

Soaring Society of America, Inc.

Master Instructor Cross-Country Program

Cross-Country Handbook for
Students

INDEX

Introduction		Page
<u>Section 1</u>	<u>Accuracy Landings</u>	
	Part 1 – Rationale	1-1
	Part 2 – Training Objective	1-1
	Part 3 – Techniques	
	1. General Principles	1-1
	2. Reference Point Technique	1-2
	3. Flexible Pattern Flying Technique	1-3
	4. Practical Implementation	1-7
	Part 4 – Completion Standard	1-8
<u>Section 2</u>	<u>Off-Field Landings</u>	
	Part 1 – Training Objective	2-1
	Part 2 – Planning	2-1
	Part 3 – Training Exercise	2-5
	Part 4 – Further Considerations	2-6
	1. Inadvertent Off-Field Landing – Will I Make It Back to the Field?	2-6
	2. Overshooting and Undershooting	2-7
	3. Emergency Action on the Ground	2-10
	Part 5 – Completion Standard	2-10

<u>Section 3</u>	<u>Thermal Acquisition and Centering</u>	
	Part 1 – Training Objective	3-1
	Part 2 – Suggested Text	3-1
	Part 3 – Minimum Equipment	3-1
	Part 4 – Safety	3-1
	Part 5 – Practical Considerations	3-2
	Part 6 – Training Exercise and Completion Standard	3-4
<u>Section 4</u>	<u>Speed-to-Fly</u>	
	Part 1 – Training Objective	4-1
	Part 2 – Suggested Text	4-1
	Part 3 – Practical Considerations	4-1
	Part 4 – Training Exercise and Completion Standard	4-3
<u>Section 5</u>	<u>Map Reading and Navigation</u>	
	Part 1 – Training Objective	5-1
	Part 2 – Training Exercise	5-1
	Part 3 – Training Specifics	5-2
	Part 4 – Completion Standard	5-4
<u>Section 6</u>	<u>Cross-Country Techniques</u>	
	Part 1 – Training Objective	6-1
	Part 2 – Exercise Prerequisites	6-1
	Part 3 – Training Exercise	6-2
	Part 4 – Training Specifics	
	1. Thermal Streets	6-2
	2. Where to Go	6-3
	3. How Fast	6-4
	4. When to Thermal	6-5
	5. Final Glide	6-6
	Part 5 – Completion Standard	6-7
<u>Section 7</u>	<u>Other Preparations for Cross-Country Flying</u>	
	Part 1 – Introduction	7-1
	Part 2 – Equipment Requirements	7-1
	Part 3 – Weather Planning	7-2
	Part 4 – Pilot Health and Safety	7-4
	Part 5 – Route Planning	7-7

Section 8 Use of Parachutes

Part 1 – Safety	8-1
Part 2 – Operation and Use of Parachutes	8-1
Part 3 – Training about Parachutes	8-1
Part 4 – Completion Standard	8-3

ANNEXES

- A. SSA Badge Program A, B, C and Bronze Badge Requirements (including bibliography).
- B. FAI Badges and Standards:
 - 1. Award Application Form.
 - 2. Flight Declaration.
- C. Specimen Pre-Landing Checklist.
- D. Thermal Soaring Protocol.
- E. Glider and Personal Equipment for Cross-Country.

INTRODUCTION TO THE FIRST EDITION

Dear Cross-Country Student:

The SSA instituted the Master Instructor Cross-Country Program in response to member demands for better access to cross-country instruction. This Handbook has been developed as a guide for students attending cross-country camps and other pilots starting out to fly cross-country. It summarizes the knowledge and skills needed to fly successfully cross-country. It assumes that you already have acquired (and retain) the knowledge and skills required to pass the knowledge and practical tests for the FAA private pilot glider rating.

You will observe that the contents of this Handbook are expressed in the form of ground and flight *instruction*. While many successful cross-country pilots have been self-taught, this is somewhat analogous to jumping in at the deep end and teaching yourself to swim straight after you discovered you could float and, perhaps, after having read ‘Swimming for Dummies’. A much better way, both safer and quicker, is to learn with the help of a qualified instructor.

Many glider pilots who have not flown cross-country, even those who have demonstrated good local soaring skills, perceive barriers to safe and successful cross-country flight. Some of these are physical - a lack of the various skills needed to make a safe and successful cross-country flight; and some of these are psychological - probably generalized as a fear of not getting to the planned goal, and being forced to endure the risks and danger of an off-field landing, with no assurance of the safe outcome. These psychological fears have likely been increased by personal experience, e.g. when pressing further away from the home field, finding a couple of good looking clouds in succession but discovering nothing except heavy sink, engendering a lack of confidence in the ability to stay up. In addition, turning away from the home field, breaking the umbilical cord and getting beyond gliding distance from it, is the opposite of what all previous flights have involved, namely getting back safely.

The ground and flight instruction contemplated in this Handbook is intended, in part, to contribute to a confidence building process to address and break down these psychological barriers. This includes actually making landings at new fields, and executing soaring flights which remain within gliding distance of an airport. You should remember that the underlying logic of safe cross-country flight is based on the premise that the probability of finding another thermal down the chosen route is just as high as finding one close to your home field.

A comprehensive approach should also include knowledge of the following areas, which are not covered here in detail –

- Instruments, their characteristics and operation
- Turnpoint verification for FAI Badge flights (photo and data logger)
- Soaring weather forecasts and interpretation.
- Airspace considerations.

You will notice that there are no specific references to what is usually referred to as the ‘Lead and Follow’ method of cross-country training. In fact it should correctly be described as the ‘Observe and Follow’ method, where the instructor observes and follows, allowing the student to lead, assess the conditions, and make the decisions. The omission is not because of disdain for this method, but because it does require thorough ground instruction in the areas covered in this Handbook, and also takes largely for granted the piloting skills outlined here. Accordingly, it is not a substitute for the skills and knowledge here; however it can be a good way of proceeding once you have acquired these.

What skill/experience levels do you need before taking instruction in cross-country and thereafter making a first cross-country flight? You likely need to have completed the requirements to qualify for the A, B, C, and Bronze badges in the SSA Badge Program. Details of these are included in this Handbook; in particular, the Bronze badge information includes a bibliography of sources of information useful for preparation for it. If you lack familiarity in any of the areas covered, it would be to your advantage to review these as part of your personal preparation for first going cross-country. Before making your first cross-country flight, you should also likely have earned the Fédération Aéronautique Internationale (FAI) Silver badge height and duration legs. See Annexes A and B.

Each section of the Handbook is, in principle, intended to involve a separate ground briefing and flight, or series of flights. Only if you are of exceptional skill, or have substantial prior experience, should you expect to combine these. This may be the case, for example, as regards ‘Map Reading and Navigation’ if you are an experienced airplane pilot with current dead reckoning navigation practice. In addition to setting out the needed knowledge and skills for cross-country flying, the Handbook establishes standards for completion at the end of each Section which should be actually achieved before first attempting a first cross-country flight.

Lastly, before attempting the flying exercises (or any cross country flight), *you must be in current glider flying practice*. You cannot expect to learn or benefit if the major part of your concentration is occupied in trying to keep up with the glider. Similarly, to fly solo safely on a cross-country flight, you must be sufficiently current (assuming you have previously attained the required proficiency) to be able to focus a substantial part of your time on planning and execution of the applied skills necessary.

I would like to acknowledge and thank the very many people who have contributed to this endeavor by providing material suggesting ideas, reviewing and improving drafts and, more generally, in providing encouragement towards making the Program a practical reality. In particular, I would like to thank Jack Wyman for reviewing, criticizing, correcting and improving the text; any remaining shortcomings are, however, my own.

Lastly, this Handbook is a work in process. If, once you have used it, you have any comments or suggestions for improvements or additions, please pass these on so that others may benefit.

Safe soaring!

Dean Carswell
SSA Chief Master Instructor
8041 Jordan Lane
Midlothian TX 76065-5956
972-775-1835
rdcarswell@aol.com
January 2002

Section 1

Accuracy Landings

Part 1: Rationale

An essential item in preparation for safe cross-country flight is the ability to land accurately at the landing goal first time, every time. This must be your primary object. This involves flying the glider on a pre-planned path until you are able to aim the glider directly at the point where it would hit the ground if it didn't flare ("Reference Point") and accomplish a safe landing. The place to learn and practice this is your home airport. Until you can do this consistently in all conditions, you lack an important element for flying cross-country with safety.

Part 2: Training Objective

To provide you with the knowledge and skills necessary to consistently make accurate landings at the landing goal.

Part 3: Techniques

1. General Principles

- a. To make accuracy landings successfully, you must fly a pattern, keeping the Reference Point continually in sight, which maintains a safe angle/height/distance relationship ("Safe Relationship") (see Topic 3b(v) of Part 3 of this Section) with the Reference Point, until you are absolutely certain, beyond any doubt, that the glider is going to make it to the Reference Point. Normally such certainty is only possible after the glider has turned onto the final approach heading. Judging accurately while visualizing round one or more turns is very difficult, if not impossible. Once you have turned final, you need to fly the glider keeping the Reference Point stably in view through the canopy so that the glider flies down the final approach aiming at the Reference Point until ready to make the landing flare.
- b. This will be addressed systematically, first by examining Reference Point technique, then using a flexible pattern maintaining a Safe Relationship to fly the glider safely to the point where Reference Point technique can be used.

2. Reference Point Technique

- a. Approach control using Reference Point technique involves judgment and decision making. There are two parts –
- (i) judging whether the glider is overshooting or undershooting from the apparent movement of the Reference Point in relation to the canopy, and making any necessary corrections.
 - (ii) Judging the steepness or shallowness of the approach and deciding how, or if, to correct it to the optimum two-thirds airbrake approach.

Use of Reference Point technique enables you to land the glider precisely where required by recognizing whether the glider is undershooting or overshooting.

- b. Approaching a relatively featureless surface can be difficult because it lacks a specifically identifiable point to use as the Reference Point. This can be simplified by picking a definite object near the landing area (e.g. a car or parked glider) and using it; however, on final approach don't be drawn into flying directly towards the object. (When initially chosen, the Reference Point in practice is more of a reference area. It narrows towards a point once established on final approach).
- c. Movement of the Reference Point up or down the canopy shows how the glider is moving in relation to a path targeted on the Reference Point. It does not tell you, however, if the glider has started its final approach high or low.
- d. If the Reference Point appears to move down in relation to the canopy, then the glider is overshooting. This is only true if the pitch attitude, airspeed and airbrake setting are constant.
- e. If the Reference Point appears to move up in relation to the canopy, then the glider is undershooting. This is only true if the pitch attitude, airspeed and airbrake setting are constant.
- f. If the Reference Point appears stationary in relation to the canopy and the pitch attitude, airspeed and airbrake setting remain constant, then the glider is approaching the reference point correctly.
- g. In theory, the ideal descent path is with half airbrake. In practice, using approximately two-thirds airbrake allows a greater margin for recovery from an undershoot, so this is the 'normal' airbrake setting.

- h. Once the flare has begun, the Reference Point is of no further use.
 - i. When approaching through a wind gradient (or any other unplanned reduction of airspeed) a more nose-down attitude is required than if the airspeed had remained constant. This will result in undershooting the Reference Point unless it is practical to reduce the amount of airbrake (as well as regaining the correct airspeed.)
 - j. Once the glider is established on final approach, you may discover the glider is undershooting substantially requiring you to close the airbrake almost completely. This is usually caused by misjudging the glider's position in the safe landing cone (see Topic 3b(iii) of this Part 3) and opening the airbrake too soon, e.g. in a strong headwind. The correct recovery procedure is to close the airbrake fully, let the glider progress forward towards the Reference Point until it is possible to complete the approach with normal (two-thirds) airbrake, then doing so. Using this technique avoids arriving at the flare with little or no airbrake, giving substantially increased risk of a pilot induced oscillation because of the glider's reduced pitch stability.
3. Flexible Pattern Flying Technique
- a. Theoretical Background

Recent accident reports highlight that experienced pilots, as well as students, continue to experience difficulty in safely accomplishing approaches leading to landings at the point of intended touchdown (landing goal). Undershooting accidents continue to occur. Experience has shown that the focus must always be on taking whatever action is necessary to achieve a safe landing rather than on flying any specific formal pattern.
 - b. Pattern Flexibility - Angle Technique
 - (i) **Primary Purpose.** The primary purpose of flying any “pattern” is to enable the glider to arrive safely at the landing goal first time, every time. Unlike airplanes, gliders do not offer the option of going around and making another attempt if the first is unsuccessful. You must acquire judgment and other piloting skills so that you can, without fail, achieve this result every time. The common airplane pattern (as referred to in Section 4-3-4 of the Airman's Information Manual (AIM) published by the FAA), where the airplane flies level throughout the downwind leg, and follows a rectangular path, is both inappropriate for, and

impossible of achievement by, a glider. It is not a legal requirement under any FAR.

