

**ACCIDENT**

<b>Aircraft Type and Registration:</b>	RAF 2000 GTX-SE, G-BXDE	
<b>No &amp; Type of Engines:</b>	1 Subaru EJ22 piston engine	
<b>Year of Manufacture:</b>	2000 (Serial no: PFA G/13-1280)	
<b>Date &amp; Time (UTC):</b>	14 September 2018 at 0955 hrs	
<b>Location:</b>	North Weald Airfield, Essex	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 2	Passengers - None
<b>Injuries:</b>	Crew - 1 (Serious) 1 (Minor)	Passengers - N/A
<b>Nature of Damage:</b>	Extensive	
<b>Commander's Licence:</b>	Private Pilot's Licence	
<b>Commander's Age:</b>	62 years	
<b>Commander's Flying Experience:</b>	904 hours (of which 100 were on type) Last 90 days - 16 hours Last 28 days - 5 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot and further enquires by the AAIB	

**Synopsis**

G-BXDE was being flown for the purpose of revalidating the owner's gyroplane rating. As the gyroplane became airborne it rolled to the right and turned through 180° before descending back to the ground. It struck the ground on its right side to the right of the runway. The examiner sustained serious injuries.

The investigation concluded that the gyroplane took off with insufficient rotor speed and excessive airspeed. It is possible that the gust lock had been left engaged, restricting the movement of the control stick.

**History of the flight**

The gyroplane was being flown from North Weald Airfield for the purpose of revalidating the pilot's gyroplane rating. The examiner, who was also an LAA inspector, was familiar with the gyroplane having previously inspected it for the renewal of its permit to fly. The visibility was reported as good and the surface wind was 230° at 14 kt.

The pilot arrived at the airfield and prepared the gyroplane for flight. On arrival the examiner completed his own pre-flight check of the gyroplane. They briefed to fly for approximately one hour, including some general handling in the local area followed by circuits back at the airfield. They both boarded the gyroplane and the pilot adjusted the

pitch and roll trims for flight with two occupants. He recalled that he released the gust lock as he boarded the gyroplane. The examiner recalled that as they were about to start he noticed that the rotor brake was still applied. He pointed this out to the pilot who tried to release it. However, the brake was very stiff and required two hands to release. The pilot recalled checking the flight controls for full and free motion whilst parked, but he did not recall repeating this check prior to commencing the takeoff roll.

Taxiing to the runway was uneventful. On reaching the holding point a light twin engine aircraft was also waiting to depart. The pilot asked the other aircraft if they would like to depart first but they declined and allowed the gyroplane to depart.

The pilot lined up on Runway 20 and spun-up the rotor whilst applying full forward stick, he then applied aft stick as he commenced the takeoff roll. The pilot recalled that he thought the initial takeoff roll was normal and that he was holding the stick fully aft, but the gyroplane did not lift off at 40 mph as he expected. He remembered seeing the airspeed pass 60 mph whilst still on the ground. He did not recall the gyroplane becoming airborne, but remembers it climbing and rolling to the right before it descended back to the ground.

The examiner recalled seeing a rotor speed of 130 rpm as the gyroplane started the takeoff roll and he noticed that the stick was not fully aft. He recalled that he was monitoring the airspeed and rotor rpm; he saw rotor speed reach 150 rpm but the airspeed was much higher than normal. He remembered seeing the airspeed reach 70 mph whilst still on the ground; the highest rotor speed he remembered seeing was 150 rpm. He recalled the gyroplane "leaping into the air", then rolling to the right and completing a 180° turn to the right. He thought they reached approximately 50 ft before descending to the ground. He stated that the takeoff roll and accident sequence happened very quickly and that he did not have time to intervene.

The gyroplane initially struck the ground on its right side, on the grass to the right of Runway 20. It stopped on the parallel taxiway (Figure 2). The pilot was able to exit the gyroplane unaided and helped the examiner out. The examiner suffered three broken vertebrae and multiple cuts and bruises. The pilot suffered minor injuries.

The accident was witnessed by the radio operator in the control tower. He reported seeing the gyrocopter become airborne after a takeoff roll of approximately 300 m. He saw the gyroplane climb to approximately 50 ft before banking and yawing to the left. It then banked to the right with 50° - 70° angle of bank and descended, hitting the ground on the front right side. He recalled noticing that during the takeoff roll the rotor disc was not tilted back in the way he normally saw gyroplanes takeoff.

### **Aircraft information**

The RAF 2000 is a two-seat gyroplane with an enclosed cockpit (Figure 1). It is powered by a Subaru EJ22 'flat four' liquid cooled engine with a three-bladed propeller. The aircraft is kit built and flown under a LAA permit to fly.

The LAA TADS<sup>1</sup> for the RAF 2000 specifies that  $V_{NE}$  is 70 mph. This limitation was introduced after a previous accident which highlighted significant control difficulties above this speed; reported in AAIB bulletin 9/2007.



**Figure 1**

G-BXDE before the accident flight

### Examiner's comments

The examiner stated the normal takeoff technique is to place the stick fully forward and engage the pre-rotator then, at 100 rpm bring the stick fully aft to allow the rotor to continue to spin-up. When the rotor speed reaches approximately 150 rpm, release the brakes and apply full power then, at 200 rpm, release the pre-rotator. Once the nose starts to lift, apply forward stick to accelerate in ground effect expecting to see the rotor at 270 – 320 rpm.

