Gliding Australia Training Manual

Trainer Guide

Unit 16

Circuit Joining & Execution

AIM

The aim of this unit is for the student to:

- Recognise their responsibility to follow circuit procedures.
- Fly a circuit from the circuit joining area through to a stabilised final approach.
- Develop awareness of the factors that may affect the execution of the circuit.
- Demonstrate modification of the circuit as required.

PREREQUISITE UNITS

- GPC 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.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Join circuit as planned.	• **Describe:** ○ Required aircraft configuration for landing phase. ○ Threats associated with entering the circuit for an off-field landing. • **Demonstrate:** ○ Arrival at the planned circuit area with aircraft correctly configured. ○ Correct joining circuit radio broadcast. ○ A range of non-standard circuit entries.
2. Fly circuit maintaining situational awareness.	• **Describe:** ○ Factors that can impact the execution of the circuit. ○ How to work backwards from the end of ground roll, touchdown, flare, aiming point to determine circuit path. ○ Options available should you require an emergency off-field landing inside the selected circuit area. • **Demonstrate:** ○ Flight path through to final turn. ○ 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. ○ Safe speed near the ground at all times.
3. Modify circuit as required.	• **Demonstrate:** ○ Correct procedure for modifying the circuit.
4. Maintain clearance and traffic separation.	• **Demonstrate:** ○ Clearance of obstacles and restricted airspace. ○ Ability to communicate with other traffic as required to achieve self-separation.

KEY MESSAGES

- Circuit and landing is a high-workload phase of flight – ensure distractions are minimised and aircraft configured correctly at height.
- 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 – Situational Awareness maintenance is essential.
- Be prepared to monitor the landing area & modify the circuit as it is being flown if circumstances – traffic, weather, etc. – require.
- Maintain a safe speed at all times.

LESSON PLANNING AND CONDUCT

Classroom Briefing

Notes:

- This briefing may be conducted over a series of sessions to cover the full scope without overloading the student. If this is the case, ensure that the flight exercises conducted match the theory elements briefed.

General

- Good circuit execution as a significant contribution to safe landing. Good flight management below 2000' AGL contributes to a stabilised approach.
- Note the significant workload issues in the landing phase of flight.
- Show a diagram of a standard circuit and describe the key decisions/actions at each stage of the circuit and landing. (See Pre-flight Briefing.)
- Good planning and Situational Awareness which includes location, traffic and environment – in particular wind and areas of lift/sink, assists in reducing stress on the pilot in the landing sequence.
- Lookout remains essential – the pilot is typically in a potentially high traffic area.
- Monitor landing area to identify congestion and obstacles –consider alternates.
- Landing area may be a selected outlanding field/paddock.
- Circuit legs and turning points are almost always different for each flight and are not fixed locations over the ground.

Commence Circuit

- Conduct targeted scan of circuit area for traffic. Maintain radio listening watch on airfield frequency.
- Ensure mindset of 'landing pilot'. No longer searching for or considering the use of lift.
- Circuit joining is the beginning of the planned circuit with the aircraft at a suitable height and location. If height is insufficient, consider joining circuit later on downwind, base or on final approach.

- Aircraft is configured for landing including straps, water ballast, engine, radio, Flaps, Undercarriage, Speed, Trim.
- Look along the intended circuit legs for potential obstacles (hills, traffic, turbulence, or airspace) that need to be avoided.
- Determine effect of wind on flying the circuit – what drift correction will be needed and how will wind affect the ground speed (and hence time spent) on each leg.

Circuit Radio Broadcast

- Aviate and Navigate and Communicate are the key priorities in that order.
- Circuit joining radio, and other calls as required to alert other traffic.
- Correct phraseology to be used.
- Positions for broadcasts – describe where these are essential and useful where situation permits.
- How we might respond to other traffic radio broadcasts in the circuit area. Use a diagram to simulate aircraft positions and simulate different radio calls and responses.

Setting the Speed

- At the breakoff point, **determine Approach speed** ($1.5V_s$ + ½ wind speed)
- Establish safe speed near the ground ($1.5V_s$) below 1000ft
- **Set approach speed** from the break-off point, but at the latest, before the pre-landing checks, (which is early on the downwind leg).

