



BRONZE &
BEYOND

A glider pilot's guide

JOHN McCULLAGH

Note

Whilst every effort has been made to ensure that the content of this book is as technically accurate and as sound as possible, the author cannot accept responsibility for any injury or loss sustained as a result of the use of this material.

This book is only intended as a guide to glider pilots. This book is not to be taken as a definitive interpretation of any aviation law, rule, regulation, procedure or information. The competent authorities for definitive interpretation are the Civil Aviation Authority and the British Gliding Association, where it has been delegated this responsibility.

Rules, regulations and procedures change frequently. It is good practice to update and check your knowledge regularly.

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PREFACE TO FIRST EDITION

There are many books for glider pilots about how to fly, meteorology and aerodynamics. However, unlike the books for power pilots, none of the current books for glider pilots seems to cover everything that a British cross-country pilot should know. This book is an attempt to fill the gap.

The aim has been to be as brief as possible so that essential information is not lost in excessive detail. As a result, many of the things that a competent solo pilot should know already have been excluded. The test for inclusion for the remaining material has been “would they be better or safer pilots if they knew this?” Consequently some topics, especially meteorology and aerodynamics, have been pared down considerably compared to other books, though some background has to be given.

Many people will want to know more about some subjects and so a list of the books that are available for further reading has been provided. In particular The British Gliding Association publishes a booklet on air law as it affects glider pilots and on its operational regulations, *Laws and Rules for Glider Pilots*. Although the *Laws and Rules* have been quoted in a few places, this book does not attempt to replace it. You must also read the BGA’s *Laws and Rules* in addition to this book.

This book is not a substitute for practical instruction in cross-country flying. In particular, dual flights with qualified instructors are essential to learn about flying cross-country and about landing in fields. You should also listen to as many experts as you can, and you should read other books and *Sailplane & Gliding*. These will all reinforce and supplement what has been covered in this book. You must also be fully briefed in advance of your first cross-country flights to ensure that you are aware of the conditions and the airspace restrictions that apply at the time.

Because this book has been aimed only at British pilots, it has a more limited market than other books on gliding. The economics of printing mean that a long period may elapse before an update can be issued. A web page, <http://www.mccullagh.demon.co.uk/update.htm>, has therefore been set up to notify readers of important amendments. All constructive criticisms and suggestions are particularly welcome and will be posted to the web-site, if relevant. Please send your ideas and corrections to me by e-mail to john@mccullagh.demon.co.uk. Your contributions will be acknowledged on the web site and in future editions of this book. The more people who make suggestions, the better this book will become in future.

In a few places I have said “he” when it was difficult to construct a non-gender-specific sentence. Some of my examples are centred on Lasham, but they should be understandable elsewhere. I hope that I have been unbiased otherwise.

As ever in British gliding there is the usual mixture of units: knots, kilometres, feet and metres to help us to practise our mental arithmetic. A conversion table is at the end.

PREFACE TO THIRTEENTH EDITION

The syllabus for the theoretical knowledge for the licensing of glider pilots throughout Europe has been agreed. The full transition to EASA licenses will take several years but the Bronze Paper was updated this year to reflect the additional requirements and the last edition of this book was expanded to take this into account.

No great changes since edition 12, but if you think that you could not adequately prepare for some of the questions in the new papers, please contact me (john@mccullagh.biz) if you would like to make any constructive input for the fourteenth edition. Any amendments to be included in the thirteenth edition will be published on the update page of the web-site <http://www.mccullagh.demon.co.uk/update.htm>

I am especially grateful to the following people for reading the various editions and for making suggestions:

- Ken Stewart
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- Peter Wyld

I made many subsequent changes to the drafts that these people read, and then made many changes in the later editions, so any remaining errors are entirely mine.

John McCullagh
September 2012

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AIR LAW - INTRODUCTION

Introduction

As the title of the first chapter of a book, Air Law probably is one of the most off-putting. Fortunately it is not too difficult to understand the regulations that allow us to fly. Furthermore the subject has been broken up into more digestible chunks by creating several smaller chapters.

Where the law comes from

In 1944, 52 countries signed a document called the *Chicago Convention*, but there have been many new joiners and modifications since. The Convention established an organisation called The International Civil Aviation Organization (ICAO). ICAO is now an agency of the United Nations. Do not confuse it with IATA which is just for airlines.

