GLIDING FEDERATION OF AUSTRALIA

ADVANCED PILOT TRAINING

Pilot Name:

ISSUE: 1 January 2005

Photo: B Eckey

FOREWORD

Welcome to advanced gliding and congratulations on reaching this stage of your training. This is where the fun starts!

Before using this training guide you should have completed the GFA basic training guide and obtained your B certificate. This training guide is intended to stimulate interest and facilitate training in advanced gliding topics ranging from aerobatics to cross country and mountain flying.

This booklet does not confer any ratings or formal approvals. Formal ratings/approvals are shown via logbook endorsement. However, this booklet does give some indication about the breadth of experience and training received in the sport of gliding.

Each of the topics is listed with headings only. You'll need to ask an instructor or the sporting coach to give you briefings under the headings listed, or alternatively you can look up the listed references. Your club may hold training courses periodically, which cover many of the topics. Otherwise neighbouring clubs may offer these courses, ask what is possible close by. You will also learn a lot from reading as much material as you can find. As a minimum buy, beg, or borrow a copy of Cross Country Soaring by Reichmann and Flying Faster and Further parts 1 and 2 – available to download from the GFA web site (see page 3).

Remember that we never stop learning. Have fun and fly safely.

With thanks to Mandy and Peter Temple and the Adelaide University Gliding Club for developing the original version of this post solo syllabus and making it available to all GFA pilots.

Cross Country Flight Log

Date	Glider	Location	Task Distance	Achieved Distance	Task Speed	Comments

Coaching Program Cross Country Flight Assessment

Score: (**5**) = Excellent (**4**) = Good **(3)** = OK **(2**) = Poor (**1)** = Must Improve **(-**) = Not Assessed

Pilot: _____ **Sailplane:**_____

			Comments
Pre Take Off Organisation:		( )_____ _____	
In Flight Organisation:		( )_____	
Basic:	Speed Control	( )_____ _____	
	Bank Control	( )_____ _____	
	Rudder Coordination-	( )_____ _____	
	Roll in/Roll out	( )_____ _____	
Times for 360ºTurns		_____	
Advanced:	Thermal Entry	( )_____ _____	
	Gaggle Joining	( )_____ _____	
	Thermal Centring	( )_____ _____	
	Thermal Leaving	( )_____ _____	
	Thermal Selection	( )_____ _____	
Flap use	Thermalling	( )_____ _____	
	Cruise	( )_____ _____	
Scanning:	While Thermalling	( )_____ _____	
	Straight Flight	( )_____ _____	
Navigation:	Map Reading	( )_____ _____	
	Track Keeping	( )_____ _____	
	GPS use	( )_____ _____	
Thermal Tracking:	From Clouds	( )_____ _____	
	From Ground	( )_____ _____	
	From Netto	( )_____ _____	
Diversions:	Thermal or Navigation	( )_____ _____	
McCready:	Setting	( )_____ _____	
	Following	( )_____ _____	
Turn Points:	Positioning	( )_____ _____	
	Timing	( )_____ _____	
Tactical:	Height Band	( )_____ _____	
	Turn Points	( )_____ _____	
	Other Sailplanes	( )_____ _____	
Maintaining Skill Level/Concentration:		( )_____ _____	
Final Glide:	Anticipation	( )_____ _____	
	Final Thermal	( )_____ _____	
	Wind Assessment	( )_____ _____	
	Monitoring	( )_____ _____	
Arrival at Airfield:		( )_____ _____	
	Finish/Overflight	( )_____ _____	
	Circuit and Landing	( )_____ _____	
Post Flight Organisation:		( )_____ _____	
Overall Assessment			
Total/Assessed Max		(/)_____ _____	

Coach: _____ **Date:** _____

REFERENCES AND LINKS

There are a number of web pages that will provide a lot of information to support your development.

As a start look at the GFA web sites

www.gfa.org.au
www.soaring.org.au

For the sporting code and international information

www.fai.org

[This is the international aviation organisation, refer to Gliding section and sporting code section].

Refer to the links on these web sites to international links and national links.

