Gliding Australia Training Manual

Trainer Guides

Section A
Units: 1-26 (Solo)

Gliding Australia Training Manual

TRAINER GUIDE

Unit 1

Lookout Awareness

AIM

The aim of this GPC unit is to:

- Develop the primacy of effective lookout; and
- Develop the application of the basic rules of the air for collision avoidance.

PREREQUISITE UNITS

There are no prerequisite units for this GPC unit.

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 9, Lookout Scan Procedures, which deals with scanning techniques, and
- GPC Unit 23, Rules of The Air (this unit will be covered later but the basic rules of the air are covered in Unit 23)

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Lookout Priority	• **Describe:** ○ the priority of lookout to avoid collisions through see and avoid; ○ the potential collision risks in flight; ○ the use of radio for alerted see-and-avoid; ○ Situational Awareness at all times in flight; ○ the risks of excessive focus on instruments and devices.
2. Application of Lookout	• **Describe:** ○ the importance of checking airspace before commencing any manoeuvre. • **Demonstrate:** ○ the limits of vision and how to look in difficult to see airspace (above, below, behind), when turning; ○ the use the clock code to report other aircraft and identify prominent landmarks.
3. Collision Avoidance	• **Describe:** ○ the rules of the air applicable to aircraft safe separation; (head to head actions, give way to the right, overtaking on the right, no flying over the top of someone). • **Demonstrate:** ○ radio listening watch and provide an interpretation of traffic location and intentions.

KEY MESSAGES

Lookout

- An effective lookout is the most important element of Airmanship and safety in the air.
- Lookout is our highest priority in avoiding collisions with other gliders and aircraft.
- Throughout training, the highest standards of lookout are required for every flight.

Collision Avoidance

- We use lookout in conjunction with listening to the radio to identify other aircraft that might pose a hazard; this technique is called “Alerted See and Avoid”.
- Head must be kept turning and eyes focused mainly outside the cockpit.
- When flying, any sightings of other gliders and aircraft must be reported.
- An aircraft on a collision course with you will appear to be stationary, on a constant relative bearing.

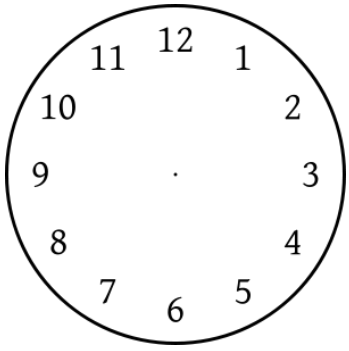
Rules of the Air.

- The student must learn and apply the Basic Rules of the Air relating to collision avoidance. see more in GPC Unit 23 – this unit will be covered later but the basic rules of the air are listed in that unit).
- The student must understand who gives way to whom.

LESSON PLANNING AND CONDUCT

CLASSROOM BRIEFING

- Explain that safety is the major priority and collision with other aircraft is by far the biggest risk.
- An effective lookout reduces this risk significantly.
- Vision is restricted by an individual’s eyesight performance, dirty canopy, poor weather/haze/sun, the glider’s airframe, so take actions to improve these deficiencies.
- Explain the need to look for and identify other aircraft, “Tell me whenever you see something”.
- Explain the clock code:



  - 12 o'clock means directly ahead, 3 o'clock means directly to the right, 6 o'clock means directly behind, and 9 o'clock means directly to the left.

- It is further defined by high or low.
- (e.g. I see a glider at 10 o'clock, high)

- Explain the meaning of alerted see and avoid in relation to the glider radio communication.
- Explain Handover/Takeover protocol.

PRE-FLIGHT BRIEFING

Limitations of vision

With the student in the front seat, direct them to look:

- ahead (12 o'clock);
- at each wingtip;
- behind each wingtip (when turning you need to look here);
- vertically above the glider;
- down – how can you see below you?

Emphasise the need to move their head in order to see properly.

FLIGHT EXERCISES

- Direct the pilot to view specific ground features, in a range of directions – ahead, to each side, behind the wing, below them, behind them, clouds directly above.
- Make sure they are moving their head accordingly.
- Show that by turning the glider you can see places not previously visible (below and behind).
- If other aircraft are flying, ask the student to spot aircraft that you have seen. Point out where they are using the clock code.
- If the flight is long enough you can introduce GPC Unit 4, Orientation and Stability exercises.
- Let the student come on the controls with you.
- On occasions handover to the student and have them confirm taking over and handing over.
- On circuit, demonstrate the use of radio, if there is any other traffic ask them to tell you what they heard and what they see.
- Assess their ability to identify key features and lookout, situational awareness, relax in the cockpit and be able to confidently turn their head and body.

COMMON PROBLEMS

Problem	Probable Cause
• Failure to ensure positive transference of control. "You have control" "I have control".	Misunderstanding of transfer of control technique. Practice the process with the student on the ground.
• Failure to move head during lookout.	Reluctance due to disorientation or dizziness. Encourage the student to scan by moving their head rather than just shifting their eyes.

• Tendency to look along or down wing during turns. Looking down the wing whilst turning can lead to disorientation and poor speed control.	Student fixation on the wing to control bank. Given that the likeliest threat is along the horizon, ensure the student is focusing their scan on this with occasional targeted scans in the turn direction. This will also help to improve the pilot's speed control and coordination.

THREAT AND ERROR MANAGEMENT

- Deficiencies may be identified in a student's visual perception:
    - They may need to fly with corrective lenses.
    - A permanent neck or shoulder injury might limit head mobility and ability to scan.
    - If there is a serious visual deficiency or pilot mobility limitation, that student might never be able to fly solo.
- It is better this is checked and discovered early, rather than later in training.
- Some students with experience in other forms of aviation, or with extensive experience flying computer simulations with fixed screens may have developed poor lookout habits, including instrument panel fixation.
- The trainer must stress that every second the student fixates inside the cockpit degrades their lookout and situational awareness.
- Be careful that the trainer does not get distracted from maintaining lookout and situational awareness whilst training and observing the student.

TRAINING MATERIALS AND REFERENCES

- Theory Lesson 1
- Whiteboard or media
- Two Model Gliders
- A parked Glider
- GPC Pilot Guide Unit 1
- GFA MoSP 2 Operations
- Australian Gliding Knowledge pages 240-247
- GFA OSB 2_12 Lookout for Glider Pilots
- GFA OSB 2_14 See & Avoid for Glider Pilots

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Unit 2

Ground Handling & Signals

AIM

The aim of this unit is to develop the skills and knowledge required to safely handle gliders on the ground and use correct signals.

PREREQUISITE UNITS

There are no formal prerequisite units to this GPC Unit.

COMPLEMENTARY UNITS

Theory Course T1 should be completed as part of this GPC Unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Control, move and secure the aircraft on the ground.	• **Describe:** ○ The boundaries between the runways, operational and non-operational areas. ○ The responsibilities of a person on a wing tip to steer the glider. ○ The concept of a sterile environment. • **Demonstrate:** ○ The safe areas to push gliders and not to push. ○ How to steer the glider from the wing tip. ○ The correct use of tow ropes, tow bars, rudder chocks, fuselage dollies and wing walkers. ○ The correct process for rotating glider in stronger wind conditions. ○ How to secure controls and the correct tie-down technique.
2. Use the standard ground signals.	• **Describe:** ○ Who can stop a launch. • **Demonstrate:** ○ The “Take up slack” signal. ○ The “All out” or “Full power” signal. ○ The STOP signal.
3. Correctly perform wing tip runner and hook-on duties.	• **Describe:** ○ Correct tow-rope and weak link configuration for launch. ○ Correct radio calls, runway and airspace clearance requirements for launch. • **Demonstrate:** ○ Correct glider hook-on procedure. ○ A satisfactory ”airspace clear for launch” check. ○ Correct wing-tip runner techniques.

KEY MESSAGES

- Safety is a shared responsibility. Any person can call and signal STOP!
- When hooking on, check for knots, rope condition and correct weak link (for winch launch).
- Check “Airspace clear for launch” including ahead down runway and launch flight path. (“All clear above and behind” is insufficient.)
- Haste increases risks of damage or injury.
- Ensure distractions are minimised, to provide better focus on safety and checks. (Ensure the student understands the concept of a sterile environment).

LESSON PLANNING AND CONDUCT

Classroom Briefing

This unit is best done over several days of operations, in a variety of environmental conditions, with careful introduction and initial close supervision. Seek advice and guidance from experienced pilots.

- Brief the areas of an aircraft where force can and cannot be applied in ground handling.

  Note that some glider types may have areas that cannot be used as shown in the diagram below

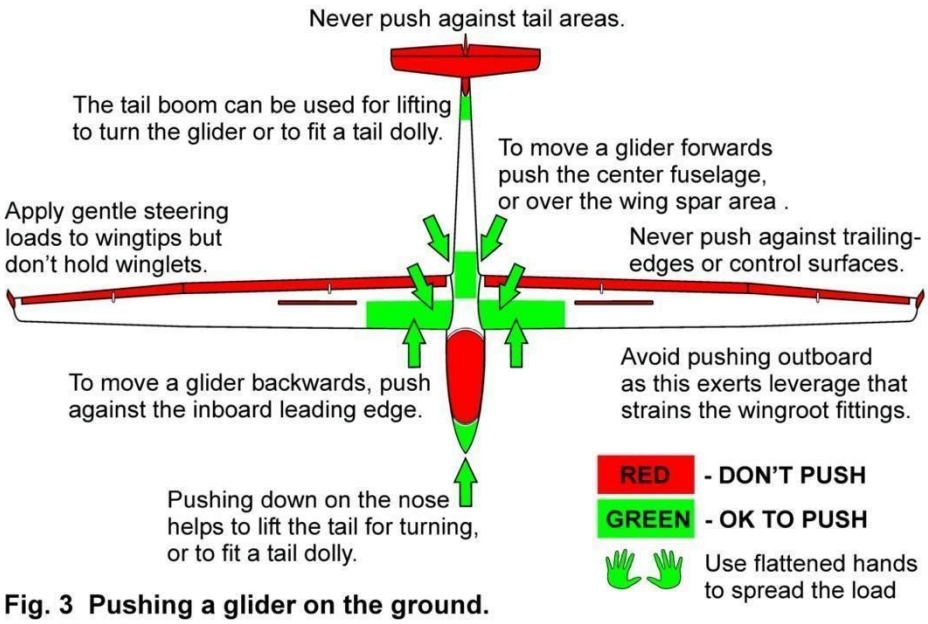
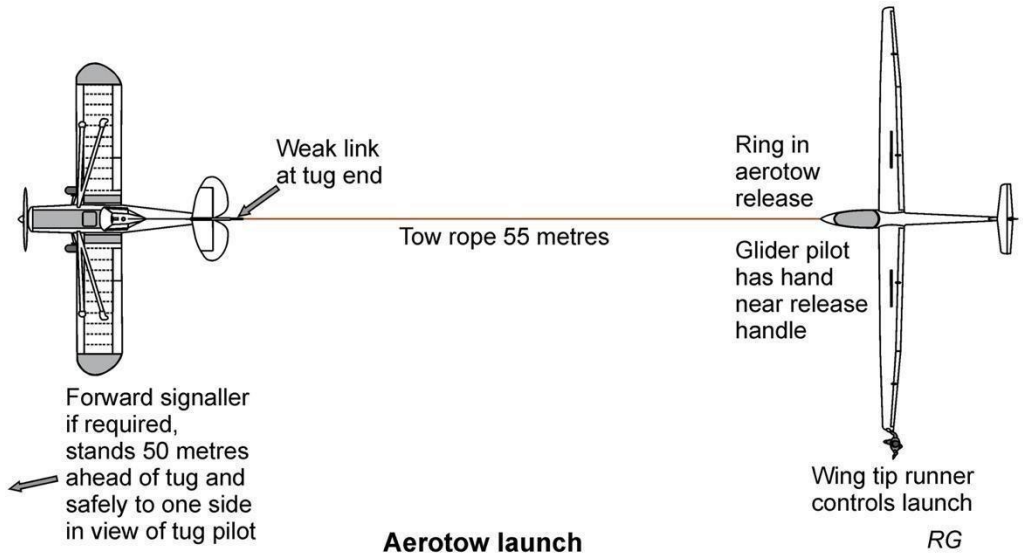


Fig. 3 Pushing a glider on the ground.

- Safe habits must be instilled early, given the inherent risk exposure - injury, glider damage, operational impacts and damage to vehicles and ground handling equipment. Early involvement of a student in these ground handling elements can build a sense of contribution

and trust, with positive motivational effects. Negative effects can also arise from poor training and supervision, or poor corrections for unintended errors or lapses.

- Use approved Standard Signals only – Take Up Slack / All Out – Full Power / Stop Stop. Stop! Demonstrate these.
- The person at the wingtip is responsible for steering the glider.
- When running a wingtip, support the wing but do not hold it back. Allow the wingtip to slide through fingers without impediment.
- With ground handling, there are many variables associated with glider design, weight and geometry, ground handling equipment configuration differences, launch methods, signals, airfield layout, ground hazards and obstructions.
- Students should be introduced to these competency elements in benign conditions first, in simplest circumstances, before being introduced to strong wind conditions, heavier gliders and more complex ground handling equipment.
- Reinforcement is therefore required. Do not assume that a student, having been shown a correct procedure or use of equipment once, will then be able to manage this unassisted in future, for all gliders and ground handling equipment, locations and weather.
- Ground handling training should address the main elements separately. Control and movement of a glider on the ground should be trained separately from correct use of Ground Signals, and then Wing-tip Runner and Hook-on duties. There will be an increasing level of responsibility and student situational awareness as they progress through this unit.
- With ground handling, hazards may arise quickly and interventions and corrections may be urgently required, particularly when inexperienced people are involved. It is fine for an instructor or supervisor to yell “Stop Stop Stop!” to prevent a hazard being realised, however, rather than shout at the offender; it is preferable to have someone else take over and then more quietly debrief the student regarding the hazard and required correction.



Aerotow launch

Notes:

1. Many pilots have been previously trained to check “all clear above and behind” prior to launch. This has proven to be inadequate. Many hazards that might pose a risk to a safe launch might emerge from a forward or lateral direction.
2. The correct check prior to launch is “**airspace clear for launch**”. This check must be thorough. The PIC (Pilot In Command) must be advised of any hazards so that they can make a decision on their readiness to proceed with or delay the launch.
3. The PIC remains in command – the check is to inform the PIC of the hazard environment.
4. This unit provides opportunities to introduce and reinforce some important concepts, including:
    - demarcation between groundside and operational airside areas;
    - diligent lookout and airspace clear for launch checks;
    - fragility of tail surfaces, trailing edges, canopies.

PRE-FLIGHT BRIEFING

There is no pre-flight briefing for this GPC Unit.

FLIGHT EXERCISES

There are no flight exercises for this GPC Unit.

COMMON PROBLEMS

Problem	Probable Cause
• Applying force to a part of the aircraft that may cause damage.	Memory lapse regarding how to safely handle the aircraft. Insufficient briefing or demonstration of how to handle aircraft on the ground.
• Holding onto wingtip during launch causing the glider to turn.	Insufficient briefing and demonstration on the way to correctly hold the wingtip during launch.
• Failure to release wingtip on launch when aircraft speed increases.	Misunderstanding of when to let the aircraft wingtip go. Additional briefing and demonstration required.
• Allowing aircraft to collide with another object or tow vehicle.	Distraction during ground handling. Reluctance to speak up when a hazard is identified. Failure to consider all other potential obstacles in the aircraft’s path.

THREAT AND ERROR MANAGEMENT

- Insufficient skills and knowledge.

- Maintain situational awareness on the flight line during launching and landing.
- Danger zones associated with launching and landing gliders and powered sailplanes.
- Safety is a shared responsibility – anyone can call and signal “Stop! Stop! Stop!”
- Some sites require Hi-Visibility clothing on the flight line. Introduce this to the pilot.
- Many avoidable accidents have happened towing gliders with tow-out equipment into fixed obstacles around the airfield. Keep a good lookout for obstacles.
- When parking the tow vehicle, always disconnect the glider so you (or others) don’t drive off with the glider still hooked onto the vehicle.

TRAINING MATERIALS AND REFERENCES

- Pilot Guide GPC Unit 2 – **Note! The Pilot guide contains necessary information for the Trainer to cover for all 3 forms of launching – aerotow, winch and auot-tow (it is not covered in detail in the Trainer notes – please refer to the Pilot Guide)**
- GPC Logbook.
- GFA MoSP 2 Operations

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Unit 3

Pre-Flight Preparation

AIM

The aim of this unit is to:

- develop the skills and knowledge required to obtain and interpret required pre-flight information; and
- to perform the outside and cockpit pre take-off checks.

A basic understanding of the parachute is also required if these are used.

The student must be able to apply standard checks reliably and thoroughly, by rote or by reference to a checklist, without undue delay.

PREREQUISITE UNITS

There are no prerequisite units for this GPC unit.

COMPLEMENTARY UNITS

There are no complementary units for this GPC unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS

1. Access required information before flight.	• **Describe:**
	  ○ The information available from:
	  ● Airfield Procedures and radio requirements.
	  ● The Maintenance Release.
	  ● Glider Placards.
	  ● Meteorological resources.
	  ○ How this information applies to the flight.

2. Use the aircraft documentation.	• **Describe:**
	  ○ the Weight and Balance requirement for the flight given the flight crew weights.
	• **For a powered sailplane calculate:**
	  ○ Take-off and landing performance.
	  ○ Forward and cross wind limits.
	  ○ Take-off distance.
	• **Demonstrate:**
	  ○ application of ballast as required for the current aircrew configuration for a safe flight. This will be different in most types.

3. Inspect the aircraft	• **Describe:**
	  ○ the difference between a pre-flight and a daily inspection (DI).
	• **Demonstrate:**
	  ○ a pre-flight inspection, explaining key observations.

4. Identify and operate basic instruments	• **Describe:**
	  ○ Basic instruments:
	  ● ASI, Altimeter, Variometer, Radio, FLARM.
	  ○ Need for looking outside the cockpit and not fixated on instruments.
	• **Demonstrate:**
	  ○ Switching on and off the glider's electrical system.
	  ○ Setting the altimeter.
	  ○ Switching on the radio and setting volume / squelch.
	  ○ Operating / avoiding the Press-to Transmit (PTT) switch.

5. Confirm Cockpit Safety	• **Describe:**
	  ○ The canopy operation & canopy jettison system.
	  ○ Ventilation controls and their operation.
	• **Demonstrate:**
	  ○ Entering and exiting the cockpit safely.
	  ○ Adjusting the seating position to give adequate lookout and easy access to all controls.
	  ○ Fitting, adjusting and unfastening the seat harness.
	  ○ How to hold the control column avoiding the PTT.
	  ○ Handover/Takeover of control procedures.

6. Conduct Pre-Flight Checks	• **Describe:**
	  ○ The need for a sterile environment during pre-launch checks.
	  ○ The action to take if a check is interrupted.
	• **Demonstrate:**
	  ○ Completion of pre-flight checks accurately, audibly and in a timely manner.
	  ○ Conduct of the pre-boarding checklist using the approved GFA checklist.
	  ○ Application of a sterile launch point environment.
	  ○ Calculation and fitting of ballast and adjustment of seating.
	  ○ Conduct of the in-cockpit Pre-Flight Check using the approved GFA checklist.
	  ○ Required in-cockpit adjustments.
	  ○ Prioritisation of critical safety tasks including airspace cleared for launch.

7. Prepare and fit the Parachute (when required)	• **Describe:**
	  ○ The steps to deploy the parachute in an emergency.
	  ○ How to deploy the parachute.
	• **Demonstrate:**
	  ○ How to confirm serviceability of the parachute.
	  ○ Identification and adjustment of all straps to fit the parachute securely.
	  ○ Adjustment of straps to correct tension.

KEY MESSAGES

- Be familiar with pre-flight briefing material.
- A sterile environment is required when checks are conducted. If the external or pre-flight checks are interrupted or distraction occurs, start again.
- Follow approved checklists and call all checks out loud.

LESSON PLANNING AND CONDUCT

Notes:

1. If the pilot uses English as a Second Language (ESL) then limitations in language skill and translation will often become evident, as it requires precise and technical use of language. The Club CFI and Training Panel should be advised of any communication difficulties or impediments to understanding. The student may need to be coached in aviation English and to fly with trainers with second language familiarity. The importance of slow, concise, clear post-flight debriefings with these students is much higher than for English speakers. (We sometimes have the reverse experience when flying overseas – remember those insights.)
2. Safety is paramount so ensure that the student knows that these set procedures are very important not only for themself but for others as well.

Classroom Briefing

Pre- Flight information

- Explain to the student how to obtain basic weather and aeronautical information before flying to determine which runway to use and ensure that the weather and other conditions are suitable for our type of operation.
- Describe the local airfield layout, training areas, airspace boundaries, circuit directions and safe landing areas in case of launch failures. Briefly introduce the radio calls to be given.

Pre-flight inspection

- Describe the difference between the DI and the pre-flight inspection.
- Verify that the aircraft is approved for flight via reference to the maintenance release.
- Complete an internal and external check of aircraft.
- Identify all defects or damage to aircraft.
- Report to, and seek advice from, qualified personnel to determine the action required in relation to any identified defects or damage.

The following elements should be delivered and assessed in a parked glider prior to any flight exercise.

Aircraft documentation

- Show and explain the use of the Maintenance Release.
- Show where to find crosswind limit information for the aircraft.
- Show and explain the Aircraft Placards for airspeed limits, weight and weak-link requirements.
- For powered sailplanes how to find take-off performance and calculate take-off distance.

Cockpit Safety

- Wearing and operation of a parachute (if required).
- Entering and exiting the cockpit safely (with the parachute if fitted).

- Demonstrate adjusting seating position to give adequate lookout and effective access to all controls.
- Demonstrate operation of the harness:
  - Fastening, securing, and releasing.
  - Ensuring all straps secure pre-flight and not unfastened until post flight.
  - Harness waist straps fitted low on hips.
  - Shoulder straps fitting firmly.
- Identify canopy release and operation (including how to lift, close and secure), canopy jettison procedure.
- Identify ventilation controls and their operation.
- Demonstrate how to hold the control column avoiding the PTT. Use a relaxed grip, 2-3 fingers and thumb, rest arm on leg if possible.
- Demonstrate the transfer of control procedures and their importance:
  - "You have control" / "Your Aircraft".
  - "I have Control" / "My Aircraft".

Basic Instruments

- Identify each basic instrument (ASI, Altimeter, Variometer, Radio) and its purpose.
- Identify other instruments where fitted (FLARM, G meter) and its purpose.
- Brief student not to adjust anything until trained in its operation.
- Demonstrate the process for:
  - Switching on electrical power
  - Setting the altimeter
  - Turning on radio and selecting frequencies and squelch level.
  - Operating the PTT switch.
- Describe how to avoid inadvertent operation of the Press-to-Transmit (PTT).
- Ensure regular scan with eyes out the cockpit as much as possible NOT on the instruments.

Pre-boarding Checks

- Identify checks that can only be conducted outside the aircraft using the standard checklist.
- Demonstrate how to calculate and fit required ballast.
- Demonstrate ABCD checks.

Pre-Take Off Checks

- Explain that the reason for this check is to ensure the glider and crew are in all respects ready for flight and that the use of a standard check ensures that nothing is omitted.
- Emphasise that the checks are important ways to mitigate threats & errors.
- The student should normally participate in the pre-boarding and cockpit checks before every flight and when able to perform the checks without assistance they should be made to recite them aloud from the checklist so that the trainer knows that the check has been completed satisfactorily.
- This also gives valuable insights into the student's assessment of conditions, launch failure options and contingency planning.
- As proficiency is gained in learning the cockpit check, introduce the Limitations Placards to the student. These placards cover the limiting speeds and weight and balance of the glider.

- Errors in completing these checks are often associated with the following:
  - Haste - rushing the checks may reduce diligence and cause key items to be missed.
  - Poor launch point discipline (also referred to as launch point hygiene) may cause distractions, hence errors and omissions.
  - Poor cockpit discipline and focus (also referred to as cockpit hygiene or sterile cockpit) may cause distractions, leading to errors and omissions.
  - Student and trainer fatigue may cause loss of concentration, lapses and errors.
  - Misunderstanding or misreading placards and calculation charts.
  - Cockpit clutter or poor harness fitting may impede access and freedom of movement.
- Describe the Golden Rule: Practice a sterile environment that is – "if a check is interrupted, restart the check at the beginning." Note also that calling checks out loud is a habit we wish to instil even when flying solo. Proper verification is more likely when the check is recited clearly.
- Ensure that critical safety checks required, such as Airspace Clear For Launch, are conducted effectively.

Parachute Familiarisation

It is preferable that this section is carried out by an experienced "Jumper" if the Club has one. Explain that it is quite normal for pilots to wear parachutes and the reason why.

- Using one of the Club's parachutes and manual (where available) explain each part of the parachute. It then should be worn by the student with the trainer assisting in ensuring the correct fitting.
- It should be emphasised in which direction to pull the "D" ring and its location in an emergency.
- Always get into and out of the glider wearing the parachute.

For powered sailplanes

- The checklist and run-up requirements are more extensive and complex, so more time must be allowed.
- Each powered sailplane is different so the trainer must be current on type and ensure the student has a sound understanding of the engine and propeller operation before starting.
- Higher noise levels when engine running will necessitate a headset or earphones.

PRE-FLIGHT BRIEFING

This is a big subject so adequate time should be taken. Normal ground instruction should not exceed 40 minutes periods to obtain maximum retention by the student. It's recommended that these sections are broken down as follows:

- **Pre-flight briefing**: providing the student has seen the Club's morning operations briefing then up to a 40-minute period should follow enlarging on the weather, NOTAM and airfield information.
- **Parachute Introduction**: 40-minute period should cover this section. May be carried out as a class briefing where multiple students are present. Can be trained by a suitable competent member.
- **Pre-Take off checks**: Carried out in the glider with the trainer alongside the student indicating controls and switches. The student should be given some time in the cockpit by themself to practice the checklist if an aircraft is available.

This may be carried out over a series of flights with repetition to support the learning.

FLIGHT EXERCISES

There are no flight exercises for this GPC Unit.

COMMON PROBLEMS

Problem	Probable Cause
• Student is slow or misses key checklist items.	Lack of knowledge or recollection. Encourage the use of written checklist cards (ensuring they do not become FOD). Student makes assumptions to cover lack of knowledge.
• Student misses key check items.	Student forgets or misplaced check items. Encourage use of mnemonics and/or written checklists.

THREAT AND ERROR MANAGEMENT

Common Threats and Errors include:

- Student's lack of knowledge - emphasise the need to seek advice rather than assume.
- Being rushed by others into completing checks quickly.
- Whilst the student should not waste time, the efficiency of the checks is paramount - so use checklists.
- Distractions in the launch point area and poor launch point discipline.
- Identification of and access to controls.
- Failure to confirm clear visibility from cockpit.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 3.
- GFA MOSP Part 2 Operations Appendix 1. GFA standard checks.
- NAIPS Internet Service.
- Bureau of Meteorology, Windy weather Website.

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Unit 4

Orientation & Sailplane Stability

AIM

The aim of this unit is for the student to:

- develop the knowledge and skills required to orient themselves in the three- dimensional flight environment in the local area;
- gain an awareness of the glider's inherent stability; and
- develop an understanding of terminology to be used in future training units.

PREREQUISITE UNITS

- GPC Unit 3 Pre-flight Preparation.

COMPLEMENTARY UNITS

- Theory course TL1 is required for this unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Orientation in the local area.	• **Describe:** ○ The local features, including the airfield, on the ground and in the air. ○ The airfield layout. ○ The boundaries of the local flying areas which can be identified by maps and charts if necessary / where appropriate. ○ The local flying operations briefs. ○ The distance/height/glide angle required to reach the aerodrome.
2. Sailplane stability.	• **Describe:** ○ The horizon as the primary attitude reference. ○ Stability in all 3 axes/planes. ○ Positive stability in Pitch and Yaw. ○ Neutral stability in Roll. ○ Hands off stability. ○ Lateral damping.
3. Knowledge of basic glider aerodynamics and components.	• **Describe:** ○ Basic glider aerodynamics. ○ The principles of Lift, Weight, Drag and Forward Flight. ○ Three axes: pitch, roll and yaw. ○ The aircraft's flying surfaces and ancillary equipment.

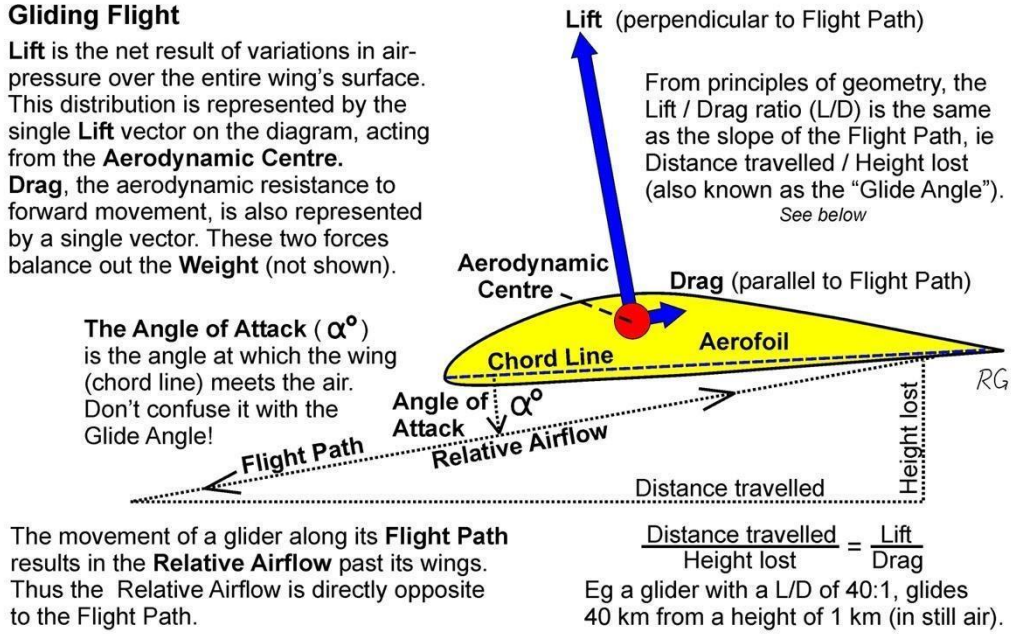
KEY MESSAGES

- The aircraft should stay within safe glide angle of the airfield at all times when flying locally.
- Lookout and visual orientation in the air is an essential skill.
- The horizon is our primary attitude reference.
- The glider is a stable platform; it will fly hands off at a particular attitude, in a straight line or shallow bank angle.

LESSON PLANNING AND CONDUCT

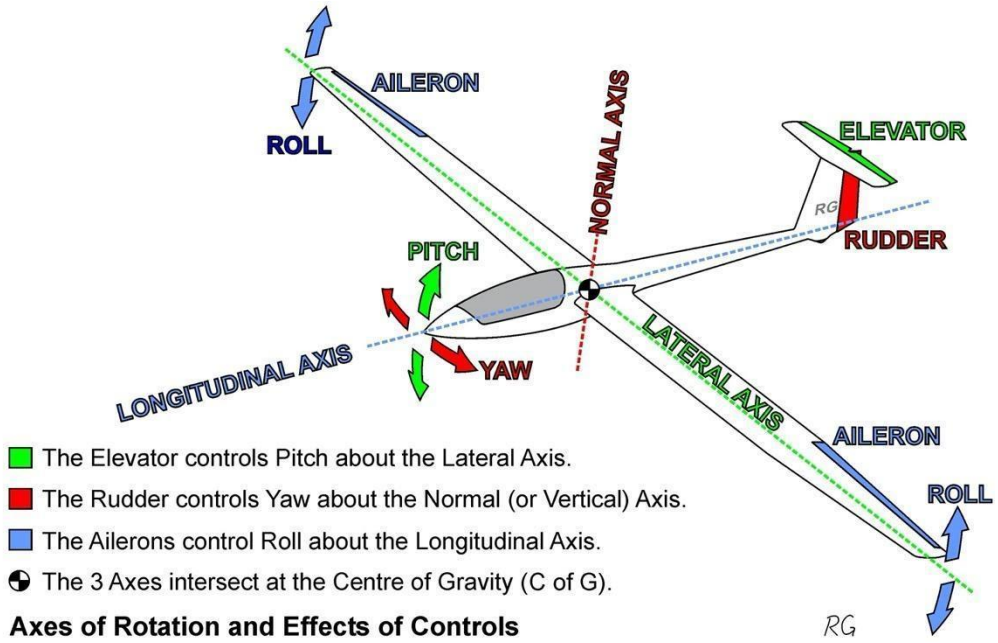
Classroom Briefing

Theory course 1 is required for this unit. A brief overview of the Gliders components, terms and aerodynamics should be given to avoid confusion during flight. This could be presented with the aid of a model glider in the classroom or a real glider on the field.



