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INVESTIGATION REPORT

Serious incident between the Diamond DA42 registered F-HCTA and the Rolladen Schneider LS8 registered HB-3284

on 27 July 2016
at Pont-sur-Yonne (Yonne)

Time	Around 17:40[1]
Operator	Diamond DA42: ENAC Rolladen Schneider LS8: Segelfluggruppe Basel Fricktal
Type of flight	Diamond DA42: Cross-country Rolladen Schneider LS8: Local
Persons on board	Diamond DA42: Pilot and two passengers Rolladen Schneider LS8: Pilot
Consequences and damage	None
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in August 2021. As accurate as the translation may be, the original text in French is the work of reference.	

[1] Except where otherwise indicated, the times in this report are in local time.

Near midair collision between an aeroplane and a glider in class E airspace, evasive action

1 - HISTORY OF THE FLIGHT

Note: The following information is principally based on statements, radiocommunication recordings, data from the glider's GNSS computer, and data from a GNSS receiver on board the aeroplane.

The pilot of the aeroplane, accompanied by two passengers, took off at 15:27 from Muret-Lherm aerodrome (Haute-Garonne) under Instrument Flight Rules (IFR) bound for Melun Villaroche aerodrome (Seine-et-Marne). The passenger sat in the front right seat also had an IFR rating and a Diamond DA42 rating.

The glider pilot took off from Pont-sur-Yonne (Yonne) aerodrome at around 13:55 for a local flight.

At 17:30, following a 352°[2] route towards the VOR-DME of Bray sur Seine (BRY), the pilot of the DA42 continued descending from FL090 to FL050 as requested by the air traffic controller. The latter then asked the pilot to head directly towards point PM501 of the RNAV Y approach to Melun-Villaroche aerodrome to make a landing on runway 28.

At 17:38, he asked the pilot to descend to 4,000 ft (QNH1018) and he cleared the pilot for the RNAV Y approach to Melun-Villaroche. At 17:40, he asked him to descend to 3,000 ft.

[2] MOU4A approach for Melun Villaroche aerodrome.

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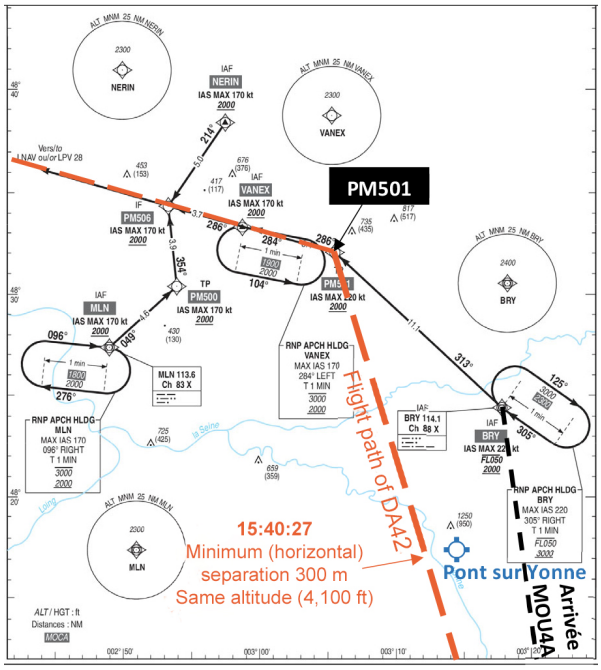
Shortly after this descent instruction, the passenger sat in the front right seat shouted "glider" three times. The pilot then, with difficulty, detected the glider that was following a path going from the right to the left of the aeroplane, at the same altitude. He disconnected the autopilot and turned right making a full right input on the stick to move behind the glider. He also increased the aeroplane's rate of descent before returning to his approach path and landing at Melun-Villaroche aerodrome at 17:55. The glider pilot continued his route without having seen the aeroplane. He landed at Pont-sur-Yonne aerodrome at 18:42.

The minimum separations between the glider and the aeroplane, at an altitude of 4,100 ft, were around 300 m in the horizontal plane and 15 ft in the vertical plane[3], reached at 17:40:27.

[3] Without taking into account GNSS uncertainties of approximately 10-15 m in the horizontal plane and 30 m in the vertical plane.

