BEA
Bureau d'Enquêtes et d'Analyses
pour la sécurité de l'aviation civile
www.bea.aero
@BEA_Aero

INVESTIGATION REPORT

Accident to the STAMPE SV-4 registered F-PTTL
on 04 July 2020
at Marcé (Maine-et-Loire)

Time	Around 11:55[1]
Operator	CPVA (Centre de Perfectionnement et de Voltige aérienne d'Angers)
Type of flight	Aerobatic
Persons on board	Pilot and instructor
Consequences and damage	Pilot and instructor fatally injured, aeroplane destroyed
This is a courtesy translation by the BEA of the Final Report on the Safety Investigation published in February 2022. As accurate as the translation may be, the original text in French is the work of reference.	

[1] Except where otherwise indicated, times in this report are local.

Loss of control during an aerobatic flight, collision with the ground

1 - HISTORY OF THE FLIGHT

Note: the following information is principally based on statements and radio communication recordings.

At 11:41, the pilot, accompanied by an instructor, contacted the AFIS officer at Angers-Marcé aerodrome (Maine-et-Loire) to make an aerobatic flight overhead the facilities. The AFIS officer informed him that the overcast cloud layer was based at 2,300 ft above ground level (AGL), i.e. 2,500 ft above mean sea level (AMSL).

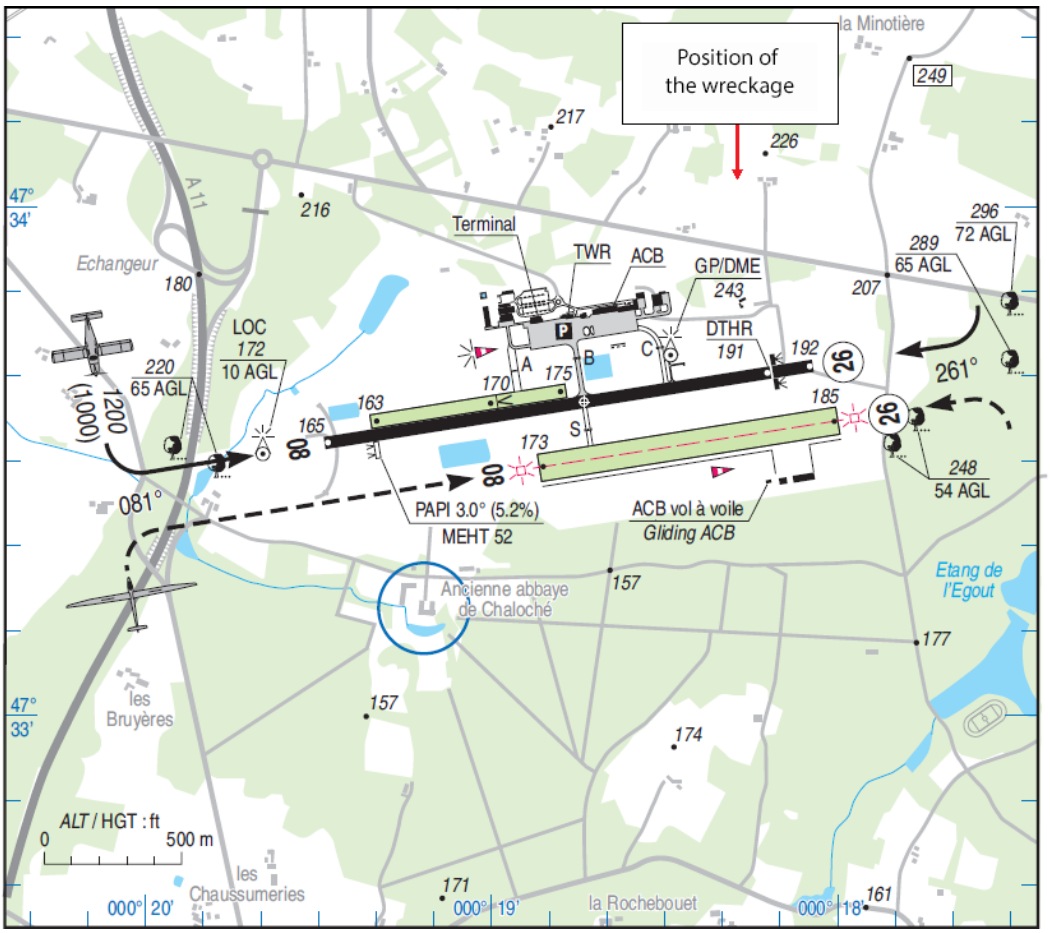
The aeroplane took off at 11:47.

[2] Take-off of a glider using a winch.

At 11:51, one of the occupants of F-PTTL announced the start of the aerobatic manoeuvres, stated that they had seen the winch launch[2] in progress and that they would remain above 2,500 ft AMSL.