Axes of Control

- There are three axes of control. We can control the glider in the pitching plane, about the lateral axis between the wingtips, where the nose goes up and down. We can control the glider in the rolling plane, about the longitudinal axis between the nose and tail, where the wings are banked left or right. We can control the glider in the yawing plane, about the vertical axis up and down, where the nose moves left or right.



Stability

- The glider has a little positive stability in pitch; the nose will gradually return to a normal flying attitude.
- The glider has neutral or positive stability in roll; the wings will tend to remain at a constant bank angle until disturbed.
- The glider has strong yaw stability; the nose will move quickly back to the direction of flight.
- The glider is controlled in the pitching plane with elevator, in the rolling plane with aileron, and in the yawing plane with rudder.

Lateral Damping

- When the glider is rolling, the down going wing has a higher angle of attack, generating more lift. This dampens the rolling motion. This is called lateral damping.
- If the wing stalls, lateral damping is lost. The glider is then unstable in roll, and may spin. When we unstall the wings, lateral damping is renewed.

PRE-FLIGHT BRIEFING

- Before take-off give the student a realistic appraisal of the launch. In the case of a winch or auto-tow launch, advise the student that they may find the climb attitude steep or strange, but that this is quite normal.
- For winch launches mention the possibility of a cable break and tell the student that if this occurs the nose of the glider will be lowered rapidly. Talk informally on the climb, perhaps about conditions at the time...normal, calmer than usual, etc. Near top, mention that releasing the cable will make a noise, and that they will feel a change of attitude and sensation.

FLIGHT EXERCISES

Orientation

- The orientation flight is intended to reinforce the points made on the air experience flight. In addition, the opportunity is taken to emphasise the three-dimensional nature of gliding and how to adapt to this from the two-dimensional world that the student has become accustomed to.
- Walk round the glider with the student, show them where things are, answer any questions, but do not go into any great detail. Provide orientation as follows: have them look at the landing area in use, tell them that the glider will be landing back there and “We can reach this area from the air at any time during the flight.”
- Point out some prominent landmarks in the vicinity of the strip, and suggest they should identify this during the flight and see how it looks from the air.
- At this stage, start introducing the fact that you are doing particular checks before flight, without necessarily bothering the student with too much detail.
- Point out key features in the local area, and in particular get them to locate the airfield at various stages during the flight. Show the student how to locate ground features starting using large features to lead into smaller features. Ask them to point to specific landmarks.
- On the base leg tell the student that you will be using the airbrakes after the next turn, that these may make a noise and change the attitude of the glider, and that this is normal.

Notes:

1. Trainers should add nothing to the above procedure except informal conversation. They will check throughout the flight on orientation, relaxation and enjoyment, and will make their initial assessment of the student.
2. During the flight, as in the air-experience flight, make all manoeuvres gently. Check on orientation several times by having the student point to the landing area and chosen landmarks.

Stability:

- The object of this exercise is to demonstrate that the glider is a stable platform, which will fly itself without the assistance of the pilot. To make this demonstration effective, reasonably calm conditions are required. Trim is used but not stressed to the student.
- Here we need to introduce the student pilot to new terminology in three dimensions. Emphasise the three types of motion: pitch, roll, and yaw, with reference to points on the horizon. Then emphasise that the glider can continue flying safely in a stable attitude without control inputs.
- Demonstrate the stability of the aircraft, ‘hands off’ several times, and further demonstrate that it will recover from displacement in the pitching plane keeping the degree of displacement within the stability characteristics of the aircraft.
- Give the student some experience in handling the controls and feeling the stability under direction from the trainer.
- Reinforce the need to look out and identify specific landmarks such as the airfield and nearby features.

- During the flight, relaxation and orientation are checked, and a further assessment of the student's level of comfort and confidence is made. Do not proceed until this is established.
- More sensation of movement may be provided if the student seems receptive.
- Clarity, patience and repetition is needed to explain pitch in the vertical pitching plane about the lateral axis, roll in the rolling plane about the longitudinal axis, and yaw in the yawing plane about the vertical axis. Post flight debriefings can help the pilot visualise these axes and movements. This can then be linked to the concepts of lift and control surfaces.
- If the student is comfortable you can let them operate the controls under guidance, the start of Primary effects, but to help them understand the Stability of the glider, so only small movements should be allowed.

Lateral Damping:

- This is a very important factor affecting the glider's stability in the rolling plane. It is very simply explained.
- If the glider rolls, either because of a pilot input or because it is tipped by turbulence, the down going wing will start to produce more lift than the up going wing. This is because of the difference in the angles of attack of the two wings during the rolling manoeuvre. The increase in lift on the down going wing tends to resist any attempt to make the glider roll; in other words, it dampens the rolling tendency. Hence the name "Lateral Damping".
- Lateral damping is a powerful force that profoundly affects the behaviour of the glider in straight flight and during manoeuvres. It can, however, be destroyed, in which case the glider will become very unstable in the rolling plane and will roll uncontrollably until action is taken to restore the damping force.
- Lateral damping can be destroyed simply by stalling the glider. This can cause the glider to roll indiscriminately, a rolling motion which can become autorotation, the breeding ground for the spin manoeuvre. It can be restored just as simply by unstalling the wings, whereupon lateral damping reappears and provides the glider with the roll stability it had before.

Notes:

1. Post-flight debriefing and reference to the glider should be used to reinforce learning of these new terms.
2. Do not overload the student; demonstrate the motions and stability in-flight and then reinforce on the ground.
3. Further reinforcement should be done in later flights.
4. It is self-evident that if shorter winch flights are undertaken, this unit will need to be covered in several flights.
5. Even with an aerotow launch and longer flight times, it may take multiple launches for the student to absorb the concepts of stability.

Caution:

Do not demonstrate the stall or spin in this early unit; the student must understand later units on control, and stalling, and gain some familiarity and comfort with normal in-flight sensations.

COMMON PROBLEMS

Problem	Probable Cause
• Failure to recognise the aircraft's stability.	Atmospheric disturbances or incorrect flying by trainer.
• Over-control	Lack of understanding of the stability, small control movements required, and inertia -

THREAT AND ERROR MANAGEMENT

- Handing over/taking over, briefed and demonstrated to the student.
- Maintain an effective lookout.
- Ensure the student is looking out and can identify other traffic and prominent features when indicated by the trainer.
- Over control.
- Emphasise a relaxed grip on the controls and smooth but positive operation.
- Make control column inputs using wrist action and not the entire arm to avoid PIOs.

TRAINING MATERIALS AND REFERENCES

- Model or Real Glider
- GPC Pilot Guide Unit 4
- Theory Lesson 1

Gliding Australia Training Manual

Trainer Guide

Unit 5

Primary Effects of Controls

Unit 5 - Primary Effects of Controls

AIM

The aim of this unit is for the student to:

- develop effective reference to the horizon for controlling aircraft attitude;
- explain the primary effects of controls in both their aerodynamic effect and their effect on the airframe;
- demonstrate use of controls to vary pitch, bank angle and yaw.

PREREQUISITE UNITS

- GPC Unit 1 Lookout Awareness
- GPC Unit 4 Orientation, Sailplane Stability

COMPLEMENTARY UNITS

This unit has no complementary GPC Units.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Effects of controls – general	• **Describe:** ○ The need for aircraft controls. ○ How to use aircraft attitude as a reference. ○ The primary aerodynamic effect of each flight control and the resultant force on the aircraft. ○ The type of stability encountered in the use of each control (positive, neutral, negative). ○ The result of varying air speed on control effectiveness. ○ How incorrect operation of each control could pose a threat to the safety of the flight. • **Demonstrate:** ○ The correct way to hold the control column. ○ The correct application of force to use flight controls.
2. Effect of controls – elevator	• **Describe:** ○ The use of elevator in controlling the aircraft's attitude. • **Demonstrate:** ○ Use of elevator to control aircraft attitude through reference to the horizon. ○ The attitude required to achieve a nominated airspeed (between 50-70 knots). ○ The use of elevator to control aircraft pitch through a range of at least +/- 10 knots, changing pitch and holding, and returning to a stable platform.

3. Effect of controls – aileron.	• **Describe:** ○ The use of aileron in controlling the extent of roll and roll rate on the aircraft. • **Demonstrate:** ○ The use of aileron to control aircraft roll from wings level to +/- 20 degrees of bank from horizontal in each direction and returning to wings level. ○ The use of aileron to maintain a desired angle of bank.
4. Effect of controls – rudder.	• **Describe:** ○ The indications provided by the yaw-string. • **Demonstrate:** ○ The use of rudder to control aircraft yaw to the left and right, returning to coordinated flight.

KEY MESSAGES

- The aircraft is a stable platform with three axes around the C of G – the flight controls provide rotational movements around each axis.
- Fly the aircraft by attitude, our primary attitude reference is the horizon.
- Different amounts of force on the controls will result in different rates of effect on the aircraft.
- Elevator is used to exert change in aircraft pitch- changing airspeed. Ailerons are used to exert change in aircraft bank. Rudder is used to exert change in aircraft yaw.
- We isolate the effect of each control so the student understands the relationship between the control input and aircraft response.

LESSON PLANNING AND CONDUCT

Classroom Briefing

It is recommended that you have a model glider available to demonstrate the Lateral, Longitudinal and Normal axis and resulting movement.

General

- Aircraft are stable.
- Controls act by exerting a rotation around each axis of the aircraft.
- Lookout is essential. Perform targeted scan prior to any control application.
- Flying by reference to aircraft attitude with reference to the horizon is essential.
- Only use enough force as needed to achieve the required outcome.
- As airspeed increases, the controls become more effective.
- Use of aileron and rudder together will be considered in the next unit.

Use of Elevator

- Elevator controls rotation around the LATERAL axis causing the nose of the glider to pitch up or down with reference to the horizon.
- Moving the control column forward increases the lift on the tail plane causing the nose to lower on the horizon.
- Moving the control column aft decreases the lift on the tail plane causing the nose to rise on the horizon.
- The elevator operates in a natural sense to the pilot.
- Changes in pitch of the glider changes the aircraft's airspeed, resulting in changes to the airspeed indication, air noise and feel of controls.
- Elevator control has positive stability, returning to the trimmed attitude.

Use of Ailerons

- Ailerons control rotation around the LONGITUDINAL axis.
- Moving the control column sideways will deflect ailerons on each wingtip in opposite directions.
- Ailerons operate in a natural sense to the pilot.
- Ailerons departure from neutral results in a rolling force changing the aircraft's angle of bank.
- Larger aileron deflection results in increased rates of roll.
- The rolling force continues as long as the control column is held deflected from neutral, i.e. the duration of aileron input governs the angle of bank.
- Angle of bank will remain constant when the control column is in the neutral position.
- How to return the aircraft to wings-level position.

Use of Rudder

- Rudder controls rotation around the NORMAL axis.
- Moving rudder controls the angle that the fuselage moves against airflow.
- Amount of yaw generated varies with the amount of movement applied to the rudder pedal - neutral rudder produces zero yaw.
- Yaw is indicated by the deflection of the yaw string on the canopy.
- An aircraft rotated in yaw will not be flying cleanly into the airflow and will experience some turbulence and reduced efficiency.

PRE-FLIGHT BRIEFING

- Emphasise lookout. Before we roll left or right, we look in that direction. Before we slow down and pull up, we look up.
- The elevator controls the pitch of the glider and thereby controls its speed. It operates in a sense that will be natural to the pilot - stick forward, nose down, stick back, nose up. Demonstrate the movement of the elevator while moving the stick.
    - Elevator - forward pressure, nose pitch down, more airspeed: back pressure, nose pitch up, less airspeed

- The ailerons control the bank of the glider. The pilot's operation of the stick is again natural - stick left, glider banks left, stick right, glider banks right. Demonstrate the "one up, one down" movement of the ailerons when the stick is moved. Mention at this stage that banking turns the glider and that the ailerons should be regarded as the primary turning controls.
    - Aileron – large aileron movement - more rapid roll, less aileron, slower roll: Centralise - holds the bank angle or holds wings level.
- The rudder controls the yaw of the glider. Make sure you define the meaning of the word "yaw". Note that the pilot's operation of the rudder pedals is "push left to go left, push right to go right", which sounds natural enough to a pilot but can sometimes confuse a person. Demonstrate the movement of the rudder when the pedals are moved.
    - Rudder - yaws the glider left or right. Centralise to fly ahead or at desired bank angle. Does not turn the aircraft.

FLIGHT EXERCISES

Specific training advice for this unit is:

- Always commence and conclude each demonstration at the stable platform.
- Demonstrate the stable platform as aircraft trimmed to fly hands-off, wings level to horizon with no yaw. Note where the nose position is, in relation to the horizon.

Hand-over/take-over Procedure

- At this early stage it is essential to set the pattern for a formal hand-over/take-over procedure between trainer and student, to eliminate confusion over who has control at any one time.
- Whatever expression is used ("your aircraft/my aircraft" is quite satisfactory) a formal procedure must always be followed. Similarly, whatever expression is used it must receive a response.
- This formal hand-over/take-over procedure must NEVER be varied in instructional work.

Elevator

- During the teaching of elevator the trainer controls aileron and rudder, isolating the effect to be observed.
- Emphasis in the early stages of training should be primarily on attitude with indicated airspeed only mentioned as a cross-reference.
- Demonstrate attitude through reference to the horizon straight ahead.
- Demonstrate use of the elevator. You should let the student follow through on the stick.
- Return the nose to the original attitude and point out that the aircraft continues to fly at the trimmed attitude, this demonstrates the positive stability of the aircraft in pitch.

Suggested Patter:

- "Look ahead at the horizon. This is the correct attitude for normal flight in this glider. See the position of the nose in relation to the horizon and hear the air sound."
- "We're now going to have a look at the Primary Effect of the Elevator. Come lightly on the controls and feel what I am doing.

- SEE the position of the nose below the horizon and SEE the nose go down as I ease the stick forward…
- HEAR the air noise increase…
- SEE the air speed indicator slowly increase…
- FEEL the pressure on the stick required to hold the nose down.
- Now SEE the nose go up as I ease the stick back …
- HEAR the air noise decrease…
- SEE the air speed indicator slowly decrease…
- FEEL that the pressure on the stick is gone as we are back to the original attitude and we can fly hands-off.
- Now it's your turn... (repeat)

Student practice and feedback

- The elevator control is handed to the student and the appropriate response received.
- Remind the student to conduct a targeted scan.
- Direct the student to lower the nose; bring it back to the normal position; fly a little faster; now a little slower; and so forth.
- Request the student to fly at the normal glide attitude. Watch the horizon. If the nose is too high and the speed too slow, ease the stick forward a little until the nose is in the right place, and then check your movement to prevent the nose getting too low."
- Repeat demonstration as many times as needed for the student.
- Demonstrate different control feel and effectiveness at different airspeeds – use trim as needed to assist.

Aileron

- Once again it is important that all demonstrations should be given with the glider stabilised in straight flight so that the required effect may be clearly observed. The effect of aileron should be clearly isolated from the effects of the other controls.
- A single demonstration, and brief practice by the student, should be sufficient for them to appreciate the effect of aileron while watching the wingtip. In all future practice see that the student orientates themself on the horizon directly ahead.
- Conduct full scan and targeted scan when ready to commence demonstration.
- Note the wings are level in relation to the horizon. Note the aircraft attitude with respect to the horizon.
- Note that the right wing goes down when you move the stick to the right and that the wing stops descending when the control column returns to the central position.
- Note that with the control column centred there is no rolling force. This demonstrates the neutral stability of the aircraft in roll.
- Observe the amount of bank by looking ahead, through the tilt of the horizon.
- Note that when you move the stick to the left that the wing comes back upwards towards level.

- Centre the stick when the wings are again level with the horizon, observing that the aircraft remains stable in the wings-level position as the rolling force has been removed.
- The same principle of course applies to lowering and raising the left wing.

Suggested Patter:

- We're going to have a look at the Primary Effect of the Ailerons. Come lightly on the controls and feel what I am doing.
- Look ahead. Now Follow me though on the aileron.
- Look to the right-hand wing tip.
- SEE the wing go down as I move the stick to the right.
- SEE the wing stop moving as I put the stick in the centre.
- Pause to reinforce the lack of roll.
- SEE the wing come up as I move the stick back to the left.
- Now look ahead.
- SEE the wings held level as I centralise the aileron.
- Now let's repeat this while looking ahead over the nose.
- SEE the nose position relative to the horizon, note that the horizon is not tilted.
- SEE that right aileron makes us roll right, bank right SEE that the horizon is now tilted
- Centralise aileron – SEE that the bank angle remains constant.
- SEE that Left aileron makes us roll left, back to straight and level.
- Now it's your turn... (repeat).

Student practice and feedback

- Exactly the same as for the elevator.

Note:

1. Although controlling the glider laterally by using the ailerons is not difficult, confusion may result if it is not demonstrated to the student that the glider will stay at any bank angle it is taken to if the stick is centralised after the desired bank is obtained. Do not over-complicate matters - simply teach the truth.

- Demonstrate to the right and left as many times as needed for the student.
- Demonstrate a fast roll rate and slow roll rate by larger and small control movement.
- Demonstrate different control feel and effectiveness at different airspeeds.

Rudder

A demonstration is given which shows that the glider is yawed (not turned) by use of rudder.

All trainers must recognise the disadvantages that arise in future flying if the effects of rudder are incorrectly emphasised.

The student must be prevented from forming the impression that the rudder steers the glider in any way other than when the glider is on the ground. Therefore, there must be no undue repetition of demonstration or practice when teaching this control.

The purpose of the exercise is to indicate the existence of the rudder as a third (or auxiliary) control and observe what the rudder does. The exercise should not go beyond this.

During the demonstration the trainer can eliminate the further effect of rudder with aileron. For this reason don't have the student on the stick because the trainer will 'cheat' by applying opposite aileron (crossed controls) to show the difference between heading and track.

The demonstration works best flown along a line feature such as road or long fence orientated into/down wind so that drift doesn't confuse the heading vs tracking).

- Invite the student to put their feet on the rudder pedals.
- Note the wings are level in relation to the horizon.
- Note that the yaw string is straight along the canopy.
- Press the right rudder pedal, feel both rudder pedals move.
- Note the aircraft swings its nose to the right. Note the yaw string on the canopy swings out to the right. Aircraft is now yawed to the right.
- May feel some buffeting of airflow over the fuselage.
- Let the student feel that you have to maintain pressure on the rudder pedal to hold the yaw.
- Point out that the nose is pointing to the right but the glider is still tracking in the original direction.
- Next demonstration is the effect of pushing the left rudder pedal.
- Press the left rudder pedal, feel both rudder pedals move.
- Note the aircraft swings its nose back to the centre. Note the yaw string returns to the canopy centreline. Aircraft is no longer experiencing a yawing force.
- May feel resumption of smooth airflow.
- Feel that there is no pressure needed on the rudder pedals when the aircraft is not yawed. This demonstrates the positive stability of the aircraft in yaw.

Suggested Patter:

- We're going to have a look at the Primary Effect of the Rudder. Come lightly on the rudder pedals and feel what I am doing.
- SEE road/hill/cloud ahead of the nose.
- SEE the nose go to the right as I push the right pedal forward.
- (if you open the clear vision panel before the demo) HEAR the air coming through the vent.
- SEE the glider's nose is pointing to the right but the glider is still tracking along the road/towards the hill/cloud.
- SEE the yaw string - we're pointing right but still flying towards the yaw string.
- FEEL how we are still flying in that direction.
- SEE the nose point straight ahead as I centralise the pedals.
- Now it's your turn... (repeat).

Student practice and Feedback

- Exactly the same as for the elevator.

Student practice (under supervision) ALL CONTROLS

- Student practices primary effects of each control under direction of the trainer:
  - Conduct FULL SCAN and TARGETED SCAN.
  - Trainer nominates control to utilise and direction, with emphasis on primary effect through reference to aircraft attitude.
  - Emphasis on gentle effort on controls.
  - Student uses control and verbalises the primary effect on the aircraft.
- Student practices primary effects of control in own time.
  - Practice should include each control, each direction.
  - Return to stable platform between practices.
  - Practice at slow and fast airspeeds and observe differences in control responsiveness.

COMMON PROBLEMS

Problem	Probable Cause
• **Student fixation on cockpit instruments:**	• Student is nervous and wants to maintain focus inside cockpit. Give student additional time with Orientation & Stability to assist with familiarisation of flight. • Cockpit instruments present a distraction. Encourage lookout on horizon, reference all instructions to aircraft attitude. Consider covering instruments in student's view for this unit.
• **Excessive grip force on controls:**	• Student is nervous or unsure how to hold the control column. Explain correct grip on control column. Ask student to hold column with just 2 or 3 fingers.
• **Minimal control input used such that effect is difficult to see or tentative use of control inputs:**	• Student is unaccustomed to the degree of force required. Demonstrate required level of control input needed prior to student use of controls. Reinforce that smooth and positive control inputs give us positive control over the aircraft.
• **Student fails to return aileron control to neutral resulting in continued rolling force and change to angle of bank:**	• Student does not recognise that the stick is not centred or does not understand that when off-centre aileron deflection is occurring.
• **Student is left-handed and has difficulty controlling aircraft with non-dominant hand.**	• Operating with the non-dominant hand may not provide the same fine degree of motor skills. Give the student time to master both the training and the difficulty in operating the controls.
• **Student may be experienced in flying a weight-shift aircraft such as a hang glider – in which case their reactions may be the opposite of what the trainer may expect (i.e. push forward in the expectation that this will raise the nose):**	• Primacy of original training will interfere with the student's actions. Give the student time to master both the training and overcoming the training primacy from their previous experience.

THREAT AND ERROR MANAGEMENT

THE THREATS THAT CAN APPLY TO THIS UNIT ARE:

- Anxious or Low G susceptible pilots.
- Turbulent atmosphere.
- High traffic level.

- Poor horizon definition.
- Ineffective communication between student & trainer (including distractions, hearing difficulties or English as a second language).
- Use of aeronautical terms such as Port/Starboard instead of left/right may cause some confusion.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 5
- Theory Lesson 2

Gliding Australia Training Manual

Trainer Guide

Unit 6

Aileron Drag & Rudder Coordination

Unit 6 - Aileron Drag & Rudder Coordination

AIM

The aim of this unit is for the student to:

- learn how aileron drag is generated whilst applying aileron;
- describe and demonstrate how aileron drag affects the aircraft;
- be able to use controls to counter the effects of aileron drag resulting in coordinated flight at an angle of bank; and
- describe and demonstrate the secondary effect of rudder.

PREREQUISITE UNITS

- GPC Unit 5 Primary Effects of Controls

COMPLEMENTARY UNITS

There are no complementary units for this GPC Unit

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Knowledge of Aerodynamics of Control Surfaces	• **Describe:** ○ How aileron drag is created. ○ How aileron drag affects the aircraft. ○ The proportional use of rudder and aileron to overcome aileron drag. ○ Develop the ability to recognise uncoordinated flight by feel so that focus can be maintained outside the cockpit on lookout etc. ○ The meaning of the yaw string indications. ○ The risks associated with uncoordinated flight (either too little or too much application of rudder).
2. Conduct coordinated flight	• **Describe:** ○ The difference between a slip and skid and how each can arise. • **Demonstrate:** ○ The effect of aileron drag/adverse yaw. ○ Achievement of coordinated flight through coordination of rudder and aileron at different rates of roll in both directions. ○ Centralising rudder when ailerons are neutral. ○ Rolling the glider on a point.
3. Use of the secondary effect of rudder	• **Describe:** ○ How the secondary effect of rudder is created. • **Demonstrate:** ○ Secondary effect of rudder in flight.

KEY MESSAGES

- Explain the use of the yaw string.
- Describe the feel that the glider slipping or skidding indicates that the rudder is uncoordinated The aircraft is flying in a coordinated manner when there is no yaw on the aircraft (yaw string is centred).
- Aileron drag is produced whenever the ailerons are used, producing uncoordinated flight if it is not corrected.
- Rudder is used to counter aileron drag and maintain coordinated flight.
- Coordination in a glider by feel is easy and important so that the pilot can focus outside the cockpit on lookout and other aspects of the flight path essential to efficiency and safety.

LESSON PLANNING AND CONDUCT

Classroom Briefing

General

- Lookout (targeted scan) is essential – particularly in direction of roll.
- Aim is to maintain coordinated (clean) airflow over the aircraft, this is efficient flying by understanding how aileron drag impacts coordination and how the pilot counters this.

Use of Ailerons Creates Aileron Drag

- Review use of ailerons to roll aircraft so that we create an angle of bank which creates a turning force (primary effect of aileron).
- Use of ailerons creates additional lift at the upgoing wingtip.
- Additional lift also causes additional drag at the upgoing wingtip.
- Drag on the upgoing wingtip causes yaw towards that wingtip, opposite to the direction the stick moved (i.e. adverse yaw).
- Adverse yaw creates side slip towards the lower wing.
- The yaw will be indicated by movement of the yaw string.
- Induced drag (and effect) will be greater at lower airspeeds.

Issues with Uncoordinated Flight

- Too much rudder results in a skid, too little results in a slip.
- Reduced efficiency of aircraft (reduced glide angle).
- Increased potential for aircraft to enter spin at low airspeeds.

Countering Aileron Drag

- Use of rudder in the same direction of turn to overcome the adverse yaw – introduced simultaneously with movement of the stick.
- Stick moved to left side – use left rudder; stick moved to right side - use right rudder. Centre rudder when stick is centred.

- Proportionate use of rudder required. Large aileron movement requires large rudder movement. Ensure sufficient force is applied on the pedal to counter adverse yaw, but no more.
- Yaw string indicates when coordination is achieved. Coordination indicator; the yaw string points down to the rudder pedal to use to overcome the yaw.

Rolling on a Point

- A good exercise to develop coordinated use of aileron and rudder.
- Emphasise the need to commence this exercise from the stable platform and start with small amounts of roll in each direction, increasing this as skill increases. Return to the stable platform if the aircraft becomes uncoordinated.

Secondary Effect of Rudder

- Describe how the use of rudder to create yaw will also create a rolling force on the aircraft.
- The roll is caused by the outer wing having to fly faster, which produces more speed and therefore more lift.
- Left rudder, right wing flies faster, right wing goes up. Glider banks to the left.
  Right rudder, left wing flies faster, left wing goes up. Glider banks to the right.
- Direct student to look ahead and then apply left rudder. Ask student to describe whether the left wing or the right wing goes down when the rudder is applied. Ask them to hold the aileron central as they apply the left rudder. Apply a lot of rudder and wait some time to spot the effect.
- You can then have the student pick up a wing by using opposite rudder, without using aileron. Instructor applies a aileron to lower the wing and then asks the student to pick it up by using the opposite rudder alone.

Pre-flight Briefing

- Cover instruments if required and brief student to maintain their view outside the cockpit.
- Explain that increased lift creates increased drag, so the upgoing wing will drag backwards. This is adverse yaw.
- You will feel this yaw, and you can observe the nose of the aircraft moving on the horizon.
- Describe that the adverse yaw can be countered by rudder in the direction of the roll. Left aileron results in the right wing being dragged backwards, so left rudder is required to overcome this drag.
- Large aileron movement causes more drag and therefore requires more rudder to counteract the drag.
- Emphasis on the same direction of movement of the stick & rudder pedals (left stick left rudder, right stick right rudder).
- Emphasis on use of controls simultaneously to maintain coordination.
- Review why uncoordinated flight introduces additional threats.

FLIGHT EXERCISES

Ensure that all exercises start and finish at the stable platform.

Demonstration of Aileron Drag

- Conduct targeted scan to maintain situational awareness.

- Start at stable platform. Note attitude using horizon. Select a point on the horizon as yaw reference. Demonstrate at low minimum sink speed for greater effect.
- Advise that we will create aileron drag by moving the stick sideways without rudder input. See the movement of the aircraft nose against the horizon opposite to the direction of bank.
- Feel the aircraft yawing.
- Hear the air noise associated with a yawed state & observe yaw string deflect from the centreline indicating yaw.
- Return to stable platform through use of rudder and wings level with aileron, repeat in opposite direction.

Suggested Patter:

- SEE that the nose is pointing towards [reference point] and that the yaw string is pointing along the canopy centreline.
- Follow me through on the stick and rudder. I will apply left aileron.
- SEE that the left wing goes down when I move the stick to the left, but also see and feel the nose of the glider swing to the right on the horizon.
- SEE that the yaw string moves to the right, showing yaw to the right.
- HEAR the sound of the disturbed airflow.
- SEE that when I move the stick to the right I can bring the wings level, but the nose swings in the opposite direction.
- Repeat demonstration as many times as needed in both directions for the student to recognize the effect. Repeat using different amounts of lateral stick force to create differing amounts of adverse yaw.

Student practice (under supervision)

- Students can predict movement of the aircraft nose when the instructor nominates the use of aileron to roll left or right. Student confirms movement naturally when roll is commenced.

Conducting Coordinated Flight by Countering Aileron Drag

- Brief the need to fly coordinated and therefore the need to remove the effect of aileron drag when we use the stick from side to side to control the ailerons.
- Conduct targeted scan to maintain situational awareness.
- Start by noting the attitude using horizon.
- Move the stick as before – and now counter the aileron drag with rudder applied in the same direction as the aileron. Feel the use of rudder and aileron simultaneously.
- Based on what you observe, you can apply more or less rudder so that no yaw occurs as indicated by the yaw string.
- Observe no movement of nose against horizon indicating no yaw to right/left and hear no change to air noise and note the yaw string remains centred indicating coordinated flight.
- Roll back to wings level using the same technique with rudder to emphasise its use whenever the stick needs to be moved left or right, to maintain coordination.

- Large aileron movement requires large rudder movement. No aileron movement, no rudder movement.
- Emphasis on when the stick is centralised (and ailerons are brought to neutral position) the rudder pedals are centralised. Ensure the student understands that in this context (overcoming aileron drag when banking) that when sideways stick movement is used – rudder is also used.
- The instructor should demonstrate poor coordination through under or overuse of rudder – with the student following on controls. Demonstrate which rudder to use, how much force is applied and when it is used to correct the yaw.

Suggested Patter:

- SEE that the nose is pointing towards [reference point] and that the yaw string is pointing along the canopy centreline.
- Follow me through on the stick and rudder. I will apply left aileron, but I will also apply left rudder to stop the adverse yaw.
- SEE that the left wing goes down when I move the stick to the left, and this time the nose does not swing and the yaw string stays in the centre.
- HEAR the sound of normal airflow.
- If we have a small swing of the nose, I can use more or less rudder to keep it coordinated.
- When I bring the wings level with right aileron, FEEL that I also use right rudder.
- Repeat demonstration as many times as needed in both directions for the student to recognize the effect. Repeat using different amounts of stick force to create differing amounts of adverse yaw.

- Repeat demonstration to the right and repeat as many times as needed for the student.
- Demonstrate the different force used on the rudder pedals at different airspeeds and roll rates.
- Demonstrate removal of force from pedals when the stick is centred.
- Demonstrate roll from left bank to right bank (i.e. through wings level).

Student practice

- Instructor nominates direction to bank.
- Crew conducts FULL SCAN and TARGETED SCAN
- Student introduces roll and counters adverse yaw with rudder.
- Student removes force on rudder when aileron force is removed.
- Critique use of rudder (selected pedal, timing, force) and if necessary, re-demonstrate.
- Return to stable platform between practice.
- Practice at slow and fast airspeeds.

Rolling on a Point Exercise

This exercise is useful practice for students to improve the simultaneous use of controls.

- Point the nose towards a conspicuous feature on the horizon (hill, cloud, prominent building etc) in a stable platform around best L/D speed.

- Start to roll slowly with coordinated aileron and rudder up to 10 degrees of bank in both directions and reverse the roll before the glider turns. The nose should remain pointing at the feature throughout the exercise.
- Demonstrate what happens to the nose if not enough and too much rudder is applied, then re-demonstrate the use of coordinated aileron and rudder.
- Hand over and have the student fly the exercise.
- The first aim of this exercise is to practice the timing of applying and centralizing the aileron and rudder simultaneously. The second aim is to develop a feel for how much rudder is required to balance the aileron input. The student may take a few attempts to achieve these aims. Encourage the student to be smooth on the controls and take over to re-demonstrate if the student continues to have difficulty.
- As student proficiency increases get them to increase the rate of roll and bank angle in each reversal. Have the student repeat the exercise at circuit speed and note the difference with the more powerful rudder at higher speed.
- For maximum use of airborne time, this exercise can be flown any time the glider is flying in a straight line e.g. on the downwind leg of the circuit before the student is ready to learn circuits.