There are also internet groups and private web pages with great articles such as:

Aus.soaring (email list Aus-soaring@lists.internode.on.net)
Rec.aviation.soaring (usenet newsgroup)
www.jamescooper.com.au/Gliding/Article.htm

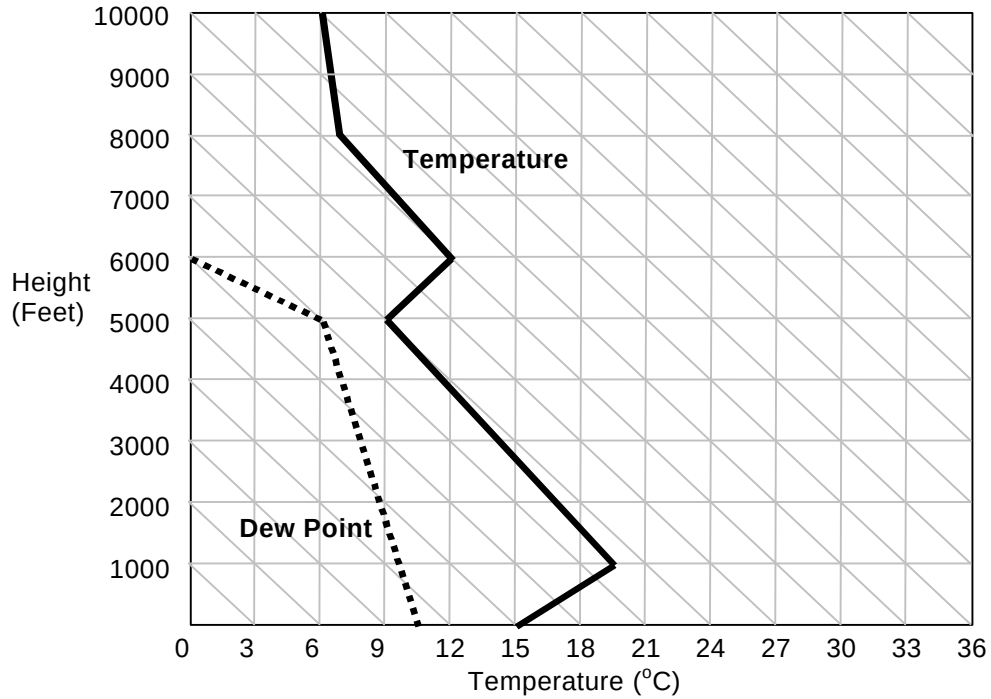
For weather/meteorology links refer to page 26

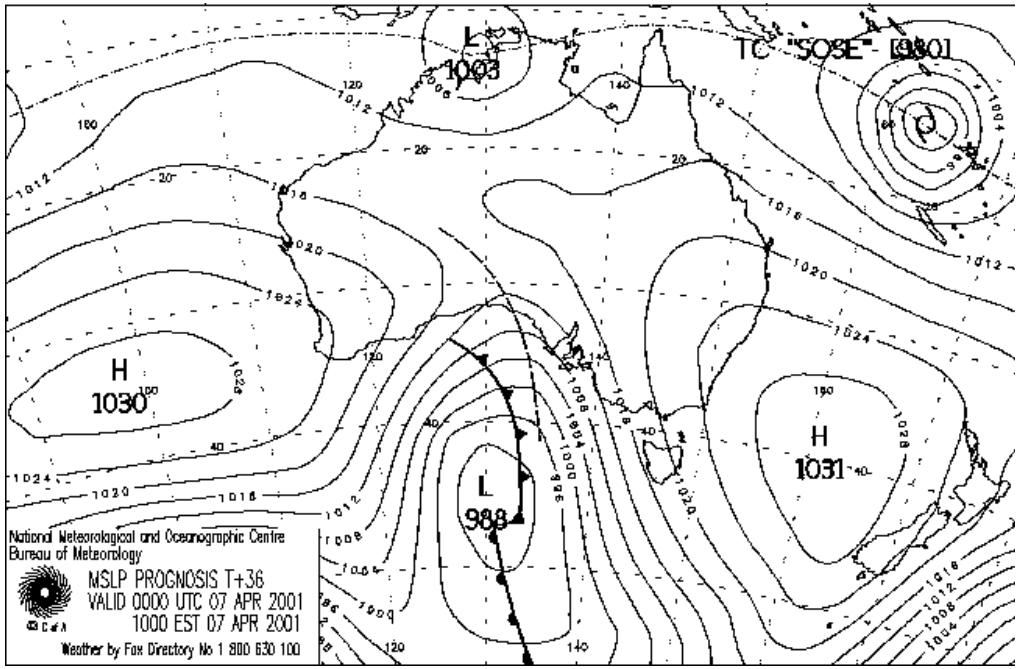
Book references:

