Federal Public Service
Mobility and Transport
Air Accident Investigation Unit

Air Accident Investigation Unit
(Belgium)
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Safety Investigation Report

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Status: Final

SYNOPSIS

Classification:	Accident
Level of investigation:	Standard
Date and time:	07 May 2016 at 18:16 UTC
Aircraft:	Sailplane Alexander Schleicher ASK-13 SN: 13244.
Owner:	Private
Accident location:	Saint-Hubert Airfield (EBSH)
Type of flight:	General aviation – Flight training – Local solo
Phase:	Landing
Occurrence type:	Abnormal runway contact (ARC)
Persons on board:	One pilot
Injuries:	Pilot seriously injured

Abstract:
The student pilot was conducting his first solo flight under the supervision of his instructor (on the ground). The sailplane was seen flying the final leg with a normal glide path when suddenly, a few seconds before the touch down, the sailplane pitched down without any visible attempt to flare. The front underside of the fuselage brutally contacted the ground a few metres in front of the threshold.

Cause

Direct causal factor:
The student pilot not pulling back on the elevator control to flare, probably focused on the airspeed indicator.

Indirect causal factor:
Excessive or wrong manipulation of the air brakes handle (either inverted action or a slip by using the air brake instead of the elevator control) leading to a decrease in airspeed in very short final.

Possible contributing factors:
- Stress because of the first solo flight
- Other 'weight and balance' configuration than used on dual flights
- The low sun may change the perspective of the airport surroundings, leading the pilot to a wrong appreciation of his altitude.

FACTUAL INORMATION

History of the flight

The student participated in an intensive sailplane pilot training course organized by the ATO FCFVV[1] on the Saint-Hubert airfield from 30 April to 8 May 2016. The objective of this training was to acquire the basic skills to fly a sailplane. The 9 days of training should culminate with the performance of a solo flight.

The practical training started with 2 flight hours with an instructor in a touring motor glider (TMG)[2] Motor Falke, in order to learn the basic flight knowledge. Thereafter the student pilot accompanied by his instructor performed about 3 flight hours of airfield circuits with touch-and-goes.
During these airfield circuits, the take-offs were conducted by the instructor up to the moment, when reaching an adequate altitude, the engine power was set in a "zero thrust" configuration. From that moment, the TMG behaviour was similar to a glider and the controls were transferred to the student pilot for the landing exercise.

The next phase involved an actual sailplane, a two-seater "Schleicher" ASK-13. The towing technique, airfield circuits and landings were intensively practised.

Based on his evaluation of the student's performance, after 3 satisfactory flights performed during the day and the flights performed the day before, the instructor proposed to the student to have his first solo flight. The student pilot stated that he also felt confident in his ability to conduct his first solo flight. It was decided to perform the flight at the end of the day when the traffic around the airfield was minimal and there was almost no wind and no turbulence.

Before the flight, the instructor again briefed the student about his last potential weak point that had been determined to be the launch phase. The instructor didn't talk about the other phases of the flight, including the landing, as he was convinced that the student had acquired the skills required for them.

The flight started with a standard towing by a Piper PA18 aeroplane from runway 14. The first portion of the flight was normal. The instructor stated that the take-off was very well managed, as well as the uncoupling at 500m AGL. Entering the left-hand landing circuit, the downwind and the base legs were uneventful. The sailplane turned to the final leg at about 100m height showing the expected path with the airbrakes partially extended. The glide path was assessed to be correct by the instructor. Suddenly, a few seconds before the touch down at 15 to 20 metres AGL, the glide path increased unusually and immediately after the airbrakes extended more. The glide path remained excessive up to first contact of the sailplane with the ground short of the threshold of runway 14L. Before the impact, the airbrakes were seen (almost) fully extended and the nose remained down, without visible flare movement. The front underside of the fuselage brutally contacted the ground with the skid causing the sailplane to rebound to 2 – 3 metres. The aircraft landed and came to rest 96 meters behind the first impact rotating almost in opposite direction with respect to the flight path.

[1] Approved Training Organization of the "Fédération des Clubs Francophones de Vol à Voile"
[2] 'Touring motor glider' means a specific class of powered sailplane having an integrally mounted, non-retractable engine and a non-retractable propeller. It shall be capable of taking off and climbing under its own power according to its flight manual. 'Powered sailplane' means an aircraft, equipped with one or more engines having, with engine(s) inoperative, the characteristics of a sailplane. It also includes sailplanes with retractable propellers.

