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

SAFETY INVESTIGATION REPORT

Accident to the ELIXIR registered F-HCDN on Friday 2 May 2025 at Amboise-Dierre aerodrome

Time	Around 11:40[1]
Operator	Aéroclub des Navigants
Type of flight	Cross country
Persons on board	Pilot, passenger
Consequences and damage	Pilot injured, aeroplane substantially damaged
This is a courtesy translation by the BEA of the final report on the safety investigation. As accurate as the translation may be, the original text in French is the work of reference.	

Runway veer-off during an emergency landing, rupture of nose gear fork, overturn

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

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August 2026 BEA2025-0156

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements and data recorded by the Garmin G3X EFIS[2].

During a cross-country flight between Châtellerault - Targé and Étampes - Mondésir, the pilot, accompanied by a passenger, noticed the appearance of an **ENGINE ECU** caution message and the steady illumination of the "LANE A" caution light. After consulting the checklist, he decided to divert to Amboise - Dierre aerodrome. The pilot landed and shut down the engine in the parking. After starting up and carrying out the before take-off engine tests, he saw that the light was no longer on. He decided to resume his flight to Étampes.

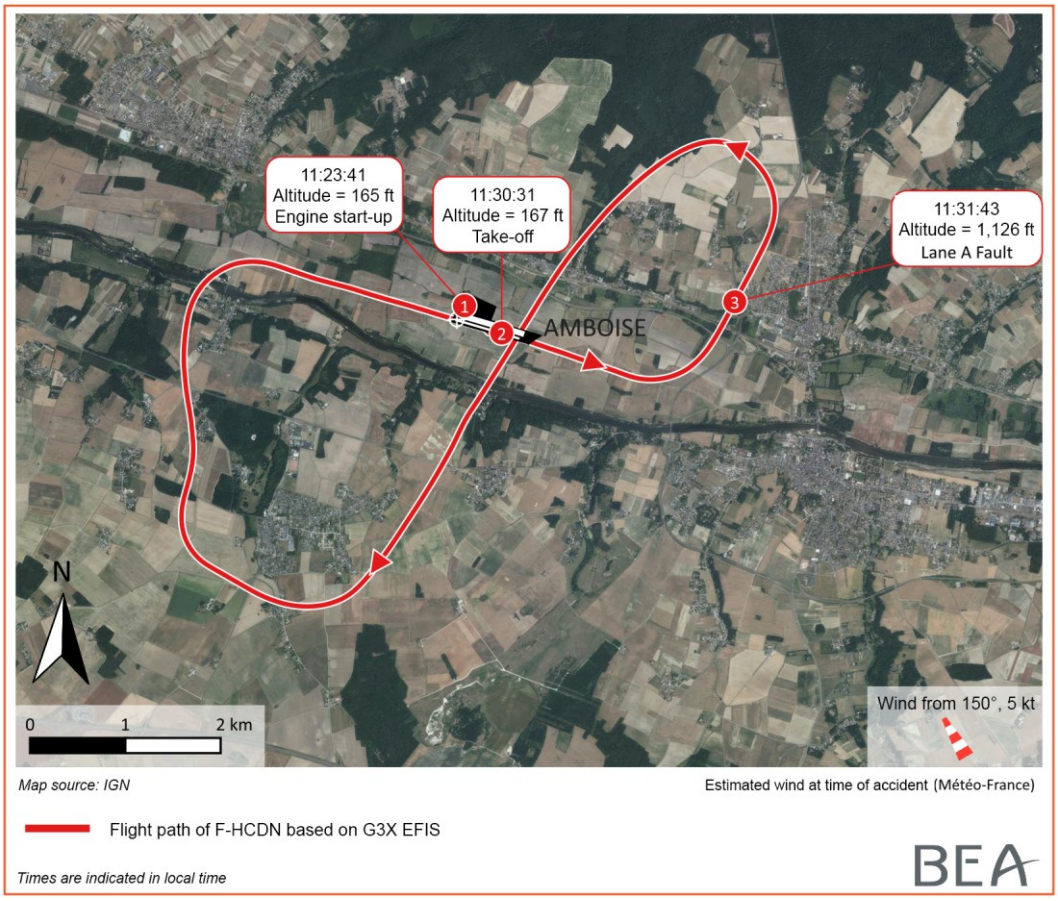

Figure 1: flight path

The pilot took off from runway 10[3]. Around one minute after take-off (see **Figure 1**, point 3), the "LANE A" caution light came on and remained steadily illuminated. The pilot decided to carry out a U-turn and an emergency landing. He joined the end of the right-hand downwind leg for runway 10. On final, the aeroplane's speed (IAS) was between 64 kt and 70 kt (see **Figure 2**, point 4) and the descent slope was around 4° (see **Figure 3**). The elevator trim was set to nose down (-39%).

