m respectively. Both crews only noticed the other aircraft shortly before the point of closest proximity. The air traffic controllers, who the crew of CS-DLB were in contact with, were unaware of the glider.

¹ AMSL: Above Mean Sea Level

² ARFA: Area control centre, regional sector for the airports Friedrichshafen (EDNY) and St. Gallen-Altentrhein (LSZR)

³ ICAO: International Civil Aviation Organisation

Causes

The serious incident was an airprox between a twin-jet business aircraft and a glider, which can be attributed to the fact that the two flight crews did not visually identify each other's aircraft in a timely manner.

The following factors were identified as contributing factors:

- The instrument approach of the business aircraft led through Class E airspace, in which air traffic control does not provide separation between IFR and VFR traffic.
- The transponder of the glider was not switched on, which was not mandatory.

The fact that the glider pilot did not have radio contact with the relevant air traffic control unit, which is not mandatory either, favoured the development of the serious incident.

Safety recommendations and safety advice

One safety advice is issued with this final report.

1 Factual information

1.1 Background and history of the serious incident

1.1.1 General

The following description of the background and history of the flights is based on radio communication recordings, radar data, saved flight path data from the glider's Flarm collision avoidance system, and statements made by crew members.

The business jet was flying under Instrument Flight Rules (IFR) and the glider was flying under Visual Flight Rules (VFR).

1.1.2 Background

On 15 October 2017, the glider pilot had planned to carry out three passenger flights from Amlikon Airfield (LSPA) in the two-seater Schempp-Hirth Arcus glider, registered as HB-3442. The first tow flight was delayed until midday due to fog. During the flight that followed, the pilot left the transponder that was fitted in HB-3442 switched off because, according to his statement, it would only be switched on if and when required. The Flarm, however, was switched on.

On the same day, the twin-jet Falcon 2000EX business aircraft, registered as CS-DLB, was scheduled for a ferry flight from Munich Airport (EDDM) to St. Gallen-Altenrhein Regional Airport (LSZR). The crew for this flight consisted of a pilot, a first officer and one cabin crew member. No passengers were on board.

Air traffic control for CS-DLB's instrument approach to St. Gallen-Altenrhein was provided by the Zurich AFRA Approach Control Unit (APP). The final approach was executed in contact with St. Gallen-Altenrhein Aerodrome Control (ADC). All of the workstations were manned as scheduled.

1.1.3 History of the serious incident

At 11:58 UTC on 15 October 2017, the glider pilot took off from Amlikon in HB-3442 for his first flight of the day. A passenger was sitting in the rear seat. The tow flight flew in a south-westerly direction to the summit of the Säntis mountain, where the pilot released the glider from the tow rope at 12:22 UTC at a flying altitude of 2618 m AMSL (8590 ft AMSL). Subsequently, he glided in a north-westerly direction to the region of Degersheim (canton of St. Gallen) and then northwards (see illustration 1). At 12:40 UTC, HB-3442 was west of the municipality of Sitterdorf at a flying altitude of approximately 1690 m AMSL (5540 ft AMSL). The pilot stated that he had specifically made sure not to fly over Sitterdorf Airfield (LSZV), which is located north-east of the municipality, and to keep to the west of it. He explained that he had also tuned in to the Sitterdorf aerodrome frequency to keep up to date regarding activities at this airfield. The glider pilot stated that this was always mentioned in the meeting in Amlikon before starting flight operations.

The twin-jet Falcon 2000EX business aircraft, registered as CS-DLB, had taken off from Munich Airport at 12:10 UTC. At 12:40 UTC, CS-DLB had just turned onto base leg for the approach to the Instrument Landing System (ILS) of runway 10 in St. Gallen-Altenrhein and was descending in a southerly direction at a flying altitude of 5770 ft AMSL. The flight crew of CS-DLB were in contact with the Zurich AFRA approach control unit (APP) and already reducing the flight speed during this flight phase. The Ground Speed (GS) was approximately 185 kt at this moment. Shortly after crossing the southern shore of Lake Constance, CS-DLB lev-

elled off at 5000 ft AMSL, which is the standard initial approach altitude before initiating the final approach to ILS 10. The GS was reduced to approximately 165 kt and remained virtually constant until the aircraft turned onto final approach.



