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A1. Factual information

A1.5 Personnel information

A1.5.1 Pilot A

A1.5.1.1 General information

Person	Male, born 1955
Licence	Airline transport pilot licence aeroplane (ATPL (A)) according to the standards of European Union Aviation Safety Agency (EASA), initially issued by the Federal Office of Civil Aviation (FOCA) on 20 May 1992
Ratings	JU52, SEP (land) with flight instructor aeroplane (FI (A)), aerobatics (ACR), night flying (NIT)
Last proficiency check	14 March 2018
Last line check	7 April 2018
Medical fitness certificate	Class I, valid until 19 October 2018 Restriction: shall wear multifocal lenses and carry a spare set of [spectacles] (VML)
Last aviation medical examination	17 April 2018
Flight training commenced	1977

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

A1.5.1.2 Flight experience

Total		20,714 h
	On the accident type	297 h ^(A)
	As commander (CMD)	14,412 h
	As CMD on the accident type	121 h ^(A)
During the last 90 days		90:02 h
	On the accident type ^(B)	42:50 h
	As CMD on the accident type	22:09 h
	As co-pilot on the accident type	20:41 h
	On single-engine aircraft ^(C)	47:12 h

^(A) Purely flight hours (not including taxiing before and after the flight)

^(B) In the last two months prior to the accident flight, pilot A carried out a total of 33 flights on the accident type, 28 of which were with pilot B from the accident flight.

^(C) Pilot A completed some of these flight hours as a member of a historic aircraft owners club.

A1.5.1.3 Periods of duty

Commencement of shifts in the 48 hours before the accident	2 August 2018: off duty 3 August 2018: 08:00 4 August 2018: 15:00
End of shifts in the 48 hours before the accident	2 August 2018: off duty 3 August 2018: 10:30
Total periods of flying duty in the 48 hours before the accident	3 August 2018: 2:30 h
Periods of rest in the 48 hours before the accident	from 3 to 4 August 2018: 28:30 h
Length of flying duty at the time of the accident	4 August 2018: 1:56 h

A1.5.1.4 Details of flying career

Pilot A began his military flight training in 1977. As a professional military pilot, from March 1978 he served in two flying squadrons, one of which with pilot B, in the surveillance unit (*Überwachungsgeschwader* – UeG) on ‘Hunter’ and F-5E ‘Tiger’ aircraft.

His annual performance reviews up until voluntarily leaving the Air Force in April 1984 each indicate a good overall appraisal as a squadron pilot and flight instructor. In 1981, a collision occurred during an air combat exercise (see section A1.5.1.7), in which pilot A was accused of failure to observe service regulations and physical injury resulting from negligence due to his lack of caution.

On 2 April 1984, pilot A left the UeG and attended the Swiss Aviation School (*Schweizerische Luftverkehrsschule* – SLS) to become an airline pilot.

After his training and subsequent retraining course for the DC-9-81 (or MD-80) aircraft type, which he passed with a grading of ‘standard’¹, he worked as a co-pilot on short-haul flights from 1984 to 1990. The recurring checks in the simulator and during scheduled flight duties do not indicate any abnormalities during this time; the respective overall evaluations are in the ‘standard’, and sometimes ‘high standard’² range.

In 1991, he completed his retraining for the Airbus A310 with a grading of ‘standard’. In 1998, he upgraded to commander on the A320. Three years later, he also gained the type rating for the long-haul A330. All reviews during this period are graded as ‘standard’ or ‘high standard’. The recurring checks in the simulator and scheduled flight duties do not indicate any abnormalities either; all assessments are marked with ‘qualified’³.

Until 2010, pilot A was working on the short- and long-haul fleet of a major airline, and as of 2009 this also included the A340. In the final few years before his retirement on 28 March 2015, pilot A worked exclusively on long-haul flights on A330 and A340 aircraft. The regular checks in the simulator and scheduled flight duties are graded as ‘qualified’, and sometimes ‘high standard’. Remarks are repeatedly made about his *“high pace of work”* and his *“clear and rather firm management*

¹ ‘Standard’ refers to good performance that meets expectations.