Cross Country Soaring by Reichmann
Flying Faster and Further parts 1 and 2 . GFA
New Soaring Pilot: Wallace and Irving

Achievements and Goals

	Date
FAI Certificates (Ref: *FAI Sporting Code Section 3*	
Silver C badge	
5 Hour duration	
50 km distance	
1000 m height gain	
Gold C badge	
300 km distance	
3000 m height gain	
Diamond C badge	
300 km goal	
500 km distance	
5000 m height gain	
Cross country achievements	
150 km distance	
300 km at greater than 80 km/hr	
300 km at greater than 100 km/hr	
500 km at greater than 90 km/hr	
500 km at greater than 100 km/hr	
500 km at greater than 120 km/hr	
Distance flights	
600 km	
700 km	
750 km	
800 km	
900 km	
1000 km	
Record flying	
Australian record	
World record!	





Meteorology Test

Given the temperature sounding and prognostic chart shown on the next page, forecast 15-20 knot winds and a maximum temperature of 31 ^{o}C:

1. At what temperature would the overnight inversion be broken and thermals go above 1000 feet?
2. At that temperature, approximately how high will the thermals go?
3. Will there be cloud when the overnight inversion first breaks? If so, at what height will the cloud base and tops be?
4. Would you expect cloud to form or dissipate during the day?
5. Roughly what thermal strength would you expect when the temperature is at the forecast maximum?
6. List the factors that may affect the length of convective activity and thermal strength?
7. What is the wind direction in your location?
8. How would the wind direction influence your task selection?
9. Would you expect significant cycling? If not, under what conditions would you expect cycling?
10. Are thunderstorms likely?
11. If you are flying a Hornet, what average cross country speed should be possible at the peak of the day:
    With a wing loading of 33 kg/m^2? (light)
    With a wing loading of 45 kg/m^2? (heavy)
12. What effect is a trough likely to have on convection?

	Date
Ratings/approvals	
Daily Inspectors Certificate	
Outlanding approval	
Radio operators endorsement	
Official observer	
Air Experience Instructor (AEI)	
Independent Operator Level 1	
Independent Operator Level 2	
Aerobatic rating—basic	
Aerobatic rating—advanced	
Sporting Coach (level1)	
Sporting Coach (level2)	
Sporting Coach (level3)	
Instructor (level 1)	
Instructor (level 2)	
Instructor (level 3)	
Achievements	
Solo outlanding	
Flight with Water Ballast	
Ridge Soaring approval	
Wave Soaring	
Competition approvals	
Regional competition – CFI authorization	
National competition – CFI authorization	
Set your own goals:	

Aerobatics

References:

Basic Gliding Knowledge – Gliding Federation of Australia

NOTE: Aerobatics should be trained and authorised by an instructor. Glider must be rated for aerobatic maneuvers.

Theory

Understanding of flight envelopes
Pre-aerobatic check (see Basic Training Book)
Suitable flight conditions
Flying at safe speed
Effect of G loading on stall
Problems
- Tail slides
- High speed stall

Reporting over-stresses
Procedure
- Loop
- Wingover / Chandelle
- Stall turn
- Steep Turn

	Signature	Date
Theory Briefing		
Air exercises		
Familiarisation with G loading		
Check negative G sensitivity		
High speed stall		
Exercise airbrakes at speed		
Loop		
Wingover / Chandelle		
Stall Turn		
Steep Turn		
Aerobatics Approval		

Meteorological Navigation

LOOKING ahead
Next thermal source
Cloud streets
Changes in terrain—likely impact on thermal strength
Thermal wave—identification
Wave impact on thermals
Identify changing weather conditions—impact on thermals
Changing gear—when to slow down/get high, when to increase speed

Notes:

It is worthwhile keeping a file of weather charts and temperature traces that relate to your personal flights. This is perhaps the best way to learn the weather and make forecasts.

