17a – FLIGHT PLANNING

SPL syllabus: Exercise 17a Flight Planning			
(i)	**Weather forecast and actuals**	**(vii)**	**ICAO flight plan where required**
(ii)	**Notices to aviation (NOTAMs) and airspace considerations**	**(viii)**	**Mass and performance**
(iii)	**Map selection and preparation**	**(ix)**	**Mass and balance**
(iv)	**Route planning**	**(x)**	**Alternate aerodromes and landing areas**
(v)	**Radio frequencies (if applicable)**	**(xi)**	**Safety altitudes**
(vi)	**Pre-flight administrative procedure, including preparation of additional required equipment, as applicable (e.g. life vest, personal locator beacon)**		

INTRODUCTION

With the complexity of today's airspace, the threat of litigation and the possible loss of one's license from airspace violations, modern GPS based moving maps with airspace warnings are all but essential. Every cross-country glider pilot should be strongly encouraged to use a moving map of some sort, with up-to-date airspace, as their primary navigation tool.

However, pilots also need to be able to navigate should that system fail. We need to teach them the process for planning and executing a flight as well as the detailed knowledge and skills required to do it.

A pilot's approach to navigation will vary depending on equipment capability, but for our purposes we should consider the typical equipment used by an early cross-country pilot – a moving map GPS – perhaps an Oudie or phone app – supplemented by a paper chart.

Additionally, pilots should develop the skills to use the radio on cross-country flights – see chapter K Radiotelephony

To complete the training course for an SPL pilots will be expected to demonstrate the required skills in practice.

Part SFCL breaks these skills down into 3 areas:

- 17a - Flight planning (important pre-flight preparation and study)
- 17b - In flight navigation
- 17 c - Cross-country techniques

THEORY

Airspace

The airspace structure in the UK is complex. There is both permanent airspace and temporary airspace – the latter usually notified via a NOTAM.

The definitive resource containing all the information you'll ever need, is the Aeronautical Information Package (AIP), found on the AIS (Aeronautical Information Service) website.

The AIP covers airspace classifications, altimeter setting procedures, details of all danger, prohibited and restricted areas, details of parachute dropping sites, charts of airspace and gliding wave boxes, etc. It is worth delving into, but the CAA Skyway Code is much easier to digest. Available at: https://www.caa.co.uk/publication/download/16110 There is information on the edges of the 1:500,000 chart.

Trainees should understand the main classes of airspace i.e. A, D, E and G. Classes B and F are not currently used in the UK

A – Not available to gliders other than under the terms of a specific Letter of Agreement (LOA).

D – The most common Controlled Airspace at low level. Gliders can enter with a clearance, but unless you are in an area that is used to dealing with gliders you may have difficulty. Brize Norton is an example.

E – Effectively uncontrolled airspace (Class G-like) for VFR gliders, controlled airspace for IFR gliders. So, no communication with ATC required if VFR. ***Gliders are unlikely to be able to obtain an IFR clearance***.

G – Free for all, see and avoid (ideally supported with EC)

Further information is available on CAA websites

The most practical ways to teach airspace and its numerous classifications is to use a 1:500,000 chart as a study aid. It is important to make sure that the airspace data that you and your trainee are using is current or make it clear that you are using an out-of-date map.

It can be used as material to test a trainee's knowledge, by getting them to identify different map symbols and then asking five main questions:

- What does the symbol/area denote?
- Can we fly in it?
- How can we find out if it is active or not?
- How high is the top or bottom of the area?
- On what altimeter setting? QNH? QFE?

Figure 1 above provides a couple of examples:

Question	**Answer**
What is symbol with the red diagonal lines?	A restricted area (co-incident with a MATZ)
Can we fly in it?	Read the note on the edge of the chart for R313. We find that we can telephone Waddington before we go or call on 119.500 to obtain information as to whether we can fly through it or not.
How high is the area?	9.5 means 9,500' above sea level (QNH), not above ground. When R313 is not active it reverts to a standard MATZ.
What is the circular symbol with red dots around Wickenby?	An ATZ.
What is the ATZ's radius and how high does it go?	1.5NM and 2000' on Wickenby's QFE.
Can we fly in it?	At the very least we must speak to the airfield. For some permission is a requirement; see Laws and Rules.

Vertical navigation – (altimetry)

For a fuller explanation of vertical navigation – refer the trainee to Bronze and Beyond. But a few key points:

When flying, there is a potentially confusing choice of reference levels for altimeter settings. The three in general use (see the grid following and Figure 5) are all important, helping a pilot understand height above ground, or the airfield height in relation to airspace or separation from other aircraft.