Six minutes later, several witnesses saw the aeroplane descend in a spin then crash into a field north of the aerodrome.

RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité



Extract from the Angers-Marcé aerodrome VAC chart

2 - ADDITIONAL INFORMATION

2.1 Aeroplane information

The Stampe SV-4 is an aerobatic biplane with two seats in tandem configuration. Its design dates back to the 1930s.

The Stampe SV-4 registered F-PTTL was built by the CPVA using a combination of original parts and more modern parts. It was issued with a restricted certificate of airworthiness in February 2018.

It was equipped with a 150 hp Lycoming 0-320-E3D engine, different from the 140 hp Renault engine equipping the original version. An engine stand was made specifically for this engine.

The aeroplane's balance, empty, was similar to that of the original SV-4.

The last maintenance inspection of the aeroplane (100-hour type inspection) was completed on 23 June 2020. The aeroplane had flown five hours since this inspection.

At the time of the accident, the aeroplane was in the weight and balance flight envelope.

2.2 Site and wreckage information

Observations made at the site showed that the aeroplane had been intact when it hit the ground, following a path close to vertical. At the time of impact, it was flying with a left bank angle and a nose-down attitude of around 30°.

The flight control linkages were continuous and the control surfaces were functional. The examination of the structure did not reveal any anomaly. At the time of impact, the engine had been operating and the propeller had been rotating.

2.3 Pilot information

The 62-year-old pilot held a Private Pilot Licence - Aeroplanes issued in 2007, as well as an aerobatic rating. He also held microlight and glider pilot licences.

He had logged 1,186 aeroplane flight hours, ten hours of which in the previous three months and six hours of which in the Stampe SV-4.

He was seated in the rear seat of the aeroplane. He was equipped with a reserve parachute. Observations at the site did not show that there had been an attempt to evacuate in flight.

He was a member of the CPVA and wanted to polish his aerobatic flying skills with a view to performing at air shows. The accident flight, made with an aerobatic instructor, fell in this category.

The medical and pathology examinations carried out after the accident did not reveal any factor likely to be related to the accident. The pilot's valid class 1 medical certificate came with the VML[3] limitation.

[3] Obligation to wear multifocal glasses and to carry a spare pair of glasses in the cabin.

2.4 Instructor information

The 49-year-old instructor held a Private Pilot Licence - Aeroplanes issued in 2002, as well as an instructor rating[4] and an aerobatic flight rating. He also held a microlight pilot licence.

He had logged 1,010 aeroplane flight hours, 177 hours of which as an instructor and 31 hours in the previous three months, 17 hours of which in the Stampe SV-4.

He was seated in the front seat of the aeroplane. He was equipped with a reserve parachute. Observations at the site did not show that there had been an attempt to evacuate in flight.

At the time of the accident, he was the only member of the CPVA to perform aerobatics at an air show.

The medical and pathological examinations conducted after the accident revealed a posteroseptal myocardial infarction. The infarction was old (comparatively to the accident to F-PTTL) and small in size. This type of infarction can cause non-specific symptoms such as momentary tiredness or vagal episodes. In the long term, other signs can develop. Indeed, the location of the lesion can lead to cardiac arrhythmia and feeling unwell with syncope.

There was nothing to suggest a more recent infarction. Nevertheless, the hypothesis of an infarction occurring during the accident flight cannot be completely ruled out as characteristic microscopic lesions are generally absent for infarctions occurring in the six hours prior to death.

[4] Obtained in December 2017, with privileges restricted to SEP and aerobatic flight.

The toxicology examinations found no medication linked to a heart condition. The instructor's widow stated that she had no knowledge of any medical history.

The instructor's valid class 2 medical certificate came with the VDL[5] limitation. His certificate request and the medical examination report made no mention of a medical history or cardiovascular risk factor. The regulations do not impose an electrocardiogram for someone of the instructor's age unless there is reason for concern.

[5] Obligation to wear corrective eyewear suitable for flying to correct long-distance vision; entails the carrying of a spare pair of glasses in the cabin.

2.5 Meteorological information

At the time of the accident, the meteorological conditions were as follows: wind 210 at 12 kt, visibility greater than 10 km, OVC (Stratocumulus) at 2,200 ft AGL (2,400 ft AMSL), temperature 19°C, dew point temperature 14°C, QNH 1,022 hPA.

2.6 Aerobatic zone

The aerobatic zone overhead the aerodrome (No 6362) was subject to a memorandum of agreement between the CPVA and the aerodrome operator.

This memorandum defines the conditions of use of the aerobatic zone during AFIS hours depending on whether the use concerns training in actual air show conditions or not (normal conditions).