[2] The glossary of abbreviations and acronyms frequently used by the BEA can be found on its website.

[3] Paved runway measuring 700 m X 25 m.

At the beginning of runway 10, i.e. 130 m from the threshold, the speed decreased to 60 kt. After the flare, the speed decreased to 55 kt. On touchdown, the aeroplane bounced, swerved to the right-hand side and then veered off the runway. The nose gear fork ruptured on running over a rut in the grass. The aeroplane nosed over onto its back and came to a stop on the grass strip on the right-hand side of the runway. The occupants were unable to evacuate the aeroplane. Witnesses present at the aerodrome managed to break the canopy of F-HCDN using a canopy breaker tool taken from one of their aeroplanes and helped the occupants evacuate.

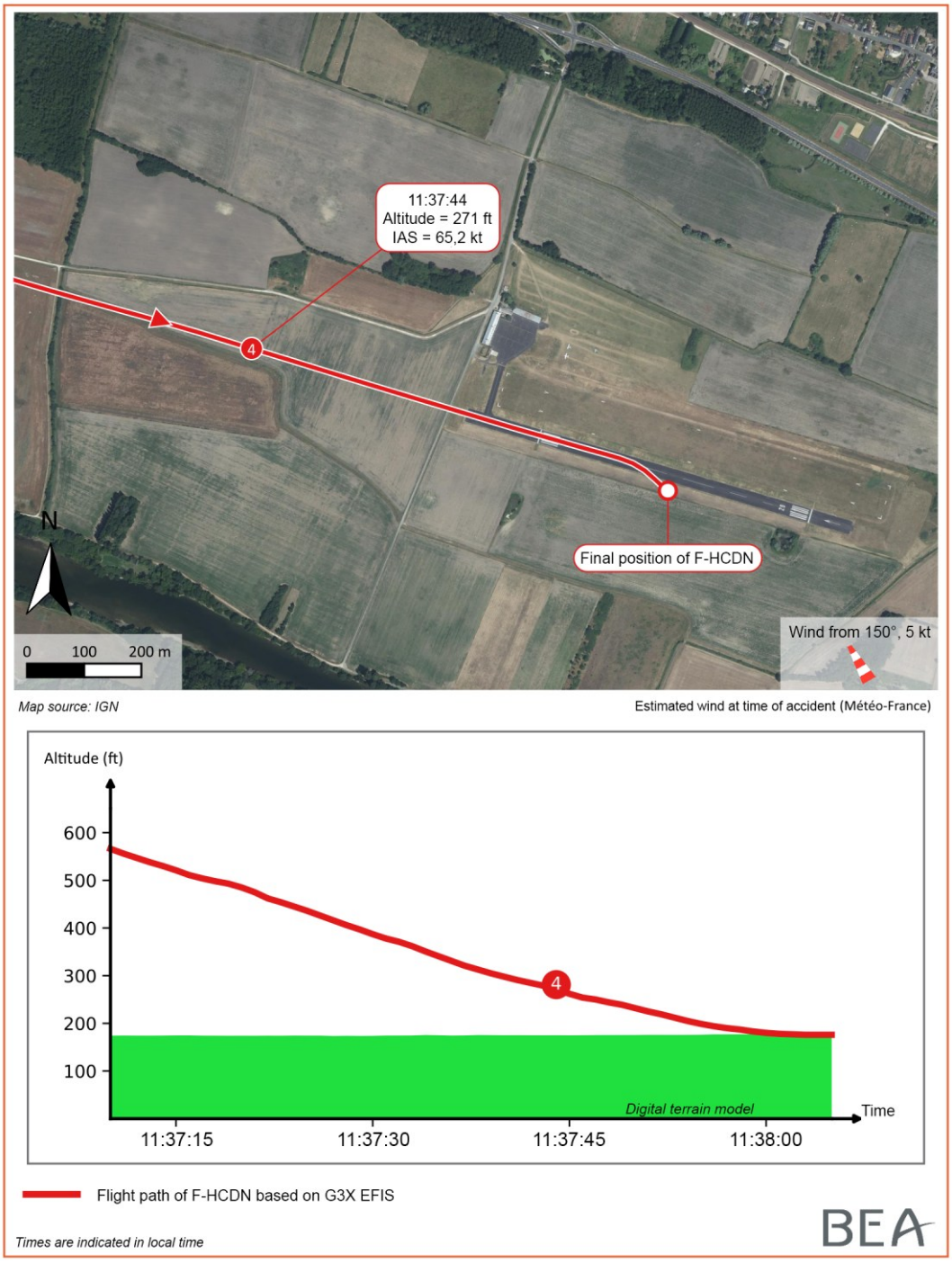

Figure 2: final of approach to runway 10

