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Swiss Transportation Safety Investigation Board STSB

Final Report No. 2362 of the Swiss Transportation Safety Investigation Board STSB

concerning the serious incident
involving the Pilatus PC-6/B2-H4 aircraft,
registration EC-IBY

on 21 December 2016

Buochs aerodrome (LSZC)

General information on this report

This report contains the Swiss Transportation Safety Investigation Board's (STSB) conclusions on the circumstances and causes of the serious incident which is the subject of the investigation.

In accordance with Article 3.1 of the 12th edition, applicable from 5 November 2020, of Annex 13 to the Convention on International Civil Aviation of 7 December 1944 and Article 24 of the Federal Air Navigation Act, the sole purpose of the investigation of an aircraft accident or serious incident is the prevention of accidents or serious incidents. The legal assessment of accident/incident causes and circumstances is expressly no concern of the investigation. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability.

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

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

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

All times in this report, unless otherwise indicated, are stated in the local time applicable to Switzerland (Local Time – LT) which corresponded at the time of the serious incident to Central European Summer Time (CEST). The relationship between LT, CEST and coordinated universal time (UTC) is:

LT = CEST = UTC + 1 h.

Summary

Aircraft type	PC-6/B2-H4	Registration EC-IBY
Operator / owner	Air Compluto, Aeródromo Don Quijote s/n, E-45870 Lillo (Toledo), Spain	

Pilot	Spanish citizen, born 1979			
Licence	Commercial Pilot Licence Aeroplane (CPL(A)) according to the European Aviation Safety Agency (EASA), issued by the Spanish aviation authority (<i>Agencia Estatal de Seguridad Aérea</i> - AESA).			
Flying hours	total	2409 hours	during the last 90 days	34 hours
	on the type involved in the incident	446 hours	during the last 90 days	33 hours

Safety pilot	Spanish citizen, born 1977			
Licence	CPL(A) according to the EASA, issued by the AESA.			
Flying hours	total	2425 hours	during the last 90 days	54 hours
	on the type involved in the incident	1520 hours	during the last 90 days	54 hours

Location	Buochs aerodrome (LSZC)		
Coordinates	---	Altitude	---
Date and time	21 December 2016, approx. 15:00 LT		

Type of operation	Private
Flight rules	Visual Flight Rules (VFR)
Point of departure	Valence (LFLU)
Destination	Buochs (LSZC)
Flight phase	Approach
Type of serious incident	Dangerous approach to the terrain at meteorological conditions below the minima for Special Visual Flight Rules (SVFR)

Injuries to persons

Injuries	Crew members	Passengers	Total number of occupants	Other
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	2	0	0	Not applicable
Total	2	0	0	0

Damage to aircraft No damage

Other damage None

1 Factual information

1.1 Pre-history and history of the flight

1.1.1 General information

Radar recordings were used for the following description of the pre-history and history of the flight. In addition, the statements of the crew and air traffic controllers were available to the investigation.

1.1.2 Pre-history

The Pilatus PC-6/B2-H4 aircraft, registration EC-IBY, was stationed on Lillo (LELT) aerodrome, Spain, which is located approximately 100 km south of Madrid. EC-IBY was used there as a plane to drop parachutists. For the purpose of performing major maintenance work, this aircraft made a ferry flight before Christmas 2016 from Spain to Buochs (LSZC) to Pilatus Aircraft Ltd.

For this ferry flight, which was made under visual flight rules (VFR), the operator of EC-IBY appointed two pilots, in accordance with internal regulations. The pilot in the left seat acted as commander. The second pilot exercised the function of safety pilot. He supported the commander with navigation and conducted the radiotelephony. For the commander this was his first flight to Buochs. In 2012, the safety pilot had flown EC-IBY to Buochs for a maintenance visit. For the flight preparation the crew used outdated navigation charts from 2007 and 2010. The approach charts for the aerodromes were downloaded and printed from the corresponding websites.