- (ii) **Safe Height Band.** The primary purpose will be achieved by keeping the glider within a safe height band so that a Safe Relationship is maintained (see subsection (v) of this Topic) while using the performance of the glider to best effect. This will result in neither being too high nor too low in the pattern at any time. This will normally be accomplished by keeping the airbrakes closed (and thus maintaining maximum performance) until it is absolutely certain that the glider will make good the Reference Point. Once absolute certainty has been ascertained, the glider can enter a safe landing cone (“Cone”) for the final approach towards the Reference Point, through the landing flare, to touchdown.
- (iii) **Safe Landing Cone.** The top of the Cone is represented by the approach angle/path of the glider with full airbrake, while the bottom is represented by the approach angle/path with airbrakes almost closed. (It is undesirable to approach with airbrakes fully closed – if the glider gets below the glidepath in these conditions, there is nothing that can be safely done to get back up to it.) The minimum approach angle retains a margin for error, and so the Cone represents a comfort zone which guarantees safe arrival. The ideal, or target, is a conservative point between the two, represented by two-thirds airbrake. (The setting that gets approximately two-thirds of the maximum rate of descent, not necessarily a two-thirds lever setting or airbrake paddle position). It is very important to note that the stronger the headwind on the final approach, the more steeply the Cone is inclined up from the horizontal.
- (iv) **Pattern and Landing Considerations -**
 - (a) Experience has shown that the human eye is unable to gauge distance, horizontal or vertical, with any great degree of accuracy. Conversely, it is able to perceive angles with a greater degree of precision, and a *change* in an angle even more accurately.
 - (b) The altimeter can only show actual height if the elevation of the ground below is known. This is not likely in the case of an off-field landing. Instrument error in the altimeter becomes more critical the closer to the ground the glider is

– an error of 150 ft at 3,000 ft. above ground level (AGL) is only 5%; at 700 ft. AGL this error becomes 21%, and at 350 ft. AGL it is 43%. To this error needs to be added inaccuracy caused by change in the pressure datum (pressure change since the altimeter was last set) and by inaccurate information on the height of the landing terrain. **Near the ground, no dependence should be placed on the accuracy of the altimeter. Do not refer to the altimeter once you are in the pattern!**

- (c) Ground objects such as houses, trucks and automobiles appear larger the lower (and closer) you are to them. Below 500 ft. AGL, judging height by the apparent size of objects works fairly well. This method of assessment is useful when judging the height of the final turn.
 - (d) Lift and sink have a substantial effect on the achieved performance of the glider in the pattern (as elsewhere), and even may place in doubt the ability to make the Reference Point. Monitoring the variometer provides information on the actual conditions, hence the likely progress of the glider to that point, and the need to take corrective action. You need to know the glider's still air sink rate at pattern airspeed (normally best L/D speed) before meaningful use can be made of information derived from the variometer.
 - (e) The foregoing mean that height and distance estimates, even when assisted by an altimeter reading, are likely have a poor level of accuracy, and greatest reliance should be placed on your ability to perceive an angle, and a change of that angle, assisted by the lift/sink information provided by monitoring the variometer, to maintain a Safe Relationship.
- (v) Maintaining Safe Angle.
- (a) To reliably maintain a Safe Relationship, you must be able to estimate the correct angle for the circumstances (which requires knowledge of the performance of the glider and the prevailing wind conditions) – the vertical, or dip, angle looking from your position in the pattern to the Reference Point, recognize it in practice, and fly the glider in the pattern so that it is maintained. If the correct angle is maintained while correlating height and distance from the

Reference Point, a Safe Relationship will be maintained and the glider will arrive at the start of the Cone, and make the Reference Point goal every time. When lower down, height and distance can be best judged by reference to and comparison with known objects on the ground. Staying within a Safe Relationship translates into the glider maintaining close to a constant angle (viewed in a vertical plane) relative to the Reference Point. For off-field landings, this means placing most reliance on the angle to achieve a Safe Relationship until shortly before turning final. (For further discussion on learning angles, see *Learning Glide Angles* in the chapter on “TLAR” in *Glider Basics from First Flight to Solo* by Thomas L. Knauff).

- (b) It should be noted that if any two of the criteria (angle, distance, height) are correct, the third has to be correct. Conversely, if any two are wrong, the third can't possibly be right.
- (c) If the glider is to maintain the correct angle relative to height and distance (i.e. maintain a Safe Relationship), the path followed must be flexible – turning towards the field if the angle decreases (flattens) (e.g. if in sink), and turning a little away from the field if the angle increases (e.g. if in lift or reduced sink). Additionally, if in strong sink, the airspeed needs to be increased to penetrate efficiently through the area of sink. If no lift or sink in the air mass is encountered, to maintain the angle constant will require the glider to be flown parallel with the landing direction.
- (d) Shortly after passing abeam of the Reference Point going downwind there needs to be made a gentle turn towards the extended center line of the chosen landing direction. This turn is maintained until the glider is on the base leg (i.e. flying at a right angle to the landing direction. Doing this also allows sight of the Reference Point to be continuously maintained. Note that the rate at which this gentle turn is made determines the distance the glider has to fly from the start of the final approach to the Reference Point. Thus in a strong wind, when the Cone is inclined more steeply up from the horizontal, the turn rate should be greater. In light winds, it should be less.

(vi) Universal Applicability of Angle Technique.

Use of the angle technique has the benefit of working effectively even if the height of the glider above the field (e.g. in an off-field landing) is not accurately known. The technique can be used in any situation.

(vii) Flexibility Essential to Deal with Varying Conditions.

Throughout the pattern, the emphasis must be on doing whatever is necessary to make a safe approach and landing, not on flying a specific pattern, either as regards heights or turning points.

(viii) Pre-Landing Checks.

An essential prerequisite to every safe landing is completion of appropriate pre-landing checks. The specimen pre-landing checklist set out in Annex C is an example of a two-part list which is designed to ensure that no essential item is missed. It allows the checks to be carried out in a sequence that provides least interruption to safe operation, and permits maximum attention to be given to maintaining good lookout while joining and actually in the pattern.

4. Practical Implementation

- a. General requirement – staying where a Safe Relationship can be maintained (**airbrakes closed, energy conserved, best performance maintained, unless in strong lift**) until absolutely certain the Reference Point can be made (usually late on base leg, or on final), when the Cone can be entered.
- b. Start at representative pattern height - no fixed position of Initial Point/High Key area - pre-landing checks complete.
- c. Ignore altimeter.
- d. Select safe dip angle (i.e. angle in vertical plane) between ground and straight line between glider and Reference Point.
- e. Ensure correct/safe angle selected (suitable for glider performance and wind conditions) – maintain a Safe Relationship.

- f. Fly maintaining selected angle, monitoring variometer to check vertical speed - strong lift may require correction by use of airbrakes, however the proximity of sink next to the lift must be remembered. Relate height and distance to the Reference Point – it is still necessary to turn final at a safe height – absolute minimum 300 feet above the ground. Once past Reference Point going downwind, select final approach speed; turn in to maintain angle. The turn onto final should be made with a bank angle of at least 30 degrees.

- g. Once absolutely certain landing goal will be made and Cone entered - select airbrake at correct time to accomplish two-thirds airbrake approach to Reference Point. This means you must delay opening airbrakes in stronger winds as Cone is inclined more steeply up from the horizontal.

Part 4: Completion Standard

You must be able to fly a safe pattern, approach and landing using the techniques set out in this Section with the safe and successful outcome never in doubt.

Section 2

Off-Field Landings

Part 1: Training Objective

1. The purpose of this section is to provide you with adequate ground instruction and flight training so that you are able to complete successfully a landing at an unfamiliar field.
2. Ground instruction should include:
 - a. Recognition of height bands and heights so that you are able to select a landing field in adequate time to plan and make a safe approach and landing to it.
 - b. Assessment and selection of suitable fields.
 - c. Evaluation of other factors relevant to a safe approach and landing. This will include review of 'Accuracy Landings' in Section 1 of this Handbook.
3. Flight instruction will include training until the completion standard has been achieved. Experience has shown that the completion standard is unlikely to be achieved if you are not already proficient in accuracy landings, crosswind landings and precision use of airbrakes during the pre-landing flare. If you lack such proficiency, training in these areas should be given first. You must be thoroughly familiar with the requirements for "Accuracy Landings" in Section 1 of this Handbook and consistently able to achieve the completion standard in that section.

Part 2: Planning

1. At any time before the Initial Point/high key area is reached in the pattern to land at the selected field, attempt should be made to use lift to avoid landing. Such an attempt should be made only if the lift is workable, and not to the detriment of making proper planning for approach and landing. Below 1,500 feet [All heights used in this Section are estimated heights above ground level (AGL) - you should be aware of the effect of pressure changes on accuracy of altimeter readings, and difficulty of determining exact height from charts, even if the precise position is known] the search for lift should be discontinued, although it can be used if found by chance. While attempting to soar, care should be taken neither to lose sight of

the selected field nor to be drifted downwind out of range of it.

2. At no time fly over unlandable areas unless there is sufficient height to overfly them, taking account of the possibility of encountering unusually heavy sink.

3. At 3,000 feet.

Select a generally landable area and fly towards it.

Identify hills likely to create surface wind or lee turbulence problems.

Avoid areas which slope visibly.

Note TV and power towers and other tall obstacles.

4. At 2,000 feet, look for suitable fields using '7 S' criteria. If possible, this process should be carried out by flying a wide circle around the fields while making the assessment.

Surface wind - strength and direction - assess direction by drift, smoke, large flags, ripples and wind shadow on water, cloud shadows – but be wary as the surface wind may not be the same as at cloud height. Unless wind very light, plan to land with substantial headwind component. Consider topography of approach and landing area and possible effect on wind. Wind in valleys may be different from hilltops or at glider altitude.

Size - check for adequate length: minimum 7-800 feet, comfortable 1,000 - 1,500 feet; however requirements vary depending on glider type, wind speed, slope, etc. Assessment of apparent size may be colored by size of surrounding fields. Small fields make adequate field look large, large fields make adequate field look small. [2 lane roads are 25 - 30 feet wide, typical small houses 50 feet long, wooden phone and power poles are usually 150 - 200 feet apart, football fields 300 feet long.]

Shape - if greatest length has a strong crosswind and little headwind component, determine if use of the width (into the wind) is better - depends on wind strength.

Slope - any visible slope unacceptable - most easily identified if viewed from a distance, not overhead; darker areas are probably wetter, and thus lower; if slope is apparent from surrounding topography and no flat alternatives available, plan to land uphill. Uphill landing requires more pitch-up in the flare, thus 5 - 10 kts more airspeed is needed. Landing uphill also gives an optical illusion of the glider being higher than it

actually is. This risks an undershoot, and can be countered by aiming to land a little deeper into the field.

Surface - adequate and clear of obstructions - requires familiarity with crops, seasons [planning ahead]; you need to be familiar with the crops in the area you are proposing to fly, and at the relevant time in the growing season. Land parallel to rows/furrows. Generally crops of lighter color are better; but watch out for straw colored corn stalks, which is much too high for a safe landing. Check for fences, hay bales, ditches, irrigation equipment etc. [Exercise - practice picking fields from the air, making an evaluation of them, then going and actually walking them to check out your assessment.]

Surroundings - obstructions on approach [buildings, trees, cables (look for poles, not wires), etc.] - reduce effective field length by 10 times obstruction height. For example, a 30 foot tree on the approach boundary of the chosen field will make the first 300 feet of the field unavailable for landing. Large obstructions can generate severe turbulence, especially on the downwind side.

Stock (livestock) - avoid fields with animals, if possible.

5. At 1,500 feet, select a landing field (and backups); carry out further evaluation of the fields using the '7 S' criteria, keeping them in clear sight. Note guide pointers to find them again in case field(s) temporarily lost from sight. One major difference between landing at a strange field and landing back at your familiar home airport is that here the decisions are left to you. Probably the most important of these are choice of landing direction, and choice of pattern direction (which side of the field to make the pattern).
6. Once you are sure of the wind direction, you need to make a decision on the best approach direction. Consider the wind, approach obstructions, field length, and surface. The order of priority is difficult to determine as most of these factors are inter-related; however the wind, slope, and field length combine to give a general direction, with approach obstructions and surface possibly refining it.
7. Having selected the line of approach, you need to select from which direction to make the final turn. The base leg direction can be critical for a successful landing. The base leg should be –
 - a. long enough to give time to alter height/position before the final turn;
 - b. on the side which gives the better option for an early turn onto final should this become necessary; and
 - c. in a position at which you can arrive with sufficient height.

