# FINAL REPORT
of civil aviation safety investigation

<table>
<thead>
<tr>
<th>Occurrence Type</th>
<th>Accident</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner</td>
<td>Private</td>
</tr>
<tr>
<td>Operator</td>
<td>Private</td>
</tr>
<tr>
<td>Manufacturer</td>
<td>DAHER-SOCATA</td>
</tr>
<tr>
<td>Aircraft</td>
<td>Socata TB9 Tampico</td>
</tr>
<tr>
<td>Registration</td>
<td>PH - BRT</td>
</tr>
<tr>
<td>Location</td>
<td>Măgura-Cisnădie Aerodrome</td>
</tr>
<tr>
<td>Date and time</td>
<td>01.07.2016 / 15:13 LT (12:13 UTC)</td>
</tr>
</tbody>
</table>

No. A 17 - 01
Date: 22.02.2017
### CRASH DURING TAKE-OFF ON AN AERODROME GRASS RUNWAY

<table>
<thead>
<tr>
<th>Aircraft</th>
<th>SOCATA TB9 Tampico, registered PH-BRT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date and time</td>
<td>01.07.2016 / 15:13 LT (12:13 UTC)</td>
</tr>
<tr>
<td>Operator</td>
<td>Private</td>
</tr>
<tr>
<td>Flight type</td>
<td>Recreational flight</td>
</tr>
<tr>
<td>Persons onboard</td>
<td>Pilot, 3 passengers</td>
</tr>
<tr>
<td>Injuries</td>
<td>The passenger on the left rear seat needed hospitalization</td>
</tr>
<tr>
<td>Commander</td>
<td>RO.FCL/CPL/..... SEP (LAND)/FI, valid</td>
</tr>
<tr>
<td>Damage</td>
<td>Substantial damage to aircraft</td>
</tr>
<tr>
<td>Location</td>
<td>Mâgura – Cisnădie aerodrome, Sibiu County, at 250 m from 330 runway threshold. Coordinates: Latitude: 45°43'57.67&quot; N Longitude: 24°10'6.89&quot; E</td>
</tr>
</tbody>
</table>

#### 1. HISTORY OF OCCURRENCE

Between June 30 – July 03, 2016, it was held an event called by the organizers "Airfield Festival", on Mâgura-Cisnădie aerodrome, Sibiu County, where there have been invited light and ultralight aircraft operators, and were organized and performed recreational flights.

Due to heavy rainfall in the days before the festival start, the aerodrome administrator informed the participants by email that on the grass runway and taxiways there are formed puddles in some places, and the aerodrome can be used until 30.06.2016 inclusively, only by ultralight aircraft and beginning with 01.07.2016 also by other aircraft, but on pilots’ own responsibility.

On 01.07.2016, around 11:00 LT, Cessna 172 aircraft, registered YR-DAS, landed on Mâgura – Cisnădie aerodrome, and after landing the pilot made two rolls on the runway to assess its condition. At 13:30 LT, the pilot took-off with the same Cessna 172 aircraft for a skydivers launch activity. After almost an hour (according to the statement) the pilot was requested by the owner of another aircraft to perform a "presentation" flight with three passengers onboard with SOCATA TB9 TAMPICO aircraft, registered PH-BRT.

After the aircraft check and passengers’ boarding, around 14:50 LT, the pilot started the engine, performed the cockpit checks (engine parameters, flaps operation, radio communication) and then confirmed by radio that the runway condition allowed take-off, mentioning that he previously performed another take-off in safety conditions (n.n. – with other aircraft type).
Around 14:53 LT, the plane started the take-off run and accelerated in order to take-off, on 150° direction. At 270 m from the rolling starting point, the aircraft passed through the first of the six different sized mud puddles located on the its trajectory, and the pilot felt a slight braking on the left side. The same happened when passing through the rest of puddles, the highest braking happened at almost 460 m from the rolling starting point, when passing a puddle of approximately 510 sqm (17 m x 30 m) with a depth of 10-12 cm.

Despite this braking the pilot continued to accelerate in order to take-off and after the total rolling of 650 m (including also the safety zone at the runway end), at speed of 55 kts, he tried to take-off, but the aircraft stalled and rapidly lost height, entering a descendent evolution in a valley situated at the runway end.

According to pilot’s statement, he tried to turn right in order to avoid some trees on the trajectory, but the aircraft touched the ground with the right wingtip. A skid with direction change of 10-15 degrees to the right followed, then the aircraft touched the ground with the propeller, hit a small shrub that brought it back to direction and it stopped at 250 m from 330 runway end, on a mound of ground, against the engine and its support with the front side.

The pilot and passengers left the aircraft on their own forces, one of the passengers suffered injuries and required hospitalization.

The aircraft was substantially damaged: broken propeller, broken engine body, broken left wing, broken right wingtip, bent rear fuselage, nose landing gear and left main landing gear were ripped out.
Remains of the wreckage were scattered over a distance of 50 m, from the first ground contact point till the final stop place.

![Wreckage](image)

Fig. 2 Wreckage

![After impact aircraft route](image)

Fig. 3 After impact aircraft route

During the impact the safety belt brackets for the back seats were broken.

![Broken safety belt brackets](image)

Fig. 4 – Broken safety belt brackets
2. ADDITIONAL INFORMATION

2.1 Meteorological information

According to the forecasts report received from the National Meteorological Administration, in the day and time of the accident, the temperature was 25°C, wind speed of 2 m/s from SV, visibility of 50 km, overcast in proportion of 5/8, with ceiling at 600 m.