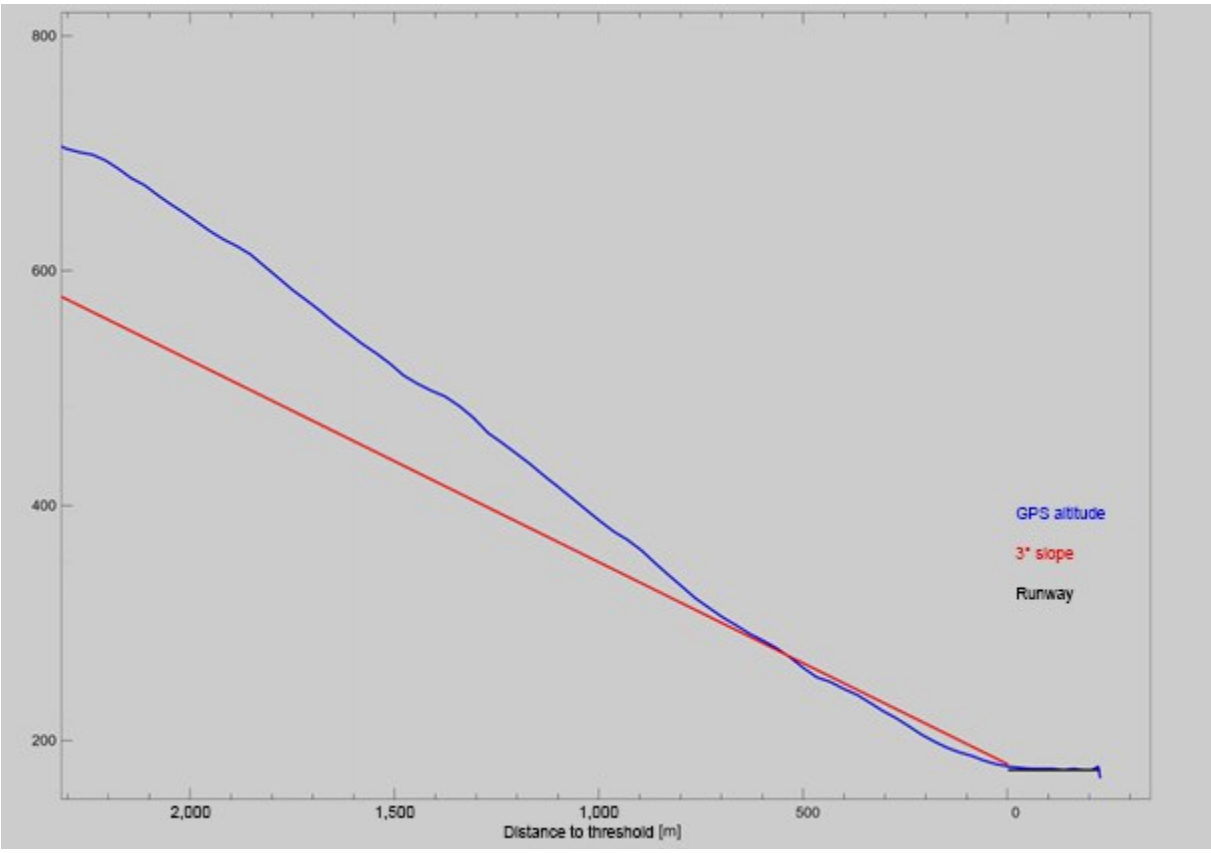

Figure 3: descent slope of F-HCDN compared to nominal descent slope (source: BEA)

2 CONTEXT

2.1 Meteorological information

The 11:30 METAR for Tours - Val de Loire aerodrome situated 19 km north-west of Amboise - Dierre aerodrome indicated a mean wind from 130 (varying between 80 and 180) of 4 kt, CAVOK, temperature 23°C, dew point temperature 10°C, QNH 1015 hPa.

According to the Météo-France analysis, in the Amboise sector, there was a light south-easterly surface wind (around 5 kt) and the situation was CAVOK.

2.2 Aerodrome information

Amboise - Dierre aerodrome has no control service and its A/A frequency (118.780) is not recorded.

The aerodrome has a paved runway 10-28 and an unpaved runway 10L-28R. The landing distance available (LDA) for runway 10 is 570 m due to a displaced threshold. The runways are not equipped with a PAPI system.