² ‘High standard’ refers to very good performance that exceeds expectations.

³ ‘Qualified’ refers to performance that meets expectations.

style". In the 2014 annual review, his knowledge was certified as being generally good, but superficial in places and could be improved.

Alongside his regular employment, pilot A had been working as an instructor in the simulator and on scheduled flights for his employer since October 1998. As he had been disregarding the employer's requirements relating to non-aeronautical aspects, his additional contract as an instructor was terminated at the end of May 2010.

In April 2013, pilot A gained the type rating for the Junkers Ju 52/3m (JU52) and from then on worked as a co-pilot on Ju-52 flights for Ju-Air. In 2015, with 176 hours of flight experience⁴, he completed the transition to commander, meaning he could also act as CMD in the left-hand seat during flights from then on. All appraisals for line checks and proficiency checks are graded as 'standard' or 'high standard'. Recurring remarks graciously comment on the high level of consideration for passengers, noise and the environment that his choice of flight paths and adaptive flying style provided.

From August 2015, pilot A attended a 'Change of operator' course with another airline and then worked on A330 aircraft. The generally good performance evaluations did, however, include comments on the use of outdated call-outs as well as an increased number of 'divers' in the final approach, i.e. a final approach below the nominal glideslope. According to the airline, there had been repeated violations of a regulation and standard operating procedures (SOPs) that fell under the just culture⁵ category of 'optimising violations'.

In addition to working for the two commercial air operators and Ju-Air, pilot A regularly served as a flight instructor on single-engine general aviation aircraft. As part of this job, he gave a detailed lecture on 'Flying in the mountains' during a refresher course at a flying club in 2018. In terms of flying tactics, the lecture illustrated, among other things, that ridges and crests should not be flown over at an angle of 90 degrees or when climbing, but should be flown over at an angle of 45 degrees with the possibility of performing a steep turn whilst in horizontal flight with sufficient safety altitude, or when descending (see section [A1.17.6.2.3](#)).

As a member of a historic aircraft owners club along with pilot B, he took passengers on sightseeing flights.

A1.5.1.5 Assessment by aeronautical colleagues

Those of his aeronautical colleagues who were interviewed described pilot A as a sociable, communicative and rather extroverted person with an easy-going demeanour. As regards his collaboration with others, he was perceived as approachable, honest and straightforward, as well as stubborn at times with a somewhat resolute tone.

His aeronautical skills were rated as average with dips in his performance. Furthermore, a partial lack of self-critique and a lack of attention to detail were noted in assessments. From an operational point of view, he was appraised of having rather diminished risk awareness, which was mainly expressed by the fact that he sometimes did not recognise potential dangers or did not seem to attach adequate importance to them.

⁴ Unlike with block hours, this figure does not include taxiing times before and after the flight.

⁵ Just culture: An environment in which people feel free to report mistakes, which others within the organisation can learn from. In contrast to a blame culture, in a just culture, individuals are not punished or dismissed because of unintentional deviations from the rules. Rather, the cause of the error is sought.

A1.5.1.6 Previous flights in summer 2018

Out of the flights for which data is available between April 2018 up to and including the day of the accident, there are 6 radar recordings involving flight paths with a risk score of 8 to 10 (see section [A1.18.4](#)), in which pilot A was a member of the flight crew; 4 of these also involved pilot B from the accident flight.

A1.5.1.7 Collision during air combat

On 18 November 1981, a collision occurred in the Moutier (canton of Bern) region during a tactical⁶ air combat exercise involving two Mirage III Ss (MSs) and two Tiger F-5Es (TEs) from the Swiss Air Force (*schweizerische Fliegertruppen*). Pilot A was involved as the pilot of one of the Tigers. During this air combat, pilot A succeeded in 'shooting down' one MS using cannon simulation. The pilot of this MS heard the 'shooting signal' from pilot A via the mutual radio channel, but assumed that his defensive manoeuvre had been successful and that he had not been 'shot down'. As a result, he did not perform the kill removal manoeuvre stipulated for a 'shot-down' aircraft. Pilot A, who had fired the 'shot', was subsequently left behind the MS, which he expected to perform a kill removal manoeuvre, and repeated his radio signal another two times. Firmly convinced that MS was now entering the kill removal manoeuvre, pilot A in the TE evidently took his eyes off the MS. A few seconds later, the two aircraft collided; both pilots were able to eject themselves from the aircraft.

