

Gliding Australia Training Manual

Pilot Guide



Unit 16 Circuit Joining & Execution

Unit 16 - Circuit Joining & Execution

WHAT THIS UNIT IS ABOUT

To fly a circuit from the circuit joining area through to a stabilised final approach and recognise your responsibility to follow circuit procedures to complete a successful flight.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC Unit 15 Break-off & Circuit Planning

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 17 Stabilised Approach and Landing
- GPC Unit 21 Radio Use and Endorsement

KEY MESSAGES

- Circuit and landings are a high-workload phase of flight. It is important to ensure distractions are minimised and the aircraft is configured correctly at height.
- The ideal outcome is positioning the aircraft at the top of final approach in correct configuration at correct airspeed and height (>300' AGL) allowing a half airbrake stabilised approach.
- Landing areas are generally high traffic areas, ensure your situational awareness is maintained.
- Be prepared to monitor the landing area & modify the circuit as it is being flown if circumstances traffic, weather or other issues require.
- Maintain a safe speed at all times.

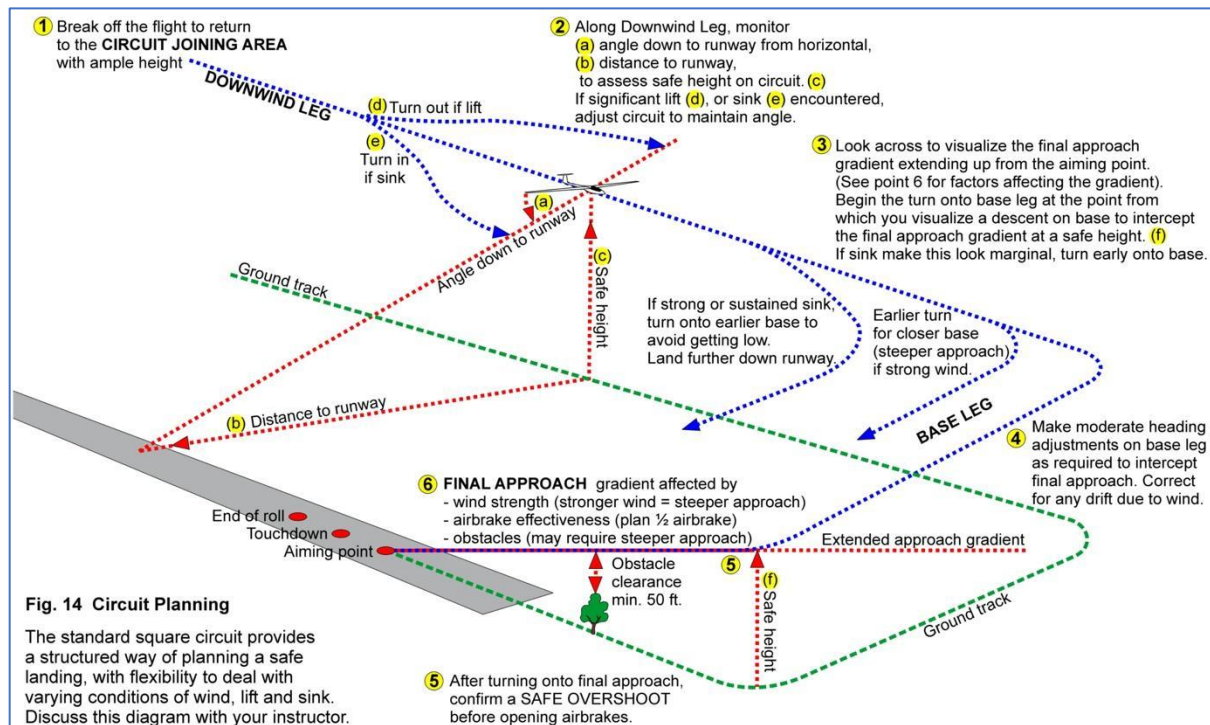
PILOT GUIDE FOR THIS UNIT

Normal Circuit

A circuit is flown in such a way that the glider is always within easy reach of the landing field. For this reason, a particular pattern has evolved over the years which will ensure that this requirement is met.

A typical circuit pattern is shown in the diagram below. Follow through the diagram from Circuit Joining Area, along Downwind leg, Base leg and Final approach. Watch some circuits being flown by other aircraft at your airfield and identify each leg.

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Setting the Speed

- At the breakoff point, **determine Approach speed** ($1.5V_s + \frac{1}{2}$ wind speed)
- Establish safe speed near the ground ($1.5V_s$) below 1000ft
- You should **Set approach speed** from the break-off point, but at the latest, before the pre-landing checks, (which is early on the downwind leg).

Crosswind Leg

- Some clubs and sites require a crosswind leg to be executed.
- This would normally be perpendicular to the Downwind leg, entering abeam the other end of the runway.