Illustration 1: Recordings of the flight paths of HB-3442 (blue) and CS-DLB (red), marked on the glider map of Switzerland. The final approach to ILS 10 St. Gallen-Altenrhein is marked as a dashed black line. The point of closest proximity is marked with a red circle. The Transponder Mandatory Zone (TMZ) around Friedrichshafen Airport is highlighted in purple. Source of base map: Swiss Federal Office of Topography.

Whilst gliding in a northerly direction, the glider pilot of HB-3442 noticed a business jet up ahead on the right-hand side of his aircraft at approximately 12:42 UTC and at a flying altitude of approximately 1570 m AMSL. This jet was CS-DLB, which was flying in the opposite direction at practically the same altitude. The glider pilot watched CS-DLB fly past to the right and estimated the distance to the other aircraft to be 100 metres or more. According to his statement, he was not alarmed since other aircraft frequently flew past at a similar distance in this airspace. He stated that it was extraordinary, however, that the aircraft was a larger business jet and that it was flying at practically the same altitude.

At almost the same time, the crew of CS-DLB saw a glider, which was HB-3442, at their 2 o'clock at a slightly higher flying altitude. During this phase, CS-DLB had just initiated a left turn that had been instructed by the Air Traffic Controller (ATCO), which led the aircraft in the direction of ILS 10. At 14:42:14 UTC, the flight crew reported the proximity to the glider via radio to the ATCO, stating that the glider had flown very close past CS-DLB on the right-hand side (*"glider very close to the right, about thirty to forty meters right hand side"*). After the flight, the flight crew stated that the distance to HB-3442 was approximately 60 metres and that the glider pilot was clearly visible under the canopy. However, an evasive manoeuvre would not have been required even if CS-DLB had not initiated the left turn towards ILS 10. They stated that the glider was not visible on the navigation monitors, nor was a warning generated by the Traffic Alert and Collision Avoidance System (TCAS).

HB-3442 was not displayed on the ATCO's monitors. He only became aware of the glider when he received the radio message from the flight crew of CS-DLB.

1.1.4	Location and time of the airprox	
	Geographical position	3 NM west of the municipality of Amriswil (canton of Thurgau)
	Date and time	15 October 2017, 12:42 UTC
	Light conditions	Daytime
	Coordinates	N 47° 33' 02" / E 009° 13' 44" (WGS84) 734 760 / 168 190 (Swiss grid)
	Altitude above sea level	5000 ft AMSL (1524 m AMSL)

1.2 Information on people concerned

1.2.1 Flight crew of CS-DLB

1.2.1.1 Commander

1.2.1.1.1 General

Person	Spanish citizen, born 1978	
Licence	EASA (European Aviation Safety Agency) Airline Transport Pilot Licence Aeroplane (ATPL(A)), issued by the United Kingdom Civil Aviation Authority.	
Flying experience	Total	7,000 h
	On the incident type	2,500 h
	During the last 90 days	90 h
	Of which on the incident type	90 h

All of the available information indicates that the pilot reported for duty well-rested and healthy. There is no indication that fatigue was a factor at the time of the serious incident.

1.2.1.1.2 Details on VFR traffic

The pilot stated that, as part of his flying activities, he regularly flew to aerodromes where aircraft were flying through Class E airspace under IFR. He would also often see VFR traffic there. When approaching St. Gallen-Altenrhein, he was aware that there could be VFR traffic. However, he was astonished that the air traffic controller was completely unaware that there was a glider in the approach area of ILS 10.

1.2.1.2 First officer

Person	Norwegian citizen, born 1969	
Licence	EASA ATPL(A), issued by the Civil Aviation Authority Norway	
Flying experience	Total	5,450 h
	On the incident type	3,100 h
	During the last 90 days	118 h
	Of which on the incident type	118 h

All of the available information indicates that the first officer reported for duty well-rested and healthy. There is no indication that fatigue was a factor at the time of the serious incident.