After the accident the examiner concluded that the gust lock had been left on. He thought that the pilot had reapplied the gust lock whilst trying to release the rotor brake and had forgotten to release it again. He believes this was why the rotor disc was not tilted back correctly and consequently why the rotor speed did not increase as expected. He reported that the controls have some “slack” with the gust lock engaged so the pilot may not have realised that the gust lock was engaged. He reported that the controls normally have approximately 11 inches of travel from full forward to full aft, so the stick is normally a long way back on the takeoff roll.

He reflected that as an examiner he was focusing on observing what the pilot was doing and was not ready to take control when the takeoff did not process as expected.

---

### Footnote

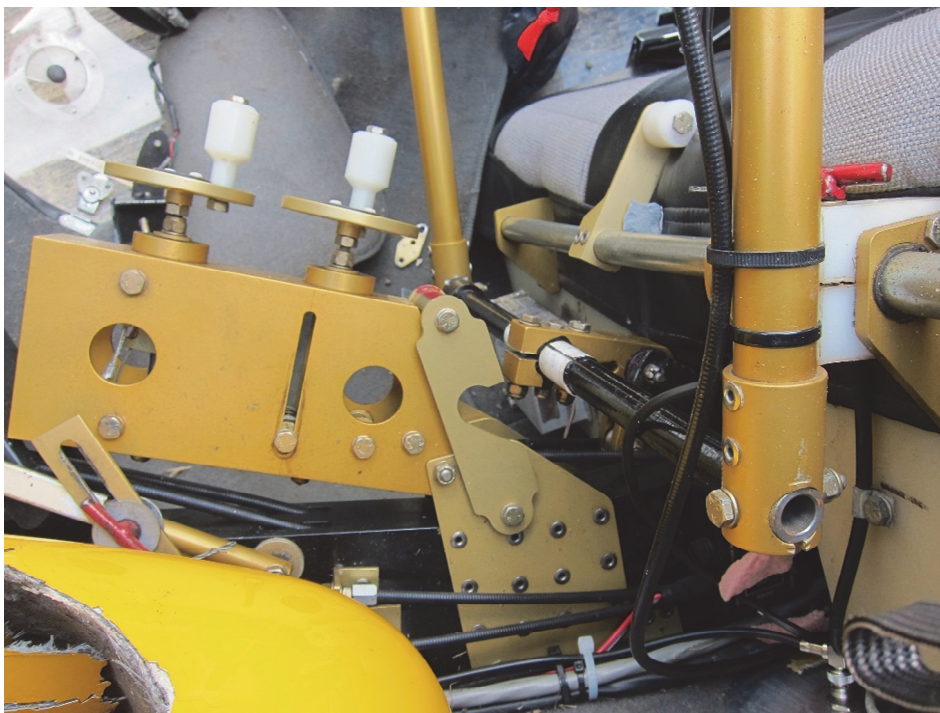
<sup>1</sup> LAA Type Acceptance Data Sheet -<http://www.lightaircraftassociation.co.uk/engineering/TADs/G13%20RAF%202000.pdf> (assessed 18 October 2018)

## Aircraft examination

The pilot examined the gyroplane after the accident and found the gust lock was not engaged (Figure 3). However, it could not be determined if the gust lock had disengaged during the accident sequence.



**Figure 2**  
G-BXDE after the accident



**Figure 3**  
Photo taken after the accident showing the gust lock disengaged

## Distraction

It is possible that the gust lock had been left on because the pilot was distracted by unexpectedly needing to release the rotor brake.

Distractions are anything that draws attention away from the task at hand. The FAA's Safety Document – '*Avoid the Dirty Dozen*'<sup>2</sup> suggests that distractions are the principal reason for forgetting things, including what has or has not been done. The document recommends mitigating the hazard by using checklists and going back several steps when restarting a task.

## Analysis

The accident occurred because the rotor speed and airspeed were not appropriately managed during the takeoff roll leading to the gyroplane becoming airborne with insufficient rotor speed and excessive airspeed. After the accident the pilot reflected that he needed to pay more attention to the airspeed and rotor speed on the takeoff roll and abort the takeoff if they are not normal.

The examiner believes that the gust lock was left engaged which is why the rotor disc was not tipped fully back during the takeoff roll. After the accident the gust lock was found disengaged but it is possible that this happened during the accident sequence. The pilot recalls disengaging the gust lock when he boarded the gyroplane. However, he may have reapplied the lock whilst trying to release the rotor brake. It is possible this distraction and change of routine meant that the gust lock was left engaged. The flight controls were not checked for full and free motion prior to commencing the takeoff. If the gust lock had been left engaged, a full and free check is likely to have uncovered this omission.

When the gyroplane lined up for takeoff there was another aircraft waiting to depart. It is possible that the presence of another aircraft caused the pilot to expedite his takeoff. This subconscious pressure to depart may have contributed to the accident.

The examiner stated that he was focusing on observing the pilot during the takeoff and was not ready to take control when the takeoff did not proceed as expected. This highlights the importance of agreeing before the flight how and when an examiner may intervene to maintain a safe operation.

The CAA Handling Sense Leaflet 04 – '*Gyroplane Handling Performance*'<sup>3</sup> highlights the importance of thinking, before every takeoff, when and how to abort the takeoff.

## Conclusion

The accident occurred because the rotor speed and airspeed were not appropriately managed during the takeoff roll. It is possible that the gust lock had been left engaged preventing the rotor disc from being tilted fully back on the takeoff roll, leading to the low rotor speed.

---

### Footnote

<sup>2</sup> <https://www.faa.gov/files/gslac/library/documents/2012/Nov/71574/DirtyDozenWeb3.pdf> (assessed on 17 January 2019)

<sup>3</sup> <http://publicapps.caa.co.uk/docs/33/20120816HSL04.pdf> (assessed on 17 January 2019)