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SAFETY INVESTIGATION REPORT

Accident to the ROBIN DR400-160 registered F-GREP on Saturday 26 October 2024 at Pérouges - Meximieux

Time	Around 11:15[1]
Operator	Aéroclub de Pérouges Plaine de l'Ain "Robert et Henri DARMON"
Type of flight	Cross-country
Persons on board	Pilot and three passengers
Consequences and damage	Aeroplane 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.	

Attempted take-off, vibrations on rotation, bounces, runway overrun

1 HISTORY OF THE FLIGHT

Note: the following information is principally based on statements.

The pilot, accompanied by three passengers (including one seated in the front right seat, who was also a pilot), carried out engine tests, then taxied to the holding point of runway 16[2]. He lined up at the runway threshold and applied take-off power. At 105 km/h, he pulled on the stick, the aeroplane adopted a nose-up attitude and started to vibrate strongly. As the end of the runway approached, the pilot tried to continue with take-off. The aeroplane deviated to the left, made a runway veer-off and overrun, crossed a fence, run in a harvested field, struck a large stone and deviated to the right. The nose landing gear collapsed and the aeroplane ended its course at the edge of a maize field.

[1] Except where otherwise indicated, the times in this report are in local time.
[2] unpaved runway measuring 690 m. Presence of a threshold displaced by 120 m on runway 34.

Figure 1: photograph of F-GREP (Source: BEA)

2 ADDITIONAL INFORMATION

2.1 Examination of site and aeroplane

Examination of the marks on the runway showed that the main landing gears were in contact with the runway when the aeroplane crossed the displaced threshold markings of the opposite runway (i.e. 120 m before the end of runway 16) and indicated that the aeroplane had started to deviate to the left. A friction mark from the aeroplane tail skid was also observed. One of the frangible runway edge markers was also torn off.

Just before the end of runway 16, marks from the main landing gears and the tail skid were observed again, indicating that the aeroplane most probably bounced with a high nose-up attitude between the two sets of marks. The aerodrome is surrounded by a wild boar fence consisting of posts with two wires stretched 20 cm and 70 cm high. The upper wire was torn off and found wound on the left main landing gear, while the lower wire was intact. When it passed the fence, the aeroplane was less than 1 m high. The run marks were observed again in the harvested field located in the extended centreline of the runway.