Meteorology

References:

Flying Faster and Further, Part 1 – GFA
Cross Country Soaring – Helmut Reichmann
Understanding Flying Weather – Derek Piggott
Meteorology and Flight – Tom Bradbury
Meteorology for Glider Pilots – C.E. Wallington (out of print)
Wonders of the Weather – Bureau of Meteorology

Sources of weather information

Media: TV, newspaper, teletext
Telephone: 1196
Web: www.bom.gov.au – Bureau of Meteorology
www.weatherzone.com.au
http://slash.dotat.org/cgi-bin/atmos
geocities.com/peter.temple/atmos.html – SA gliding plots
Metfax:

Cross country flight weather forecasting

Use of aviation area forecast
Use of synoptic and prognostic charts
Effect of wind on thermals
Cloud types, bases, tops and their effect on convection
Effect of dew point, freezing level
Rate of heating
Prediction using atmospheric soundings
- Thermal height estimation
- Effect of inversions – trigger temperature
- Cloud forecasting
- Thermal strength estimation (height/1000 -1 in knots)
- Uniformity
- Wind strength and direction at altitude
- Limitations of sounding data

Predicting sea breezes – strength and timing
Predicting length of convection
Predicting cycles and cycle duration
Predicting wave and streeting
Hazards: thunderstorms, high winds, fronts, squall lines

Notes:

More advanced aerobatic maneuvers are possible with an approved instructor and suitably rated aircraft

Cross Country Rating—Outlandings

References:
Basic Gliding Knowledge – Gliding Federation of Australia
Cross Country Soaring – Helmut Reichmann

Outlanding Check

Wind – check strength and direction, land into wind
Size – must be adequate in landing direction
Surface – must be smooth, no crop or high grass
Slope – land up slope if slope cannot be avoided
Stock – sheep OK if clear landing path, avoid other stock
Surroundings – look for SWER lines, trees etc.

Preparation

Check trailer
Organise crew
The Mandy mnemonic (MODE)
Map
Mobile phone
Money
On barograph
On camera
On Oxygen
Drink
Declaration
Eats
Extra clothes
Effluent!

Outlanding Theory

When to select paddock
Checking wind – drift, dust, smoke, water, windsocks
Determining altitude
Common problems

Oxygen Systems

References:
www.jamescooper.com.au/Gliding/Articles.htm (Oxygen cascade)
Oxygen briefing David Peitsch

Use at ALL times above 10000’
Types of systems
Use of oxygen

	Signature	**Date**
Ridge flying briefing		
Safety considerations		
Wave flying briefing		
Flying in difficult conditions briefing		
Hypoxia/Hyperventilation briefing		
Oxygen systems briefing		
Flying in controlled airspace briefing		
Decompression chamber run		
Wave check flight		

Mountain Flying

References:
Cross Country Soaring – Helmut Reichmann
Wave Camp Manual – Beverly Soaring Society
Aviation Medicine – Department of Defense
Airways and Radio Procedures for Glider Pilots – GFA

Theory

Ridge flying
Ridge lift mechanism
Location of best lift
Minimum workable height
Low level flying
Give way rules
Safe speed near the ground

Wave flying
Theory of wave formation
Locating and maintaining lift
Use of ground features for maintaining location
Never turn downwind
Cloud considerations
Navigating without reference to the ground

Flying in difficult conditions
Rough air considerations
Planning circuits

Hypoxia/Hyperventilation
Theory of O^2/CO^2 partial pressures
Effect on physiology
Symptoms
Aviation medicine course
Decompression chamber run

Post landing Actions

- Contact crew
- Obtain permission from farmer before retrieving glider
- Fire considerations
- SAR considerations

Never underestimate the risk

	Signature *	**Date**
Briefings		
Outlanding check		
Preparation		
Outlanding theory		
Post landing actions		
Air exercises		
Picking paddocks		
Circuits, approach and landing		
Motorglider circuits		
Dual outlanding		
Solo outlanding		
C certificate		
20 solo flights		
Two 1 hour flights		
Outlandings (see above)		
Passenger awareness briefing		
Demonstration of spin		
Oral examination		
Cross Country Rating		

* Signature of Coach indicates that competence has been shown on the date indicated. This does not indicate that competence is maintained over time, Refer to logbook for approvals/ratings.

Cross Country —Thermalling

Thermal structures
- Thermal sources
- Bubbles, streams, columns
- Putting theory into practice

Thermal entry
- **Lookout**
- Thermal entry technique
- Joining other gliders

Thermal centering techniques
- First turn correction
- Best/worst sector method
- Surge method (straighten in surge)
- Huth method (tighten in core)
- Widening to search

Thermal technique
- Scanning
- Use of Audio vario
- Constant bank and speed
- Time circles (less than 20 sec)
- Effective bank angles
- When to leave thermals