No equipment on board the aeroplane or the glider alerted the pilots to the presence of the other aircraft.



Source: AIP AD 2 LFPM IAC RWY28 –INA GNSS of 10 December 2015

Figure 1: Path of DA42 on the GNSS approach chart for runway 28 at Melun-Villaroche aerodrome

2 - ADDITIONAL INFORMATION

2.1 Onboard system information

2.1.1 Diamond DA42 registered F-HCTA

F-HCTA is equipped with a Garmin G1000 integrated avionics system that comprises a series of interconnected equipment including a mode S transponder enabling information to be exchanged between the aeroplane and ATC facilities.

Note: All aircraft in IFR flight must be equipped with a mode S transponder with encoding altimeter.

The Garmin G1000 avionics system incorporates a TAS system designed to facilitate the detection and avoidance of aircraft. This system only uses information exchanged between mode S transponders.

2.1.2 Rolladen Schneider LS8 registered HB-3284

The glider is equipped with a GNSS computer which incorporates a FLARM module. This system transmits the glider's GNSS position to facilitate the detection and avoidance of other aircraft equipped with the same type of FLARM system. It operates independently of ground radionavigation and air navigation (transponder) equipment. This is a "*cooperative*" system that transmits the aircraft's GNSS position to similar systems in operation installed on nearby aircraft. In use since 2004, the FLARM's main function is to improve the "*see and avoid*" rule principle. The glider was also equipped with a transponder.

In 2012, the French Gliding Federation (FFVP) decided to make it mandatory to carry FLARM type equipment on all aircraft declared by associations affiliated to or recognised by the FFVP and where the private owners hold a FFVP licence: gliders, powered gliders and tugs.

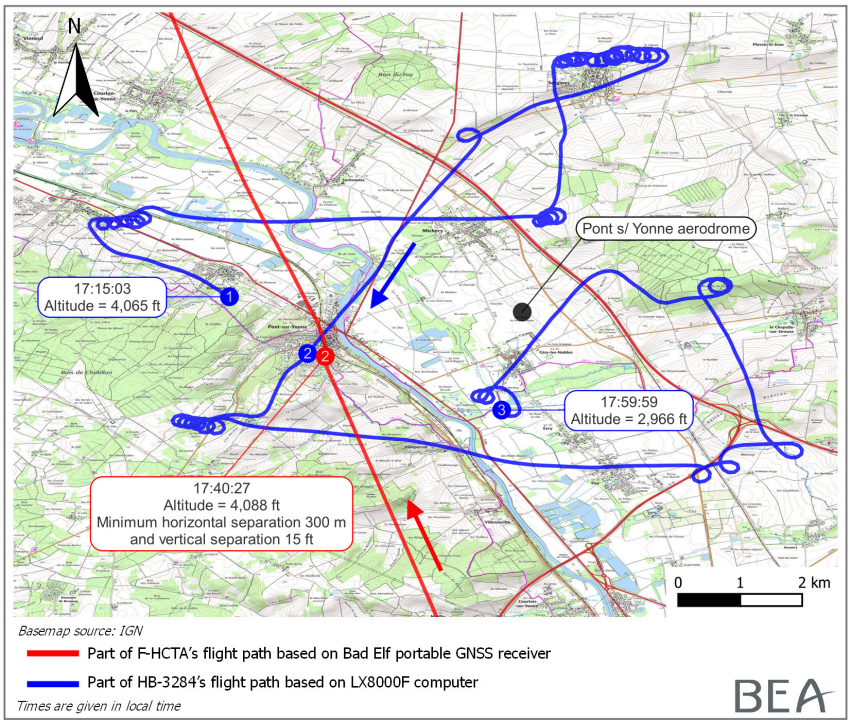


Figure 2: Paths of the glider and the aeroplane in the vicinity of Pont-sur-Yonne aerodrome

2.2 Meteorological information

The meteorological conditions recorded at the time of the incident were calm. Visibility was greater than 10 km and the wind was blowing westerly at around 10 kt at the incident altitude. A few cumulus clouds (1 to 2 oktas) were present with their base at 4,500 ft.

The passenger in the rear seat took several photographs during the flight. The photograph in Figure 3 was taken shortly after the evasive action.