The pilot, having temporarily lost consciousness and suffering severe back pain, rapidly recovered his senses and vacated the sailplane assisted by a bystander. The pilot examination at the hospital showed a few vertebral fractures although without neurological damage.

Damage

The structure of the sailplane was substantially damaged at the front underside of the fuselage and at the rear underside of the fuselage where the welded steel tube structure was severely deformed.

Figure 1: areas showing visible structural damages

Figure 2: rear underside of the fuselage

Figure 3: front underside of the fuselage

Pilot information

Student pilot:
Male, 51 years old.
No aeronautical experience before the intensive training course organized in the Saint-Hubert airfield during which the accident occurred. Holder of a medical LAPL license delivered on 28 April 2016 (Valid up to 28 April 2017).
The student pilot performed 9 duo flights of 30 minutes and 43 landings with the “Falke” motor sailplane. Thereafter, he continued his training with the ASK-13 by performing 17 duo flights with his instructor for a total duration of 5 hours and 30 minutes.

The instructor stated that at the beginning of his training using the "Falke", 2 or 3 times the student pilot had unexpected reactions in final when he pushed on the stick instead of pulling. The instructor corrected the situation and briefed the student accordingly. Consequently, this unexpected reaction did not occur anymore.

For information, the EU regulation regarding the conditions to be fulfilled by a sailplane student pilot to fly solo (FCL.020) states only that they must be at least 14 years of age and be authorized and supervised by a flight instructor. Additionally, he must hold a medical licence. The student pilot fulfilled all these conditions.

Instructor pilot:
Male, 61 years old. Sailplane "SPL" license (Winch and aerotow). License Privilege: TMG (Touring Motor Sailplane).
Qualifications: Flight instructor "FI(S) since 1994 and flight examiner FE(S) since 2013.
First sailplane solo flight conducted on May 1970. Large experience as sailplane pilot: 6.427 starts totalizing 2.908 Flight hours. Experience flying TMG: 64:12 Flight hours including about 10 Flight hours for his own instruction in order to obtain the TMG privilege.
Large experience as instructor totalizing about 2000 Flight Hours instruction. Annual average of 10 to 15 student pilots trained up to the performance of a first solo flight.
Last 6 months experience: 91 starts totalizing 36:39 Flight Hours.

In 2015, the instructor completed the requested 30H as PIC on TMG and the additional assessment of competence and obtained the privilege to act as an instructor in TMG. However, this was not endorsed on his license because he was not aware that an endorsement on the license was requested by the BCAA.

Regulation about the Flight instructor "FI(S) qualification

Part FCL regulation requires the following (FCL.915.FI (e)):

> *The applicant for a FI (S) shall have completed at least 100 flight hours and 200 launches as PIC on sailplanes and powered sailplanes, excluding TMG.*
> *Additionally, where the applicant wishes to give instruction on TMGs he/she shall complete 30H as PIC on TMG and an additional assessment of competence on a TMG with an FI allowed to give instruction for the FI certificate.*

Figure 4: Part FCL extract about instructor prerequisites

It is not specified in the Part FCL regulation how the privileges to give instruction on a TMG should be endorsed. When asked about the system applicable in Belgium, the Belgian CAA answered that the privilege to act as instructor FI(S) for TMG should be endorsed on the license.
BCAA transmitted this information to the Royal Belgian Aero Club (RBAC). However, there is no official instruction, letter or communication published by BCAA for the sailplane instructors on this subject.

Meteorological information

Wind direction and speed: 160°, 3-4kt. Visibility: CAVOK without cloud. Temperature: 19°C. QNH: 1011 hPa.
Local sunset: 19:06 UTC, sun position at 18:16 UTC: 7° altitude, 289° azimuth.

Airfield information

The EBSH Saint-Hubert airfield is an airfield located at 2,5 km NE of the city of Saint-Hubert. Coordinates: 50°02'09"N - 005°24'15"E. Elevation: 563m (1847 ft).

It is equipped with four grass runways:
05L/23R and 05R/23L: 600 m long x 42 m wide
14L/32R and 14R/32L: 799 m long x 42 m wide

The use of the aerodrome is subject to prior permission from the operator. Communication facilities: basic information. Call sign: “Saint-Hubert radio” on 122.175 MHZ.