The Convention defines international standards for aviation in matters such as airspace, aircraft registration and safety. Since aviation often involves crossing frontiers, all aircraft should follow the minimum standards of this convention. This will give some comfort should you ever encounter a French glider coming at you head-on. Both of you will (or at least should) give way by turning right.

Although the *Chicago Convention* only makes recommendations, the UK uses these as the basis of its statutes. The statutes include the *Air Navigation Order* (ANO) and several other statutory instruments.

To UK law must be added the requirements of the European Aviation Security Agency (EASA) for airworthiness and eventually on licensing. EASA is a body of the European Union which defines even more detailed common standards for European countries. Previously the civil aviation authorities of European countries co-operated through Joint Aviation Authorities (JAA) through a series of requirements, the *Joint Aviation Requirements* (JAR). JAA is gradually being absorbed in EASA. EASA's regulations and UK law are enforced in the UK by the Civil Aviation Authority, a government agency.

EASA's regulations can be found at:

<http://easa.europa.eu/level1/enlangverstempl.html>

Key ICAO standards

You need not know much about each article of the *Chicago Convention* except a few important provisions:

- Each state has sovereignty over its airspace
- Every aircraft shall comply with the rules of the air
- Radios may only be used by flight crew issued with a licence (UK law differs here - see later)
- Every aircraft must have a certificate of airworthiness
- The crew must have certificates of competency issued or validated by the state.

The Convention has eighteen 'annexes' with titles like "Personnel Licensing" and "Rules of the Air". These contain the detailed recommendations.

Publications

To comply with the Chicago Convention, each country's aviation authority issues publications describing its detailed operational arrangements. For all countries the key publications are:

- The *Aeronautical Information Publication* (AIP)
- *Notices to Airmen* (NOTAMs)
- *Aeronautical Information Circulars* (AIC)

In the UK these publications are produced by the Aeronautical Information Service (AIS), which is part of National Air Traffic Services (NATS).

Like all ICAO countries the UK publishes an AIP. It describes airspace; obstacles; wave windows for gliding; the facilities at each aerodrome; navigation aids; and services for weather, search and rescue and air traffic control. If you want to know the exact co-ordinates of some controlled British airspace, or the directions of the runways at an airfield, the UK AIP is where you should look.

NOTAMs (see later) describe temporary or permanent changes to airspace and aerodromes. For example, if the Red Arrows wanted to put on a display in the UK or someone wanted to fly a kite to a great height, a notice for everyone else to stay clear would be published in a NOTAM.

Air law

The Air Information Circulars (AICs) are published monthly and contain permanent amendments to airspace and charts, advice on operational, safety and administrative matters.

All AIS's publications are available on website of the Aeronautical Information Service (registration is free) .<http://www.nats-uk.ead-it.com/public/index.php.html>

Summarised information about the current NOTAMs and other temporary changes can be obtained from AIS as a Pre-flight Information Bulletin (PIB).

Another piece of terminology is Aeronautical Information Regulation and Control (AIRAC). This is the procedure in the *Chicago Convention* that ensures all this information from AIS is published around the world for the benefit of anyone who may be flying into the country. The AIRAC procedure also ensures that enough notice is given before a change becomes effective.

In addition to meeting its international obligations, the CAA publishes a wide range of other documents on many aspects of aviation such as radio procedures, engineering issues, safety, human factors and accident reports. These are available from its web site and by subscribing to its e-mail services..

The British Gliding Association

The British Gliding Association (BGA) has been responsible for gliding in the UK since the sport started here. Over the years the BGA has satisfied the authorities that it is able to control the clubs, the gliders and the pilots. The certification of pilots; airworthiness; the registration of gliders; the training of instructors and engineers; and the investigation of minor accidents had all been delegated to the BGA.

This position is changing. More functions will come under the direct control of the Civil Aviation Authority, though some delegation will continue. At the time of writing the BGA's own publication *Laws and Rules for Glider Pilots* still contains important operational regulations and recommended practices (see later chapter). A prudent pilot would do well to observe them. A court of law that was considering a case of negligence would not be impressed if you had disregarded them.

The next chapters on air law & op procedures

After this fairly academic beginning, the remaining chapters on air law are more practically based. These chapters are:

- Airmanship and rules of the air
- Altitude
- Airspace
- Visibility
- Key operational procedures

It is planned that the topics covered in this first chapter and the five listed above will cover the Air Law and Operational Procedures paper that all pilots will eventually have to take before going solo.