1.2.1 Pilot of HB-3442

1.2.1.1 General

Person	Swiss citizen, born 1958		
Licence	ICAO glider pilot licence with passenger flight rating, issued by the Federal Office of Civil Aviation (FOCA)		
Flying experience	Total		908:29 h
	On the incident type		37:25 h
	During the last 90 days		8:24 h
	Of which on the incident type		2:49 h

All of the available information indicates that the glider pilot was well-rested and healthy. There is no indication that fatigue was a factor at the time of the serious incident.

1.2.1.2 Details on IFR traffic

The glider pilot stated that he had not been aware that he could encounter a larger aircraft such as CS-DLB, which is operated under IFR, in the Amriswil region. He explained that he had also not known that the flying altitude of aircraft before descending onto ILS 10 in St. Gallen-Altenrhein was approximately 1500 m AMSL; according to the glider pilot, this information was not marked on the glider map either. He also mentioned that this had never been discussed in the gliding club and there had not been any relevant recommendations.

He stated that after the serious incident, however, the topic was discussed at the annual general meeting.

1.3 Aircraft information

1.3.1 Aircraft 1

Aircraft type	Falcon 2000EX
Registration	CS-DLB
Characteristics	Twin-jet business aircraft designed as a self-supporting low-wing monoplane in an all-metal construction with retractable landing gear and nose-wheel configuration
Manufacturer	Dassault Aviation
Year of manufacture	2006
Relevant equipment	TCAS

1.3.2 Aircraft 2

Aircraft type	Arcus
Registration	HB-3442

Characteristics	Two-seater, high-performance glider, designed as a mid-wing plastic construction with a wingspan of 20 m
Manufacturer	Schempp-Hirth GmbH
Year of manufacture	2015
Equipment	Mode S transponder, Flarm collision avoidance system

1.4 Meteorological information

1.4.1 General weather conditions

An intense area of high pressure extended from North Africa to Central Europe. At altitude, it was supported by a ridge stretching from Tunisia to Hungary.

1.4.2 Weather at the time and location of the serious incident

There was persistent low stratus above Lake Constance. There were no clouds in Oberthurgau. Visibility was approximately 60 km. The wind was blowing at approximately 10 kt from the west-northwest.

Weather/clouds	Sunny and clear
Visibility	Approximately 60 km
Wind	280 degrees, approximately 10 kt
Temperature / dew point	16°C / 8°C
Atmospheric pressure	1,028 hPa (pressure reduced to sea level, calculated with the values of the ICAO standard atmosphere)

1.4.3 Astronomical information

Position of the sun	Azimuth: 207 degrees	Elevation: 30 degrees
Light conditions	Daytime	

1.5 Navigational aids

The flight crew of CS-DLB approached runway 10 at St. Gallen-Altenrhein using the ILS. The final approach starts at an altitude of 5000 ft AMSL (1524 m AMSL), shortly after the navigational waypoint SITOR, which is located on the localizer axis at a distance of 9 NM from the runway threshold (see illustration 2). In the western extension of the localizer, Sitterdorf Airfield is located at a distance of 12 NM from St. Gallen-Altenrhein and the airfields Amlikon and Lommis at about 22 NM.