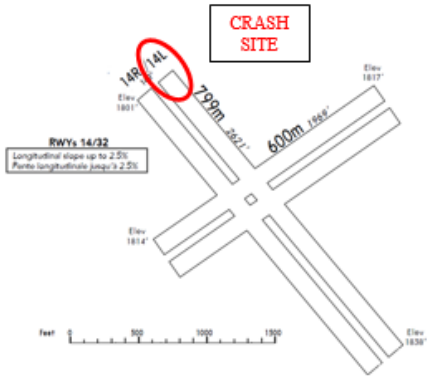

Figure 5: view of the EBSH runways

Circuit height: 1 000 ft AGL for motorized aircraft, 500 ft AGL for towing aircraft and 600 ft AGL for sailplanes.

Sailplanes: left-hand circuit. Motorized aircraft: right-hand circuit. On each axis, motorized aircraft shall primary use the right runway and sailplanes shall primary use the left runway. When the accident occurred, runway 14L was in use for the sailplanes.

Aeroplane

The aircraft was registered in Belgium and held a Certificate of Airworthiness and a valid Airworthiness Review Certificate (ARC).

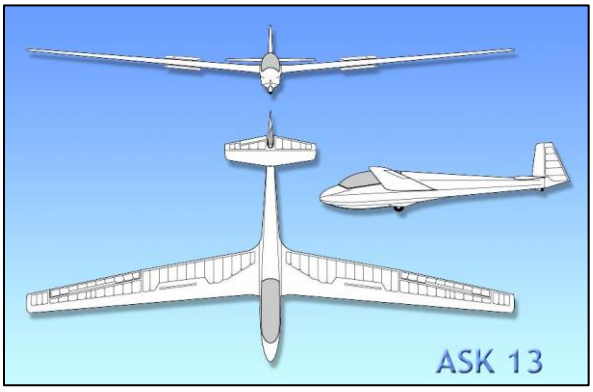

Figure 6: general view of the sailplane.

The ASK 13 is a two-seater sailplane that was built by Alexander Schleicher. It was and still is widely used for ab-initio training of sailplane pilots. The leading edge is of plywood and the whole wing is fabric-covered. There are metal air brakes above and below the wing. The fuselage is a welded steel tube structure covered in fabric. Landing gear consists of a non-retractable sprung wheel, mounted aft of the center of gravity. Originally there was a skid under the forward fuselage, which is still the configuration of the accident sailplane but many K13s now have a nose wheel.

The control of the airbrakes is on the left side of the cockpit. The handle is in blue which is the standardized distinctive color for the airbrake controls of sailplanes and an identification placard shows the function of the control.

To extend the airbrakes, the control has to be pulled backwards; to retract, the control has to be pushed forwards, but no placard is available to show in which direction it works.

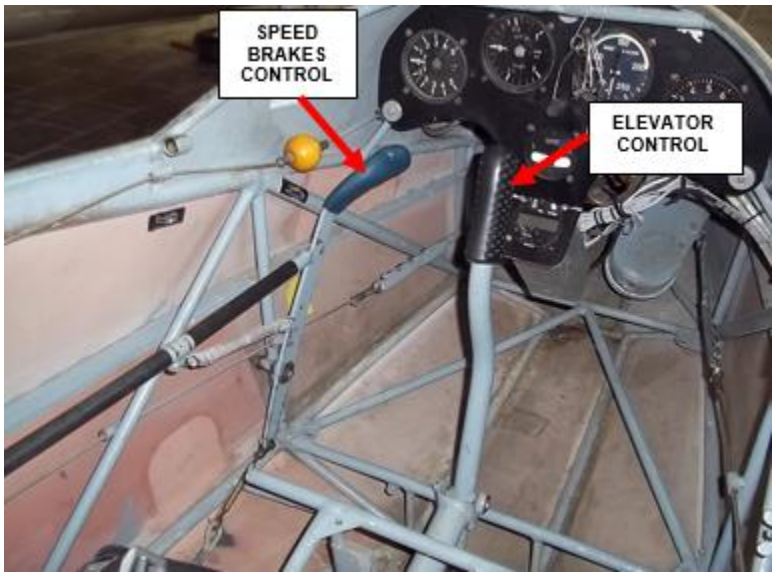

Figure 7: Elevator and airbrakes controls

General characteristics

- Crew: 2
- Length: 8.18 m
- Wingspan: 16 m
- Height: 1.6 m
- Wing area: 17.5 m2
- Aspect ratio: 14.6:1
- Empty weight: 321 kg
- Max takeoff weight: 480 kg
- Max weight of non-lifting parts: 320 kg
- Weight and Balance datum: Wing leading edge at rib 3
- CG limits at max take-off weight: Fwd: 70mm, Rwd: 246 mm
- Empty weight CG limits[3]: Fwd: 437 mm, Rwd: 508 mm (At empty weight = 320 kg)