For aerobatic training in normal conditions, the aerobatic zone is defined as follows:

- centreline located 200 m north of paved runway 08/26 and parallel to it;
- width 350 m on either side of the centreline;
- length 2,100 m (1,050 m on either side of taxiway B);
- vertical limits: from 1,700 ft to 3,500 ft AMSL.

In the event of simultaneous glider winch launch activity, these vertical limits are increased to 2,500 ft / 3,500 ft AMSL and the glider release ceiling is lowered to 1,900 ft AMSL.

In addition, the memorandum specifies that aerobatic activity must take place in VMC conditions.

According to the vice-president of the flying club, when the cloud ceiling is below 2,400 ft AGL (2,600 ft AMSL), it is usual to limit aerobatic manoeuvres in the vertical profile and to give priority to manoeuvres in the horizontal profile: rotation exercises in roll (rolls, and even snap rolls), inverted flight and English bunts.

2.7 Spin information

The spin is a standard figure in aerobatics. The "*Guide de l'Instructeur Voltige et du Voltigeur*[6]" advises against initiating a spin at a height below 3,000 ft, or 2,000 ft for experienced aerobatic pilots.

[6] 2nd edition, published by Cépaduès.

Due to the increased angle of attack and asymmetry, many aerobatic manoeuvres carry a risk of involuntary initiation of spin. For example, this is the case with snap rolls, a manoeuvre compatible with a manoeuvre in the horizontal profile.

2.8 Statements

2.8.1 AFIS officers

The trainee AFIS officer and his supervisor explained that they had been surprised to be contacted regarding an aerobatic flight despite the relatively low cloud ceiling.

The geographic position of the tower had prevented them from seeing F-PTTL in aerobatic training.

Nevertheless, they observed the final descent of the aeroplane, just before it collided with the ground. They described an aeroplane in spin, with an almost-vertical descending path. They specified that the aeroplane fell to the north of the control tower, outside of the aerobatic zone, where no figure is usually performed.

2.8.2 Witnesses at the aerodrome

Several witnesses present at the aerodrome explained that the aeroplane had been flying south towards the threshold of paved runway 26 and that it had entered a spin, nose-down, with an angle of around 30°. The path was then practically vertical.

The statements do not corroborate in terms of the altitude of the aeroplane when it entered the spin. According to two witnesses, the aeroplane nevertheless remained below the cloud layer for the duration of the flight.

One witness located between paved runway 26 and glider runway 26 explained that the aeroplane had flown straight and level for around 10 seconds before entering a spin to the left (counterclockwise rotation). The aeroplane made several spins (maximum of five) and collided with the ground.

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 an instructor, took off for an advanced aerobatic training session overhead the aerodrome.

An overcast layer of stratocumulus cloud was present at 2,200 ft AGL, i.e. 2,400 ft AMSL. At the start of the flight and due to a simultaneous glider winch launch activity, one of the occupants announced to the duty AFIS officer that they would be flying above 2,500 ft AMSL. However, according to the statements, the aeroplane had remained below the cloud layer for the duration of the flight.

After around 10 flight minutes, when it was north of the aerobatic zone and coming back towards it, still under the cloud layer, the aeroplane entered a left spin and then collided with the ground.

Contributing factors

The investigation was unable to determine the reasons for entering a spin, or whether this manoeuvre had been intentional or unintentional.

It is not possible to rule out the hypothesis of an in-flight incapacitation during the flight, in particular in light of the discovery that the instructor had suffered a previous myocardial infarction. In an aeroplane with two seats in tandem configuration such as the Stampe, the hampering of the controls by an incapacitated individual, for example due to a tightening of the grip, can make it difficult for the other individual to maintain or regain control of the path.

Safety lessons

Manoeuvre margins for an aerobatic flight

When the pilot and the instructor decided to make an advanced aerobatic training flight in the meteorological conditions prevailing at the time, they exposed themselves to various threats, including:

- A reduction in all height margins in relation to the ground. In the event of loss of control during a manoeuvre, this could compromise the recovery of the situation or evacuation of the aeroplane.
- An unintentional entry into the cloud layer during a manoeuvre, leading to loss of external visual references and conducive to loss of control of the aeroplane.
- A reduction in distance with the glider activity, increasing the risk of mid-air collision or loss of control of one of the aircraft following evasive action.

Aerobatic medical check-up

In the absence of specific requirements regarding out-of-competition aerobatic flying, it could be advantageous for pilots to demonstrate a certain proactiveness in terms of medical check-ups. For individuals with a predisposition to heart problems, the physiological stress inherent in aerobatic flight, even low intensity, may be conducive to an in-flight incapacitation. The risk of in-flight incapacitation can be heightened by a sudden stress, for example during a manoeuvre. The stress caused by multiple pre-identified external threats, as well as the additional effort needed to manage manoeuvres, may also be conducive to the onset of an incapacitation.