8. Having decided on the approach direction and the base leg direction, pick out location of IP/high key area, planning to be there at estimated 1,000 feet AGL. **It is vital to get the IP/high key area in the correct general location. After picking a good field, this is probably the most important decision you have to make.** This needs to be well upwind and well off to the side if the Safe Relationship with the Reference Point is to be achieved. Beware of illusions caused by 'scale' effects - if a pilot is accustomed to landing on a rectangular field, when faced with a long narrow strip (e.g. a ribbon asphalt strip of same length and 20 ft width where the proportions may be 200:1) an inexperienced pilot will likely over estimate length and pick an IP/high key area too far downwind and too close in; a pilot accustomed to landing on a long asphalt strip, when faced with a rectangular field is likely to pick an IP/high key area too far out and upwind.
9. 1,500 feet to 1,000 feet - fly around chosen field(s) - a complete circle enabling observation from all directions is best - continuing evaluation of '7 S' criteria, aiming to arrive at IP/high key area at 1,000 feet heading downwind, having completed pre-landing checks. (See Annex C). Make your seat belts as tight as possible. Ideally the complete circle should be started above 1,500 feet so that it can be of large radius and completed before arrival at IP/high key area and permit better scrutiny for the presence of slope in the chosen field. If landing uphill, plan to use higher airspeed.
10. At 1,000 feet [in strong winds, this figure should be increased] - no further attempt to use lift - now committed to landing - on downwind, select and maintain Safe Relationship to Reference Point. [Accuracy Landings - Section 1 of this Handbook]. If strong sink encountered, fly faster and maintain/regain safe angle. Continue to evaluate field using '7 S' criteria; concentrate on trying to see things that may have been too small to recognize from further away, particularly obstructions on the approach and in the field. Don't cramp pattern, in particular **leave room for long/high final approach**. Increase airspeed to final approach speed when going downwind opposite Reference Point and re-trim the glider.
11. Plan for two-thirds airbrake approach - in middle of Cone. Maintain Safe Relationship throughout. Remember, the stronger the wind, the more the Cone is inclined up from the horizontal.
12. On final, check correct airspeed, adequate height margin to clear obstructions, Reference Point a safe distance into field using reference point technique and two-thirds airbrake approach after Cone has been entered. [If field of adequate length, Reference Point should be one-third of way down field.] Ignore factors for simple derig e.g. rolling out close to a gate or habitation. Once approach obstructions have been cleared and field made, full airbrake and hold off during flare to touch down at minimum speed with minimum energy. [Energy increases as square of speed].

13. At touchdown, use full airbrake/wheelbrake for shortest ground run. Remember to ignore factors for simple derig.
14. After landing - safeguard glider from wind, livestock and humans; keep onlookers away so further damage to field avoided, contact crew and advise location; contact landowner, explain what is involved in retrieve and get permission to do what is required. Be polite! Don't admit liability for damage, but don't cause any; give insurance carrier particulars. Leave gates etc. how found (and avoid cutting stock off from water by closing a gate which was open).

Note: (1) Typical pitfalls/mistakes -

Decision to land made too late.

Wind direction misjudged.

Unsatisfactory field selected.

Cramped pattern (usually caused by failure to pick the correct place for the IP/high key area) resulting in approach too high and fast.

Last minute change of mind, often as a result of poor planning.

Attempting to soar away from too low altitude.

- (2) With experience, the field selection process can be made more quickly, and from a lower altitude, however still plan to be at IP/high key at not less than 1,000 feet.

Part 3: Training Exercise

1. A typical practical training exercise will likely use another airport with which you are unfamiliar which is relatively close to the home field.
2. Unless you are experienced in the exercise, your instructor will first demonstrate an off-field landing going through the planning items in Part 2. **You should note that the technique does not require accurate height information AGL**, and uses the same principles as a pattern at home field. After the demonstration, your instructor will likely let you fly the second off-field flight, prompting only as necessary for safely accomplishing the landing. While experience has shown that many students can meet the completion standard required after one demonstration and one student flown practice, if this has not clearly been achieved, the exercise

will be repeated.

Part 4: Further Considerations

These considerations may not apply to the primary off-field landing training exercise, but are vitally important in the event you get something wrong.

1. The Inadvertent Off-Field Landing – Will I Make It Back to the Field?
 - a. The discussion in this Section has thus far assumed you are well away from your home (or any) airfield. However, a substantial proportion of off-field landings are made close to the home field – sometimes very close to it. The pilots involved can be generally categorized as those who misjudged their position and/or the conditions, and discovered they couldn't make it back. They include pilots who had no intention of flying cross-country, but did so inadvertently by getting out of gliding range of the field. Typically this scenario results in the decision to land off-field being made much too late, leaving very little time for planning and preparation. Look again at Note 1 at the end of Part 2.
 - b. While clearly it is better to make a safe landing back at the home (or any) airfield rather than in a strange pasture, being forced to land in a strange pasture with little or no preparation or choice is likely the worst possible situation. Accordingly it is very important to decide early and in good time whether or not you will make it back to the field. That way, if the possibility of recovery to the home field appears remote, you can and should start your preparation and planning for an off-field landing while there is still adequate time left to do so.
 - c. How do you decide whether you will make it back to your home field? Assuming that the field is in clear sight, this is not too difficult. First, the glider needs to be pointing towards the home field, if you aren't heading that way already, flying at best speed to fly, with a constant pitch attitude and airspeed. Look at the field through the canopy (remember Reference Point Technique in Section 1, Part 3, Para. 2) – does the field appear to be moving up, down, or staying in a constant position in relation to the canopy? If it is moving up, you will not make it. **If it is constant, you may just make it – but you will be arriving straight in with no margin for safety or height for a pattern – this is *not* the Safe Landing Cone!** If it is moving down, your situation is improving and you will likely make it. Remember, however, that this analysis depends for accuracy on the air mass being stable, without lift or sink, or with sufficient lift to compensate for the sink

encountered during your progress back toward the field. The effect of the wind (assuming it remains constant) is automatically taken into account.

- d. This method gives you a tool for making an early decision whether you can make it back or not. If the probability of making it back appears low you must discontinue what is likely a vain attempt and concentrate on the planning and preparation for your off-field landing. The earlier (and higher) you make this decision, the safer the likely outcome will be – running out of height, ideas and options while stretching the glide in an unsuccessful attempt to get back leaves the outcome to chance and, if you have it, dumb luck.
- e. Don't delay making a decision – make the call while you still have time and height to plan and prepare for a safe off-field landing.

2. Overshooting and Undershooting

The primary causes of off-field landing accidents are failure to reach the chosen field, being unable to land in the chosen field because you are too high to get into it, and encountering something adverse once you land in it. The whole purpose of Section 1 – Accuracy Landings – is to prevent overshooting and undershooting from happening; if you are successful in maintaining a Safe Relationship, these two problems will most likely be avoided.

a. Undershooting

If the correct/safe angle is not maintained, and the angle becomes too flat, so that a Safe Relationship is not maintained, then the sooner that you take corrective action to bring the angle back to an acceptable value, the less likely an undershoot is to occur. The performance of the glider gives a substantial margin of safety and allows a reasonable amount of time and opportunity to make corrections. The sooner the problem is identified, and corrective action taken, the less the safety margin is eroded. The primary lesson is clear – you must establish and maintain a Safe Relationship throughout. Don't open the airbrakes unless and until you are absolutely certain you have the field made.

b. Overshooting

- (i) Overshooting is the result of being too high and close in during the latter stages of the pattern, putting the glider in a position where even use of full airbrake will not prevent it overshooting the chosen field. It is of the greatest concern when a short field is

chosen. As with undershooting, the sooner that you recognize that a Safe Relationship is not being maintained - that the angle is too steep, and the sooner you take corrective action, the more time will be available for the corrective action to be effective.

- (ii) Assuming that the corrective action is not effective, there are a few things that may help. All of them, however, require time to be effective – you can be too high and close in at 800 ft. AGL, and also at 100 ft. AGL – in the former case, you should still have time for the remedial action to be effective; in the latter, you will not. In principle, you should always plan to have a normal pattern (i.e. IP/High Key area at 1,000 ft. AGL) – if you elect to have a very small pattern (e.g. an IP/High Key area at 500 ft. AGL) *and* get too high, the chances are great that you will have insufficient time for any remedy to work. You should understand that all the suggested remedies are radical solutions for an emergency, and carry some risk, and are not things which are, or should be, used routinely, even though you should be in current practice in using them.
- (iii) How can you lose height quickly and safely?
 - (a) Forward and Side Slips (these are alternatives, depending on the presence or absence of a crosswind) which, when added to full airbrake/flap, will appreciably increase the descent rate, *but only* if properly executed. If the airspeed is allowed to build up, much of the benefit may be lost. This maneuver, if not properly performed, may result in increased airspeed, with reducing effectiveness. If the action is taken in a flapped glider, the flap limiting speed risks being exceeded if not carefully monitored and controlled. You must be in current practice if this remedy is to be safe and successful. **Practice this maneuver at altitude.**
 - (b) Turning Slips are very effective, particularly when used along with full airbrake/flap; by definition, they must be executed in a turn. If you are already on final, it is too late; again, you must be in current practice.
 - (c) Increasing Drag: Drag increases as the square of the airspeed. Especially with a glider with effective airbrakes, height can be lost rapidly by lowering the nose to increase airspeed and drag. Additionally, acceleration inertia with a heavy glider increases the ability to lose height rapidly for a

short time. Starting at normal approach speed, it's possible to lose an additional 100 – 400 ft. on final by diving the glider steeply at the ground with full airbrake/flap selected before the airspeed starts to increase materially.

The inertia of the glider results in a substantial loss of height in the first couple of seconds before the airspeed starts to increase. Once the airspeed rises materially, drag continues to increase, but the increased speed will make the procedure progressively less effective because of the need to dissipate the speed again before touchdown and landing. **Once the airspeed starts to rise, you must resume the normal approach attitude and speed.**

Clearly, this procedure must only be attempted while and so long as you have safe clearance above the ground. Once again this procedure requires you to be in current practice with the maneuver. **Practice it at altitude.**

- (iv) “S”-Turns with Airbrake Open can be used on final approach to extend the distance flown, and thus achieve greater height loss compared with straight line flight between two points. It is vitally important that you maintain a safe airspeed and good coordination while the S-turns are executed. Practice doing good clean S turns at altitude.

c. Warnings and Other Comments

- (i) Other possible methods of using up height which have not been mentioned – a 360° turn on final – have been omitted because they are not recommended.
- (ii) Slips – some pilots are reluctant to slip for fear that their glider will stall and spin. The slip, however, uses top (or outspin) rudder opposite to the lowered wing, making a spin a remote possibility; however, it is always unwise to stall on final approach.
- (iii) Practice – none of the suggested maneuvers should be attempted if you are not in current practice using that maneuver. **IF YOU ARE UNFAMILIAR WITH A MANEUVER, FIRST PRACTICE IT WITH A QUALIFIED INSTRUCTOR.** If you are familiar, but not current, you should practice it at a safe height.

- (iv) Lastly, as in most things, avoidance is better than cure – being in current practice doing accuracy landings should avoid the need for any extreme remedies. Remember that the superior pilot uses his/her excellent judgment to avoid situations which would require use of his/her outstanding skills!

3. Emergency Action on the Ground

If, despite all the foregoing including, especially, having been in current practice to do what is necessary, you find yourself touching down in a field with insufficient distance and braking effort to stop before the end of the field, what must you do?

- a. First, if there is a wire fence on the boundary, or if there is any doubt at all that there isn't, then you must make every effort possible to avoid this hazard. **Wire fences are lethal**, having the capability of shearing through the canopy or other structure of the glider and garroting the hapless pilot. Preservation of the glider is secondary to avoiding this hazard to life. While time and space still remain, turn the glider away from the fence – if necessary, by inducing a groundloop. To do this, put one wingtip firmly on the ground, and apply full rudder deflection in the direction of the grounded wing. With this maneuver, there is always a risk of damaging/breaking the rear fuselage during the groundloop. This risk can be reduced by using the elevator to keep the tail off the ground while the groundloop is performed.
- b. Second, if there is no wire, or it is not possible to turn the glider away, pick a gap between obstructions – e.g. between two trees – steer the nose towards the gap so that, if necessary, the wings bear the brunt of the impact. While doing so, lean forward and lower your head below the cockpit edge to minimize the risk from outside objects penetrating the canopy. This, however, is a very poor second to turning away from the obstruction.

Part 5: Completion Standard

You must be able to select a field, and fly a safe pattern, approach and landing to it with the safe and successful outcome never in doubt.

Section 3

Thermal Acquisition and Centering

Part 1: Training Objective

For effective cross-country soaring, you must have the ability to make the most efficient use of the thermal conditions prevailing. Centering thermals efficiently and climbing quickly are two of the most fundamental skills you need to soar successfully. This section details the knowledge and skills you need to do this.

Part 2: Suggested Text

You should be familiar with the theory and practice of a system for thermalling; if you don't have one, use that set out in -

Wander - The Art of Thermalling ... Made Easy.

Note: As Wander states, successful thermalling is part science, part art. There are many methods used in attempting to make best use of thermals, some even apparently contradictory. The two most important criteria for a thermalling system are (a) that it works, and (b) that it is simple to learn and use. Wander's text meets both. If you are familiar with and use a different system which meets the criteria equally well, you should use that system.