On 13 December 2016 EC-IBY flew from Lillo to Sabadell (LELL), Spain. The flight from Sabadell to Valence (LFLU), France, followed the next day. The final leg to Buochs was then delayed by one week, as flight operations in central Switzerland were greatly restricted because of a low layer of stratus clouds. Every day of this week, the crew had to postpone the flight to Buochs to the following day already during the planning phase. This was partly due also to the bad weather in Valence.

On the morning of 21 December 2016, the weather conditions in central Switzerland seemed to improve to such an extent that it was possible to plan the ferry flight from Valence to Buochs. In the weather forecast a 40% chance of CAVOK¹ was announced for the afternoon. After the crew had arrived at Valence aerodrome, they prepared EC-IBY for the flight. Both tanks were fuelled up and Valence, the actual point of departure, was filed as the alternate aerodrome in the ICAO² flight plan.

The air traffic controller on duty (ATCO 1) in Buochs described the weather conditions from the time he started his shift in the morning as follows: at the beginning there was a very low ceiling with poor visibility. Towards midday, the fog around the village Beckenried lifted slightly. However, the brightening stalled, so the fog never cleared. There were isolated spots through which the blue sky was weakly recognizable.

After several telephone conversations with various persons at Buochs aerodrome, the crew decided to file the ICAO flight plan with a departure time in Valence of 13:15 LT. The time of arrival in Buochs was indicated as 15:00 LT.

¹ CAVOK: Ceiling and Visibility Okay, i.e. no cloud below 5000 ft or below the highest minimum sector altitude (MSA) if this is higher than 5000 ft, no cumulonimbus CB or towering cumulus (TCU) at any altitude, no significant meteorological phenomena.

² ICAO: International Civil Aviation Organisation

1.1.3 History of the flight

EC-IBY took off from Valence at 13:25 LT. The weather conditions above the clouds were perfect according to information from the crew. For navigation, on the one hand the crew used the GPS navigation equipment installed in the aircraft, along with the charts mentioned in section 1.1.2. On the other hand, the safety pilot also occasionally checked the position of EC-IBY using the GPS receiver on his mobile telephone.

The crew called Buochs tower for the first time at 14:49:19 LT on the aerodrome control frequency and gave their position as 15 NM from Buochs aerodrome at flight level (FL) 81 in descent. ATCO 1 informed the crew that the wind was from 210° at four knots and that runway 24 was in use, with a visibility of 4 km in mist. The cloud ceiling was reported overcast at 600 ft AGL³ with a temperature of 2 °C, a dew point of 1 °C and a QNH⁴ of 1029 hPa. ATCO 1 also informed the crew that the aerodrome was being operated below the minima for Special Visual Flight Rules (SFVR) (cf. section 1.7.1). The crew then answered that they were not familiar with the surroundings of Buochs. They also asked whether the area was open for a descent with an attempt to land. ATCO 1 answered that for the moment he could not see a chance of getting an aircraft below the low layered clouds. In this context he mentioned the crew's lack of familiarity with the environment around Buochs in marginal weather conditions.

The crew confirmed this and asked whether they could remain at 6000 ft QNH above the clouds for the time being. ATCO 1 issued EC-IBY a corresponding clearance and gave the crew the hint to look out for a possible hole in the clouds in the south-east of the Control Zone (CTR). Regarding the question about their current position, after the second call the crew indicated to ATCO 1 at 14:51:25 LT that EC-IBY was approximately 11 NM south-west of Buochs. For approximately one minute there followed an exchange concerning the transponder code set in EC-IBY. Finally, ATCO 1 assigned transponder code 6105 to the crew of EC-IBY, which the latter confirmed. At 14:52:48 LT ATCO 1 cleared the crew to fly into the CTR of Buochs with the request to report when a descent below the cloud was initiated; the crew confirmed this.