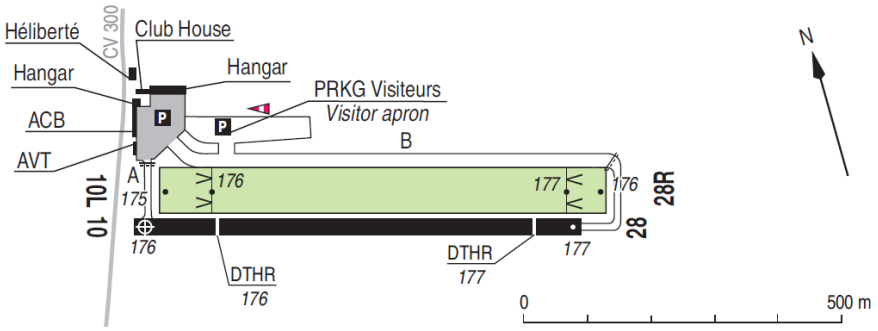

Figure 4: excerpt from VAC chart of Amboise - Dierre aerodrome (source: SIA)

3 EXAMINATIONS CARRIED OUT

3.1.1 Examination of site

The damaged aeroplane was moved and placed in a hangar before the BEA arrived on site. However, the visible marks on the runway and in the grass were examined. They showed the aeroplane was in a continuous right-hand skid until it veered off the runway around 85 m after the threshold of paved runway 10.

Figure 5: aerial view of accident site (source: BEA)

Ruts were observed in the grass, due to agricultural machinery having passed through.

3.1.2 Examination of wreckage

The damage observed on the tail plane, the propeller and its cone, the engine cowling and the wing tips was consistent with the aeroplane nosing over onto its back.

Figure 6: overall view of aeroplane after it was moved (source: BEA)

The nose gear had ruptured at the connection between the moving leg and the fork. Part of the fork was still integral with the nose wheel, found in the grass, upstream of the final position of the wreckage

The examinations carried out on the wreckage in the presence of the manufacturer revealed a lack of lubrication of the nose gear legs, causing significant friction likely to affect the damping behaviour of the gear in abnormal operating conditions.

When F-HCDN was manufactured, the fixed leg of the nose gear should have been fully lubricated. However, given the total absence of grease observed during the examination, this operation was probably not carried out.

Elixir Aircraft was not able to explain why this lubrication had not been carried out when the aircraft was being manufactured. It indicated to the BEA that it had not identified any similar cases.

The Elixir maintenance programme, as defined in the AMM, did not specify a verification of the lubrication during the 100-hour inspection, but only during the annual inspections. As F-HCDN had a service life of less than one year at the time of the accident, this omission when it was manufactured had not been detected.

3.1.3 Examination of engine

The preliminary examinations of the engine identified substantial play between the manifold air temperature sensor of lane A of the ECU, and its wiring harness. A fault on this sensor or its wiring is consistent with the steady illumination of the “LANE A” caution light based on the data recorded by the on-board avionic systems.

The engine was sent for examination to the Rotax approved service centre in France. After several bench tests, the nominal behaviour of the engine was confirmed. The problem of erratic values coming from the temperature sensor concerned could not be reproduced. The sensor and its wiring were electrically tested and showed no malfunction.

Rotax indicated to the BEA that it was aware of a limited number of cases where erratic values from the temperature sensors had led to the illumination of an engine caution light. According to Rotax, the information collected indicates that these occurrences may be connected to high vibrations linked to the specific installation conditions on the aircraft.

This hypothesis is consistent with the intermittent appearance of the caution light observed by the pilot.

Given the extremely low rate of occurrence of this failure and the intrinsic redundancy of the system, Rotax does not consider it necessary to make any design modifications or take any additional corrective measures for the moment. However, Rotax indicated that it was continuing to monitor this subject and that it would take appropriate measures if new elements appeared.

4 AIRCRAFT INFORMATION

4.1 General

The Elixir is a two-seater aeroplane with low wings. It is equipped with a Rotax 912 iSc 3 Sport engine providing 100 hp. It has double-slotted flaps which increase lift at low speed.

4.2 Powerplant control

The engine and the propeller are controlled by a single lever. The engine ECU automatically manages the mixture (injection) while the SCU[4] controls a hydraulic governor to adjust the pitch of the propeller and maintain the optimal rating. The ECU operates with a two-lane system: Lane A and Lane B process the same data in parallel to ensure redundancy. Consequently, if an anomaly is detected on one of the lanes, the ECU automatically switches to the other lane. No loss of engine power or deterioration in engine performance is anticipated. The flight manual indicates that only the fuel consumption will increase as the mixture will be full rich.

4.3 Nose gear

The tricycle landing gear is fixed. The nose gear has damping, steering and locking functions.

