

USE OF GNSS NAVIGATION IN LAPL & PPL SKILLS TEST

Issue

1. The increasing problem of airspace infringements by UK GA pilots is well known and documented¹. Use of GNSS functionality for navigation is now actively encouraged by the CAA² and GASCO as a mitigating measure. However, the current LAPL and PPL skills test format denies the use of these aids to the candidate during the primary navigation test element, and does not effectively test the competence of the candidate in integrating GNSS successfully into the cockpit workflow during normal navigation. This paper recommends changes, which do not require EASA regulatory change, to the execution of the skills test to remedy this.

2. Recommendations

a. The current LAPL and PPL skills test do not reflect the reality of how pilots will navigate post-skills test, and the opportunity to embed GNSS assistance as an airspace infringement mitigation measure during training is being missed.

b. In response to accidents and AAIB recommendations, there is increasing adoption of portable Electronic Conspicuity devices which display traffic information on tablet navigation apps. Denial of GNSS apps removes this safety assistance and the candidate's opportunity to display airborne TEM.

c. Standard Document 19 is updated to permit use of GNSS devices and apps, with appropriate checks and guidance, and competence in their use by candidates is checked during the primary navigation phase of the PPL/LAPL skills test.

d. Standards Document 19 is updated to test the 'dead reckoning' competence of candidates during the diversion element of the skills test.

Analysis

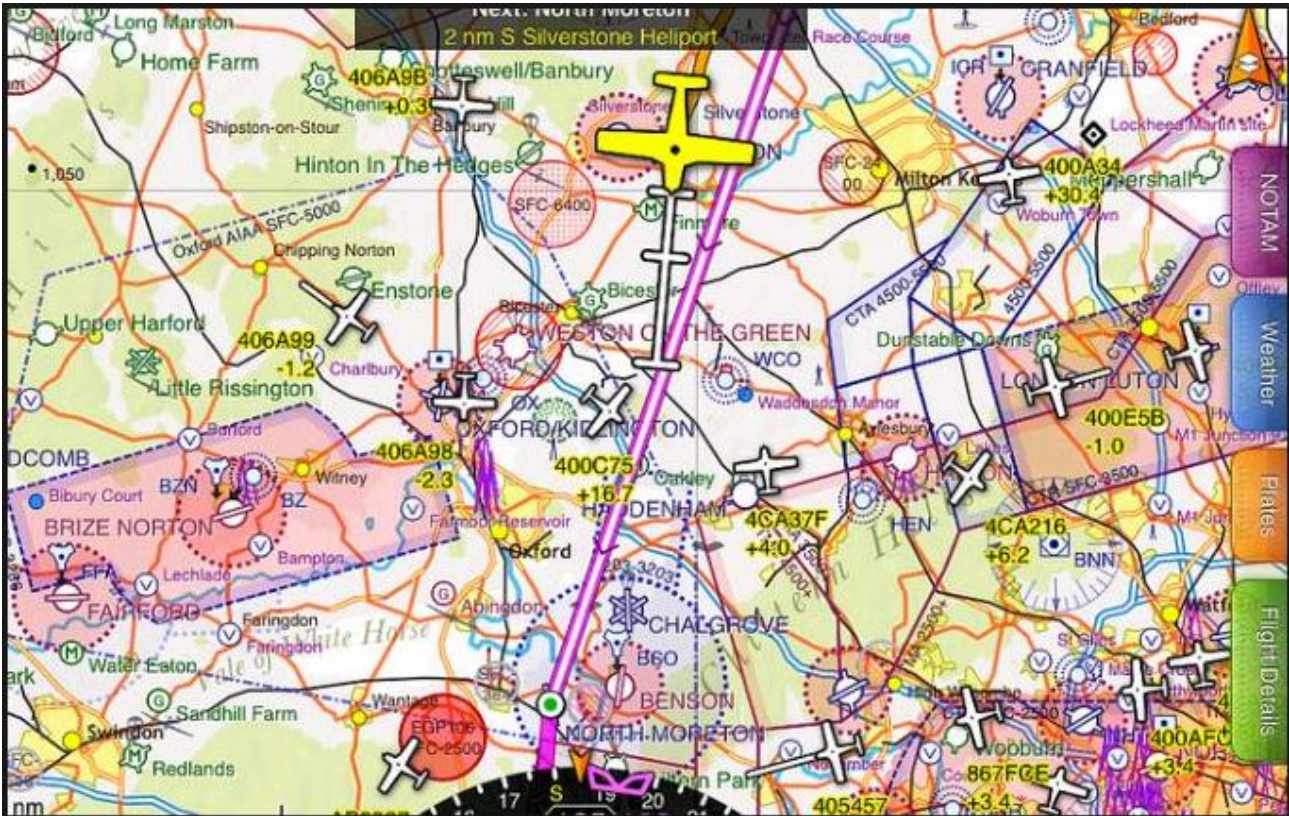
3. With complex airspace becoming normal in the GA operating environment, especially in the South East of the UK, pilots have increasingly adopted GNSS as a key navigational tool, replacing reliance on legacy 'dead reckoning' and radio navigation aid methods. Furthermore, many VORs, the only practical radio navigation for most PPL holders other than GNSS, are currently being phased out in many locations. In their stead, moving map GNSS units are now being used by many pilots, initially hand-held units such as the Garmin Pilot range, and more recently tablet devices running software applications such as SkyDemon, Runway HD and Easy VFR. The flight planning capabilities of these apps can be extremely developed, but the basic capability under consideration in this paper is the inflight ability to ascertain current position and performance against the planned track to a significantly more accurate degree than using traditional 'dead reckoning' techniques.

