

# **Report log on my gyroplane flight from Enstone to Papa Stronsay.**

*By Tom Felici, 12/02/2020*

## **Introduction**

On the 28<sup>th</sup> of October 2019 I undertook a journey in a Magni M16c Gyroplane with my son from Enstone Airfield to Papa Stronsay, a tiny island in the Orkneys. This is a recount of that journey and back with a focus on my thoughts on what I have learned, the mistakes I made, and what, upon reflection, lead me to make them.

The purpose of writing this report is to both help me crystallise the lessons learned and, hopefully, useful reading for others planning a similar journey.

Indeed upon reviewing this material myself it became clear that many of the issues highlighted in this report arose from it being my first very long journey, with multiple legs, and each leg being significantly longer than I had flown before (the most having been 1.5 hours with a stop for lunch and 1.5 hours back)

## **Flight details and planning**

The outgoing flight was done over two days. First leg from from Enstone to Fishburn (estd 2.6 hours journey at 80mph), refuel stop and break, and second leg from Fishburn to Perth (estd 1.5 hours journey at 80mph)

Then after an overnight stay in Perth, The final leg was from Perth direct to Papa Stronsay (estd 2.7 hours at 80mph).

The exact reverse was planned for the way back, with similar timings.

On each leg, all frequencies likely to be relevant to the journey were written down on my kneeboard for easy access, all routes drawn on maps, and relevant PPR's obtained, as per standard planning requirement. On each leg, the total weight limits allowed us to fill up the tanks to the brim (total useable fuel of 68 litres)

The weather window with an incoming high pressure from the west gave us a prediction of 4, maybe 5 days of nice weather – albeit with a light headwind in both directions (going up on day 1&2 the high pressure was incoming from the west, causing a light southerly wind, while on the way down on days 3&4 the high pressure was predicted to be already in the east, and therefore causing a light northerly wind).



## The Outward journey

### Leg 1: Enstone to Fishburn

Engine on was at 9:30am local time, and the total flight time was 2.7 hours hobbs from engine on to off. This was only slightly more than predicted in my plan, so I was satisfied with this number.

The flight itself was uneventful with listening squawks utilised when going past Birmingham, East Midlands and Leeds, and basic service & penetration obtained through Leeming MATZ.

I should note at this stage that I travelled with a manifold pressure at 30, giving an ASI of 90 mph instead of the planned 80mph, in an effort to reduce timings and because of the slight headwind.

### Lesson 1: Correct clothing

We realised we had underestimated the clothing required by the passenger in the back-seat. On the ground before departure the passenger, my son, did feel rather warm in the flying suit, even without a coat on. This continued to be the case for myself in the front seat, and \*in the beginning\* was also the case for the back seat passenger.

Indeed my son had flown with me before in similar temperatures and with similar clothing, **but** on far shorter flights. On this occasion however, he started feeling cold about half way into the flight. Upon reflection, if the clothing is (just about) inadequate, the decrease in

body temperature is gradual and the passenger initially may not feel discomfort, but this will change **well into the fight** as the body temperature lowers below a certain threshold. In our case, had the planned flight been any longer, we probably would have had to do an unscheduled landing to avoid the passenger's body temperature lowering to a point of suffering from hypothermia!

It is therefore important to **OVERESTIMATE** the amount of clothing required when the outside temperature is somewhat lower than body temperature, mindful that the passenger might not start to feel cold until well into a long flight, potentially forcing an unscheduled stop, or even forced landing if far between airfields!

In our case this problem was thankfully resolved at Fishburn with a hot drink and a meal, and by putting on his coat, including one lent to us by our fellow gyro-traveller (Keith Hall) who joined us at Fishburn from where we flew up to Papa Stronsay in loose formation.

### **Lesson 2: Correct assessment of fuel requirements.**

At Enstone I had filled up the tank completely (68 litres), and did the same upon arrival at Fishburn. This allowed me to ascertain precisely the fuel consumed (58 litres).

It would have been an opportunity to correctly calculate my fuel consumption (21 L/H), and subsequently realise that it was **ABOVE** what I had initially estimated (around 18 L/H). This in turn would have led me to realise that I had arrived at Fishburn with barely 30 minutes fuel to spare (assuming continued travel at same speed) which is the legal threshold!

It would also have affected my planning for the last part of the journey and the avoidance of the subsequent mistakes explained below.

