



Accident to the YAKOVLEV - YAK18-A registered F-AZYK

on 8 April 2018

at Lens Bénifontaine (Pas-de-Calais)

⁽¹⁾ Unless otherwise stated, all times given in this report are in local time.

Time	Around 17:00 ⁽¹⁾
Operator	Private
Type of flight	Cross country
Persons on board	Pilot and one passenger
Consequences and damage	Pilot and passenger fatally injured, aircraft destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2020. As accurate as the translation may be, the original text in French is the work of reference.	

Barrel roll at low height on the fringe of an air rally, collision with the ground, close to the public

1 - HISTORY OF THE FLIGHT

In the spring of 2017, some Canadian pilots travelled to France to take part in the ceremonies commemorating the centenary of the Battle of Vimy Ridge. They were based at Lens-Bénifontaine Aerodrome (Pas-de-Calais). They stayed there for almost a month to prepare for the overflight of the Vimy Memorial on the anniversary date of 9 April 2017. On this occasion, friendships were formed between French and Canadian pilots.

A year later, a group of Canadian pilots wanted to visit Vimy again. As part of this rally, an overflight of the Notre Dame de Lorette Memorial and the Vimy Memorial with over ten vintage aircraft was organised for 8 April 2018.

On the day of the accident, the pilot of F-AZYK arrived from Pontoise Cormeilles-en-Vexin Aerodrome (Val-d'Oise) and landed at about 13:15 at Lens Bénifontaine Aerodrome. After lunch, he took off with a Canadian passenger to fly over the Notre Dame de Lorette Memorial and the Vimy Memorial before returning to Lens.

At the end of the flights, the pilot, with his passenger, took off from runway 21 and, before heading for Pontoise Aerodrome, flew an aerodrome traffic pattern during which several other aircraft had time to take off. While other aircraft were still waiting to take off at the holding point, he flew over the aerodrome. At the last third of runway 21, the aircraft began a half-roll to the left followed by a descending half-loop. The aircraft collided with the ground at the threshold of runway 03.



Figure 1: aerial view of the accident site - photo by GTA SR drone

2 - ADDITIONAL INFORMATION

2.1 Examination of the site and wreckage

The examination of the site and the wreckage found that the aircraft had collided with the ground in a nose-down attitude and with significant energy. At the moment of impact, the aircraft was intact and the engine was producing power.

The rudder control system was continuous before the impact. The state of destruction of the aircraft meant that it was not possible to check the continuity of the aileron and elevator control systems.

2.2 Pilot Information

The pilot, aged 60 years, had logged more than 12,000 flight hours in aeroplanes, including more than 7,000 as captain. He held an ATPL(A) airline transport pilot licence with a valid single-engine piston (SEP) rating, a multi-engine instrument rating (IR/ME), and a Falcon 50/900 type rating. He also held a CPL(H) commercial helicopter pilot licence without any valid ratings and a microlight pilot licence with valid fixed-wing microlight, powered paraglider and flex-wing microlight ratings. Flying a YAK18 requires only the SEP class rating, there is no specific authorization to fly vintage aircraft.

It was not possible to determine the pilot's experience on single-engine piston or vintage aircraft, particularly the YAK18. However, the owner reported that the YAK18 flew only about 10 hours per year and that, during the winter, the vintage aircraft remained in the hangar. He added that a 45-minute flight had been made with the YAK18 the day before the accident. The pilot was at the controls and the owner was keeping a record of the parameters in the back. Some first category aerobatic figures had been performed during this flight: loop, split S, Immelmann, stall turn, roll.

⁽²⁾The French decree of 13 March 1992 on aerobatics, defines it as any flight during which an aircraft intentionally performs manoeuvres involving an abrupt change in attitude, an unusual position or an unusual variation in speed, generally associated with significant variations in level.

The aircraft owner said that the pilot had followed first category aerobatics training in a Stampe in the 1980s. To his knowledge, the pilot had not received any other aerobatics training. Once a year, at the beginning of the year, he did two or three aerobatic sessions of 15 minutes each, with the pilot. Finally, he added that the pilot had often been invited to take part in air shows during which he had never done any aerobatics. According to the owner, the pilot wanted to take an aerobatics training course first to make sure he could do the aerobatic figures safely during the shows.