Summary

This chapter can be summarised as saying that throughout the world all pilots follow a broadly similar set of rules. In the UK these rules have been codified by *The Air Navigation Order 2010*. Detailed operation matters are defined by AIP and any changes appear on AICs and NOTAMs. The regulations on airworthiness, and soon on licensing, are defined by EASA.

Questions

1. What international organisation defines minimum standards for air navigation?
2. Where would you look for a list of temporary hazards that you could encounter today?
3. What publication gives the recommended procedures for aerotowing gliders?
4. What document contains information about specific aerodromes, dimensions of airspace and other aeronautical services?
5. What does 'ANO' stand for?

AIRMANSHIP AND RULES OF THE AIR

Introduction

Airmanship can be defined as good decision-making, good manners, defensive flying and applying common sense. This chapter describes some of the related rules and procedures.

Risk of collision

The greatest risk that glider pilots face is collision, so a good look-out is essential at all times. It is the responsibility of “the commander of an aircraft to take all possible measures to ensure that his aircraft does not collide with any other aircraft.”

The most likely places that you will encounter another aircraft at the same height are when you are on the circuit into an airfield and when you are in a local thermal, so vigilance should be greatest here.

However, you should also appreciate that the risks of collision continue when flying cross-country. This is because gliders do not spread out evenly, but will congregate in good lift, under cloud streets, near turning points, at other airfields and where the airspace channels them. Elsewhere the random chance of an encounter with another aircraft, though less, is still significant.

The risk of collision not only arises from other gliders, but from other users of airspace. These are usually light aircraft, but you can expect to encounter small passenger aircraft, military aircraft (from small jets to large transports), paragliders, hang-gliders, micro-lights and balloons. They will also congregate near their own sites and in channels between areas of controlled airspace..

Many power-pilots incorrectly assume that they will be warned by radio of conflicting traffic. Their aircraft will also maintain the desired height and course with very little intervention. Consequently some power-pilots may spend less time looking out than glider pilots. In addition, gliders have small cross-sections and are easy to miss. Glider pilots have to compensate for this by even greater vigilance.

Fortunately the sky has a large volume and random separation usually works, but this is not a guarantee. The greatest protection is provided by keeping a good look-out, not flying in another glider’s blind-

spot, fitting a FLARM anti-collision device and by staying well clear of cloud.

Closing speeds

Distant aircraft with a small cross-section can appear very quickly. Spotting these needs great vigilance and better eye-sight than is specified by the number-plate test for driving.

A glider approaching your thermal may appear as a small object when you first see it, but after you make one more thermalling turn, it will be a kilometre closer. Furthermore, the other pilot may still not have seen you.

The head-on image of an aircraft is initially small, and will grow in size only slightly, until close to impact, where it suddenly appears to ‘explode’ into the field of view.

30 sec from collision

2.4 km away. Closing speed 150 knots



10 sec from collision

800 metres away



3 sec from collision

240 metres away

If you hold this page one metre away, the images above are about the same apparent size as in reality.

Although the closing speed of two gliders might be 150 knots, a light aircraft and a glider may have a closing speed of over 200 knots. The time available to react is reduced proportionately. Moreover, a military jet may have a closing speed of over 600 knots, reducing the reaction time in the diagram above by a factor of four, but fortunately military jets, when operating at this speed, tend to be either

Airmanship and rules of the air

lower or higher than gliders, except in mountainous areas where gliders and military jets can be at similar heights.

If you spot a potential collision hazard, just turning the glider will increase its visibility and will increase the chance of the other pilot also taking avoiding action.

Vision and look-out

The detail that we see across our field of view varies because of the structure of the retina at the back of the eye. This can be divided into three areas:

- A small oval shape (the fovea) that subtends only about 3° comprised of receptors called cones, where we see detail in colour
- A secondary area comprising a mix of cones and other receptors called rods with worse resolution
- A third area of peripheral vision comprising only of rods, which are mainly sensitive to sudden movement.

Rods are not as sensitive to colour. Consequently vision is increasingly monochromatic as images move away from the central fovea. We can only resolve any detail in a very small arc of vision. (Try fixating a word in the middle of the page and then recognizing adjacent words.)