### **Leg 2: Fishburn To Perth**

From this point on, we flew in loose formation with Keith in his gyroplane. The flight was uneventful and all went as planned.

### **Leg 3: Perth to Stronsay**

#### **Preparation**

The weather forecast was clear, albeit with low clouds in the Highlands clearing later in the morning. My plan was originally to fly over the Highlands but with the option of circumnavigating them to the east should the low clouds not allow the direct route. This would have allowed me to fall back along the coast if the cloud base prevented a direct route through the hills.

On the day, a decision was made to alter this plan slightly and to head along the A9 valley should the cloud base not allow a direct crossing. This had the advantage of following a large valley along a main road (with several airfields along it), albeit with the risk of remaining boxed in by low cloud with the only option being one to turn back.

The maximum planned journey time was estimated at 2.7 Hours. With a full tank of 68 liters of usable fuel, based on an estimated consumption of 18 L/H, I calculated this would allow me to arrive at destination with approximately 1 hour of remaining autonomy.

### **The flight**

This flight was initially uneventful but, as we had feared, upon approaching the hills the low clouds forced us to turn back and head into the A9 valley. Things only got worse, and eventually the low clouds forced us to backtrack. Luckily we had just passed a gliding site 5 minutes before, so we were able to land safely and await the clouds to lift as per weather forecast.

We were able to depart again after one hour, and continued along the A9 valley. However the last part of the valley climbs to its highest point just before the end, and it was clearly still blocked by clouds. We therefore elected to take a slight detour and arrive on the coast at Findhorn instead of Inverness (20 miles east).

From then on the clouds disappeared and we were able to fly straight up to Stronsay.

### **Urgent refuelling stop**

As we approached the top of Scotland I began to become concerned with the fuel level. The gauge was indicating far less than what I had anticipated at this stage of the flight. I was indeed puzzled by this and wondered just how "low" the fuel actually was (the small gauge does not show a precise count of the fuel in the tank). Anyhow I began to consider landing at Kirkwall airport (at this stage only 15 minutes away).

Just how critically low the fuel level actually was became clear on approach at Kirkwall, when the low fuel warning light went on!

Upon landing I ascertained that there was barely 6-7 liters of fuel remaining!

### **The final leg.**

This was only a 15 minutes flight. Upon leaving Kirkwell ATZ I began focusing on the landing on Papa Stronsay. The planned landing site was to be a field at the back of the tiny island sufficiently long for a safe takeoff in a fully loaded gyroplane. The inhabitants (The monks of the Golgotha monastery) had already inspected the surface and confirmed its suitability (the same field had previously been used by a microlight).

The landing went as planned on the strip mowed on purpose for the occasion.

### **Final mistakes and the "arrivitis" disease**

By the time we landed in Kirkwall (our second unscheduled stop), we were already behind schedule by about 1.5 hours. This in itself was not a problem as it was still early afternoon. However I was aware that our hosts were expecting us and whilst rationally I knew this was not a problem, I could sense the impatience beginning to get hold of me. This only became worse by the fact that we had to wait in Kirkwall while Keith disappeared for 20 minutes to pay the landing fees. At this stage, 20 minutes to me felt like an eternity! This led me to make some non life threatening, but very silly, mistakes.

1. After engine-start was approved and initial warm up I began moving along what I thought was the correct direction BEFORE explicit permission was granted from the

ATC. Realising this I then asked ATC for instructions who promptly told me to do a 180 degree turn and head in the opposite direction. What an embarrassment!

2. When I left Kirkwall ATZ I began concentrating on the arrival. NOT having heard anymore from ATC I (falsely) assumed I was now outside of their control. I could not have been more wrong. I later understood that Kirkwall likes to keep in radio comms with all aircraft on the Orkneys. The reason they had not told me to change to onwards frequency is not because they were busy with other aircraft, but because they wanted to remain connected!

### **Lesson 3: get-on-with-it**

Upon reflection, both of these silly assumptions were caused by the level eagerness I was experiencing to “get on with it”. What is, with hindsight, astonishing is that I was well aware of the risks of “get-on-with-it” being likely to happen on such long journeys, but I nevertheless failed to spot it actually happening to me. I would class this as a discovery of my personal performance and limitations which will be of use in the future, now that I have experienced just how insidiously such a psychological condition can creep on you without realising.

