# FINAL REPORT

of civil aviation safety investigation

<table>
<thead>
<tr>
<th>CLASSIFICATION</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>AUTO GIRO GmbH Germany</td>
</tr>
<tr>
<td>Aircraft</td>
<td>Girocopter Calidus</td>
</tr>
<tr>
<td>Registration country</td>
<td>Czech Republic</td>
</tr>
<tr>
<td>Registration</td>
<td>OK-UWC 23</td>
</tr>
<tr>
<td>Location</td>
<td>Caransebeș Aerodrome</td>
</tr>
<tr>
<td>Date and time</td>
<td>19.06.2015 /12:00</td>
</tr>
</tbody>
</table>

**NO.** A 15-03  
**Date:** 30.09.2015
AKNOWLEDGEMENT

This REPORT presents data, analysis, conclusions and recommendations on civil aviation safety, of the Civil Aviation Safety Investigation Commission appointed by the Director General of CIAS.

The flight safety investigation was conducted in accordance with the provisions of the Government Ordinance No. 51/1999 concerning the technical investigation of civil aviation accidents and incidents, approved with amendments and additions by Law No. 794/2001, of the REGULATION (EU) No. 996/2010 of the European Parliament and of the Council from 20 October 2010 on the investigation and prevention of accidents and incidents occurred in civil aviation and repealing of Directive 94/56/EC and the provisions of Annex 13 to the Convention on International Civil Aviation signed at Chicago on 7 December 1944.

The objective of civil aviation safety investigation is preventing the occurrence of accidents and incidents, by effective determination of causes and circumstances that led to this occurrence and establishing the necessary recommendations for civil aviation safety and it HAS NOT THE PURPOSE of finding guilty, individual or collective responsibilities.

As a consequence, the use of this REPORT for other purposes than preventing the occurrence of accidents and incidents might generate misinterpretations.
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SYNOPSYS

CLASSIFICATION

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<td>AUTO GIRO GmbH Germania</td>
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<td>Aircraft</td>
<td>Calidus gyro-copter</td>
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<tr>
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</tr>
<tr>
<td>Registration:</td>
<td>OK-UWC 23</td>
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Gyro-copter CALIDUS type

On 19.06.2015, the pilot (owner) of Gyro-copter Calidus ultralight aircraft, registered OK-UWC 23 prepared his aircraft in order to perform flights in the area of Caransebeș aerodrome.

After receiving clearance to open the flight activity from COAP, the pilot rolled on landing - take-off runway and took-off on 290° direction in order to perform taxiing.

During landing, due to lateral wind from 210°, the pilot came compensating to keep the aircraft on direction and he chose to make contact with the nose wheel at high speed, after main landing gear contact for higher aircraft stability.

After main wheels contact and covering a distance of almost 8-10 m, during nose wheel contact with runway, because this was not aligned with landing direction, the gyro-copter deviated to the left. In this condition the pilot with an experience of
over 180 hours on motor paraglider (with tricycle), instinctively operated the left rudder to return to flight direction, as in the case of motor paraglider, which accentuated the deviation to the left and implicitly led to gyro-copter overturning.

Analyzing the notes in the logbook it was noticed that the pilot’s flight experience on gyro-copter aircraft is of 20 hours and 55 minutes out of which 19 hours and 25 minutes were performed with a gyro-copter MTOsport type, permissive device, very stable, destined for school activities, and only one hour and 15 minutes with Calidus gyro-copter (personal propriety).

The cause of accident is an error in pilotage technique based on crosswind landing, lack of experience on this aircraft type and some technical skills in pilotage, acquired over time on motor paraglider.

After accident investigation, CIAS issued a safety recommendation.
FACTUAL INFORMATION

1.1 History of accident

1.1.1 General

For the following descriptions concerning flight activity preparing and performing on 19.06.2015 there were used the notes in aircraft time book, logbook as well as witness’ statements.

The flight was performed in own interest, without passengers onboard, according to visual flight rules (VFR).

1.1.2 Flight

On 19.06.2015, the pilot (owner) of ultralight aircraft Gyro-copter Calidus type, registered OK-UWC 23, prepared his aircraft in order to perform flights in the area of Caransebeș aerodrome. At 11:30 LT the pilot requested and received from COAP clearance no. 34 to open flight activity.