From 14:54:41 LT onwards ATCO 1 reminded the crew of EC-IBY that in the prevailing poor visibility as well as the low cloud ceiling, a descent would be entirely at the crew's discretion and that the challenging terrain around Buochs would have to be taken into consideration. The crew confirmed this and said that a descent would be carried out at their own discretion and outside of the clouds. ATCO 1 confirmed this with an instruction to the crew to always fly under VFR in Visual Meteorological Conditions (VMC). At 14:55:33 LT the crew reported their position as over the aerodrome at 6000 ft QNH, which ATCO 1 confirmed again with the instruction to report if the descent becomes possible. The crew immediately enquired whether ATCO 1 thought that a descent in the south-east would be possible. ATCO 1 informed the crew that the best chance in getting below the clouds could exist in the south-east corner of the CTR. The crew responded that they would attempt it, although it did not look good in this region for the moment. ATCO 1 confirmed this with the information that meteorologically it had looked better in that area after midday and that now it was worsening again. In the meantime, a second air traffic controller (ATCO 2), who was to replace ATCO 1 for a break and who monitored the events from this point onwards, arrived in Buochs control tower.

³ AGL: Above Ground Level

⁴ Pressure reduced to sea level, calculated using the values of the ICAO standard atmosphere.

Approximately five minutes had passed since the last radio contact with EC-IBY when the crew reported at 15:01:25 LT that they would fly back to the point of departure, which ATCO 1 confirmed with the instruction to report leaving the CTR, together with the frequency reference for the next air traffic control unit. ATCO 1 also instructed the crew to set the transponder to code 7000 for VFR flights.

At 15:03:23 LT a short fragment of a conversation conducted in Spanish was recorded. Later the crew indicated that they had been speaking about a hole in the clouds below EC-IBY's current position. At 15:03:34 LT there followed the radio message to the effect that the crew had located a small hole where a descent would be feasible. ATCO 1 replied to the crew with the instruction "*Maintain VFR in VMC*". Furthermore, the crew were to report as soon as EC-IBY was below the clouds; the crew confirmed this. At this time ATCO 1 was of the opinion that the pilot was better able to judge the situation from above and that EC-IBY was in the region of Brunnen. On his radar screen, however, he ascertained that EC-IBY was to the south of the aerodrome and was descending.

There followed four 180° turns to the left. The commander flew the second turn with the intention of manoeuvring the aircraft into the hole in the clouds. The third 180° turn then followed. When the aircraft was heading east, the fourth 180° turn followed, such that EC-IBY reached the lower part of the hole in the clouds on the downwind leg of the traffic pattern for runway 06. The commander estimated the bank angles which were attained as 45° or more and the speed at approximately 90 kt. The landing flaps were not used. The crew estimated their height during the downwind leg at 400 ft to 500 ft above ground.

Suddenly ATCO 2 called out to ATCO 1 to say that the PC-6 was flying very low. When ATCO 1 glanced towards his colleague, with his viewpoint in the direction to the Buochserberg, he too saw the PC-6 flying low over the terrain. He described his observation as an aircraft falling from the clouds. Moreover, ATCO 1 did not identify any hole in the clouds in this area, large enough to allow an aircraft to descend below it. Both ATCOs were very frightened.

Below the clouds the crew could spot the runway of Buochs. The commander saw on his left the rising terrain, in front of him a village and on his right the aerodrome. In relation to his orientation, he judged that he was immediately on the aerodrome traffic pattern for runway 06. The crew described the visibility conditions during the descent manoeuvre as generally cloudy horizontally and that the ground could be seen in the oblique light.

EC-IBY was now already on the downwind leg for runway 06. Both ATCOs observed the flight path and noted that the cloud ceiling was lower in direction towards the Stanserhorn than overhead the aerodrome. At 15:05:56 LT ATCO 1 informed the crew that the aerodrome was on their right and asked whether they could see it. The pilot confirmed this and reported he was following the downwind leg. ATCO 1 then pointed out to the crew the mountains in front of them, followed by a landing clearance for runway 06 or 24. After repeated calls by ATCO 1 the landing clearance was briefly confirmed by the crew at 15:06:13 LT.