Downwind leg

- The Downwind leg must be flown close enough to the runway so that you can clearly see any obstructions on the landing area, and far enough away to give you enough room for a base leg. Look out the side of the glider at the runway and determine how steep it is down to the landing point.
 - If the angle is too steep then you are too close and you will not be able to adjust your glide on base leg. To correct for this, turn the glider away from the strip (20-30 degrees) for a few seconds, then resume a track parallel to the strip and re-assess.
 - If the angle is too flat then you may not be able to get back to the runway if you hit sink. To correct for this, turn towards the runway for a few seconds and resume a parallel track.
- Maintain your attitude through reference to the horizon ($1.5V_s + \frac{1}{2}$ wind speed).
- Maintain your track parallel to the runway.

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- Make a radio call entering the circuit (generally joining crosswind or downwind) and LOOKOUT.
- If not already complete ensure that aircraft is configured for landing and pre-landing checks (FUST) are completed by mid-downwind leg.
- Don't forget to check the wind direction and strength.
- When passing abeam the landing area on the downwind leg check the landing area is clear and pick an aiming point. This will be used on the final approach and during training it helps if it can be easily identified from circuit height. Typical examples of useful aiming points are – suitable marks or a bare patch of ground on a grass strip. Anything that attracts the eye is useful during training.
- Then, in your mind's eye, draw a line, a kind of "ramp in the sky" up the approach path from the aiming point. This is the line you will follow down to the ground on the final approach. The reason you mentally sketch it all out at this point is that it helps you decide when to make the turn onto base leg.
- As the downwind leg progresses and the landing area recedes behind you, glance back over your shoulder to keep that mental final approach path in view. Then, when you reach a point where a turn onto base leg will intercept the final approach path at a satisfactory height and position, make the turn.
- Judge when to make the base leg turn by assessing height, position, and angle and make any necessary adjustments to the circuit. When the angle starts looking shallow or if you start losing sight of the landing area, it is time to turn base.

Base leg

- Fly the base leg parallel to the runway final heading, adjusting towards or away from the final leg as necessary. The purpose is to adjust height and position to ensure the final turn occurs at correct height/location.
- When you have completed the turn onto base, you should be able to see that the interception of the final approach path will take place as planned and will result in a straight run-in down the "ramp" to touch-down with plenty of time to make fine adjustments.
- The final approach leg must be sufficiently long to allow time on final to settle and assess approach path prior to using airbrakes to establish a stabilised approach.
- Ensure turn onto base leg and onto final is a coordinated (30-40° bank) turn – airbrakes should not be used – but if extended prior to entering the turn do not extend further during the turn.
- Maintain the approach airspeed and monitor situational awareness. Targeted scan for traffic coming head-on from an opposite circuit or for traffic approaching from the side on long final.
- Continue to monitor the approach path and landing area – assess the ability to land or determine changes required.
- Adjust commencement of the final approach turn for head/tail wind component on base leg. If in a tail wind start turn earlier.
- During the Base leg locate and put your left hand on the Airbrake lever.
- If height is excessive airbrakes can be used, provided they are opened before the turn, ensure airspeed is maintained. Ideally we want to be a **minimum** of 300' AGL when you have completed the turn onto Final.

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The Final Turn from Base to Approach

- Refer GPC Unit 17 for Stabilised approach and landing which is covered separate to this lesson. However, you should be aware of the following:
 - The final turn should be a normal (30-40°) banked turn, similar to the one onto the base leg at the selected safe approach speed, having regard to the local conditions.
 - Upon completing the turn and with the wings level, line the glider up with the required landing path into the landing area and confirm the landing area is clear.
 - The turn should be initiated early enough to avoid overshooting the centreline of the intended approach.
 - Turning too late is a common student error, which often induces a steep final turn and misalignment with the landing area centreline.
 - Good energy management is critical to safety, setting up a good stable approach from which a safe landing can be conducted.
 - Poor landings, or landings causing damage or injury, are much more likely to result if the final turn is executed too late, too close to the ground or with poor energy management, all of which make a stabilised approach and controlled landing much more difficult.

Situational awareness

- Maintain a targeted scan of the circuit area and periodic full scan to maintain situational awareness.
- When other aircraft in circuit are sighted coordinate to avoid conflict on approach. This may require extending downwind if safe to do so. Remember rules of the air – lower aircraft and lower performance aircraft have priority.
- Although the use of radio is strongly recommended as a useful adjunct to safety in the circuit, remember the old saying "AVIATE – NAVIGATE - COMMUNICATE". This neatly summarises the order of priorities which a pilot must remember. Don't over-concentrate on making a radio call, at the expense of losing control of your aircraft.