### **Lesson 4: Errors in fuel planning.**

Had I acted on “Lesson 2” above, I would have realised that my assumptions on fuel consumption were incorrect: at 90mph a fully loaded Magni Gyro M16c is consuming 21 litres per hour, not 18 as I thought. The difference might not seem very much, but the autonomy reduces from 3.8 to 3.2 hours.

Had the flight gone as planned, even travelling this higher speed 90mph instead of 80mph as I did in the last hour after Inverness, this would still not have been a problem, as upon arrival there would still be about 30 minutes of fuel left.

However on this occasion, the backtracking into the A9 valley, retreating to a landing point while waiting for the weather to clear, and the extra diversion to go around the clouds via Findhorn added approximately 30 minutes travel time. Had my assumed fuel consumption been correct, this would \*still\* have allowed me to arrive at the destination with 30 minutes to spare. But in actual fact I barely had enough fuel to complete the journey.

Had I been aware of the actual fuel consumption, I would have elected in advance to stop at Wick to refuel, thus avoiding an emergency landing at Kirkwall!

### **Lesson 5: performance under stress - lookouts**

The entire trip, including radio comms, was filmed by a GOPRO camera fitted on the gyroplane mast facing forwards, connected to USB power and to the radio via an audio jack (it was a gopro hero 7 black, which is the only camera I found capable of smoothing out the mast vibrations). This proved immensely useful in reviewing my own performance and spotting the ATC mistakes mentioned above.

It also allowed me to visualise my own flying performance - in particular how frequently I was doing lookout sweeps. At the beginning of the leg these were satisfactory, HOWEVER towards the end, approaching Kirkwall, my lookouts had all but stopped!

The reason? Three factors were at play:

1. eagerness to arrive led to fixate on the destination
2. fixating on the fuel gauge, concerned at it being unexpectedly low
3. concentrating on the comms with Kirkwall

These factors combined led me to completely forget the basic duty as a pilot of doing regular lookout sweeps!!



*Me looking ahead totally transfixed (argh!)*

## **The return journey**

This journey resulted in a forced landing halfway with an unscheduled overnight stay in the village of Newtonmore along the A9 valley. The sequence of errors that preceded this flight, while not being directly the cause of this forced landing, did significantly increase the risk of everything going horribly wrong. I will explain my thoughts as the narrative unfolds below.

### **Papa Stronsay to Perth**

#### **Preparation**

The planned departure time was 13pm. Weather was completely calm, and clear of clouds all the way to Perth, our first programmed stop for the night. Flight time was expected to be 2.7 hours at 80 mph (there was very little wind on the way back)

As per planning I elected to refuel the gyroplane with normal unleaded from the main island's gas station. The fuel was carried back to the gyroplane with two jerry cans belonging to the Monks which were explicitly reserved for unleaded fuel (they had separate ones for diesel, etc). The gyroplane was filled with the aid of a jug that allowed me to inspect the fuel as I poured it in. I did not observe any contaminants or cloudiness that might indicate water in the fuel. The tank was filled completely to 68 litres.

#### **The flight**

Actual departure time ended up being 13:45 (45 minutes later than scheduled). This still allowed us to arrive in Perth before sunset, but with only half an hour to spare. Apart from this, the journey was proceeding as planned, with a basic service from Kirkwall handed over to Wick with additional permission to penetrate the danger area granted by Inverness, allowing us to reduce the travel time slightly.

The plan was to follow the A9 valley, however, mindful of the time, I was tempted to "cut a corner" of the valley by crossing a mountain range and rejoining the valley on the other

side. The weather was clear and there were no clouds. I therefore began the climb to 3000 feet in order to safely clear the hills. Manifold pressure was at 35.

Suddenly, at 2800 feet, just before crossing the ridge, the engine loses power.

I immediately bring back the throttle to a low setting, make a U-turn and head back into the valley. While heading back, I attempt again to add power and again the engine immediately begins to choke. Sporadically, whenever I attempted to add power above 28-30 manifold pressure, the engine felt that it would stall. This meant that in order to maintain or gain height I could only fly at best-climb-speed of 65mph.

Being unsure of the problem, I had to assume that the engine would stop at any moment! So rather than attempt to continue on the journey, I descend to 1000 feet above ground and begin searching for a place to land. Luck has it that we came across an empty golf course, with the added benefit of being within walking distance of the village of Newtonmore and its train station.

At this point I stopped searching for a field and selected a "run" that allowed me to land safely, with the added option of taking off the following morning should it be possible to diagnose/fix the problem in-situ.