As stated in the Military Justice's corresponding final report from 31 August 1982, neither of the two pilots who were directly involved had a comprehensive overview⁷ of the situation immediately before the collision. According to the aeronautical assessment in said final report, pilot A's lack of caution was, to a certain, unquantifiable extent, the cause of the collision. His lack of caution consisted of taking his eyes off the MS without ensuring that the MS pilot would follow a flight path that would lead him away from his own trajectory.

The final report goes on to state that the conduct of pilot A was understandable from his point of view to a certain extent since, for one, only the mentioned MS could have been shot down and, secondly, the air combat continued. Therefore, if nothing else, the MS wingman could have benefited from a delay by manoeuvring into an optimal position in relation to pilot A. The tactical interest or intention to achieve the set goal, i.e. the successful combat against the MS patrol, contributed to pilot A momentarily lacking the basic caution required.

The case was closed on 4 October 1982.

A1.5.2 Pilot B

A1.5.2.1 General information

Person	Male, born 1956
Licence	Airline transport pilot licence aeroplane (ATPL (A)) according to the standards of European Union Aviation Safety Agency

⁶ Unlike formal air combat exercises, tactical air combat exercises constitute missions, in which usually only the initial situation and the framework conditions are prescribed, but the course of the actual combat results from the pilot's conduct and manoeuvres, and cannot be foreseen in advance.

⁷ According to the final report, the most important components of the 'overview' in air combat are as follows: visual contact with other aircraft or knowledge of their relative position and movements (or a mixture of visual contact and knowledge of relative positions); comprehensive radio communication techniques; spatial awareness (ability to understand positions conceptually and in terms of space as well as map out one's own movements and the flight paths of other aircraft); ability to adapt and react appropriately and swiftly to events and problematic situations.

	(EASA), initially issued by the Federal Office of Civil Aviation (FOCA) on 17 September 1992
Ratings	JU52, SEP (land), aerobatics (ACR), night flying (NIT)
Last proficiency check	13 March 2018
Last line check	12 May 2018
Medical fitness certificate	Class I, valid until 4 October 2018 Restriction: shall wear multifocal lenses and carry a spare set of [spectacles] (VML)
Last aviation medical examination	20 March 2018
Flight training commenced	1978

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

A1.5.2.2 Flight experience

Total	19,751 h
On the accident type	945 h ^(A)
As commander (CMD)	12,751 h
As CMD on the accident type	710 h ^(A)
During the last 90 days	60:45 h
On the accident type ^(B)	52:17 h
As CMD on the accident type	32:30 h
As co-pilot on the accident type	19:47 h
On single-engine aircraft ^(C)	8:28 h

^(A) Purely flight hours (not including taxiing before and after the flight)

^(B) In the last two months prior to the accident flight, pilot B carried out a total of 41 flights on the accident type, 28 of which were with pilot A from the accident flight.

^(C) Pilot B completed all of these flight hours as a member of a historic aircraft owners club.

A1.5.2.3 Periods of duty

Commencement of shifts in the 48 hours before the accident	2 August 2018: off duty 3 August 2018: 08:00 4 August 2018: 08:15
End of shifts in the 48 hours before the accident	2 August 2018: off duty 3 August 2018: 10:30
Total periods of flying duty in the 48 hours before the accident	3 August 2018: 2:30 h
Periods of rest in the 48 hours before the accident	from 3 to 4 August 2018: 21:45 h
Length of flying duty at the time of the accident	4 August 2018: 8:41 h

A1.5.2.4 Details of flying career

Pilot B began his military flight training in 1978. As a professional military pilot, from March 1980 he served in a flying squadron along with pilot A in the surveillance unit (*Überwachungsgeschwader – UeG*) on 'Hunter' and F-5E 'Tiger' aircraft.