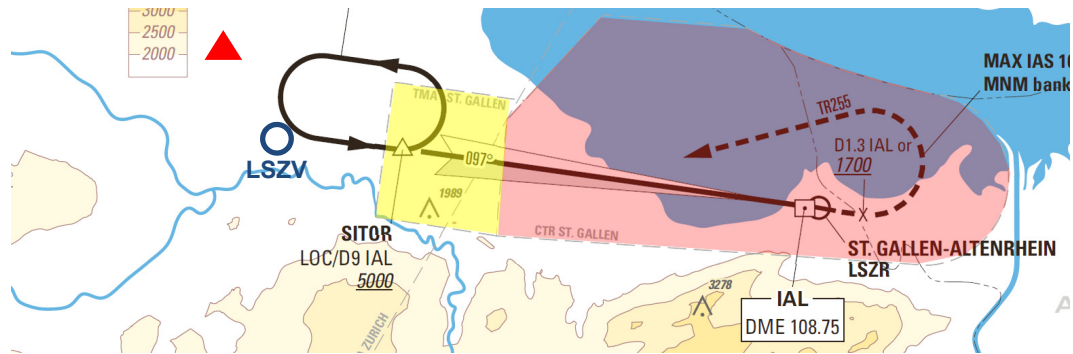


Illustration 2: Section from the Instrument Approach Chart (IAP) of ILS 10 at St. Gallen-Altenrhein, Swiss Aeronautical Information Publication (AIP). The location of the Sitterdorf Airfield (LSZV, dark-blue circle) was later added, as were the locations of the Control Zone (CTR, highlighted in red) and the Terminal Control Area (TMA, highlighted in yellow) at St. Gallen-Altenrhein. The point at which the airprox occurred is marked as a red triangle.

1.6 Communication

Radio communication between the flight crew of CS-DLB and the air traffic controllers involved was duly undertaken and without any difficulties.

1.7 Airspace information

The terminal control area (TMA) at St. Gallen-Altenrhein is Class D airspace and ends one nautical mile west of the waypoint SITOR; adjacent to this is Class E airspace from an altitude of 2000 ft above ground to 6500 ft AMSL.

There is IFR traffic as well as VFR traffic in the controlled Class E airspace. IFR traffic is only separated from other IFR traffic. There is no separation between IFR and VFR traffic or VFR and other VFR traffic respectively. Information on VFR traffic is provided where possible. Radio contact with air traffic control is not required for VFR traffic.

In Class E airspace, it is only mandatory to carry and switch on a functioning transponder with altitude transmission above 7000 ft AMSL. For non-motorized aircraft this requirement does only apply if sufficient electrical supply is guaranteed.

There is a Transponder Mandatory Zone (TMZ) around Friedrichshafen Airport (EDNY) north of Lake Constance where all air traffic must carry a transponder that is switched on (see illustration 1). No TMZ has been defined for the Swiss territory around St. Gallen-Altenrhein, which is adjacent to this in the south.

1.8 Flight recorders

HB-3442 was equipped with a Flarm collision avoidance system that was switched on during the entire flight. The GPS positional data were read from the Flarm.

CS-DLB was equipped with a Honeywell flight data recorder (FDR). This FDR was not read.

The flight path of CS-DLB was established based on radar data. The flight paths are shown in illustration 3. The closest proximity between the two aircraft was at 12:42:08 UTC with a horizontal distance of approximately 660 m (with an accuracy of approximately ± 100 m) and a vertical distance of approximately 40 m (± 25 m).

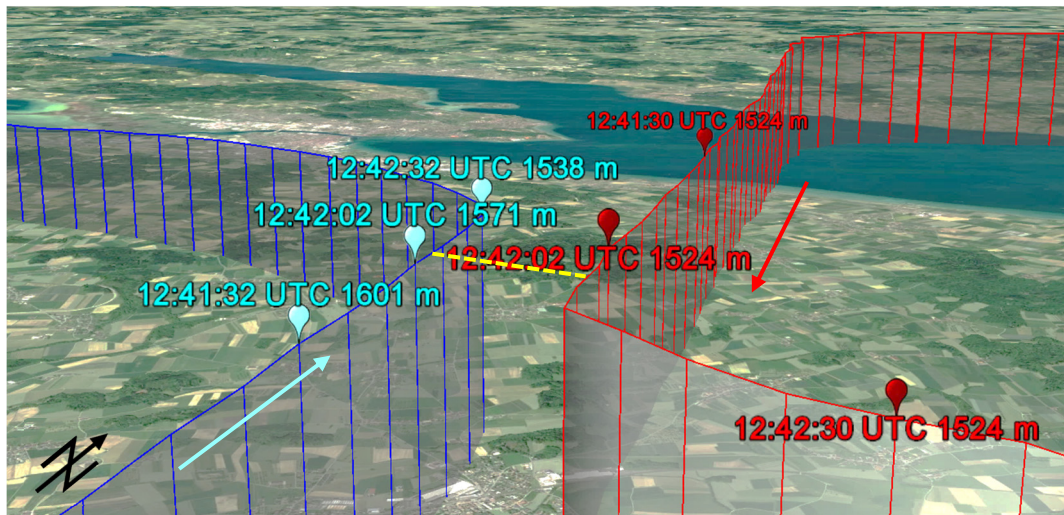


Illustration 3: Flight path of HB-3442 (blue) based on the Flarm data and of CS-DLB (red) based on the radar data, shown in Google Earth. The closest proximity occurred at 12:42:08 UTC (dashed yellow line).