After a very short traffic pattern, EC-IBY landed on runway 06 at 15:07 LT. After a few radio calls it became clear that the PC-6 should be parked at the maintenance facility of Pilatus Aircraft Ltd. ATCO 1 then gave the corresponding taxi clearance. ATCO 1 then expressed his concern to the crew of EC-IBY as to whether this approach had been made according to VFR in VMC. The crew stated that they had seen a hole and had descended through a thin layer of clouds. EC-IBY arrived at the apron near of hangar 10 at 15:15 LT.

1.2 Meteorological information

1.2.1 General weather situation

Switzerland was at the edge of an anticyclone which extended from southern Germany to northern Spain.

1.2.2 Weather at the time and location of the serious incident

The Swiss Plateau was under closed stratus clouds which extended into the adjacent Alpine valleys. The cloud tops around the Bürgenstock were at approximately 2600 ft or 800 m AMSL. Above the stratus clouds, the air was dry and cloud-free in the environment of Buochs aerodrome. Visibility was 50 km and more. There were some flat cumulus clouds along the Alps.

Weather	Dry, covered by stratus clouds
Cloud	8/8 at 600 ft AAE ⁵
Visibility	4000 m, mist
Winds	Variable, 5 kt
Temperature/dew point	2 °C / 1 °C
Atmospheric pressure QNH	1029 hPa, pressure reduced to sea level, calculated using the values of the ICAO standard atmosphere.

1.2.3 Astronomical information:

Position of the sun	Azimuth: 216 deg.	Elevation: 11 deg.
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Lighting conditions	Uniformly diffuse light below the stratus clouds, which was overcast and approximately 170 metres thick, with a simultaneous low position of the sun and a flat angle of incidence.
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⁵ AAE: Above Aerodrome Elevation

1.2.4 Webcam images



Figure 1: Webcam images taken at Stanserhorn Station looking north-east towards the aerodrome area at the time of the serious incident (top) and for comparison an image from 10 April 2017. The yellow dashed cylinders indicate the area above the cloud cover (top) and over the terrain within which the descent was performed.

To illustrate the area below the stratus clouds, an image from the Stanserhorn webcam database was searched, from which the rising terrain to the south of the aerodrome is evident (on the right of the lower, yellow dashed cylinder).

1.3 Aircraft information

The aircraft Pilatus PC-6/B2-H4 "Turbo Porter" is a single-engine, strutted shoulder-wing monoplane of metal construction with a fixed landing gear in a tail-wheel configuration. The aircraft is equipped with a turbo-prop engine which drives a variable-pitch propeller. The maximum take-off mass (MTOM) is 2800 kg. Because of the wing configuration, the pilot on the left-hand seat has good downward visibility. The characteristic flight properties of the PC-6 permit both flying tight turns and making steep approaches.

EC-IBY was used by the operator for flights to drop parachutists and was certified for flights according to VFR by day.

1.4 Communications

Radio communications between the crew and ATCO 1 took place normally and without difficulties. A recording of the conversations was available for the investigation.

1.5 Airport information

1.5.1 General

Buochs aerodrome was built during the Second World War as a military aerodrome in the canton of Nidwalden and lies on the plateau between the villages of Stans, Buochs and Ennetbürgen. In the north the Bürgenstock limits the view towards the Lake Lucerne and in the south the Buochserhorn and the Stanserhorn form the natural borders of the Control Zone (CTR).

The reference elevation of the aerodrome is 1475 ft AMSL⁶ and the reference temperature is 24.7 °C.

1.5.2 Runway equipment

The runway dimensions of the Buochs aerodrome are as follows:

Runway designation	Dimensions
06/24	2000 x 40 m

1.5.3 Air traffic control

The Buochs aerodrome CTR is active during the periods of operation of the adjacent military aerodromes and air traffic control is provided by personnel from the Skyguide company. Special regulations apply to flights outside the times of military flight operations.

There is no air traffic control radar at Buochs aerodrome. The images for air traffic control of the Buochs control zone are transmitted from various, surrounding radar stations into the control tower.

1.5.4 Visual approach chart

For aircraft up to 5.7 tonnes, the Buochs visual approach chart stipulated an aerodrome traffic pattern on the south of the runway at 3000 ft AMSL.