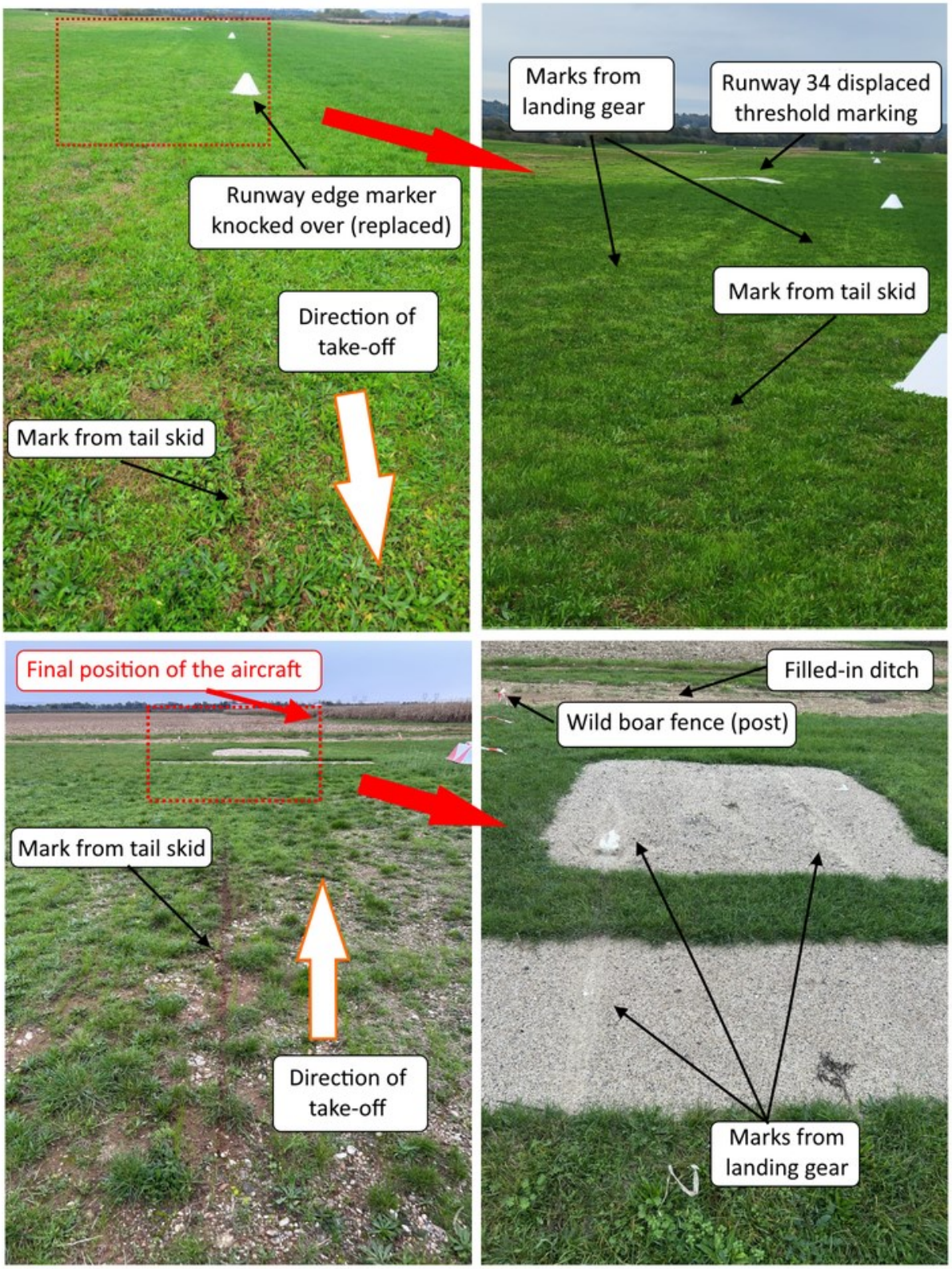

Figure 2: marks recorded (Source: BEA)

Photographs of the aeroplane taken just after the accident showed that the carburettor heat system was not activated, the power control was in the “full throttle” position, the mixture control was in the “full rich” position and the trim was in the “nose up” position (index on 6), outside the recommended range for take-off.

Figure 3: elevator trim position (Source: BEA)

The battery and alternator contacts were in the "OFF" position, the magnetos contact was in the "OFF" position with the key removed and the fuel selector was in the "Closed" position. These positions were the result of the pilot's inputs to make the aeroplane safe after the accident.
The flaps were in the "landing" position. According to statements, this position was changed by one of the passengers during the evacuation from the aeroplane[3].

The examination of the engine did not bring to light any anomaly that could have contributed to the accident. The damage observed on the propeller indicated that the engine was delivering power. The control linkages were continuous.

2.2 Pilot information and statement

The 60-year-old pilot held a Private Pilot Licence - Aeroplanes (PPL(A)) issued in 2012. He had logged approximately 370 flight hours, 10 hours of which in the previous 12 months, all on F-GREP.

The pilot indicated that he was used to fly with other members of the flying club on this aeroplane and to fly with passengers.

He specified that it was a cross-country flight bound for Brioude aerodrome (Haute Loire). He planned to make the outbound flight, and the passenger to his right, who was also a pilot, planned to make the return flight. Due to weather forecasts, they planned to take off at around 11:00, to have lunch on site and to return at around 15:00.

He explained that before the flight, he added 75 l of fuel to the main tank to fill it to capacity (110 l). He added that there were approximately 20 l of fuel in each of the two wing tanks[4] and that, based on his calculations, he needed 112 l for the cross-country flights (outbound and return legs). He also completed the weight and balance sheet based on the weights declared by each of his passengers and on the amount of fuel on board (150 l). After calculation, the point was 40 kg below the maximum weight of 1,050 kg and at the limit of the aft centre of gravity, within the permitted flight envelope[5].

He added that he carried out the engine tests at the flying club's parking area and that he did not start taxiing to the holding point immediately, to allow a student-pilot who was performing a runway circuit to get back to the parking area. He specified that, on arriving at the stop position, the engine was hot due to the hold. He mentally carried out the pre-take-off briefing, he set the flaps to the first detent position[6] and the electric pump to "ON" and he lined up.