1.9 Further incident

On 18 May 2018, a single-engine aircraft performed an instrument approach to ILS 10 in the westerly extension of runway 10/28. Above the municipality of Bürglen (canton of Thurgau), which is located between the airfields Amlikon and Sitterdorf, and at an altitude of around 5000 ft AMSL, the crew saw two gliders approximately 1 NM south of their flight path and at the same flying altitude. No transponder signal was received from either of the two gliders, nor were their crews in radio contact with the Zurich ARFA air traffic control unit or the St. Gallen-Altenrhein aerodrome control unit.

1.10 Safety recommendations

In previous investigations, the STSB has already analysed airproxes between aircraft which overall were similar to this serious incident. As part of these investigations, corresponding safety recommendations were issued:

- Safety recommendation no. 466 was issued as part of final report no. 2208 concerning the serious incident that took place on 11 August 2012, involving an A340 commercial aircraft and an ASW 20 glider in the terminal control area of Zurich Airport. It states that for the areas surrounding large Swiss airports, TMZs should be specified which include both control zones (CTR) and terminal control areas (TMA) and contain vertical and horizontal buffer zones with regards to this airspace.
- Safety recommendation no. 518 was issued as part of final report no. 2294 concerning the serious incident that took place on 3 June 2015, involving an airprox between a commercial aircraft and a hot-air balloon in the terminal control area of Zurich Airport. It states that any aircraft which can pose a danger to a large aircraft, should be obliged to carry an operational and switched-on transponder over Swiss territory without exception. Particular attention should be paid to its compatibility with the most widespread traffic warning systems. The determination of the technical and operational framework conditions should take place in cooperation between air traffic control and FOCA to allow the best possible use of this transponder obligation for air traffic control.

- Safety recommendation no. 519 was issued as part of the same final report no. 2294. It states that simply designed and sufficiently large controlled airspaces in the areas surrounding large Swiss airports should be specified.

At the time of publication of this final report all three safety recommendations were neither implemented, nor was there a specific implementation plan.

2 Analysis

2.1 Technical aspects

There is no indication of pre-existing technical faults that could have caused or influenced the serious incident.

2.2 Human and operational aspects

2.2.1 Air traffic control

The Air Traffic Controller (ATCO) at the Zurich AFRA Approach Control Unit (APP) saw CS-DLB approaching from the north on his workstation monitor and was in radio contact with its flight crew. HB-3442, whose transponder was not switched on, was not displayed on the monitor. It was therefore not possible for the controller to see the glider and its position in order to provide CS-DLB with corresponding traffic advice.

2.2.2 Flight crew of CS-DLB

The flight crew of CS-DLB were rightly aware that they were flying in Class E airspace during their approach to St. Gallen-Altenrhein and that they had to apply the 'see and avoid' principle to notice other aircraft. The selected flight speed was appropriate for the conditions. However, the pilot was astonished that the ATCO was completely unaware that glider HB-3442 was in the approach area of ILS 10. He obviously did not know that the Transponder Mandatory Zone (TMZ) around Friedrichshafen Airport (EDNY) extended only to German territory and not to Swiss territory.

2.2.3 Glider pilot of HB-3442

The glider pilot was flying in Class E airspace, where using a transponder is not mandatory. He therefore left the transponder switched off. As a result, neither his position nor his flying altitude were displayed on the ATC's monitor and CS-DLB's navigation monitor. This also prevented the Traffic Alert and Collision Avoidance System (TCAS) on board CS-DLB from generating a warning. Switching on the transponder, particularly around an airport with IFR traffic, offers an excellent opportunity to make one's own position and flying altitude visible to the flight crews of other aircraft equipped with the relevant devices and to the ATC. The flight crews can then take or command evasive flight paths (sense and avoid). In the case of this airprox, both flight crews were only able to notice the other aircraft by visually identifying it (see and avoid).