After aircraft inspection the pilot rolled to take-off – landing runway, and he took-off on 290° direction in order to perform lap flights. At the first flight, after making the fourth turn and centering on runway centerline it was established a speed of 90-100 km/h on landing slope. After touchdown with main wheels and covering a distance of about 8-10 m, at nose wheel contact with runway, the gyro-copter suddenly turned to the left, hit the runway with bearing rotor blades, after which stopped on the left side.

The accident occurred at 12.00 LT and resulted only in aircraft damage.

Wreckage location:

45°25′14,29′N
22°14′59,66′E
Quota:252 m

Fig. no. 1
1.2 Injuries to persons

N/A.

The pilot suffered no lesion or bodily injury, he left the aircraft and did not need medical help.

1.3 Damage to aircraft

After occurrence, the aircraft was damaged.

- the two blades of bearing rotor suffered major deformations;

Fig. no. 2

- blades ends were destroyed at impact with a rough surface;

Fig. no. 3

- on blade extrados, there can be noticed yellow-orange paint marks;

Fig. no. 4
- support beam (spar) of vertical empennage was bent towards cockpit right side and the vertical and horizontal empennages were destroyed (the part of vertical empennage remained on the beam presents a cut made with a rough surface);

![Fig. no. 5](image)

- both on left and right side of the cockpit, front side, there can be noticed friction marks with a rough surface;

![Fig. no. 6](image)

- the three blades of propulsion system were damaged;

![Fig. no. 7](image)
There were also noticed the following:
- main landing gear right wheel, broken,
- nose wheel, misaligned;
- scratches on left side of cockpit canopy;

1.4 Other damage
No damages to third parties.

1.5 Personnel information

<table>
<thead>
<tr>
<th>Pilot (Captain)</th>
<th>Male, 50 years old</th>
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<tbody>
<tr>
<td>License</td>
<td>Motorized Ultralight Aircraft pilot license, valid until 29.09.2016</td>
</tr>
<tr>
<td>Medical certificate</td>
<td>Valid until 29.09.2016</td>
</tr>
<tr>
<td>Flight experience</td>
<td>201 h /out of which 20h 55 min on gyro-copter</td>
</tr>
<tr>
<td>Work time</td>
<td>N/A</td>
</tr>
<tr>
<td>Rest time</td>
<td>Rest time couldn’t be determined</td>
</tr>
</tbody>
</table>

The aircraft owner attended the theoretical and practical flight course for passing to gyro-copter between 21.07-12.09.2014, when he made 18 hours and 40 minutes with 112 landings, out of which 2 hours and 30 minutes in simple control.

The work field runway on which schooling was performed is a grass runway. After the certification flight from 30.09.2014 the pilot has returned to flight activity on 05.06.2015 and he performed other 2 hours and 15 minutes of simple control flight.

1.6 Aircraft information

<table>
<thead>
<tr>
<th>Manufacturer and aircraft type</th>
<th>Auto Gyro GmBh-Calidus</th>
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<tbody>
<tr>
<td>Series number and manufacturing year</td>
<td>2005</td>
</tr>
<tr>
<td>Registration state and mark</td>
<td>Czech Republic, OK-UWC-23</td>
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<tr>
<td>Owner</td>
<td>Private</td>
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<tr>
<td>Owner (Operator)</td>
<td>Private</td>
</tr>
<tr>
<td>Airworthiness certificate</td>
<td>Recognition certificate available until 13.02.2017</td>
</tr>
<tr>
<td>Total number of hours</td>
<td>138 h19 minutes</td>
</tr>
</tbody>
</table>

Calidus auto gyro is an auto gyro designed and manufactured by Auto Gyro GmBh. This has a main rotor, with two seats in tandem, closed cockpit, tricycle landing gear, with nose wheel, and a 4-stroke turbo engine of 115 CP (84 Kw) Rotax 914 type in conjunction of pusher, with propulsive propeller (with three composite blades with variable pitch).
The fuselage is made of composite materials and has a tear shape for as small as possible advance resistance and to ensure an uniform airflow for propulsive propeller.

Characteristics:
- Empty weight: 265 Kg;
- Maximum weight at take-off: 450 Kg;
- Main rotor with diameter of: 8,4 m;
- Maximum speed: 185 Km/h;
- Crew speed: 160 Km/h.

The aircraft was bought by the owner in February 2014 from Czech Republic from Nirvana System Company. Till buying, this aircraft performed 117 hours and 24 minutes in schooling and recreational flights.