Performance

- Stall speed: 61 km/h
- Never exceed speed: 200 km/h in smooth air, 140 km/h in rough air, 140 km/h on aero-tow,100 km/h on winch launch.
- Approach speed: 80 km/h – 89 km/h
- g limits: +4.0 -2.0
- Maximum glide ratio: 27 at 85 km/h
- Wing loading: 27.7 kg/m2

Weight and Balance

The weighting report mentions the following data:

[3] If the empty weight CG is within the flight manual given limits, it is verified that the in-flight center of gravity is correct provided the weight of the pilot(s) + parachute defined in the flight manual are met.

- Empty weight: 321 kg
- Empty weight CG: 552 mm
- Weight of the non-lifting parts: 154 kg
- Single occupant weight (on front seat): Minimum: 73 kg – Maximum: 100 kg
- Weight on front seat in dual occupant configuration: Minimum: 65 kg – Maximum: 100 kg
- Maximum total weight of 2 occupants: 159 kg

ANALYSIS

The weight and balance was examined to determine if a possible out of balance situation may have surprised the pilot and adversely affected his attention during the landing. The calculation of the W&B showed that for the accident flight, with the student alone on board, the centre of gravity position and the total weight were within the prescribed limits (Total weight was about 405 kg).

During the previous flights, with the instructor and the student pilot on board, the loading was also within the balance limits but the sailplane was slightly overloaded (Total weight was about 490 kg).

As the centre of gravity position of the sailplane was within the limits for all the flights, it is unlikely that a significant change in the sailplane behaviour occurred that could adversely have affected the student pilot performance. However, the mass of the sailplane with 1 occupant is about 15 to 20% less than with 2 occupants on board. This means that the airspeed has to be 7 to 10% lower, and thus slightly different control inputs are needed, to obtain the same aircraft attitude and glide path, which is maybe not so easy during the first solo flight.

The sun was low to the west (289° azimuth at 7° altitude above the horizon) at the time that the accident occurred. When flying in the final leg of runway 14, the pilot therefore had the sun more or less at his back and could not have been blinded by the sinking sun. However, the low sun may change the perspective of the airport surroundings, possibly leading him to a wrong appreciation of his altitude.

The end of the flight including the accident was captured by a bystander. This video clip lasting 29 seconds shows the sailplane flying in final. Despite the poor quality of the footage, some valuable information could be obtained.

Time 0 of the video clip corresponds approximately to the entering in the final approach path.

Figure 8: After 10 seconds, the airbrakes are clearly visible. They seem to be partially deployed.

Figure 9: After 19 seconds, the nose down attitude is noticeably increased. No visible modification of the airbrakes' position.

Figure 10: One second later (time 20), when flying at approximately 20 – 30 metres AGL the air brakes are more deployed.

Figure 11: After 21 seconds, an enlargement of the picture allows a light grey line to be seen between the upper skin and the top airbrakes, indicating a full deployment.

Figure 12: After 22 seconds, last useable picture in flight: the pitch down attitude seems to be again increased for a fraction of a second just before impact. No visible attempt to flare.