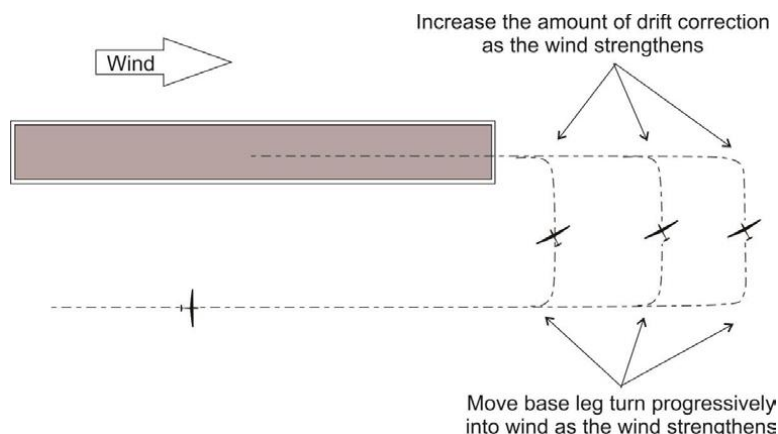
Modifying the circuit

- If angle becomes too low for a safe landing at the original intended landing area we should modify our circuit and land in the nearest available safe area.
- Monitor the intended landing area for obstacles. Consider options to modify the circuit or landing area if it is not clear (or not expected to be clear) for the approach.

Strong Winds

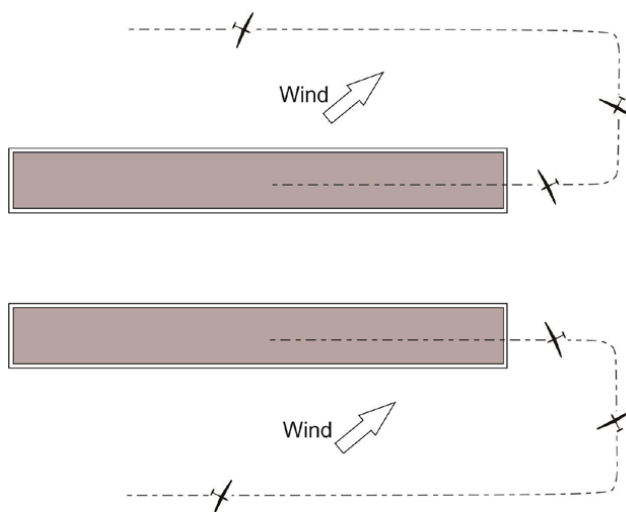
- The base leg turn should be made earlier than usual in strong winds to ensure you don't end up too far away from the aiming point. (see diagram below) The stronger the wind, the earlier the turn. Considerable drift correction will be needed on the base leg in strong winds.

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Cross Winds

- It is preferable to do a crosswind circuit on the "downwind" side, i.e. with the wind tending to blow you away from the strip. (see below)
- This means that any drift correction is made TOWARDS the strip, making it easy to see the landing area. The base leg also takes a longer time to complete, resulting in a reduction in workload because of the extra time available.



- If compelled by aerodrome rules to do a circuit on the "upwind" side of the strip, (see above) the drift correction is made away from the strip, putting the strip to some extent behind the glider and therefore awkward to see. The base leg takes a very short time because of the high groundspeed and this tends to make for an increased workload.

Running out of Height

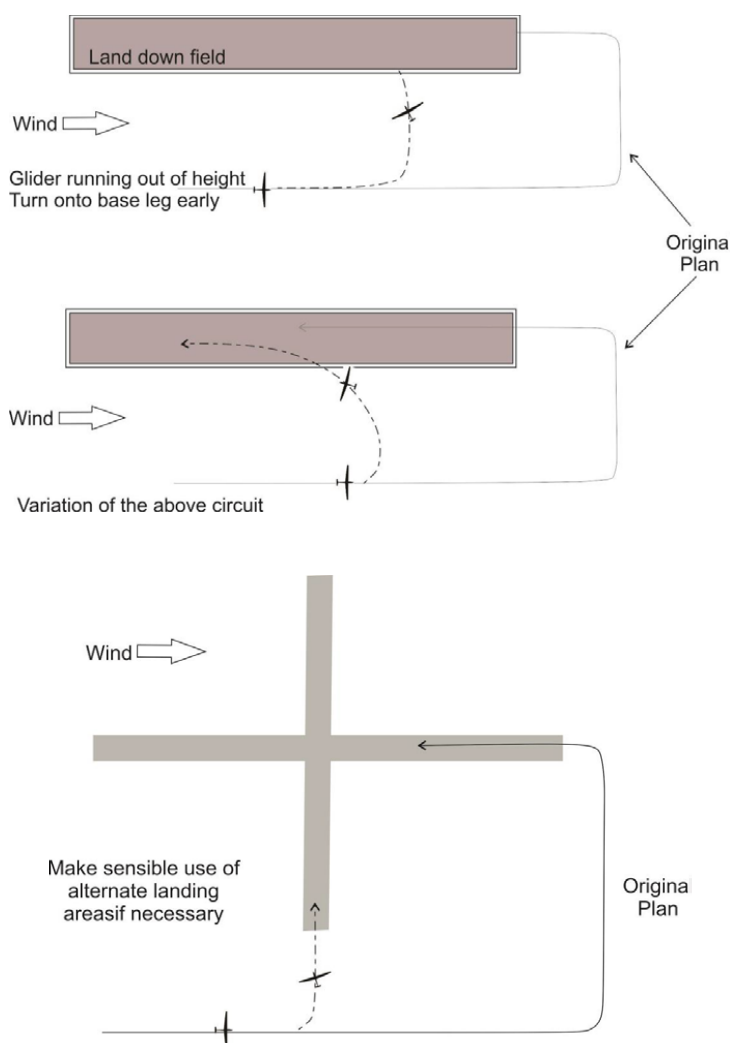
- If unexpected heavy sink is encountered or a misjudgement of angle/distance relationship made, it may not be possible to complete the circuit originally planned. In this case the whole plan will need to be altered and a turn made onto the base leg much earlier, in some cases right away.
- A new landing area must be selected; anywhere on the aerodrome will do, the only requirement being that it is SAFE to land on. Convenience does not come into the argument.