	Signature	**Date**
Thermal entry briefing		
Thermal entry Lookout		
Speed control before and after entry		
Thermal centering briefing		
Thermal centering Lookout		
Speed control with angle of bank > 40 degree		
Use of audio vario		
Thermal sources—blue		
Thermal sources –cloud		
Average circle time:		

***Notes*:**

Flight preparation

Sailplane preparation

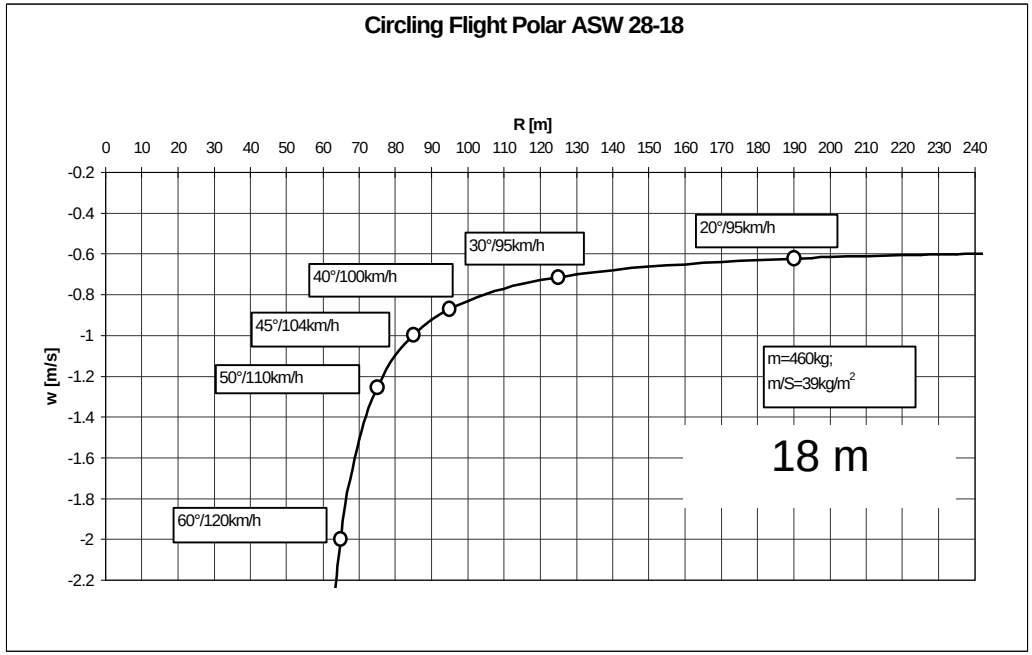
Make sure you will be comfortable for long flights
Surface finish
Seals
Control surfaces
Canopy
Wing roots
Undercarriage doors
Centre of Gravity adjustment
Wax/polish
Instruments and batteries
Rigging and de-rigging the glider
Radio

Sports physiology / psychology

Nutrition – how often to eat when flying, what to eat?
Hydration – drink regularly!
Hydration – pee in glider - practice!
Oxygen (see mountain flying section)
Coping with stress
Relaxation

Competition flying

Obtain competitors license
Preparation
Knowledge of rules
Task types – set tasks, PST, AAT
Tactics
Team flying



The Circling polar shows the rate of sink of the glider, and the radius of the circle (in metres) for different angles of bank and speed. Note the very rapid increase of sink once the angle of bank exceeds 50 degrees. From 20 degrees to 45 degrees, rate of sink increases by 80 feet per minute, but radius of turn reduces from 190 metres to only 85 metres. Optimum angle of bank is approaching 45 degrees.

CIRCLE DIAMETER in METRES / CIRCLE TIME in SECONDS									
SPEED	**Bank Angle in Degrees**								
KTS	20	25	30	35	40	45	50	55	60
40	237/36	185/28	150/23	123/19	103/16	86/13	72/11	60/9	50/8
45	300/41	234/32	189/26	156/21	130/18	109/15	92/12	76/10	63/9
50	371/45	289/35	234/29	193/24	161/20	135/16	113/14	94/12	78/10
55	448/50	350/39	283/31	233/26	194/22	163/18	137/15	114/13	94/10
60	534/54	416/42	336/34	277/28	231/24	194/20	163/17	136/14	112/11
65	626/59	489/46	395/37	326/31	272/26	228/21	191/18	160/15	132/12
G force	1.06	1.10	1.15	1.22	1.31	1.41	1.56	1.74	2.00

Cross Country - Speed to fly

References:
Flying Faster and Further, Part 1 – GFA
Cross Country Soaring – Helmut Reichmann

