ACCIDENT

Aircraft Type and Registration:	Rotorsport UK MTOSport, G-LZED
No & Type of Engines:	1 Rotax 912 ULS piston engine
Year of Manufacture:	2010
Date & Time (UTC):	27 June 2011 at 1120 hrs
Location:	Shell Island Campsite, Llanbedr, Gwynedd, North Wales
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Pod, right main and nose landing gear, rotor blades, propeller, tail fin and rudder pedals damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	47 years
Commander's Flying Experience:	380 hours (of which 88 were on type) Last 90 days - 38 hours Last 28 days - 7 hours
Information Source:	AAIB Field Investigation

Synopsis

The pilot selected a field for takeoff which was shorter than that required. There was no evidence of any fault with the gyroplane, which struck a wall shortly after becoming airborne, before crashing. The gyroplane was extensively damaged but neither occupant was injured. A number of similar accidents have highlighted the need to enhance pilot understanding of gyroplane performance.

Two Safety Recommendations are made.

History of the flight

Shell Island is a large campsite located on the coast, 600 m north-west of Llanbedr disused airfield. The campsite consists of a number of close-cut grass fields at an elevation of between 20 and 30 ft amsl. The fields are bounded by low hedging, intermittent stone walls 2 to 4 ft in height or a combination of both.

The pilot had flown in the previous day and, having considered his options, selected the field he wished to use for departure. He estimated, by pacing, that the length of the field was 250 m and noted a slope. In his report, the pilot stated that he considered the field was "tight but achievable" and that "no other options were any better". The pilot had calculated his takeoff mass as 472 kg, which was below the 500 kg structural maximum.

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During the morning the pilot had been using a row of flags at the campsite's main building to monitor the surface wind. He estimated that it was from the west at 5 mph and occasionally calm. The pilot decided to take off downslope, which made the departure downwind. He noted, from the rotor bearing temperature sensor, that the ambient temperature was 18.7°C.

The pilot took the precaution of arranging, with the campsite, for staff to close the field for his departure. Having conducted his pre-flight checks, which included a "test run" across the slope, the pilot shut down the gyroplane and, to ensure there was no unused space, positioned it with the tail against the hedge at one side of the field. He then restarted the engine, accelerated the rotor to its maximum pre-rotator speed of 260 rpm and, with the stick fully back, released the brakes. The gyroplane accelerated down the slope and "skipped", which gave the pilot confidence that the takeoff would be successful. He later commented that it felt as if the gyroplane had been "held back"; one witness reported to him that, at some point during the takeoff run, the tail might have struck the ground. The pilot noticed that the gyroplane's rotor had a high angle of attack and was, therefore, generating additional drag, reducing the aircraft's rate of acceleration. He considered that this was due to the downward slope and that he had raised the nose too high. The pilot corrected the pitch attitude and the gyroplane accelerated becoming airborne as the slope flattened out. However, there was insufficient distance remaining to accelerate in ground effect and the right main landing gear contacted the field's far perimeter wall, causing the gyroplane to crash into a bush. Despite extensive damage to the gyroplane, there was no fire and the pilot and his passenger were uninjured.

The pilot concluded that his lack of familiarity with sloping ground operations resulted in an incorrect takeoff pitch attitude and an extended takeoff roll.

Field length

Post-accident measurement of the field, using Ordnance Survey data, indicates that the actual length of the field was 200 m +/- 5 m, with an average downslope of about 1 % in the direction of takeoff.

Takeoff technique

Flying a 'New Generation' Gyrocopter[1] describes the gyroplane take off sequence as:

> *'Prerotate: use the mechanical prerotator to start the rotors turning*
>
> *Rotor speed build up : Using forward airflow through the rotors to build up the speed of the rotors whilst moving forward*
>
> *Wheel Balance: Establishing the correct attitude of the Gyrocopter on the ground before attempting to lift off*
>
> *Lift off and airspeed build up: Flying along level just a few feet above the ground and building up speed to 70 mph*
>
> *Climb out: Climbing to circuit height in the fastest possible time.'*

A performance takeoff, used to achieve the shortest possible ground run, is also described. It explains that:

> *'...as you will have become airborne at a lower forward airspeed it is vital that you extend this section* [lift off and airspeed build up] *of the take off.'*

Footnote

[1] Flying a New Generation Gyrocopter, Phil Harwood; The Gyrocopter Company, 2008.

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Performance

The MTOSport Pilot's Handbook includes performance data. Issue 4 (dated 17 December 2010) states:

> *'TAKE OFF DISTANCE (MTOW)*
>
> *Take-off run 20 - 170 m (66-560ft) (depending upon loading and wind force) Take-off distance over 15m (50ft) obstacle 320m (1056ft) in still wind with the rotors at 200rpm on grass, hot conditions.'*

It notes that:

> *'The parameters apply to standard conditions (sea level, normal pressure, 15°C, zero wind, max take-off weight 500Kg or as noted, even field with short grass in good condition).'*

There is no performance data provided for tailwinds. The manual does state:

> *'If possible always take off into wind.'*

Figure 1 gives a pictorial description of the elements of the MTOSport's takeoff to a height of 50 ft, clearing a nominal obstacle.