Each eye also has a blind spot where the optic nerve connects to the retina. An object that is focused just on a blind spot will not be seen by that eye. Normally you use two eyes, but if anything obstructs one eye, such as the canopy frame, the other eye can miss things.

Be aware that when a pilot is operating with an empty field of view such as blue sky, the eyes will tend to focus at a point 1 to 2 metres away. You must actively look for objects on which to focus, such as the horizon, or even just the wingtips.

How to look out

An effective technique for looking-out is a habit that must be learned. Even if you are looking out most of the time, it is still easy to miss other traffic, unless you look systematically. In mountains the irregular background can reduce the contrast of another aircraft's image even more.

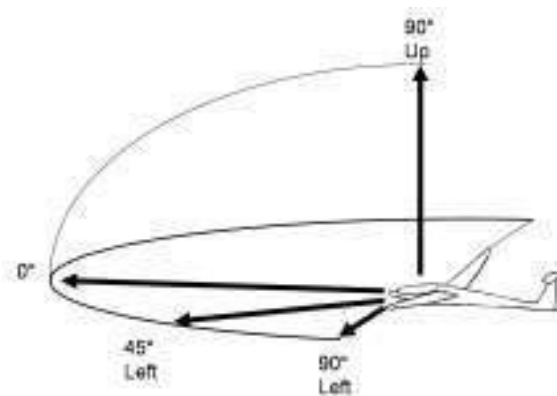
It is easy to become fixated on just one thing instead of looking out all around regularly. This

object could be the next cloud, just one of the gliders in your thermal, the instruments, the map, your lunch or something on the ground. By concentrating on just one object, you can easily miss another aircraft nearby.

As mentioned already, our field of view can be divided into three areas: a small oval shape where we see detail, a second area with worse resolution and a third area of peripheral vision, which is mainly sensitive to sudden movement. (The 3° of primary vision is not much larger than the area of a full-sized altimeter on the instrument panel as seen from the pilot's seat.)

The secondary area is inadequate to notice a small but rapidly closing object. You must, therefore, methodically fix your gaze in each direction to use your primary vision. Do not just swivel your head about without pausing.

Try to maintain a steady rate of scanning throughout the flight rather than ten minutes of extreme scanning followed by very little.



Half the scan cycle. At each point in the horizontal cycle, look above and below the horizon.

Look ahead, then horizontally to the side at 45° and then at 90° , or more if possible. At each of the horizontal points, also look above and below the horizon. Look overhead, and then check the attitude and perhaps the instruments, before checking the other side of the glider. This cycle should be repeated as often as possible.

Note that the greatest risk comes from other aircraft that are at the same height. They will therefore be on or near the horizon, and may be difficult to spot against this background. Consequently looking up at clouds or down at the

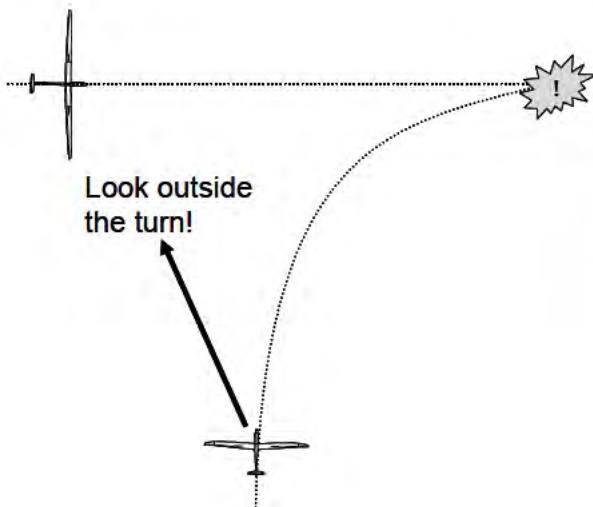
ground does not count as a major part of your look-out. A threat can easily appear within 30 seconds, so if you have not looked all round for this long, you are trusting in another pilot's look-out.

If an object does not seem to move across your field of view, it is on a collision course. There is a saying "Constant bearing = constant danger". Furthermore, if the threat is not moving across your field of view, it will not be picked up by your peripheral vision, because this part of your vision is not sensitive to stationary objects. Read that sentence again. It means that if you do not look directly at the threat, you will not see it.