2.3 Information about Lens Bénifontaine Aerodrome

This uncontrolled aerodrome has two intersecting grass runways. Runway 03/21 is 1,070 m long and 60 m wide. Displaced thresholds limit the usable lengths for landing and take-off.

The aerodrome's VAC chart draws users' attention to landings on runways 03 and 09 due to the presence of roads. In addition, a leisure park and shopping centre are situated to the south-east of Lens Aerodrome, immediately adjacent to it. The boundary of the parking areas for the leisure park is about 40 metres from the threshold of runway 03, where YAK18 struck the ground, and runs along the edge of the access road to the aerodrome.

Aerobatics⁽²⁾ are possible on the centreline of the runway in use at an altitude of between 2,000 and 3,500 ft, on Saturdays, Sundays and public holidays only.

2.4 Analysis of video recordings and photographs

The examination of the photographs and various videos taken by witnesses did not reveal any technical problem. It was determined from spectral analysis of the soundtrack of the videos, that the power delivered by the engine when flying over the aerodrome was between 86 and 88% of maximum power. The acoustic signature of the Yak18 propeller and engine assembly did not reveal any particular anomaly.

Analysis of the videos also determined that:

- the Yak18 was travelling at a speed of more than 110 kt before starting its manoeuvres;
- after a low pass, the Yak18 started a half-roll to the left, probably controlled, followed by a half-loop;
- the aircraft's final path was over or nearly over the parking areas of the leisure park and shopping centre south of the threshold of runway 03.

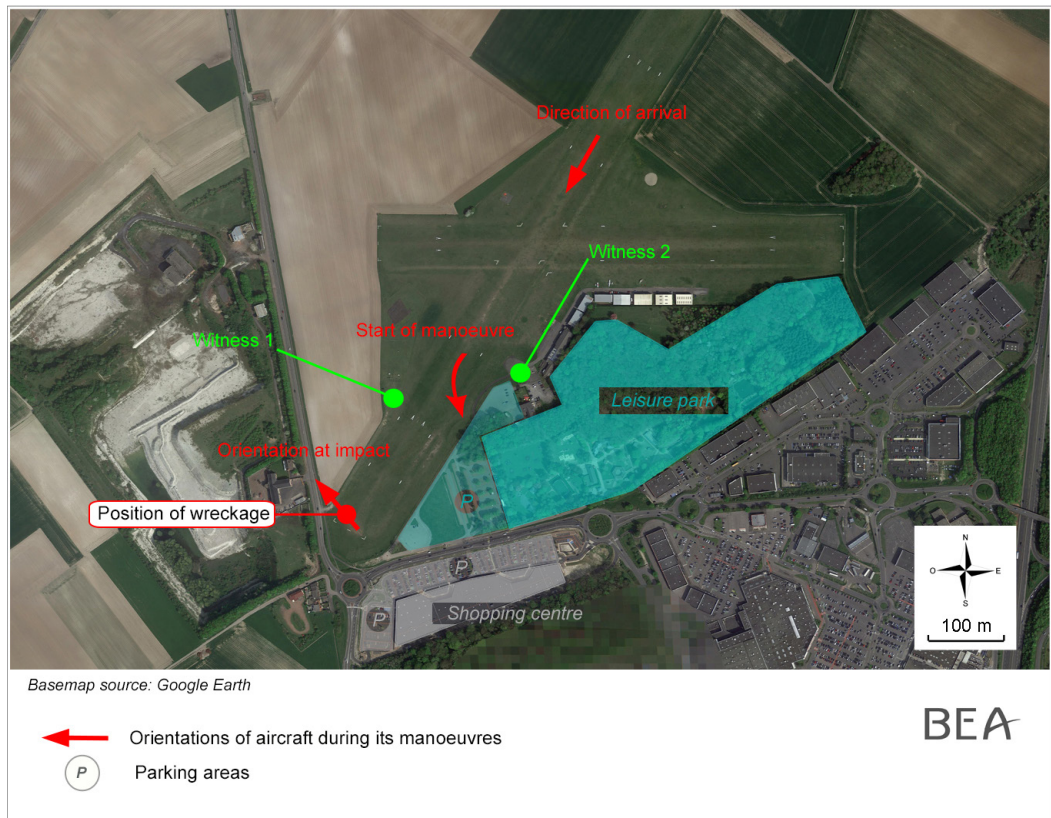


Figure 2: overview of the aerodrome and the aircraft's manoeuvres

2.5 Air rally on 8 April 2018

2.5.1 Regulations regarding air shows

According to Article 3 of the decree of 4 April 1996, air shows are characterised by the following:

- existence of a specific location accessible to the public;
- manoeuvres performed intentionally as a public show by one or more aircraft;
- advertising to the public by the organisers, through posters, notices in the media or any other means.