Abbreviation	**Reference**	**Correct terminology**
QFE	Airfield	Height
QNH	Sea Level	Altitude
SPS	Standard Pressure Setting (1013.2 hPa)	Flight Level

Pressure settings

We should teach trainees to fly on QNH whilst cross-country or using the standard pressure setting if above the transition altitude and close to airspace (most nav' systems will allow a box showing Flight Level which avoids having to make changes in altimeter setting).

They have the option of changing back to QFE when they get back to the airfield or remaining on QNH. There are pros and cons:

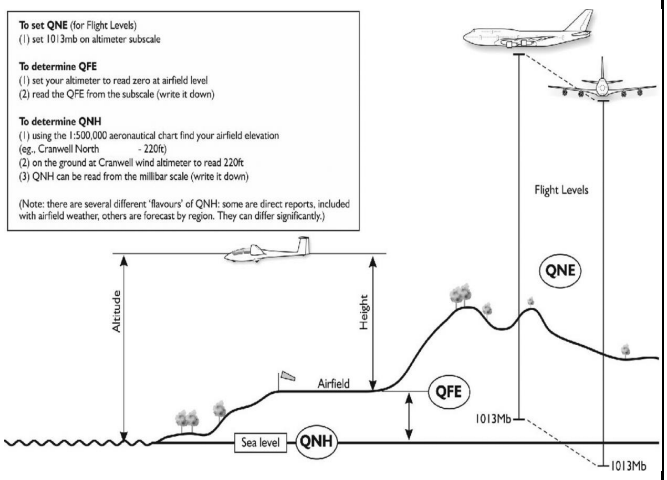
- Staying on QNH means that you do not have to switch altimeter settings. However, airfield elevation needs to be considered for final glide calculations (a nav system will do this automatically) and the circuit.
- Switching to QFE makes the circuit simpler, but they must remember to do it (perhaps an addition to the pre-circuit checks).

Each part of the country has an altitude above which Flight Levels are used. This is called the Transition Altitude. For much of country it is 3000 feet, but for areas close to a TMA or CTA it tends to be higher – often 6000 feet. In practical terms, glider pilots do not need to worry about the Transition Altitude, other than to be clear when to look at which Flight Level they are at, rather than altitude, if the base of local airspace is defined as a Flight Level.

From a practical point of view, trainees must be able to manipulate and understand the altimeter subscale to help them keep clear of relevant airspace. Some simple rules which can help keep pilots out of trouble, especially with airways.

Flight Levels effectively go up (i.e. in relation to the ground) as atmospheric pressure increases, and down when it decreases. If you leave your altimeter on QNH on a day when the pressure is 1013 or higher, your indicated altimeter reading will still be below the airway. So, when climbing on a low-pressure day, set 1013 early if underneath airspace defined by flight levels. If you insist on leaving it on QFE on a low-pressure day, having taken off from a high airfield, it is possible for an airway to easily be more than 2000' lower than your altimeter indicates. Watch out!

With many modern nav systems it is possible to have a nav-box which shows Flight Level – this might be a good strategy to discuss with the trainee. It is in any case important that the trainee knows what the primary altimeter is set to and changes it when appropriate.



Flight Planning - Practical Considerations

To reach SPL standard, pilots must be able to self-brief. To achieve this, it is helpful to have a systematic approach to planning a cross-country flight. This should include the following items:

(i) Weather forecast and actuals Demonstrate to them a practical process for weather briefing – perhaps starting with the big picture and working down to the detail. For example:

- current weather radar picture
- winds - current and forecast on the ground and at likely flying heights
- the synoptic picture
- the soaring forecast (cloud base, cloud cover, thermal activity)
- significant weather forecast (as we acclimatise to the flying conditions, it is all too easy to overlook a gradually deteriorating situation.)

There are multiple sources of information: paid and unpaid. For gliding RASP is free, and SkySight and TopMeteo good paid options. Windy.com can provide a lot of useful information. The Met Office publish useful synoptic charts and weather radar. Encourage the trainee to develop their own process.

By looking at a fairly wide area, a sensible choice can be made of route later. If the trainee aspires to become a successful x-country pilot encourage them to understands tephigrams which will give them a greater insight into understanding the forecast.

(ii) Notices to Aviation (NOTAMs) and airspace considerations It is important to check that the airspace information that you are using is current. The pilot should know where the airspace files in the GPS have come from, what they include, and what date they were valid. There may be subsequent changes (perhaps NOTAMed), and the pilot must be aware of these changes/additions.

NOTAMs are notices issued by the CAA to inform airspace users about aeronautical facilities, services, procedures and hazards designed or changes to airspace – temporary or otherwise. The challenge is to sift through much irrelevant information to find the important points. These are the things that will affect the conduct of the proposed flight (for example the imposition of a temporary restricted area – RA(T)) or might affect our route planning.

There is no single, best, source of NOTAMs. Each has its own advantages and disadvantages.