Fly Circuit

- Flying a standard circuit allows time for progress to be judged, alternatives considered, and the necessary actions are taken to set up a good approach and complete a safe landing; and enables the pilot to maintain a good view of the airfield and landing area.
- The exact position of the circuit joining area, the turn onto base leg and final turn will vary with glider type and even more with conditions - particularly wind strength and direction. Early decisions on modifying circuits and landing areas must be made to allow a safe final turn at a safe height (not lower than 300’ AGL), as a precursor to a controlled, safe landing.
- Good and reliable circuit planning techniques take time and practice to achieve and can deteriorate quickly with lack of currency and/or pressure brought about by difficult or unusual flight situations.
- Maintain safe speed above ground at all times
- Maintain separation from other aircraft wherever possible, and alert others if you may come into conflict with them in the circuit.
- Maintain separation from obstacles and remain outside restricted airspace.

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

- Identify end of roll, ground roll, touchdown, flare, aiming point.

- Continual monitoring of height, airspeed, track parallel to the approach path and angle down to intended landing area.
- Assessment and countering of crosswind on downwind leg to maintain required track.
- Perform pre landing check (FUST) which is the last chance to correct any configuration issues that should have already been actioned as per GPC unit 15.
- Assessment of base leg turn position considering wind conditions and height and using approximately 30-40° angle of bank.
- 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.
- Turn base when the angle starts looking shallow or to prevent losing sight of the landing area.

Base leg

- The purpose is to adjust height and position to ensure the final turn occurs at correct height/location.
- Lookout to long final for conflicting traffic (especially power traffic).
- Monitor speed and height and angle to desired glide slope to enable a half airbrake approach.
- Check landing area for possible obstructions.
- Locate and identify and hand on the airbrake lever.
- Assessment of when to turn onto Final, taking cross/head/tail winds into consideration.
- Complete the turn onto Final at a **minimum** of 300 ft AGL to align with the proposed landing path.