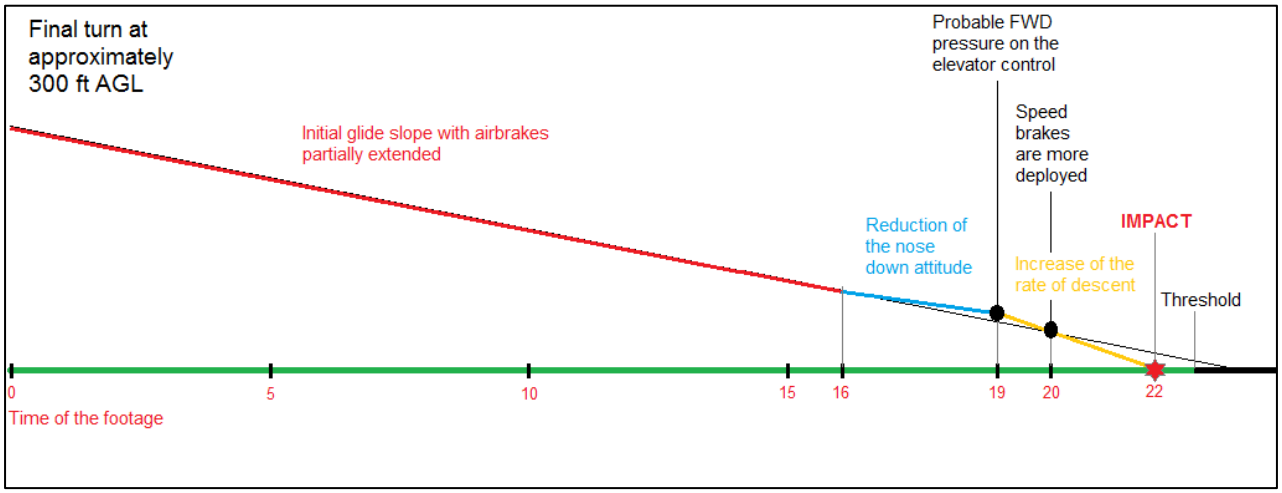

Figure 13: Approximate (not on scale) view of the glide path

The instructor explained that during the initial training of his students, in order to simplify understanding, he teaches that the elevator control is essentially used to adjust the airspeed and the airbrakes are to be used to control the rate of descent. He also emphasises the importance of maintaining airspeed to a given value, according to the flight phase.
In fact, any movement on the elevator control also influences the rate of descent and any retraction or extension of the airbrakes also impacts the airspeed. Both controls interact with each other.

Due to the shock, the student pilot had no recollection of what actually happened during the flight. However, based on the fact that during his training the instructor emphasized repeatedly about the importance of an adequate airspeed, we can postulate that the student pilot's attention was focussed on the airspeed indicator.

The instructor stated that following his observation made from the ground, the entire flight, including the major part of the final leg, had been very well performed by the student pilot. He also stated that the initial glide path, in red on the above figure, was adequate to land a little further than the threshold, at the typical place where the students are trained to touch down. It is only in very short final that the flight started to go wrong.

At the end of the final, the footage shows a reduction of the nose down attitude between time 16 and 19 (in blue on the graph). The investigation could not determine whether the pilot slightly pulled back on the elevator control, maybe in order to land a little further on the runway or whether it was due to another phenomenon (pilot action on the elevator trim, meteorological etc.).

Immediately after, the rate of descent increases, suggesting that the pilot tries to recover the correct approach glide path and/or airspeed. He likely modified the glide path first by pushing forward on the elevator control and one second later, at time 20, by extending the airbrakes further.

Additional deployment of the airbrakes would have cause an airspeed reduction and the tendency for the sailplane to increase the rate of descent. The pilot would have then logically tried to recover his airspeed by pushing forward on the stick.

In this scenario, the pilot, focused on the airspeed and surprised by the abnormal rate of descent, did not have enough time to assess the situation. He was focused on the airspeed and didn't have the reflex to pull back on the stick to flare.

CONCLUSIONS

Findings

- The sailplane was issued with a valid airworthiness certificate and a valid Airworthiness Review Certificate.
- The student pilot, having no previous aeronautical experience, was attending an intensive 9 days sailplane training organized at the Saint-Hubert airfield. He held a valid medical LAPL license.
- The instructor pilot had a wide experience flying sailplanes and motorized sailplanes and was duly qualified to act as instructor. He was also qualified to give instruction on TMGs, however his assessment of competence on a TMG was not formally endorsed on his licence.
- When the accident occurred, the student pilot was conducting his first solo flight under the supervision of his instructor.
- The entire flight including the initial glide path was considered adequate by the instructor witnessing the flight of his student. However, in very short final the nose down attitude and the rate of descent of the sailplane increased up to a crash landing showing no attempt to flare.
- The airbrakes, partially extended during the final leg were additionally extended during the last seconds of the flight.
- The pilot sustained serious injuries to his back.
- The fuselage of the sailplane suffered significant structural damage.

Cause(s)

Direct causal factor:

The student pilot not pulling back on the elevator control to flare, probably focused on the airspeed indicator.

Indirect causal factor:

Excessive or wrong manipulation of the air brakes handle (either inverted action or a slip by using the air brake instead of the elevator control) leading to a decrease in airspeed in very short final.

Possible contributing factors:

- Stress because of the first solo flight
- Other 'weight and balance' configuration than used to on dual flights
- The low sun may change the perspective of the airport surroundings, leading the pilot to an incorrect appreciation of his altitude.