Part 3: Minimum Equipment

Safe thermalling requires constant, careful lookout. To achieve this, the glider must have a working audio variometer. Neither this exercise, nor thermal soaring in general, should be attempted without an operating audio variometer.

Part 4: Safety

Joining, sharing and leaving a thermal all require care. You must keep a careful, continuous lookout to be sure you observe, and continue to see, every glider that is or may become a collision factor or risk. Any time spent looking inside the cockpit reduces the safety margins both for you and all the other gliders in your proximity. **Keep your eyes outside the cockpit.** Anticipate where each other glider is going, and what course alterations it might make so you can maintain

good separation. Observe the Thermal Soaring Protocol in Annex D. Don't make sudden or unpredictable maneuvers.

Part 5: Practical Considerations

Assuming study and understanding of your chosen thermalling system, the following should be kept in mind.

1. Good thermalling requires accurate flying; in the classic, regular, round ("perfect") thermal, this means making round circles - correct airspeed and correct bank angle being maintained. It is hard enough to make assessments of thermal strength, extent and location when the glider is being flown accurately, almost impossible when it is not.
2. The perfect thermal is strongest at its center (core). The closer the glider can stay to the core, and for the longest period of time, the faster it will climb. The further away from the core, the slower it will climb. Low time/under-confident pilots tend to make their turns in thermal too shallow. Initial turns should be at around 40° angle of bank (possibly more in desert and mountain terrain where thermals tend to be narrower and stronger). If turning insufficiently steep is a persistent problem, draw a temporary mark on the canopy showing 40°. Also helpful is the fact that an imaginary line drawn between the diagonally opposite mounting screws of each instrument in the panel describes 45°. Once established in the thermal, bank angle can be increased/reduced to ascertain whether doing so increases the climb rate.
3. To make best use of a thermal, you should attempt to picture in your mind's eye where the core lies in relation to the glider's position. Remember that variometer indications may lag up to 5 seconds, surges can be felt in real time. Having such a 'visual' picture can be used as an aid to moving the circle flown by the glider to center it on the core. The successful soaring pilot knows at all times where the thermal core is in relation to the glider.
4. In a non-centered thermal, when the variometer is showing the lowest reading, the core is most likely in the general direction of the lower/inside wing.
5. When lift is first encountered and the glider rolled into the thermal, the course followed is elliptical as a result of the time taken to reach the chosen bank angle and reduce speed to the optimum. If the thermal is lost in this process, maintain the turn through 270°, straighten out

For a few moments, then resume turning. This should get the glider back close to the area where the thermal was first encountered.

6. When attempting to move the circle to center in the core of the thermal, it is better to move the glider in two or three small shifts rather than in one large one. The latter risks losing the thermal entirely if made in the wrong direction.
7. The closer to the ground a thermal is encountered, the narrower it is likely to be, hence the need to achieve a smaller radius of turn by banking more steeply.
8. Don't keep on circling in sink - widen the search area to see if the thermal (or the glider) has moved. If, after a couple of turns, contact is not re-established, stop circling and search for another thermal.
9. Low down (up to the top of the wind gradient) if there is any significant wind, the thermal will tend to lean downwind. As the glider is always descending through the thermal, if contact is lost it is fairly likely that it has fallen out of the downwind side of the thermal. Accordingly first fly straight upwind for a few seconds in the attempt to regain contact.
10. If low, don't leave the thermal you have for something better - unless drift is unacceptable, stay with it.
11. If zero sink is encountered when low down, circle in it - it is a weak thermal. If dying, it will disappear quickly, if not, it will probably gradually strengthen and permit a climb. Even reduced sink may be the first sign of a new thermal.
12. The weaker the lift, the more accurately the glider needs to be flown. Higher pilot concentration should not be at the expense of failing to maintain good lookout.
13. If uncertain which way to turn on entering a thermal, turn anyway, either way. Don't delay the turn just because the correct direction can't be decided.
14. Thermal at minimum sink speed for the angle of bank chosen. Minimum sink speed increases with angle of bank/load factor in exactly the same way as stalling speed. [The increase is the square root of the load factor, thus in a 60° banked turn, where the load factor is 2g, the minimum

sink speed will increase by 1.4; if wings level minimum sink at a given weight is achieved at 40 kts., at 60° of bank it will be 56 kts.]. Know the relationship between the calculated wings level minimum sink speed for your glider and the onset speed of the pre-stall buffet (assuming there is one); approximately the same relationship exists at any bank angle. For example, if the calculated minimum sink rate with wings level is achieved at 42 kts, and the onset of the buffet occurs at 39 kts, establishing the buffet onset at any bank angle and adding 3 kts will give an approximation of the minimum sink speed at that bank angle. The following table illustrates minimum sink speeds at representative bank angles.

Bank Angle	0°	30°	45°	60°
Load Factor	1.0g	1.2g	1.4g	2.0g
V min. sink	40	44	48	56
V min. sink	42	46	50	59
V min. sink	45	50	54	63
V min. sink	48	53	58	67
V min. sink	52	57	62	73
V min. sink	55	61	66	77

Part 6: Training Exercise and Completion Standard

You should be able to circle with reasonable precision and to center the thermal reasonably quickly and reliably.

Section 4

Speed-to-Fly

Part 1: Training Objective

For effective cross-country soaring, making best use of thermal conditions and available time, you must have a clear understanding of the practical effect of lift and sink, and wind, on the achieved performance of the glider. This should give you knowledge of the best speed-to-fly in the conditions prevailing at any time. This section sets out the knowledge that you need so you can to work out and fly at best speed to fly.

Part 2: Suggested Text

You should be familiar with the concepts discussed in -

Wander - Glider Polars and Speed-to-Fly ... Made Easy.

Part 3: Practical Considerations

Assuming study and understanding of the principles in Wander's text, the following should be kept in mind.

1. Never fly slower than the wings level minimum sink speed - to do so always results in lower performance.
2. In achieving best speed-to-fly in medium and better performance gliders it is normally sufficient to fly within 5 kts of the optimum speed as the polar curve gradient changes gradually - better a little too fast than a little too slow.
3. Inter-thermal speed – low-time pilots may use a McCready setting of '0' until confidence is gained. Remember the higher the setting, the greater the probability of not completing the flight. Optimum is probably a McCready setting of one quarter the best rate of climb in the last thermal or one half the average rate of climb, unless conditions ahead warrant something different.
4. The change in performance resulting from an increase or decrease of the

McCready setting (i.e. a change of airspeed) is not linear throughout the range of settings used. At a high McCready setting (near the average achieved rate of climb) a small reduction of McCready setting (and speed) reduces achieved cross country speed by a relatively insignificant amount, but increases the distance covered significantly. At the other end of the range - a McCready setting of near zero - a small change in setting will affect cross country speed substantially, but only have a small effect on distance achieved. Inexperienced cross-country pilots should probably start by using an intermediate McCready setting - about half of the average achieved rate of climb.

5. The McCready setting should be adjusted depending on the height band in which the glider is operating [The higher the setting, the more aggressive, the lower, the more conservative]. Absent other indications a reasonable rule of thumb for an experienced pilot is height in thousands (agl) minus one = McCready setting, e.g. flying at/descending through 4,000 ft agl, use McCready setting of 3 (kts). A low-time pilot might start by using half the calculated number (in the example, 1½).
6. Height bands. Spacing of thermals is generally proportional to the height of the convective layer - the higher the thermals go, the more widely apart they are spaced, and *vice versa*. The normal operating band is usually accepted as the top two thirds of the convective layer, e.g. if the maximum achieved altitude is 6,000 ft. AGL, the band is between 2,000 ft and 6,000 ft. AGL. Until confidence is gained the new cross country pilot may use the top half of the convective layer as the normal operating height band. Below the normal operating band, any lift should be used.
7. Minimum acceptable rate of climb should increase with altitude - the higher/closer to cloudbase, the stronger the minimum acceptable rate. At that height it may well be possible to proceed just by S-turning and (if flying conservatively) slowing down to minimum sink speed through lift of less than the minimum acceptable rate.
8. Anticipate onset of sink on leaving the thermal - increase speed on rolling wings level. However, care must be exercised - check and clear area below and on course before doing so.
9. Make speed compensation for wind only on final glide. Headwind rule of thumb is to increase speed by half the estimated headwind. For a tailwind, slow down to minimum sink speed.
10. Keep eyes out of the cockpit and maintain good lookout - keep instrument scan brief. A working audio is an essential item of equipment. Knee-

mounted GPS are not acceptable – GPS must be mounted where your peripheral vision remains outside the cockpit, and there is no need to look down.

Note: You must be fully familiar with the operation of your GPS, and all other instruments, before using them in flight. Get to the top of the learning curve before leaving the ground!

11. An 'E6B', 'whizzwheel', 'prayer wheel' or 'John Willie' (JSW) flight planning computer (circular slide rule) can be used to calculate final glide performance for any glider, regardless of L/D ratio.

Part 4: Training Exercise and Completion Standard

At least one flight should be made with you flying and establishing correct speeds for the changing conditions of lift and sink and, on final glide, wind. You must be able to do this while keeping a good lookout throughout, and not become preoccupied watching the instruments.

Section 5

Map Reading and Navigation

Part 1: Training Objective

1. The purpose of gaining familiarity with map reading and navigation is to enable the soaring pilot to plan ahead in preparation for a cross-country flight, and, using the derived information, to fly the intended route with as little deviation as feasible consistent with making best use of the soaring conditions. This means, among other things, an ability to conduct the flight without becoming lost and without entering controlled or other restricted airspace.
2. This knowledge is essential for the cross-country pilot, even with the availability of GPS or the like. GPS, when working properly, can be most helpful, and greatly reduce the pilot's workload. In particular, knowing your precise position and the location of the nearest airports is most useful. However, a GPS will cease to operate accurately, or at all, from a variety of causes including power source failure, operator error, and hardware or software failure. Any mechanical device of this sort may cease operating for a number of reasons and should never be relied on as the sole means of navigation.
3. It should be emphasized that this task for the soaring pilot is both different from and more difficult than the task of the airplane pilot, who normally has the luxury of being able to devote most of his attention to it, without being concerned with the need to keep the glider up, and having to make whatever course deviations are needed to do so.

Part 2: Training Exercise

Note: Unless an airplane or motor glider is used, this exercise should be performed within gliding range of the home field or (if a towplane is available) another field, preferably an airport (alternate) from which the glider can be towed out.

1. Preflight preparation should include selection of at least one straight-line route, with start and finish points, and selection of safety heights for recovery to the home field or alternate. The route should be marked on the chart, with distance from the start point checked so that speed down the route can be calculated. Sectional charts should be marked with circles of 5 miles radius

increments around the home field and any alternates.

2. Once the chart has been marked, you should work out the magnetic course to fly. Your instructor will then review the route in detail with you, ensuring that you are familiar with landmarks close to the route and are able to pick the features that will be useful on the flight. You must be able to have a mind's eye picture of the route, based on the information displayed on the chart.
3. Where practicable, the chosen route should be over or close to features which can be identified both on the chart, and on the ground - freeways, major highways, railroad tracks, rivers, substantial lakes, big towns, etc.
4. The flight should be carried out with you flying the glider and following the course, with your instructor monitoring progress and, in particular, ensuring that you follow the procedures set out in this Section. Where necessary, your instructor will assist you in finding and using lift so that the navigation exercise is not thwarted by your inability to stay up and make progress along the planned route.
5. The exercise requires reasonable visibility - at least 10 miles - so that more distant landmarks are visible.

Part 3: Training Specifics

1. Except when lost, you should read the chart, and only then identify the corresponding features on the ground from the information derived from the chart. Only if lost should this process be reversed.
2. At the start of the route, you should confirm that the glider is actually at the start point, then orient the chart in the direction of the route/flight path so that the course line on the chart is pointing in the same direction as the glider.
3. If not already accomplished, your instructor will demonstrate the errors of the magnetic compass [acceleration - worst on east and west headings; turning - compass lags or leaps]. In practice, the compass should only be relied on when the glider has been flying with wings level at a constant speed for 15 - 20 seconds. When making heading changes, you should correlate the compass indications to outside references, e.g. if the existing compass heading is 360°M (M = magnetic) and it is required to turn on to 090°M, identify a landmark which is approximately East, and use that as a guide for picking up the new heading, which should be confirmed once the compass has stabilized. Except when making large changes - e.g. when rounding a turnpoint - there is usually only little need to refer to the

compass if course can be maintained (or resumed) by reference to the position of landmarks on the route, or to the sun.