Displaying a poor look-out is a certain way to fail a check-flight. You will not be allowed to fly solo again until a good look-out habit has been learned.

Looking before turning

In your early flying lessons you were probably taught to look where you will be turning before you started to turn. However, looking in just one direction is insufficient.

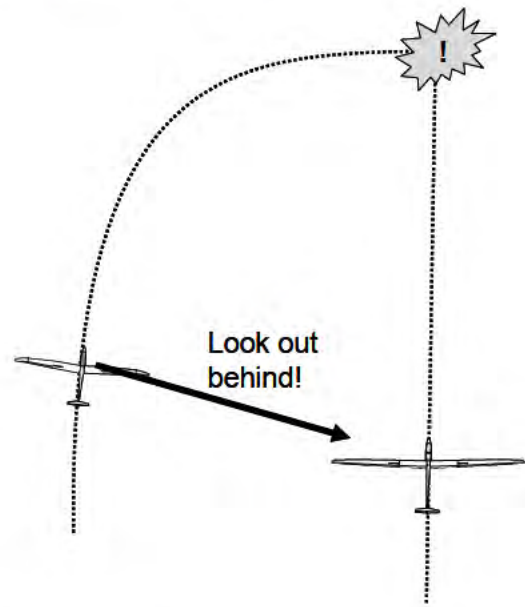


However a rapid 180 degree scan just as you turn is not practical. You should therefore have done your clearing-lookout well beforehand by scanning from the outer wingtip.

Just before the turn, look beyond the wingtip in the direction of the turn and then back over the nose before turning. Once turning you will need to check the horizon for speed control, but you also need to keep checking inside the turn and elsewhere.

Although the other aircraft should see you, do not rely on this; the pilot may be distracted and could be looking elsewhere.

In the diagram below, the right-hand glider might be even further behind and so would be invisible from the left hand glider, until the pilot started the turn. A continuous look-out during the turn is therefore essential.



Looking out in thermals

Special considerations apply when thermalling with other gliders. Not only should you monitor all the gliders in the thermal, you must also continuously check that no-one else is about to join or fly through the thermal.

Gliders should circle in the same direction in a thermal, and gliders already established in the thermal have the right of way. If someone joins your thermal at a similar height and circles in the opposite direction, they probably have not seen you. Even if you found the thermal first, change direction to prevent a conflict or, if necessary, leave the thermal.

Join thermals at a tangent to the circles of the existing gliders, ensuring that the gliders already turning are not forced to make a manoeuvre to avoid you.

Pilots should keep to the principle of 'see and be seen'. Wherever the lift may be, your first responsibility is to keep the other gliders where you can see them AND where they can see you. You

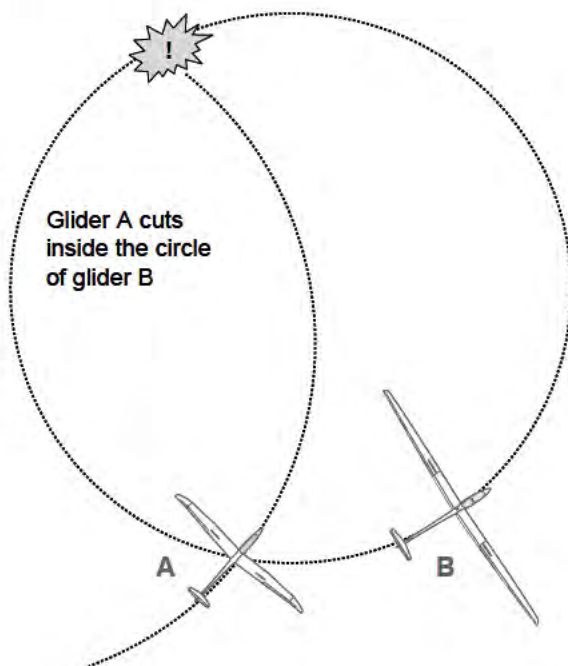
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must be able to keep track of all gliders in your vicinity.

Waving at the other pilot in a shared thermal is not only friendly, but confirms to the other pilots that you have seen them.

If you lose sight of another glider in a thermal, leave the thermal. Look around especially outside the turn before straightening up. You must get clear of other gliders, however low you are, or however good the thermal is. It is just not worth risking a collision.