The fork (see **Figure 7** point 1) connects the nose wheel to the moving leg (point 2) and to the moving leg shaft (point 3) which ensures the alignment of the nose wheel with the fixed leg. The moving leg slides in the internally-lubricated fixed leg (point 4). The fixed leg can also slide in the lower fixation (point 5) which ensures the junction of the landing gear with the fuselage. The damping function of the nose gear is provided by the compression of polymer blocks between the bottom of the moving leg and the end of the fixed leg.

On the ground, the landing gear is steered via the rudder pedals while an upper fixation (point 8) and a nose gear unlocking spring (point 7) automatically lock the wheel on the aeroplane's axis after take-off. A steering damper (point 9) completes the assembly to prevent the "shimmy" phenomenon.

[4] *System Control Unit*.

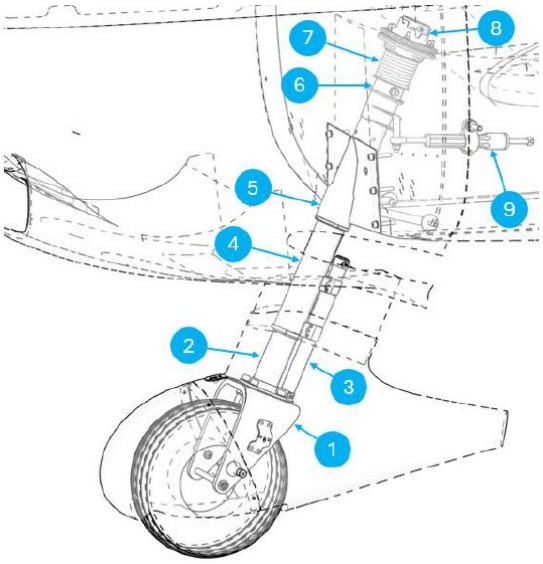

Figure 7: nose gear (source: Elixir Aircraft)

4.4 Avionics

The Elixir is equipped with a Garmin G3X Touch avionics suite. F-HCDN is equipped with a central MFD on which the flight instruments, navigation instruments and engine parameters are displayed. The caution messages are displayed on the MFD.

In the centre of the instrument panel, above the MFD, a warning and caution panel includes the "MASTER WARN" red light and the "MASTER CAUTION", "CANOPY", "LANE A" and "LANE B" amber lights (see **Figure 8**).

When one of the two "LANE A" or "LANE B" amber lights is continuously illuminated, the **ENGINE ECU** message is displayed on the MFD and the "MASTER CAUTION" amber light illuminates.

Figure 8: warning and caution panel on F-HCDN (source: BEA)

The AOA information picked up by the Garmin GAP 26 pitot can be displayed on the MFD, but this display is supplemented by a remote physical indicator (Garmin GI 260) installed on the instrument panel for the left seat.

4.5 Operational procedures

4.5.1 Normal procedures

4.5.1.1 Final approach

The flight manual recommends an indicated airspeed of 60 kt for the final approach with the flaps in the LDG position. This speed is calculated for the maximum allowable weight (630 kg) in the landing configuration to guarantee a safety margin of 30 % with respect to the stall speed (1.3 V_{S0})[5].

An approach speed of more than 60 kt increases the kinetic energy to be dissipated on landing. On final approach, the effectiveness of the double-slotted flaps accentuates the effect of this speed exceedance. In this case, it may be necessary for the pilot to adopt a shallower or even negative pitch attitude to hold the descent slope.

According to Elixir Aircraft, the position of the elevator trim on approach can be between 10% nose down and 90% nose up according to the centre of gravity.

4.5.1.2 Landing

The flight manual indicates that on landing, the throttle must be set to "IDLE". The procedure indicates that the pilot should touch down on the main wheels and slowly release the elevator to let the nose wheel down smoothly. The brakes are to be used as required after the nose wheel has touched down.

4.5.2 Abnormal and emergency procedures

The emergency procedures section of the flight manual explains the various degrees of urgency associated with the following three instructions:

- "*Perform EMERGENCY LANDING*" means that the pilot must immediately land; if there is no aerodrome nearby, the pilot must land on the nearest reasonably large and smooth surface. This is an emergency situation;
- "*Land AS SOON AS POSSIBLE*" means that the pilot must land at the closest aerodrome and declare the emergency to air traffic control. This is a situation which may become an emergency in the short term;
- "*Land At the Nearest Suitable Airfield*" requires the pilot to choose the closest suitable aerodrome where local support will be found. This is not an emergency situation, but the pilot must closely monitor the parameters.

[5] V_{S0} is the stall speed in the landing configuration and with the aeroplane's maximum allowable take-off weight (V_{S0} = 46 kt for Elixir aeroplanes).

