



**Accident** to the Beechcraft Beech 18S  
registered **F-AZEJ**  
on 11 September 2021  
at Melun-Villaroche aerodrome (Seine-et-Marne)

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|--|---|
| Time   | 15:06 <sup>1</sup>                                      |
| Operator   | Association Amicale Jean-Baptiste Salis                 |
| Type of flight   | Demonstration flight                                    |
| Persons on board   | Pilot and one safety pilot                              |
| Consequences and damage  | Pilot slightly injured, aeroplane substantially damaged |
| This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in August 2022. As accurate as the translation may be, the original text in French is the work of reference. |   |

**Loss of control on take-off in tailwind conditions, runway veer-off, during a formation flight at an air show**

**1 HISTORY OF THE FLIGHT**

*Note: the following information is principally based on videos taken by the public, on statements and on the examination of the site and the wreckage.*

The pilot, accompanied by a safety pilot<sup>2</sup>, was taking part in Air Legend, a major air show organised at Melun aerodrome. A public area was located 130 m back from the edge of runway 01/19, from which most aeroplanes were taking off and landing<sup>3</sup>.

<sup>1</sup> The times in this report are in local time.

<sup>2</sup> The regulations related to air shows specifically forbid passengers on board. However, a second crew member may be on board to assist the pilot, provided that they themselves are a pilot or mechanic and that they are trained in the procedures they may have to perform.

<sup>3</sup> The regulations require a minimum distance of 100 m.

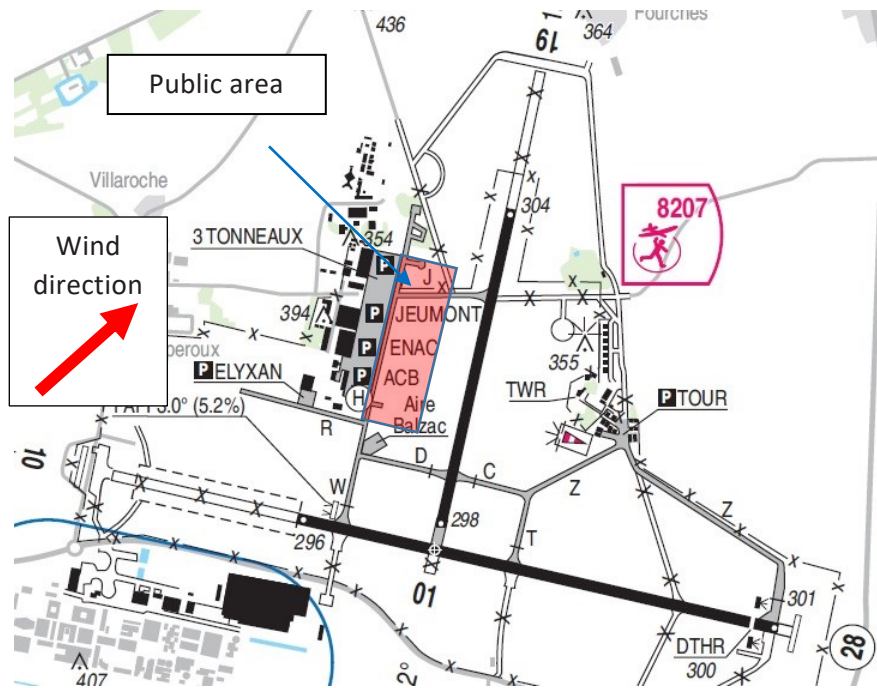


Figure 1: excerpt from the Melun aerodrome VAC chart

The pilot of the Beech 18 was participating in a demonstration that also included seven North American T6 aeroplanes and a Consolidated PBY Catalina seaplane.

The Catalina took off first from runway 28, which is longer, before joining a holding pattern. A few minutes later, the seven T6s and the Beech 18 lined up in front of the public on runway 01<sup>4</sup>.

The seven T6s took off, then the pilot of the Beech 18 lined up, released the brakes and began to run on the runway. As soon as the tail wheel lifted from the ground (main landing gear still on ground) the Beech 18 deviated first to the left, then more sharply to the right, and the right wheel ran over the grass. Observation of the videos revealed that the pilot tried to compensate for these movements with the rudder pedals.