Off-airfield operations

CAA General Aviation Safety Sense Leaflet 12 '*Strip Sense'* contains advice on how to assess an area for aviation use. It states:

> *'The length of the strip must be accurately established. If you pace out, remember an average pace is not one metre but considerably less. This may decrease still further after walking several hundred metres. A proper measuring device is better.'*

Safety factoring

CAA General Aviation Safety Sense Leaflet 7 '*Aeroplane Performance'* contains advice on performance related issues, it states:

> *'Wind: even a slight tailwind increases the take-off and landing distances very significantly.'*

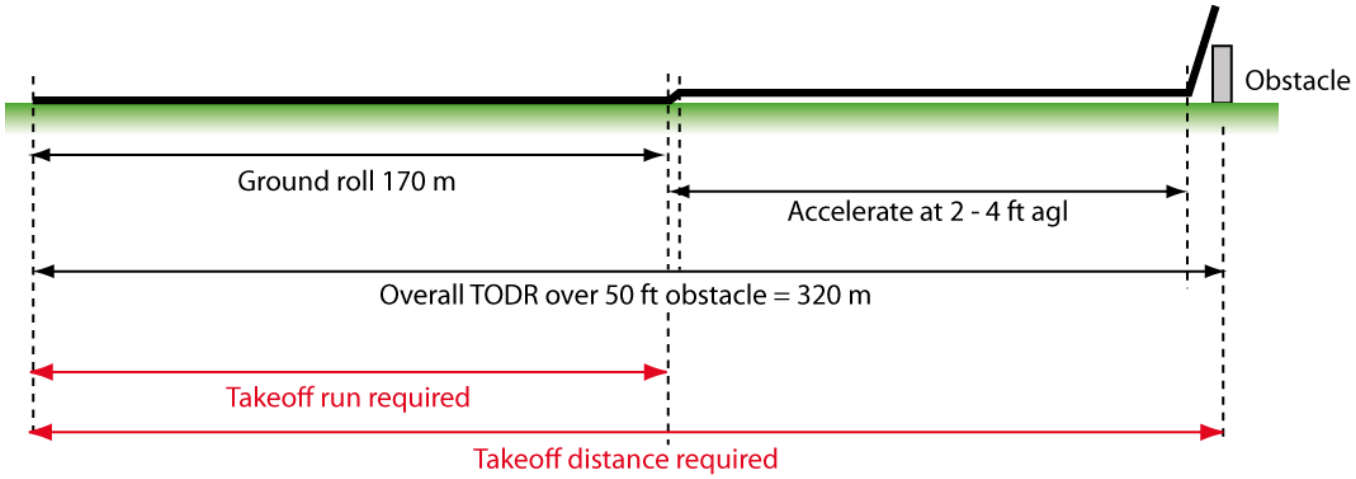

Figure 1

MTOSport gyroplane's takeoff performance at MTOW in still air

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It recommends the use of factors to account for possible degraded conditions, such as a tailwind:

> *'a tailwind component of 10% of lift-off speed – factor 1.2'.*

(A 5 mph tailwind is about 10% of the MTOSport lift-off speed.)

A final safety factor should then be added:

> *'It is strongly recommended that the appropriate Public Transport factor, or one that at least meets that requirement, should be applied for all flights. For take-off this factor is x 1.33.'*

It goes on to say that should the Takeoff Distance Required (TODR) then exceed the Takeoff Distance Available (TODA) *'you must offload passengers, fuel or baggage.*'

Previous accidents

The AAIB has published reports on other MTOSport accidents which have occurred during departure. The accidents to G-CGGV in June 2011 (published in AAIB Bulletin 9/2011), G-CGGW in November 2010 (published in AAIB Bulletin 2/2011) and G-DWDW in July 2009 (published in AAIB Bulletin 1/2010) all resulted from the gyroplane becoming airborne but then being unable to clear obstacles safely.

The MTOSport's UK manufacturer commented that they were aware of a developing trend of accidents in which the gyroplane had performed as designed but had been unable to operate safely from the field selected by the pilot. They believed that pilots were failing to realise that, although the gyroplane has a very low Takeoff Run Required (TORR), the period of acceleration close to the ground, to achieve climb speed, can be disproportionately long. This resulted in a larger TODR than pilots had allowed for.

The UK registry, as of September 2011, included 36 MTOSport models.

PPL (Gyroplane) Syllabus

The PPL (Gyroplane) syllabus is issued by the British Rotorcraft Association. The 2009 edition was in force at the time of the accidents referred to in this report. Exercise 8a includes: '*Performance considerations for the type of Gyro'* and requires that students can:

> *'Answer questions relating to the type of Gyro being used for the test. Specifically weights and payloads, fuel weight and consumptions and min/max speeds, especially in turbulence.'*

Analysis

The MTOSport Pilot's Handbook reports a takeoff run of up to 170 m, in still air. Applying the CAA factor of 20% for a tailwind, G-LZED required about 204 m to become airborne. This does not include the 1.33 safety factor which would increase the TORR to 271 m. However, once airborne the gyroplane would still need to accelerate, in ground effect, at a height of between two and four feet before climbing away. As such, even if the pilot's estimate of the field as 250 m long had been correct, the field did not appear to have been of sufficient length to depart safely.

At least three other MTOSport gyroplanes have crashed in similar circumstances in the last two years. This is 11% of the UK registered fleet. The four accidents have included a consistent error, by different individuals, while the flights were being planned. Given this developing trend in reportable gyroplane accidents, the following Safety Recommendations are made:

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Safety Recommendation 2011-097

It is recommended that the Civil Aviation Authority emphasise to gyroplane operators the need to consider field suitability and gyroplane specific performance, including the safety factors to apply, when planning a flight.

and

Safety Recommendation 2011-098

It is recommended that the Civil Aviation Authority, in conjunction with the British Rotorcraft Association, review the Private Pilot's Licence (Gyroplane) syllabus to ensure that students receive adequate tuition and examination on the takeoff and landing performance of gyroplanes.

Conclusions

The pilot selected a field for takeoff which was shorter than that required. Hence the TODR, including the relevant safety factors, exceeded the TODA. Safety factors help to take into account variability in conditions and pilot handling. There was no evidence that there was any fault with the gyroplane. Similar accidents highlight the need to enhance pilot understanding of gyroplane performance.

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