The “Lane A” light is an amber (CAUTION) light. Several procedures exist in the flight manual including the following:

- if the “Lane A” light flashes, this indicates a minor fault in ECU lane A. If the light starts flashing in flight, no action is required. On the ground, a one-way flight to maintenance facilities is allowed;
- if the “Lane A” light is steadily illuminated, this indicates a major fault in ECU lane A. The other lane will take control of managing the engine. Full engine performance is available but possibly in degraded mode with increased fuel consumption. If there is an additional failure, the engine may become inoperative (loss of back-up). On the ground, the flight must be cancelled. In flight, the *Land at nearest suitable airfield* procedure must be complied with;
- if both “LANE A” and “LANE B” lights are illuminated, this indicates a situation that may quickly evolve into an emergency situation. The procedure indicates that the pilot must “*Land AS SOON AS POSSIBLE*”.

4.6 Recorded data

The recorded data shows that the descent slope of F-HCDN was approximately 4°, i.e. above the standard slope. The elevator trim was set to 39% nose down.

The recorded data indicates that the aeroplane had a negative pitch attitude on short final until reaching the aerodrome’s altitude at which point the pitch attitude became positive. At this point, at what seems to correspond to a flare, the indicated airspeed was around 58 kt.

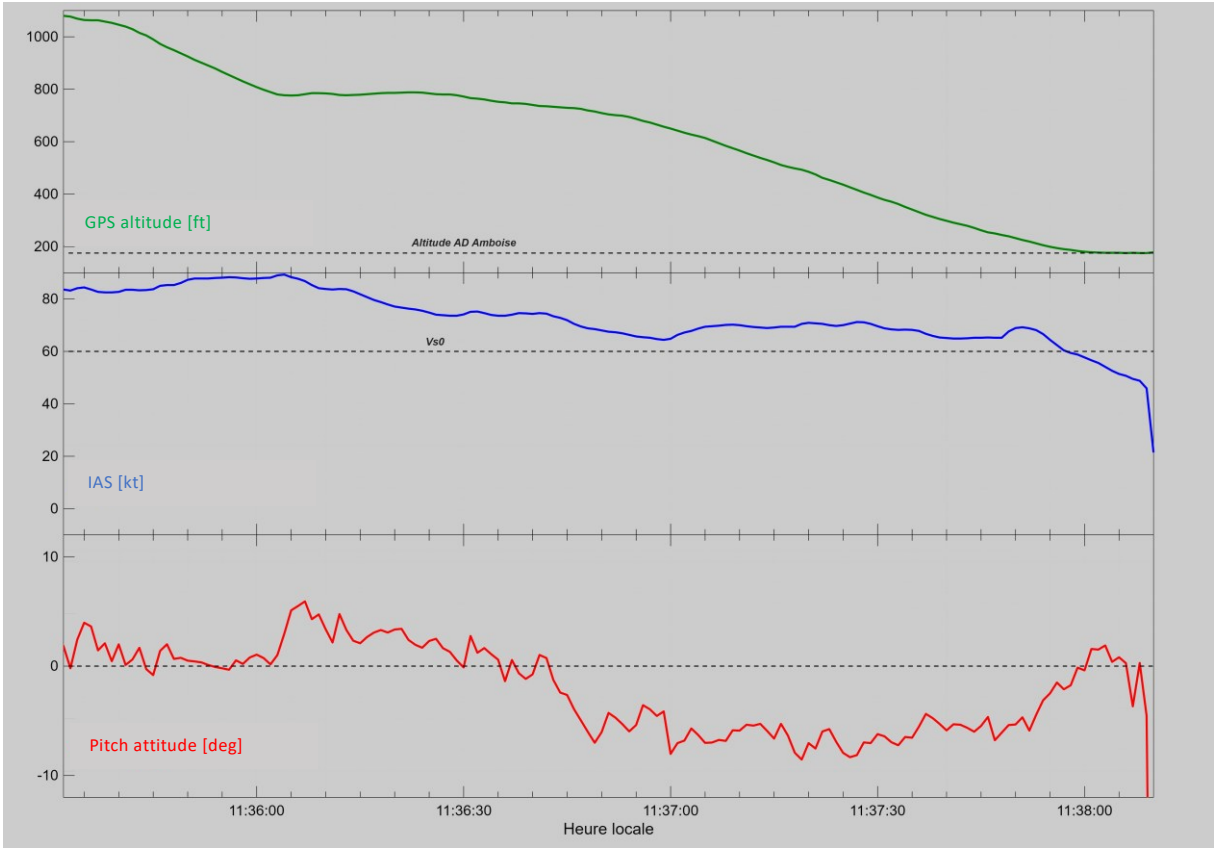

Figure 9: recorded altitude, speed and pitch attitude parameters during final

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5 OPERATIONAL INFORMATION

5.1 Pilot

5.1.1 Experience and training

Age	79 years
Licence(s) (type and date of issue)	PPL (A) issued on 8 July 2008
Ratings	SET, night flight
Medical certificate	Class 2 valid

The pilot also held an instrument flight rating issued by the FAA.