The aeroplane took off and immediately went into a sharp left roll. The left-wing tip did not gain height and scraped the runway.

<sup>4</sup> Paved runway measuring 1,300 m long and 30 m wide.



**Figure 2: photo of F-AZEJ taken during take-off from the public area (source: DGAC)**

The aeroplane deviated to the left while the main landing gear wheels made contact with the runway again. It skidded off the left side of the runway and ripped out the aerodrome's perimeter fence beyond the public area (see Figure 4). The right landing gear ruptured as it crossed an embankment, and the aeroplane made a ground loop before coming to a stop in a field beyond the public area.

## **2 ADDITIONAL INFORMATION**

### **2.1 Air show information**

The Air Legend event took place at Melun aerodrome on 11 and 12 September 2021 and attracted over 58,000 visitors over the two days. Rehearsals for the demonstration took place on 9 and 10 September.

During the two days of the event, each morning before the flights, the flight director held a preparatory meeting that all the pilots were required to attend and which included a reminder of the safety instructions.

As the Melun tower control service is closed at weekends, radio communications took place over a frequency dedicated to the event, which was not recorded.

### **2.2 Meteorological information**

On the day of the accident, the sky was overcast in the afternoon with a variable wind. The METAR report at 15:00 indicated a wind from 230° of 10 kt.

Photos and videos taken by spectators confirmed the wind speed and the tailwind component at the time the Beech 18 took off.



**Figure 3: excerpt from a video taken from the public area during the Beech 18's take-off run on runway 01 (source: YouTube)**

## 2.3 F-AZEJ information

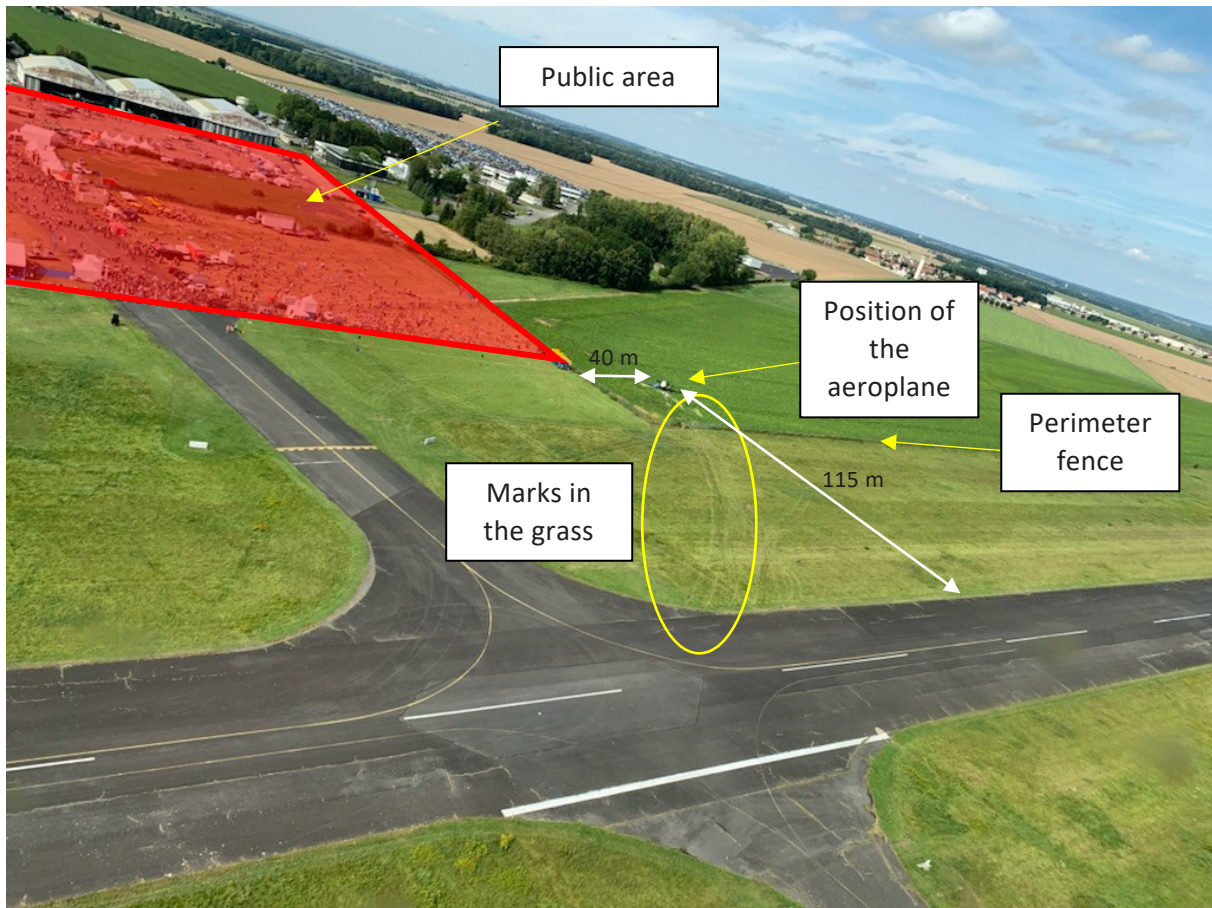
The Beechcraft Beech 18 is a single-pilot, twin-engine aeroplane with a conventional landing gear produced between 1937 and 1969. F-AZEJ was built in 1958 and was acquired by the Amicale Jean-Baptiste Salis in 1983. It is equipped with two Pratt & Whitney R-985-AN-14B radial engines, each delivering a power of 450 hp. The Beech 18 has a control that allows the pilot to lock the tail wheel in the centred position before take-off.