4. You should be aware of the effect of magnetic variation [map] and compass deviation [cockpit deviation card]; and also be mindful that glider compasses are rarely “swung” – the process of calibrating the compass to a known datum (magnetic north) - so there is a need to check to ascertain error against a known heading before setting off on course.
5. You should be able to calculate course corrections if the glider deviates from the course line. (1 in 60 rule - one mile off track at 60 miles = 1°, 5 miles at 60 miles = 5°, and so on).
6. Your instructor will make you aware of the ease of confusion where there are a number of similar features - towns, highways, railroads, or the like, and the need to identify a unique combination of features to be certain that the surface position identified is confirmed by other features.
7. If an airplane or motorglider is used for this exercise, your instructor will cause course deviations and simulate thermal turns. After each thermal climb, once the glider is established back on course, you must check to confirm that the heading is correct. This is done most simply by reference to a known landmark on the route or the position of the sun if available, otherwise the compass should be used.
8. Unless necessary to stay up, the glider should not be flown on a heading more than 30° off course.
9. When line features are being followed, you must check the direction on the chart and confirm the glider heading is correct.
10. Chart considerations -
 - a. You must learn and be familiar with the symbols displayed on the chart – see the chart legend and explanations.
 - b. It is essential that you use a current chart – the vital information that you need might just have been changed.
 - c. When picking features on the chart to be used to correlate with those on the ground, do not pick those which appear frequently or which might be easily confused e.g. a single lake is a good feature; a lake where there are several other similar ones nearby is not. Try and pick features which are not duplicated in the immediate area.

- d. Not all roads are marked on charts - this may cause confusion when unmarked roads are identified on the surface.
- e. If there are more than a couple of railroads, they are easily confused.
- f. Small features - e.g. airports, small towns etc. can easily be obscured by cloud shadows or by higher terrain.
- g. Line features, unless very large (e.g. freeways) may only be identifiable from 2 or 3 miles distance.
- h. It is easy to confuse different towns, particularly where the chart includes peripheral areas as part of the town which are not clearly recognizable on the ground as urban areas.
- i. Lakes etc. change shape depending on water level, flooding, etc.

In general the moral of all of the above is that it is never safe to rely on a single feature - every feature identification must be cross-checked by reference to other features that make the combination unique.

- 11. Unlike flying an airplane cross-country, the erratic course which a glider takes means that the effect of the wind is difficult to predict, even if an accurate forecast is available. You need to be aware of the existence and effect of wind and the identification of the result; where a crosswind is identified (i.e. drift), make appropriate heading corrections to maintain course.
- 12. If you become lost, the primary concern is to locate a landable area, and keep within gliding range of that area (see Section 2, Part 2) and thereafter attempt to ascertain your position by working out time/speed/direction from your last known confirmed position, selecting the area of best probability from the chart, then attempting to correlate features on the ground with the chart.

Part 4: Completion Standard

You need to be able to do all of the following with reasonable proficiency -

- 1. Read and understand symbols displayed on the chart.
- 2. Identify specific ground features from reading the chart.
- 3. Maintain the glider on course, consistent with using available lift and staying up. This includes not becoming lost, and not setting off in the

'wrong' direction unless necessary for staying up.

4. Comply with good airmanship practice while doing the above, including maintaining good lookout, speed control, heading, coordination, etc.

Section 6

Cross-Country Techniques

Part 1: Training Objective

The purpose of demonstrating cross-country techniques is to highlight the differences between these techniques and those generally used by low time pilots/pilots accustomed only to local soaring and/or pilots accustomed to low performance sailplanes. The three most common factors counterproductive to good cross-country technique are -

1. Failure to circle tightly/bank steeply enough. (See Section 3). This is most usual in pilots who fly low performance/low wing loaded sailplanes. These are usually able to climb using big shallow banked turns, however higher climb rates can still be achieved with higher bank angles, reducing turn circle radius and staying close to the thermal core. Circling tightly/banking steeply is more important low down where thermals are typically narrow.
2. Flying too slowly between thermals. Again this is usually exacerbated if the pilot is accustomed to flying a low performance sailplane whose performance decreases rapidly as speed is increased above best L/D airspeed. See Section 4 (Speed to Fly) of this Handbook.
3. Circling in all available lift. This characteristic occurs most frequently in pilots whose previous objective has only been to stay up, without need to progress over the ground. Ignoring the effect of wind, a thermalling glider will stay over the same point on the ground until it leaves the thermal. To progress cross country, the pilot must spend as little time as possible circling, and as much time as possible steady on course towards the goal. Circling should be in the chosen height band, and only thermals of minimum acceptable strength or better should be used.

Part 2: Exercise Prerequisites

You should have completed the training required to satisfactorily complete Section 3 (Thermal Acquisition and Centering) and Section 4 (Speed-to-Fly) Section of this Handbook.

Part 3: Training Exercise

Note: This exercise should be performed within gliding range of the home field or (if a towplane is available) another field (alternate) from which the glider can be towed out.

1. Preflight preparation should include selection of at least one straight line route, with start and finish points, and selection of safety heights for recovery to the home field or alternate. Experience has shown that a triangular route is better than an out and return. The route should be marked on the chart - sectional charts are preferable to terminal area charts because of the limited coverage of the latter. Sectional charts should be marked with concentric circles of 5 miles radius increments around the home field and any alternates. Known safe landing places should be marked. The forecast wind should be known, but not plotted on the chart.
2. After tow release and becoming established in an acceptable thermal, your instructor should, with your input, select height bands based on the prevailing conditions, and select thermal strengths to be accepted or rejected, and initial McCready speed to be used. The forecast wind direction and strength should also be checked.
3. Your instructor will guide you down the route. When climbing, your instructor will monitor your thermal acquisition and centering technique with the intent of getting the best average rate of climb, and ensure observance of chosen thermal strengths. When not climbing, your instructor will monitor use of correct speed to fly, observance of good navigation and (if appropriate) map reading practices, and give assistance in choice of course to fly to the next thermal, including assessment and selection of clouds, if any. Throughout the flight you must observe good airmanship practices, particularly those relating to lookout, and entering, using, and leaving thermals. (see Annex D, Thermal Soaring Protocol).
4. Except where necessary to avoid a landout or demonstrate a technique, you should perform all the flying, with prompting as necessary by your instructor.

Part 4: Training Specifics

1. Thermal Streets.
 - a. You need to have an understanding of thermal streets. Thermals often organize themselves in fairly predictable patterns, so knowing about such patterns and what to look for to find them is very useful. Wind is present

at soaring levels on most days. Wind tends to organize thermals in lines parallel with it, resulting in a long line (or “street”) of consecutive thermals. Although streeting occurs regardless of whether the thermals are forming cumulus clouds, when clouds are present, observation will show that often the clouds take up an oval shape, with the longer axis parallel to the wind.

- b. What also occurs in these conditions is sink lining up parallel with the lift streets to form sink streets in between.
- c. Clearly, to fly efficiently, you want to spend (a) as much time in lift as possible, thus following a lift (or cloud) street, and (b) as little time in sink as possible, thus avoiding or spending the minimum time in sink streets where possible. If your course takes you across the streets, the most efficient way is usually to work along the lift street, then turn at 60 degrees to it to jump across to the next lift street, spending as little time as practicable in the sink street. This angle is an approximation – if only light sink is encountered, the angle should be less, if very strong sink, it should probably be more.

2. Where to Go.

- a. Establish as early as possible relationship of lift to clouds - upwind, downwind, etc. – this usually remains the same throughout the day.
- b. Use gentle zig-zag on course - this increases probability of finding thermals; it is especially helpful in blue conditions.
- c. Stay upwind of course line - go downwind only if necessary to avoid landing.
- d. If long period of heavy sink, glider may be in sink street between two cloud/lift streets - make a deliberate turn away. (See Paragraph 1c above).
- e. Even if no clear cumulus, follow short cycling cloud wisps, even if they disappear before arrival.
- f. Follow lift/cloud streets even if up to 30° off course line – but don't get too far off course - transfer to next street line to regain track by flying at 60° to street line (see Paragraph 1c above). If blue, look for lift streets – head directly upwind or downwind on leaving thermal to check; gentle zigzag until found – use same principle as for cloud streets.
- g. Plan ahead - select next thermal source before leaving existing thermal. Use expected performance instead of guesswork to assess potential range.

Rule of thumb for sailplanes of L/D of 30 to 35 (assuming wind around 15 kts) should be 5 nm/1,000 feet loss of altitude in still air, 3½ nm/1,000 feet going into wind and 6 nm/1,000 feet going downwind.

- h. Avoid areas likely to have sink - downwind of lakes, downwind of ridges etc., sandy areas, wet/irrigated/low ground if higher/dryer ground available, forests, except late in the day.
 - i. Try to use areas likely to have good lift – baked bare ground, industrial sites, large areas of concrete/asphalt, higher ground, especially when the slope is oriented at right angles to sun.
 - j. Keep track of wind direction as it may change - need to know direction for landing. Direction can be assessed by drift, smoke, large flags, ripples and wind shadow on water, cloud shadows (but be wary – the surface wind may not be the same as at cloud height).
 - k. On leaving a thermal, get on your pre-selected course, then confirm you are going in the correct direction.
3. How Fast.
- a. Upon leaving the top of the present thermal, the primary object is to get to the top of the next one as fast as possible.
 - b. Optimum speed should be based on the performance of the glider, the rate of sink, and the strength of thermals. (The McCready ring is calibrated for the glider's performance, the rate of sink is shown by the variometer, and the strength of thermal is set by the pilot.)
 - c. When setting the McCready ring, base the setting on the average rate of climb in the last thermal from the time circling began until the glider departed the thermal. If no averager or stop watch, use half the perceived rate of climb e.g. if the thermal would be described as a '4 knotter', then the average is probably about 2 kts.
 - d. The change in performance resulting from an increase or decrease of the McCready setting (i.e. a change of airspeed) is not linear throughout the range of settings used. At a high McCready setting (near the average achieved rate of climb) a small reduction of McCready setting (and speed) reduces achieved cross country speed by a relatively insignificant amount, but increases the distance covered significantly. At the other end of the range - a McCready setting of near zero - a small change in setting will

affect cross country speed substantially, but only have a small effect on distance achieved. Inexperienced cross country pilots should probably start by using an intermediate McCready setting - about half of the average achieved rate of climb.

- e. The McCready setting should be adjusted depending on the height band in which the glider is operating [The higher the setting, the more aggressive, the lower, the more conservative]. Absent other indications a reasonable rule of thumb is height in thousands (agl) minus one = McCready setting, e.g. flying at/descending through 4,000 ft agl, use McCready setting of 3 (kts).
 - f. Be prepared to change gear if conditions appear to be changing. If clouds ahead appear to be down-cycling, slow down. If a couple of clouds in succession reveal no lift, this may signal a deterioration - slow down. But speed up when conditions improve. Fly faster if clouds become more widely spaced.
4. When to Thermal.
- a. Circle as little as possible - the glider is not progressing on course while it is circling. It is, however, less detrimental to speed achieved when the course is downwind, worse when upwind. For this reason, when approaching a turnpoint before turning onto a leg which is upwind, try to reach the turnpoint high to minimize the need to circle during the leg. Conversely, when the next leg to be flown is downwind, you can risk reaching the turnpoint low and then thermalling while the wind carries you downwind.
 - b. After the first climb, decide on minimum acceptable rate of climb for use in normal operating height band. This should be the same as the chosen McCready speed, e.g. if McCready setting of 2 (kts.) is chosen, only accept thermals of at least 2 kts.
 - c. Minimum acceptable rate of climb should increase with altitude - the higher/closer to cloudbase, the stronger the minimum acceptable rate. At that height it may well be possible to proceed just by S-turning through lift of less than the minimum acceptable rate for circling.
 - d. Height bands. Spacing of thermals is generally proportional to the height of the convective layer - the higher the thermals go, the more widely apart they are spaced, and *vice versa*. The normal operating band is usually accepted as the top two thirds of the convective layer, e.g. if the maximum

achieved altitude is 6,000 ft. AGL, the band is between 2,000 ft. and 6,000 ft. AGL. Until confidence is gained the new cross country pilot may use the top half of the convective layer as the normal operating height band. Below the normal operating band, any lift should be used.

- e. The sink rate often increases immediately before a thermal is encountered - probably caused by cooler subsiding air descending to take the place of the rising thermal air - keep flying straight for a few seconds to see whether the thermal is there.
- f. Circling birds are usually in thermals; circling gliders may not be - don't chase another glider unless it is clearly going up; even then, if it is materially higher, the lower glider may have difficulty finding the lift, or discover there is none because it is below the bottom of the thermal bubble.
- g. Leave the thermal when the climb rate drops to two-thirds of the average.
- h. Always think ahead of the glider, checking conditions ahead and modifying plans accordingly.
- i. Below 3,000 ft. AGL the likelihood of having to land is increased - start planning for the eventuality - see Section 2. Pilot workload will increase substantially - turn radio down/off and devote full attention to flying/planning/airmanship.