4. At this stage, it should be noted that GNSS in this context is assumed to be a VFR navigation package, either on an installed device or carry-on equipment. Equipment designed and installed for IFR operations, such as a Garmin 430W, may be able to provide positional information, but will not have the mapping capability for sole use in the proposed context. This paper will not consider the intricacies of equipment certification and installation since the proposed capability will be a part of an overall navigation technique, as opposed to a primary source of navigation.

¹ CAP1404 summarises the problem and remedial action undertaken.

² Part of 5 point action plan launched at GA Unit 2017 Roadshow presentations

5. In response to a number of mid-air collision (MAC) accidents, portable Electronic Conspicuity devices have been rapidly gaining in popularity such as PilotAware and SkyEcho. Traffic information from these devices is generally displayed by a GNSS navigation app such as Skydemon demonstrated below. Denial of the GNSS app denudes the candidate of this traffic information and an important safety barrier to MAC is removed. The candidate loses the opportunity to demonstrate effective airborne Threat and Error Management (TEM) with information that he/she will most likely immediately adopt post skills test, and the examiner loses the opportunity to check effective cockpit workcycle integration.



6. Standards Document 19 para 3.6.5 currently states (in relation to the primary navigation leg):

The applicant is expected to navigate by visual positioning in a practical way, not to feature crawl. Numerous heading or altitude changes that are the result of poor flying may constitute a fail in this section. The applicant is expected to calculate changes to his heading and ETA in order to correct deviations from his plan. Radio navigation aids may not be used during the first leg of the en-route section although they may be tuned and identified in anticipation of their use on the next leg. After the first leg VOR, ADF, VDF and DME may be used, but not at the expense of accurate flying. The applicant will be expected to tune and identify any aids used and to operate within their promulgated range. For the PPL test, at some stage during the second leg, the Examiner may require the applicant to establish position by using these radio navigation aids. RNAV, GPS or radar shall not be used as the primary fixing or tracking aid.

Additionally, at Appendix 1 it also states:

- (c) *Orientation, timing and revision of ETAs, and log keeping:*
- *Navigate by means of calculated headings, ground speed and time.*
 - *Achieve destinations or turning points within 3 minutes of estimated time of arrival (ETA).*
 - *Maintain a navigation log and radio log by recording all pertinent information such that the whole route may be reconstructed if necessary after flight.*

The Flight Examiner Handbook 2016 also states the following in the sample PPL brief:

This first leg to _____ is a visual navigation exercise.

PPL: Radio aids are not to be used for fixing on this leg. You may prepare those you may wish to use later but I may detune them, if so I will reinstate them before the second leg.

PPL: After the first leg you may use navigation aids to assist with your fixing but may not use them to track directly to _____. You may use any fixing facility except Radar position and GPS, but you can use GPS raw data to confirm a fix that you have already made.

PPL: At some stage on this leg I will ask you to take a radio aids fix and plot it on your map.

Continue to _____ until I advise you of a new destination.

Navigate to this new destination using visual and radio fixes (PPL only) as you wish.