### **Diagnosis and decision on what to do next.**

Once in the hotel room I reflected on the possible causes. The problem manifested itself all of a sudden when I went above the snowline (where air temperature was therefore below zero).

In a conversation with Keith we decided that a LIKELY cause MIGHT be carb icing or similar. The following morning I therefore put my son on the train back to Oxford, and given that

- the golf course was in open countryside surrounded by large flat fields,
- the A9 valley presented all along it places to safely perform an emergency landing should it be necessary,
- the weather all the way to Perth was forecast as clear,

I elected to attempt a take-off on full power. In the worst case scenario I would be able to put down the gyroplane in any of the several fields in front of me.

The gyroplane did take off on full power, and fuel pressure readings were normal during climbout.

I therefore elected to continue to Perth, maintaining an altitude of at least 2000 ft.

So far, the problem seemed to be resolved. However 20 minutes before Perth the choking did start again whenever I increased the manifold pressure over 28 or so. At this stage I did notice the fuel pressure had dropped, indicating therefore that the problem was in all likelihood the fuel filter.

As I now was the only one onboard, I was still able to maintain height, even climb on a lower power setting without exhibiting this "choking" problem, and was therefore able to land at Perth.

### **The flight from Perth to Fishburn**

The filter was replaced at Perth, and after a successful test I elected to continue to Fishburn. Departure time was 14.30. As it was too late to arrive back in Oxford on the same day, I telephoned ahead and arranged for the gyroplane to be hangared upon arrival.

The flight was uneventful and the arrival was at the expected time, 30 minutes before sunset.



The next day the weather, as predicted, changed and it was no longer safe to fly. At this stage I took the train back home (luckily Durham nearby is on a direct connection to Oxford!).

I was only able to return with the gyroplane several weeks later.

## **Thoughts about the return journey, lessons learned, and open questions**

### **Get-home-itis**

I mentioned previously the “get-on-with-itis” experienced on the way up. “Get-home-itis” is a different manifestation of the same thing, which in this case risked turning a simple inconvenience into an absolute nightmare.

I still now reflect with horror of what might have happened had the engine problem manifested itself just AFTER I had crossed the ridge on that attempted shortcut!

Yes, ok: the brilliant thing about gyroplanes is that you can land them pretty much anywhere, even in the middle of the highland ridges, but at what cost? I would probably have ended up performing a forced landing in the middle of nowhere, maybe even on a ridge, and just before sunset, with temperatures likely to drop below freezing as the night progressed.

A mixture of impatience fuelled by the late departure and naive faith in the gyroplane led me to perform a stunt that with hindsight, was horrendous!

### **The achilles heel of gyroplanes: fuel lines.**

Faith in the modern factory built gyroplanes such as the Magni Gyro M16c is not entirely misplaced: the mandatory periodic checks and revisions carried out by qualified engineers as mandated by the CAA do provide a high degree of reassurance. However the ONE element that is not included in this process and is left up to the pilot is the FUEL.

Indeed rotax engines are designed to function with normal/super unleaded instead of AVGAS. It is only the latter that has a reliable supply chain, being only available in airports which presumably carry a certain guarantee of quality.

The same cannot be said for fuel from petrol stations, where the quality, it would seem, can vary significantly.

To this date I am unable to say for certain what caused the blockage (I should have kept the old fuel filter and opened it up to have a look). The timing of the engine failure suggests the fuel picked up at Stronsay might have been the culprit. However this was from the island’s main gas station, the jerry cans used to transport the fuel were regularly (and only) used to carry the same fuel, AND I was inspecting the fuel with a jug before pouring it into the tank.

I am not therefore sure this was the direct cause.

Also what contaminant in the fuel would lead it to block such a large filter?? Was it maybe water accumulation on the filter membrane? That would explain why the gyroplane was functioning normally until the outside temperature went below zero degrees, causing the water in the filter membrane to freeze ....

This might also explain why I felt the engine running “rough” during warm-up when I departed from Perth on the outwards journey ...



If this is indeed the case then it is not unlikely the "water damping" could have been accumulating from months before, only to manifest itself for the very first time when flying the gyro in freezing temperatures ,which happened to be on this occasion!

I underline that I am not a qualified engineer, so these are only my thoughts, possible conjectures, not an explanation.

### **Consequence and take-home lesson**

One important thing I take away from this. My illusion that a gyroplane is indestructible has vanished. On top of this, it has affected the way I fly: I am now not only looking for places to land while flying (this I was already doing before), but also HOW PRACTICAL they are: sure I can land anywhere, but how much grief am I going to experience? Is there easy access from a road? Etc ....