The F-AZEJ flight manual indicates a take-off speed below 90 mph. The stall speed in the landing configuration, with the landing gear and flaps extended, is 77 mph at the maximum weight of 4,350 kg, and 75 mph at 3,600 kg. The pilot explained that the aeroplane's weight at the time of the incident was approximately 3,200 kg and that the stall speed verified during check flights was then below 70 mph.

The flight manual does not mention a maximum tailwind; it indicates a maximum crosswind of 23 kt at take-off.

## 2.4 Site information

The aeroplane came to a stop approximately 115 m to the left of the edge of runway 01, around 40 m after the end of the public area.



**Figure 4: aerial photograph taken after the accident (source: DGAC; annotated by the BEA)**

Marks were visible in the grass from the point where the aeroplane exited the runway. The aerodrome's perimeter fence was ripped off when the aeroplane went through it. The right main landing gear of the aeroplane detached as it crossed an embankment about 50 cm high which runs along this fence.

The examination of the aeroplane, the photos and the video taken by the public indicated that at the time of the accident, the flaps were extended to approximately 15°. The flight control linkages were continuous and operational on the three axes. The trims were set to approximately the neutral position on the three axes. Observation of the videos did not reveal any loss of power or any asymmetry between the engines. No technical anomaly which could have contributed to the accident was observed.

## 2.5 Crew information

### 2.5.1 Pilot

Since 1964, the 74-year-old pilot had held a number of aeronautical licences, including:

- a valid airline transport pilot licence issued in 1990, along with valid SEP and MEP ratings;
- a valid instructor rating issued in 1972;
- a valid glider pilot licence.

At the time of the accident, he had logged more than 30,000 flight hours, 150 h of which during the year, and had good experience flying various models of vintage aeroplanes. He had been flying the

Beech 18 registered F-AZEJ since 2001 on which he had logged a total of approximately 280 h, and was the aeroplane's regular pilot in the association.

Prior to the accident, he had performed around 12 flights in F-AZEJ in 2021. In particular, he had taken part in three air shows with it in June and August. During these previous events, he had taken part in formation flights with other aeroplanes, in similar take-off configurations. However, he added that on these occasions, there had been fewer aeroplanes<sup>5</sup> and that the wind conditions had been different, with no tailwind component.

### 2.5.2 Safety pilot

The 32-year-old safety pilot held an airline transport pilot licence issued in 2018<sup>6</sup>, as well as an instructor rating issued in 2016.