The METAR information issued for SIBIU International Airport (LRSB), situated at 7 km from Măgura-Cîsnădie aerodrome, valid at the time of the accident, for 12:00 UTC was the following:

METAR LRSB 011200Z 22004KT 9999 SCT033CB SCT043 25/20 Q1018=

2.2 Flight field data

Măgura aerodrome (LRCD) holds the “Aerodrome authorization certificate” no. AP19/2014 issued by the Romanian Civil Aviation Authority. According to this certificate, the aerodrome is authorized for general aviation operations, for non-instrumental approach category and it is not equipped with runway lighting system, being approved only for daily operations and flights performed according to visual flight rules. The runway is grassy.

The take-off – landing runway characteristics are the following: 600 m (1968 ft) length, 18 m (59 ft) width, quota of 641 m (1500 ft), safety zone at end 330 is of 50 m.

On the day of the accident, both on the grass runway and taxiways there were formed in some places, mud puddles of various sizes and depths, due to heavy rains that have fallen in the previous days (see figures below).

![Fig. 5.1 Take-off – landing runway condition on the day of the accident](image)
Around 14:45 LT, a briefing was made with all present crews about runway condition and operational procedures. It was decided to operate with those aircraft that may use the runway in the given condition, its assessment and the decision of using it were the pilot in command’s responsibilities.

2.3 Aircraft

To calculate the necessary distance for take-off there were used the data from the *Pilot’s Information Manual – Section 5.8 Aircraft performances during take-off*, taking into account the aircraft weight during take-off - 925 kg and the aerodrome quota of 641 m (1500 ft).

Therefore, the distance calculated for take-off, according to fig. 6, is 480 m (1575 ft) + 10% due to grass runway (see fig. 7), resulting a necessary distance for take-off of 528 m (1732 ft).
NOTICE

Measurements were taken with zero wind condition on dry tarmacked runway.
The performance are presented as a function of the altitude in feet and the temperature at the considered altitude.
Take-off and landing performance figures are based on a dry hard surface runway.
The total take-off and landing distances (taxing and clear 50 ft) will be corrected as follows:
- Influence of runway condition:
  Increase by:
  7% on hard sod
  10% on short grass
  25% on high grass
- Influence of wind:
  Increase by 30% for each 10 kt rear wind
  Reduce by 10% for each 10 kt headwind.
TAKE-OFF PERFORMANCE
Flaps extended
The take-off runs correspond to tests conducted in TARBES-033, on tarmacked runway.

Fig. 7 – Extracted from the Pilot's Information Manual – Take-off distance depending on surface

STALLING SPEEDS

CONDITIONS:
Weight: 2307 lbs (1040 kg)
Power OFF

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>BANK 0°</th>
<th>30°</th>
<th>45°</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLAPS RETRACTED</td>
<td>68</td>
<td>66</td>
<td>62</td>
</tr>
<tr>
<td>FLAPS TAKE-OFF</td>
<td>64</td>
<td>63</td>
<td>59</td>
</tr>
<tr>
<td>FLAPS LANDING</td>
<td>60</td>
<td>59</td>
<td>54</td>
</tr>
</tbody>
</table>

NOTE:
The indicated airspeeds (IAS) suppose instrument error to be null.

Figure 5.2 – STALLING SPEEDS

Fig. 8 – Extracted from the Pilot's Information Manual – Stall speeds
For SOCATA TB9 Tampico aircraft, the very low position of the landing gear fairings and their friction with grass during take-off run may be considered a problem for the operation on grass runway with muddy ground, with muddy areas of various sizes and depths.

3. CONCLUSIONS

On the day of the accident the pilot flew two different aircraft in SEP class (Cessna 172 N and SOCATA TB9), changing the aircraft in a short period of time. Checking the Pilot’s Information Manual for each aircraft, it is noticed that the speed indicated for take-off is different: 55 KIAS for Cessna 172N versus 65 KIAS for SOCATA TB9.

It can be also noticed from Figure 8 that for SOCATA TB9 aircraft the STALL speed for TAKE-OFF flaps position and 0° inclination is 54 KTS, very close to the rotation speed of 55 KIAS that the pilot used for this flight.
Analyzing the aircraft evolution during take-off, it can be concluded that the speed required for take-off could not be reached, due to crossing the mud puddles, even if it was used the entire runway length. It was also used the safety area at the end of the runway, but even after covering this, the aircraft speed did not reach the required take-off value.
The distance necessary for take-off was 528 m (1732 ft) out of the 600 m (1968 ft), but the presence of the largest mud puddle in the last rolling segment (at 460 m (1500 ft)), led to the aircraft braking in a critical moment of take-off. Although the successive aircraft braking was felt when passing each mud portion, the pilot did not consider to reject take off and he was sure that the aircraft could reach the take-off speed before reaching the runway end. The pilot confused the value of this take-off speed (55 KIAS) with the one of CESSNA 172N aircraft which he used earlier in safety conditions.

Considering that for SOCATA TB9 aircraft, the rotation speed is higher (65 KIAS), the remained runway length, after passing through the last puddle, was not enough to allow reaching this speed, the aircraft aerodynamically stalling and crushing at 250 m from 330 runway threshold.

The probable cause of this accident is the incorrect assessment of the aircraft performance in relation with the necessary take-off distance remained after the speed loss caused by crossing the mud areas existing on the aerodrome grass runway, based on confusing the rotation speeds of the two aircraft operated in the same day.

Note: The documents and analysis objects used for the issuance of the flight safety investigation Report are confidential and are archived at the Civil Aviation Safety Investigation and Analysis Center, according to legal provisions.