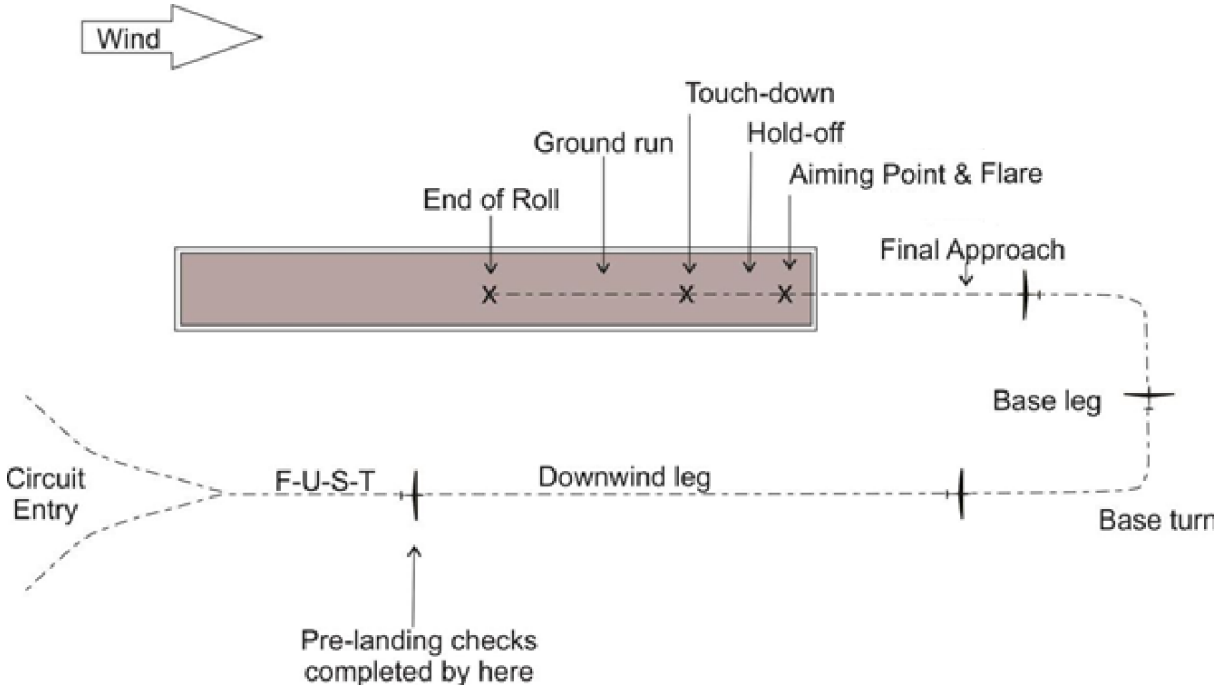
The Final Turn from Base to Approach

- Refer GPC Unit 17 for Stabilised approach and landing. Tell the student that approach and landing will be a separate briefing. However, you can include this in your circuit and landing briefing and lesson:
    - 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.

Modifying the Circuit

- Decision on when a circuit requires modification. Often related to encountering sink in the circuit area but can also be due to traffic and other threats.
- What actions to take in the circuit if conditions require modification. Ensure positive circuit modification is made.
- Ensure that Situational Awareness is maintained.
- Monitor nose attitude and air noise to ensure approach speed is maintained. Beware of changing attitude perception as you get lower.
- Factors that impact on circuit management:
    - If circuit is becoming too steep or too shallow relative to chosen landing point, then a decision to modify the circuit must be made.
    - For example: Moving your track closer to the landing path or further away, or selecting a new aiming point, or consider use of airbrakes.
    - Be aware that strong lift is often followed by strong sink.
- If the angle is too steep, beware of extending too far downwind in case of impacting strong sink.
- If the angle is too steep, beware of losing sight of the aiming point behind you. Consider use of a “diagonal leg” prior to turning base in order to retain visual reference.
- Impact of wind on circuit decisions:
    - Start downwind from a point that is further upwind to accommodate a strong tailwind.
    - Avoid going too far downwind in case you cannot get back to the landing area.
    - Tailwind or headwind on base leg will impact on the time available to make corrections to circuit.
    - A downwind leg that is too close to the landing area will reduce time on base leg and will require steep turns to arrive at the top of approach.
    - Crosswind (see GPC Unit 19 Crosswind take-off and landing) will mean aircraft heading will differ from aircraft track.
- When making circuit modifications, ensure all threats are taken into account (traffic, position, obstacles, airspace).
- Once a decision to modify the circuit has been made, carry out the modification and reassess the situation.

PRE-FLIGHT BRIEFING



Draw the Diagram on paper, whiteboard or dirt working back from End of Roll.

FLIGHT EXERCISES

Normal circuit

- Establish aircraft on downwind – fly parallel to the landing runway or extended line of the intended landing area. [Due to crosswinds on each leg, the aircraft heading may not be strictly parallel or 90° to the runway].
- Identify appropriate angles to the landing path.
- Continual reassessment of the situation – monitor the aircraft's height and angle to landing area to reassess landing area feasibility and consider options. Do not refer to the altimeter for height judgement.
- On downwind if the angle to the runway is too steep (or shallow), move away from (or towards) the runway to correct the situation and resume the parallel track.
- If angle becomes too shallow for a safe landing at the original intended landing area we should modify our circuit and land in the nearest available safe area.
- 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.
- Monitor and respond to radio calls as necessary to maintain separation but ensure priority is AVIATE - NAVIGATE - COMMUNICATE.

- 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.
- If not already complete ensure that the aircraft is configured for landing and pre-landing checks are completed by mid-downwind leg.
- Maintain safe aircraft attitude with approach speed set to 1.5 VS + ½ wind speed.
- Judge base leg turn by assessing height, position, and angle and make any necessary adjustments to the circuit.
- Consider varying the turn onto base to make it easier to monitor the landing area without looking back over the shoulder.
- 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.
- Avoid having to open airbrakes as soon as you straighten up on final.
- Ideally we want to be a minimum of 300’ AGL after the turn from base leg to the beginning of the approach.
- Ensure turn onto base leg and onto final is a coordinated (30° - 40° bank) turn – airbrakes should not be used – but if extended on 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 final approach turn for head/tail wind component on base leg. If a tail wind, start turn earlier.
- If height is excessive airbrakes can be used provided they are opened before the turn, ensure airspeed is maintained.