At the time of the accident, he had logged 2,200 flight hours, around 10 h of which in the Beech 18 registered F-AZEJ, in which he had been flying since 2019 and was about to fly solo.

## 2.6 T6 and Beech 18 take-off sequence

Several video recordings made by spectators showed that it took 38 s for all seven T6s to take off from runway 01. They took off in a staggered pattern: the first pilot ran on the right side of the runway, followed by the second on the left side, and so on until the seventh pilot on the right side.

A few seconds after the last of the T6s had released its brakes, the Beech 18 pilot lined up on the runway and stopped to lock the tail wheel. He then increased power before releasing the brakes to take off. The Beech 18 was brought into a level attitude 20 s after the last T6 had taken off.

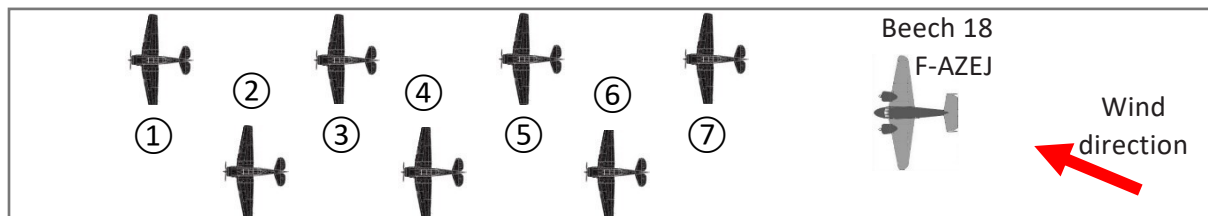


Figure 5 : positioning of the seven T6s and the Beech 18 registered F-AZEJ on runway 01

The videos showed that the Beech 18's first swerve to the left occurred almost immediately after it had been brought into a level attitude.

## 2.7 Statements

### 2.7.1 Flight director statement

The flight director specified that during the morning preparatory meeting, in addition to giving a reminder of the regulatory aspects and procedures specific to the event such as the paths to be observed and public safety, he had paid particular attention to the lack of training or recent experience of most of the pilots due to the cancellation of events for two years as a result of the COVID-19 health restrictions.

<sup>5</sup> In addition to F-AZEJ, there were four aeroplanes at the La Ferté Alais event on 28 and 29 August, and two aeroplanes at the Cambrai event on 5 September.

<sup>6</sup> The safety pilot held a private pilot licence - aeroplanes obtained in 2008.

He specified that the pilots always decided on the runway and take-off direction to be used according to the characteristics of their aeroplanes. Taking off from runway 01 allowed the pilots to be as close as possible to the public, but also to substantially shorten the running phase for a more fluid demonstration.

He explained that the Beech 18 pilot had asked him for permission not to take part in the Friday training flight and that he had granted him this exemption because of his experience (including recent experience) on the aeroplane and in demonstrations at air shows.

### **2.7.2 Pilot statement**

The pilot explained that when the Beech 18 is on the ground, forward visibility is reduced. He usually boards a safety pilot to have “two pairs of eyes”.

This was his third air show demonstration flight of the year with F-AZEJ. He specified that he had not identified any particular threat during the preparatory meeting with the flight director. The aspects discussed concerned vigilance over the recent training of pilots, the weather and the event organisation.

Due to the tailwind component, the pilot had briefly considered taking off from runway 28, but he explained that this would have made the scheduled demonstration with the T6s more complicated. He therefore decided to take off after the T6s, from runway 01. He added that the potential accumulation of wake vortices from the T6s and the blasts from their engines were considered, but that their impact in combination with the tailwind component had probably been underestimated.

According to him, he released the brakes about 20 s after the T6s had taken off, then he gradually applied power without reaching full power. Once the aeroplane had a level attitude, he felt a slight swerve to the left that he corrected with the pedals, followed by a second much more severe swerve to the right that he tried to counter. He explained that he had the impression that the aeroplane’s controls were not responding as smoothly as usual and that the aeroplane was having difficulty accelerating.

He felt the aeroplane take off on its own at approximately 85 mph<sup>7</sup>, then he had the impression that the speed decreased while the aeroplane was in the air. He explained that he felt the left wing stall abruptly, which resulted in the aeroplane returning to the ground without any input from him on the controls.