Speed to fly

McCready theory

Selection of ring setting
Effect of flying too fast
Effect of flying too slow

Block Speeds

Impact of block speed compared to McCready
Selecting the block speed

	Signature	Date
Speed to fly briefing		
Maintaining speed to fly in lift and sink		
Following block speeds		
Impact of height band on speed selection		

Block Speeds (knots) - Hornet

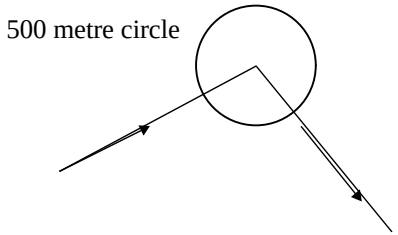
		Weak	Medium	Strong
Heavy	**High**	**70**	**85**	**95**
	Low	**65**	**75**	**85**
Light	**High**	**65**	**75**	**85**
	Low	**60**	**70**	**80**

Cross Country - Flight verification

Apply for your official observer rating as soon as you have your Silver C

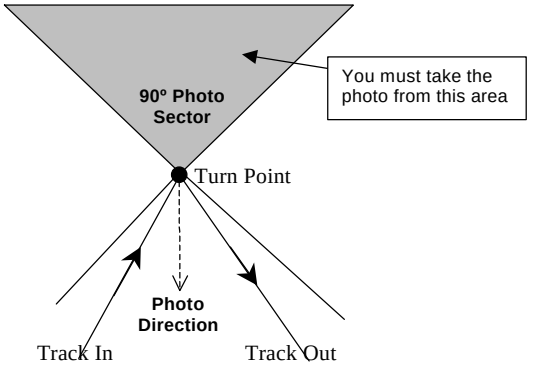
	Signature	Date
Turnpoint techniques briefing		
Flight demonstration of turnpoint techniques		
Lookout issues at turnpoints		
Photographic evidence briefing		
Electronic evidence briefing		
Flight demonsration of electronic results		
Review sporting code on FAI web page		
Official observer rating		

Electronic 'beer can' Turnpoint sector



Logger must have at least one record inside the circle. You do not need to go around the turnpoint (Note: Some flights do not permit 'beer can" verification, you must pass through the FAI sector—check the sporting code)

FAI Turnpoint sector



Flight Verification

References:
Flying Faster and Further, Part 1 – GFA
Cross Country Soaring – Helmut Reichmann
FAI Sporting Code Section 3

Read the FAI sporting code section 3 (www.fai.org)

Photographic procedure for badge/record flights
Declaration - date of flight
name of pilot
type and rego of glider
type and serial no. of barograph
departure point
turnpoint(s)
finish point or goal
time of declaration
date, signature and name of pilot
date, signature, no. and name of official observer
Mounting camera – witness mark
Preparing barograph
Turnpoint photography
Photo of tail after landing
Processing negatives (**don't cut negatives**)
Duties of official observer

Electronic procedure for badge/record flights
Configuring logger – sample interval
sector/cylinder
clear memory
Electronic declaration
Mounting logger
Turnpoint considerations
Downloading flight log
Duties of official observer

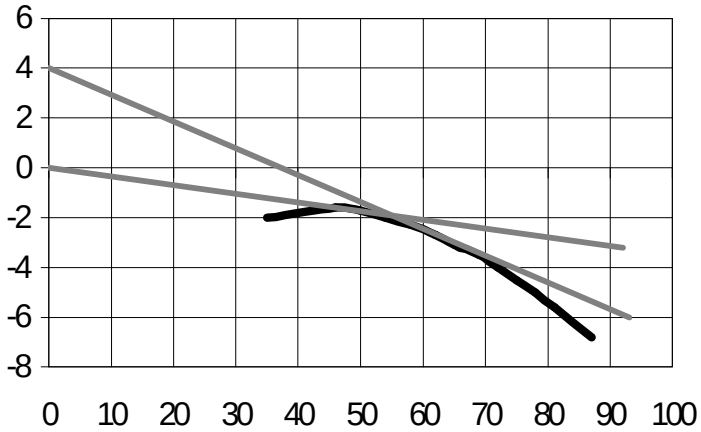
Cross Country - Height bands

Use of height bands
Minimum height (e.g. 1/3 of max height)
Varying McCready setting with height

	Signature	Date
Use of height bands briefing		
Nominating height bands in varying conditions		
Thermal selection in top 1/3 of height band		
Thermal selection in middle 1/3 of height band		

***Notes*:**

Typical 2-seat Polar



Advanced Cross Country Flying

References:
Flying Faster and Further, Part 2 – GFA
Cross Country Soaring – Helmut Reichmann

Advanced training

Dual cross country (see assessment sheet on page 30)
Lead and follow cross country

	Signature	Date
Dual cross country experience		
Lead and follow briefing		
Lead and follow experience		

Lead and follow techniques.