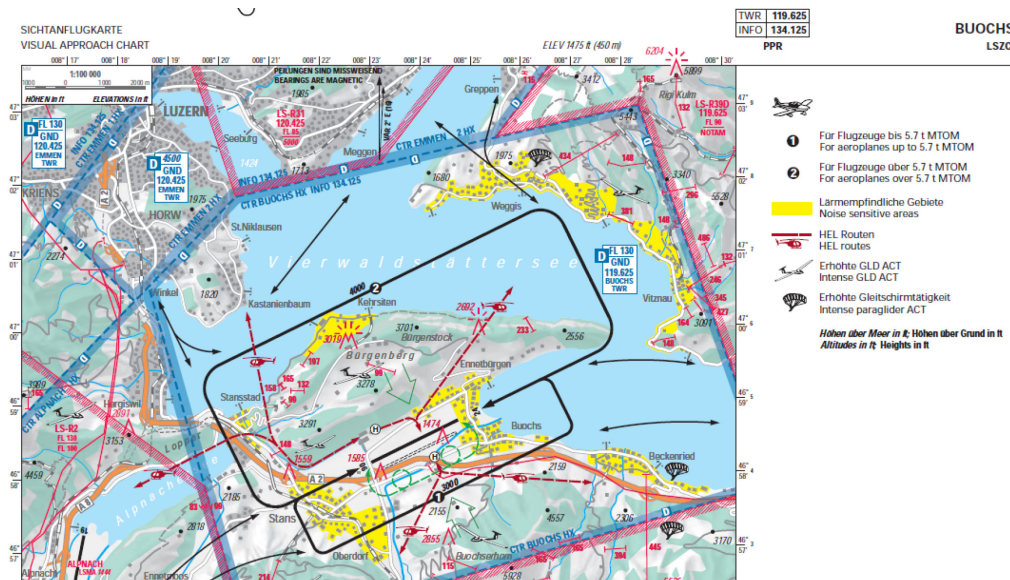


Figure 2: Excerpt from the Buochs visual approach chart. Source of the basic map: Skyguide.

On this approach chart the terrain surrounding the aerodrome is also clearly visible.

⁶ AMSL: Above Mean Sea Level

1.6 Flight path evaluation

It was possible to reconstruct the flight path of EC-IBY using various radar data.