The official source is the AIS website nats.aero/ais. You will need to login, but it is free to register. A NOTAM decode is also available on the AIS site. It primarily uses a 'text only' presentation that is particularly difficult to interpret and easy to misread. Use of the AIS web site is logged, and being able to prove that you have received an official briefing at a particular time may be helpful but using a visualisation system is helpful. There are several unofficial, systems offering graphical representations. However, should you choose to use another source the pilot will be responsible for an infringement if it is on AIS website and omitted by an unofficial provider. Whichever you use - take care.

Before you start to rely on them, you need to be familiar with the software and any quirks it has, and how to set it up. These systems include:

- SkyDemon. A good source of NOTAMs, which presents complex NOTAMs well. It requires a paid subscription.
- SPINE (Soaring Pilots' Intelligent NOTAM Editor). A PC based system which gives a graphical NOTAM representation.
- The NOTAM tab on the Airspace Select website, which can provide an overview (and provide airspace files for complex RA(T)s which are planned).
- NOTAM Info – a website giving a good overview of NOTAMs but has been known to miss important ones.
- It is important to understand that the times given in NOTAMs are UTC (so add an hour to get local time (BST) in the summer).

All NOTAM systems have a delay between NOTAM publication and them appearing on the site. You can call the AIS information line on 0500 354 802 to find out about things that have appeared since you checked or had not made it into the data. This lists all major Temporary Restricted Areas, Airspace Upgrades, and emergency restrictions on flying, e.g. due to an accident or incident.

(iii) Map selection and preparation

It is a legal requirement to carry suitable and current charts for navigation. Whilst these can be electronic, a backup is needed, and it makes sense for this to be a paper aeronautical chart. When planning the route, it may be easier to check the airspace en-route on a paper chart. This can be particularly important given that many early-stage pilots are flying with low-cost devices with small screens which may not be adequate for a good appreciation of airspace and may not be dependable.

For the GPS moving map system it is important to have a current airspace file. Some systems can automatically update, but it is not always clear what the valid date of the airspace file is. In that event, it is better to download a known file from, for example, Airspace Select. The user can customise the airspace shown on the GPS, to some degree (for example, the height to which airspace is shown) and to include Letters of Agreement that give access to otherwise disallowed airspace. Also, it is possible to select airspace representations that show the level of blocks of airspace on the map, which can be very useful.

In the UK there are basically two aeronautical charts to choose from:

- The CAA 1:500,000 which is good for longer cross countries and works well in conjunction with a GPS.
- The CAA 1:250,000 shows a higher level of detail and might be useful for shorter cross countries in hilly terrain. It is important to note that it does not show airspace above 5,000 ft / FL 55, so needs to be used with care, if at all.

It is important that the map is folded appropriately. A glider cockpit in the air is no place to re-fold a map.

(iv) Route planning

A suitable route can be chosen based on the skills and desires of the pilot, taking into consideration the weather, notams and airspace considerations. Other factors to consider are the airspace (ATZ, Class D), terrain in mountainous areas, the state of land out fields, the availability of other land out options, and relevant frequencies (if any) at these sites. Do not task under low airspace ceilings (< 4,000 ft AGL), or just upwind of 'forbidden' airspace as wind-drift when thermalling will inevitably push the pilot into it.

Particularly for early-stage pilots, the route should be eminently achievable given their likely slow cross-country speed.

It is very disappointing for a trainee to complete a badge flight and find when it is not valid after you/they realise they have not followed the rules for claiming the flight. The FAI sporting rules do change from time to time to encompass changing glider performance and GPS recording technology. The Sporting Code is available online and gives the detail of what is required for badge flights. Issues to watch out for include:

- The allowed length of start and finish lines
- The reduction in task length caused using 'barrels' or 'thistles' at turn points
- The reduction in task length caused by the difference in start and finish height

The route should be marked on the map with an indelible marker (if you use a coated map, the marker can be removed with white spirit). See Figure 6. As the electronic map will give the pilot the range to a TP (and bearing), it is useful to mark range marks (every 10 kms) from the next TP thus giving the pilot an instant 'where are they' on the map. Turn points should be left clear (put a clear circle around a TP. Highlight possible land out sites / airfields and ensure radio frequencies are on the chart (and readable). The wind should be marked on the map. Relevant NOTAMs should be marked on the map and if close to track significant airspace highlighted.

Once the route has been planned, and the map marked up, it needs to be studied, so that the trainee knows what their route, safety, land out and airfield bolthole airfields are. Particular reference should be taken to the 'big feature' navigational features – large / distinctive towns, lakes / rivers /canals, motorways crossing route, large woods, etc (either side of the route as the pilot will take the best energy line) – these will greatly assist in locating oneself and lead to accurate navigation. Particular attention should be paid to airspace positions and levels, and NOTAMs.