The decree also prohibits flying over the public and over parking areas accessible to the public during manoeuvres. The public at an air show must be positioned more than 100 m from the edge of the runway for take-off and landing manoeuvres or, if local constraints do not permit this, the organiser must present a study taking into account the specific characteristics of the site and the aircraft, to be submitted to the civil aviation authority for their opinion.

2.5.2 Air rally organisation

The organiser of previous air shows at Lens Bénifontaine Aerodrome indicated that he provided logistical assistance and expertise for the air rally. He contacted several associations and owners of vintage aircraft, in particular the Albert Vintage Aircraft association which owned the YAK18.

The rally organisers had not planned a specific location accessible to the public or any aerial manoeuvres constituting a public show. They considered it to be a private rally and that they were not subject to the constraints associated with air shows. Consequently, they had not contacted the DSAC (CAA safety department).

Some photographs of old planes and a notice stating: *“No air show but sunshine and beautiful planes passing through this Saturday and Sunday at Lens Bénifontaine Aerodrome”* were published on the social network of the Lens air show before the date of the rally.

A pilot briefing was held before the flights, during which the following points were discussed:

- pairing off of the Canadian pilots and passengers;
- sequencing of take-offs: the fastest aircraft before the slowest so that the aeroplanes would not catch one another up;
- instructions not to take risks and not to do any formation flying.

2.5.3 Presence of spectators near Lens Bénifontaine Aerodrome

The proximity of the leisure park to the aerodrome enabled visitors to watch the aircraft manoeuvres, especially those of the vintage aircraft taking part in the rally. On the day of the accident, there were many people in the leisure park's parking areas and on the access road to the aerodrome.

3 - LESSONS AND CONCLUSION

The accident occurred at the start of the return flight after participation in a vintage aircraft rally for which no demonstration flight was planned. After flying over the runway centreline, a half-roll to the left was performed, followed by a descending half-loop. This manoeuvre was not carried out at the altitudes required for aerobatics at Lens Bénifontaine Aerodrome. The height at which the manoeuvre began did not provide a sufficient safety margin to avoid collision with the ground at the end of the manoeuvre. The investigation did not find any technical failures. It could not be determined whether the inputs on the flight controls were deliberate or the result of a medical problem.

The pilot's recent experience with this type of flight, in this type of aircraft and at Lens Bénifontaine Aerodrome, meant that he lacked sufficient points of reference for performing aerobatic figures.

The organiser's publicity and the configuration of Lens Bénifontaine Aerodrome meant that there were many people in the immediate vicinity of runway 03. During the manoeuvre, the aircraft flew over parking areas and collided with the ground about

40 m away from numerous spectators. The number of casualties could therefore have been much higher. As the rally did not meet the definition of an air show, no safety study had been carried out regarding the immediate proximity of a large number of people.

⁽³⁾ BEA report on the accident to the Pipistrel Virus 912 SW 100 identified 17-YO on 7 August 2017 at the Saint-Estèphe microlight base (Gironde).

This accident illustrates the risks involved in performing an aerobatic manoeuvre at a low height, both for the persons on board and for any third parties in the vicinity. It also shows that the level of protection for persons in the immediate vicinity of an air rally is lower than for an air show.

As a result of an accident in 2017⁽³⁾, the BEA conducted a study which found that, since 2004, in France, for all categories of aircraft, more than 120 accidents had occurred during manoeuvres not required for normal flight, indicating that pilots were clearly taking risks caused by emulation. Of these, at least 70 fatal accidents had resulted in the death of nearly 120 people, representing 13.5% of fatalities in general aviation accidents since 2004. In more than half of these 120 accidents, the overflowed site (aerodromes, homes, gatherings of people) suggested that the pilot may have been seeking to do some form of demonstration to third parties on the ground. In more than 20 cases, the presence on the ground of spectators, particularly people close to the pilot, was confirmed. This form of demonstration could also be carried out to impress passengers. In two thirds of recorded cases, the pilot was accompanied by at least one passenger.