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Anyone can make a misjudgement or get caught by unusual conditions; the important thing is to place safety above all other considerations. Nobody cares if the glider has to be retrieved from several hundred metres down the field.

- NEVER risk a low base leg and final approach. Such a situation may be impossible to fly yourself out of, no matter how capable you are. Turn in early and land down the field. An early turn-in and down-field landing is known as a MODIFIED CIRCUIT.
- Failure to modify a circuit leaves a pilot without an escape route. This in turn increases the risk to an unacceptable level.

Some Examples of Modified Circuits



FLIGHT EXERCISES FOR THIS UNIT

- Your instructor will establish the aircraft on downwind and show you the appropriate angles to landing path - approximately 30 degrees down from horizontal with approach speed set to $1.5 V_s + \frac{1}{2}$ wind speed.

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- You must continually reassess the situation and monitor the aircraft's height and angle to landing area to reassess landing area feasibility and consider options.
- If the downwind angle to the runway is too steep (or shallow), you will move away from (or towards) the runway to correct the situation and resume the parallel track.
- If the angle becomes too low for a safe landing at the original intended landing area your instructor will modify the circuit and land in the nearest available safe area.
- You both will maintain a targeted scan of the circuit area and periodic full scan to maintain situational awareness.
- Your instructor will show you where to turn base leg turn by assessing height, position, and angle and make any necessary adjustments to the circuit. The final approach leg must be sufficiently long to allow time on final to settle and assess approach path prior to using airbrakes to establish a stabilised approach.
- Ideally we want to be a **minimum** of 300' AGL after the turn from base leg to the beginning of the approach.
- It's a busy time for the pilot at in the circuit and perfecting your judgement takes time. For this reason, you will spend quite a few flights practicing this important unit.

THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS	
Problem	Probable Cause
<ul style="list-style-type: none"> • Incorrect downwind leg <ul style="list-style-type: none"> ○ Too close or too far away ○ Incorrect speed ○ Not parallel to the landing direction 	Not monitoring angle down to the aiming point Not monitoring nose attitude Not monitoring track
<ul style="list-style-type: none"> • Late or early turn onto base lag 	Poor judgement of angle to aiming point
<ul style="list-style-type: none"> • Too high turning final 	Too early turning base Lack of angle adjustment on base leg

HOW DO YOU DEMONSTRATE COMPETENCE?

- Arrival at the planned circuit area with aircraft correctly configured.
- Correct joining circuit radio broadcast.
- A range of non-standard circuit entries.
- Maintaining required speed and track and angle relative to the aiming point.
- Completion of pre-landing checks.
- Judgement as to when to turn to base leg and when to turn final.
- Arrival at a stabilised final approach no lower than 300ft AGL.
- Adjustment to the circuit path in response to changes in conditions and other factors.

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RESOURCES & REFERENCES

- Australian Gliding Knowledge (AGK) pages 116-136
- Theory Lesson PowerPoints
- Gliding Handbook: FAA 2013

SELF-CHECK QUESTIONS

Use these questions to test your knowledge of the unit.

- What is the purpose of flying a circuit?
- What is the "formula" to calculate your downwind safe speed?
- If you have a strong headwind on your final leg, what allowance should you make on base leg?
- If you are too close on downwind leg, how should you adjust?
- With a crosswind which side of the runway is the best option to fly your circuit?