Total experience	777 h including 17 h 36 min on the Elixir (F-HCDN)
Experience in last 30 days	2 h 11 min including 1 h 33 min on F-HCDN
Experience in last 24 hours	0 h 48 min on F-HCDN

The pilot had been trained to fly the Elixir by an instructor from the flying club who had followed the familiarization training given by Elixir Aircraft. The latter had recommended to him that he hold at least 65 kt on final.

5.1.2 Statement

The pilot indicated that the “Lane A” light came on and was steadily illuminated just after taking a heading to Étampes shortly after take-off. He decided to carry out a U-turn and perform an emergency landing at Amboise. He indicated that the engine spluttered a little on the base leg. According to him, on final, he was on the slope, stable at 65 kt. He then reduced the speed to 60 kt overhead the threshold to touch down. He indicated that during the touchdown, the aeroplane bounced on the nose wheel and then swerved to the right-hand side. He could no longer exactly remember the flare sequence but his passenger (private pilot) told him that he had first touched down on the main wheels and then on the nose wheel.

He had the impression that the nose wheel sunk into the grass as soon as the aeroplane exited the runway. He thought that the fork broke at this point. He explained that the aeroplane quickly nosed over onto its back and came to a stop. He indicated that neither he nor his passenger were able to open the canopy and that it was members of the Amboise flying club who managed to do so with some difficulty.

The pilot specified that compared to the other aeroplane in the flying club, a DR400, he found the Elixir more sensitive and with quick reactions. According to him, the engine effects are more noticeable particularly in yaw: the aeroplane has a tendency to yaw to the right if power is reduced quickly on landing. He indicated that the pitch control could sometimes be “stiff”.

With respect to the AOA indicator, he explained that he was not in the habit of monitoring this instrument on final and that he preferred looking outside during the landing.

He indicated that he followed the procedure associated with “Lane A” caution light steadily illuminated taken from the flying club’s checklist (see 5.3) which explained that it was a major problem unlike the “Lane A” light flashing. In his opinion, he had to return to the aerodrome and land as soon as possible. He did not know if the thought of it being an emergency might have affected his piloting during the final approach.

5.2 Weight and balance

The estimated weight at the time of landing was around 540 kg, below the maximum weight. For this weight, the actual stall speed[6] in the landing configuration is 43 kt. The flight manual indicates, however, a single stall speed in the landing configuration, which is 46 kt with the maximum weight of 630 kg. This is a reference value, the speed includes a safety margin.

5.3 Operational documents

With respect to the final approach procedure, the flying club checklist requires the pilot to adopt a speed of 65 kt (rather than the 60 kt indicated in the flight manual) and to reduce the speed to 60 kt overhead the runway threshold. For the aeroplane's weight during the accident, as the actual stall speed was 43 kt, a speed of 65 kt corresponded to 1.5 V_{S0}.

The flight manual distinguishes between the case when only one of the two "Lane A" of "Lane B" lights is illuminated and the case where both lights are illuminated (see Abnormal and emergency procedures). In the flying club checklist however, both cases were grouped together in a single procedure, Lane A or/and Lane B steadily illuminated, which required the pilot to land at the closest AD, and prepare an emergency landing.

6 ADDITIONAL INFORMATION

6.1 "Wheelbarrowing"

During the landing, after wheel touchdown, if a substantial part of the aeroplane's weight is resting on the nose wheel, a wheelbarrowing phenomenon occurs. This phenomenon can lead to a loss of directional control because the braking action becomes ineffective and the aeroplane has a tendency to yaw or pivot on its nose wheel, particularly in crosswind conditions.

One of the most frequent causes of this phenomenon during the landing is when the wheels of the main landing gear and nose gear touch down simultaneously at an excessive speed followed by the elevator control being pushed forward (nose down input on stick). As a general rule, the situation can be corrected by gently applying a nose up input (pulling) on the elevator control.

Elixir Aircraft issued a Flight Information Letter (FIL-633-01) to raise pilot awareness about the risk of wheelbarrowing during the landing and remind them of the importance of a stabilized approach and rigorous control of the speed. The manufacturer underlined that excess speed makes it more likely that the pilot will adopt a shallow pitch attitude on approach and that the nose wheel will touch down too early which is liable to contribute to a wheel-barrowing phenomenon.