1.7 Meteorological information

According to data sent by the regional meteorological center Banat -Crișana the meteorological information from 19.06.2015 was visibility over 10 Km, wind 4 m/s from 2100, temperature 250 C

1.8 Aids to navigation

N/A.

1.9 Communications

N/A.

1.10 Flight filed data

Take-off was performed from ex Caransebeș Airport runway, which is currently a private field.

The take-off – runway is concreted, has a length of 2000 m, a width of 60 m, and runway orientation is 1100—2900; Currently the filed falls under the provisions of Government Decision no. 912 since 25.08.2010, at other fields but certified aerodromes on/from which civil aircraft can perform take-off and landing.

Coordinates:  
45° 25' 12" N  
22° 15' 12" E  
Quota: 249 m
1.11 Flight recorders
This aircraft type is not equipped with flight parameters recording system.

1.12 Wreckage and impact information
At the accident site, the investigation commission noticed the following:
- the first traces of bearing system blades impact with runway were noticed at almost 1200 m from the runway and at approximately 14 m laterally from runway centerline;
- the distance from the first blade contact up to where the gyro-copter stopped is of almost 20 m;
- the first traces indicate that both bearing rotor blades touched the runway then the traces indicate contact with only one blade;
- Traces direction indicate an aircraft deviation to the left from landing direction;

Fig. no. 9

Gyro-copter position

Fig. no. 10
- the fragments spreading area from horizontal and vertical empennages is of almost 100 mp, and it is between blades contact points with runway and the place where the aircraft stopped;

![Fig. no. 11](image)

- the aircraft stopped on an almost perpendicular direction on runway centerline (~200°)

![Fig. no. 12](image)

- main landing gear right wheel was subject to an important lateral force.

1.13 Medical and pathological information

From toxicology examination, it was not revealed alcohol, medicines or drugs.

1.14 Fire

After the impact, there was no fuel leakage and the aircraft did not caught fire.
1.15 Survival information

After accident occurrence, the pilot decoupled the general contact of the electric source, during closing of fuel valve and onboard contacts. He came out of the aircraft by himself and did not require medical attention.

1.16 Tests and research

N/A.

2 ANALYSIS

The aircraft involved in the accident is a gyro-copter Calidus type, of new generation, performant but with high sensibility on longitudinal stability during rolling which requires the pilot to be an experienced pilot, especially if it is intended to take-off/land on a concreted runway.

The accident occurrence, with bearing system blades deformation and vertical empennage cutting (see fig. no. 5) could have been caused at least by the following factors:

- technical nature;
- operational nature.

2.1 Technical nature deficiencies

After the performed checking, the investigation commission members did not find elements involving an abnormal functionality of the gyro-copter engine. It was checked the fixing manner of bearing system blades on central hub (fig. no.13), the existence and integrity of balance limiters, the central bolt (fig. no. 14) as well as the elements in the control chain and no elements were found that might have led to the possibility of bearing plateau inclination below the minimum level established by the manufacturer.
2.2 Operational nature deficiencies

The accident occurrence might have been caused as a result of an error in pilotage technique materialized either through a rough contact on main landing gear or through skid landing.

a) Rough landing

A rough landing on main landing gear, at reduced speed of bearing system blades, may lead to blades buckling and even, in extreme cases, to vertical empennage cutting. From landing gear analysis, it appears that it doesn’t show the specific damage for such an impact, especially because the right wheel presents deformations that are specific for the application of an important lateral force (Fig. no. 12).

b) Skid landing

From the analysis of tracks on runway surface, of damage/destruction suffered by aircraft as well as the spreading area of aircraft parts, fragments, it was established its evolution, from the main landing gear contact with runway until its stop, as follows:

- during landing, main landing gear contact and performance of a roll of 8-10 m;
- after nose wheel contact with runway, the gyro-copter skidded to the left, from flight direction, followed by an overturn to the right, around the gyro-copter longitudinal axis;
- due to overturning moment, the bearing rotor blades hit the runway surface (see the three impact traces in fig. no. 10), action which stopped overturning, but also led to their deformation and bending (blades);
- after the rough contact with runway a blade was bent downward, which made it possible to hit the spar on which the horizontal and vertical empennages
were fixed leading to their bending, on blade rotation direction, implicitly its wheel stopping (blade blockage at spar level), see fig. no. 15;

- vertical empennage was cut by a bearing rotor blade;

- rotor blade stopping from its rotation movement determined fuselage rotation to the left and its stop on the left side.

According to the procedure, after landing flare, the gyro-copter should be stabilized on direction, the main landing gear touches down the runway, followed by landing speed decrease to zero and nose wheel contact.