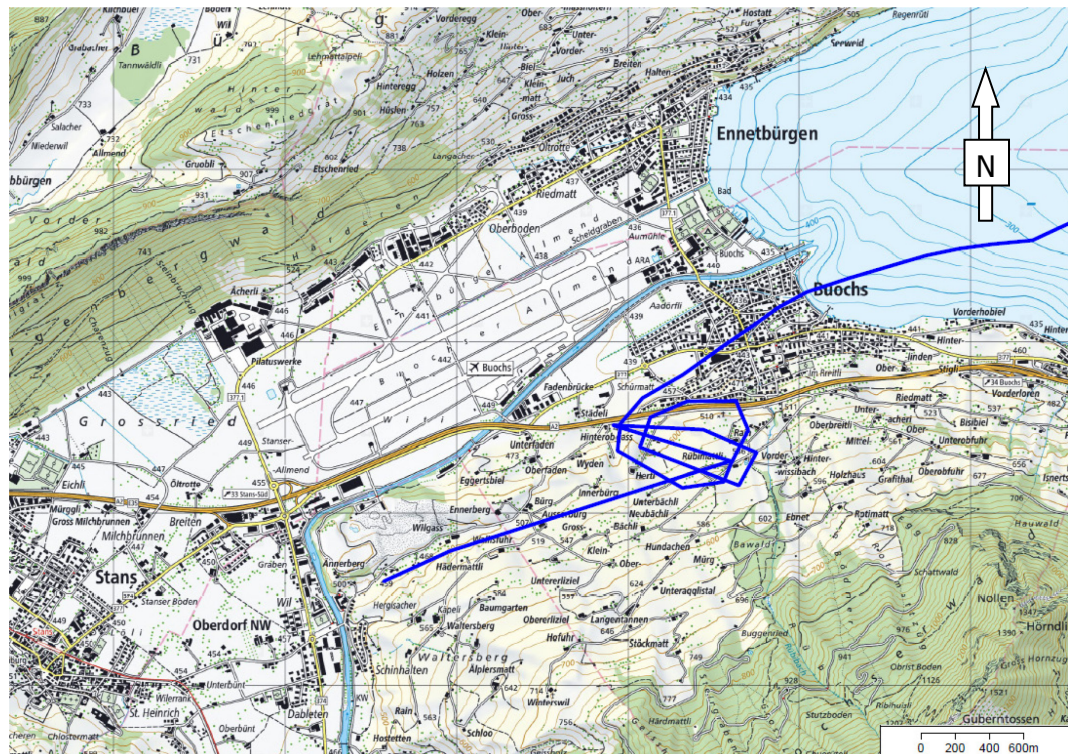


Figure 3: Plan view of the flight path of EC-IBY in the final phase of the flight. Source of the basic map: Federal Office of Topography.

As these recordings show, the descent through the clouds was made south of the village of Buochs over a surface area which is less than 1 km².



Figure 4: 3D side view of the flight path shown in figure 3. Source of the base map: Google Earth.

The yellow line illustrates how the altitude decreased from approximately 5000 ft to just over 2800 ft between 15:03:17 LT and 15:04:37 LT before the aircraft joined the downwind leg (orange line) for runway 06. The altitude then continuously decreased further in the final phase of the recording to temporarily 100 to 150 m above the ground, before the turn onto the base leg.

1.7 Additional information

1.7.1 Special visual flight rules

Special Visual Flight Rules (SVFR) can be applied to make VFR flights even in poor conditions within a control zone possible.

In the manual ATMM⁷ II of Buochs aerodrome, VFR and SVFR flights are regulated by air traffic control as follows:

"3.5 SVFR (Special VFR)

3.5.1 VFR Minima

- *ceiling: 1500ft AGL.*
- *visibility: 5000 m*

3.5.2 Special VFR (SVFR) Flights

(Refer to ATMM CH, Section 9, §4.12.2)

When the applicable VFR minima are not met, and provided that the ground visibility is not less than 2000 m, SVFR may be authorized in CTRs.

The transition from VFR to SVFR flight applies with a ground visibility of less than 5 km or when the ceiling is less than 1500 ft AGL.

Following SVFR-flights can be approved:

- *enter a CTR for the purpose of landing*
- *take-off & depart from a CTR*
- *cross a CTR*
- *operate locally within a CTR*
- *only aircraft with radio equipment are permitted and crews are required to establish two-way communication and monitor the assigned frequency*

Helicopters on a search and rescue mission or on an urgent transport mission may operate below SVFR minima (refer to §3.5.3). For search, rescue and MIL helicopter operations, ATC may issue a SVFR clearance with a ground visibility of less than 2000 m. For such flights IFR or SVFR separation shall be applied.

Pilots shall be informed about SVFR operations upon initial call. Decision if and how long SVFR is in force shall be made by ATCO TWR1.

3.5.3 SVFR Minima

- *Military aircraft* *according OM C⁸*
- *Civil aircraft* *ceiling: 1000ft AGL*
visibility: 2000m

When the meteorological conditions for SVFR are not given, SVFR traffic shall be suspended.^[9]"

⁷ ATMM: Air Traffic Management Manual

⁸ OM C: Operations Manual C

⁹ This sentence was included in the ATMM II of Buochs aerodrome, but not in the ATMM CH.

1.7.2 Information of the crew

When they were interviewed, the crew stated the following, among other things:

The commander could no longer recall whether the information concerning the weather conditions which were not fulfilled for SVFR had been transmitted in the first radio call. He was also of the opinion that the aerodrome was open and that the weather conditions were not below the conditions for VFR flights.

In addition, the safety pilot specified that this information from air traffic control was not subsequently interpreted by the crew as meaning that the aerodrome was closed for VFR flights. In this regard he referred to the hint from ATCO 1 to try at most in the south-east of the control zone to get below the clouds.