[3] This possible change in the position was confirmed by a test carried out by the BEA.
[4] The capacity of each wing tank is 40 l.
[5] This calculation was confirmed by the investigation, based on the information available to the pilot.
[6] "Take-off" position.

When he applied the take-off power, he did not notice any anomalies. According to him, the engine parameters were correct. He reported that he carried out the rotation at 105 km/h. It was at this point that the vibrations started. He checked the throttle lever position, which was “fully forward”, and continued with the take-off. He indicated that, according to him, the aeroplane had taken off, but he did not manage to gain height. He added that there were several bounces and that, seeing that the end of the runway was approaching, he did not consider rejecting the take-off and tried to have the aeroplane take off to avoid the ditch that he thought was located after the end of the runway. He specified that, although he was informed that the ditch had been filled in two weeks before, he did not remember it at the time of take-off.

He reported that throughout the run and take-off phase, there was no engine spluttering. However, when the vibrations started, he associated them with an engine problem.

The pilot stated that after the accident, during the evacuation from the aeroplane, after unlocking the canopy, he started to push this back and it jammed after about 30 to 40 cm of travel. He added that he tried to reach the jettison hooks, but could no longer see them. He then tried to close the canopy again, but it remained locked in position. He specified that he was able, with the help of one of his passengers, to apply force to the canopy and increase the opening sufficiently to allow evacuation.

The meteorological conditions estimated by the pilot at the time of the accident were as follows: south-easterly wind of 5 kt to 10 kt, CAVOK, temperature 16°C, dew point temperature 12°C, QNH 1,016 hPa.

2.3 Take-off performance and applicable procedures

On the day of the accident, the grass runway was wet. Precipitation recordings at a station located near the aerodrome indicated a cumulative rainfall depth of 0.5 mm during the night from 24 to 25 October.

The take-off performance tables for the DR400 at maximum weight on a paved runway, at the aerodrome’s altitude (700 ft) and in standard temperature conditions, give:

- a run distance of 320 m;
- a take-off distance of 630 m.

The distance to be added on a dry grass runway is 15%, and the distance to be removed for a headwind of 10 kt is 15%. The Flight Manual does not indicate any additional distance for wet or greasy unpaved runways.

Since the runway is limitative, the flying club asks pilots to use the entire runway distance available for take-off. The “short runway” take-off procedure (increasing power with the brakes applied for take-off) is not mandatory and remains at the pilot’s discretion.

3 CONCLUSIONS

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

Scenario

After a take-off run that seemed normal to him, the pilot made an input on the stick to initiate rotation. The aeroplane had an aft centre of gravity and the elevator trim in the nose-up position beyond the aft limit for take-off.

The input made by the pilot on the elevator control caused an unusual and excessive variation in nose-up attitude. The aeroplane's tail skid made contact with the ground. The aeroplane then had an extreme nose-up attitude which meant that it could no longer accelerate. The aeroplane remained on the backside of the power curve and bounced several times.

The pilot, focused on the presence of a ditch at the end of the runway (without remembering that this had been filled in a few days before), did not attempt to reject the take-off. He continued with his action plan, even though he had overrun the runway and was running in the ploughed field at the end of the runway. On striking a stone, the aeroplane deviated from its path, it skidded and its nose landing gear collapsed, putting an end to the take-off attempt.

Contributing factors

The following factors may have contributed to the adoption of an excessive attitude at take-off:

- an incomplete check of the aeroplane's configuration before lining up, which led to taking off with the elevator trim in the nose-up position beyond the limit.

The following factor may have contributed to the continuation of the take-off:

- an erroneous representation of obstacles at the end of the runway.

Safety lessons

An aeroplane having its centre of gravity to the aft will be characterised by increased manoeuvrability, but also by instability. This requires lower-amplitude inputs on the elevator, in particular during rotation at take-off, to avoid the adoption of an excessive attitude which would prevent acceleration and thus exiting from the backside of the power curve.

On DR400s, the passengers seated in the rear and the central fuel tank are major contributors to the centre-of-gravity displacement to the aft. During the flight preparation, it is important to choose the positioning of passengers judiciously and, if necessary, to distribute the fuel preferentially in the wing tanks (if the aeroplane is so equipped), which have a lower arm and therefore less impact on balance.