Figure 3: Photograph taken by the rear passenger shortly after the evasive action

2.3 Information about the persons on board the aeroplane

2.3.1 Pilot

The pilot held a Commercial Pilot Licence (CPL(A)) and a pilot licence issued by the air navigation engineering corps. He held an Instrument Rating (IR(A)) (single-engine and multi-engine aeroplanes, including the Airbus A320) as well as a Flight Instructor (FI(A)) rating. On the day of the incident, he had logged around 1,345 flight hours, 10 hours of which in the last three months in a Diamond DA42.

2.3.2 Passenger in front right seat

The passenger seated in the front right seat held a Private Pilot Licence - Aeroplanes (PPL(A)) and a pilot licence issued by the air navigation engineering corps. She held an Instrument Rating (IR(A)) (single-engine and multi-engine aeroplanes) as well as a Flight Instructor (FI(A)) rating. She had logged around 1,745 flight hours, 60 hours of which in the last three months (including 25 hours in a Diamond DA42).

2.3.3 Statements from pilot and passenger seated in the front right seat

The pilot and the passenger stated that during flight preparation, they had checked the NOTAM (aerodromes and FIR) and the meteorological conditions. To prepare for the flight and on board the aeroplane, they had access to the Jeppesen IFR atlas, as well as the Jeppesen tablet application.

One hour and twenty minutes before the evasive action, the pilot and the passenger had signalled an AIRPROX[4] after seeing the presence of an aircraft near the DA42 on the TAS (to its rear left, approximately 400 ft lower). The DA42 was in level flight at FL090 in the cloud layer, near Saint-Flour Coltines aerodrome (Cantal) and in contact with the approach controller at Clermont-Ferrand Auvergne (Puy-de-Dôme). The latter had detected the other aircraft on the radar (which turned out to be a Cirrus SR20) shortly after the pilot made contact over the frequency.

Just before the TAS signalled the Cirrus, the pilot and the passenger had talked to the rear passenger about the fear in IFR flight, of finding gliders in or around the cloud layer. They added that this TAS warning led them to be more vigilant in their look-out.

[4] Expression designating the proximity of aircraft in an air traffic incident report.

The initiation of descent from FL090 was requested by the approach controller much earlier than the pilot had planned. The instruction to head directly towards point PM501 shortened the path of the DA42 while setting up for the approach and resulted in it passing not far from the west of Pont-sur-Yonne aerodrome.

The pilot and the passenger stated that the conditions were bright, with a few cumulus clouds making it difficult to detect gliders. After avoiding the glider, they notified the air traffic controller of the evasive action and of the presence of gliders. They also asked him which class of airspace they were in. The controller told them that they were in class E airspace and that he had no knowledge of glider activity at Pont-sur-Yonne aerodrome.

2.4 Glider pilot information

The pilot held a glider pilot licence (SPL(S)) and a Light Aircraft Pilot Licence (LAPL). He had logged around 300 flight hours on gliders, 27 hours of which in the last three months.

He stated that he had not seen the Diamond DA42 and that, during the flight, his attention had been mainly focused on the meteorological conditions and other gliders flying in the vicinity of Pont-sur-Yonne aerodrome. He stated that, to limit power consumption, he had not switched on his transponder and that he was using the onboard FLARM. He added that, from now on, he would always switch on the glider's transponder in flight.

2.5 Air navigation information

2.5.1 Class E airspace

Class E airspace permits visual flights (VFR) and IFR flights. Air traffic organisations provide a separation service between IFR flights, and an information service between VFR flights and between VFR-IFR flights. Radio contacts are only mandatory for IFR flights. Visual Meteorological Conditions (VMC) are:

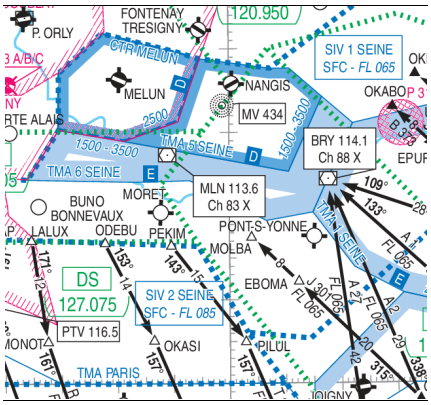
- ❒ distance in relation to clouds of 1,500 m horizontally and 300 m (1,000 ft) vertically;
- ❒ visibility of 8 km above FL100 and 5 km below FL100.