His annual performance reviews up until voluntarily leaving the Air Force in April 1985 each indicate a good overall appraisal as a squadron pilot and flight instructor, as well as head flight instructor from 1983 onwards. The service records⁸ for 1978 to 2003 also show consistently good performance reviews without any abnormalities.

On 2 April 1985, pilot B left the UeG and attended the Swiss Aviation School (*Schweizerische Luftverkehrsschule – SLS*) to become an airline pilot.

After his training and subsequent retraining course for the DC-9-81 (or MD-80) aircraft type, which he passed with a grading of 'high standard', he worked as a co-pilot on short-haul flights from 1984 to 1989. The recurring checks in the simulator and during scheduled flight duties do not indicate any abnormalities during this time; the respective overall evaluations range from 'standard' to 'high standard'.

In 1991, he completed his retraining for the Airbus A310, which he passed with the grading of 'high standard'. In 1997, he aborted his upgrading to commander on the A320 at his own request. Out of the three options a) immediate re-entry, b) re-entry on the next course or c) returning as co-pilot on the A310, he chose the latter. A specially convened committee certified him as having a "very high level of aspiration", but as "dealing with his own mistakes in an immature manner". Approximately two years later, in May 1999, he qualified as a CMD on the A320.

Eight years later, he also gained the type rating for the long-haul A330. None of the recurring checks in the simulator and during scheduled flight duties indicate any abnormalities and all are marked with 'qualified'.

Until 2009, the CMD worked on the short- and long-haul fleet of a major airline; after gaining the additional A340 rating, he exclusively worked on long-haul flights until his retirement on 15 July 2015. Regular checks in the simulator and scheduled flight duties are marked with 'qualified', ranging from 'standard' to 'high standard' with good leadership conduct as a CMD and good intervention conduct towards the co-pilot.

In February 2004, pilot B gained the JU52 type rating and from then on worked as a co-pilot in Ju-Air flights. In 2008, with 235 hours of flight experience, he completed the transition to commander, meaning he could also act as a CMD in the left-hand seat during Ju-52 flights from then on. All of the appraisals regarding line checks or proficiency checks are graded as 'standard' or 'high standard'. In the context of final checks as a CMD, he was appraised as having a very high level of aspiration, which "could also be a hindrance". Recurring remarks graciously comment on his prudent choice of flight paths with regard to noise and consideration for passengers.

In terms of general aviation, like pilot A, he was a member of a historic aircraft owners club.

⁸ In accordance with the Ordinance on Military Controls (*Verordnung über das militärische Kontrollwesen – VmK*), a service record was kept for officers, in which not only personal data and information regarding military service were recorded, but also performance reviews.

A1.5.2.5 Assessment by aeronautical colleagues

Those of his aeronautical colleagues who were interviewed described pilot B as a quiet, friendly, reserved, reliable and rather introverted person who was very approachable when working together. As an experienced pilot with a great deal of knowledge and a very high level of aspiration and sense of duty, he is said to have worked meticulously and accurately, but did not communicate his thoughts much in flight.

His aeronautical skills were unanimously rated as above average. From an operational point of view, he exhibited a calculated readiness to take risks, i.e. he always considered potential alternatives or different routes, for example in the event of engine failure.

A1.5.2.6 Previous flights in summer 2018

Out of the flights for which data is available between April 2018 up to and including the day of the accident, there are 8 radar recordings involving flight paths with a risk score of 8 to 10 (see section [A1.18.4](#)), in which pilot B was a member of the flight crew; 4 of these also involved pilot A from the accident flight.