Notes:

- The student must have a relaxed grip on the stick and controls adjusted correctly for reach during flight.
- During student flight exercises the student may feel that they are pressing on the rudder pedal harder than they actually are. The instructor may need to assist by demonstrating the required force but if this is done, ensure the student is aware that the instructor is assisting.
- Ensure lookout is maintained by all aircrew. Cover instruments in the student's view if necessary to discourage looking inside the cockpit.
- Be very careful with terminology and clarity of language. Make it clear when discussing control surfaces and control inputs (elevator, aileron, rudder), their effects in terms of motion (pitch, roll and yaw) and their effects in terms of attitude and flight path (attitude, bank angle, yaw angle or slip-skid angle).
- Precision with terminology must be synchronised with demonstrations inflight. Patter must be concise and careful. Feedback from the student must be sought. "What did you see when…?"
- If the flights are to be short (such as winch-launched sorties on a non-soaring day) do not attempt to include all elements of this module. It is better to allow the student time for a good demonstration and opportunity for practice on a single learning outcome.
- Focus attention on the horizon during initial demonstrations to ensure the student identifies the yaw occurring and in what direction.
- Ensure that the student has been briefed on the correct hand-over/take-over procedure and their expected action and verbal response to each. There must be no confusion about terminology for transfer of control.
- Remove all distractions from the exercise, for instance mute audio variometers.
- Do not reference changes to flight instruments – at this stage of learning the student must learn with reference to external cues.

COMMON PROBLEMS

Problem	Probable Cause
• Insufficient rudder utilised to overcome aileron drag.	Student may tend not to push hard on the rudder as it may feel harder to use than stick forces. Encourage the student to utilise correct force, demonstrate with them shadowing instructor inputs. Student may be applying too much aileron and generating a large amount of aileron drag for their skill level. Encourage use of aileron for lower angles of bank.
• Excessive use of rudder or perhaps late use followed by excessive rudder	Excessive use of rudder dangerous. Nose must not screw into turn. Risk of spinning at low speeds.
• Rudder is maintained when stick is centred.	Student may forget to remove rudder inputs due to workload or distraction. Encourage workflow of 'use stick, use rudder' to encourage the student to make movements in both controls when necessary.
• When rolling on a point, coordination is not maintained.	May be caused by late or insufficient application of rudder by student. Encourage simultaneous input of controls with sufficient rudder input. May be caused by student attempting large bank angles on the rolls. Have the student start with very low angles of bank (5 degrees) and work up as their skill level improves.

THREAT AND ERROR MANAGEMENT

The threats and errors that can apply to this unit are:

- Misunderstanding of use of rudder simultaneously with aileron.
- Left-handed student may have difficulty in controlling ailerons with non-dominant hand.
- Higher force required to operate rudder relative to lateral stick movement.
- Loss of SA during exercises when focussing on coordination.
- Potential for loss of controlled flight if airspeed reduces towards stall in yawed configuration.
- Loss of height during conduct of exercises away from the landing area – maintain SA with relation to the airfield.
- Ineffective communication between student & instructor (including distractions, hearing difficulties or English as a second language).

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 6
- Theory Lesson 2
- Model Glider

Gliding Australia Training Manual

Trainer Guide

Unit 7

Straight Flight, Various Speeds and Trim

Unit 7 - Straight Flight, Various Speeds and Trim

AIM

The aim of this GPC unit is to develop the knowledge and skills required to fly a glider in straight flight at a steady speed, in a set direction, with wings level, without slip or skid.

PREREQUISITE UNITS

- GPC Unit 6 Aileron drag, Rudder Coordination
- GPC Unit 9 Lookout Scan Procedures.

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- Unit 8 Sustained Turns

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Straight flight is conducted at various speeds:	• **Demonstrate:** ○ Selection of an appropriate attitude to produce a nominated airspeed within a range from minimum sink speed to 80 Knots, with accuracy of +/- 5 knots; ○ Maintaining a constant airspeed with the Airspeed Indicator covered; ○ Maintaining straight flight with wings level and balanced (as per yaw string).
2. Trim aircraft:	• **Demonstrate:** ○ Maintaining nominated attitude whilst aircraft is trimmed; ○ Confirmation of correct trim; ○ Adjustment of trim whenever speed is varied.
3. Maintain straight flight to nominated track:	• **Describe:** ○ The heading and the achieved track. • **Demonstrate:** ○ Flight towards a nominated distant point on the horizon; ○ The nominated track is maintained, with correction for drift; ○ Attitude remains stable, with coordinated control movements to maintain wings level without slip or skid; ○ Appropriate look-out –cruising and targeted scan.

KEY MESSAGES

- A relaxed grip on the stick is required to effectively fly the glider and feel the air.
- Airspeed is determined by attitude.
- Looking in the distance makes it easier to maintain attitude/airspeed, heading/track, and lookout/scan. Looking inside the cockpit makes it harder to fly.
- Select the attitude you want by moving the stick and then adjust the trim to help you maintain that attitude. Do not move the trim to change the attitude.
- A small angle of bank or rudder deflection will cause you to fly away from your desired track.

LESSON PLANNING AND CONDUCT

Classroom Briefing

Attitude/Speed and & Trim:

- Refer to the stable platform: glider will maintain its current situation until it is displaced by a control movement or via air movement.
- A change in attitude will produce a different airspeed. You need to learn and remember the attitude required for any desired speed. E.g. 50kt, 60kt, 70kt, minimum sink speed, best glide speed, circuit speed.
- Normally the controls should be moved positively but by a small amount to establish the desired attitude. Then wait to see if an additional or correcting control movement is required.
- If you fly at 50 knots and then increase to 80 knots by moving the stick forward, what will happen if you release the pressure on the stick? [The attitude will rise on the horizon and return to the 50-knot attitude and speed. (stable platform)].
- To maintain 80 knots, you must adjust the trim to reduce pressure on the stick.
- If you have to push **forward** on the stick to achieve the required attitude, then you will need to move the trim lever **forward**.
- If you have to pull **backward** on the stick to achieve the required attitude, then you will need to move the trim lever **backward**.
- Hold and maintain the stick position and pressure to achieve the desired attitude/speed. Then move the trim to remove the pressure. Do not move the trim to achieve the attitude that you want.
- Whenever you change the attitude/speed and wish to return to the stable platform, you must adjust the trim also.

Flying straight

- When you want to fly in a certain direction or towards a certain point, you have to fly in a straight line. What are examples of when you would want to fly in a set direction? [on circuit; returning to the airfield, flying towards a thermal].
- To achieve this, you need to look into the distance and identify a point to fly towards. Looking far away lets you spot any deviation from your proposed track.
- If you fly directly into wind or downwind the glider will not drift so your heading (direction that you are flying) and track (direction of where you want to go) will be the same.

- If you make small, unneeded control movements or if you are flying across the wind, the glider will drift away from the desired track. Turbulence in the air can also cause the glider to deviate.
- The pilot's task is to see the deviation and then change the heading through co-ordinated use of the controls.
- Flying cross wind may mean that although the glider is heading towards a particular point the drift means that we track towards another point. To achieve the desired track (e.g. to the airport) you may have to head slightly upwind of the airport so that the glider drifts onto track. You need to identify and set a new heading so you can achieve your desired track.
- You cannot achieve this just by using the rudder alone, you must turn the glider using aileron and rudder so that it is heading in the new direction.
- Practice will mean that you can fly straight towards your desired goal even whilst adjusting your attitude/speed.

PRE-FLIGHT BRIEFING

- Remember: if you fly at 50 knots and then increase to 80 knots by moving the stick forward, what will happen if you release the pressure on the stick? [The attitude will rise on the horizon and return to the 50-knot attitude and speed. (stable platform)].
- To maintain 80 knots, you must adjust the trim to reduce pressure on the stick.
- If you must push **forward** on the stick to achieve the required attitude, then you will need to move the trim lever **forward**.
- If you must pull **backward** on the stick to achieve the required attitude, then you will need to move the trim lever **backward**.
- Hold and maintain the stick position and pressure to achieve the desired attitude/speed. Then move the trim to remove the pressure. Do not move the trim to achieve the attitude that you want.
- Whenever you change the attitude/speed and wish to return to the stable platform, you must adjust the trim also.
- The Heading of the glider is which direction the nose is pointing to.
- The Track of the glider is the actual path over the ground below.
- The Drift of the glider is the angle between the Heading and the Track.
    - Caused by the direction of any crosswind.
- As the glider deviates from the desired track, identify this is happening (early is better) and then correct by turning the glider onto a new heading using coordinated controls.
- Maintain Lookout at all times, keep orientation of where the airfield is and point out any other traffic sighted.

FLIGHT EXERCISES

Attitude/Speed and Trim:

Trainer demonstrates:

- Stable platform, flying at 50 knots.
- Directs the student to look at the horizon ahead and note the attitude.
- Explains that this nose attitude will (always) result in 50 knots once stabilised.

- Ask the student to follow through on the controls.
- Lower the nose to achieve 70 knots. Point out that the attitude is lower on the horizon. Say that the student should remember this attitude also.
- Explain that when you want to change speed, you should smoothly move the stick to give the attitude that will produce that speed. It may take a number of seconds for the speed to stabilise.
- Ask the student to feel the pressure that has to be applied to the stick to maintain this speed. I am now moving the green trim lever forward to take away this pressure. Trainer shows hands-off to maintain 70 knots.

Student practices:

- Trainer asks the student to ease the stick back to see the 50-knot attitude that they noted before. Note that this requires some force to hold the stick there. Hold the pressure on the stick.
- Trainer explains that the trim will help remove the pressure on the stick.
- Ask the student to identify the trim lever and to slowly ease it backwards. Question the student as to whether they felt the pressure come off the stick.
- Ask the student to move the trim lever so that there is hardly any pressure. Ask the student to relax their grip completely and explain that if it is trimmed correctly that the attitude will stay constant at nearly 50 knots. The trainer should guard the stick so that there is no sudden movement if the trim is not set correctly. Ask the student which way the nose wants to go when the pressure is relaxed from the elevator.
- If necessary, the trainer can demonstrate and have the student follow through on the controls.
- Ask the student to move the stick forwards to bring the nose of the glider back to the 70-knot attitude. Comment that the student has to hold forward pressure on the stick. Hold the pressure. Ask the student to slowly move the trim lever forward to reduce and eventually remove the pressure.
- Confirm that the glider is now trimmed for 70 knots by relaxing the grip.
- Repeat this exercise 2-4 times and include an example where the student adopts an attitude to produce 60 knots.

Notes:

1. Trainer is responsible for maintaining safe flight. The student will lose concentration on lookout so the trainer needs to be responsible for effective lookout. As the glider settles at each new speed the trainer should comment that we need to look out for others when we are flying and direct the student to look in the appropriate direction
2. Some students don't feel the pressure on the stick very well, so encourage them to relax their grip and identify which way the stick is trying to move. The more they relax the easier it is to trim the glider.

Flying straight

In the early stages of training avoid drift by choosing clouds or directly into wind/downwind ground features for the student to fly towards. Introduce crosswind features later to illustrate the concepts of drift, track and heading. It is important that the trainee appreciates the effects of very small changes of bank from wings level, without having the picture confused by drift.

- Ask the student to follow through on the controls and fly towards a prominent landmark directly upwind or downwind (to avoid drift). Point the landmark out and ask the student to continue to fly at 55 knots toward the point. State that the student is heading to that point and the glider is tracking towards that point.

Handover/Takeover

- As the glider deviates from the desired track note this and say that the student has to identify this is happening (early is better) and then must correct by turning the glider onto a new heading. [Note: if the glider does not deviate – which is rare, then choose another point to fly towards that has a cross wind component].
- Explain the factors that can cause the glider to deviate from the desired track (controls not central, wings not level, turbulence, wind).
- The trainer should ask the student to select another landmark (in the general direction of the airfield) and fly towards that. As experience grows, select directions with a greater wind influence.

Key factors:

- Ask the student to confirm their heading and their track (allowance for wind drift).
- Relax on controls so as not to input to a change in direction.
- Focus on pilot flying with zero to minimal bank – look ahead. Look to the wing to confirm.
- Small coordinated movement of controls to change heading.
- On circuit, ask the student to fly downwind leg at circuit speed, trimmed, allowing for drift.

Notes:

1. Always start and finish at the stable platform.
2. If the ability to fly straight is not properly developed early on, other problems may arise later on. For example, the trainee will fly towards a ground feature, but in a gentle sideslip.
3. Later exercises, such as learning to aerotow and the approach and landing, cannot be taught or learnt successfully if the trainee cannot maintain a reasonably consistent, wings level heading.
4. Encourage trainees to hold the stick lightly between thumb and fingers rather than with a strong, white-knuckled grip. A tense trainee won't learn very much, while a relaxed one is more likely to feel and be sensitive to what the glider is doing. Being relaxed (relatively speaking), trainees are also more likely to respond to your advice.
5. Anyone learning a new and unusual skill will be unaware of most, if not all of the important clues needed to do the thing correctly, and it requires some subtle skills and perceptions to be able to fly well. They take time to develop. Their lack is characterised by the trainee making corrections long after the trainer has noticed things are going awry. Initially, you can only help by prompting. As the trainee's flying improves, you can help the trainee develop and hone their skills further by requiring greater degrees of accuracy.

COMMON PROBLEMS

Problem	Probable Cause
• Attitude not stable.	The student may be watching the ASI rather than horizon – cover ASI.

	Student's grip on stick may be too tense which makes trimming difficult. Ask the student to relax their grip, possibly hold with only 2 fingers and thumb for a period of time.
• Failure to select appropriate attitude.	Possible confusion with regards to defining nose attitude. Emphasise horizon, question where the horizon cuts the canopy.
• Difficulty determining attitude when flying towards undulating terrain or in poor visibility when the horizon is not clear.	Have the student hold the attitude constant to maintain a constant airspeed without worrying too much about the actual airspeed.
• Speed change is very slow.	Student is possibly flying with the trim. Ask the student to make a 20-knot speed change and hold the pressure to maintain attitude. After some time, then allow the student to adjust the trim to remove pressure.
• Glider wanders off track.	Possible lack of focus by the student. Direct the student to positively identify the target point and to state when the glider is not tracking. Teach appropriate control movements to change heading. Possibly unnecessary movement of controls. Ask the student to completely relax their grip, or even remove their hand from the stick. This may demonstrate that they have been making unnecessary movements. The student may not yet be able to detect the small bank angles involved. This is more common in gliders with curved instrument panels because of the lack of references to parallel the horizon. Ask the student to glance at each wingtip to confirm the slight bank angle (usually less than a few degrees) and scan the entire horizon rather than fixating in front of the nose. Can be caused by a high workload and/or not looking far enough ahead. The student may also be spending far too much time looking at the instruments. Take control and return the glider to the desired heading and remind them of the feature towards which you want them to fly.
• Wandering and sideslipping.	Most commonly seen when the student uses aileron to level the wings for a small bank angle correction without using the rudder and the nose swings the wrong way due to adverse yaw. Remind the student about adverse yaw and the need to balance any aileron inputs with rudder.

• Pedalling the rudder pedals.	The student is usually in a futile attempt to return the yaw string to the centre. This suggests that the student has not fully understood the relationship between the rudder and ailerons.

THREAT AND ERROR MANAGEMENT

- Lookout is critical: High concentration required by the student. The trainer will need to take responsibility but find opportunities to remind the student with directed guidance.
- Avoid situations where the student releases the control whilst high pressure is being applied to stick. Question to ensure the student is describing whether forwards or rearward pressure is being applied.
- Be aware that flying away from the airfield may result in increased outlanding potential. Emphasise & maintain situational awareness.
- Poor horizon definition.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 7
- Theory Lesson 2

Gliding Australia Training Manual

Trainer Guide

Unit 8

Sustained Turns, All Controls

AIM

The aim of this GPC Unit is to develop the knowledge and skill to:

- use all primary controls to enter, maintain and exit a sustained turn in a coordinated manner;
- identify and correct coordination errors in the turn;
- vary the angle of bank in a turn;
- describe the relationship between the angle of bank and the radius of the turn; and
- demonstrate smooth and coordinated entry, maintenance and exit of sustained turns at various angles of bank and speeds.

PREREQUISITE UNITS

- GPC Unit 6 Aileron Drag & Rudder Coordination.
- GPC Unit 9 Lookout Scan Procedures

COMPLEMENTARY UNITS

There are no complementary units for this GPC Unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Describes control usage in turns	• **Describe:** ○ How primary flight controls are used to turn the aircraft. ○ The requirement for lookout and scan procedures whilst in a sustained turn. ○ How coordination is maintained in the turn.
2. Enters a coordinated turn	• **Demonstrate:** ○ Targeted and full scan to maintain situational awareness. ○ Use of aircraft controls to enter a coordinated turn in both directions to various angles of bank up to 40 degrees. ○ Coordinated turn at various speeds from Minimum sink through to 70 knots. ○ Centralised aileron and rudder once desired bank angle is achieved.
3. Maintains coordinated turn with varying bank and speed	• **Demonstrate:** ○ Constant angle of bank for 2 complete circles. ○ Coordinated flight for 2 complete circles in both directions. ○ Aircraft airspeed by reference to attitude for two complete circles. (minimum sink speed through to 70 knots). ○ Targeted and full scan appropriately during turn. ○ Different turn rates at different angles of bank. ○ Application of controls to return aircraft to coordinated turns from an uncoordinated state.
4. Exits sustained turn on desired heading	• **Demonstrate:** ○ Targeted and full scan when exiting the turn. ○ Roll out to heading on horizon. ○ Use of aircraft controls to return the aircraft to wings level in a coordinated manner whilst maintaining aircraft attitude. ○ Return to wings level on roll out heading +/- 10 degrees.

KEY MESSAGES

- Gliders spend most of their time aloft in sustained turns.
- Lookout is essential – before entering, during and before exiting the turn.
- Have a relaxed grip on the control column and controls adjusted correctly for reach during flight.
- Correct hand-over/take-over procedure and expected action and verbal response to each.
- There must be no confusion about who is in control of the aircraft.
- Lookout to clear any airspace before turning into it.
- Use of all controls must be coordinated. i.e. Control column and rudder inputs are simultaneous in the same direction, keeping the yaw string centred.
- Use elevator to maintain aircraft attitude and trim to relieve workload on the control column for each new configuration.
- Use moderate angles of bank whilst learning.
- It takes time to master coordination of controls.

Sub-gravity Sensation .

- Some people show a sensitivity to "sub-gravity" sensations. The sensitivity is to reduced gravity (sub-gravity) not negative gravity. You need to be aware of the condition and its consequences.
- A briefing is not strictly necessary. At no point in this exercise should there be any extreme attitudes.
- Firstly produce an extended sub-(reduced) gravity sensation – NOT a zero or negative gravity – using a gentle bunt. Some will enjoy the sensation and most will not be affected. Some will find the sensation disturbing and often will react by raising hands or throwing the head back. The test is only effective if the manoeuvre is as mild as possible while producing clearly reduced gravity for a period.
- If the student is sensitive
    - Discuss and reassure
    - Demonstrate and have the student execute the bunt until the response is controlled and expected. Such students may never be 'happy' but must understand the response and it must be controlled.
    - Be sure, in the following work on stalling that the student Clearly distinguishes sub-gravity from stalled flight.
    - Make an obvious note in the log book or other record and be sure to report to the panel.

LESSON PLANNING AND CONDUCT

Classroom Briefing

General

- Lookout is essential – before entering, during and before exiting the turn.
- Gliders spend most of their time aloft in sustained turns.

- It is therefore important that pilots correctly understand the forces that cause a glider to turn and how to influence those forces to achieve the desired result.
- Learning to turn a glider follows logically from learning the primary and secondary effects of the controls.
- When the glider is banked into a turn, the lift force is tilted over with it; remember that lift acts at right angles to the airflow around the wing.
- This tilted lift force, as well as trying to balance out the weight of the glider, also "pulls" the glider in the direction the pilot wants to turn.
- You need more elevator in order to provide the extra lift required for the turn.
- The more the glider is banked over, the greater the rate at which the glider will turn.
- The basic principle is as simple as that.
- Remember that the primary turning controls are the ailerons, not the rudder.
- The ailerons are used to bank the glider and it is the bank angle which produces the force which turns the glider.

Entering the Turn

- Ensure a good targeted LOOKOUT scan away from the direction of turn and then in the direction of turn.
- Then look ahead over the nose and apply aileron and rudder together in the appropriate direction.
- Correct coordination can be checked by noting whether the nose moves smoothly around into the turn as the bank develops.
    - If the nose "hesitates" before moving in the direction of the turn, insufficient rudder has been used in conjunction with the ailerons.
    - If the nose moves noticeably in the turning direction before any bank has developed, too much rudder has been applied.
- The most common fault in the early stages of learning turns is insufficient rudder.
- Yaw string indicates success.
- Elevator is utilised as required to maintain aircraft attitude. Explain with the use of the diagrams above, why the nose will drop in a turn if no backstick is applied.
- Higher angles of bank require greater control inputs.
- Aileron and rudder must return to neutral at desired angle of bank.
- Resume targeted scan. Scan regularly inside the turn along the horizon, not the wingtip and back to the nose. Each time you scan ahead, also check the nose attitude.

Sustaining the Turn

- During the turn, monitor and if necessary control bank angle with **Aileron**, suitably coordinated with **Rudder**. Maintain correct nose attitude with **Elevator**. Remember the little mnemonic A-R-E. "ARE we maintaining a correct turn?"

- Maintain targeted scan and regular full scan to maintain situational awareness.

Correcting Coordination or Attitude Errors in the Turn

- Uncoordinated flight is indicated by the yaw string and is corrected by use of the rudder.
- Any change in attitude is indicated by referencing the nose to the horizon.
- The nose should remain smoothly tracking at the same angle to the horizon "like a well oiled conveyer belt" without nodding up or down.
- "The Nose Knows" telling you a change in airspeed before the ASI does, use the elevator smoothly to return the nose to the correct attitude/speed then use trim to relieve workload.
- Look around frequently!

Varying the Angle of Bank

- To change angle of bank, the control column & rudder move the same way, maintaining coordination.
- Use the rudder proportional to the ailerons and note the change in aircraft angle of bank on horizon.
- If there is a steep angle of bank, the outer wing is travelling faster than the inner, developing more lift; so there is a tendency for the glider to overbank, especially large wingspan gliders. If the glider is allowed to overbank, the nose will drop further. If this is corrected by more back pressure, the turn will tighten into a spiral dive.
- If the glider starts to overbank, demonstrate how to coordinate controls to take off bank to desired angle.
- Check "A-R-E".

Exiting the Turn

- Note the point on the horizon where we want to exit the turn, then conduct a targeted scan to the outside of the turn and then in the direction that you will exit to maintain situational awareness.
- Before that point is reached in turn use simultaneous use of aileron and rudder to reduce angle of bank.
- Adopt wings level position just before the desired heading is reached (remember the glider has some inertia)
- Relax the back pressure on the elevator to counter the nose rising on exit of the bank.
- Coordinated flight is indicated by centering the yaw string.
- Use elevator trim for the new configuration.
- Maintain cruise scan and regular full scan to maintain situational awareness.

PRE-FLIGHT BRIEFING

- Cover instruments if required and brief for maintaining view outside the cockpit.
- Explain the plan to conduct multiple sustained turns of at least one/two complete circles.
- Reiterate coordinated use of all three primary flight controls.

FLIGHT EXERCISES

Turn Entry

- Targeted and full scan.
- Looking straight ahead using the horizon as attitude.
- Turn with simultaneous use of aileron and rudder.
- Control column & rudder move the same way maintaining coordination.
- Roll the aircraft to the desired angle of bank.
- At the desired angle of bank, centralise the aileron and rudder simultaneously.
- Move the control column aft slightly to maintain attitude.
- Check coordinated flight indicated by yaw string.

Sustaining the turn

- Complete regular targeted and full scans to maintain situational awareness.
- Angle of bank & attitude maintained by reference to horizon.
- Feel apparent G-force straight down through the seat. Check coordinated flight indicated by yaw string.
- Check “A-R-E”.

Correcting coordination or attitude errors in the turn

- Uncoordinated flight is indicated by yaw string.
- Use of rudder to correct coordination.
- Change in attitude indicated by reference to horizon. (The Nose Knows!)
- Use of elevator to return to correct attitude.
- Use of trim to reduce workload.
- Varying the angle of bank.
- To adjust the turn, control column & rudder move the same way maintaining coordination.
- Use rudder proportional to aileron.
- Note change in aircraft angle of bank on horizon.
- Check “A-R-E”.

Exiting the turn

- Note point on horizon where we want to exit the turn.
- Targeted scan outside turn and then in that direction to maintain situational awareness.
- Before that point is reached in turn use simultaneous use of aileron and rudder to reduce angle of bank.

- Wings level position attained as the desired heading is reached.
- Coordinated flight indicated by yaw string.

Student Practice

Student practices entering and maintaining a sustained turn in both directions:

- Instructor nominates direction to bank.
- Conduct FULL SCAN and TARGETED SCAN.
- Student smoothly rolls the aircraft to the desired angle of bank, maintaining coordination and attitude.
- Angle of bank in the turn is maintained.
- Turn is continued to monitor for correct coordination and attitude.
- Lookout is maintained.

Student practices exiting a sustained turn:

- Instructor nominates time to leave turn.
- Conduct FULL SCAN and TARGETED SCAN
- Student smoothly rolls the aircraft to wings level, maintaining coordination and attitude.
- Return to stable platform between practice.
- Practice at slow and fast airspeeds.

As student becomes more proficient:

- Conduct turns in one direction straight to opposite direction.
- Student identifies point on horizon to exit turn.
- Student identifies if correct exit heading has been achieved.
- Conduct turns at varying airspeeds at the same angle of bank.
- Conduct turns at varying angles of bank at the same airspeed.

Notes:

1. The student must have a relaxed grip on the control column and controls adjusted correctly for reach during flight.
2. Ensure lookout is maintained by all aircrew. Cover instruments in the student's view if necessary to discourage looking inside the cockpit.
3. If the student is reacting negatively to G forces do not try to 'inoculate' them by continuing to expose them to it. Rather continue with reduced movement or if turbulence is too great for this, land. Encourage the student by noting that this is a common issue for humans as we evolved in a 1G environment where rapid changes in G force was often associated with falling.
4. Depending on trim and CofG to maintain attitude at lower speeds may require back pressure on the stick.

5. Be very careful with terminology and clarity of language. Make it clear when discussing control surfaces and control inputs (elevator, aileron, rudder), their effects in terms of motion (pitch, roll and yaw) and their effects in terms of attitude and flight path (attitude, bank angle, yaw angle or slip-skid angle).
6. Precision with terminology must be synchronised with demonstrations inflight. Patter must be concise and careful. Feedback from the student must be sought. "What did you see when…?"
7. If the student is still prone to airsickness, ensure that the flight exercise does not continue if they have indicated onset of illness, or fail to respond to communication.
8. Ensure that the student has been briefed on the correct hand-over/take-over procedure and their expected action and verbal response to each. There must be no confusion about terminology for transfer of control.
9. Remove all distractions from the exercise, for instance mute audio variometers.
10. Do not reference changes to flight instruments – at this stage of learning the student must learn with reference to external cues.
11. Do not reference compass headings for these exercises, due to compass lag and inertia it will be difficult for low experience pilots to come out of a turn to a compass heading, instead use a point on the horizon.

COMMON PROBLEMS

Problem	Probable Cause
• Failure to look out properly before turning.	Student may forget or be distracted. Do not let turns proceed without adequate lookout.
• Insufficient rudder with aileron at turn entry.	Student may use no or insufficient rudder. Check understanding of correct use of controls from GPC 6.
• Grip too tight on the controls.	Student may be nervous or unsure how to hold the control column. Brief use of two fingers and thumb as a means of a lighter hold.
• Failure to remove rudder once bank achieved.	Student may misunderstand how rudder is used in an aircraft. Check understanding of correct use of controls from GPC 6.
• Failure to maintain back pressure in the turn.	Student is failing to monitor horizon. Emphasise need for constant nose attitude to maintain constant airspeed. Student looking at ASI instead of monitoring nose attitude
• No or insufficient use of ailerons in turns.	Student may misunderstand how rudder is used in an aircraft. Check understanding of correct use of controls from GPC 6. Brief student that we NEVER try to turn a glider in flight by using rudder alone.

THREAT AND ERROR MANAGEMENT

- Risks associated with uncoordinated flight (either too little or too much application of rudder).
- Control risks associated with excessive angle of bank.
- Failure to maintain situational awareness during sustained turns.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 8
- Gliding Handbook: FAA 2013
  https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/glider_handbook/
- Gliding Basics: British Gliding Association 2019
- The Glider Pilot's Manual: Ken Stuart: 2nd Edition; Airlife 1999
- Understanding Gliding: Derek Piggot: 3rd Issue; AC Black 1996

Gliding Australia Training Manual

Trainer Guide

Unit 9

Lookout Scan Procedures

Unit 9 - Lookout Scan Procedures

AIM

To develop the skills and knowledge required to apply appropriate lookout procedures and scanning techniques.

PREREQUISITE UNITS

- GPC Unit 1 Lookout Awareness

COMPLEMENTARY UNITS

This unit may be read in conjunction with:

- GPC Unit 21 Radio use and endorsement
- GPC Unit 22 Use of Situational Awareness Aids
- GPC Unit 31 Thermal Entry
- GPC Unit 32 Soaring with other gliders.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Effective lookout**	• **Describe:** ○ The practice of alerted see and avoid. ○ Visual scanning techniques and their applications. ○ Focus of attention and time management in the cockpit. • **Demonstrate:** ○ Use of the clock code in communication of traffic.
2. **Lookout scan procedures**	• **Describe:** ○ Risks and causes of mid-air collisions. ○ Responsibility for collision avoidance. ○ Aircraft appearance at various distances and time to impact if no avoidance action. ○ Aircraft blind spots. • **Demonstrate:** ○ Cruising scan technique. ○ Full scan technique. ○ Targeted scan techniques (Turning, Circuit, Thermalling).
3. **Perform lookout during flight**	• **Describe:** ○ The need for a clean canopy. • **Demonstrate:** ○ Appropriate combinations of scanning techniques for various manoeuvres including cruising, turning, pull-ups and pushing forward. ○ Scan rate is adjusted as required for various manoeuvres and hazardous situations. ○ Identification of blind arcs of other aircraft. ○ Safely combining cockpit instrument scan, FLARM and visual scanning techniques to ensure situational awareness.

KEY MESSAGES

- Lookout must be top priority at all times. This supports situational awareness where you are aware of all other traffic and can predict and avoid potential conflict situations.
- When communicating the location of other traffic to a co-pilot, use the clock code.
- An effective lookout requires head movements, and focused attention, not just glances.
- Different scan techniques are required for different circumstances.
- Alerted see-and-avoid is more effective than unalerted see-and-avoid, so radio must be monitored attentively and used wherever possible.

LESSON PLANNING AND CONDUCT

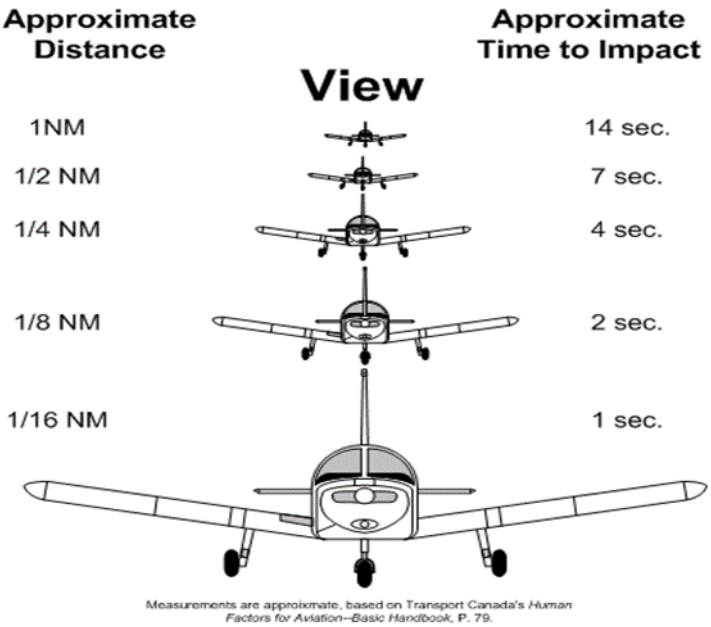
Notes:

1. Lookout is developed and reinforced throughout pilot training, post-solo and post-GPC coaching.
2. Shortcomings in pre-solo instructing of lookout are often evident in post-solo training and coaching and in flight reviews.
3. Require a high standard, retraining and correcting poor lookout habits is difficult and time-consuming.
4. Trainers have an absolute responsibility to get this training right. This includes intervening and preventing manoeuvres when student lookout is insufficient or incorrect.
5. It may not be possible to sign this competency unit off as ‘competent’ till much later in the training.