2.5.2 Pont-sur-Yonne aerodrome

Gliding is permitted at the aerodrome. The VAC chart indicates that the aerodrome is in the SEINE Flight Information Sector (FIS) (ground to FL065) and under two Terminal Manoeuvring Areas (TMAs) in the PARIS class E airspace (TMA4.1 between 3,500 ft and 4,500 ft, where the incident occurred, and TMA5.1 between 4,500 ft and FL065), managed by the Melun-Villaroche aerodrome control service. The gliding club at Pont-sur-Yonne aerodrome is not required to report its activity at the aerodrome and in its vicinity to this control service (this absence of information is not specific to this club).

2.5.3 Melun-Villaroche aerodrome

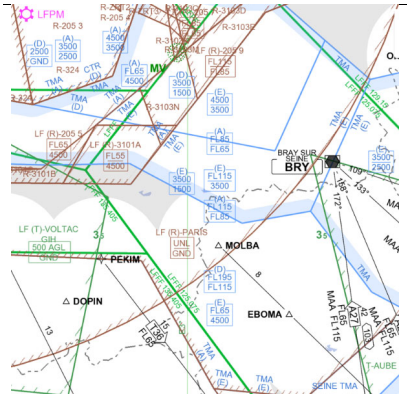
The AIP regional chart for Melun-Villaroche aerodrome shows the routes inside the control zone (CTR) and the TMA managed by the SEINE approach control centre, as well as their airspace classes (see Figure 4). The approach control centre (SEINE) uses the Vectoring, Radar Surveillance and Radar Assistance functions to provide control, information and alert services. Pont-sur-Yonne aerodrome is located under the PARIS TMAs. As a consequence, the class and the altitudes of the airspace flown through by the DA42 heading for point PM501 of the GNSS approach to Melun-Villaroche aerodrome are not indicated.



Source: AIP AD 2 LFPM ARC of 10 December 2015

Figure 4: Extract from the Melun-Villaroche regional chart

The charts in the Jeppesen printed atlas do not show the various airspaces with their associated classes. Conversely, the Jeppesen tablet application shows them on the en route chart (LOWIFR in particular) and indicates their floor and ceiling altitudes (see Figure 5). However, not all aerodromes are shown.



Source: Jeppesen digital tablet application

Figure 5: Extract from the LOWIFR chart

The SEINE approach controller had no knowledge of glider activity at Pont-sur-Yonne aerodrome.

2.6 "See and avoid" principle[5]

The "*see and avoid*" principle constitutes one of the means described in the rules of the air to avoid collisions[6]: "*Regardless of the type of flight or the class of airspace in which the aircraft is operating, it is important that vigilance for the purpose of detecting potential collisions be exercised on board an aircraft. This vigilance is important at all times including while operating on the movement area of an aerodrome*". Therefore, even if in some airspace classes, air traffic controllers can provide traffic information and separation instructions to guarantee distance between aircraft, the "*see and avoid*" principle remains the rule of thumb, in visual flight and instrument flight.

[5] For more information: BEA study and ATSB research report.

[6] Standardised European Rules of the Air (implementation of EU regulation 923/2012 "SERA" in France).

While this principle prevents a lot of collisions, it is far from being reliable. Many limitations, such as those of human sight or flight management workload, combine to make the "*see and avoid*" principle, an unreliable traffic separation method. Ground and cloud characteristics can also make it difficult to identify aircraft (image less clear due to interaction between the form of the aircraft and the contours of the background).

In addition, even when an aircraft has been identified, time is also required to recognise and respond to a collision threat.

The SISA study ordered in 2011 by the European Aviation Safety Agency (EASA) showed that the collision risk does not only concern gliders. Between 2006 and 2011, 82 midair collisions occurred in Europe. These accidents caused 82 deaths and 16 serious injuries. The majority involved aircraft with a maximum take-off weight below 2,250 kg. The study showed once more, the operational limits of the "*see and avoid*" concept as well as the requirement to develop onboard traffic detection systems for all aircraft. Within the context of the safety investigation pertaining to the midair collision between a tug and a glider in 2012[(7)], the BEA recommended that "*EASA encourage the development, use and generalisation of interoperable onboard traffic detection systems. This can be achieved through standardisation of the broadcast and exchange formats between the various systems.*" [Recommendation 2015-057]. In response to this safety recommendation, EASA has been working to implement, with the support of technical partners, actions to reduce the potential hazard of midair collision (e.g. interoperability of devices and systems, installation of these devices on all types of EASA-certified aircraft, airspace design).