A1.5.3 Previous incidents involving pilots A and/or B

On 6 July 2013, the same flight crew flew over the Segnes pass in a similar manner in the sister aircraft HB-HOP during a climb approximately 30 m above ground. The altitude abeam the Martinsloch was 2,684 m AMSL (approximately 8,800 ft AMSL). At the time, pilot A occupied the right-hand seat as the pilot monitoring (PM), while pilot B was the pilot flying (PF) seated on the left. Further information can be found in section [A.1.18.1](#).

On 6 July 2018, pilot A, acting as the CMD, flew together with pilot B over the city of Munich in HB-HOT at an altitude which, according to the competent authority of the government of Upper Bavaria, was “*for a long period considerably and continuously*” below the minimum required safety altitude of 300 m above ground (see section [A1.17.1.18.6](#)).

On 2 October 2015, an aircraft entered the airspace above the Oktoberfest festival in Munich without permission, with pilot B as the commander on board.

Further information on these and other incidents involving pilots A or B can be found in annex [A1.17](#).

A1.5.4 Assessment

A1.5.4.1 Flying careers, flight experience and collaboration

At the time of the accident, both pilots possessed vast overall flight experience and their training on the accident type was sound and up to date. Pilot A joined Ju-Air in 2013 and successfully completed the transition to CMD just short of three years later. At the time of the accident, he had 297 flight hours and thus a good level of flight experience on the accident type. Pilot B joined Ju-Air back in 2004 and successfully completed the transition to CMD five years later. At the time of the accident, he therefore had 945 flight hours, meaning he had considerably more flight experience on the accident type.

There are significant parallels between the flying careers of the two pilots, from them joining the Swiss Air Force (*schweizerische Fliegertruppen*) to their transition to work as airline pilots at the same airline, to the models they flew on short- and long-haul flights. Moreover, the aeronautical skills of both pilots were rated good to very good by their respective examiners over all these years. A flat hierarchy can therefore be surmised between the two pilots due to the similarities in their experience and careers. In principle, this is a good basis for solid crew resource management (CRM)⁹.

The paths of the two pilots crossed again and again: as professional military pilots serving in the surveillance unit (*Überwachungsgeschwader – UeG*) in the same flying squadron, within the same airline, and since 2013 in Ju-Air flight operations. They also showed a common interest as members of the same historic aircraft owners club. The two were also considered good friends by their colleagues. It can therefore be concluded that the two pilots not only knew each other well in their private lives, but also had great confidence in each other's flying skills.

In the last two months before the accident, pilots A and B carried out 28 flights together on the accident type. During these flights, they both acted as the pilot flying (PF) and pilot monitoring (PM) from the left-hand and right-hand seats. Operational framework of this kind can create the conditions for a certain degree of complacency. This is a state of satisfaction with one's own performance, coupled with a lack of awareness of upcoming problems or dangers.

Complacency and excessive mutual trust within a flight crew reduce mutual monitoring¹⁰, which is an essential safety net in a two-person cockpit. In this investigated accident, the lack of a natural difference in their level of experience may have had an inhibitory effect on monitoring between the pilots, who both held the type rating as commanders.

A1.5.4.2 Human aspects

A1.5.4.2.1 General

Although the flying careers of the two pilots are similar and their capabilities at the individual stages of their careers are at a comparable level, the assessments of pilots A and B show certain differences in their characters which may have played a decisive role in the development and course of this investigated accident.

⁹ Crew resource management: CRM was developed as training for flight crews based on the experience of numerous accidents in which poor collaboration in the cockpit was a causal factor. CRM is intended to raise awareness of the fact that, in addition to technical understanding on board an aircraft, human relations are also a critical factor for safe flight operations.

¹⁰ Monitoring: This is generally defined as the active and meticulous observation of the flight path and aircraft systems, and the cross-checking of actions. Monitoring serves to detect deviations or improper operational activities early on and to make adjustments if necessary.