After the crew's decision to fly back to Valence, they located a hole in the clouds. They described this as being somewhat rectangular. Through this hole the ground as well as a road and a field with two or three white houses could be spotted. Both judged this hole being large enough to perform a descent.

In retrospect, the crew believed the hole in the clouds was probably too small to permit a normal descent. They were also of the opinion that it would probably have been better not to carry out the approach. Furthermore, the commander expected to fly below the clouds much higher above the terrain than it was finally the case.

The safety pilot believed the advice from the ATCO to search a hole in the clouds in the region rather encouraged their belief that approaches would be possible in Buochs. In addition, other radio calls were apparently audible, leading the crew to conclude that there were active flying operations in Buochs. It should be noted in this context that the radio communication mentioned was taking place with a PC-12 from Pilatus Aircraft Ltd., which was awaiting clearance to depart under Instrument Flight Rules (IFR).

The crew defined the term Visual Meteorological Conditions (VMC) with a visibility of more than 3 km, outside of cloud and with visual contact with the ground.

Regarding the technical condition of EC-IBY, the crew stated that all systems on board had been fully available

2 Analysis

2.1 Technical aspects

There are no indications of any pre-existing technical defects which might have caused or influenced the serious incident.

2.2 Human and operational aspects

The crew of EC-IBY had to wait several days in Valence (LFLU), France, before they could begin the final leg of the planned trip to Buochs (LSZC). After a low layer of stratus clouds extended over the aerodrome for several days, on 21 December 2016 the weather forecast promised a small chance to allow a landing in Buochs. The crew thereupon decided to make the flight on that day. The crew countered the possibility that the weather at the destination could make a landing impossible by fuelling fully up EC-IBY. This amount of fuel would have been enough for a diversion back to the point of departure. With this decision the crew showed a degree of foresight in their flight planning.

After the crew had called the air traffic controller ATCO 1 before entering the Control Zone (CTR) of Buochs, the latter informed them that the weather conditions in Buochs would be below the minima for Special Visual Flight Rules (SVFR) and that a landing would be unlikely. The crew were evidently not able to analyse this information correctly. The subsequent advice from air traffic control to look out for a possible hole in the clouds in the south-east of the aerodrome might have been appropriate for a crew familiar with the surroundings of Buochs. For the crew of EC-IBY, however, this was not useful. On the contrary, it led to a situation, which encouraged the crew's perception that approaches were possible, which contributed to the development of the serious incident. As a result, the crew of EC-IBY decided to make a risky approach.

It is remarkable that the altitude of the aerodrome traffic pattern laid above the cloud tops. According to the crew's statements, the visibility within the small hole they located, were such that the ground could be seen vertically below them. The crew had never been able to further anticipate the flight path below the clouds, not to mention knowing how the terrain scenery would present itself (cf. section 1.2.4). It was pure chance that EC-IBY, after descending through the clouds, made the right-hand downwind leg for runway 06 flying very low over the terrain and did not collide with the rising terrain. After the serious incident the crew stated that they expected their height above the terrain below the clouds to be significantly higher. This attests to the misjudgement of the situation.

In relation to the conduct of air traffic control, it remains to be noted that the repeatedly given information to the crew, after initiation of the descent, to always fly in Visual Meteorological Conditions (VMC), was contrary to the prevailing weather conditions. These were below the minima for SVFR. Flight operations for such flights would have had to be suspended according to the ATMM II (Air Traffic Management Manual) of Buochs aerodrome.

This serious incident is an exemplary indication of how misunderstandings, false assumptions and lacking or unclear information could have led to a collision with the terrain (Controlled Flight Into Terrain – CFIT).

3 Conclusions

3.1 Findings

3.1.1 Technical aspects

- The aircraft was licensed for VFR traffic by day.
- There are no indications of any pre-existing technical defects which might have caused or influenced the serious incident.