The approach axis of Instrument Landing System (ILS) 10 in St. Gallen-Altenrhein and, in particular, the altitude of approximately 1500 m AMSL at which IFR aircraft fly to the Final Approach Point (FAP), are not charted on the glider map. For this reason, the glider pilot was not aware that he was more likely to encounter an aircraft in this area that operated under IFR, such as CS-DLB. The extended TMA west of the St. Gallen-Altenrhein CTR, which ranges from 3500 ft to 5500 ft AMSL, was the only indication that instrument approaches might be executed in this area and at this altitude.

As recommended in the gliding club's morning meeting, the glider pilot tuned the radio frequency of Sitterdorf Airfield, which is located directly on the approach axis of ILS 10. He did this to keep up to date on the activities in Sitterdorf in order to increase his situational awareness during the current flight phase. Whilst this approach is forward-thinking in principle, in this case it led to an inadequate situational

awareness, as the St. Gallen-Altenrhein traffic situation was not included. In the vicinity of a frequented aerodrome, particularly in sectors in the extension of instrument approaches, it can be appropriate to make contact with the Aerodrome Control Tower (TWR) frequency and to provide positional information, even when flying outside of the CTR or TMA. Therefore, the STSB issues a safety advice (see section 4.2.1).

2.2.4 Procedures

The flight path of CS-DLB to St. Gallen-Altenrhein, which was specified by the ATCO, led via a flight route and at an altitude which were standard for the approach to ILS 10.

There is a TMZ around Friedrichshafen Airport over German territory. Therefore, all air traffic within a certain altitude range and radius around CS-DLB was acquired by the TCAS and was shown on CS-DLB's navigation display. In the event of an airprox the TCAS would have generated a traffic advisory and a resolution advisory to the flight crew. In addition, the ATCO was able to see all air traffic within the TMZ on his workstation monitor and give the flight crew of CS-DLB corresponding traffic advice.

Due to the airspace around St. Gallen-Altenrhein being designed without a transponder requirement (no TMZ), the same ATCO was unable to provide CS-DLB with traffic information on aircraft without a switched-on transponder flying over Swiss territory. During the investigation, this was found to be a risk factor.

Furthermore, it is not possible for the ATCO to map out the approach or departure path of an IFR aircraft in such a way that an airprox between a VFR aircraft and an aircraft flying without a switched-on transponder could be avoided. Similarly, the Standard Instrument Departures (SIDs) as well as the Standard Arrival Routes (STARs) run through Class E airspace that has no TMZ.

The risk identified above is generally present in all Class E and Class G airspace for all types of aircraft.

In the context of the STSB final reports no. 2208 and no. 2292, three safety recommendations no. 466, no. 518 and no. 519 were issued (see section 1.10). These safety recommendations, which have not yet been implemented and for which there is no specific implementation plan, are all based on a safety deficit that is similar to the one identified in this investigation. The present investigation highlights that the problems are not restricted solely to individual airports or specific types of aircraft, but exist in the entire airspace over Swiss territory and affect all aircraft. An implementation of the above mentioned safety recommendations would also address the safety deficit that was identified in this investigation. Therefore the STSB does not issue a new safety recommendation.

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- The business jet was approved for IFR operation; the glider was approved for VFR operation.
- The investigation did not find any indication of pre-existing technical defects which could have caused or influenced the serious incident.
- The transponder in the glider was switched off; the Flarm collision avoidance system was switched on.

3.1.2 Crews

- The pilots possessed the necessary licences for the flights.
- There is no indication that the pilots experienced any health problems during the flights involved in the incident.

3.1.3 Air traffic control staff

- The air traffic controllers held the required licences for carrying out their duties.
- There is no indication that the air traffic controllers experienced any health problems at the time of the serious incident.