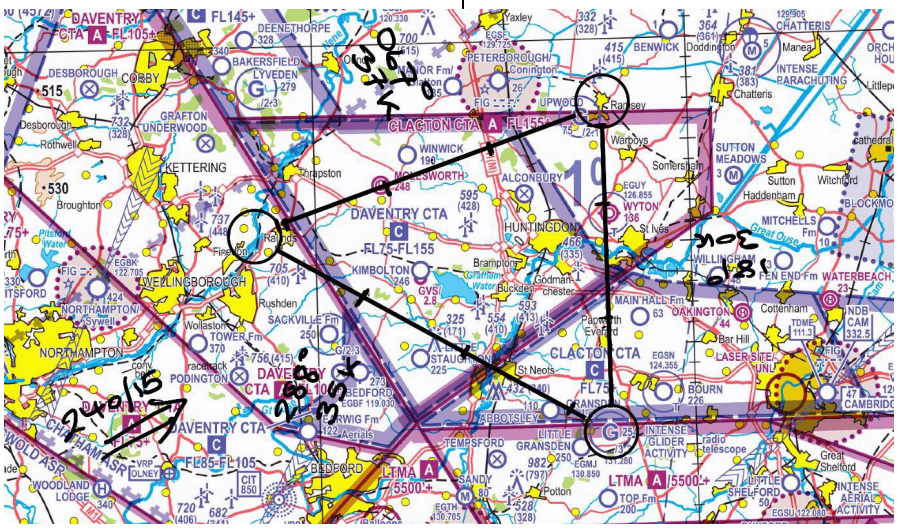


Figure 6

(v) Radio frequencies (if applicable)

The pilot does not need a FRTOL licence to use the standard gliding channels but strictly speaking a licence is required to communicate with using other frequencies e.g. to contact some aerodromes, AIS etc. Whilst it is worth encouraging pilots to get a FRTOL, remind them that in some situations it is better to communicate as needed even without a licence – e.g. when needing to land out at an aerodrome etc. The pilot should ensure that they have up to date radio frequencies to hand in to communicate with airfields or air traffic as required.

Sources for these include:

- NATS Frequency Reference Cards
- Airfield frequencies in electronic data such as airspace files (ASSelect), and the Airfield and Land out package from Paul Ruskin (ruskin.me.uk/gliding-data)
- Frequencies programmed into a radio are a little more difficult to manage and care needs to be taken to ensure that they are current.

Particularly for early flights, it is sensible to have the frequencies likely to be needed written on a single planning piece of paper along with relevant NOTAMs, or even better on the chart.

(vi) Pre-flight administrative procedure, including preparation of additional required equipment, as applicable (e.g. life jacket, personal locator beacon)

Trailer and retrieve. Before the flight sort out the retrieve equipment and arrangements. Make sure trailer is serviceable, and crew or pilot knows how to de-rig and what additional equipment they may need to bring – trestles, de-rigging tools etc.

Also consider what other equipment is required, for example:

- Sunglasses/ suncream / lip cream.
- a hat (long flights in sunshine will cause problems if you do not have one – avoid large brims that prevent adequate lookout such as baseball style caps).
- drinking water.
- pee bag system / other suitable arrangements.
- food & sweets to suck to keep mouth moist.
- a survival blanket (easy and small to carry).
- a warm coat in case of land out.
- a personal locator beacon. That normally needs to be registered, and the battery checked in line with the instructions.

Ensure the item are all properly stowed – no loose items in the cockpit.

(vii) ICAO flight plan where required

An ICAO flight plan is a legal requirement if the flight crosses an international frontier – so, unlikely to be needed in the UK, but might be if flying in, say, the Alps.

There are various ways to file these online, and the flight plan will need to be activated via a Flight Information Service once airborne and closed before landing.

(viii) Mass and performance

Mass and performance are not generally an issue with gliders, albeit the use of water ballast is appropriate for some gliders in some conditions. That is unlikely to be the case with early-stage cross countries though. Always refer to the flight manual.

(ix) Mass and balance

The consideration of mass and balance (Centre of Gravity) are a normal part of our pre-flight checks that are conducted ahead of every flight.

(x) Alternate aerodromes and landing areas

It is possible to fly cross-country making use of known land out areas or places. This is not necessary in much of the UK for much of the year, but in inhospitable areas such as mountainous terrain, over large, wooded areas, or over small field areas (Devon, The Dales, moors etc) it can be a necessary discipline.

In that case it is necessary to know where the available landing places are, and to stay at a safe glide angle to those places. In the event of descent to that limiting glide angle, the action taken should be to immediately fly towards the safe landing place.

(xi) Safety altitudes

The concept of a safety altitude is an altitude above which there is no possibility of hitting terrain or an obstacle on it. That can be very useful in powered flight, particularly in poor visibility or IMC – it is less useful in a glider which will usually be remaining VMC or at least clear of cloud.