3.1.2 Human and operational aspects

- The crew were in possession of the required licences for the flight.
- The air traffic controllers were in possession of the required licences for their activity.
- This was the commander's first flight to Buochs.
- On the occasion of this flight the safety pilot was flying to Buochs for the second time since 2012.
- There are no indications of any health problems affecting the crew or the air traffic controllers during the serious incident.

3.1.3 History of the flight

- The aircraft was on a ferry flight from Spain to Buochs for major maintenance work.
- The crew called Buochs tower for the first time at 14:49:19 LT on the aerodrome control frequency and gave their position as 15 NM from Buochs aerodrome at flight level (FL) 81 in descent.
- Air Traffic Controller 1 (ATCO 1) reported that the aerodrome was being operated below the weather conditions for Special Visual Flight Rules (SVFR).
- ATCO 1 informed the crew that the best chance of flying below the clouds was in the south-east corner of the Control Zone (CTR).
- The crew was requested by ATCO 1 several times after initiating the descent to fly under Visual Flight Rules (VFR) in Visual Meteorological Conditions (VMC).
- At 15:01:25 LT the crew reported they were flying back to the point of departure.
- The crew reported by radio at 15:03:34 LT that they had located a small hole in the clouds which would permit a descent.
- The descent involved four 180° turns, so that the aircraft reached the lower part of the hole in the cloud on the downwind leg of the traffic pattern for runway 06.
- During the descent, according to the crew, bank angles of 45° or more were attained. The speed was approximately 90 kt.
- The aircraft's descent was accomplished without the use of the landing flaps.
- On his radar screen, ATCO 1 ascertained that the aircraft was descending south of the aerodrome.
- Suddenly ATCO 2 called ATCO 1 to point out how low the PC-6 was flying.
- When ATCO 1 glanced towards his colleague, with his viewpoint in the direction Buochserberg, he too saw the PC-6 flying low over the terrain.

- ATCO 1 described his observation as an aircraft falling from the clouds.
- ATCO 1 did not identify any hole in the clouds in this area, large enough to allow an aircraft to descend below it.
- Between 15:03:17 LT and 15:04:37 LT the aircraft descended from approximately 5000 ft to just over 2800 ft, before it joined the downwind leg for runway 06 low over the terrain.
- The altitude then continuously decreased further in the final phase of the recording to temporarily 100 to 150 m above the ground.
- After a very short traffic pattern, the aircraft landed on runway 06 at 15:07 LT.

3.1.4 General conditions

- The aerodrome and its environment was overcast by stratocumulus clouds.
- Visibility around the aerodrome was 4000 m.
- The ceiling of the clouds was 600 ft above the aerodrome.
- The SVFR minima for Buochs aerodrome are 2000 m visibility and a cloud ceiling of 1000 ft above ground.
- The cloud cover was approximately 170 m thick and the cloud tops were below the aerodrome traffic pattern altitude of 3000 ft.

3.2 Causes

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 contributory factors does not, therefore, in any way imply assignment of blame or the determination of administrative, civil or criminal liability.

The serious incident consisted of a dangerous approach to the terrain because the crew carried out a risky descent below the clouds close to the ground.

The continuation of visual flight operations on the aerodrome in weather conditions below the limit values for Special Visual Flight Rules (SVFR) contributed to the development of the serious incident.

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

4.1 Safety recommendations

None

4.2 Safety advices

None

4.3 Measures taken since the serious incident

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

4.3.1 Skyguide

In its comments on this serious incident of 1 November 2018, the air navigation service provider stated, inter alia, that:

"Skyguide wird eine „lessons learned“ in Bezug auf die SVFR Konditionen für die Flugverkehrsleiter publizieren. Diese wird offene Fragen adressieren, klären und Guidance für die Flugverkehrsleiter enthalten, unter anderem zum Thema „Suspension of SVFR traffic“ - [Skyguide will publish a "lessons learned" on the SVFR conditions for air traffic controllers. This will address and clarify open questions and contain guidance for air traffic controllers, including the subject "Suspension of SVFR traffic".]

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).

Bern, 16 May 2023

Swiss Transportation Safety Investigation Board