The PPL and LAPL Skills Test Examiner reports specify the following:

PPL Skills Test Examiner Report – SRG2128	LAPL Skills Test Examiner Report (SRG2127)																																
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7. With Standards Documents now assuming the regulatory position as ‘Guidance’ under Part-FCL, both Part-FCL and associated AMC-GM were reviewed for definitive statements on the situation. AMC1 to FCL.235 details the skills test, the content of which replicates the extracts from SRG2128 and SRG2127 above i.e. the only specific mention of ‘dead reckoning’ is in “a. Flight Plan, dead reckoning and map reading”. No other Part-FCL restriction on the use of GNSS can be found in relation to the PPL or LAPL skills test.

8. From this, **it is suggested that the only regulatory requirement is that ‘dead reckoning’ is demonstrated at some point during the en-route phase of the test.** Although not specifically defined in Part-FCL, it can be said that “dead reckoning is the process of calculating one’s current position by using a previously determined position, or fix, and advancing that position based upon known or estimated speeds over elapsed time and course”³. Therefore, **in the current regulation,**

³ https://en.wikipedia.org/wiki/Dead_reckoning

it is reasonable to agree that a non-GNSS assisted navigation leg is required to be demonstrated.

Proposal

9. The vast majority of pilots, post PPL or LAPL skills test, will immediately purchase an app and device to assist them in exploiting GNSS assisted VFR navigation. Indeed this method of operation is encouraged by the CAA and officially sanctioned safety guidance. Unfortunately, as this equipment has been specifically denied during the skills test, the majority of the training also does not teach these capabilities. This leads to a situation where PPL/LAPL training and testing has become unrepresentative of real-life licence holding operations, and the opportunity to train the safe and effective integration of this equipment into the cockpit workflow has been missed. Indeed, confusion over device usage/capabilities, poor integration into the cockpit workflow and decreasing overall situational awareness is anecdotally being seen amongst licence holders.

10. **It is proposed that the skills test is amended as follows:**

- Candidates are permitted to use a carry-on GNSS navigation device designed for VFR navigation of light aircraft of their own provision.
- Candidates are permitted to use installed GNSS equipment capabilities which are suitable to VFR operations.⁴
- Candidates must demonstrate the device and/or app are up to date, and how the device will be safely secured, carried and used during the pre-flight briefing.
- Candidates must be prepared to answer questions about the device capabilities and operation during the pre-flight planning phase.
- Candidates must still prepare an appropriate navigation log and plan, but may use moving-map GNSS assistance to assess their position and progress towards next the turning point during the primary navigation leg.
- A high standard of accuracy, simulating navigating in a congested airspace area, will be expected during the navigation phase when using GNSS assistance.
- During the diversion to alternate aerodrome leg, the examiner will simulate the loss of GNSS capability. A dead reckoning leg will be required to be demonstrated using traditional techniques.
- Once the diversion leg and satisfactory demonstration of 'dead reckoning' has been achieved, the examiner will restore all GNSS capability for use by the candidate during the remainder of the test.
- Throughout the test, the candidate will be expected to deal with any actual GNSS or device failures in an appropriate manner and continue the test.
- The integration of GNSS capability into cockpit workflow and airmanship will be assessed throughout the test in the extant airmanship sections.

11. **It is suggested that the above changes do not require Part-FCL regulatory change, and can be implemented wholly by appropriate guidance changes in the Standards Document and Flight Examiner Handbook.** In time, it may be possible to ascertain that failure of GNSS assistance for the diversion leg is equally unrealistic, but while Part-FCL specifies 'dead reckoning' it is appropriate to continue to check competence in this way.

⁴ For example, the mapping on an IFR device such as the Garmin GNS430W, GTN650, or G1000, or the Avidyne IFD440, is not suitable as the only mapping display for a VFR navigation flight, but other indications should as track, groundspeed and position are suitable.

12. It is suggested that these changes will encourage evolution of PPL/LAPL training under FCL.210 exercise 18c (Radio Navigation) of the current flight training syllabus and FCL.215 section 9.2 of the theoretical knowledge syllabus to reflect best practice. This will encourage appropriate and effective utilisation of GNSS tools in the cockpit, guided in a controlled and professional manner by Flight Instructors and Examiners. This will replace the ad-hoc self-learning of equipment post license issue with a structured training programme. Regulatory change is not required, and the change can be implemented with ease. However, the temptation to subvert the issue into a detailed analysis of GNSS equipment technology/failure modes must be avoided and the focus remains on sensibly allowing pilots to utilise their own carry on equipment and manage it accordingly.