A1.5.4.2.2 Pilot A

His long-standing work as an instructor with the airline that employed him as an airline pilot was abruptly terminated as he had failed to comply with the employer's instructions relating to non-aeronautical aspects (see section A1.5.1.4). Furthermore, he failed to adhere to the syllabus of the flying club as a flight instructor during a trainee pilot's difference training on the Robin DR40 aeroplane. Knowing that, among other things, the specified 10 landings in different configurations had not been fulfilled, he allowed this trainee pilot to cross the Alps by himself twice for planned flights between Dübendorf and Locarno, and noted these on the training record as relevant training flights for 3 and 4 August 2018.

Behaviour that also failed to comply with provisions was demonstrated during the flight over the city of Munich in HB-HOT on 6 July 2018, which was carried out considerably below the minimum required safety altitude (see section A1.5.3). There is no doubt that pilot A had been familiar with this figure.

The same is true of the flight tactic principles when flying in the mountains, on which he gave a lecture during a refresher course in 2018. He was fundamentally familiar with the principles which state that ridges and crests should not be flown over at an angle of 90 degrees or when climbing, but should be flown over at an angle of 45 degrees with the possibility of performing a steep turn whilst in horizontal flight with sufficient safety altitude, or when descending. Nevertheless, the accident flight and previous flights in summer 2018 (see section A1.5.1.6) indicate that these principles were not always followed.

Repeated violations that fell under the just culture category 'optimising violations' during his employment with his other employer also indicate that he interpreted underlying rules his own way.

In the final report regarding the collision of 18 November 1981 in the Moutier (canton of Bern) region during a tactical air combat exercise in which an F-5E 'Tiger' collided with a Mirage III S, pilot A was accused of not being cautious enough when he momentarily took his eyes off the Mirage without ensuring that the Mirage pilot would follow a flight path that would lead him away from his own trajectory (see section A1.5.1.7).

In order to triumph as a pilot in air combat, a certain amount of fighting spirit or bravado is required. This is linked to a certain readiness to take risks¹¹. Conversely, a fighter pilot who is always overcautious or overanxious when entering air combat will almost always lose and therefore cannot perform their task with the same level of success. In addition, it can earn them a bad reputation, i.e. it can make them be seen as inferior among the Air Force pilot community. During complex air combat involving fast-paced and often taxing sequences, there are moments when other factors prevail, such as the will to outmanoeuvre the other aircraft or to maintain a tactically favourable situation. In this context, one speaks of target fascination¹². This is understood as too much willingness to take risks, as was shown by pilot A when he continued to perform a manoeuvre even without having a comprehensive overview of the situation immediately before the collision, as the Military Justice's final report states.

¹¹ Pilot A had completed his training with the Air Force during the Cold War. According to the Swiss Air Force, today's training programme for military pilots and the current air traffic control system of the Air Force cannot be compared to the conditions of that time and now conform with the international standards applicable today.

¹² Target fascination: This effect occurs when a person is so fixated on an object that they become unaware of anything else.

In light of aviation safety being top priority in military flight operations during peacetime, every pilot faces the challenge of finding the right balance between aspects of aviation safety and the requirements of realistic training. From the course of the accident, an increased willingness to take risks could be deduced for pilot A, which was ultimately a causal factor in the collision with the other fighter aircraft. Those of his aeronautical colleagues who were interviewed also confirmed that he exhibited diminished risk awareness, which was mainly expressed by the fact that he sometimes did not recognise potential dangers or did not seem to attach adequate importance to them.

A1.5.4.2.3 Pilot B

In 1997, pilot B aborted his upgrading to commander on the A320 at his own request. He was certified as having a very high level of aspiration, but also of dealing with his own mistakes in an immature manner. He declined the opportunity to resume the ongoing upgrade process and voluntarily returned to work as a co-pilot on the A310. A similar personal assessment was carried out as part of final checks as a CMD at Ju-Air, when he was appraised as having a very high level of aspiration, *“which could also be a hindrance”*.

The term ‘level of aspiration’¹³ encompasses the pursuit of a goal and the perceived difficulty in achieving said goal. It is human nature to maintain, lower or raise the current level of aspiration in each instance based on the latest performance result, i.e. success or failure, which depends on the discrepancy between the achievement of goals. The above-mentioned reaction of pilot B implies that – in response to his partial success – his level of aspiration remained the same or even increased during the upgrade process. Dealing with personal performance results can ultimately be debilitating and thus hinder training or work. The above relative clause relating to pilot B being appraised as having a very high level of aspiration during the final check is probably to be understood in this sense.