Good briefing before flight:
Meeting up – leader finds student.
Agreed radio procedures and frequency
Safety – below a nominated altitude student must look after himself with regard paddock selection.

Coach.
Must use the radio frequently to be informative,
Always pull the brakes to come to the level of the student through the flight.
When leaving a thermal call on the radio "Leaving 80knots" or whatever speed.

Student.
Your job is to follow, do not make your own thermal selection.
If the leader straightens in a thermal to move its centre do the same, otherwise you will cut inside, very dangerous.
Try to remain opposite to the leader in a thermal.
Be prepared to ask "Why are you doing what you are doing"
When he leaves follow that turn and radio "Following"

Task Setting

Predicting achievable speed
Allowing for wind drift
Setting task length and direction
Estimating elapsed time
Determining start time
Selecting terrain/direction of task

	Signature	Date
Interpret weather forecast		
Estimate task time		
Estimate launch/start time		
Tracking progress on task		

Average cross country speeds (Hornet) - kph

Thermal strength (kts)	LIGHT	HEAVY
1	40	40
2	60	65
3	75	80
4	80	90
5	90	100
6	95	105
7	105	115
8	110	120
9	115	125
10	120	130

Average speed will be reduced by strong winds, increased by streeting
Assumes stronger lift associated with higher heights

Flying with other gliders

References:

Flying Faster and Further, Part 2 – GFA
GFA competition safety pack—GFA
Pair flying radio procedures—Brian Spreckley (GFA)
LOOKOUT— see GFA lookout package (GFA)

	Signature	Date
Thermalling with other gliders		
Use of audio and radio		
Lookout		
Gaggle flying—4 or more gliders		
Safety demonstration—maintain separation		
Cruising		
Cruising with others —safety consideration		
Cruising—tactical advantage		
Pair flying		
Pair flying briefing		
Radio procedures		
Pair flying practice		
Cockpit management		
Safe adjustment of instruments		
Safe map reading		

Water ballast

Effect on climb rate
Effect on glide ratio and speed
Achieved average speed: ~1% faster per 10kg extra ballast
When to use…

Climb rate (knots)	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Loading (kg/m^2) - std	Light	32	35	38	41	44	47	50
- 15m	Light	34	37	40	43	46	49	52

	Signature	Date
Safety considerations of ballast use		
Flying with water ballast		
Wing loading management in varying weather		

Use of flaps

Effect on polar
Importance of varying flap setting during cruise
Optimising cruise flap setting – speed to flap rings
Whenever changing speed always lead with flaps

	Signature	Date
Flap use on takeoff—briefing		
Flap use on landing—briefing		
Conversion to flapped glider		

Rain / severe bugs

Effect on performance
Dealing with rain
Dealing with bugs

	Signature	Date
Speed to fly with rain/bugs—briefing		
Impact on final glide—briefing		
Safety considerations of poorer glide—briefing		

Cross Country —Final Glides

Final Glides

When to leave your last thermal
McCready for glide
Calculation of height needed
Effect of wind
Don’t forget to plan a circuit

	Signature	Date
Final glides		
When to leave your last thermal		
McCready for glide		
Calculation of height needed		
Effect of wind		
Safety allowance		
Don’t forget to plan a circuit		
Dual final glide		
Solo final glide - 1000 feet finish		
Solo fiinal glide—500 feet finish		
Solo fiinal glide—50 feet finish		
Use of final glide computer		
Final glide to a turnpoint		

Cross Country —Navigation

Navigation

Knowledge of airspace
Map reading
Use of compass
Use of GPS

Flying in controlled airspace

Block clearances
Requesting clearance

	Signature	Date
Navigation		
Knowledge of airspace limits		
Map reading		
Use of compass		
Use of GPS		
Radio procedure test		
Flight demonstration		
Finding a specified location using a map		
Locating current position on map		
Flying on a compass heading		
Navigation using GPS		
Programming a GPS		