The fact that the aircraft suddenly skidded to the left, during landing, means that landing was either made in three points (all wheels), or the nose wheel, not aligned to flight direction, was lowered on runway, when rolling speed was very high.

It should be taken into account that in case of landing on a concreted surface, if during nose wheel contact with runway, the aircraft is not aligned with runway centerline or on landing direction, then the gyro-copter will turn immediately in the direction on which the wheel is oriented and due to inertia, but also to bearing system gyroscopic moment, the gyro-copter may overturn on the opposite side of skid direction.

The way in which the bearing rotor blades were deformed during runway contact in this accident show that the skid to the left was very high and sudden which can be performed only if the wheel initial skid angle, during runway contact, was accentuated by a rudder inappropriate action instead of being corrected.
From the analysis of flight activity, which was noted in the technical notebook, it was found that the pilot had a flight experience of over 5 years on motor paraglider aircraft type summing up over 180 flight hours.

A particularity for this aircraft type (motor paraglider), is that the rudder is used only during rolling to keep the aircraft on the desired direction. Considering that the rudder is rigidly fixed with nose wheel axis, in order to turn left, the right rudder pedal should be pressed (detail A) and in order to turn right, the left rudder pedal should be pressed (detail B), thus in opposite direction from aircraft of which rudder is correlated with the direction.

Due to this particularity, many motor paraglider pilots face difficulties when passing on airplane and/or autogiro due to reflexes acquired in years of flight on this aircraft type, requiring an intense training to restrain the instinct created on motor paraglider.

From the analysis of notes in the technical logbook it appears that of the 20 hours and 55 minutes performed on gyro-copter, 19 hours and 25 minutes were performed on a MTOsport gyro-copter type, permissive device, very stable, designed for schooling, and only one hour and 15 minutes with Calidus gyro-copter (personal property).

Moreover, schooling flights as well qualification exam for gyro-copter pilot were performed on a grass flight field.

To mention that when landing on grass flight field, even though the nose wheel is not aligned with runway centerline that does not feel very much because the wheel slips and returns, aligns on direction and lands in safety.
The commission members found that during licensing flight for gyro-copter pilot qualification that was performed on 30.09.2014 and restarting the pilot’s flight qualification there was an interruption of almost eight months.

Considering that landing was performed with left lateral wind, the commission members considers that the pilot came to landing with compensation in order to keep the aircraft on direction and chose to touch down with nose wheel, at high speed, for a higher aircraft stability, and during skidding to the left, the pilot instinctively operated the left rudder to reenter the flight direction, as in motor paraglider, which accentuated the skid and implicitly the gyro-copter turnover.

3 CONCLUSIONS

3.1 Findings

The investigation commission on the accident occurred on 19.06.2015, involving the Gyro-copter Calidus aircraft type, registered OK-UWC23, operated by a private owner, found the following:

- the aircraft was registered in the Czech Republic and had a Recognition Certificate, issued according to the Romanian regulation sin force, through which the aircraft was considered airworthy;
- the aircraft pilot had valid motorized ultralight aircraft pilot license;
- on the date of the accident, the pilot’s medical certificate was valid;
- no constructive changes were observed in comparison to the aircraft technical documentation;
- the two bearing system blades suffered major deformations;
- the blades ends were destroyed after contact with runway surface;
- the supporting beam (spar) of vertical empennage was bent towards cockpit right side and the vertical and horizontal empennages were destroyed by the bearing system blades;
- on the front side of the cockpit, both on the left and the right there are scratches marks;
- the three propulsion system blades were damaged;
- the main landing gear right wheel was broken.

3.2 Causes of accident occurrence

The cause of accident occurrence is the error in pilotage technique based on a lateral wind landing, lack of experience on this aircraft type and on some skills in pilotage technique, acquired over time in motor paraglider.
Favoring causes:
- high sensibility of gyro-copter longitudinal stability in rolling;
- lack of experience on the new aircraft type and especially for landings on concreted surface;
- weather conditions (lateral wind).

4 RECOMMENDATIONS

The investigation commission makes the following recommendation:

1) The licensing authority shall consider during training and/or formation process of auto gyro pilots to provide, especially for those who previously flew on moto-paragliders and/or moto-gliders, rolling exercises of landmark type to defeat the instinct formed on rolling with this aircraft types, and if appropriate, at least landing with instructor on a concreted runway.

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.