(7) https://www.bea.aero/fileadmin/uploads/tx_elydbrapports/f-sh120505.en_01.pdf

On its part, in 2016, the Federal Aviation Agency (FAA) issued an advisory circular[(8)] for the purpose of alerting all pilots to the potential hazards of midair collisions and near midair collisions (NMAC). It indicates that "*from January 2009 through December 2013, a total of 42 midair collisions occurred in the United States. During this same time period, there were 461 reported NMACs. Statistics indicate that the majority of these midair collisions and NMACs occurred in good weather and during daylight hours*". In addition to the "*see and avoid*" principle which limits the potential hazard of collisions or near-collisions, the circular indicates that pilots should have knowledge of all airspace flown through during the planned flight (pre-flight and in flight). It also highlights the particular characteristics of class E and G airspaces.

(8) Pilots' Role in Collision Avoidance

The circular presents equipment that provides pilots with information about the position and flight path of other aircraft and enables pilots to share information with each other. It recommends using this equipment, whenever possible, to limit the potential hazard of collision.

Among near midair collisions or collisions that occurred in class E airspace, the near-collision described below is similar to the one analysed in this report.

- In October 2017, at an altitude of 5,000 ft and in a class E airspace, the flight paths of a Dassault Falcon 2000EX and an Arcus glider intersected in opposite directions. The closest horizontal and vertical distances between the two aircraft were approximately 660 m and 40 m respectively. The aircraft and glider pilots only noticed the other aircraft shortly before the point of closest proximity. The air traffic controllers were unaware of the glider. The Dassault Falcon 2000EX was equipped with a Traffic Collision Avoidance System (TCAS). The glider was equipped with a FLARM which was activated, whereas its S mode transponder was not switched on. [Investigation report of the Swiss Transportation Safety Investigation Board STSB]

3 - CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation. They are not intended to apportion blame or liability.

Scenario

In descent to Melun-Villaroche aerodrome in IFR flight, in a class E airspace, the passenger seated in the front right seat of the aeroplane detected a glider at the same altitude and on a conflicting flight path. The glider pilot had not switched on his transponder in order to limit the glider's power consumption. The detection of traffic by the glider's FLARM therefore relied solely on the use of information from other FLARM. The glider pilot was not in radio contact with the approach controller and had no obligation to be. The approach controller was therefore unaware of the presence of a glider in the area and was unable to provide early traffic information to the aeroplane pilot. The TAS system installed on the DA42 could not provide information to the pilot regarding the glider's position since the glider's transponder was not switched on. The DA42 pilot's evasive action relied solely on the "*see and avoid*" concept despite the presence on board both aircraft of systems designed to facilitate aircraft detection and avoidance. The glider pilot did not see the aeroplane at any time.

Contributing factors

Due to their vigilance and look-out while flying under IFR on the edge of the cloud layer, the aeroplane crew managed to detect the glider and to change the path to avoid collision.

The following factors may have contributed to the near midair collision between the aeroplane and the glider:

- The combination of IFR and VFR traffic in class E airspaces in which VFR pilots may not be in contact with air traffic controllers and in which the switching on of transponders is not mandatory.
- The lack of interoperability between some onboard systems that do not use the same technologies.
- The operational limits of the "*see and avoid*" principle that did not enable a timely detection of each of the aircraft by the persons on board.

Safety lessons

In the hierarchy of potential hazards to be managed in class E airspaces (and also in class G airspaces) in which radio contact and the use of the transponder are not mandatory, collision with another aircraft can be considered as a priority and necessarily involves vigilance and a heightened look-out. In IFR flight, manoeuvres on the edges of or in the cloud layer can make it more difficult to detect other aircraft, and gliders in particular.

Moreover, adherence to distances in relation to clouds in VMC will enable potential conflicts between VFR flights and IFR flights to be avoided or limited when emerging from the cloud layer, in climb or in descent.