5. Final Glide

- a. Your final glide begins when you calculate that you have sufficient height to glide directly to your goal, usually your home airport, without the need to use further lift. Remember that you must factor into your calculation the height at which you want to arrive above the goal – at what height do you want to arrive at the High Key area?
- b. All previous calculations of speed-to-fly have been based on maximizing your performance within the airmass the glider is flying. On final glide, groundspeed is important because the goal is a fixed point on the ground. On final glide, your best speed-to-fly must compensate not only for lift and sink which you are flying through, but for the effect of the wind, whether headwind or tailwind, also.
- c. There are several ways to make this computation. The easiest (and most expensive) is to use a final glide computer like a Cambridge L-NAV or ILEC SN 10. With such a computer you manually program in the distance

to fly and your estimate of the wind, and the instrument does the rest, telling you how fast, or how slow, to fly. If you have a GPS linked to the final glide computer, it will provide speed-to-fly information automatically! Alternately, you can use a final glide calculator (a circular slide rule often referred to as a 'whizzwheel', 'prayer wheel' or 'John Willie' (JSW)) or the ubiquitous 'E6B'. You can make up your own final glide chart, based on your glider's polar curve, showing headwind/tailwind component and airspeed to be added/subtracted to the no-wind speed.

- d. The simplest way is to use the rule of thumb, mentioned earlier, of increasing the airspeed by half the calculated headwind. Again, this should be added to the McCready speed. If a tailwind, fly a little slower than the best L/D airspeed, but a little faster than the minimum sink airspeed. Remember, however, you still need to speed up if sink is encountered.
- e. Thus far, your final glide has been calculated so that you fly most efficiently towards your goal. Pilots seeking to maximize their cross-country speed – contest pilots, pilots flying for records, and the like – seek to optimize their speed to their goal while on final glide. They typically fly as fast as possible consistent with just reaching the finish line. This carries the penalty – if the conditions are more adverse than calculated, or the pilot has not calculated accurately – of failing to reach the goal and being committed to an off-field landing.
- f. Getting started in cross-country, your objective should be to arrive with a safe height margin at your goal, so that you should plan to fly most efficiently towards it so that margin is preserved. Once you gain experience, and turn your attention to speed tasks, you will have to make your own compromise between speed and the risk of landing out.

Part 5: Completion Standard

You need to be able to demonstrate your ability to satisfactorily assess the conditions, pick a route, select speeds to fly and, in general, show acceptable decision making based on the conditions encountered.

Section 7

Other Preparations for Cross-Country Flight

Part 1: Introduction

1. The preceding sections of this Handbook have been devoted primarily to piloting knowledge and skills to enable you to fly your glider safely and successfully so your chosen cross-country goal can be achieved. Successful achievement of that goal does, however, require other knowledge and preparation.
2. You need to have at least the minimum equipment, both fitted to your glider, and ready so that the glider can be safely retrieved in the event of your being unable to soar back to your home field. You also need to have adequate knowledge of weather, and weather planning, if your cross-country flight is to be flown in conditions suitable to permit your goal to be achieved. Both you and your glider need to be fit for the task. Lastly, you need to be able to pick a safe route for that task.

Part 2: Equipment Requirements

1. It is assumed that a suitable glider is available. The actual choice of a make/model of sailplane is outside the scope of this Handbook. Whatever is available, however, must be properly equipped. There is set out in Annex E a list of glider and personal items which the well equipped cross-country pilot needs. These two areas have been combined because most of the personal items need to be taken with the pilot *and safely secured* in the glider.
2. The glider will likely have a minimum equipment list specified in its Type Certificate Data Sheet or flight manual/pilot operating handbook. In any event, it is necessary to have an altimeter, an airspeed indicator, a compass and a total energy variometer. For safe soaring, the variometer *must* have an audio function so that a good lookout can be maintained while thermalling. Carrying a VHF radio is a safety item as well as a comfort.
3. For badge, contest or record purposes, it must be possible to verify where the glider has flown, and to confirm continuity of flight. The glider will thus need a camera (for confirming turnpoints made good) and a barograph; alternately, it is possible to opt for a secure datalogger which records GPS position information and other flight parameters.

4. It goes without saying that all these things must be operating properly.
5. It will be observed that the list in Annex E includes a parachute. A serviceable parachute is an essential item of equipment for a cross-country flight, as it should be for local soaring. Mid-air collision with another thermalling glider is always a possibility. You should be familiar with the care, operation and use of parachutes. See Section 8, "Use of Parachutes".
6. While not every cross-country flight ends in a landing away from the home airport, some do, and you must make preparation in advance for this. Failing to do so, and calling in for a retrieve, expecting other people to drop what they are doing, find the trailer and a retrieve vehicle and come to get you, will quickly make you the airport pariah. While an aerotow retrieve from another airport may be practicable, you should always leave a retrieve vehicle, with keys immediately available, attached to the correct and properly equipped trailer, before you leave on any cross-country attempt. Properly equipped includes gas in the tank, air in all the tires, spares included, and electrics connected and all trailer lights working! If you are not well-known at the airport, it is helpful to let the operator know the make/model and location of your rig.
7. You also need to have a crew, prepared to drive your rig, and make the retrieve if necessary. The operator needs to know the identity of your crew and where to find him/her/them.
8. All these preparations and arrangements must be made *before your cross-country flight begins*.

Part 3: Weather Planning

1. Thus far, the you likely have only been concerned to ensure that the weather has been safe for you to fly – winds within limits, no precipitation, adequate cloudbase for the planned flight, etc. You probably obtained the necessary weather prediction from a combination of sources like TV weather broadcasts, The Weather Channel, weather pages found on the web, and the local FAA Flight Service Station (FSS) telephone automated weather briefing service on 1-800-WX-BRIEF (992-7433). None of these address to any real degree the prediction of soaring conditions.
2. Soaring meteorology can fill a book! At the least you need to be familiar with the conditions which give rise to convection (thermals). It is worth restating here some of the basic principles.
3. The air at any level must support the air above it, so air at lower altitude is more compressed than the air above. Consequently atmospheric pressure decreases with

height. A thermal is a parcel of air which starts next the ground by becoming warmer than the surrounding air – the result of differential surface heating or other causes. By becoming warmer, the particle also expands and becomes less dense, and tends to rise. Instability is the tendency of the parcel to continue rising without any energy being added to it from the surrounding atmosphere. As the parcel rises, if the surrounding air is cooler and denser, it will keep on rising – the atmosphere there is ‘unstable’. The parcel continues to rise while the instability remains. Its upward movement ceases when the parcel’s temperature reduces to that of the surrounding air.

4. The process of expansion causes the air within a rising parcel to cool. If the ascending parcel is cooled to the dew point, water vapor within it will condense, causing cumulus cloud. The rate of cooling of unsaturated (“dry”) air is 5.4°F/3.0°C per 1,000 feet. This rate of change is called the dry adiabatic lapse rate (DALR). Adiabatic means that the rate of change (the lapse rate) applies to air which does not exchange heat with its surroundings - the physical process is internal to the parcel. The DALR tells how much a rising parcel of air will cool adiabatically as it ascends. So a parcel which had a temperature of 80°F/27°C at the surface will cool down by approximately 54°F/12°C to 26°F/-3°C if it reaches 10,000 feet AGL.
5. Thermal Index (TI) is a measure of the atmosphere’s stability or instability. To determine the TI, calculate the temperature of a lifted parcel of air (which cools at the DALR). Next establish the temperature of the surrounding air (by weather forecast, or direct measurement by an airplane). Subtract the calculated temperature of the lifted parcel from the predicted/measured ambient air temperature at the same altitude. The resultant is the TI. If it is a negative quantity, there is instability; the higher the negative value, the greater the instability and the better the likely lift. If the TI is positive, then the air is stable at that altitude, and the thermals, if any, will not reach that height. You may be able to obtain the TI directly as part of a soaring forecast from an FSS briefer.
6. Assuming cumulus cloud formation, the height of the cloudbase can be calculated from the temperature/dewpoint convergence rate, which, in a parcel of rising air, is 4.4°F/2.4°C per 1,000 feet. Cloudbase height is calculated by deducting the dewpoint from the surface temperature, dividing it by the convergence rate, and multiplying the result by 1,000, or:

$$1,000 \frac{(ST - DP)}{(4.4)}$$

To avoid having to make the calculation, this can be expressed in a simple table.

Surface Temperature – Dewpoint (°F/°C)	Cloudbase forms at (feet AGL)
5.0/2.7	1,100
10.0/5.5	2,300
15.0/8.3	3,400
20.0/11.1	4,500
25.0/13.9	5,700
30.0/16.7	6,800
40.0/22.2	9,100
50.0/27.8	11,400
60.0/33.3	13,600
70.0/38.9	15,900
80.0/44.4	18,200

Part 4: Pilot Health and Safety

1. Safe and successful cross-country flight depends to a very large extent on you being fit to make the flight. You will likely be flying under considerable stress for an extended period working at a task which is both physically and mentally demanding. In these circumstances, it is necessary to be at a high level of fitness and health if the flight is going to be successful.
2. While athletic fitness is not an essential requirement, you must be in good health and able to maintain top performance for the duration of the flight, which will likely last several hours. “Wellness” is a word often used in preventive health care. You must be well, in the sense that you have no condition, impediment or sickness that inhibits wellness.
3. Part of being well is under your direct control – you must be rested – fatigue from lack of sleep, involvement in other activities, or just as the consequence of a long drive to the airport followed by a struggle in the heat to rig your glider – is not acceptable! In addition, you must be properly nourished and hydrated. Lack of proper food makes the human body more prone to performance deterioration from other causes.
4. Dehydration is insidious and debilitating – a hot cockpit with lots of sun maximizes the potential for it. If you have not maintained your fluid intake, you will be subject to the resulting problems – headache, dizziness, fatigue, cramps, loss of concentration, faintness – all of which reduce very substantially your ability to fly safely. One problem is that by the time the symptoms are detected, it

takes a while to catch back up. You must drink water (not coffee, tea, sodas or other drinks containing caffeine) throughout the day, preferably in small quantities taken frequently.

5. You also need to dress appropriately and protect himself/herself from the effects of the sun – a combination of sunblock and clothes which give the needed protection from longer term sun damage. A hat is essential, but must not impair your all round vision. Baseball caps are unsatisfactory as the bill causes a blind spot at the front, and the back and sides are left unprotected. Whatever kind you choose, the button at the top must be removed, otherwise turbulence may cause injury to your skull when it impacts the canopy.
6. The foregoing relate largely to assessment of your fitness to start a flight. While being fit to fly cannot always be reduced to a single checklist, use of the **I'M SAFE** list covers most of the bases.

Illness: Not just fever and sickness, but are you below par? Headache, sinus blockage, other minor but distracting ailment, hangover? All reduce your concentration.

Medication: Some drugs have side effects – drowsiness, blurred vision, allergic reaction, and so on. Why are you taking the drug in the first place, and are you safe to fly if you are?

Stress: Everyone has it from time to time. Are you really sure you can put all the stressing factors aside when you climb in your glider? If you can't honestly say yes, your concentration will be impaired – fly in this condition and you may discover real stress!

Alcohol: Any residual alcohol in the system has an adverse effect; and this is amplified at altitude because of the oxygen depletion – even if you are using supplemental oxygen.

Fatigue: Good night's sleep? How many hours have you already worked/driven/flown prior to your intended flight? Wandering attention is a flight hazard.

Familiarity: Are you really current? Read the flight manual recently? Ready for an emergency? Done a thorough CAC? Don't let familiarity divert your attention elsewhere.

Eating: Lack of food can reduce your blood sugar causing loss of concentration; dehydration can incapacitate you. A favorite question of accident investigators is ‘when did the pilot last eat?’ This is a no-brainer!

If you can't say I'm Safe on all these heads, you should not fly until you can.

7. As cross-country sailplanes may be frequently rigged and derigged, the reference to the ‘CAC’ mentioned in the I’m Safe checklist needs closer examination. This refers to a Critical Assembly Check of the glider. Doing a CAC is a recommendation of both the SSA and the Soaring Safety Foundation.. The recommendation is –

Prior to flight, the pilot-in-command of each glider shall inspect his/her glider to ensure that it is airworthy. Such inspection should include the following critical assembly checklist and procedure (“CAC”). A CAC is a short list of steps mandatory for safe flight. It should be developed from manufacturer's requirements and recommendations and the service history of a glider make/model.

A pilot-in-command should develop and use a CAC for each glider make/model he/she intends to operate.

A pilot-in-command should perform a CAC each day prior to flight.

The CAC should include an independent verification of the procedure by another person.

Designing, performing and arranging for the verification of the CAC is entirely the responsibility of the pilot-in-command and in no way compromises the pilot-in-command's sole responsibility for safe flight.

You require to have a CAC checklist and procedure for the glider you intend to fly.

8. Focusing next on health during the course of the flight, it is vitally important for you to maintain a safe level of fitness. Probably the most important single factor in doing this is maintaining the proper level of hydration, so that the debilitating effect of dehydration is avoided. As well as carrying and consuming sufficient water for to do this, you must also provide for urine relief so you can flush waste out of your system. The glider needs to be able to accommodate this being done. Too many pilots have succumbed to dehydration because they limited their fluid intake because they had no way of disposing of the waste. The rule of thumb is that if you do not have a need to urinate every hour or so, you are not taking in enough water and/or not disposing of the natural waste.