Briefing

- Mid-air collision is a high risk and can be managed through an effective lookout. All aircrew in all aircraft are responsible for avoiding collisions.
- Effective lookout is a combination of the aircraft’s crew using a variety of scan techniques in conjunction with alerts from radio, FLARM or situational awareness.
- The scan techniques used, and the frequency of use will vary depending on the actions being performed, the traffic level and the surrounding environment.
- The human eye has limitations, and you must take actions to reduce these impacts (see pilot guide and GFA Human Factors Manual).
- To see an aircraft, you have to focus your eye on the area where it is or may be. This means that you have to look and focus then move to another area and look and focus, etc.
- We have scanning techniques to ensure that we look at the key places and focus on that area. A passing glance is not appropriate as the eye will not focus on the object. Utilise a continuous cycle that primarily focuses attention outside the cockpit, but also includes a periodic scan of cockpit instruments including FLARM.
- Aircraft fly fast, 60 knots airspeed is approximately 120 kph, equivalent to highway driving speed. This means that two gliders flying head-on towards each other will be closing at roughly 240 kph!

- A small speck a few kilometres away can quickly become an aircraft that can collide with you in the time that it takes you to complete two circles in a thermal.
- The following diagram gives you some idea of the problem:



Measurements are approximate, based on Transport Canada's *Human Factors for Aviation—Basic Handbook*, P. 79.

- Note that closing speed is the sum of the speed of the two aircraft if flying directly towards each other. If one glider is circling, then the time to impact is double what is shown here. Given that a single circle in a thermalling glider takes 15-20 seconds, you need to be aware of the other aircraft and increase your targeted scan as you circle because one turn later it will be too close.
- Notice the "blooming" effect of the confliction at the last minute (very frightening!)
    - https://www.youtube.com/watch?v=uztz25m1pD4 (Start at 1:05)
    - https://www.youtube.com/watch?v=W3BQqhaxUsY

Scanning Techniques

FULL SCAN: A Systematic scan along the horizon from behind our left wing tip, directly ahead through to behind our right wing tip, including the area above and below the horizon, and directly overhead our glider and below the glider. This will take a few minutes to do correctly and should be repeated regularly depending on traffic density.

- We may also have aircraft coming from the side, across our flight path, or overtaking us on either side, so we also need to monitor these areas. The technique is to focus on a spot for a few seconds, then moving our view 20-30 degrees ahead and repeating the process.
- This FULL SCAN can be completed in stages, interrupted by a CRUISING scan or TARGETED scan as required.

CRUISING SCAN: When flying straight the most dangerous area is straight ahead and 60 degrees cone around the flight path - including the area above and below the horizon. We need to see aircraft in this region quickly so we can avoid any collisions risk. We focus on this cone of airspace (known as a CRUISING scan).

- In situations where there is random traffic (cross country, training area, etc) it may pay to broaden the size of the Cruising Scan cone to 120 degrees.

TARGETED SCAN: This where we focus on a smaller area which has potential increased traffic or greater risk. Examples include:

- Turning the glider. You will be turning into an area that you may not have had clear vision of previously. You start this scan by firstly looking in the opposite direction to the planned turn to identify threats from behind and the side; then scanning around the horizon through straight ahead and finishing at the area behind the wing in the direction you are turning. This will progressively let you see any aircraft that may be coming from behind you.
- Joining a thermal with other gliders. You need to identify all of the gliders in the thermal, not just the first one you see. Also look for other gliders that are also trying to join the thermal, they may come from any direction. If you are pulling up to slow down to enter the thermal, look up as well.
- Thermalling: Looking at the horizon in the direction of the turn to identify any aircraft that is approaching you. Remembering that it will be another 20 seconds before you see this view again so you need to identify potential conflicts so that you can monitor their movement.
- Leaving a thermal: Before straightening up to leave, first focus on the area outside the turn to detect if another glider is joining or overtaking in that area.
- Joining the circuit for landing: There is likely to be increased traffic, arriving from many different directions. You should conduct a TARGETED scan before you get to the circuit joining area so that you have better situational awareness of all gliders that may be in conflict with you. Monitor radio and visually identify any aircraft that calls.

Other considerations:

- When describing traffic locations to others, use the ‘clock code’ relative to the aircraft. Twelve o’clock is on the nose, six o’clock is behind, three o’clock is to the right and nine o’clock is to the left.
- Locate the blind spots of an aircraft.
- Do not fly in another aircraft’s blind spot; for example, do not follow another directly astern and higher. The glider that is behind and can see the glider ahead is responsible to maintain separation.
- A glider doing a pull-up can be in a double-blind situation where you cannot see the glider above and behind you, and you may be below the nose of the glider behind you and therefore not visible to it– there is no obvious fix for this so prevention is the only defence. Avoid flying directly above or below another glider with less than 500 ft clearance.
- A dirty canopy will significantly affect a pilot’s ability to identify other airborne traffic. Ensure that your canopy is clean before each flight to reduce this threat.
- Glare from a rising or setting sun can also be a significant threat to lookout. Avoid flying directly into the line of the sun at these times as it will be difficult to see other traffic.

PRE-FLIGHT BRIEFING

To emphasise the importance of looking back as far as possible, the student should be seated in the glider on the ground with the right wingtip down and the trainer then walks to a position of about five o'clock and ask the student to look for them.

Emphasis that this is where a threat might first appear and turning to look back over their shoulder as far as is comfortably possible, will ensure that any threat is seen and assessed as soon as possible.

FLIGHT EXERCISES

Using Full Scan

- Demonstrate a full scan to the student, describing where you are looking and the pace of progressing around the horizon.
- Emphasise the need to move your head and to focus for a few seconds at each step.
- Ask the pilot to demonstrate the Full Scan, ask them to say out loud where they are looking and what they see. Ensure they are turning their head in particular when looking behind the wing. If they don't look STOP them.

Using Cruise Scan

- Demonstrate flying towards a prominent landmark, or back to the airfield. Whilst flying straight explain how you conduct the Cruising Scan. Focus on a cone directly ahead which spans say 30 degrees each side of the direction of flight (so from eleven o'clock through to one o'clock). Confirm that you are also looking above the horizon and below the horizon. Point out landmarks ahead within that cone.
- Ask the pilot to demonstrate the Cruise Scan, ask them to say out loud where they are looking and what they see. Ensure they are turning their head. If they do not look STOP them!
- Where the traffic pattern is random (lone cross-country or in the terminal area, i.e., local soaring) concentrate the scan on straight ahead and then to about 60 degree to each side. When flying fast, concentrate more on straight ahead, when flying slower expand the area of concentration.

Using Targeted Scan

- This can be delivered over a series of flights and repeated/assessed often. Entering a turn and entering the circuit can be described on every flight.
- The terminal area (within say, 5 miles) at a crowded site is a high traffic area with random traffic. This is particularly dangerous airspace and lookout needs to be excellent. High speeds in this area are not appropriate. Flying pre-start in a competition is a particularly hazardous situation of this type.
- Gliders on a reciprocal heading are very difficult to see. Avoid such circumstances and where this is not possible take special care. Examples are in thermal streets, and in vicinity of an obvious thermal close to a turn point, or flying in the opposite direction of the circuit.

COMMON PROBLEMS

PROBLEM	PROBABLE CAUSE
• Student doesn't turn head when conducting look out.	Student may have motion sickness or has forgotten to move head for optimum lookout. Reinforce correct scan technique.
• Student fails to conduct periodic lookout.	Student is focused on the flight procedure and has missed the lookout step. Remind and reinforce the need for periodic lookout.
• Student fails to conduct targeted or cruising scan when required.	Student may be distracted with other tasks. Stop the procedure and refocus on the prerequisite lookout.

THREAT AND ERROR MANAGEMENT

- Ensure fit to fly - use IMSAFE mnemonic prior to flight.
- If vision correction is needed, use spectacles and carry a spare pair.
- Bright sunlight can affect lookout - use sunglasses.
- Dirty canopies will reduce look out effectiveness.
- Headwear that protects from the sun may also cut down the breadth of vision, broad brimmed baseball caps are not recommended.
- Bright coloured hats worn in the front cockpit will also interfere with rear seat visibility due to reflection of the hat in the canopy.
- Maintain VMC, consider the effects of precipitation and sun glare from rising or setting sun has on visibility.

TRAINING MATERIALS AND REFERENCES

- Theory Lesson 3
- GPC Pilot Guide Unit 9
- Australian Gliding Knowledge pages 240-246
- MoSP Part 2 Operations
- GFA Human Factors Manual (OPS 0010)

Gliding Australia Training Manual

Trainer Guide

Unit 10

Use of Ancillary Controls

AIM

The aim of this GPC Unit is to:

- develop the practical skills and knowledge to operate the Airbrakes, Flaps, Undercarriage, Canopy and Tow release in various gliders.

PREREQUISITE UNITS

- GPC Unit 4 Orientation & Sailplane Stability
- GPC Unit 5 Primary Effect of Controls
- GPC Unit 6 Aileron Drag & Rudder Coordination
- GPC Unit 7 Straight Flight, Various Speeds & Trim
- GPC Unit 9 Lookout Procedures

COMPLEMENTARY UNITS

There are no complementary units for this GPC unit

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS

1. Airbrake controls	• **Describe:**
	  ○ The purpose and limitations of the airbrakes on a glider.
	• **Demonstrate:**
	  ○ Identification and correct operation of the airbrake to control the rate of descent of the glider.

2. Flap controls	• **Describe:**
	  ○ The purpose and limitations of the various flaps on a glider.
	  ○ The limitations on when flaps can be used.
	  ○ The threats that flaps can introduce.
	• **Demonstrate:**
	  ○ Identification and correct operation of the different types of flap on the glider.

3. Undercarriage controls	• **Describe:**
	  ○ The purpose and limitations of the undercarriage controls on a glider.
	• **Demonstrate:**
	  ○ Identification of the undercarriage lever and its action.
	  ○ Raising and lowering the undercarriage in accordance with Flight Manual limits.
	  ○ Confirming how the undercarriage is down and locked.

4. Canopy latches	• **Describe:**
	  ○ The way that the canopy latches work on the aircraft in both normal and emergency operations.
	  ○ How to avoid damage to the canopy.
	  ○ Why an unattended aircraft must always have its canopies secured.
	• **Demonstrate:**
	  ○ Appropriate care when handling the canopy.
	  ○ Operation of the canopy in both normal and emergency operations.

5. Tow release.	• **Describe:** ○ The purpose of the tow release handle and how it operates the aerotow and winch tow hooks. • **Demonstrate:** ○ Identification and operation of the tow release.

KEY MESSAGES

- The airbrakes are used to control the rate of descent of the glider, typically on approach to land. They are not used to control the airspeed – the elevator controls airspeed.
- Extending airbrakes will increase the stall speed of the wing by increasing the wing loading.
- Flaps enable the camber of the wing to change and enhance slow and high-speed flight characteristics. Typically used on landing to allow a slower touch down speed and steeper approach.
- Canopies are expensive and easily damaged parts of the glider.

LESSON PLANNING AND CONDUCT

Classroom Briefing

Locate - Identify - Operate

All ancillary controls must be positively located and identified as the one required prior to use. This eliminates any possibility of error in selection of the wrong control.

The principle applies to all ancillary controls - airbrake, flaps, canopy, trim, tow release and undercarriage - and in the latter case extends to ensuring that the undercarriage selector is placed in the appropriate position (eg. Down and locked) in accordance with the placards fitted to the glider.

Standard colour coding of controls, which are:

CANOPY Normal Release	**WHITE**.
CANOPY Emergency Release	**RED**
TRIM	**GREEN** (See GPC 7)
AIRBRAKES	**BLUE**
TOW RELEASE	**YELLOW**
FLAPS	**GREY**
UNDERCARRIAGE	**BLACK**

NOTE: Some manufactures may not conform to colours of flaps and undercarriage.

Airbrakes (BLUE)

- Explain the difference between spoilers and airbrakes.

- Their primary purpose is to control the descent angle of the glider on approach to land or to reduce height.
- Emphasise that speed is controlled by the attitude of the glider on approach, not the airbrake.
- The spoiler/airbrake control colour is always BLUE.
- All spoiler and airbrakes have maximum speeds for activation. See Aircraft Flight Manual (AFM) and placards in cockpit.
- The control (BLUE) must be identified before use.

Flaps: (GREY)

- Explain the difference between the different types of flaps (plain, fowler and flaperons).
- The primary reason for flaps fitted to some gliders is to enable the camber of the wing to be modified to better suit the speed being flown.
- Flaps on gliders are lowered by a single handle moved aft which lowers them and forward to raise them.
- When the flaps are lowered, they will increase lift but also drag. Normally there are two settings down about 8 degrees for slow speed flight and 30 degrees for landing (more drag).
- Some gliders, to increase their performance, have flaps that can be raised above the neutral setting and may have 2 or 3 settings. This is known as negative flap.
- When flaps are lowered (positive flap) the stall speed will be lower. When flaps are raised (negative flap) the stall speed will be higher.
- In some gliders the flaps may be linked to the ailerons so that when the flaps are moved both ailerons move in the same direction to provide maximum lift and control along the full wingspan - Called Flaperon (flap and aileron)

Use of flap for take- off and landing

- Some gliders benefit from using a positive flap setting so that the glider will fly at a lower airspeed therefore reducing the take-off distance and landing distance.
- Some start the take-off ground run with a negative flap setting which provides better aileron control. Pilots then move them to positive flap to enable an earlier take off.
- Pilots need to maintain proximity to the release handle until aileron control is achieved before moving their hand back to the flap handle. Again, the handle must be positively identified.
- All flaps have airspeed limitations. Refer to the aircraft Flight Manual and placards.

Undercarriage: (BLACK)

- Understandably, the undercarriage must be down and locked when the glider is on the ground. Some undercarriages can be retracted to improve performance of the glider so care must be taken to ensure that it is checked down and locked before landing (FUST).
- Note any speed limitation for undercarriage deployment.
- Note the undercarriage placards which indicate which direction is down. This varies with different gliders. Some gliders have an audible alarm (buzzer or siren) if the airbrake is actuated when the undercarriage is not down and locked. However, these alarms may malfunction and must not be relied upon.
- You need to also check that the wheel is Locked in the down position, which requires clear focus and attention.

Canopy: (WHITE Normal. RED EMERGENCY).

- Explain the glider types normal and emergency operating handles while sitting in the glider.
- Explain the dangers of reaching into the cockpit through the clear view panel.
- Describe the care and attention needed to control the canopy when open - especially in high winds.
- Explain why you never leave an aircraft unattended with an unlocked or open canopy.
- Note that for some aircraft designs, an open canopy can focus the sunlight onto the seat cushions or headrests and start a fire.

Tow Release: (YELLOW)

- Identify release to student and explain the positioning of hand during hook up and take off for winch and aerotow launch.

PRE-FLIGHT BRIEFING

- Note that this lesson is about the effects of individual ancillary controls.
- Remind the student that they have seen the use of the airbrake by the trainer when landing on previous flights.
- There is potential for a relatively large change in attitude with full activation of airbrake. If this causes discomfort, then please notify the trainer.
- Identify the correct blue control lever and practice on the ground and note the control surface movement on the aircraft.
- Student may have used the GREEN trim control in previous flight.
- Advise the student that they might feel the trainer using controls other than the one being used during their flying to damp out non-relevant effects due to turbulence.
- Emphasis the student to remain on controls and follow through with the trainer when requested.

FLIGHT EXERCISES

Undercarriage

- The student should at this stage have been aware of the undercarriage movement from previous flights.
- It is essential the trainer indicates to the student on the ground the lever and action required to raise and lower on the type being flown. This should include the up and down indicators and any electronic warnings.
- Demonstrate any potential down-but-unlocked scenarios if these are possible with the aircraft.
- It is very important to stress when these actions occur – raise undercarriage following release from tow, and down and locked PRIOR to the pre-landing checks

Airbrake

- Students should have seen the activation of the airbrake on previous flights, but this will be the first time they will have used it.

- From level flight at 60 Kt get the student to identify the BLUE lever. Get the student to unlock the airbrake, ensuring it does not 'suck out' and then deploy half brake and notice the force required. Maintain speed with attitude and note new nose down position.
- Various positions of brake should be practiced. Thermal if possible, to regain height.

Flaps

- Emphasise check of airspeed prior to flap extension.
- If the training glider has flaps then the trainer should demonstrate the new attitude at 50Kt on the first position of positive flap.
- Emphasis on identifying correct control. Handover to the student to practice and maintain the new attitude and trim. Remind the student that this position can be used for Thermaling at slower speeds. If Thermaling, demonstrate and handover.
- Full positive flap and attitude should be demonstrated for landing configuration. Student practices maintaining correct attitude and trim.
- Demonstrate the correct landing position for flaps and what must be checked on the pre-landing check.

Notes:

1. Ensure lookout is maintained throughout.
2. Ensure the student verbally identifies (Locate-Identify-Operate) each control before movement.
3. Make sure the correct handover of control is maintained.

COMMON PROBLEMS

Problem	Probable Cause
• Student pulls out the airbrake quickly with a large extension.	Airbrake over-centre lock may be hard for some students to overcome.
• Student has difficulty raising undercarriage.	Undercarriage may be difficult to raise due to weight or position of lever in the cockpit. Provide guidance to student on how to achieve this.

THREAT AND ERROR MANAGEMENT

- Maintain effective lookout as the student will need to look inside the cockpit for this unit.
- In some aircraft the colour coding for ancillary controls may be different from that specified here.
- In older aircraft the colour coding of ancillary controls may have faded.
- Use of airbrake during yaw can create uncommanded pitch down in some aircraft.
- Maintain effective communications.
- Recognise an undesired aircraft state.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 10
- Australian Gliding Knowledge. Pages 45, 48,58-61, 89
- Aircraft Flight Manual of the training glider (control limitations)

Gliding Australia Training Manual

Trainer Guide

Unit 11
Introduction to Soaring

Unit 11 - Introduction to Soaring

AIM

To introduce student pilots to soaring and what can be achieved by progressing through GPC training and beyond. It aims to foster enthusiasm to continue training and remain with the sport longer term. Thermal soaring is comprehensively covered in post-solo GPC units – this unit provides only a basic introduction to thermal soaring.

Note: It is preferred that a Silver Coach train this unit when available to do so.

PRE-REQUISITE UNITS

- GPC Unit 7 Straight flight, various speeds, trim
- GPC Unit 8 Sustained turns, all controls
- GPC Unit 9 Lookout scan procedures

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Summarise soaring pathways and personal goals	• **Describe** o Pathways available in the sport • **Identify** o Soaring goals beyond solo
2. Demonstrate basic aircraft control	• **Demonstrate** o Cruising at a constant attitude and heading in the direction of a geographic feature o Constant attitude while rolling to 35-45 degree angle of bank o Constant angle of bank and attitude in a sustained turn
3. Demonstrate basic Thermaling skills	• **Identify** o A thermal through feel or using the variometer • **Demonstrate** o Basic thermal centring using minor corrections

KEY MESSAGES

- Soaring is not just about safely taking off and landing. There are many opportunities such as flying advanced aircraft types, cross country flying, mountain flying, flying competitions, badges and records, and aerobatics. Training is available for all of these pathways.
- Soaring in thermals is a key skill essential for longer duration flights and cross country flying.
- More advanced soaring concepts are trained in the GPC syllabus after solo.
- Soaring is a great sport where you never stop learning.

LESSON PLANNING AND CONDUCT

Briefing

This unit is best achieved by exposing the student to flight experiences showing what they could achieve beyond solo. The briefing should be relatively short since the concepts will be trained through later training units.

Brief the opportunities available to a glider pilot including flying advanced aircraft types, cross country flying, mountain flying, flying competitions, badges and records, and aerobatics. Relate each pursuit to the training available.

Thermal soaring is a key enabler for all soaring pursuits. Introduce how gliders fly cross country in thermals by climbing in thermals and cruising to the next thermal.

With reference to the diagrams in the pilot guide for GPC Unit 30 Thermal Centring Techniques, briefly introduce the concept of a thermal and two primary methods of thermal centring:

1. Using feel. When a sustained upward acceleration is felt, bank should be reduced to about half for 2-3 seconds before resuming the original angle of bank.
2. Using the vario. Identify the minimum vario indication in the turn (preferably using audio). 45 degrees (1/8 turn) after this point bank should be reduced to about half for 2-3 seconds before resuming the original angle of bank.

Weather permitting, discuss where it may be possible to fly on a short cross country flight. Introduce planning and TEM for the flight.

Flight Exercises

Soaring is best experienced on a cross country flight. If the weather is suitable conduct a short cross country flight – reasonable thermal conditions are required to ensure a low stress flight and to enable the student pilot to feel the accelerations from lift and sink.

Where conditions are marginal the cross country flight can be around a number of close waypoints that do not take the glider far outside glide range of the home airfield (if at all); or an option may be to take a high aerotow (where available) and fly a short task within glide of the home airfield.

All efforts should be made to enable the student pilot to experience soaring flight outside the normal circuit area.

Demonstration

Demonstrate thermal entry and centring. Verbalise your mental picture of where the core is and approach to recentring. Ask the student to describe where they think the core is. Keep control movements slow and smooth and try to get the student to feel acceleration. Re-iterate the importance of maintaining a constant nose attitude and constant angle of bank once centred.

On a cross country flight, demonstrate initial climb, departure on task, cruising towards a goal, basic thermal joining, basic Thermaling and thermal departure. Allow the student to enjoy the experience and do not explain complex concepts. Point out ground features, local towns etc.

Student Exercises

Under direction the student practices thermal joining, centring, cruising and related skills. In particular:

- Lookout
- Turning with a constant angle of bank and attitude
- Coming out of a turn on a heading
- Cruising towards a geographic feature holding constant attitude and heading
- Thermal entry – if they think they are in lift start a turn (don't forget lookout)
- The student verbalises where they think the best lift is in a turn
- The student practices moving the centre of the circle in the direction of best lift using one of the basic methods

COMMON PROBLEMS

Problem	Probable Cause
• Speed varying in turns	Flying using airspeed indicator instead of nose attitude relative to the horizon Not trimmed correctly

Debrief

- Identify the parts of the flight the student most enjoyed and elaborate on these to motivate them to complete the GPC.
- Discuss the elements of the flight and how they will be trained in the GPC syllabus.
- Discuss the pathways in soaring for the student once post GPC.
- If a cross country was not possible, it is important to strongly encourage the student fly a cross country with a coach or instructor as soon as the weather allows, or provide assistance in identifying a club where cross country flight is possible.

THREAT AND ERROR MANAGEMENT

- There are a number of unique threats associated with conduct of the cross country flight for this unit; these must be managed and possible errors mitigated. In addition this unit is a good opportunity to introduce the student to the importance of appropriate TEM for a cross country flight.
- The cross country flight may be one of many flights conducted by the trainer on the day with other such flights and/or training introducing threats related to time pressure, lack of preparation and outlanding. Pay attention to hydration for yourself and your student and manage heat stress. This flight will be longer and more stressful than a normal training flight.
- Time pressure is a major source of errors. Consider rescheduling other training and do not attempt the flight if there is insufficient time. You may not have time for the preparation that you would normally complete prior to a cross country flight. Make sure that you always consider actions such as task planning, weather assessment, airspace assessment and arranging a retrieve crew.
- This flight is not about outlanding – minimise that threat by choosing to train this unit in better cross country conditions, or selecting a task that does not venture too far from the airfield.

Don't allow your student to fly when in proximity to other aircraft – it's too distracting for them at this stage of their flying anyway.

- Introduce your student to basic threat and error management concepts ("to err is human") and strategies that can be employed to reduce risks during the flight.

TRAINING MATERIALS AND REFERENCES

The trainer should be versed in the following units to ensure consistency in training practice even though only a basic introduction to these units will be imparted to the student:

- Unit 30 Thermal centring techniques
- Unit 31 Thermal entry
- Unit 32 Soaring with other gliders
- Unit 33 Thermal sources and structure
- Unit 40 Cruising, speed to fly, height bands and thermal selection

Gliding Australia Training Manual

Trainer Guide

Unit 12

Slow Flight, Stalling

AIM

THE AIM OF THIS GPC UNIT IS TO ENSURE THE STUDENT:

- Can fly accurately and confidently close to the stall;
- Is aware of the importance of always maintaining a safe margin from the stall whenever close to the ground i.e. below 1000' AGL;
- Can recognise the approach of a stall; and
- Will initiate prompt prevention and recovery from stalls.

PREREQUISITE UNITS

- GPC Unit 7 Straight flight various speeds and Trim
- GPC Unit 8 Sustained turns all controls

COMPLEMENTARY UNITS

There are no complementary units for this GPC Unit

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Demonstrate slow flight techniques	• **Demonstrate:** ○ Monitoring of attitude and air sounds together with the 'feel' of the stick to maintain flight above the stall without reference to instruments. ○ Moving the stick forward when a wing drop is experienced, to lower the angle of attack with sufficient rudder away from the wing drop direction to counter any yaw.
2. Safe flying practices	• **Describe:** ○ The individual glider's 'flight envelope' as indicated by the cockpit weight and speed placard and the use of ballast to ensure flight is within these limits. ○ The significance of the yellow triangle on the airspeed instrument. ○ The need for coordinated turns in the circuit. ○ The need to avoid using excess rudder during a turn which may lead the glider to spin. • **Demonstrate:** ○ Use of the GFA Pre-aerobatic checklist HAS(E)LL. ○ Identification of the near onset of a stall and counter by easing the stick forward to decrease the angle of attack. ○ Selection and maintenance of a suitable safety margin above stall speed (1.5 Vs) habitually when flying below 1000 ft AGL.

3. Stall recognition	• **Describe:**
	  ○ The aerodynamics of the stall.
	  ○ Factors that impact stall speed – angle of attack and wing loading (G force, angle of bank, flaps and use of airbrakes).
	• **Demonstrate:**
	  ○ Recognition of symptoms of flying near and below the stall speed.

4. Stall recovery	• **Demonstrate:**
	  ○ Moving the stick forward to decrease the angle of attack to regain and maintain a safe speed, prior to the stall.
	  ○ Stall recoveries with minimal height loss appropriate to type:
	  i. Without and with full airbrake/spoilers and;
	  ii. Without and with flaps:
	  1. Straight and level;
	  2. 30 degree turns;
	  3. 45 degree turns.
	  ○ Additionally for self launching gliders:
	  i. With and without engine power;
	  ii. With and without engine pod extended:
	  1. Straight and level;
	  2. 30 degree turns;
	  3. 45 degree turns.

KEY MESSAGES

- Prior to flying as pilot in command solo, the pilot must demonstrate their ability to fly constantly at their designated safe speed and confidently stall and recover.
- Sometimes pilots who do not fly frequently lose these competencies.
- If you feel that the glider is not responding correctly, move the stick forward (to un-stall the wing).
- Allow the glider to establish normal flight at an appropriate airspeed prior to trying to undertaking a turn The glider takes some time to stabilise once the nose has been lowered

LESSON PLANNING AND CONDUCT

Classroom Briefing

- Explain the aerodynamics of the stall with reference to details in the Pilot Guide:
  - Progression of stall from root to tip.
  - Loss of lateral damping and how washout impacts on stability.
  - Change in location of the centre of pressure.
- Turbulent, low speed airflow at the stall produces a number of useful indicators that the stall is imminent:

  - Increasingly quiet.
  - Buffeting of the glider's tail from turbulent air from the wing.
  - The stick becoming less responsive and effective in both pitch and roll.
  - The feel of Loss of lateral dampening.
  - Increasing descent rate.
  - The nose dropping in spite of the stick being held fully back.
- Typically the stall results from a higher nose attitude than normal but the attitude may not appear significantly higher.
- Explain lateral stability and lateral damping and that at low speed , and how the stall may also occur at higher airspeed if the stick is pulled back rapidly – over rotating the glider. (e.g. at 60 knots in a turn, excessive and rapid back stick can result in a stall). The turbulence is quite noticeable in this situation.
- Explain the purpose of washout on the wing tips is to ensure that the wing roots stall before the wing tips.
- A stall is easily recovered, but it is important to avoid the stall at low level or when flying close to other gliders, as there is potential for it to quickly develop into a spin. This gives rise to the definition of Safe Speed Near to the Ground. (1.5 Vs)
- The yellow triangle on the airspeed instrument marks the lowest approach speed at maximum gross weight - without ballast recommended by the manufacturer. JAR 22.1545 (d) refers.
- It may not be the same speed as 1.5 Vs.
- Flying faster than the stall speed and not applying excessive G forces, will avoid a stall.
- Recognise when a stall is imminent, and act immediately by moving the stick forward to un-stall the aircraft.
- The glider controls will have a more solid feel when the glider is flying normally again.

PRE-FLIGHT BRIEFING

- Explain that you will be investigating flight at low speed as gliders often fly in this situation.
- Normal flight in an aircraft is conducted between the stall and VNE.
- Thermalling Is often conducted close to stall speed and it is not uncommon for gusts in the air to stall the glider, so you need to recognise when this happens and act accordingly to "un-stall' the wing.
- Explain that stalling is not a dangerous situation provided that you act to un-stall the glider by simply moving the stick forward.
- Explain the symptoms of approaching the stall, as listed above. We want to fly slightly faster (with a lower nose attitude) than the stall speed.
- Explain that as the glider gets close to stall, a small forward movement of the stick will reduce the angle of attack and prevent the stall.
- Describe simple aerodynamics – particularly:
  - Relate to angle of attack.
  - Lift depends on speed and angle of attack

- As the glider slows the angle of attack increases.
- Cause of stall is angle of attack
- Stall is fixed by correcting angle of attack – stick forward

FLIGHT EXERCISES

Flying Near the Stall

Objective

- Principally precautionary – recognition of condition
- Introduce and explain loss of lateral damping
- Use of rudder to catch wing drop – but does not result in recovery. Rudder may pick the wing up but without stick forward the other wing will drop.
- BUT recovery is immediate with reduced angle of attack
- However, if the manoeuvres which resulted in the approach to stall resulted in a speed lower than the stall speed the stick must be held forward till the speed increases to above the stall speed before the stick can be eased back so that the wing again can take the full load of the weight of the glider.

Three issues:

- Rudder can pick the dropped wing up but does not recover the stalled wing and is not actually necessary
- Stick forward reduces the angle of attack immediately and hence recovers normal flight characteristics
- The glider speed must be higher than the stall speed before the wing will carry the full weight of the glider.

Briefing

- Describe as precautionary
- Describe loss of lateral damping and aileron control reversed if anything (except for wash out).
- Recovery with elevator
- Optional use of rudder to remove yaw.

Air demonstration and exercise

- Emphasise feel of loss of lateral damping.
- And recovery of lateral damping immediately with angle of attack
- And recovery of flying speed
- Rudder to catch yaw – does not recover.
- Explain - may need to wait for speed recovery before

The important competence is recognition of the feel of loss of lateral damping and the development of an **AUTOMATIC** response to move the stick forward.

Specific demonstration and practice of the Stall

- For all stall manoeuvres, conduct a HASLL check.
- If possible, introduce the in-air exercises when thermal conditions enhance the possibility for regaining height, otherwise higher than normal aerotows are required or many winch launches may be required to cover this unit.

- Ask the student to fly at 45 knots and trim the glider accordingly. Then ask the student to raise the nose slightly and continue to fly straight and level. Point out that the trim may not be sufficient, and they may have to hold backward pressure on the stick.
- Ask questions to see if they can identify indicators of an approaching stall:
    - reduced controllability;
    - reduced noise level;
    - slight shuddering on the elevator; and
    - loss of lateral damping.
- Some students may be apprehensive and you may need to take control and ask them to follow you through as you get closer to the stall.
- Demonstrate that moving the stick forward slightly removes these indicators and the glider feels like it is flying normally again.
- Demonstrate what happens when you fly a slightly higher nose attitude where the glider stalls and the nose drops, (in some gliders this may not be possible at a low nose attitude).
- Again, indicate that the glider flies again when you move the stick slightly forward.
- Let the student demonstrate this a few times so they start to relax with the situation.
- Explain that you will now demonstrate a higher nose attitude and they should more clearly identify the indicators of the approaching stall. Ask the student to describe these indicators when they then do the same manoeuvre.
- Introduce the techniques to deal with a wing drop close to stall, through use of opposite rudder, and that forward stick solves the overall problem. However, it needs to be clear that the problem is angle of attack - so recovery is stick forward. Glider will recover normal flying characteristics by stick forward only.
- Over time you may be able to demonstrate a high nose attitude stall with the ensuing nose drop, and that even with the nose of the glider pointing down again it is not flying properly until the stick is moved forward to un-stall the wing. Some gliders may let you demonstrate that pulling the stick back in this situation does not raise the nose. You must push forward on the stick to un-stall first and then recover.
- As students relax more, ask them to read the airspeed as the glider stalls.

Advanced training

- In later flights you can introduce the impact of airbrakes and flaps on stall speed and glider reaction.
- Introduce the stall in a turn, primarily to identify the indicators and the effect of moving the stick forward.
- Avoid entering a spin through these exercises.