3.1.4 History of the flight

- At 12:40 UTC on 15 October 2017, the twin-jet Falcon 2000EX business aircraft, registered as CS-DLB, was flying the base leg for an instrument approach to runway 10 in St. Gallen-Altenrhein (LSZR) in a southerly direction at a flying altitude of 5000 ft AMSL.
- At the same time, the two-seater Arcus glider, registered as HB-3442, was gliding approximately 3 NM west of Amriswil (canton of Thurgau) in a northerly direction at an altitude of 1570 m AMSL.
- The flight crew of CS-DLB were in radio contact with the air traffic controller of the Zurich ARFA approach control unit.
- The air traffic controller had no knowledge of HB-3442. The glider was not displayed on his workstation monitor.
- After both the flight crew of CS-DLB and the glider pilot had seen each other's aircraft, their flight paths crossed at 12:42:08 UTC flying in opposite directions at a horizontal distance of approximately 660 m and a vertical distance of approximately 40 m.
- The flight crew of CS-DLB reported the airprox to the air traffic controller at 12:42:14 UTC.

3.1.5 General conditions

- There is a Transponder Mandatory Zone (TMZ) around Friedrichshafen Airport (EDNY) above German territory. No such TMZ has been specified for the area surrounding St. Gallen-Altenrhein Airport.

3.2 Causes

The serious incident was an airprox between a twin-jet business aircraft and a glider, which can be attributed to the fact that the two flight crews did not visually identify each other's aircraft in a timely manner.

The following factors were identified as contributing factors:

- The instrument approach of the business aircraft led through Class E airspace, in which air traffic control does not provide separation between IFR and VFR traffic.
- The transponder of the glider was not switched on, which was not mandatory.

The fact that the glider pilot did not have radio contact with the relevant air traffic control unit, which is not mandatory either, favoured the development of the serious incident.

4 Safety recommendations, safety advice and measures taken since the serious incident

4.1 Safety recommendations

None

4.2 Safety advice

The STSB may publish safety advice in response to any safety deficit identified during the investigation. Safety advice shall be formulated if a safety recommendation in accordance with (EU) Regulation 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. The legal basis for STSB safety advice can be found in Article 56 of the OSITI:

“Art. 56 Information on accident prevention

The STSB may publish general relevant information on accident prevention.”

4.2.1 Transponder use and radio contact

4.2.1.1 Safety deficit

Outside of the Control Zone (CTR) and the Terminal Control Area (TMA), approaches and departures executed under Instrument Flight Rules (IFR) at St. Gallen-Altenrhein Airport take place in Class E airspace over considerable distances. For aircraft flying under Visual Flight Rules (VFR), transponder use is not compulsory in this airspace, nor is there any obligation to maintain radio contact with air traffic control. As a result, VFR traffic may remain completely unrecognised by the air traffic controller and only be detected by the IFR flight crew by means of visual identification ('see and avoid').

4.2.1.2 Safety advice no. 24

Topic: Use of the transponder and contact with air traffic control in the vicinity of regional airports with IFR traffic

Target group: Aero Club of Switzerland (AeCS) and all airspace users

The Aero Club of Switzerland should raise awareness among its members of the fact that increased IFR traffic is to be expected in Class E airspace which borders on Control Zones (CTR) and Terminal Control Areas (TMA) of regional airports such as St. Gallen-Altenrhein. Keeping the transponder switched on continuously and making contact with the aerodrome controller of the respective aerodrome to communicate their own position and flying altitude are the only possible way, besides 'see and avoid', to make a VFR aircraft detectable for IFR traffic.

4.3 Measures taken since the serious incident

The measures known to the STSB are listed without comment below.

At the 2018 general meeting of the Cumulus gliding club, which is based at Amlikon Airfield, the topic was brought up by the chief flight instructor. A member of staff from air traffic control gave a presentation on the problem regarding St. Gallen-Altenrhein Airport.

The following points were listed as a conclusion:

“What can we do?”

- *Look out not just Altenrhein and Friedrichshafen with E airspace*
- *Do not insist on right of way*
- *Keep cloud distances*
- *XPDR*
- *Respect IFR flight paths*
- *Radio (active/passive)*
- *Tune in within TMZ (what are others doing)”*

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

Bern, 20 August 2019

Swiss Transportation Safety Investigation Board