Part 5: Route Planning

1. The difference between a safe and successful cross-country flight, and a failed flight, can be made by planning a good route. There are several considerations to bear in mind, some of which may be contradictory. Route planning should take into consideration all relevant airspace issues. In general, the route should avoid Classes B, C and D airspace, and keep clear of Victor airways and crossings, and of active MOAs with activities incompatible with a cross-country soaring flight.
2. An important part of the plan is to establish the likely operating height band based on the soaring forecast. If the top of the lift is expected to be at 3,000 feet AGL, a conservative route will be substantially different than if the lift is expected to go up to 6,000 feet.
3. While the intent is to avoid having to land out, you must plan appropriately in case the need arises. Unlandable terrain should be avoided, or overflown, based on the glider's performance and the top of the forecast operating height band. Remember to factor in the possibility of encountering unusually heavy sink. Unlandable terrain is not just mountains – it clearly includes urban areas, and some agricultural areas at times (e.g. immediately prior to harvest) when the common crops are too high to land in.
4. You need to consider where, based on the topography and the season, the likely landing areas are going to be. Start with airports at the top of the list, and then look at the other reliable landing possibilities. Remember to factor in the performance of the glider, and plan the route to remain within gliding distance of these landable areas taking into consideration the top of the forecast operating height band.
5. Lastly, your route needs to be planned out based on the foregoing conservative assumptions so that the glider will remain within gliding distance of a safe landing area. The most conservative approach is, of course, one which keeps the glider always within gliding range of an airport. If the local area permits, you should plan early cross-country flights so that you remain within gliding distance of an airport. You can then mark up your charts with the circles and required safety heights so that you are always able to make a recovery to an airport.
6. Once you get experience using good cross-country techniques, and begin to realize improving skills, you can afford to become less conservative. Having said that, planning must always keep the glider within range of a safe off-field landing area.

Section 8

Use of Parachutes

Part 1: Safety

Cross-country flying, and thus thermalling, brings increased risk of collision between gliders. It is recommended that all pilots wear serviceable parachutes and be familiar in their care and use.

Part 2: Operation and Use of Parachutes

Parachutes provide an alternative for surviving an in-flight emergency where the aircraft is uncontrollable. They are effective only if the parachute is serviceable, correctly fitted, and operated correctly. Accordingly, before wearing a parachute you must be familiar with inspection of parachutes, correct fitting of parachutes, and proper operation of them, including exiting the glider prior to use.

Part 3: Training for Parachute Use

The knowledge referred to in Part 2 should include the following:

1. Preflight inspection of the parachute, which must include:
 - a. A general external examination looking for any untoward conditions (e.g. stains, loose parts, exposed parachute canopy, etc). If it does not appear right, check with a parachute rigger or other knowledgeable person before wearing.
 - b. Checking for proper stowage of the ripcord handle and re-seating it if out of its elastic or Velcro stowage.
 - c. Inspection of the pins to ensure they are not bent, nor seated improperly - i.e. not jammed into the shoulder at the top of the pin, nor pulled almost all of the way out of the loop - located midway is ideal.
 - d. Checking that the red break thread is intact and that the three -

character code on the lead seal matches that noted on the packing card.

- e. Checking that the parachute repack is current - the packing card must show a repack within the preceding 120 days.
4. Care, carrying and storage of the parachute:
- a. Particular care should be taken not to spill drinks, or worse, on the parachute. In the event of a spill, a parachute rigger should be advised immediately in order that the appropriate safeguarding action may be taken in time to prevent irreversible damage.
 - b. Parachutes should not be left out in the sun.
 - c. If a parachute is borrowed for an extended period (e.g. to attend a contest) a carry bag should be used to provide protection.
5. Connection of the parachute straps, adjustment of such straps, and proper wearing of the parachute:

Parachutes are adjustable to fit a large range of body sizes. An improperly fitted parachute will be uncomfortable, and may be dangerous. In general, the shoulder straps should be used to bring the parachute pack to an appropriate level on the back; once this is done, the leg straps should be made to fit snugly.

6. Wearing of the parachute:
- a. Normally, the parachute should be put on and adjusted before the wearer enters the glider, care being taken not to damage the glider by striking it with the straps or other parts of the parachute.
 - a. After flight, the wearer should exit the glider before taking off the parachute, again taking care not to damage the glider.
7. Location of all the glider canopy locks, and the correct procedure for jettisoning the canopy prior to bailing out.
8. Emergency exiting from the glider.

In order:

- a. jettison the canopy,

- b. undo the seat belts, but NOT the parachute straps!
- b. get out of the glider

("Canopy, Belts, Butt"). The method of exit is not important - quickest is best.

- 9. Operation of the parachute after exiting the glider:
 - a. As soon as clear of the glider (almost immediately after leaving it) **look** for the ripcord handle, grasp it with both hands, and pull it forward away from the body.
 - b. Emergency parachutes are steerable using their design forward speed of around 5 kt, which cannot be varied. Steer with the steering toggles (red or yellow tape loops, usually attached to the rear riser with Velcro or break thread) or with the rear risers. Pull right to turn right, left to turn left, never both (it only increases the rate of descent).
 - c. Use the 5 kt forward speed to steer to avoid dangers - power lines, fences and water can be fatal.
 - d. Face into the wind.
 - e. As the ground approaches, slightly bend knees, make legs as firm as possible, and look at the horizon.
 - f. After landing, release the parachute; if being dragged, pull on a riser until the canopy collapses.

Part 4: Completion Standard

You must know how to inspect, adjust, strap on and operate a parachute.

SSA Badge Program

A Badge

Pre-flight phase:

Applicant must demonstrate knowledge of:

- (1) sailplane nomenclature,
- (b) sailplane handling procedures,
- (c) pre-flight checks,
- (d) airport rules and Federal Aviation Regulations (FARs),
- (e) tow equipment, signals and procedures,
- (f) hook-up of tow rope or cable,
- (g) take-off signals, and
- (h) pilot responsibilities.

Pre-solo phase:

Applicant must hold a valid FAA student glider pilot certificate and gliding logbook and have completed the following minimum flight training program:

- (1) familiarization flight,
- (2) cockpit check procedure,
- (3) effects of controls on ground and in flight,
- (4) take-off procedure, cross-wind take-offs,
- (5) flight during tow,
- (6) straight and level flight,
- (7) simple turns,

- (8) circuit procedure and landing patterns,
- (9) landing procedures and downwind and crosswind landings,
- (10) moderate and steep turns up to 720 degrees in both directions,
- (11) stalls and stall recovery,
- (12) conditions of spin entry and spin recovery,
- (13) effective use of spoilers/flaps and slips,
- (14) emergency procedures, and
- (15) oral examination on FARs.

Solo phase:

One solo flight.

B Badge

Demonstration of soaring ability by a solo flight of at least 30 minutes duration after release from a 2,000 foot AGL tow (add 1½ minutes for each 100 feet on tow above 2,000 feet).

C Badge

- (1) Receive dual soaring practice, including instruction in techniques for soaring thermals, ridges and waves (simulated flight and/or ground instruction may be used when suitable conditions do not exist).
- (2) Have knowledge of (a) cross-country procedures recommended in the *American Soaring Handbook**; (b) sailplane assembly, disassembly and retrieving; and (c) dangers of cross-country flying.

* Note: Out of print – may be available in libraries or from used book sources – the information in this Handbook should be sufficient.
- (3) Solo practice - 2 hours minimum.
- (4) Demonstrate soaring ability by solo flight of at least 60 minutes duration after release from a 2,000 foot AGL tow (add 1½ minutes for each 100 feet on tow above 2,000 feet).

- (5) While accompanied by an SSA Instructor, demonstrate ability to (a) make a simulated off-field landing approach without reference to the altimeter; and (b) perform an accuracy landing from the approach, touching down and coming to a complete stop within an area 500 feet in length.

Bronze Badge

Complete the following under the supervision of an SSA Instructor:

- (1) Complete ABC Badge program with issue of C Badge.
- (2) 15 solo hours in gliders including at least 30 flights with at least 10 flights in a single place glider.
- (3) Two solo flights each of at least 2 hours duration.
- (4) Perform at least 3 solo spot landings witnessed by an SSA Instructor, the accuracy and distance parameters being based on glider performance data, current winds, runway surface condition, and density altitude; as a guideline, 400 feet would be acceptable for a Schweizer 2-33.
- (5) While accompanied by an SSA Instructor, demonstrate ability to make at least 2 accuracy landings without reference to an altimeter to simulate off-field or strange field landings.
- (6) Pass a closed book written examination administered by an SSA Instructor covering cross country techniques and knowledge, passing score 80%.

Suggested reference books and study materials for the Bronze Badge:

1. *SSA Soaring Flight Manual*
2. [*Soaring Cross Country*, Byars & Holbrook]
3. *Glider Basics, First Flight to Solo*, Knauff
4. *Glider Basics, Solo to License*, Knauff
5. *Cross Country Soaring*, Reichmann
6. [*Soaring Across Country*, Scull]
7. [*New Soaring Pilot*, Welch & Irving]
8. *Federal Aviation Regulations, Parts 61 and 91*

Note: Books listed in brackets are out of print – copies may be available in libraries or from used book sources.

FAI Badges and Standards

The FAI regulates records, contests and other achievements in gliding. This is done in Section 3 of the FAI Sporting Code. Section 3 contains detailed rules for this including the issue of FAI badges. These rules are not difficult to understand, but are detailed and strictly applied.

If you are intending to make a badge flight, it is *absolutely essential* that you are familiar with the Sporting Code requirements in Chapter 3, and that these are complied with. The Sporting Code is amended frequently so, even if space did permit, it would be unhelpful to reproduce it here as of the date of going to press. It can be viewed at, and downloaded from, the FAI webpage, www.fai.org/gliding. You are strongly encouraged to do so well before embarking on a badge flight. Although you will require an Official Observer (OO) to oversee your attempt, it is your responsibility, not the OO's, to ensure that you comply with the rules.

Badge flights require to be overseen by an OO. For all badge claims, it is necessary to prove continuity of flight, normally by evidence from a barograph or datalogger. Cross-country flights (other than straight line flights) require evidence that the glider went around the required turnpoints. This is normally provided by turnpoint photographs or GPS position information recorded on a datalogger. The same is necessary for start and finish points. Certain flights require a signed declaration made before takeoff of the course to be flown. Awards are claimed by the pilot and the OO completing a Soaring Awards Application Form (see Annex B-1). Depending on the type of flight, the Form may also require to be signed by the towpilot and landing witness(es). A specimen of a hardcopy FAI Flight Declaration is set out in Annex B-2); electronic declarations can be made in certain models of datalogger).

The completed badge application paperwork, along with barograph traces or diskettes downloaded from the datalogger must be sent to the SSA, as the US representative of the FAI, within 6 months of the date of the flight. Based on a satisfactory review of these, the badge, or badge leg, will be awarded.

The soaring performances required to qualify for the FAI badge standards of achievement are:

Silver Badge The Silver badge is achieved on completing the following three soaring performances:

- a. SILVER DISTANCE: a flight on a straight course of at least 50 kilometers.

Any leg of 50 kilometers or more of a longer predeclared course may qualify, subject to the requirements of Rule 4.4.2 of the Sporting Code, Section 3, on altitude difference applied to the whole course flown.

The Silver distance flight should be flown without navigational or other assistance given over the radio (other than permission to land on an airfield) or help or guidance from another aircraft.

- b. SILVER DURATION: a duration flight of at least 5 hours.
c. SILVER HEIGHT: a gain of height of at least 1000 meters.

Gold Badge The Gold badge is achieved on completing the following three soaring performances:

- a. GOLD DISTANCE a distance flight of at least 300 kilometers,
b. GOLD DURATION a duration flight of at least 5 hours,
c. GOLD HEIGHT a gain of height of at least 3000 meters.

Diamonds There are three Diamonds, each of which may be worn on the Silver, Gold, 1000 Kilometer or 2000 Kilometer Badges.

- a. DIAMOND DISTANCE a distance flight of at least 500 kilometers.
b. DIAMOND GOAL a goal flight of at least 300 kilometers over an out-and-return or triangular course.
c. DIAMOND HEIGHT a gain of height of at least 5000 meters.

1000 Kilometer Badge and Diploma

This badge is achieved on completing a distance flight of at least 1000 kilometers.

2000 Kilometer Badge and Diploma

This badge is achieved on completing a distance flight of at least 2000 kilometers.

Finally, it is worth repeating, *familiarity with the Sporting Code is essential for the successful claiming of an FAI badge.*

ANNEX B-1

The Soaring Society of America expects that all soaring flights will be conducted within the Federal Aviation Regulations.