If you are thermalling at the same height, stay on opposite side of the circle, even if the other pilot has not, in your opinion, fully appreciated where to find the best lift. If you start chasing another glider's tail, the other pilot has lost sight of you, and is probably cursing you. This may mean that you have to adjust your speed, or to adjust your rate of turn to match that of the other glider. These rules still apply in gliding competitions.



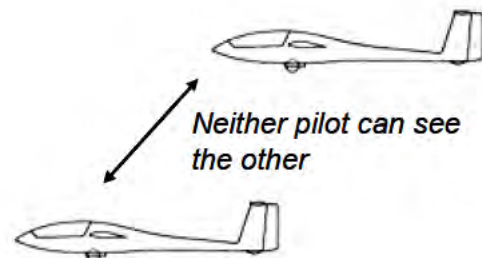
Other points to bear in mind in a thermal are:

- Never turn inside the circle of another glider
- Never fly towards or ahead of another glider
- Never fly directly below another glider. They could dive to pick up speed or even spin. You should not fly under another

thermalling glider unless there is at least 200 feet of clearance

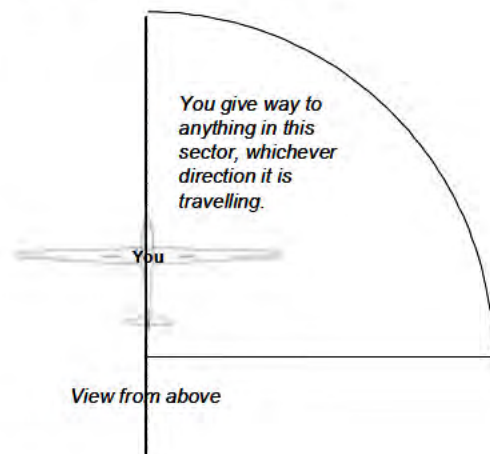
- Never fly in a blind-spot. For example, a position that is almost alongside would give you little chance, were the other glider to turn suddenly.

Some thermals have two cores so that you might find that the circles of two gliders intersect. This is highly dangerous. It would be much safer if you matched your circles in the same core.



A big risk occurs when one glider is flying slightly above and behind another. Neither can see each other. The upper glider cannot see through the floor and the lower glider cannot see behind. Be aware when 'dolphining' that another glider can be in this position.

Right of way when converging

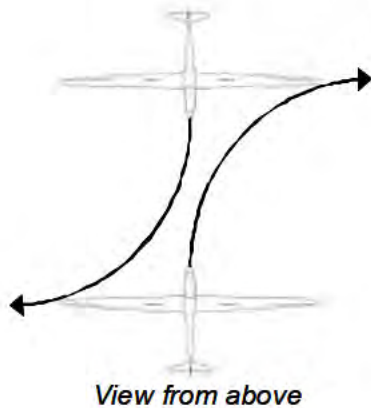


The rule on converging aircraft is simply expressed as: if you see an aircraft on your right-hand side, give way to it. Alternatively you can say 'If it's on your right, it is in the right.'

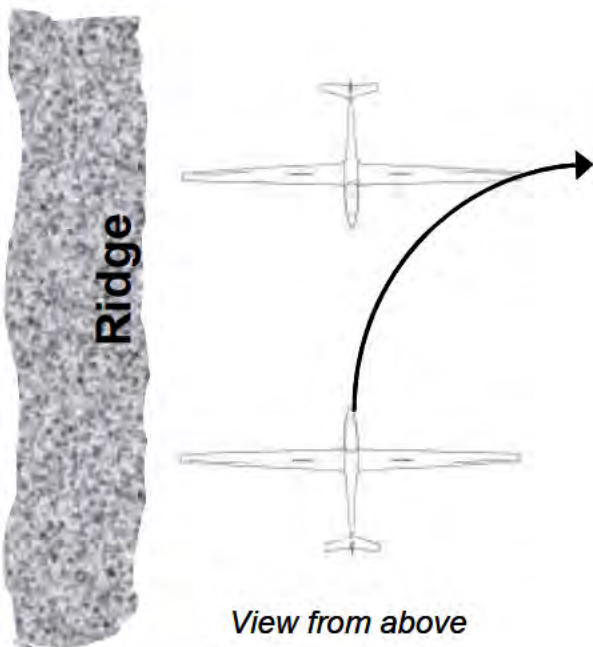
Head-on

The rule for head-on aircraft is that both should turn to the right (in plenty of time, unlike the diagram below).