Modifying the circuit

- You must expose the student pilot to common errors in the circuit - too high, too low, poor speed control, traffic conflict, different circuit direction, need to land long, change of landing area and demonstrate appropriate corrections.

Notes:

- Demonstrate Circuit joining and execution from various points around the airfield. This should show different circuit joining positions and directions to allow the student to be comfortable with variations of circuits at the airfield.
- As the student progresses ensure that a modified circuit pattern is demonstrated such as running through excessive lift or low return to field.
- Review options if you lose too much height and cannot make it to the landing area.
- Ensure lookout is maintained by all aircrew. Cover instruments in student's view if necessary, to discourage looking inside the cockpit.
- Remove all distractions from the exercise, for instance mute audio variometer once transition to landing pilot mode has occurred.
- Ensure the pre-landing check is called just that - it is NOT a 'FUST' check. The pre-landing check is a checklist not an action list.
- Students may need to build skills in individual competency elements on separate flights.
- Student must be competent at basic flying skills (coordinated turns, straight & level flight and use of trim) at this stage to avoid overloading the student.
- Be wary of students that have learned circuits in high performance gliders that are now operating in lower performance aircraft, their circuit judgement may be too optimistic.

Student Exercises

- Student practices joining circuit:
  - Entry to downwind.
- Student practices flying the downwind and base legs:
  - Correct configuration of aircraft.
  - Monitoring of angle to landing area.
  - Decision making regarding circuit modifications.
  - Execution of circuit modifications.
  - Maintenance of situational awareness and correct airspeed.
  - Appropriate radio calls.
- As Student becomes more proficient:
  - Trainer can ask what they would change in the event of traffic or wind changes.
  - Trainer can ask what action would be taken if the chosen landing area is no longer reachable.

Debrief

Using open questioning as much as possible, review the student's ability regarding:

- Appropriate circuit pattern and joining area selection.
- Usage of pre-landing check items as a check list.
- Ability to locate and coordinate separation with other traffic in the terminal area.

- Modification of the circuit as required to suit conditions.
- Ability to maintain situational awareness regarding traffic, landing area location, circuit joining area.

COMMON PROBLEMS

Problem	Probable Cause
• Downwind leg is not flown parallel to runway.	Student is not monitoring aircraft track with relation to intended landing runway. Student may be unconsciously lining the aircraft up with other roads, runways, fences, tree-lines that are at an angle to the intended landing runway.
• Student transits through active circuit area, over runway (if winch club) or other inappropriate path.	Student is not aware of these areas. Student is distracted with managing other aspects of the circuit and has lost situational awareness. Incorrect selection of circuit and joining area from break-off position that requires a flight path through these areas. Management of height leaves no other option.
• Circuit flown at too high or too low level.	Student fails to recognize out-of-tolerance (steep or shallow) angle to landing area. Student is distracted with managing other aspects of the circuit and has lost situational awareness.
• Steep or shallow	Student fails to recognize out-of-tolerance (steep or shallow) angle to landing area. Possible overload and failure to follow circuit work-cycle. Student does not apply modification long enough for any meaningful effect.
• Base leg too close / too high.	Student turning too early on base leg. Demonstrate required angle to landing area. Reiterate distance on downwind past runway threshold will equal final approach distance.
• Aircraft extends too far on downwind.	Possible student overload or distraction. Poor judgement regarding required angle to landing area, or over estimation of aircraft performance. Consider a discussion re outlanding options.

THREAT AND ERROR MANAGEMENT

- Heavy sink and lift in the area.
- High traffic density.
- Running out of height – do not put into a position that you as the trainer would have trouble with.

- Cockpit distractions – radios, varios, internal expectations.
- Proximity of geographic obstacles, mechanical turbulence and/or restricted airspace to/in circuit area.
- Non-standard circuit procedures.
- Traffic on the opposite circuit. Following or preceding traffic.
- Ineffective communication between student & trainer (including distractions, hearing difficulties or English as a second language).

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 16
- Theory Lesson PowerPoints
- Australian Gliding Knowledge (AGK) pages 116-136
- Gliding Handbook: FAA 2013