6.2 Evacuation aspects

When an aircraft turns over onto its back, it may become impossible for the occupants to open the canopy. The present certification standards do not require a canopy breaker tool to be carried on board the aircraft. F-HCDN did not carry such an instrument. Following this occurrence, Elixir Aircraft tested various canopy breaker tools and identified devices which would facilitate the evacuation of the occupants. A canopy breaker tool is currently being certified. New aeroplanes will be equipped with this canopy breaker tool when they are manufactured. For the other aeroplanes, its installation will be proposed by service bulletin in the near future.

[6] The calculation is indicated in FIL-633-001 written and published by Elixir Aircraft in August 2025.

6.3 Similar occurrences

Based on recorded data, Elixir Aircraft analysed several landing swerves that occurred between 2021 and the end of 2025. These swerves did not necessarily lead to a runway excursion or damage[7]. The following trends emerge:

- an indicated airspeed on final approach often higher than the speed specified in the flight manual;
- an approach slope above the (standard or published) approach slope for the runway used;
- an inappropriate elevator trim setting which contributed to more loads being generated on the elevator control during the landing;
- an engine rating above idle at the time of the flare.

[7] Only the accident to F-HCDN resulted in slight injuries.

7 CONCLUSIONS

The conclusions are solely based on the information which came to the knowledge of the BEA during the investigation.

Scenario

Around one minute after taking off from Amboise, the "Lane A" caution light came on and was steady. The pilot decided to turn around in order to carry out an emergency landing as indicated in the flying club checklist procedure, whereas the flight manual procedure only recommends landing at the closest suitable aerodrome.

During the final approach, the elevator trim was set to 39% nose down. The pilot followed an approach slope which was above the nominal slope. He adopted a speed of 65 kt, as recommended in the flying club checklist, which is higher than the speed of 60 kt indicated in the flight manual. This excessive speed, with the flaps in the landing position, resulted in the pilot adopting a negative pitch attitude on final to intercept the standard slope. The pitch attitude remained negative until the flare. The aeroplane bounced. On touchdown, the nose-down load generated by the trim setting transferred a considerable portion of the aeroplane's weight onto the nose wheel. The aeroplane may have experienced a wheelbarrowing phenomenon which probably locked the nose wheel and caused the aeroplane to skid. When the aeroplane ran off the runway, the nose wheel rolled into a rut, the fork ruptured and the aeroplane nosed over.

Contributing factors

The following factors may have contributed to the loss of directional control during the landing run:

- the recommendation, in the flying club checklists and during the pilot's training with a flying club instructor, to hold an approach speed higher than that indicated in the flight manual which led the pilot to adopt an excessive speed on final;
- a nose-down setting (-39%) of the elevator trim which might have caused a wheelbarrowing phenomenon after wheel touchdown when the pilot released the stick. The lack of lubrication of the moving leg may have accentuated such a phenomenon by reducing the effectiveness of the damping and contributing to the transmission of excessive loads to the nose wheel.

The flying club's synthesis of the manufacturer's abnormal and emergency procedures concerning the "LANE A" light led the pilot to prepare an emergency landing for what the flight manual describes as an abnormal situation. This may have caused additional stress for the pilot which degraded his piloting capabilities.

Measures taken by Elixir Aircraft

Lubrication of nose gear in production
Elixir Aircraft has modified the Production Instruction Sheets to insist on the importance of the lubrication.

Furthermore, in the scope of an overall analysis of the nose gear, Elixir Aircraft is assessing the introduction of a new lubrication port so that this operation can be carried out without having to disassemble the gear.

Operational measures

Following the landing safety occurrences (see paragraph 5.3), Elixir Aircraft letter FIL–633-001 specifies the flare and stabilized approach techniques. It raises pilot awareness of the risk of wheelbarrowing during the landing, particularly in the event of excessive speed on final. It reiterates the importance of a stabilized approach and rigorously controlling the speed. It particularly recommends the use of the AOA indicator during the final approach. This indicator, not designed to be used as a primary instrument, but as a secondary instrument, can serve as a piloting aid.

Technical evolutions

Elixir Aircraft has published several service bulletins and technical modifications concerning:

- the adjustment of the toe-in for directional stability (SB-633-038);
- the instruction to configure the G3X so that an **ELEV TRIM** message is displayed on the PFD in certain conditions in order to limit the risk of an excessive nose-down setting of the elevator trim (SB-633-040).

Other modifications are currently being deployed or certified such as:

- new aluminium nose gear fork to replace the composite fork;
- installation of a canopy breaker tool on the aircraft which can be accessed by each occupant.