Notes:

1. The student may be overanxious undertaking this unit. A calm and matter-of-fact approach to instructing the stall is required.

2. Introduce the flight exercises with gentle slow flying and straight-ahead stalls demonstrating ease of recovery, gradually developing to more aggressive stalls in differing configurations with growing student confidence over a number of flights.
3. Direct the student's attention outside the cockpit towards the horizon to counter any discomfort felt during the stall and recovery.
4. Stalls should be demonstrated by the instructor with the stick right back followed by the student trying in the same configuration. This is to demonstrate that accidents occur when the stick is held back in the stall due to visual interference of dropping towards the ground instead of easing it forward to recover by reducing the angle of attack to get the wing flying again.
5. In no or poor lift conditions it is wise to pre-flight brief the pilot on the sequence of activities to be conducted and to confirm most of the HAS(E)LL checks during launch to enable more height and time for the exercises after the release.
6. Ensure that the student differentiates between the nose drop at the stall and the sensations associated with reduced "G".

COMMON PROBLEMS

Problem	Probable Cause
• Not holding the higher nose attitude	Apprehension of the stall Unwilling to hold pressure on the stick.
• Excessive forward stick movement	Apprehension of the stall Too Tense, not feeling when the glider I flying normally again Adverse reaction to reduced G

THREAT AND ERROR MANAGEMENT

- Ensure the glider is stall/spin rated and know and follow the aircraft Flight Manual specifications/limitations for these exercises.
- The control stick must be guarded closely when the student tries to recover to prevent excessive forward movement leading to negative "G" which may lead the student to think the aircraft is still stalled and move the stick aggressively further forward.
- Ensure that the student also recognises the difference between the pitch change employing the air brakes/spoilers and stall onset at height before circuit work.
- With aerotow launches, brief the tow pilot pre-flight regarding the proposed stall exercises, so the tug can descend well clear of the glider and look out for the glider when the tug enters its circuit.
- Similarly, both glider pilots must maintain situational awareness of the tug's and other aircraft positions.
- It is recommended that the pilot should transmit immediately prior the exercise a call of "(LOCATION) TRAFFIC (GLIDER REGISTRATION) CONDUCTING STALL MANOEUVRES FROM approximate POSITION AND HEIGHT (LOCATION)". This follows conducting HAS(E)LL checks to warn other traffic in the vicinity.

TRAINING MATERIALS AND REFERENCES

- Theory Lesson 4
- Australian Gliding Knowledge (AGK) pages 63-66
- GPC Pilot Guide Unit 12
- The Glider's Aircraft Flight Manual
- Gliding Basics: British Gliding Association 2019
- Gliding Handbook: FAA 2013
- The Glider Pilot's Manual: Ken Stuart: 2nd Edition; Airlife 1999
- Understanding Gliding: Derek Piggot: 3rd Issue; AC Black 1996

Gliding Australia Training Manual

Trainer Guide

GLIDING
AUSTRALIA

Unit 13A

Launch & Release (Aerotow)

Unit 13A - Launch & Release (Aerotow)

AIM

To develop and demonstrate the skills and knowledge required to safely fly an aerotow launch in the correct low tow position after transitioning from the initial climb, and then release from aerotow.

Note that this aligns with the normal training sequence and risk profile for these units. Upper air aspects of launch are taught first, then ground roll and take-off, then crosswind conditions and emergencies.

A number of launches may be required to demonstrate competence and underpinning knowledge.

PREREQUISITE UNITS

- GPC Unit 2 Ground Handling, Signals
- GPC Unit 8 Sustained turns all controls
- GPC Unit 9 Lookout Procedures

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- Unit 14 Takeoff
- Unit 19 Crosswind Takeoff and Landing
- Unit 20 Launch Emergencies
- Unit 27 Advanced Aerotowing

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Conduct an aerotow glider launch above 300 feet AGL in the low & high tow position**	• **Demonstrate:** ○ Identification of tug slipstream with glider held below slipstream for low tow and above slipstream for high tow (using elevator). ○ Maintaining glider bank angle parallel to towplane bank angle at all times (through use of coordinated aileron/rudder). ○ Maintaining line astern position behind towplane (through use of rudder). ○ Recovery from out of station position using coordinated controls. ○ Maintenance of situational awareness during the launch with respect of traffic, location and emergency options. ○ Correct procedure to correct bow in tow rope. ○ Correct transition between low and high tow.
2. **Conduct the release from aero-tow**	• **Demonstrate:** ○ Pre-release lookout for tug and glider. ○ Locate-Identify-Operate tow release. ○ 'Rope Gone!' verified visually. ○ Clearing right turn and confirming tug separation. ○ Post release actions if appropriate. ○ Transition from launching pilot to soaring or landing pilot.

KEY MESSAGES

- Early introduction of the aerotow launch is inappropriate. It can reduce a student's confidence and will probably prolong their training. The student must not be introduced to aerotow until their competence in smooth and reasonably accurate co-ordination of aileron, elevator and rudder controls has been acquired. Only when the student can maintain straight flight and gentle turns at 60, 65 and 70 knots, without over-controlling or jerky movements can towing instruction be commenced – not before.
- The student's initial and early attempts to fly the aerotow launch must always start at a safe height, say above 800' AGL, and will be progressively lowered as their skills develop.
- In the introduction to aerotow, the student should be taught to remedy small divergences from position by keeping the glider's wings parallel with the towplane's wings using aileron, and then using rudder only to ease the glider into position. This is supported by the glider's self-centring tendency when using a nose release.
- Lookout during aerotow launch is critical. Get the student to look to the horizon, ahead and to the side; do not let them fixate on the towplane.
- Emphasise that if the pilot loses sight of the towplane, then the tow rope must be immediately released.

LESSON PLANNING AND CONDUCT

Briefing

Terminology

At this stage introduce the terminology of Launching Pilot – Soaring Pilot – Landing Pilot, each of which requires different mindsets and actions to configure the glider correctly for the next phase of flight.

Stages of aero-tow launch are described:

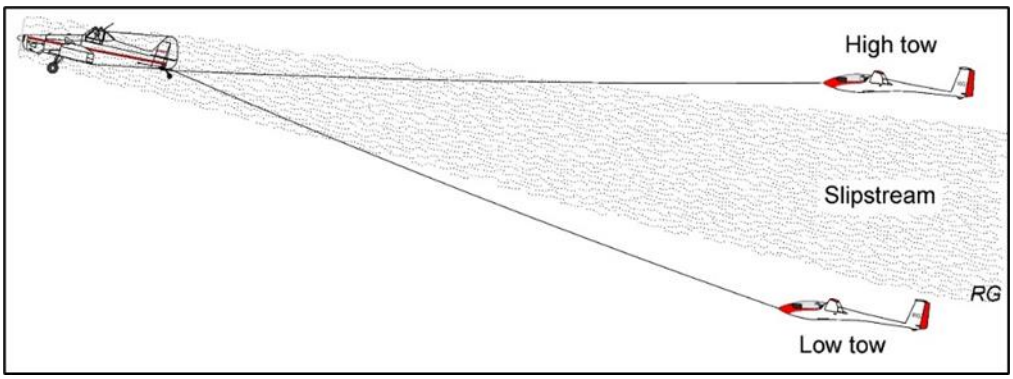
- Normal climb and release (this unit).
- Ground roll, separation, and initial climb (Unit 14A).
- Correcting for crosswinds (Unit 19).
- Launch Emergencies (Unit 20A).

Normal climb

Explain that they will initially develop their skills for normal climb above 800 feet AGL for safety reasons, above any hazardous wind gradient or turbulence.

Tug aircraft produce a turbulent slipstream in flight, consisting of a combination of wingtip vortices and propeller wash. Gliders are normally positioned either just below, or just above this slipstream while on tow. The positions are known as low tow and high tow respectively. Describe correct low and high tow positions, noting that:

- The low tow launch is the standard procedure for Gliding Australia clubs using aerotow (low tow reduces the risk of tug upset emergencies and in high tow the combination feels a little more pitch sensitive).
- Whilst the low tow position is the norm, the pilot needs to be able to transition between the low and high tow positions.
- In straight line climb, the glider's nose will normally be pointed at the tail of the towplane. The pilot should be able to see both sides of the towplane at the same time.
- In a shallow turn, the glider's nose will normally be pointed slightly to the outside of the turn towards the towplane's outside wingtip rather than directly at the tail.
- Wings are maintained parallel to the towplane's, in a line astern position, in straight and level flight through use of controls.



Maintaining Line-Astern Station

Brief on how to recover from an out-of-station position back to line-astern.

- For very small diversions, just apply a small amount of rudder whilst holding the wings level.
- The trainer may retain the elevator and aileron control and maintain height and wings level to assist the student, during the first attempts.
- Urgent correction is not required provided the diversion is small.
- For larger diversions, you will need to apply a coordinated turn in the correct direction. Use small movements.

After some experience, introduce using all three controls to maintain position and gradually extend to cover the whole tow including the release. Coordination takes time to develop and will come as the student gains experience.

If using coordinated controls, note that just centralising the stick will mean that the turn will continue. The turn must be stopped by using opposite aileron and rudder, and then centralise the controls.

It is typical that the glider will wander from side to side until you get the coordination correct – relax more on the stick, make small movements. Most out of station diversions are the result of the pilot moving the controls.

Hazards associated with out of station flight are discussed in GPC Unit 20A. Correct procedure to correct bow in tow rope is discussed.

If the student ends up with a bow in the rope a gentle correction is required otherwise they risk breaking the rope. Get the student to apply a little drag through use of rudder or in more extreme cases the gentle application of airbrake.

Be aware that the airbrakes of some gliders are apt to suck out if opened at aerotow speeds, and with some types just cracking the brakes can start them juddering in and out. Timing is important. Close the airbrakes or remove the sideslip just before the rope goes taut again, to avoid a violent jerk which may:

- pitch the glider,
- yaw and roll it,
- break the rope and/or the weak link, or
- catapult the glider forward and create an even bigger bow in the tow rope.

If you have to release with a big bow in the rope, wait until just before the rope goes tight again. Releasing without getting rid of the bow first can lead to the rings flying back and hitting the glider. In the worst case they can become entangled with the aircraft.

Situational Awareness

Lookout:

- Emphasise to look ahead at the towplane but also search for possible conflicting traffic. Scan ahead, above and to each side on a regular cycle.

Position:

- Throughout the tow both the trainer and the student must remain aware of their position in relation to the airfield and safe landing options.

Emergencies:

- Be alert to the possibility of a rope/weak link break and have a plan to deal with abnormal situations.

Release

Pre-release and release actions are described.

Plan to release. Check location and height – is this suitable?

If towing in low-tow, release from low-tow, If towing in high tow release from high tow.

Lookout: It is essential to check that, prior to release, the airspace is clear (a) to the right where the glider is just about to turn, and (b) to the left and below where the tug is just about to descend.

Locate, Identify, Operate: The tow release. The release should not be operated until it has been positively located and identified as the one required. This eliminates any possibility of error in selection of the wrong control. This principle applies to all ancillary controls.

Pull the release, observe the rope go and begin a right turn without delay to obtain maximum clearance from the rope and simultaneously applying normal targeted scan.

The release should be operated while the towrope is still under some tension. The tug pilot, after feeling “release” should check that the glider has in fact released and begin a descending turn to the left.

The towplane should be monitored to ensure that the release has been identified and that separation is maintained. It may be necessary in lighter aircraft to advise the tow plane that the glider has released.

Tell the student they will probably need to reduce airspeed on turning right, as towing is carried out at 65-70kts and the aircraft will need to slow down.

Post release actions should then be carried out and transition from launching pilot to soaring or landing pilot.

Pre-Flight Briefing

Normal Climb

Emphasise that the stable platform is just as effective on tow as it is in free flight. This will be backed up by a demonstration.

Given that the airspeed is higher than the student has been accustomed to in handling the controls in free flight, the control forces are higher, but at the same time the controls are more effective.

Some gliders are very heavy on the ailerons at aerotowing speeds, others tend to run out of elevator trim in low tow, leading to a residual push force. It is important to know the characteristics of the trainer in use and brief accordingly.

Warn the student that they will probably over-control and that this is quite normal. Emphasise the need for small movements on the controls. From a learning perspective, remember that mistakes will need to be made for learning to take place and correct feel to be developed.

Emphasise that the correct towing position is relative to the tug slipstream. If there is any doubt whether the glider is in the right place, find the slipstream and then position the glider accordingly.

Suggested patter:

"On this flight, I will hand over control to you on aerotow at about 600' AGL. The glider will be trimmed out, so you should not have much difficulty."

Note that the air should be reasonably smooth for a student's first attempts at this exercise.

"When you take control, do very little at first, let the stable platform work for you. Get used to the feel of the glider on tow, then gently exercise each control to see and feel its effect. You can expect that the elevator will be more sensitive than you are used to, while the ailerons will be quite a bit heavier. You will soon get used to this. The rudder feels about the same as in free flight."

Flight Exercises

Launch

- Trainer demonstrates the correct tow position. Point out wings parallel to towplane wings, in line behind the towplane; just below the slipstream. Demonstrate feeling for the slipstream to find the right position. Student then follows through on the controls. Point out small movements. Ask them to relax their grip on the controls.
- When comfortable, hand over to the student (handover/takeover routine).

- Small bows and horizontal displacements can usually be ignored. Bows will gradually pull out if nothing is done to worsen the situation, and any displacement will automatically correct itself.
- Talk the student through corrections – small movement, use small rudder pressure to move back into line. Ask the student to find the slipstream by gentle use of elevator, and then move back to position. Ask the student to make small bank changes and observe the ensuing turn. – put wings back level and then use rudder to correct. The trainer may have to take over at various stages of this practice.
- If serious over-controlling occurs, return to the stable platform demonstration, which works perfectly well on tow if the trim has been correctly adjusted.
- They should be shown that, should the glider get out of station laterally, it must be because bank has developed. The first requirement is therefore to ensure that the glider's wings are parallel with those of the towplane by gentle application of aileron and rudder. This will stop the glider getting further out of station, and in most cases the glider will tend to return to the central position of its own accord after a few seconds.
- During the early air exercises in aerotowing, it is important to build confidence in the student, as it is easy to get demoralised by constantly getting out of station without apparently getting any better. Let them make mistakes, then analyse the mistakes very carefully to ensure that they are actually learning from them.
- At lower altitude there is a small advantage in having a slightly nose heavy trim, in case they get a rope break. The trim will help with maintaining safe speed near to the ground. Once established, encourage the pilot to adjust the trim to reduce workload.
- When the student is relaxed, direct them to look around to identify landmarks and other aircraft. The aim is to do this without moving the controls to follow their head.

Release

- Ask the student to confirm that height and location are as expected.
- Ask them to perform a suitable lookout to ensure the airspace is clear in the direction both the tug and glider will be flying post release under your direction.
- Ask them to Locate and Identify the release knob, and then Operate it when safe to do so.
- Once it is confirmed that the rope is released, execute a turn to the right.

High Tow

- Once the student is capable of flying in low tow, you can ask them to try flying in high tow. This is a good challenge.
- Demonstrate transitioning through the slipstream and the need to maintain a small amount of back stick so they don't get stuck in the slipstream. This is good practice for when they are doing the take off and have to transition down to low tow when climbing out.
- Demonstrate the correct position just above the slipstream.
- Emphasise the problem of getting too high where you can lose sight of the tug (release).
- Handover to the student and give advice as required. They should handle this after a few attempts.
- Direct them to release in High Tow, and then in a later flight return to Low Tow and release.

Notes

1. Once released, the pilot transitions from Launching Pilot to either Soaring or Landing Pilot and should configure the glider appropriately.
2. Gliding Australia does not mandate any single post-release action list or checklist.
3. Some clubs choose to apply local checklists, which may vary for particular sailplanes and prevailing local environmental conditions. e.g., FUST Flaps set as required or fixed, Undercarriage set as required or fixed, Speed as required and Trimmed for speed. This is a CHECK and should be conducted after the release and established off-tow.

COMMON PROBLEMS

Problem	Probable Cause
• Glider swinging from side to side behind tug.	Student trying to use aileron alone to control the glider in roll, thereby inducing large amounts of adverse yaw. In the early stages of learning aerotow, the trainer should assist the student to get back into position, as the effort of students to stop this swinging on their first aerotows often leads to even larger oscillations.
• Glider much too low behind tug (very common).	Failure to use slipstream as primary reference for towing position. Failure to adjust trim to provide stable platform in normal low-tow position.
• Student over-controlling on aerotow.	Student has forgotten, or has never been instructed, that the stable platform works just as well on tow as in straight flight. A good demonstration of this will produce excellent results.
• Having got out of position and managed to start moving the glider back into position, student has difficulty in stopping the glider in the correct place.	Student has not developed the required amount of anticipation needed to apply corrective controls a little before the glider gets into position. Student may possibly have been put onto aerotowing too early in training.

THREAT AND ERROR MANAGEMENT

- Lookout tends to vanish due to concentration on the towplane. trainer to demonstrate and regularly remind the student.
- Situational awareness of height, position and other aircraft needs to be discussed and monitored.
- Releasing too low or too far away or downwind needs to be explained and safe landing options monitored.
- The towplane should be monitored to ensure that the release has been identified by the tug pilot and that separation is maintained.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 13A
- Gliding Basics: British Gliding Association 2019
- Australian Gliding Knowledge (AGK) pages 92-94, 104-110
- Gliding Handbook: FAA 2013

Gliding Australia Training Manual

Trainer Guide

GLIDING
AUSTRALIA

Unit 13S

Launch & Release (Self-Launch)

Unit 13S - Launch & Release (Self-Launch)

AIM

To develop and demonstrate the skills and knowledge required to safely fly a self-launching glider through a normal climb and engine shut down to transition to soaring pilot.

PREREQUISITE UNITS

- GPC Units 1-10
- GPC Unit 12 – Slow Flight & Stalling

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 14S – Take-Off (Self Launch).
- GPC Unit 20S – Launch Emergencies (Self Launch).

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Self-launch is conducted above 300' AGL.**	• **Demonstrate:** ○ Transition to V_y (best climb rate speed) if climbing at V_x (best angle of climb speed) for obstacle clearance purposes. ○ Full scan lookout, lowering nose momentarily if necessary to clear ahead. ○ Climbing turns no steeper than 15° unless using thermal assistance. ○ Engine parameter check with close monitoring of any tendency to overheat.
2. **Use of appropriate launch pattern.**	• **Demonstrate:** ○ Maintaining runway heading until 500' AGL unless keeping within gliding range of the airfield. ○ Situational awareness of and provide separation between the launch and any other powered traffic (especially towing combinations). ○ Remaining clear of any winch launch area. ○ Good airmanship by avoiding climbs using thermal assistance in the normal circuit area. ○ Regular engine parameter checks until top of launch height.
3. **Engine management in accordance with the Flight Manual and transition to soaring flight.**	• **Demonstrate:** ○ Shut down procedure in accordance with the Flight Manual. ○ Appropriate level of lookout while shutting down the engine. ○ Smooth transition to soaring pilot (or landing pilot if conducting circuits). ○ Restart procedure in accordance with the Flight Manual above a safe restart height. ○ Safety procedures after engine failure to start.

Unit 13S - Launch & Release (Self-Launch)

KEY MESSAGES

- Care must be taken in operating low powered self-launchers in high density altitudes or in the lee of mountain ranges as sink areas may prove in excess of the powered climbing performance.
- Conduct regular engine parameter checks until top of launch height.
- Where possible avoid climbing under power using thermal assistance in the active circuit area and through the normal towing pattern. Avoid all conflict with winch launching aircraft.
- Every different type of self-launcher has a different shut down and restart procedure which must be observed otherwise engine damage may result.
- Engine restarts must be initiated above a safe height that in the event of failure to start, a normal circuit and landing to a suitable landing area can be achieved.

LESSON PLANNING AND CONDUCT

Briefing

Close study of the self-launching glider's Aircraft Flight Manual is required to obtain:

- Expected climb rates at ambient air temperatures.
- Temperature limitation on operations. Cooling mechanism limitations for the self-launch method (e.g., air vs. liquid).
- Any limitations on use of full throttle (e.g., Rotax 912 maximum 5,800 RPM with five-minute limitation on full throttle above 5,500 RPM).
- Detailed shutdown procedure involving cooling down before engine shutdown and/or retraction.
- Detailed in-flight restart procedure.
- Safe heights for restarts and safety procedures in the event of a failure to engine start.

Flight Exercises

- Specific demonstration and practice required:
- Trainer demonstrates normal climb, shutdown and restart.
- Student practice (under supervision) practices normal climb, shutdown, and restart.
- Student should not shut down too early as it is likely more height will be lost while they are learning this procedure.
- Ideally lift is identified and the glider "parked" in it.
- Motor correctly shutdown, cooled and stowed iaw the FM. The engine may take some minutes to cool down.
- In flight relight
    - Select safe landing area first with engine-up reduced glide considered.

- Start engine according to AFM
- Manage application of power according to AFM (some may require warming before full power)
- Manage climb speed
- Brief fuel endurance for engine “retrieves”
- Brief and demonstrate saw-tooth cruise.

Notes

- Do not let shutdown or restart procedures distract pilots from the primary duty to see and avoid.
- If shutdown and restart procedure is complex, use of a printed checklist is strongly recommended to prevent engine or airframe damage.
- Retractables usually have operational speed limits, the engine may not deploy or restart if those limits are not observed.

COMMON PROBLEMS

Problem	Probable Cause
• Failing to monitor engine parameters.	Student distraction or confusion. On the ground get the student to note position of key gauges and identification of normal operating ranges (green arcs). Ensure monitoring of parameters is part of the launch work cycle.
• Maintaining throttle outside engine operating limits.	Student distraction or failure to note passage of time. Brief student on engine operating restrictions. Note the need to confirm the engine is operating within required limits throughout the launch.
• Failure to climb at expected rate.	Best climb speed is not being maintained. Brief student to monitor airspeed during launch and note attitude for Best Climb.

THREAT AND ERROR MANAGEMENT

- Adequate lookout must continue to be made during shutdown and restart.
- Follow through early student attempts at shutdown and restart procedures to ensure student observance to prevent engine or airframe damage.
- Engine restart attempts at low altitudes present significant threats to flight safety, consider landing safely as an alternate.

TRAINING MATERIALS AND REFERENCES

- Aircraft Flight Manual
- GPC Pilot Guide Unit 13S
- Powered Sailplane Manual: GFA Ops 0009 Aug 2015

Gliding Australia Training Manual

Trainer Guide

Unit 13W

Launch & Release (Winch)

Unit 13W - Launch & Release (Winch)

AIM

To develop and demonstrate the skills and knowledge required to safely fly a winch launch, from the initial climb stage through to release.

Note that this aligns with the normal training sequence and risk profile for these units. Upper air aspects of launch are taught first, then initial climb, full climb, and then crosswind conditions. Several launches may be required to demonstrate competence and underpinning knowledge.

Whilst the precursor for launch emergencies is discussed here (speed out of tolerance) the actual briefing and handling of the emergency is covered in GPC unit 20.

PRE-REQUISITE UNITS

- GPC 7 – Straight Flight various Speeds & Trim
- GPC 8 – Sustained turns, all controls
- GPC 10 – Use of Ancillary Controls
- GPC 12 – Slow flight & Stalling

COMPLEMENTARY UNITS

- There are no complementary units for this GPC Unit

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Conduct of Winch launch from Initial Climb through Full Climb	• **Describe:** ○ The stages of a winch launch from Initial Climb upwards. ○ The airspeed limitations on the aircraft during a winch launch. ○ The actions of the pilot in each stage of the launch. ○ The risks associated with winch launch during the stages of initial climb, full climb and release. • **Demonstrate:** ○ Correct handling of the aircraft in the initial and full climb stages of the launch. ○ The actions to take when there is a significant crosswind during the launch.
2. Winch Launch Release	• **Describe:** ○ How to release the winch cable from the glider. • **Demonstrate:** ○ The release of the cable without significant tension. ○ The required post release actions.
3. React to airspeed changes during the Launch	• **Describe:** ○ When to provide a signal to the winch driver and what signals are permitted. ○ The airspeed criteria for entry into full climb. • **Demonstrate:** ○ Clearly recognisable too fast signals at initial and full climb stages. ○ Regaining safe airspeed in full climb stage.

KEY MESSAGES

- Winch stages occur quickly – pilot must remain ahead of the aircraft.
- Always remain in the safe winch speed range for the aircraft.
- Use the too-fast signal prior to the speed exceeding the upper limit.
- When to use speed signals and when to abort a launch.
- Conduct launch work cycle continuously through the launch.
- Always abort the launch if the speed is unsafe (fast or slow).
- Winch upper limit may be exceeded by up to 10% in the initial climb stage only.
- Release should be performed manually with as little cable tension as possible.
- Never allow the winch launch to continue outside VMC.
- Risks associated with winch launching from initial climb stage.

LESSON PLANNING AND CONDUCT

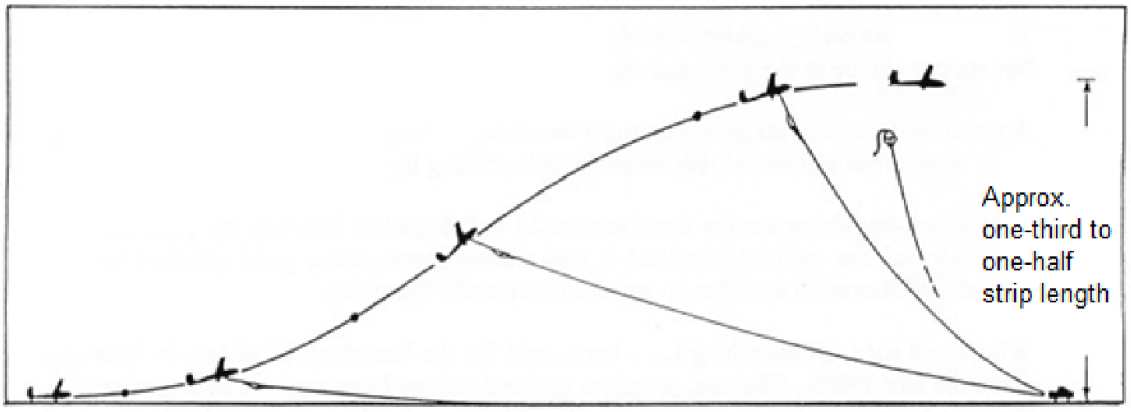
Notes:

1. Different winches use different types of launch cables such as single wire, multi-strand cable and Dyneema rope.
2. Trainers must ensure that they tailor the training in this unit to the cable in use.

Classroom Briefing

General:

- Winch launch stages.
- Control actions during launch.
- Pre-launch lookout is critical.
- Always maintain positive control of the aircraft.
- Launch occurs quickly – issues need to be identified & resolved.
- Launch work cycle (airspeed – attitude – drift).
- How to recognize the top of launch – decaying airspeed, need to lower nose to maintain speed within range.
- Release sequence and post-launch check.
- Perform ground observation of launches from side to explain stages.



Initial Climb:

- Starts at take-off attitude a metre or two above the ground.
- Do not proceed into full climb unless a positive rate of climb within airspeed is established.
- Do not climb steeply at low altitude.
- Smooth and continuous aft movement of control column to enter full climb.
- Advise whether the glider tends to self-steepen or self-shallow.
- Prevention of wing stall during rotation.
- Handling slow/fast speed at this stage.
- Management of cross wind drift.

Full Climb Stage:

- Required angle of wingtip to horizon.
- Use of aft pressure on the elevator to maintain a correct climb angle.
- Observation of wingtips to determine correct position for drift correction.
- Monitoring airspeed throughout.
- Consequences of exceeding maximum winch airspeed.
- If airspeed decays, lower attitude and gain airspeed.
- If airspeed increases, too-fast signal and if not effective, release.
- Management of cross wind drift.

Release:

- Lower attitude as airspeed decays.
- Locate - Identify - Operate release twice as nose attitude passes through horizon.
- Action to take on back-release.
- Perform post-release actions.

PRE-FLIGHT BRIEFING

- Be prepared for a launch failure at any stage on every flight.
- Any launch emergency will be handled by the trainer.
- How to determine min and max speeds. Actions to take if airspeed approaches these limits. Note the ability to exceed max winch speed by 10% only in the lower third of the launch.
- Explain the operation of the cable rings in the release, including how back-release occurs.
- Brief the student to maintain their view outside the cockpit. Cover instruments if required.
- Initial handover will occur at height and progress lower in subsequent flights as student skills improve.

FLIGHT EXERCISES

Demonstration of Initial Climb & Full Climb Stages

Where possible, demonstrate the “too fast” yawing of the aircraft on a previous airborne demonstration.

Targeted and full scan:

- Look outside to obtain situational awareness.

Take-off:

- Aircraft will commence winch launch under control of the trainer, training sequence begins after separation.

Initial Climb:

- Trainer maintains a take-off attitude.
- Note the aircraft has a positive rate of climb with increasing airspeed.
- Maintain coordinated flight with aileron and rudder.
- Ensure airspeed increases to minimum winch speed.
- Commence smooth aft movement of the control column – at least 5 seconds to complete transition from take off attitude into full climb.
- Compensate for any cross wind drift.
- Reference wingtips for assessment of angle.

Full Climb:

- Maintain wingtip angle to horizon for full climb.
- Set angle of bank during launch according to expected/experienced crosswind.
- Continue the launch work cycle – Airspeed (in limits), Angle on wingtip, Drift (bank required to counter).

Speed Limits Approached:

- Continue to monitor airspeed during the launch work cycle.
- Action is taken if we see the airspeed approaching limits:
    - Slow – lower nose to regain airspeed;
    - Fast – too-fast signal

- Monitor airspeed after action; if no improvement consider release.
- Do not allow the aircraft to fly into the Non-Maneuvering Area (NMA).
- Do not let aircraft exceed Max winch speed or fall below **V_{WMin}** / 1.3 Vs

Repeat the launch sequence as many times as needed. As the student improves in skill, reduce the height at which hand-over is performed until handover occurs just after separation.

Release Stage

Airspeed decays at top of launch:

- Note the reduction in airspeed on aircraft, hear less noise.
- Note the airspeed decay at top of launch.
- Smoothly reduce attitude to maintain safe airspeed and reduce tension on cable.

Operation of Release:

- Locate-Identify-Operate release twice as nose attitude passes through horizon.

Post Release Actions:

- Perform post-release actions.
- Transition from launching to soaring pilot.

Notes:

1. Once released, the pilot transitions from Launching Pilot to either Soaring or Landing Pilot and should configure the glider appropriately.
2. Gliding Australia does not mandate any single post-release action list or checklist.
3. Some clubs choose to apply local checklists, which may vary for particular sailplanes and prevailing local environmental conditions. e.g. FUST Flaps set as required or fixed, Undercarriage set as required or fixed, Speed as required and Trimmed for speed.

Repeat launches and progressively introduce student exercises. Where possible expose the student to launches in varying wind conditions.

Winch Speed Actions (Speed Approaching V_{WMin})

Change aircraft attitude to ensure airspeed remains above V_{WMin}.

- Airspeed is monitored during the launch work cycle. If airspeed approaches lower limit, ease control column forward to maintain speed within the winch launch band.
- If airspeed continues to decay, continue to ease control column forward. Winch driver should notice flattening and increase power.
- If the control column is still easing forward and approaching the attitude of level flight, release and conduct a launch failure procedure.

Winch Speed Signal (Speed Approaching V_{WMax})

Prior to providing a signal on launch, use free flight at altitude to practice the signal:

- Airspeed is monitored during the launch work cycle. If the airframe approaches the high end of the winch launch band, use the rudder pedals to demonstrate the too fast signal. Maintain wings level with aileron.
- Note the movement of the airframe.
- Explain that in a launch we monitor airspeed for improvement and repeat if needed or immediately release before exceeding max winch speed (V_{WMax}).

Allow the student to practice the signal in free flight, ensure that it is neither excessive nor insignificant.

Student exercises

- Student practices launches from different stages of the launch (commencing high and working lower):
- Instructor hands over to the student at appropriate height.
- Student:
    - Verbally identifies stage of launch.
    - Maintains correct launch attitude by reference to wingtips.
    - Holds wings level and counters drift.
    - Identifies different launch stages.
    - Identifies if airspeed is moving towards winch launch limits.
    - Practices release of cable:
    - Recognizes loss of power at end of full climb stage and reduces aircraft nose attitude.
    - Identifies release handle.
    - Releases cable with double pull on release handle.
    - Conducts post-release checks and adopts required attitude in stable flight.
    - Conducts FULL SCAN to maintain situational awareness.
- As skill is gained student monitors launch airspeed and takes appropriate action on recognition of:
    - Loss of airspeed by reducing aircraft nose attitude; and
    - Increasing airspeed likely to exceed permitted upper limit in AFM by providing effective too-fast signal.