The fastest way to get a safe distance between you and the other aircraft is to move vertically, ie dive or climb, but this assumes that the other aircraft does not do the same, so a turn away is also needed



Hill soaring



When flying near hills and mountains, all turns must be made away from the hill. On a ridge the same rule about head-on aircraft also applies, except that one aircraft may be unable to comply without

colliding with the terrain. Any glider on a beat with the hill on its left has a particular responsibility to keep a good look out, and to give way in plenty of time. Since a glider may suddenly turn away from the hill, you should only overtake another glider on a hill by flying between the glider and the hill.

Because they may have to give way, gliders flying with the ridge on their left should fly further out from the ridge than those with the ridge on their right.

Overtaking

Away from the hills, an overtaking aircraft should keep out of the way of the slower aircraft. In the UK gliders can pass either side of each other, whereas powered aircraft only overtake on the right.

Landing

If two gliders are landing together, the lower aircraft has precedence, but may not cut in front of another which is on final approach, nor overtake it. If you are aware that the other aircraft is making an emergency landing, you must give way to it.

“Steam gives way to sail”

Gliders shall give way to balloons, though you have the right of way with airships. Powered aircraft should give way to gliders, but do not rely on it.

Following landmarks

If you are following a road, railway, the coast or another linear landmark, you should keep right, so that the landmark is on your left. (British roads and railways tend not to be straight for very long and so compliance by gliders is uncommon.)

On the ground

After landing you can turn to clear the runway, if it is clear. If you are unsure where someone is landing alongside you, it is safer to land long and to taxi straight. The convention is that if you are overtaking another aircraft on the ground, you should land to the right of it, but most gliding sites have local procedures.

As you might expect, flying machines and vehicles shall give way to aircraft which are taking off or landing. Vehicles, and flying machines which are not taking off or landing, shall give way to vehicles

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towing aircraft. Vehicles which are not towing aircraft shall give way to aircraft.

Even if you have right of way

There is little satisfaction to be had after a collision even if you point out that you had the right of way. You can never assume that you have been seen, and you should always be prepared to take avoiding action.

Take the safe option

There are a myriad of situations where you can choose between a risky and a safe option, and it is not proposed to list them all here. The choice that you make may not be the direct cause of an accident, but may be part of the chain of events.

For example, you are flying downwind in a circuit with a much higher performance glider in front which is at about the same height. This glider will probably fly downwind further than you would want. You could wait until you get too low, or you could take the safe option of turning in early, well before the other glider, and landing further up the field to avoid a potential conflict.

During a flight the controls seemed stiffer than usual. There is a temptation to believe it was your imagination. After landing, it is essential to get it checked out, after ensuring that no-one else will fly the glider in the meantime. Bear in mind that the next pilot may encounter severe difficulties if the problem got worse. If you did nothing and a serious accident occurred, you would have to live with your conscience.

While doing a DI, you see a small fault but you are uncertain whether it makes the glider serviceable. The thermals are already booming and you think that the fault will probably not be a problem, especially since the previous day was normal. However, you have a small doubt. You should already know the answer to this dilemma. If in doubt, take the safe option. Remember that taking-off is optional but landing is compulsory.

Aerobatics

The CFI of your club is responsible for authorising aerobatic flights and has defined an area and minimum heights at which aerobatics may be performed.

Do not attempt aerobatics unless:

- You have received training
- Your glider is cleared for that type of manoeuvre and you have read its flight manual
- The weather is suitable
- You are current in that type of glider and for that manoeuvre
- Your glider is fitted with a serviceable g meter.
- You are clear of a congested area (ie a town, industrial or recreational area)
- You are wearing a parachute

Always keep your hand on the air-brake lever when performing aerobatics, or you might accidentally lower the wheel or the flaps in an attempt to control your speed.

If more than the maximum load is registered, usually 3.5g, the glider should be grounded until it has been inspected. You should also consider further training before flying aerobatics again.

Before any aerobatic manoeuvre and before practicing stalls and spins, you should perform the HASSIL checks:

- Height (sufficient?)
- Airframe (cleared for this manoeuvre, within placard limits and configured eg flaps, g-meter reset)
- Straps (tight?)
- Security (no loose objects?)
- Location (not over a built-up area or another airfield, and not in controlled airspace)
- Look-out (no aircraft nearby or below?)