The time of day (as mentioned above) now also is firmly present in my mind.

### **Use of Skydemon and phone GPS**

The entire route was drawn on CAA 1:500000 aviation maps. In practice I was using skydemon to navigate and using the maps as a backup should this fail. I am always mindful of how I use this (amazing) tool, but have learned to just refer to it when I need to set course, and then use a VRP in the distance to keep on track, instead of constantly staring at the screen. This works well and on the few occasions skydemon stopped working (due to my phone screen switching off) I was able to maintain the correct course while referring back to the maps on my knee.

However this was the first time I was using this tool in an area with little phone signal. Indeed when backtracking to the glider airfield on the leg from Perth to Stronsay, I initially referred to skydemon in order to direct to the gliding site for the precautionary landing, only to realise that the direction AND position it was indicating was completely wrong! Eventually I ended up using skydemon only for its map with its recorded ground features, and followed the VRP's safely to the airfield (in this case the stream coming from a large lake going past the airfield).

Upon reflection, mobile phones rely on network data to increase the reliability of its positioning software, and not just on GPS. This is how mobile phones manage to know where they are even in cloudy conditions. Lack of access to a data network (as can happen in the highlands) can lead to the GPS 'lagging'. Moreover the reflections of hill sides in valleys can lead to the GPS giving you the totally wrong location! There is more info on this subject here

<https://www.gps.gov/systems/gps/performance/accuracy/>

Thankfully, in valleys there are plenty of VRP's to keep you on track (the valley itself being the main one of course), however as we encountered clouds, visibility was significantly reduced, to the point that I was unable to see the other side of the valley as it was covered in clouds. This led me initially to want to rely on the GPS, precisely at a time when it was the least accurate!

I will be mindful of this next time I fly along similar terrain.

## **Landing in a golf course: Legal considerations**

I confess that I was not aware at the time that under UK Air Law, golf courses are considered urban areas. It is therefore illegal to land on them, even if empty and in the middle of nowhere. It is, apparently, also illegal to do so in emergency situations!

I therefore ask myself as to what I would have done had I been aware of this rule.

All considered, I openly admit my action would probably have ended up being the same, given, in particular, that I had my son in the back seat and it presented no danger to third parties.

Landing in this Golf course meant we could quickly get out of the cold and into the village before dark, and it would have, I believe, been ethically incorrect to act otherwise, irrespective of the law.

Having said this, had I been aware of its illegality, it would have prompted me to look harder for alternatives and treat the golf course only as a last resort, rather than choose it as my first option.

Here is the video of the landing in the golf course. I had published this before my awareness of the illegality of such an operation. I have now delisted it from public view, so it can only be accessed via this link for reference in this report

<https://youtu.be/2BbHoGsqvX0>

### **Correction!**

I have since learned this was not correct: it is indeed illegal to PLAN to land on a golf course in case of emergency, but not if you happen to stumble across one during an emergency, so all considered I did take the correct action and did not break the law.

## **Departing from the golf course: Legal considerations**

I have now learned that this was an ILLEGAL action, irrespectively of how trivial I thought the problem was, and irrespectively of how safe I felt it was to continue the journey in spite of the problem. Had I been aware of this at the time, I would have not flown back to Perth. Period.

## **Conclusion: Will I do it all again?**

Yes I would! Such a journey in a gyroplane is absolutely unforgettable, as is the destination.

Would I do anything differently? You bet!!!

Firstly I should state the obvious: this is really something to be done (comfortably) in the summer, where the long days remove the added stress of remaining on-schedule.

It is also warmer (!) - this being good not only for the passengers, but evidently also helps minimise problems with the gyroplane.

The other main difference is a stop in Wick for refuelling on the outward and return journey, thus also eliminating the "known unknown" of the local fuel on Stronsay island.

Furthermore the long summer days COULD allow the entire journey to be performed in a single day: Taking into account one hour stops at the 3 refuelling points of Fishburn, Perth and Wick the total journey time would be 10 hours (allowing us to arrive several hours before sunset).

However I am uncertain as to how I would perform on the final leg of the journey through the highlands, precisely at a time I would require most concentration .... (?)

The time might allow it, but probably best to stop in Perth again for an overnight stay and continue the next day. After all, it is not as if we have a plane to catch :)