Debrief

Review the student's ability with relation to their:

- Ability to smoothly control pitch at different launch stages.
- Monitoring of airspeed and actions taken if approaching winch launch limits.
- Monitoring of launch angle and corrective action taken throughout launch.
- Effectiveness of speed-signals provided.

- Ability to recognize top of launch and release cable tension before operating release.
- Conduct of post-release actions.

Notes:

1. The student must have a relaxed grip on the control column and controls adjusted correctly for reach during flight. Ensure that the cable release is reachable, and the student can operate it fully whilst on the ground.
2. Ensure lookout is maintained by all aircrew. Cover instruments (other than ASI) in the student's view if necessary, to discourage looking inside the cockpit.
3. If the student is reacting negatively to G forces do not try to conduct launch training on highly convective days or where known significant turbulence exists.
4. Be careful with terminology and clarity of language. Make it clear when discussing control surfaces and control inputs (elevator, aileron, rudder), their effects in terms of motion (pitch, roll and yaw) and their effects in terms of attitude and flight path (attitude, bank angle, yaw angle or slip-skid angle).
5. Precision with terminology must be synchronised with demonstrations inflight. Patter must be concise and careful. Feedback from the student must be sought. "What did you see when…?"
6. Do not attempt to include all elements of this module in the first few launches. It is better to allow the student time for a good demonstration and opportunity for practice on a single learning outcome. Students are often overloaded when flying their first few winch launches.
7. Ensure that the student has been briefed on the correct hand-over/take-over procedure and their expected action and verbal response to each. There must be no confusion about terminology for transfer of control.
8. Remove all distractions from the exercise, for instance mute audio variometers.

COMMON PROBLEMS

Problem	Probable Cause
High negative G manoeuvre at release.	Student moving control column forward too quickly, possibly not monitoring nose attitude against horizon.
Excessive or insufficient climb angle in full climb.	Failure to monitor wing tips for correct climb angle.
Excessive rotation rate into full climb.	Over enthusiastic or nervous student – demonstrate correct technique and external references for correct climb angle for the aircraft.
Excessive deviation from runway.	Failure to keep wings level (or correct for cross wind) in the launch.

THREAT AND ERROR MANAGEMENT

- Highly anxious G sensitive pilot.
- Turbulent atmosphere or excessive crosswind during launch.

- Launch cable/winch failure.
- High cockpit noise during launch.
- Lack of control by the trainer.
- Excessive rotation rate and yaw cause stall on entry to full climb creating flick roll.
- Ineffective communication between student & trainer (including distractions, hearing difficulties or English as a second language).

TRAINING MATERIALS AND REFERENCES

- Aircraft placard for winch speeds
- GPC Pilot Guide Unit 13W
- Australian Gliding Knowledge (AGK) pages 100-103
- The Glider's Aircraft Flight Manual
- GFA Winch Launching Manual Ops 0007 Issue 3 Nov 2015

Gliding Australia Training Manual

Trainer Guide

Unit 14A

Takeoff (Aerotow)

Unit 14A – Takeoff (Aerotow)

AIM

The aim of this GPC Unit is to develop and demonstrate the skills and knowledge required to prepare and then safely fly an aerotow launch ground roll, separation, initial climb and then transition into the normal aerotow climb position.

PREREQUISITE UNITS

- GPC Unit 2 Ground Handling, Signals
- GPC Unit 7 Straight Flight, Various Speeds, Trim
- GPC Unit 8 Sustained turns all controls
- GPC Unit 9 Lookout Procedures
- GPC Unit 10 - Use of ancillary controls
- GPC Unit 13A – Aerotow Launch and release.

Note to Trainers: Correct control and operation of the aircraft is an essential pre-requisite.

COMPLEMENTARY UNITS

This unit can be read in conjunction with:

- Unit 19 Crosswind Takeoff and Landing
- Unit 20 Launch Emergencies

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Preparation for takeoff.	• **Describe:** ○ Threats associated with an aerotow launch through the separation and initial climb. • **Demonstrate:** ○ Pre Boarding and Pre Take off checks with options for launch emergencies identified (ABCD-CHAOTIC). ○ Connection of aerotow rope to aircraft. ○ Obtaining airspace clearance for launch confirmation from the ground crew. ○ Locate and identify yellow release handle and hand in close proximity to it. ○ "Ready for takeoff" signal to the wing runner.
2. Ground run and separation.	• **Demonstrate:** ○ Independent non coordinated control inputs whilst on the ground: ● Glider is kept straight behind the tug using rudder; ● Wings are kept level using aileron; ● Elevator is used to balance the glider on the mainwheel in the correct takeoff attitude. ○ Aircraft is allowed to separate from the ground, held in position no higher than the height of the tug's fin. ○ Use of coordinated control movements once off the ground. ○ Controlled transition to low tow when the tug is positively established in the climb at a safe height.
3. Initial climb.	• **Demonstrate:** ○ Position just below the slipstream of the tug. ○ Wings parallel to the tug wings. ○ Lookout for conflicting traffic. ○ Situational awareness. ○ Call out options for launch failure actions as each option becomes available (GPC Unit 20 refers).

KEY MESSAGES

- Plan ahead. Anticipate possible emergency options.
- The Pilot in Command is responsible for confirming “airspace clear for launch” and “pilot ready - launch approved”.
- Keep wings level with aileron, nose pointed at towplane with rudder, takeoff attitude set with elevator, independently, until the glider is airborne.
- The tow pilot has a release and WILL use it if an unsafe launch is evident, or the towplane runs out of elevator authority.

LESSON PLANNING AND CONDUCT

Classroom Briefing

Ground run and separation:

- Before takeoff on aerotow the trim should be set forward as required during the cockpit check. The controls used independently to get the glider into the wings level takeoff attitude, from which it will separate naturally when flying speed is attained. The glider should not be abruptly “rotated” in the nose-up sense at the separation stage.
- At this stage the wings are kept level (or banked slightly into any crosswind) with aileron, position behind the tug is maintained with rudder and takeoff attitude maintained with elevator. Coarse control movements will be required until the glider gains speed.

Initial climb:

- Whether intending to carry out an aerotow in the high or the low tow position, the separation and climb-away stages are identical. The glider will lift off before the tug and should be held at a height of two metres / six feet above the ground (about the height of the tug’s fin) until the tug also separates. In this situation the glider will be just above the tug’s slipstream.
- If intending to carry out a high tow, this position above the slipstream is maintained as the combination climbs away. Remember that high tow is, by definition, just above the slipstream, not above the tug. The slipstream is the primary reference, not one of the fixtures on the tug.
- If intending to carry out a low tow, maintain station above the slipstream as the tug leaves the ground. When the tug is positively established in a climb, move the glider gently but positively down through the turbulence behind the tug until once again in smooth air (typically 100-300 ft AGL). The glider is now in the low-tow position. Once again, the slipstream is the primary reference. Do not go too low in relation to the slipstream - it is not necessary.

Notes:

1. The glider going too low in the low-tow position results in the tug pilot needing more and more forward stick to compensate. Although this could get to the stage of running out of elevator power to keep the tug under control, it is rather unlikely to become this serious and in any case such a situation usually develops slowly enough for the tug pilot to release the glider before control is lost.
2. In contrast, **it is dangerous to go too high behind the tug in high tow**, because this situation can get out of control very quickly and the tug pilot may not have enough time to pull his release before a "tug upset" occurs. See GPC Unit 20 on "implications of glider going too high behind tug". If the glider goes so high that the pilot loses sight of the tug, the glider's release should be pulled WITHOUT DELAY.

PRE-FLIGHT BRIEFING

There are three parts to the briefing:

- **Glider and tug on ground**. Due to the slow acceleration of the tug/glider combination, the briefing should point out that the controls will be sluggish and unresponsive at the start of the launch and will become more responsive slowly. The glider should be placed in the flying attitude as soon as the controls are functioning and kept in this attitude until flying speed has been attained and the glider separates.
- **Glider airborne, tug still on ground**. When the glider lifts off, it will start to climb higher and higher as the airspeed continues to increase. This must be resisted by a progressive forward elevator pressure, holding the glider no higher than the towplane's tail fin. DO NOT LET THE STUDENT LET THE GLIDER GO HIGHER THAN THIS AS YOU PULL THE TUG'S TAIL UP ON ITS GROUND RUN.
- **Both glider and tug airborne**. When the tug lifts off, maintain the glider in a position above the slipstream until the tug is positively established in a climb. Then move gently but positively down through the turbulence of the slipstream until the glider is once again in smooth air.

FLIGHT EXERCISES

Ground run, separation, initial climb

- As a prolonged ground-run is normal with aerotowing, it may be expected that a student will initially have difficulty in keeping position behind the tug. However, they must be allowed to practice and make mistakes. It is unlikely that a clean separation will occur on the first attempt, but the trainer should not interfere unless absolutely necessary.
- When the tug separates, it is likely that the student will have difficulty in moving cleanly into the low-tow position. Once again, errors will have to be permitted, provided they are not gross enough to endanger the combination.

Trainer demonstrates:

- Trainer demonstrates and explains the process.
- Then invites the student to come on controls to feel the stick and rudder movements.

Student practices under supervision and guidance.

- Trainer intervention will likely be required in the first attempts.

- Take over and advise the student to leave their hands and feet on the controls.
- Hand back once stable.

COMMON PROBLEMS

Problem	Probable Causes
• Wings are not kept level.	Student may not identify that one wing is lower, they need to identify this through reference to the horizon ahead and through peripheral vision. Insufficient control movement at low speed, aileron and rudder. Student will need to intervene early and use rudder secondary effect as necessary at early stages of the launch.
• Very fast taxiing on ground run with unstable handling	The student has failed to adopt the takeoff attitude – advise to ease the stick back more to run the aircraft on the main wheel only.
• Glider continues to climb after separation	Student is not compensating for the increasing effectiveness of the elevator.

THREAT AND ERROR MANAGEMENT

- Loss of control on ground run. Timely guidance is required.
- Not separating from the ground.
- Ballooning after separation due to improved elevator effectiveness.
- Banking too close to the ground after takeoff, be defensive in posture to prevent wing strike.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 14A
- Australian Gliding Knowledge (AGK) pages 106-8, 111.
- Gliding Handbook: FAA 2013
- GFA MoSP 2 Operations
- BGA Instructors Manual 2017

Gliding Australia Training Manual

Trainer Guide

Unit 14S

Takeoff Self Launching

Unit 14S - Takeoff Self Launching

AIM

To develop and demonstrate the skills and knowledge required to prepare and then safely fly a self-launch ground roll, separation, initial climb and then transition into the normal climb.

PREREQUISITE UNITS

- GPC Unit 7 - Straight flight, various speeds, trim
- GPC Unit 8 - Sustained turns, all controls
- GPC Unit 10 - Use of ancillary controls

Note to Trainers: Correct control and operation of the aircraft are essential pre-requisite.

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 19 - Crosswind takeoff and landing
- GPC Unit 20 - Launch emergencies

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Preparation for takeoff.**	• **Describe:** ○ How to calculate the takeoff distance required for the aircraft. • **Demonstrate :** ○ Pre-Take Off checks with options for launch emergencies briefed in accordance with the Aircraft Flight Manual. ○ Nomination of an Abort point on the takeoff run in the event of expected performance not achieved. ○ Aircraft engine checks. ○ Transmission of appropriate radio calls. ○ Confirmation of airspace clearance for launch.
2. **Taxi to launch point.**	• **Describe:** ○ The use of the controls whilst taxiing the aircraft (and how these are affected by the surface wind). • **Demonstrate:** ○ Planning of taxi route allowing for wingtip clearance. ○ Manoeuvring aircraft safely to take off point using appropriate controls for conditions.
3. **Conduct ground run and Separation.**	• **Demonstrate:** ○ Application of independent non-coordinated control inputs. ○ Keeping the aircraft straight on the centre line. ○ Keeping the wings level using aileron. ○ Using elevator to balance the glider on the mainwheel(s) in the correct takeoff attitude. ○ Allowing the aircraft to separate from ground and held in ground effect until the Take Off Safety Speed (TOSS) is established. ○ Pitching the aircraft to the appropriate climb speed (V_X or V_Y).

KEY MESSAGES

- Care must be taken whilst taxiing for takeoff to allow for wind direction and wing tip clearances.
- There are additional recommended radio calls.
- Apply the throttle smoothly over a few seconds - don't slam it open.
- There are specific effects on takeoff and initial climb from the engine operating.
- An abort point must be preselected in the event of non-performance of the aircraft.
- Plan ahead. Anticipate possible emergency options. You have more control over the flight path than with other launch methods. Think about the safest track, turn heights and directions. Cross wind and local land features will need to be considered. There may be local procedures for flight paths that must be followed if safe to do so.
- Plan the takeoff roll distance for the surface you are on, the crosswind/headwind and the density height for the day (function of temperature, elevation, and humidity). Ensure you have adequate distance for clearance of obstacles as well as emergency plans at any phase of the launch.
- The Pilot in Command is responsible for confirming "airspace clear for launch" and "pilot ready - launch approved".
- Where there is no wing runner, it is necessary to operate like a powered aircraft and advise local traffic of your intentions as well as being aware of the intentions of the other traffic.
- Place the into-wind wing down in a crosswind to enable earliest pickup of the wing.
- Keep wings level with aileron, aircraft on centerline with rudder, takeoff attitude set with elevator, independently, until the glider is airborne.
- Ensure the glider does not climb out of ground effect until the safe climbing speed (Vy best rate of climb) is reached.

LESSON PLANNING AND CONDUCT

Briefing

Preflight Planning

- Weather. Can you even self launch today? Is it too hot? (hot, high and humid increase density height which negatively impact length of ground run). Is there too much cross wind for the available rudder control at low speed?
- Airfield – elevation affects density height and engine performance. If field elevation is high, is it long enough? What is the surface? Bitumen has the lowest drag on the wheel and therefore best acceleration. Dirt, gravel, short, long and wet grass will all increase takeoff run
- Consult your Flight Manual. Takeoff performance ground run and length to clear a 50' obstacle is usually specified for various temperatures.
- Fuel sufficient. Drain completed to ensure no water or foreign matter (dirt etc) in fuel. Microbes can grow in fuel/water interface and usually appear as brown, discoloured water

and be introduced with a batch of fuel. Fueling from partially full drums is a possible water source.

- Correct fuel. Most motorgliders prefer premium unleaded but can use AVGas. Consult your FM. Two stroke fuel may require mixing with specified oil.
- DI engine. Vibration of components (especially two stroke) means you should be extra vigilant. Common failures include belts, electrical wiring including to ignition module. If the engine has not run for a while and not properly preserved, carburettors could be gummed up with dried fuel/oil residue. Safe engine test running on ground is recommended.

Glider setup

- Glider setup. Correct (into wind) wing down for wing-drag takeoff or wing runner briefed. Note wing runner may have to wait for engine to warm and then have longer ground run dependent on performance.
- If you operate alone off a different runway to the active glider runway, think about where your car should be parked.
- Pre Take Off Safety Brief and Takeoff plan. Where will you go if the engine fails partially or completely
    - on the runway
    - just airborne
    - below turnback height
    - after turnback height

      (remember the increased sink rate and reduced glide performance with the engine extended)
    - What is the height and direction of your first turn to remain within reach of landable options?

Calculation of Takeoff Distance

- The Aircraft Flight Manual must be consulted to calculate the Takeoff Distance (TOD) required.
- Factors affecting TOD:
    - Headwind.
    - Outside air temperature.
    - Density altitude.
    - Runway surface and slope.
    - Obstructions.
    - Aircraft takeoff weight.

Additional Pre-Takeoff Checks

- Refer to GFA MOSP 2 and Aircraft Flight Manual.

Pre-Boarding and Take-off Checks - Powered Sailplane

From Outside Cockpit	A	**Airframe**: Walk around check for damage and/or defects. Maintenance release checked, including DI validity.
	B	**Ballast**: Powered Sailplane loading is within placard limitations and trim ballast, if required, secure.
	C	**Controls**: Check controls, including airbrakes and flaps appropriate to type, for correct sense and full deflections.
	D	**Dollies**: All dollies and ground handling equipment removed.
	E	**Engine**: Oil quantity checked sufficient for flight, oil cap/stick secure, cooling fluid level checked if required, Propeller checked for condition and serviceability. Run fuel boost pump with the fuel turned on & check for fuel leaks.
	F	**Fuel**: Dipped, quantity sufficient for flight, correct type and octane, oil mix correct if two-stroke, fuel caps on and tight.
From Inside Cockpit	C	**Control Access**: Seat adjustments secure and positioned to allow for comfortable access to all flight controls, panel switches/knobs and the tow release. Rudder pedals adjusted for reach if applicable.
	H	**Harness**: Tight and secure, lap belt low on hips, both pilots.
	A	**Airbrakes**: cycled and set for launch, closed and locked. Flaps: (if fitted) cycled, set as required for take-off.
	O	**Outside**: Airspace and take-off path clear. Wind velocity checked. Sufficient competent ground crew available. **Options**: Evaluate and brief emergency plan, identify aircraft critical speeds.
	T	**Trim**: Check for full movement and Set for launch. **Ballast**: Correct ballast confirmed.
	I	**Instruments**: Altimeter set to QNH, other instruments reading normally, no apparent damage. Radio on and set to correct frequency, other avionics on and set correctly.
	C	**Canopies**: Closed, locked and clean. Side vent adjusted. (under)**Carriage**: Check undercarriage down and locked. **Controls**: Full and free movement available.

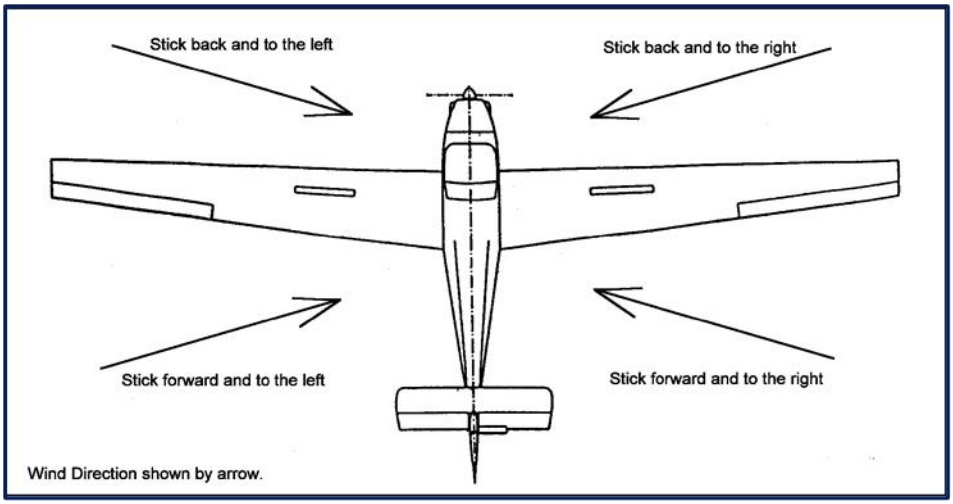
NOTE: The following additional checks should be used unless the Powered Sailplane Aircraft Flight Manual (AFM) specifies otherwise. Engine run up checks are to be completed in accordance with the AFM.

From Inside Cockpit	I	**Ignition**: Magneto check carried out, magneto or magnetos on both.
	F	**Fuel**: On and sufficient, most full tank selected if applicable.
	P	**Propeller**: Set for take-off/ fine position, plus checks required by Aircraft Flight Manual.
	C	**Choke/Carburettor Heat**: Off **Cowl Flaps**: Set if fitted.
	R	**Radio/Transponder**: correct frequency, volume set, call as required/Transponder 1200 Mode C.
	B	**Brakes**: Wheel brakes released, airbrakes locked.

Ground-handling and taxiing techniques

- Glider pilots are not used to taxiing and the exercise must be consciously learned. All pilots will be unaccustomed to the very long wings of powered sailplanes and they will have to think carefully about wing-tip clearances.
- Be aware of the turning radius and stopping distances required for the motor glider.

- In almost all cases, the steerable tailwheel has limited travel and the turning circle is large. Powered sailplanes and tight spots do not mix well. In winds over 10 knots, the control positions for taxiing should be in accordance with the following diagram.



- Arrows denote wind direction. Note that, whenever the stick is forward during taxiing, the wheelbrake(s) must be used with extreme caution. In winds of less than 10 knots, the stick is generally held back.

Additional Recommended Radio Calls to an unpowered sailplane

- Taxiing.
- Before entering a runway for back- tracking or takeoff.

The effect of the engine on directional control on takeoff

- Apply full power with gradual application of the throttle over a few seconds. “Slamming” the throttle open may strain some of the components over time. An immediate effect may cause the engine to “bog” and stutter due to incorrect fuel/air mixture in the carburettor. Smooth application of the throttle is required.
- Most people have heard that powered aircraft sometimes have a tendency to swing to one side on takeoff, powered sailplanes often swing quite badly on takeoff, even those with only 30 or 40 Kw under the cowling. It is often quite a shock to a glider pilot, who is unused to such behaviour.
- As power develops, periodically scan engine instruments to **ensure that expected values are being achieved and prepare to abort the launch if not.**

Propeller torque

- Although torque is a minor factor in forcing a powered sailplane off its takeoff line, it is by far the least important, as it acts in the rolling plane and only really asserts itself in very powerful aircraft, where the torque pushes one mainwheel into the ground and increases the drag on that side. As there are few powered sailplanes with Rolls-Royce Merlin or Wright Cyclone engines, torque effect can be discounted.

Slipstream effect

- The effect of the propeller wash, sometimes called "slipstream effect", is a bit more significant. The air forced back by the propeller has some spiral motion to it, the air striking one side of the rear fuselage and fin more than the other, thus pushing the tail of the aircraft to one side.
- Although noticeable, it is easily corrected by applying a small amount of rudder to compensate.

Asymmetric blade effect

- Another factor causing swing on takeoff is the so-called asymmetric blade effect, also known as propeller factor, or "P" factor. This comes into play if the aircraft is a taildragger, which means that the thrust line is not parallel to the relative airflow while the aircraft is on the ground.
- This causes the down going propeller blade to have a slightly higher angle of attack than the upgoing blade. This in turn displaces the thrust-line slightly to one side of the aircraft's centreline and produces a swing. Once the tail is raised on the takeoff run and the thrust-line is more closely aligned with the aircraft's takeoff path, the effect diminishes. Because nosewheel designs have their thrust-lines more closely aligned with the centreline during the takeoff run, they have little or no tendency to swing.
- Asymmetric blade effect is sufficiently marked in powered sailplanes that it can substantially reduce their takeoff limit in crosswinds, the limiting case being where the crosswind is coming from the direction in which the aircraft is already trying to swing.
- This accounts for why some powered sailplanes have very low crosswind limits in their flight manuals:
    - The Grob G109, for example, is only 11 knots and the RFSB Sperber is even lower at a mere 8 knots, beyond which the pilot runs out of rudder control if the crosswind is from the right.
    - The PIK20E (pop-up engine) is also only 11 knots.
- Even if there is no crosswind, pilots will notice that there is a need to hold on a noticeable amount of rudder during takeoff, just to keep the aircraft straight.
- This effect of the engine on directional control on takeoff is something new for glider pilots to learn, as is the effect on the aircraft's crosswind handling capability.
- Power pilots brought up on tricycle designs, please consider.

After Separation

- Maintain the aircraft in ground effect until it accelerates to the Takeoff Safety Speed (TOSS) then pitch the aircraft to either best angle of climb speed (Vx) or best rate of climb speed (Vy).

The effect of the engine in the initial climb

- Once established in the climb, “P” factor still makes its presence felt, aided and abetted by slipstream effect. The reason for this is that the powered sailplane is still being operated at an angle of attack higher than that for level flight. It must be, or it wouldn't climb. Thus there is still a requirement for the pilot to hold on a certain amount of rudder during the climb, otherwise the slip ball will show that the aircraft is not in balanced flight.

- Many powered sailplanes (e.g. the Stamo-engined Falkes) will be reluctant to climb if there is any slip or skid showing during this phase of the flight, as the drag produced by unbalanced flight is sufficient to largely negate the meagre amount of thrust available.
- Pilots converting to powered sailplanes must become very conscious of their rudder feet and need to get used to referring to the slip/skid ball at frequent intervals during the takeoff and climb, to ensure that the aircraft is in balanced flight and the drag is thus reduced to the minimum.
- While a nose mounted engine is operating any yaw string fitted will be useless, so the slip/skid ball will have to be used.
- Reminder: ball left needs left rudder, ball right needs right rudder, (stamp on the ball), use your feet!

FLIGHT EXERCISES

Specific demonstration and practice required:

- Trainer demonstrates takeoff with the student lightly on the controls.
- Student practise (under supervision).

THREAT AND ERROR MANAGEMENT

Advice to Trainer regarding their responsibility to maintain safe flight:

- Ensure that weight and balance limits are calculated and complied with.
- Ensure that the takeoff distance is calculated especially at a high-density altitude.
- Observe crosswind limitations.
- Be prepared to abort the takeoff if the student fails to compensate for the swing into any crosswind as once a swing is allowed to develop, the aircraft may have insufficient rudder authority to recover, e.g., a Super Ximango with left crosswind.

COMMON PROBLEMS

Problem	Probable Cause
• Wings not kept level.	The student may not have identified that one wing is lower, they need to identify this through reference to the horizon ahead and through peripheral vision.
• Insufficient control movement at low speed.	The student may be hesitant to use larger control inputs. Explain that at lower speeds the controls are not as effective and will need greater inputs.
• Failure to adopt the takeoff attitude.	The student cannot identify the correct takeoff attitude or is not judging the attitude of the aircraft correctly. Demonstrate the correct takeoff attitude to the student on the ground. During demonstration of takeoff, note the correct attitude to the student.

• Insufficient rudder to compensate for engine effects.	The student is not recognising the P effects or not applying correct countering control input.
• Failure to keep aircraft in ground effect until TOSS is reached.	The student is allowing the aircraft to rise at lower airspeed. Student needs to counter aircraft tendency to gain height by applying forward stick to keep the aircraft in ground effect until TOSS is reached.

THREAT AND ERROR MANAGEMENT

- Wings not kept level – students may not identify that one wing is lower, they need to identify this through reference to the horizon ahead and through peripheral vision.
- Insufficient control movement at low speed, aileron and rudder.
- Failure to adopt the takeoff attitude results in very fast taxiing with unstable handling.
- Trainer intervention will likely be required in the first attempts.
- Insufficient rudder to compensate for swing on takeoff and initial climb due to engine/propeller effects.
- Failure to keep the aircraft in ground effect until takeoff safety speed (TOSS) is reached.

TRAINING MATERIALS AND REFERENCES

- Powered Sailplane Manual: GFA Ops 0009
- GPC Pilot Guide Unit 14S

Gliding Australia Training Manual

Trainer Guide

Unit 14W

Takeoff (Winch)

Unit 14W - Takeoff (Winch)

AIM

To develop and demonstrate the skills and knowledge required to safely commence a winch launch, from the cable hook on through to initial climb.

Note that this aligns with the normal training sequence and risk profile for these units. Upper air aspects of launch are taught first, then initial and full climb, then crosswind conditions. Several launches may be required to demonstrate competence and underpinning knowledge.

PREREQUISITE UNITS

- GPC Unit 2 Ground Handling, Signals
- GPC Unit 5 Primary Effects of Controls
- GPC Unit 13W Launch and Release (Winch)

COMPLEMENTARY UNITS

Where crosswind is a factor in the launch, consider complementary training in GPC Unit 19.

If radio calls are to be introduced for launching, training in GPC Unit 21 may be performed.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Preparation for take-off.	• **Describe:** ○ The purpose of the weak link fitted to the winch cable. ○ Threats associated with a winch launch through the separation and initial climb. • **Demonstrate:** ○ Pre-take off checks with options for launch emergencies identified (ABCD-CHAOTIC). ○ Winch cable hook-on procedure. ○ Confirmation of correct weak link used.
2. **Ground run and separation.**	• **Describe:** ○ The stages of a winch launch up to the Initial Climb stage. ○ The airspeed limitations on the aircraft during the early stages of a winch launch. ○ The actions of the pilot in each stage of the launch. • **Demonstrate:** ○ Positive control of aircraft during ground run. ○ Holding the correct attitude for separation. ○ Ability to maintain wings-level in a variety of wind conditions. ○ Smooth transition to take-off attitude. ○ Separation and appropriate initial climb attitude. ○ Monitoring speed and direction and correcting accordingly.

KEY MESSAGES

- Winch launches progress quickly – pilot must plan ahead to remain ahead of the aircraft.
- The pilot must keep their hand on the release to ensure quick launch abort if required.
- On ground maintain positive control of aircraft in direction and keeping the wings level (or held into crosswind).
- Allow aircraft to take-off whilst running on the main wheel without using elevator.
- Always abort the launch if the speed is unsafe (fast or slow) or if a wing drops and hits the ground.

LESSON PLANNING AND CONDUCT

Notes:

1. Whilst the precursor for launch emergencies is discussed here (speed out of tolerance) the actual briefing and handling of the emergency is covered in GPC Unit 20.
2. Different winches use different types of launch cables such as single wire, multi-strand cable and Dyneema rope.
3. Trainers must ensure that they tailor the instruction in this unit to the cable type in use.

Briefing

General

- Describe winch launch stages.
- The structure of the trace, drogue, weak link and rings assembly.
- The purpose of weak links in the cable and how to identify them.
- How to determine the winch airspeed window and perform a launch failure briefing as part of the pre-take off check.
- Control actions performed during the winch launch stages.
- Pre-launch lookout is critical laterally to either side and up the launch path.
- Maintain positive control of the aircraft.
- Gentle manoeuvres close to the ground.
- Launch occurs quickly – issues need to be identified & resolved.
- Perform ground observation of launches from side to explain stages.
- Describe the effect of different cable release positions on fuselage and nose-heavy/tail-heavy aircraft on behaviour of aircraft in initial launch stages.
- Note the effect of fast (turbo) launches and need to ensure positive control of aircraft throughout.

Hook On

- Sterile environment – inside cockpit and with launch crew.
- Check the correct weak link used.
- Check cable is inserted & release closes smoothly.
- Check that airspace clear for launch is performed.
- Positive ready to launch signal from PIC.
- Monitor launch signals and cable tension.
- Locate & identify release handle. Keep hand close.
- Release immediately if an anomaly occurs.

Ground Run

- Control column starting position as required for aircraft.
- Control effectiveness & recovery of lowered wing at low airspeed. Release if it hits the ground.
- Use of aircraft controls on the ground to maintain wins-level (or appropriate for cross wind).
- Actions on cable overrun.
- Run the aircraft on the main wheel (take off attitude).

- Brief on problems that can occur at take-off (high speed launch, wing drop, loss of directional control).

Separation

- Aircraft flies when lift generated exceeds weight.
- Allow aircraft to separate.
- Why we do not assist take-off with elevator.
- Avoid large manoeuvres close to ground.
- Weathercock into crosswind.
- Use of flap as appropriate for aircraft.
- Climb not initiated in this stage.
- Transition to Initial Climb - allowing height & speed to build. Monitoring airspeed.

PRE-FLIGHT BRIEFING

- Be prepared for a launch failure on every flight.
- Any launch emergency will be handled by the trainer.
- Brief for maintaining view outside the cockpit. Cover instruments if this is a problem.
- If possible, position the student in the cockpit and elevate tail to demonstrate take-off attitude.

FLIGHT EXERCISES

Demonstration of Hook On

- Completion of GFA Pre-Flight checks. Trim forward in case of cable break.
- Ensure a sterile environment.
- Confirm correct weak link for aircraft in use.
- Identify and activate cable release as required by launch crew.
- Confirm that cable is inserted by ground crew pulling on cable.
- Maintain hand on release from this point in case of launch abort.
- Check airspace clear for launch.
- Ask for recheck if unsure or launch delay occurs.
- Perform radio launch broadcast if required.
- Monitor cable for commencement of ground run.

Ground Run

- Looking ahead, gauge wings level on horizon.
- Use rudders to maintain direction.

- Identify departure from wings-level. Use opposite rudder to pick up the lowered wing at low airspeed. Use aileron to keep wings level when airspeed allows.
- Use elevator smoothly and gradually to position the aircraft on main wheel only.
- Repeat launches as needed to acquire competency standard, particularly for control of aircraft on the ground.
- Where possible expose student to launches in varying wind conditions.

Separation and Transition to Initial Climb

- Identify increasing airspeed to generate sufficient lift.
- Identify aircraft separation from ground.
- Maintain take-off attitude.
- Confirm airspeed at or above $1.3V_S$ prior to continuing into Initial Climb.
- Once speed is positively increasing you can raise the nose to adopt the initial climb. Tell the student they must not pull back to a steep angle until they have enough height/speed to recover from a cable break.
- Progressively increase the climb angle monitoring acceleration and speed.
- Airspeed MAY exceed V_W (Max winch) at this point of the launch but not by more than 10%. Airspeed MUST be back within limits by the start of the full climb stage.