Low flying

A glider shall not fly closer to any person, vessel, vehicle or structure than 500 feet, except with the permission in writing of the CAA.

Specific exemptions to the 500 feet rule exist for hill soaring, for normal take-off and landing and for life saving. Exemption also exists for competition flying, but only when within a horizontal distance of one kilometre of the persons gathered to witness the event. Detailed procedures have been defined for competition finishes.

Except with the permission in writing of the CAA, an aircraft flying over a congested area of a city

town or settlement shall not fly below 1,000 feet above the congested area or the highest fixed object within a horizontal radius of 600 metres of the aircraft, or below such height as would permit it to land clear of the congested area (whichever is the higher). The definition of a congested area is thought to include any urban area that is marked in yellow on the half million scale map.

Unless there has been specific CAA permission any aircraft shall not fly over or within 3,000 feet of any open-air assembly of more than 1,000 persons and must remain 1,000 feet above the assembly or at a height which allows it to land clear of the assembly (whichever is the higher). This part of the rule does not give an exemption for landing and taking off. A normal circuit over the Glastonbury Festival for a field landing would therefore be illegal.

Dropping objects

You must not drop anything from a glider, except for: persons by parachute in an emergency; articles for the purpose of saving life; ballast in the form of fine sand or water; or tow ropes at an aerodrome.

Flying at another site

Flying from another airfield is useful experience, and should be tried, even if you can only fly dual. You may be on vacation or your visit may be an unplanned stop on a cross-country flight and you merely want another launch to be on your way. However you should always be aware of the additional stress of an unfamiliar airfield.

Whatever the reason for your visit, you must always spend time understanding the local practices and rules, such as:

- Do they require a check-flight before you fly solo?
- In which direction do you tow to the launch point?
- How do you queue to launch?
- What is the system for log-keeping including logging of your return?
- Do I need temporary membership?
- How do you pay for the flight?
- What signals are used for launching?
- Do they use high-tow or low-tow on the aero-tow?
- How does the winch behave?
- What are the options after a launch failure?
- Are there special considerations in certain wind directions?

- To where should I ask the aero-tow to take me?
- Are there known areas of lift, sink, turbulence or curl over?
- Are there airspace restrictions?
- Are there any other local hazards?
- Are you happy about flying near a hill?
- Is there other traffic such as powered aircraft or parachuting?
- Are there minimum heights to return to the airfield?
- Are there places to lose height if you are coming down from a great height?
- What are the circuit patterns?
- Are radio calls needed to launch or to land? In what language? What frequency?
- Where do you land, and to where do you taxi?
- How do you comply with local laws about pilot licensing, glider licensing and insurance?

All this additional information and the unfamiliar surroundings will increase your stress, so you may be a less able pilot than normal. Think through each stage of the flight carefully before you take off.

Summary

Ensure that you understand the following points:

- Where the risk of collision is greatest
- How to look out systematically and effectively
- Avoiding collisions and looking out in thermals
- Rights of way
- Rules for hill soaring
- Rules for aerobatics
- Low flying limits
- Stress levels when first flying at another site

Questions

1. You have dropped a bolt and it has disappeared under the seat-pan of your glider. You have declared 300km and cumulus has started to appear. What do you do?
2. You are flying with a ridge to your left. Another glider is coming the other way. What should you do?

Airmanship and rules of the air

3. What mnemonic should be used before aerobatic manoeuvres and for what do the letters stand?
4. What angle does your field of primary vision subtend?
5. How should you look out systematically?
6. You are approaching a large town into a headwind at 1000 feet AGL, but you hope to pick up some lift over the town, so that you can get to your home airfield, which is beyond. What should you be thinking about?
7. What is the minimum height needed to perform aerobatics over a town?
8. You see a powered aircraft coming from your left, what should you do?
9. Can a glider fly at less than 500 feet above the ground when it is not taking off or landing?

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Bronze & Beyond has been written for British glider pilots who are aiming for the Bronze Badge, but it will also be useful to more experienced cross-country pilots. It provides the essential information on a wide range of topics:

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- Altitude
- Field landings
- Human factors
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- Silver Distance
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- Use of the radio
- Visibility
- Weather

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