SOARING AWARDS APPLICATION FORM

Federation Aeronautic International (FAI) badges are administered in the U.S. by the Soaring Society of America, Inc., under authority delegated by the FAI representative in the U.S., the National Aeronautic Association. Submit to The Soaring Society of America, Inc., P.O. Box 2100, Hobbs, NM 88241-2100.

Submit this application within 6 months of flight

APPLICANT COMPLETE THIS SECTION FOR ALL FLIGHTS: (please type or print legibly)

Name of Pilot Applicant _____ Date of Birth _____
Address _____ City _____ State _____ Zip _____
Type of SSA Membership _____ Date dues paid thru _____ SSA Membership No. _____ Sporting License No. (if any) _____
Are you a U.S. Citizen? _____ If no, do you intend to become a U.S. Citizen and desire a U.S. award? _____
If no to which National Aero Club should application be forwarded? _____
Non-U.S. Sporting License No. _____

	BADGE		LEGS		1000km Diplome Barringer
Application is made for:	Silver	Altitude	Distance	Duration	
(Circle all that apply)	Gold	Altitude	Distance		Century I, II, III
	Diamond	Altitude	Distance	Goal	Hilton Cup
					State Record (Notify State Record Keeper & attach SSA Form RS-2) Symons I, II, III

Date of flight _____ Does this flight complete a Badge? _____ If so, which? _____
Other Badges/legs held _____ Type of sailplane used _____ Reg. No. N- _____
Sailplane Owner _____ Description of flight _____

I hereby apply for this award: _____
(Signature of Pilot)

- FOREIGN PILOTS** who are **NOT** members of SSA, please enclose the processing fee of **\$20 per badge leg** with this application. If the 6 month deadline for submission of this application is not met, the processing fee is \$60 per badge leg.
- SSA MEMBERS:** There are no processing fees for pilots who are members of SSA. This application is void if not postmarked to the SSA within 6 months after the date of the flight.

OFFICIAL OBSERVER COMPLETE THIS SECTION (Signature on reverse)

Location of take-off site: Airport _____ City _____ State _____
Elevation of take-off site _____ feet **above sea level** Altitude of Release or Engine Off _____ feet **above sea level**
Take-off time: _____ Release/Engine-off time: _____ Landing time: _____
Barograph/GPS Type & No. _____ Sampling Rate/Rotation Rate: _____
Calibration Date: _____ Range: _____

ALTITUDE FLIGHTS

High point (that provides maximum altitude gain) _____ feet **above sea level**
The barogram must indicate the release and pertinent high and low points. Previous low point _____ feet **above sea level**
Maximum altitude gain _____ feet

CONTINUOUS SURVEILLANCE DURATION FLIGHTS

If Duration is claimed, the barogram, showing an uninterrupted trace, must be submitted or, if flight was local and was under continuous surveillance, the following certification must be signed. (The use of a barograph is suggested for Duration flights and is required on all other flight tasks.)
I certify that the duration flight described above was a local flight under my continuous surveillance:

(Signature of SSA Official Observer) (Badge No. or Leg held) (Print Official Observer's Name)

FOR OFFICE USE ONLY
Baro _____ Cal Trace _____ Cal Graph _____ Film _____ Dec _____ St. Rec. Ap. _____ GPS _____
Print _____ Note _____ Aprvd. Dist. _____ Other _____

Hold/Date Approval Date By Letter Sent Denial Date By Reason (Code) Review Date Upheld Reversed
SSA Form B-1(5/96) SSA-2

DISTANCE AND GOAL FLIGHTS DESCRIPTION

Distance and/or goal flights using turnpoints and/or Remote Start and/or Remote Finish Points must fill out a Flight Declaration Form (available from the SSA) or the equivalent, and it must be photographed before the flight. After the flight, fill in the following information on this form:

Date _____ Time _____ Take-off site _____ Lat. _____ Long. _____
The following flight was made (Circle one): Triangle Out & Return Other
Remote Start _____ Coordinates: Lat. _____ Long. _____
Turnpoints:
No. 1: Place _____ Coordinates: Lat. _____ Long. _____
No. 2: Place _____ Coordinates: Lat. _____ Long. _____
No. 3: Place _____ Coordinates: Lat. _____ Long. _____
Remote Finish _____
or Goal: _____ Coordinates: Lat. _____ Long. _____ Elev. (msl) _____
Landing Place: _____ Coordinates: Lat. _____ Long. _____

TOWPILOT - REQUIRED FOR ALL DISTANCE AND GOAL FLIGHTS

I certify that the release was made at: Lat. _____ Long. _____ Distance and Direction from Airport _____
Print name of tow pilot _____ Signature of tow pilot _____

LANDING WITNESSES - REQUIRED FOR ALL DISTANCE AND GOAL FLIGHTS

Signatures of two witnesses OR one SSA Official Observer who did not make a flight trying for a badge leg on the same date.

I certify that I observed the pilot and sailplane
at (place) _____

I certify that I observed the pilot and sailplane
at _____ (place)

_____ on (date) _____
Signature _____
Street Address _____
City _____ State _____ Zip _____

_____ on (date) _____
Signature _____
Street Address _____
City _____ State _____ Zip _____

OFFICIAL OBSERVER - REQUIRED FOR ALL FLIGHTS

Was a start line used? If yes, Lat. _____ Long. _____ sailplane crossed at _____ feet above sea level
Start time: _____

Was a finish line used? If yes, Lat. _____ Long. _____ sailplane crossed at _____ feet above sea level
Finish time: _____

Distance claimed: _____ statute miles. SSA Distance approved: _____ statute miles
Location of Landing: Place _____ Lat. _____ Long. _____ Elev. _____

I certify that I supervised the above described flight, including sealing the barograph, unsealing it after the flight, determining the pertinent altitudes on the flight trace by comparison with the calibration graph, supervised duration timing and otherwise attest to the statements herein. I have initialed all changes made on this form.

I further certify that, if applicable, the photographic procedures used for the flight described on this form comply with section 3 of the FAI Sporting Code:

(Official Observer should be convinced that all requirements were met before signing this statement.)

(Signature of SSA Official Observer) (Badge No. or Leg held) (Print Official Observer's Name)

(Address of Official Observer)

If Airport Manager, appointed by _____

If Observer who supervised the flight is not familiar with the turnpoint(s), an alternate Observer who is familiar with the turnpoint(s) should sign the following statement:

I certify that the turnpoint photo(s) for this flight is (are) of the point(s) declared and was(were) taken within the limits specified by the FAI Sporting Code. _____

(Signature of Alternate Observer)

MOTORGLIDER

Complete the start line section. If a finish line was used, complete the finish line section, also. Complete the following statement with the Official Observer's signature.

The motorglider was observed with the motor stopped before passing the Start Line. Further, the power source recorder documents that the motor was not restarted during the performance of the flight per the FAI Sporting Code, as applicable.

(Signature of SSA Official Observer) (Badge No. or Leg held) (Print Official Observer's Name)

FAI FLIGHT DECLARATION

WRITE BIG & PHOTOGRAPH FOR FILM DOCUMENTED CLAIMS
Lettered items are as listed in Sporting Code 2.3.1

a.) DATE OF FLIGHT: _____

b.) NAME OF PILOT:(print) _____

c.) SAILPLANE MODEL & REGISTRATION: _____

d.) BAROGRAPH OR GPS MODEL & SERIAL #: _____

e.) DEPARTURE POINT: (Circle one)

TOW RELEASE* START LINE (Center point) REMOTE DEPARTURE POINT

* use "Tow release" as the Place Name and write "TBD" in spaces provided for coordinates

PLACE NAME: _____ LAT: _____ LONG: _____

f.) DECLARED TURNPOINTS or TURNPOINT LIST:

_____ NAME: _____ LAT: _____ LONG: _____
_____ NAME: _____ LAT: _____ LONG: _____
_____ NAME: _____ LAT: _____ LONG: _____
_____ NAME: _____ LAT: _____ LONG: _____
_____ NAME: _____ LAT: _____ LONG: _____

* Number turnpoints ONLY if you are declaring a designated sequence; leave this space blank if you are declaring turnpoint options for a Free Distance or Free O&R flight. SSA POLICY PERMITS UP TO 3 TURNPOINT OPTIONS FOR FREE DISTANCE FLIGHTS AND AN UNLIMITED NUMBER OF OPTIONS FOR FREE O&R.

g.) DECLARED FINISH POINT/GOAL: (Circle ONE)

Must be declared and achieved to receive credit for O&R, Free O&R, Speed flights, triangle courses and for any flight using a Remote Finish Point. Otherwise, circle "NONE" and write "N/A" for place name and coordinates.

NONE SPECIFIED LANDING PLACE FINISH LINE REMOTE FINISH POINT

PLACE NAME: _____ LAT: _____ LONG: _____

h.) DATE & TIME OF DECLARATION: _____

i.) PILOT'S SIGNATURE: _____

j.) OBSERVER'S NAME: (Print) _____

OBSERVER'S SIGNATURE, DATE & TIME: _____

SPECIMEN PRE-LANDING CHECKLIST

TEXAS SOARING ASSOCIATION, INC.

(see flight manual for details)

PRE-LANDING VITAL ACTIONS

**Before reaching IP -
("WUFASS")**

WATER - ballast dumped

UNDERCARRIAGE - landing gear down and locked

FLAPS - set for approach

AIRBRAKES - check operation and close

STRAPS - tight and locked

SPEED – fly at best speed-to-fly; calculate approach speed for conditions

**On Downwind –
("LAST")**

LOOKOUT - for correct position, other aircraft, clear landing area

ANGLE – confirm safe angle

SPEED – increase to calculated approach speed for conditions

TRIM - to approach speed

ANNEX D

Thermal Soaring Protocol

A pilot who complies with the procedures in this Protocol will be predictable and enhance safety for himself/herself and the pilots around him/her.

Divergence from the procedures in this Protocol will increase the risk of collision and make the pilot responsible for the consequences.

Joining the Thermal

Gliders established in the thermal have right of way.

Do not pull up into a thermal unless absolutely sure that there is no other glider above or in front which could possibly be a collision risk.

All pilots must circle in the same direction as any glider already established in the lift.

If there are gliders already thermalling in opposite directions, the joining glider must turn in the same direction as the one nearest/with least vertical separation.

The entry to the turn should be planned to enable visual contact to be maintained with all gliders at or near the pilot's entry level.

The entry should be flown at a tangent to the circle so that no glider already turning will be required to take avoiding action.

When a contest is in progress all gliders (including non-contestants) within a 6 mile radius of the field or within a 1 mile radius of a contest turnpoint must thermal to the left.

Sharing the Thermal

Pilots should adhere to the principle of 'see, *be seen* and avoid'.

When at a similar level, never turn inside, point at, or ahead of another glider unless able to overtake with certain safe separation.

Leave the thermal if uncertain of maintaining safe separation.

Maintain lookout for other gliders joining the thermal, or converging in height.

Leaving a Thermal

Look outside the turn before straightening out.

Do not maneuver abruptly unless clear of all other gliders.

Glider and Personal Equipment for Cross-Country

Personal/Glider

Ruler
 Protractor
 Pen, pencil, grease pencil, eraser
 Final glide calculator
 Sunglasses
 Gloves
 Soaring hat
 Stout shoes
 Proper clothing for season, expected conditions
 Food – apple, granola bars etc.
 Pilot certificate
 Cash
 Credit card
 Drivers license
 Soaring & general weather forecast
 Emergency phone numbers
 Instrumentation –
 Glider minimum equipment list (as specified in Type Certificate Data Sheet or Flight Manual) Electric variometer with audio function
 Radio transceiver
 GPS – properly installed – handheld or knee mount is NOT ACCEPTABLE – must be mounted so that pilot’s peripheral vision while observing GPS remains outside the cockpit
 Chart(s) of task area, marked appropriately
 Sunblock
 Bugspray
 Waterbottles (2 – one for after landing)
 Pee bags or other relief system
 Barograph, foil/paper, smoking kit, spare batteries
 Cameras, film, mounting bracket
 Cellphone
 First aid kit
 Space blanket

Gap seal tape
 Parachute
 Batteries and charger
 Canopy cover
 Tiedown kit
 Landing certificate
 Handheld radio
 Glider Cleaning Kit
 Bucket, sponge, chamois leather
 Canopy cleaning cloth and cleaner

Retrieve Vehicle

Spare key for retrieve car
 Vehicle documents
 Toolkit
 Flashlight
 Radio and antenna
 Handheld GPS
 Spare wheel
 Jack
 Lug nut wrench
 Correct size towball
 Crew properly briefed
 Additional water/refreshments

Trailer

Spare wheel
 Jack
 Lug nut wrench
 Keys plus spare
 Spare bulbs
 License tag
 All glider fittings
 Wing stands
 Tail dolly
 Towout gear
 Towrope
 Ballast containers
 Ballast pump
 Vaseline to lube and seal ballast valves

Soaring Society of America, Inc.

Master Instructor Cross-Country Program



**CROSS-COUNTRY HANDBOOK
FOR STUDENTS**

First Edition

January 2002