Student exercises

- Student practices launches from hook on of cable:
    - Trainer hands over to Student on the ground.
    - Student:
        - maintains positive directional control with wings level on ground run;
        - maintains take-off attitude until separation;
        - verbally identifies early stages of launch;
        - allows aircraft to lift-off and gain height in take-off attitude;
        - identifies criteria for commencement of initial climb.
- As skill is gained the student monitors launch airspeed and takes appropriate action. Student recognises:
    - loss of airspeed and reduces aircraft nose attitude;
    - increasing airspeed likely to exceed permitted upper limit (V_W) in Aircraft Flight Manual AFM (+10%) and provides effective signal.

Notes:

1. The student must have a relaxed grip on the control column and controls adjusted correctly for reach during flight. Ensure that the cable release is reachable, and student can operate it whilst on the ground.
2. Where radio calls are taught in parallel and the student has capacity to perform it, the pre-launch radio broadcast can be made.
3. Ensure lookout is maintained by all aircrew. Cover instruments (other than ASI) in the student's view if necessary, to discourage looking inside the cockpit.
4. Be careful with terminology and clarity of language. Make it clear when discussing control surfaces and control inputs (elevator, aileron, rudder), their effects in terms of motion (pitch, roll and yaw) and their effects in terms of attitude and flight path (attitude, bank angle, yaw angle or slip-skid angle).
5. Precision with terminology must be synchronised with demonstrations inflight. Patter must be concise and careful. Feedback from the student must be sought. “What did you see when…?”
6. Do not attempt to include all elements of this module in the first few launches. It is better to allow the student time for a good demonstration and opportunity for practice on a single learning outcome. Students are often overloaded when flying their first few winch launches.
7. Ensure that the student has been briefed on the correct hand-over/take-over procedure and their expected action and verbal response to each. There must be no confusion about terminology for transfer of control.
8. Remove all distractions from the exercise, for instance mute audio variometers.

COMMON PROBLEMS

PROBLEM	PROBABLE CAUSE
• Failure to transition aircraft to run on main wheel on the ground.	Not repositioning control column to neutral position as airspeed increases. Not exerting sufficient force on control column to overcome nose or tail mass. Ensure student briefed on need to reposition control column smoothly into take-off attitude position as airspeed builds.
• Inadequate or excessive pull up through initial climb.	Student fixation on cockpit instruments: Consider covering instruments in student’s view for the conduct of this unit. Encourage lookout to wingtips and over nose to assess wings level as part of launch work cycle.
• Coarse control of airspeed and climb angle.	Excessive force used on controls, explain correct grip on control column and ask student to hold column with just 2 or 3 fingers.

• Excessive drift port or starboard of runway.	Not keeping wings at appropriate angle to counter cross wind. Describe correct operation of rudder pedals during ground run.
• Aircraft separates at low speed and/or tail wheel/skid hits ground on rotation.	Student tries to pull aircraft off ground with elevator. Ensure enough time is allowed for sufficient airspeed to allow lift generation over aircraft weight. Explain potential for ballooning or stalling with consequence of uncontrolled roll.
• Student uses forward stick to hold aircraft on the ground after flying speed is attained.	Student may not recognise speed build up or hold aircraft in incorrect take off position. Demonstrate correct take-off position on ground and in flight to show how aircraft will lift off when speed is sufficient. Aircraft should not be held on ground with elevator.

Debrief

Review the student's ability with relation to their:

- Ability to ensure hook-on is effective.
- Control of aircraft on the ground.
- Ability to position aircraft running on the main wheel with directional control.
- Separation in correct take-off attitude.
- Effectiveness of speed-signals provided.

If student performance is affected by crosswind, consider concurrent instruction with GPC Unit 19.

THREAT AND ERROR MANAGEMENT

- Highly anxious "G" sensitive pilot.
- Moderate to high cross-wind or turbulence.
- Non-sterile launch environment.
- Poor winch cable or engine maintenance or operation leading to launch failures.
- Launch cable/winch failure or launch improper procedure by winch driver.
- Excessively slow or fast initial speeds from the winch at any launch stage.
- Other traffic entering the winch launch area.
- Collapsing seat back or soft cushions allow pilot to lose access to controls or release.
- Proximity of objects on ground near take-off path.
- Incorrect weak link used on the winch trace.

- Ineffective communication between student & trainer (including distractions, hearing difficulties or English as a second language).

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 14W
- Australian Gliding Knowledge (AGK) pages 19,65,88,89,99-103
- GFA Winch Manual (OPS 0007)
- The Aircraft Flight Manual

Gliding Australia Training Manual

Trainer Guide

Unit 15

Break Off & Circuit Planning

Unit 15 - Break Off & Circuit Planning

AIM

The aim of this GPC unit is to enable the student to:

- Decide when a flight is to be terminated - to transition from soaring pilot to landing pilot.
- Identify a circuit pattern appropriate to the airfield, weather, traffic and other factors.
- Determine location of the circuit joining area, based on the selected circuit pattern.
- Configure the aircraft for circuit and determine when to use the pre-landing check.
- Demonstrate good lookout and traffic separation in the terminal area.

PREREQUISITE UNITS

- GPC Unit 7 Straight Flight Various Speeds, Trim
- GPC Unit 9 Lookout Scan Procedures
- GPC Unit 10 Use of Ancillary Controls

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 16 Circuit Joining and Execution
- GPC Unit 19 Crosswind take-off and landing
- GPC Unit 20 Launch Emergencies
- GPC Unit 21 Radio Use and Endorsement

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Make the decision to land.	• **Describe:** ○ Factors appropriate to the break-off decision that enable arrival at circuit joining with enough height for normal circuit entry. ○ The factors to consider in the decision to commit to landing. ○ *NOTE: Full competence on this element may not be demonstrated till close to solo. Do not sign this off too early.*
2. Determine appropriate landing area, circuit pattern and associated circuit joining area.	• **Describe:** ○ Options of where to join the circuit. • **Demonstrate:** ○ Identification of a clear landing area on airfield or suitable alternate if insufficient height to reach the airfield. ○ When to return to the landing area with sufficient height to join circuit on arrival. ○ Appropriate circuit direction and circuit joining area in accordance with airfield procedures, weather conditions and aircraft performance.
3. Transit to Circuit Joining Area.	• **Demonstrate:** ○ Configuration of the aircraft for landing. ○ Positioning of the aircraft in circuit joining area at appropriate height. ○ Maintenance of situational awareness of traffic & environment. ○ Assessment of feasibility of original landing plan. ○ Safe speed below 1000ft AGL
4. Clearance and traffic separation during transit to circuit.	• **Demonstrate:** ○ Clearance of obstacles and restricted airspace. ○ Adjustment of flight path to maintain separation with other traffic. ○ Ability to communicate with other traffic as required.

KEY MESSAGES

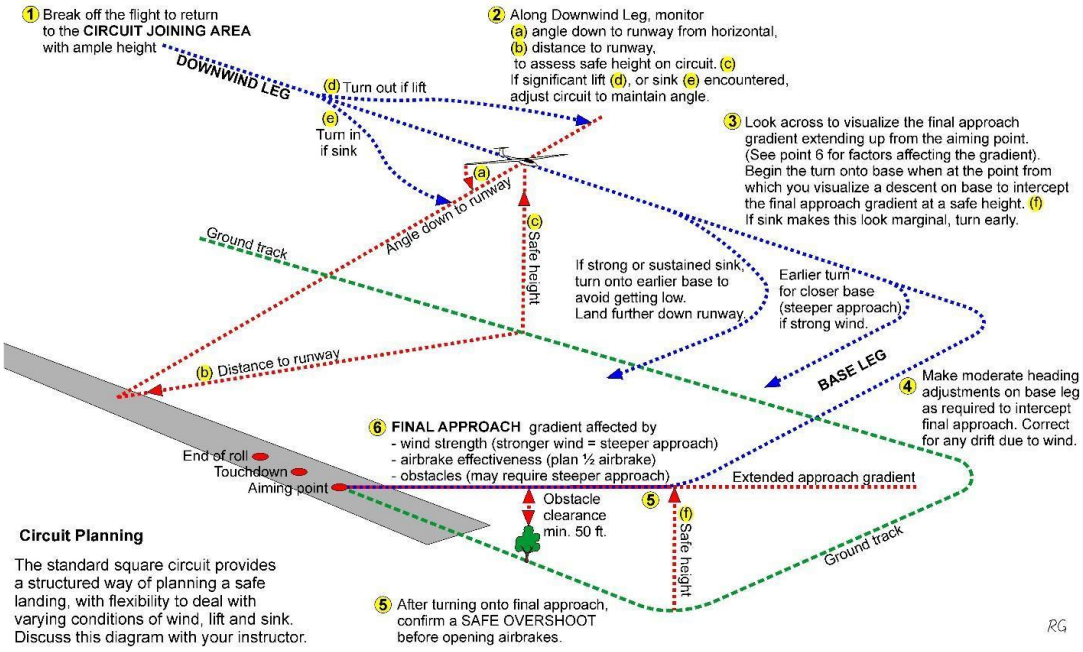
- Break off from soaring flight with enough height to return safely to the chosen landing area.
- The circuit is the flexible tool which helps make a good approach. The main benefit of flying a standard circuit is that it allows time for progress to be judged, alternatives considered, and the necessary action to set up a good approach and complete a safe landing; and the pilot maintains a good view of the airfield and landing area.
- Landing is a high-workload phase of flight – ensure distractions minimized and aircraft configured correctly at height.
- Identify options for joining a circuit with other traffic (refer CASA AC91-10 https://www.casa.gov.au/sites/default/files/2021-10/advisory-circular-91-10-operations-vicinity-noncontrolled-aerodromes.pdf).
- Landing areas are generally high traffic areas – Situational awareness of traffic is critical.
- Maintain separation from obstacles and restricted airspace.
- Be prepared to modify the circuit plan if circumstances – traffic, weather, etc. – require.
- Be prepared to land off-field within the selected circuit area if necessary because of meteorological reasons, runway blockage or pilot error of judgement.

LESSON PLANNING AND CONDUCT

Classroom Briefing

General

- In every flight the pilot will need to cease soaring flight and proceed to a selected landing area.
- Objective is to identify a suitable landing area, a circuit direction and final approach path that enables a safe circuit and landing with safe margin over obstacles.
- Use the diagram of the circuit to identify each leg, joining options and associated circuit joining areas.



- The landing area may be a runway on an airfield or a selected outlanding field/paddock.
- Ensure there is sufficient height to fly to the circuit area and then conduct a circuit & landing.
- The pilot must adopt the mental approach of a ‘landing pilot’ and configure and operate the glider accordingly.
- Good circuit planning and good flight management below 2000’ AGL makes a significant contribution to a good circuit and safe landing.
- Monitor any decline in personal performance levels that may impact decision making and flying performance, possibly due to the human factors of fatigue, stress or dehydration etc.
- Good planning and situational awareness assist in reducing stress on the pilot in the landing sequence.
- Situational awareness includes location, traffic, terrain and environment – in particular wind & areas of lift/sink.
- Lookout remains essential – the pilot is entering a potentially high traffic area.
- Break-off points and circuit joining areas are almost always different for each flight and not fixed locations over the ground.
- For various reasons the landing area used when returning to an airfield may be different to the take-off location.

Break Off

- We make a conscious decision to break-off the flight – changing from a ‘soaring pilot’ to the ‘landing pilot’ mindset.
- Criteria used for determining when to cease soaring flight and return to the circuit include:
    - Sufficient height to transit to the circuit.
    - Changing weather conditions.
    - Potential hazards such as sun glare.

  - Traffic density, pilot fatigue and hydration.
  - Time limits for flight.
  - The height required to return safely to the circuit area in current conditions.
- The pilot must make a number of important decisions:
  - Determine the wind strength and direction (check the windsock if at an airfield) and consider the likely effects of wind and gradient.
  - The circuit direction and the location for the circuit joining area — a stronger wind might need a circuit joining area further upwind.
  - Determine the effect of crosswinds on the circuit. A crosswind away from the airfield might mean a circuit joining area closer in and a shorter base leg, whereas a crosswind towards the field would suggest a circuit joining area further out and a longer base leg.
  - Assess the landing area. There is no point in starting a circuit to one that is unsuitable or blocked.
  - Determine an 'Approach Speed' for the conditions (1.5Vs plus ½ wind speed).
- Actions required to configure the glider in preparation for landing can be undertaken at height:
  - Straps are tight.
  - Water ballast dumped in gliders so equipped.
  - Engine configuration set.
  - Radio is on the correct frequency, that volume and squelch are correctly set, and that the microphone is positioned for best performance.
  - Flaps set.
  - Undercarriage lowered. Check lever against placard.
  - Speed required at circuit.
  - Trim to an appropriate speed for the downwind leg.
  - Adoption of safe speed attitude below 1000' AGL.
- Brief the threats posed by reverting to 'soaring pilot' mode after making the break-off decision.

Circuit Preparation

- List options for joining a circuit with other traffic (CASA C91-10) & Pilot Guide.
- Cover positioning to join on Base, Final, from a 45° angle onto Downwind and Crosswind.
- Need to maintain separation from traffic, other obstacles and remain outside restricted airspace.
- Continual evaluation of alternates – if other traffic appears, if wind changes, if lift/sink occurs etc.
- Discuss options for emergency off-field landings within the circuit area due to meteorological or human factor reasons taking into account:
  - Wind direction considerations.
  - Minimum field length requirement.
  - Ground looping rather than going through a fence.

PRE-FLIGHT BRIEFING

- Need to consider angles and altitudes – break-off points and joining areas are almost always different for each flight and not a fixed location over the ground.
- Student should be assessing the position of aircraft relative to selected landing area when below 2000’ AGL.
- Explain that the circuit is planned to land into wind in almost all circumstances

FLIGHT EXERCISES

Demonstration of Break-Off Point

- Lookout - FULL SCAN outside to maintain situational awareness.
- Consider angle back to the chosen landing area.
- Targeted scan for conflicting traffic.

Transit to Circuit Joining Area

- Locate a clear landing area and identify the best return path. Set direction and angle to the airfield.
- We need adequate height to return to the airfield in these conditions.
- Determine appropriate Circuit Joining Area and determine expected circuit direction to be used for selected landing area.
- Demonstrate break-off and circuit preparation from various points around the airfield. This should show different circuit joining options and demonstrate where to join the circuit as height varies.
- Transit must not conflict with circuit direction – avoid potential head-on situation.
- Assess original circuit plan during transit as to whether it requires amendment, replan as required.
- Consider tracks over the runway or on the dead side of the circuit if appropriate for site. Not with winch launching in progress.

Demonstration of Circuit Preparation

- Manoeuvre aircraft towards the circuit joining area.
- Do not return to soaring flight.
- Adoption of safe speed attitude below 1000’ AGL.
- Configure Aircraft for landing:
    - Straps are tight.
    - Water ballast dumped in gliders so equipped.
    - Engine configuration set.
    - Radio is on the correct frequency, that volume and squelch are correctly set, and that the microphone is positioned for best performance.
    - Flaps set.
    - Undercarriage lowered. Check the lever against placard for DOWN.
    - Set approach speed

    - Trim to required airspeed for the downwind leg.
- Reassess landing area feasibility and consider emergency options within the circuit area. Identify obstacles, restricted airspace, high traffic areas.
- Conduct TARGETED SCAN of circuit area and periodic FULL SCAN to maintain situational awareness.

Student exercises

- Student practices break-off judgement by:
    - Identifying environmental wind.
    - Choosing landing area.
    - Estimating angle to landing area and associated margin for return.
    - Predicting what height they will arrive at the circuit joining area.
- Student practices determination of circuit:
    - Selects landing runway.
    - Selects circuit direction.
    - Selects and can navigate to the circuit joining area.
- Student adopts safe speed 1.5Vs below 1000' AGL. Student determines the Approach Speed 1.5Vs + ½ Wind speed.[1]
- Student configures the aircraft for landing.
    - Straps are tight.
    - Water ballast dumped in gliders so equipped.
    - Engine configuration set.
    - Radio is on the correct frequency, volume and squelch are correctly set, and the microphone is positioned for best performance.
    - Flaps set.
    - Undercarriage lowered. Check the lever against placard for DOWN.
    - Speed required at circuit
    - Trim to an appropriate speed for the downwind leg.
- The Trainer may do the radio calls in the early training for circuit planning until the student becomes more proficient.
- As Student becomes more proficient, the trainer can ask:

[1] **Determine Approach speed** (1.5Vs + ½ wind speed) at the break-off point.

Set approach speed from the break-off point but at the latest, before the pre-landing checks, (which is early on the downwind leg).

Although some people argue that this may result in a high airspeed on downwind, this is a secondary consideration compared to ab-initio students' workload and the complexities of changing speed/attitude/re-trimming after the pre-landing checks.

- What would you change in the event of traffic or wind changes?
- What action would be taken if the chosen landing area is no longer reachable?

Debrief

- Students should always be made “self-critical” of their performance in circuit judgement.
- Ask the student to analyse how the circuit and landing went immediately following each flight, as often deterioration in performance can be identified early and remedial actions taken with relation to their:
  - Appropriate circuit pattern and joining area selection.
  - Amount of height available to transit to circuit joining area and complete proper circuit.
  - Usage of pre-landing check items as a checklist.
  - Ability to locate and coordinate separation with other traffic in the terminal area.
  - Ability to maintain situational awareness regarding traffic, landing area location, circuit joining area.

Notes:

1. Ensure lookout is maintained by all aircrew. Cover instruments in the student’s view if necessary, to discourage looking inside the cockpit.
2. Remove all distractions from the exercise, for instance mute audio variometer once transition to landing pilot mode has occurred.
3. Ensure the pre-landing check is called that - it is NOT a ‘FUST’ check.
4. Students may need to build skills in individual competency elements on separate flights.
5. Students must be competent at basic flying skills (coordinated turns, straight & level flight and use of trim) at this stage to avoid overloading the student.

COMMON PROBLEMS

Problem	Probable Cause
• Student transits through active circuit area, over runway (if winch club) or other inappropriate path to joining area.	Fixation on joining circuit may result in failure to maintain adequate situational awareness of where aircraft is in relation to airfield. Incorrect decision as to where to locate the circuit joining area – where possible it should be located such that flying over the strip is not required.
• Inadequate height for aircraft to return to chosen landing area	Student has not estimated angle back to chosen landing area correctly.
• Student selects same joining area regardless of height or location.	Student may be flying by rote – using the same pattern as done previously in the belief it will still work.
• Fixation on particular circuit direction or landing area.	Student may be failing to employ judgement and relying on geographical features (site bound) regardless of current circumstances, reinforce need for adapting circuit plan to fit with available height, wind, traffic etc
• Too slow to configure for landing resulting in late checks and rushed planning	Give the student time to plan the circuit; get them to rehearse the actions and checks when not training.

THREAT AND ERROR MANAGEMENT

- Pilot focus on instruments for speed and height. Cover instruments if required and brief for maintaining view outside the cockpit.
- Heavy sink and lift in the area requires appropriate and timely circuit adjustment.
- High traffic level (particularly in circuit areas): consider taking the radio operating and delegating flying to the student while directing them to separate with other traffic.
- Cockpit distractions – radios, varios, internal expectations – minimise as much as possible.
- Threat of distraction which can result in wheels up landing. Emphasise checking lever against placard.
- Proximity of geographic obstacles, mechanical turbulence and/or restricted airspace to/in circuit area.
- High student workload if asked to undertake multiple tasks – manage student workload by taking back tasks if overload is detected.
- Non-standard circuit procedures – insist on a high standard of procedures. Demonstrate first.

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 15
- GFA MoSP Part 2 Operations
- Australian Gliding Knowledge pages 116-120

- AC 91-10 v1.1 Operations in the vicinity of non-controlled aerodromes https://www.casa.gov.au/sites/default/files/2021-10/advisory-circular-91-10-operations-vicinity-noncontrolled-aerodromes.pdf

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.

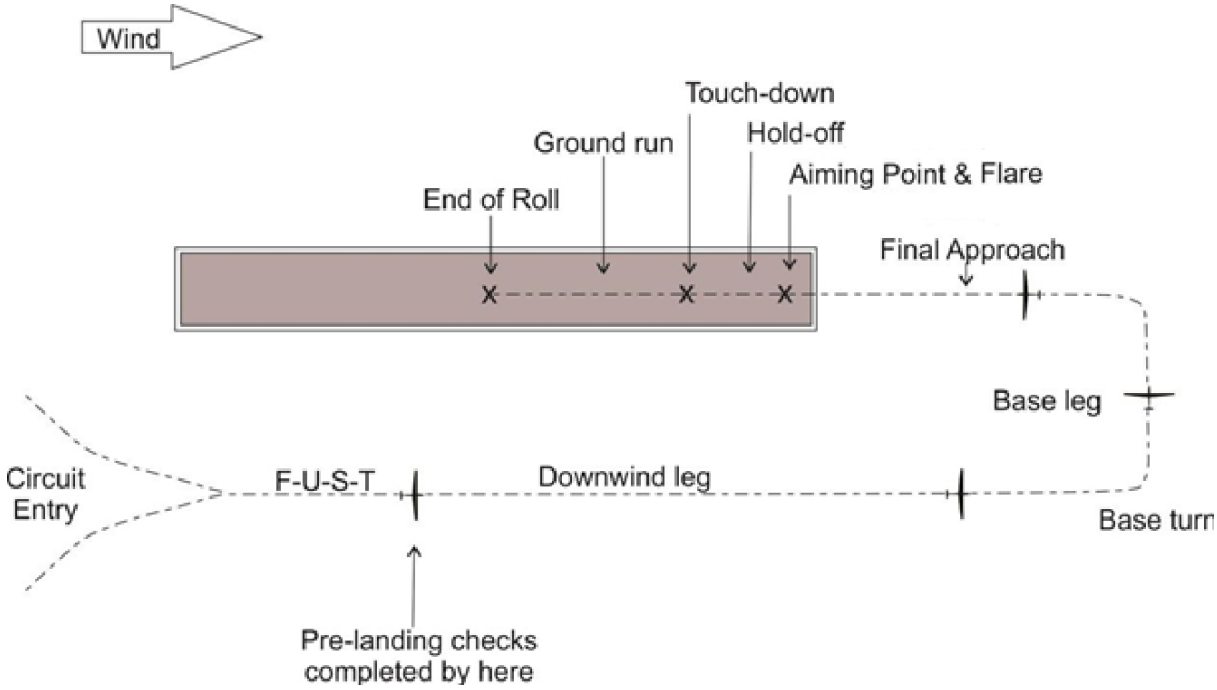
The Final Turn from Base to Approach

- 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

Gliding Australia Training Manual

Trainer Guide

Unit 17

Stabilised Approach and Landing

Unit 17 - Stabilised Approach and Landing

AIM

The aim of this unit is to train the student with the skills and knowledge required to perform a safe stabilised approach and landing, for a wide range of environmental conditions.

Note that this unit has serious safety consideration due to students taking control at low level. The Trainer must review the safety aspects detailed in Flight Exercises and Threat and Error Management to ensure training is completed safely and effectively.

PREREQUISITE UNITS

- GPC Unit 16 Circuit Joining & Execution

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- Unit 19 Crosswind Take-off and Landing
- Unit 21 Radio Use & Endorsement

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Plan for approach and landing.	• **Describe:** ○ Obstacle and runway clearance requirements. ○ Threats from wind and other environmental factors. ○ Threats due to turbulence and wind shear, and corrective actions.
2. Conduct approach.	• **Describe:** ○ Illusions present when landing upslope or downslope. • **Demonstrate:** ○ Rollout from final turn to line up with intended landing path. ○ Identification of the landing area and aiming point. ○ Identification of overshoot and undershoot situations. ○ Establishing overshoot on the glide path before extending airbrakes. ○ Stabilised approaches with half airbrake clearing all obstacles by at least 50 feet. ○ Maintains constant airspeed ○ Use of elevator to control attitude to achieve and maintain safe approach airspeed. ○ Use of airbrakes to correct for undershoot or overshoot. ○ Adjusting heading to account for drift during approach, to achieve a flight path aligned with intended landing track. ○ Monitoring and adjusting approach for wind shear.

3. Conduct flare, hold-off and landing.	• **Describe:**
	  ○ Recovery actions from incorrectly judged flares (late, bounce or balloon).
	  ○ Changes to flare technique when landing up slope, down slope and cross slope.
	• **Demonstrate:**
	  ○ Hold off height is sustained to a minimum energy touchdown at the correct landing attitude.
	  ○ Movement of gaze away from the aiming point towards the far end of the runway, to assist judgement of the correct flare attitude and height.
	  ○ Commencement of flare at a correct height to arrest the rate of descent and achieve the hold off height, using elevator as the primary flight control.
	  ○ Positive control of the aircraft during the ground roll.
	  ○ Using elevator, rudder and ailerons to keep aircraft moving in a straight line until stationary.
	  ○ Correct application of airbrake and wheel brakes as required to slow and stop the glider.
	  ○ Achievement of planned end of roll within 10 metres.

KEY MESSAGES

- Stabilised approach involves constant attitude/airspeed, descent rate and track.
- On approach, attitude/airspeed are controlled with elevator and rate of descent with airbrakes/spoilers.
- During flare and hold-off, the primary control is elevator, not airbrake. Speed will progressively reduce until the glider settles on the ground.
- If a landing is bounced or ballooned, reduce airbrakes, establish a safe approach attitude, then repeat flare for landing.
- Positive control must be maintained after touchdown.

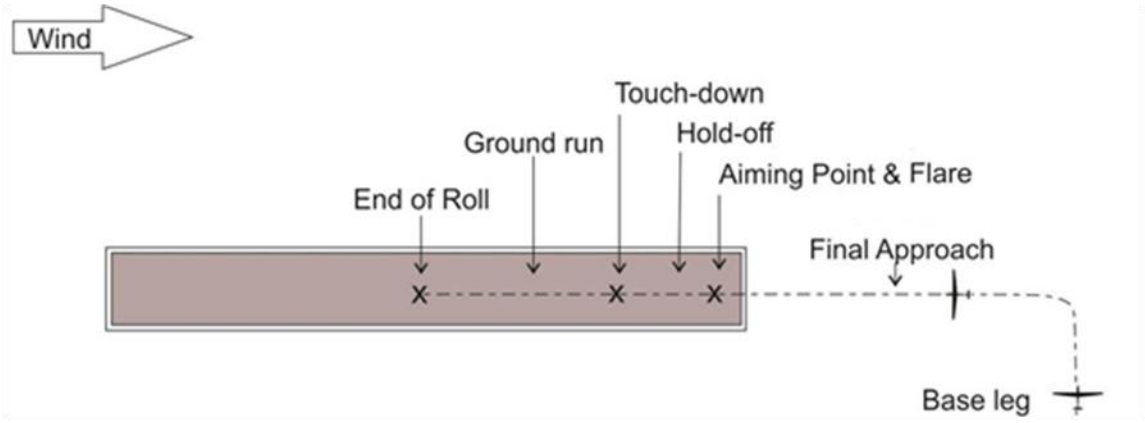
LESSON PLANNING AND CONDUCT

Classroom Briefing

Early in the Approach

- Once the turn from base-leg is completed and the glider is wings level on the approach path, check approach speed, flap setting and heading, and then maintain until the flare or round out.
- Start a work cycle that repeats through the approach – SPEED – DIRECTION – GLIDESLOPE.
- Identify the aiming point, locate and identify the airbrake handle (this should have been completed on the Base leg)

- Airbrakes should not be used until the pilot has assessed that the aircraft is beginning to unmistakeably overshoot the intended touchdown area and will clear all obstructions with a half airbrake approach.
- Once established, airbrakes/spoilers are then used as required to maintain the correct final stabilised approach path.
- Any tendency to undershoot or overshoot the aiming point should be corrected by appropriate fine adjustment of the airbrake/spoiler settings. Coarse movement is to be avoided at this stage of the flight.



Wind gradient

- The glider is now about to enter an air mass which is affected by ground friction, resulting in a phenomenon known as "wind gradient". This means that the wind speed decreases progressively closer to the ground. The effect this has on the glider is to cause a decrease in airspeed at a constant approach attitude.
- The reason it happens is related to the inertia of the glider and the fact that it cannot accelerate quickly enough to keep pace with the falling wind speed. This is the reason why the approach speed is set to 1.5Vs + ½ wind speed.
    - e.g. a glider with a safe speed near the ground of 50kts in nil wind, approaching into a 10 kt headwind, will set an Approach Speed of 55 kts in the pre-landing checks.

Use of Airbrakes

- Control the descent path with the airbrakes and the speed with the elevator. Be prepared to close the brakes and land long to clear obstructions. Emphasise to the student:
    - AIRBRAKES control rate of descent
    - ELEVATOR controls speed.
- Do not use large and unsafe elevator inputs, particularly close to the ground.
- Use of airbrakes must be introduced to the student at safe altitudes, long before any introduction to their use during approach and during flare and hold off. Emphasise smooth opening and “unlock then hold” until the effect is identified.
- The final glide path is based on a half to full airbrake setting; therefore, the airbrakes/spoilers will typically be used to a sufficient degree to maintain this glide path.

- Note that when increasing the airbrakes, the nose may need to be lowered slightly with gentle forward elevator pressure as the brakes come out further, in order to prevent the speed from decaying due to the increased drag.

Approach – Using the Aiming Point to maintain glide slope

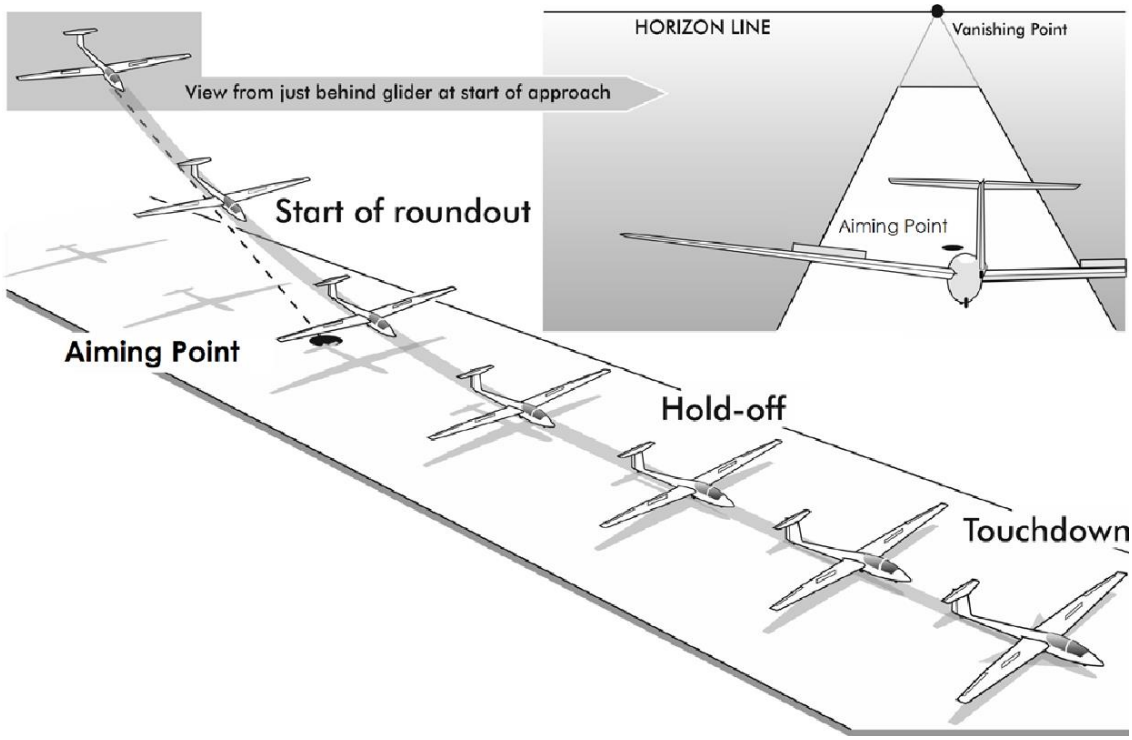
- The aiming point is an approach aid. It is a point (or to be more practical an area) on the ground which will appear stationary from the cockpit when the glider is stabilised on the selected final approach path.
- **OVERSHOOT**
    - When the glider is in an overshoot situation (i.e. it is above the final approach path), the aiming point moves downwards and tends to disappear out of view under the nose as the glider overshoots it. It becomes obvious that the glider will land well beyond the aiming point.
    - An **OVERSHOOT** requires further extension of the airbrakes to steepen the final approach path and restore the aiming point to a stationary position.
- **UNDERSHOOT**
    - If the glider is undershooting (i.e. it is below the final approach path), the aiming point moves upwards in the canopy towards the horizon. It becomes obvious that the glider will land before the aiming point is reached.
    - An **UNDERSHOOT** requires reducing the extension of airbrakes, in order to make the approach path less steep and once more restore the aiming point to a stationary position.
- Changes to the airbrake setting may result in changes to aircraft attitude and therefore light pressure on the elevator is required to return to the correct approach speed.