He specified that the Beech 18 is very unstable by nature during the run phases, and in particular during take-off. He added that he had very rarely taken off with a tailwind component.

### **2.7.3 Safety pilot statement**

The safety pilot also attended the morning preparatory meeting organised by the flight director with all the pilots. At approximately 14:00, he prepared the aeroplane with the pilot, then they

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<sup>7</sup> The speed of 85 mph is the speed at which the pilot usually took off at. However, observation of the videos revealed that the elevator was in the nose-up position just before the aeroplane’s take-off. The videos also revealed that the aeroplane immediately banked to the left at take-off and that the left wing tip constantly remained at ground level.

carried out a pre-flight briefing focusing on the run phase and then on the planned flight demonstration. He was aware that the take-off would be performed with a tailwind component.

Once the aeroplane was lined up on the runway behind the T6s, the safety pilot checked that the tail wheel was correctly locked. He estimated that the power was increased about 20 s after the departure of the last T6. The start of the take-off run took place normally, until he felt a slight deviation to the left, followed by a return to the centreline, then by an abrupt deviation to the right. He explained that the right wheel might have run over the grass and that he saw the pilot try to control the path of the aeroplane. When he felt the aeroplane lift off and adopt a steep bank angle to the left, he had the impression that the aeroplane was higher above the ground than it actually was; he had been afraid that the aeroplane would stall and turn onto its back and instinctively pushed on the stick to force the aeroplane to stay on the ground.

He explained that the speed at which the pilot initiated rotation had seemed normal to him and that he had not felt any loss of power. He added that the air had seemed very turbulent to him and that they had maybe underestimated the accumulation of vortices from the T6s.

#### **2.7.4 T6 pilot statements**

Before the flight, the pilot of the first T6, who was the formation leader, suggested taking off from runway 01 to the other T6 pilots and to the Beech 18 pilot. He explained that he considered the wind conditions to be compatible with this option, which would allow them to offer the public a great show, without compromising safety. He added that the pilots of the other T6s and of the Beech 18 did not question this suggestion.

The pilots of the T6s explained that a tailwind component made it more difficult to take off and required more time to bring aeroplanes into a level attitude, but that this situation did not raise any difficulty when properly planned for. They were all used to taking off in formation and in a staggered pattern, when the runway width allowed for it. They had had the opportunity to carry out a training flight on Friday, under similar wind conditions. The Beech 18 pilot had not taken part in this training. Several of the T6 pilots explained that this type of take-off in formation naturally created turbulence which they were prepared for.

The pilot of the first T6, and then all the pilots who took off on the left side of the runway, explained that the take-offs had been normal, with the aeroplanes requiring some time to be brought into a level attitude due to the tailwind component. The pilot of the third T6 (second on the right side of the runway) explained that he took off into the turbulence, without any difficulty. The pilots of the fifth and the seventh T6s, (on the right side of the runway), specified that the air was very unstable; the last pilot explained that he took off on one wheel, he then decided to deviate after take-off to exit the area of turbulence.

These statements indicate that strong turbulence had formed on the right side of the runway.

Several of these pilots added that the Beech 18 was known to be difficult to control at take-off.



### 3 CONCLUSIONS

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

#### **Scenario**

The pilot, accompanied by a safety pilot, was carrying out a demonstration flight at a major air show. He took off from runway 01 with an estimated tailwind component of 7 to 8 kt shortly after a formation of seven T6s.

The decision of the T6 pilots to take off from runway 01 may have encouraged the Beech 18 pilot not to take off from runway 28, which was longer, and to take off in tailwind conditions that he had little experience of, and in which the Beech 18 was known to be difficult to control.

The disturbance resulting from the wake vortices of the T6s and from the blasts of their propellers, combined with the disturbance due to the tailwind component, may have taken the pilot by surprise during the rotation and may have been the cause of the aeroplane's destabilisation. The pilot was unable to regain control of the aeroplane and the safety pilot aborted the take-off. This action caused a runway veer-off, but mitigated the consequences of the loss of control.