According to those of his colleagues who were interviewed, he exhibited a calculated readiness to take risks based on potential alternatives or different routes, for example in the event of engine failure. Being a rather introverted person, he did however not communicate his thoughts much in flight.

As the discussions on the morning of 4 August 2018 show (see section [A1.1.2.5](#)), pilot B was also familiar with the flight tactic principles when flying in the mountains, which state that ridges and crests should not be flown over at an angle of 90 degrees or when climbing, but should be flown over at an angle of 45 degrees with the possibility of performing a steep turn whilst in horizontal flight with sufficient safety altitude, or when descending. Nevertheless, the accident flight and previous flights (see section A1.5.2.6) indicate that these principles were not always followed.

A1.5.4.3 History of the flight

As there was no cockpit voice recorder (CVR) on board HB-HOT, the human aspects that would allow for a direct insight into pilot collaboration are not accessible. When HB-HOT travelled on a north-northeasterly heading approximately in the middle of the basin south-west of Piz Segnas – possibly to give passengers a spectacular view of the Martinsloch – the following human aspects may have played a role in the choice of lateral flight path and altitude:

¹³ The level of aspiration is defined as the level of future performance in a familiar task which an individual, knowing their level of past performance in the task, explicitly undertakes to reach. Who a person chooses to play tennis against or which route they choose for their daily running training reflects their level of aspiration.

- **Complacency:** This state of satisfaction with one's own performance, coupled with a lack of awareness of upcoming problems or dangers, can lead to insufficient situational awareness, which prevents a person from intervening when necessary.
- **Lack of monitoring:** Excessive trust in the other person, potentially combined with complacency, can negatively influence monitoring. In this investigated accident, the lack of a natural difference in the level of experience between the two pilots may have had an additional inhibitory effect.
- **Representativeness heuristic¹⁴:** This mental tool for making decisions, especially under time pressure in unclear or uncertain situations, often brings the desired outcome, but can also misdirect a decision unfavourably. In this investigated accident, the choice of flying tactics may have been based on the experience of the many similar flights over ridges and passes, and the successful flight over the Segnes pass on 6 July 2013 (see sections A1.5.1.1.6 and A1.5.1.2.6). However, the fact that something has happened successfully many times, thus making it representative, does not make success more likely. This leads to the neglect of probabilities that are actually relevant (base rates), which is why people overestimate their ability to accurately predict an event.
- **Reward learning¹⁵:** The spectacular view of mountain landscapes that are almost close enough to touch may trigger enthusiasm, recognition or admiration (reward) from passengers, meaning this choice of flight tactic (behaviour) is likely to become more frequent in the future.
- **Overconfidence¹⁶:** This is usually contextual and not a personality trait. People tend to overestimate their abilities in tasks that are repetitive, simple and common, in this case navigating the Junkers Ju 52.
- **Invulnerability¹⁷:** Many people falsely believe that accidents happen to others, but never to them. They know accidents can happen, and they know that anyone can be affected. However, they never really feel or believe that they will be personally involved. Pilots who think this way are more likely to take chances and increase risk.

¹⁴ A judgemental heuristic in which the probability of events is evaluated according to how closely they correspond to certain prototypes. Here, a decision is based on the frequently made and thus mentally represented multitude of experiences regarding a similar or the same situation (base rate).

¹⁵ Reward learning describes learning by positive reinforcement: if a certain behaviour is followed by a pleasant situation in the form of a reward, this behaviour will present more often in the future.

¹⁶ Overconfidence is a systematic manner of misjudging one's own ability and, like the representativeness heuristic, belongs to the category of cognitive distortion.

¹⁷ As described in the 'Pilot's Handbook of Aeronautical Knowledge' published in 2016 by the FAA.