Lineup/Directional control

- There may be a need to adjust the lineup if the glider isn't lined up in the intended landing direction after turning finals too early or too late, not anticipating the rollout, not holding wings level on finals or cross-wind component. Small directional corrections are best made by "squeezing" small amounts of rudder to steer the nose in the intended direction. Trying to correct by turning the glider will be difficult for early students if they aren't perfectly coordinated (secondary effect of aileron will worsen the lineup problem) and difficulty in anticipating the desired aircraft heading.

Landing – Flare, Hold-Off and Ground Roll

- The landing phase covers the transition from the stabilised approach, through a flare and then a hold-off, then a ground roll, until stationary.



- The aim in landing is to fly the glider just above the ground so that it will touch down gently at the minimal possible speed, for a smooth and safe ground roll clear of obstacles.
- The Flare changes the glider from a descending attitude at constant speed to a horizontal attitude with decreasing speed.

- This is achieved by slowly moving the stick backwards until the 2-point landing attitude is achieved.
- If you move the stick back too early or too quickly then the glider will be too high when it stalls, and you get a heavy landing and damage.
- If you move the stick back too late or too slowly then the glider will strike the ground at too high a speed, and you get damage and a bounce.
- Judging when to flare is a key skill. A guide to the commencement of the flare is when the runway appears to the pilot to “zoom” in width or the ground appears to “rush” towards the pilot.
- Your gaze should be transferred towards the other end of the landing area, this will help you judging the landing.
- When you have the glider flying in the 2-point landing attitude, this “Hold-off” should be maintained with increasing back pressure on elevator (due to reduced airspeed) until the glider touches down at minimum energy.

Sloped Runways

- To simulate the visual illusions resulting from a sloping runway, hold your arm straight out from your shoulder, palm down with your hand flat. This is what a level runway looks like on a normal 3-5° approach.
- Now, tilt your hand up about 10°. This is the view you see when setting up for landing on an up-slope runway. The illusion tells you that you are too steep. The potential danger is that you will respond to the illusion and come in too shallow.
- Tilt your hand downwards to simulate the illusion of the down-slope runway. The illusion is that you are too shallow and, thus, the potential difficulties arise when you approach the runway too steep. Landing on a down-sloped runway is particularly difficult because, as you flare, the runway drops away and the glider will tend to “float” for a long distance.

PRE-FLIGHT BRIEFING

- A model aircraft is very useful to describe the approach and landing configuration and angles. The Theory lesson PowerPoint has diagrams and may be easier than the words in this guide.
- Emphasise the need for smooth control movements with both elevator and airbrakes.
- Monitor track down the landing path by looking well ahead to identify deviation.
- Explain the need to monitor airspeed (attitude), direction, glide-slope/rate of descent (with airbrakes).
- They must not make abrupt or large control movements as this can impact the safety of the flight.
- Trainer will demonstrate and student will be invited to follow through on the controls. When handing over to the student the trainer will be close to the controls and generally will explain what the student needs to do, but it is not unusual for the trainers to come back on the controls as there may be insufficient time to explain what to do next.

FLIGHT EXERCISES

WARNING: Advice to trainers regarding their responsibility to maintain safe flight.

- Adopt a defensive posture, with hands close to or limiting position of both elevator and airbrake, to guard against controls being operated to an irrecoverable situation.
- The student pushing the stick forward or pulling the airbrake out without warning may not be recoverable at low height.
- If in doubt, take over especially if you are low in instructional experience.
- Do not over-progress the student on coordinating use of airbrakes and elevator close to the ground.
- This must first be practiced at higher altitudes, above the circuit area.
- Before the first flight where the student will operate the airbrakes, spend time in the cockpit discussing and demonstrating the airbrake corrections. Point out that a reasonable correction to a typical overshoot or undershoot is only a cm or so of airbrake handle travel,
- Watch for students with limited landing experience that have had a long break since their last flight, skills or response to abnormal situations in the landing sequence may be considerably degraded.
- Ground proximity wind shear should be compensated for by reducing airbrakes as necessary, and if energy reduces, with appropriate forward elevator pressure and fully closing airbrakes.
- Flying for this unit ideally requires benign weather conditions with little turbulence and wind effects for initial student exercises, building up to more demanding conditions as their experience and competency develop.

Approach

- Key point is the work cycle of SPEED – DIRECTION – GLIDESLOPE.
- Maintain safe approach speed through use of elevator. Note that attitude may start to look different due to the large amount of ground visible at lower heights.
- Direct student to look into the distance to determine and correct track to the aiming point. Adjustments require early intervention with coordinated controls.
- Once overshoot is identified announce this and invite the student to use airbrakes accordingly.
- Avoid this happening close to the ground, probably by setting up a higher approach for the first few landings.
- Guard the stick (to stop rapid forward elevator) and airbrakes (to ensure the opening is controlled).
- Regularly remind the student to monitor the work cycle of SPEED – DIRECTION – GLIDESLOPE.
- Monitor descent to aiming point and identify any indicators of undershoot or overshoot. Correct with airbrakes.
- Encourage student to make early small corrections and then only add controls movements when necessary.
- Minor deviations can be ignored in the early stages of practicing the approach and landing. These will be corrected in later flights.

- Warn the student if you anticipate wind shear and either take over or direct them through the steps of easing the airbrakes and lowering the nose.

Flare and Hold-off

- State that we now need to ease the stick back to change the flight path to the landing attitude instead of the approach attitude. Your peripheral vision will identify when the glider is no longer descending and flying parallel to the ground.
- After the flare the glider is flown parallel to and just above the ground.
- This non-descending path of the glider after the flare is called the hold-off.
- Failure to hold-off will often result in either a heavy or ballooned landing.
- The hold-off phase should be sustained at a steady height just above the ground.
- As the speed decays the glider will inevitably sink and increasing elevator back pressure will be required to prevent this.
- Eventually the glider will ‘land itself’, settling onto the ground in the touchdown attitude at MINIMUM ENERGY with no tendency to bounce or resume flying.
- Maintain the landing attitude until the end of roll, not just touchdown.
- Failure to look far enough ahead during the final approach is the prime cause of early students being unable to judge the flare/round out.
- Incorrectly judged flares/round outs generally lead to ballooning in cases where up elevator is excessive, or to bounced landings where the flare/round out is left too late.
- The right way to fix any mishandled glider landing is by a combination of attitude and airbrake control.

Touch Down and Ground Roll

- Once the glider has touched down, direct the student to progressively open the airbrakes fully (watch out for any coupled wheel brake!) and bring the stick progressively back to the stop if it is not there already.
- Aircraft with wheel brakes at the end of airbrake adjust travel so that we do not deploy brakes too quickly and damage the aircraft nose.
- The pilot’s priorities are to keep the glider on the ground in the touch down attitude, wings level with aileron and travelling in a straight line using rudder until it rolls to a stop.
- As the speed decays, progressively larger control movements will be required to keep the wings level and/or steer the glider.
- Like the ground run on take-off, this is another occasion where independent use of the ailerons and rudder may be required.
- Wheel brake should be applied as necessary.

Notes:

- Develop safe landings first, then develop “spot” landings.
- It is very important that students are coached in the correct use of airbrakes at height prior to use on final.
- Do not accept consistently high, steep approaches during training, as this encourages “automatic” opening of the airbrakes/spoilers as soon as the final turn is completed.
- Trainees should be shown the undershoot situation and trained in the necessary techniques to correct it.
- Once a stabilised approach is established the airbrake setting should ideally remain unaltered until touchdown.
- A "long float" landing with a trainer is a useful training exercise.
- If the glider is rounded out too high with safe speed, a level attitude and moderate brake setting, then hold everything still and let the glider sink. Do not open the airbrakes further to reduce height.
- Cross wind landings are the subject of GPC Unit 19 Crosswind Take Off and Landing.
- It is a good idea to get the student to self-analyse how the circuit and landing went immediately following each flight at debriefing, as often deterioration in performance can be identified early and remedial actions taken.
- Stress to the student that a stabilised approach is a pre-requisite for a good landing. For the initial few circuit attempts, the trainer can set up a deliberately high/wide circuit which will give the student appreciably more time on finals to master a stabilised approach.

Training Notes and Lesson Planning for Powered Sailplane Pilots.

COMMON PROBLEMS

Problem	Probable Cause
• Turning final too close to the aiming point which requires immediate and excessive use of airbrake.	Circuit plan has been too conservative or poorly executed. Encourage the student to extend downwind more so that they have time on final to assess the situation before having to use airbrakes.
• Use of elevator to ‘point at the aiming point’ instead of using airbrake to control descent to the aiming point.	Student may be confusing the role of the controls. Emphasise the different role of the elevator and the airbrakes.
• Incorrect under/overshoot identification.	Student is not monitoring movement of aiming point on approach, or student has not identified fixed aiming point on runway. Coach UNDERSHOOT identified – less airbrake, OVERSHOOT identified - more airbrake. Emphasis work cycle including GLIDESLOPE.

• Failure to identify and correct for wind shear.	Student is not monitoring airspeed on approach. Reduce Airbrakes and ease stick forward if height permits. If unsure, take over, close airbrakes and land. Emphasise work cycle including AIRSPEED.
• Early or late flare.	Excessive or slow reaction to ground rush by student. Have hands in defensive posture adjacent to dive airbrakes and elevator control if student fails to correct and especially guard against student pushing stick forward, or excessive use of airbrake.
• difficulty maintaining directional control after landing	Typically due to overcontrolling with rudder. Tell them when to centralise the rudder or they will keep the rudder on too long and weave down the runway. When the student applies the rudder to straighten the glider, as soon as the nose starts to respond in the desired direction, centralise the rudder."

THREAT AND ERROR MANAGEMENT

- Ensure Handover-Takeover protocols are followed.
- Stay alert. Unprompted rapid control and airbrake movement can cause significant dangers when close to the ground. Always adopt a defensive posture, with hands close to or limiting position of both elevator (forward and backward movement) and airbrake.
- Lack of attention may result in undershoot problems. Trainer must ensure not to let this progress beyond their own abilities to correct.
- Heavy landing accidents, and accidents involving an apparent loss of control during final approach, have been too frequent since gliding began. Many of these involved two-seat aircraft on training flights involving students with a relatively low time and/or minimal launch experience being directed or monitored through the landing by a trainer.
- Many of these accidents involved an unexpected and inappropriate control input by the student, usually involving the elevator control, leading to either an abrupt nose down pitch and dive, or a nose up pitch and stall, from which the trainer was unable to recover sufficiently or not at all.
- Students must not be progressed through their training into being directed by the traier through the final approach and landing, until they have demonstrated a high level of control co-ordination during upper air work training sequences.
- Before being allowed onto the controls at low level (i.e. circuit height), the student will be benefitting from trainer demonstrations with the student following on the controls. Remember the demonstrate-direct-monitor training sequence and be clear where the student is on this sequence once landing training is to be introduced. Do not 'over progress' the student through this phase!
- Above circuit altitude the trainer must demonstrate the primary effect of elevator at lower airspeed to show stick movement, and also at approach speed so that the student appreciates the reduced stick movement and increased effectiveness of the elevator at these higher speeds.. It is important the student understands the range of stick movement at various speeds before handling the aircraft close to the ground (i.e. below the spin recovery height for the aircraft). This emphasises a need to ensure that the student has gained the fine motor skills to manipulate the

controls appropriately, particularly the elevator, and the student appreciates the relatively small elevator control inputs that are required at approach speeds.

- When conducting an actual approach, any tendency for the student to make frequent adjustments to the airbrake setting must be discouraged, especially if it is not possible to detect the effect of one change before the next one is made. Failure to maintain a near-constant setting may be due to lack of familiarity with the forces and changes involved.
- Caution: Even though the trainer may be guarding the stick, this will not prevent the stick moving in response to a student applied input. This is because the trainer's hand and arm will be relaxed. It takes about 1-2 seconds for the trainer to then react where discrimination and judgment are involved. Remember, 60 knots is 100 feet per second – so a trainer will have very little time to react to a steep push-over at heights below 200ft.

Threshold of Intervention and Defensive posture

- The trainer must be ready to take over during the approach and particularly close to the ground if the student becomes unresponsive to directions or responds inappropriately. The trainer should "guard" (i.e. lightly grasp) the stick against the student over-controlling the elevator in both directions. This requires maintaining a light hold on the stick and be aware that a "negative G" bunt manoeuvre might lift the trainer's hand off the control column!

- During the first few occasions when the student is being directed through the approach and landing sequence, allow the student to control the glider with the control column (with the trainer "guarding" the elevator with the right hand), while the trainer retains control of the airbrake. This allows the student to concentrate on maintaining direction and speed control while the trainer controls the aiming point.

- The trainer must monitor the student's workload on final approach. If the student stops responding to the trainer's directions, this is a sign that the student is becoming overloaded and the trainer must take over for safety and training benefit.

- In the event of a high ballooned landing or serious bounce, the trainer must respond immediately by taking over control, closing the airbrakes and stabilising the aircraft off the ground, before resuming the landing with an appropriate airbrake setting. At this stage, lower the nose if necessary to stabilise the aircraft, with care.

TRAINING MATERIALS AND REFERENCES

- Australian Gliding Knowledge (AGK) pages 114 - 140
- BGA Instructors Manual 2017
- GFA MoSP 2 Operations
- Theory Lessons

Gliding Australia Training Manual

Trainer Guide

Unit 18

Spin / Spiral Dive Avoidance and Recovery

Spin / Spiral Dive Avoidance and Recovery

AIM

The aim of this unit is for the student to:

- Explain the aerodynamics of the spin manoeuvre.
- State the common causes of unintended spins and the ways to avoid them,
- Be capable of recognizing the symptoms of a spin and spiral dive.
- Be capable of efficient recovery of the aircraft from all phases of a spin or spiral dive.
- Verify that a glider is rated for spins

PREREQUISITE UNITS

- GPC Unit 12 Slow Flight, Stalling

COMPLEMENTARY UNITS

This unit has no complementary GPC Units.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Knowledge of spins & spiral dives.	• **Describe:** ○ The actions that a pilot can take to prevent an accidental spin. ○ The phases of an aircraft spin noting the difference between the entry, incipient and fully developed phases. ○ The difference between a spin and a spiral dive. ○ The threats associated with: ● Spins and; ● Spiral dives. ○ The process of recovery (clearly identifying emergency actions without reference to checklists) from: ● The entry phase of a spin; ● The incipient and fully developed phases of a spin; and ● A spiral dive.
2. Ability to demonstrate recovery from spins & spiral dives.	• **Demonstrate:** ○ The use of internal and external references during recovery from spins and spiral dives. ○ The process of recovery (clearly identifying emergency actions) from: ● The entry phase of a spin; ● The incipient and fully developed phases of a spin; ○ Recovery from a spiral dive.

KEY MESSAGES

- Gliders spend a lot of their time at high angle-of-attack and therefore have a high potential for spin entry.
- Pilots must be trained to PREVENT spins, RECOGNISE when a spin is developing or occurring, and be able to RECOVER from any phase of a spin.
    - Pilots should first and foremost fly their aircraft in a manner that prevents spins. Maintain safe speed above ground when low, do not over rudder turns, do not thermal close to the ground.
    - Pilots need to recognize the precursors of a spin and take action to avoid progression into the spin by recovering early.
    - Every pilot needs to recognise & recover from spins & spiral dives.
- Whilst they may appear similar, Spins and Spiral Dives are different and have different recovery procedures. It is vital the pilot can recognise the difference and apply the appropriate recovery technique.
- Some aircraft may progress into a spiral dive from a developed spin.
- Recovery from spins is the same basic procedure (with some variations) for all aircraft but ALWAYS read the Aircraft Flight Manual (AFM) to ensure that the aircraft is rated for spinning and for any specific actions to use in the spin recovery.
- Spins & spiral dives consume considerable amounts of height and are dangerous below 1000' AGL.
- Spiral Dives can be dangerous at any height if the forces in the manoeuvre build up to a point where they exceed the aircraft's load limits.

LESSON PLANNING AND CONDUCT

Classroom Briefing

General

- While spin and spiral dive recovery are very important - because most spinning accidents occur too low for recovery, spin prevention is at least as important as recovery.
- Likely scenarios when spins might occur:
    - Mishandled (over-ruddered) turn
    - Attempt to stretch glide with low level turn
    - Attempt to turn a stalled glider (e.g., after winch cable break).
    - Not maintaining a safe speed above the ground when low
    - Thermaling too low.
- Describe pre-spin symptoms. In particular the loss of lateral damping leading to wing drop and how this can be overlooked by a pilot under stress or overloaded.
- Note that pre-stall buffet may not be felt due to turbulence missing the tail in the pre-spin period.

- Note that a key element that distinguishes a spin is the auto-rotation around the spin axis.
- Gliders certified to the EASA standard CS-22 must be able to be recovered from a spin in less than 1.5 additional turns regardless of configuration. If the aircraft is in a configuration approved for intentional spins, it must recover in one additional turn or less. Thus, all gliders designed to CS-22 must be recoverable.
- However, not all CS-22 aircraft are certified for deliberate spins and not all gliders are certificated to CS-22. Furthermore, some certified aircraft may not be approved for spinning in certain configurations. This means it is critical that the pilot understands the limitations (if any) put in place by the manufacturer regarding spinning the aircraft.
- Pilots must understand that the primary reference for spin approval to certified standards, or spin limitations, is the approved Aircraft Flight Manual or Pilot Operating Handbook (and applicable supplements).

Spin Phases

- A spin will not exist without both stall and yaw.
    - Note that the stall speed at any given moment varies with the load on the wing, which in turn depends on glider mass, angle of bank, use of airbrakes etc., therefore airspeed is only an indirect indication of an approaching stall.
    - If the aircraft is yawed, a roll will develop in the direction of yaw because the outer wing has increased airspeed, and therefore increased lift. The descending (inner) wing gains an increased angle of attack and if it is at or near the stall its lift will reduce. The effect of these differences in lift will be to produce an accelerating roll rate in the direction of the initial yaw.
    - The change in angles of attack will affect drag from each wing. The down-going wing with an increased angle of attack suffers increasing drag. The up-going wing gets a drag reduction. The difference causes even more yaw towards the down-going wing.
    - Explain how these forces create the rotation that the aircraft experiences as the spin develops.
- Note how yaw can be created in the aircraft:
    - Out of balance (uncoordinated flight) either unintentional or intentional (such as over-ruddering turns)
    - Wing drop at stall due to loss of lateral damping.
    - Application of aileron at the stall.
    - Gusts.
- Describe all four phases of a spin (entry, incipient, fully developed, recovery):
    - Spin entry characterised by departure from controlled flight at the stall and uncommanded wing drop. Recovery can be made by reducing the angle of attack and controlling yaw.
    - Incipient phase is the period of stalled flight between the commencement of rotation and the developed, stable or steady phase of autorotation. The aircraft's yaw is developing and accelerating and now requires full spin recovery control input.
    - Fully developed phase is where aerodynamic forces created by the aircraft are balanced by gyroscopic forces due to the distributed mass of the rotating aircraft, causing a steady autorotational state. By this time the corkscrew flight path is vertical and oscillations in pitch, roll and yaw steadily repeat with each turn.

    - Recovery phase is where the pilot has initiated the spin recovery actions and the aircraft is no longer in autorotation and the aircraft can be recovered from the ensuing dive.
- Note that spin characteristics will vary, the pitch angle may be steep or flat.
- Spin entry, in-spin characteristics and responsiveness to recovery conditions will depend on the aircraft C of G position for that flight.
- There is a tendency for some aircraft to transition from the spin into spiral dive during the incipient phase. This will also be influenced by location of the aircraft's CoG.

Spin Recovery

- Pilots need to develop an acute detection of spin events and the ability to initiate an automatic recovery response.
- The best time to recover from a spin is at the entry phase (stall and wing drop).
- Use external references (ground, horizon, air-noise) to confirm spin and identify direction.
- Describe recovery technique from spin:
    - At the entry phase using stick forward and rudder to counter any yaw; and
    - From incipient and fully developed phase using the full spin recovery technique.
    - If in doubt about whether a spin is commencing, move the stick forward.
- Note that spin recovery process is the same basic procedure (with minor variations) for all aircraft but ALWAYS consult the Aircraft Flight Manual (AFM) for any specific actions to use in spin recovery.
- Explain that during the recovery phase, the nose attitude may steepen and the rate of rotation may momentarily increase as well, giving the impression that the spin is actually getting worse.
- Spin recovery may not be instantaneous. It may take up to several turns for the anti-spin control inputs to take effect.

Spin Avoidance

- Explain that preventing a spin is better than having to recover from one, by:
    - Avoiding skidding (over-ruddered) turns.
    - Maintaining safe speed when close to the ground.
    - Ensuring that after a launch failure, no attempt is made to turn without regaining safe speed.
    - If the desired landing area is looking out of reach but another option is available closer, chose the safer closer option to maintain airspeed.
    - Have a disciplined approach to break-off height when thermalling - know when to transition to landing pilot.
    - Being aware of false horizons in hilly terrain that may distort the pilot's perception of the aircraft's pitch & roll.

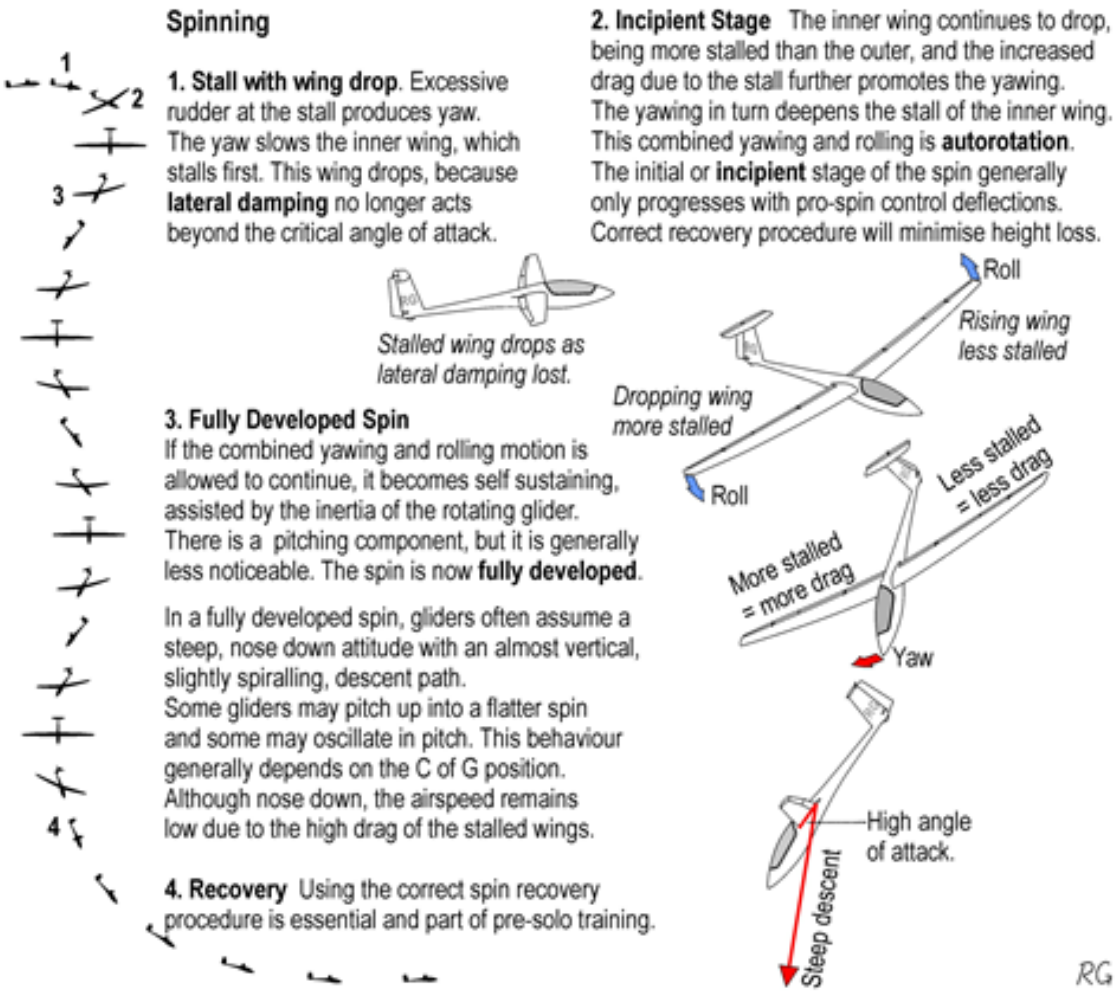
Spiral Dives

- Note that it is possible to confuse a spiral dive with a spin. Spiral Dives are steep, descending turns that become progressively tighter over time. They occur at lower angles of attack (the wing is not stalled) and display the same over-banking tendency common to all steep turns.

- Describe the events that could lead to a spiral dive.
- Describe symptoms of a spiral dive.
- Explain the different aerodynamics of the spin & spiral dive.
    - Spins result from a stall and yaw with auto-rotation about the lower wing.
    - Spiral dives are controlled flight in a descending spiral.

Spiral Dive Recovery

- Describe recovery from spiral dive.
- Explain why the airbrake should not be used.
- Discuss threats imposed by spins and spiral dives, particularly the potential for aircraft overstress.



Aids to Developed Spin/Spiral Dive Identification

Attribute	***In Developed Spin***	***In Spiral Dive***
Aircraft stalled	YES	NO
G Loading	Normal	Increasing
Load on controls	Light (unresponsive)	Effective and increasing control loads
Yaw string	Large deflection, pointing towards rudder for recovery	Generally normal flight position
ASI	Low or unreliable	Steady and increasing
Air sounds	Stable (but may vary on rotation)	Increasing

Recovery Techniques

This table is a guide only – the Aircraft Flight manual must be consulted for specific actions for any given airframe.

From Spin (Entry Phase)	***From Spin (Incipient & Fully Developed Phase)***	***From Spiral Dive***
Stick forward.	Full opposite rudder to spin rotation.	UNLOAD wings, move control column forward.
Rudder to correct yaw.	Aileron neutral.	ROLL wings level gently using aileron & rudder.
	Ease control column forward until rotation ceases.	Ease out of dive with elevator.
	Rudders neutral and ease out of dive with elevator.	
Adopt gliding position, re-orientate yourself, regain situational awareness with FULL SCAN.		

Human Factors

- Explain how a pilot may become progressively disorientated as the spin or spiral progresses.
- Explain how a pilot will be affected as the spin or spiral ceases.
- Explain the human aspects of startle and surprise and how pilots can build a defence against these responses.

PRE-FLIGHT BRIEFING

- Ensure pre-aerobatic check is completed.
- Note that motor-gliders have particular prohibitions regarding spins and the AFM/POH must be consulted.
- Explain how we use internal and external references (ASI, yaw string, ground rotation, compass movement).
- How spin entry phase and simple (push forward + rudder) recovery will be demonstrated.
- How the incipient and fully developed spin symptoms and full recovery sequence will be demonstrated.
- Emphasis on spin recovery using the forward movement of control column until aircraft returns to unstalled flight (entry phase) and rotation stops (incipient and fully developed spin phase).
- Describe the things the pilot should look for during spins and spiral dives that allow the pilot to discriminate between them (airspeed, g-force, rate of rotation).
- Emphasis on spiral dive recovery by unloading the wings by easing elevator forward (RELEASE) first, then rolling wings level (ROLL), prior to easing back on control column (PULL) to reduce airspeed.

- Describe the impact on spin entry & recovery of having flaps and airbrake deployed for the particular aircraft being used.
- Some use of rudder to create yaw may be required at the entry phase to assist a wing to drop and initiate the spin.

FLIGHT EXERCISES

Demonstrate spin entry at altitude from the four spin scenarios described earlier (mis-ruddered turn, extended glide, turn whilst stalled and low thermaling).

Entry Phase Spin Symptoms & Recovery

- Demonstrate entry phase spin symptoms and recovery.
- Explain recovery actions, stick, rudder, return to level flight.
- Note amount of control input and responsiveness of aircraft.

Incipient & Fully Developed Spin Symptoms & Recovery

- Demonstrate incipient & fully developed phase spin symptoms and recovery off simulated base turn (over-ruddered turn, nose slightly higher than normal).
- Point out ASI and yaw string indications.
- Refer to internal and external references to determine the direction of rotation.
- Note the aircraft is stable in the full spin phase, it generally will not recover by itself.
- Emphasise use of full rudder whilst moving stick forward to restore the aircraft to flying condition.
- Note: larger amount of control input and longer response from aircraft.

Spiral Dive Symptoms & Recovery

- Point out indicators of spiral dive and recovery technique. The earliest and most obvious symptom is the rate of rotation.
- Point out ASI and yaw string indications.
- Point out increasing G force – either through instrument or pilot sensation.
- Refer to internal and external references to determine the direction of rotation.
- Describe actions to recover to normal flight attitude:
    - RELEASE G force on wing by easing forward on stick
    - ROLL wings level
    - PULL back to recover from dive. Emphasise the need to keep within G limits.
- Where the aircraft has a tendency to migrate from a spin to a spiral dive ensure the student identifies the transition and applies the correct recovery technique as required.
- Repeat demonstration as many times as needed for the student to recognize the symptoms and undertake the effective recovery of spins/spiral drives. Repeat using different duration of spin.
- Ensure entry is demonstrated from straight and level and various angles of bank.

Student practice (under supervision)

- Student to practice recovery of entry, incipient phase and fully developed spins that have been initiated by the trainer.

- Recovery from fully developed spins may take longer to recover in some aircraft and the student should understand patience may be required for the recovery to take effect.
- Student to demonstrate spin entry, incipient phase first then the fully developed phase followed by recovery. Ensure exercise is commenced straight and level and various angles of bank.

Notes:

- Trainers must confirm that spin training is permitted in their aircraft. Refer to the AFM/POH.
- Ensure that specific procedures in the AFM/POH are followed for the recovery of the aircraft from a spin or spiral dive.
- Ensure that realistic nose attitudes are used on spin entry – i.e., do not allow the pilot to conclude that spins will only occur with high nose attitude.
- Ensure an adequate pre-aerobatic check is performed by the student prior to all flight exercises.
- Utilise the altimeter pre- and post- spin/dive exercise to illustrate how much height was lost and what this could mean if the upset occurred in the circuit.

COMMON PROBLEMS

Problem	Probable Cause
• Failure to conduct adequate pre-aerobatic check.	Student may forget or misremember checklist. Emphasise that spins are an aerobatic manoeuvre and require the pre-aerobatic check to be completed.
• Failure to identify the spin entry.	Student is not sensing the stall/yaw/nose drop symptoms. Utilise simulators if available to demonstrate the entry, spin and recovery sequence so that the student is aware of the visible attributes of the spin prior to flight exercises.
• Failure to identify the direction of rotation.	Student is not considering internal or external references. Utilise simulators if available to demonstrate the direction indicators of the spin.
• Failure to maintain forward stick until rotation stops.	Student is trying to recover too soon or may be pulling back as an instinctive reaction to the nose down attitude. Reinforce full recovery sequence, demonstrate in a variety of spins to allow student to gain familiarity with the spin sensations.
• Failure to use adequate (i.e., full) rudder during recovery from fully developed spin.	Student may find partial application of rudder does recover some aircraft types. Reinforce need to use full application of rudder as that may be needed in some circumstances.
• Inability to differentiate between spin and spiral dive	Student is misdiagnosing the spin/spiral symptoms. Re-brief the spin/spiral identification table.

Problem	Probable Cause
• Excessive use of controls during recovery	Student may have tight grip on control column or may be nervous about spin manoeuvres. Advise correct control column grip and expose student to spins gradually to encourage familiarity with the control inputs required.
• Student continues to hold rudder in after cessation of rotation or fails to centre ailerons	Student may not recognise cessation of rotation. Demonstrate recovery sequence with clear description of actions at each point.

THREAT AND ERROR MANAGEMENT

- Ensure a pre-aerobatic check is completed before spinning exercise.
- Low trainer currency in spinning in the aircraft type is a threat.
- Avoid confusion about what is happening, differentiate between symptoms of a spin/spiral dive – ASI, yaw string, noise.
- Recognise the direction of rotation.
- Poor height judgement can result in aircraft going below 1000’ AGL during manoeuvre (or 2000’ AGL near a registered airfield).
- A highly anxious pilot that has not experienced a spin manoeuvre previously can be a threat – use a simulator, video presentation or model to explain the manoeuvre 2or consider not flying the student.
- Poor aircraft handling can result in failure to recover from the spin or to recommence the spin in the opposite direction.
- Student confusion and disorientation. Student may be anxious about the spin sequence and sensitive to pitch and attitude changes during the manoeuvre.
- Aircraft that may require significant rearward C of G to spin easily but are normally operated in forward C of G position.

TRAINING MATERIALS AND REFERENCES

- GPC Unit 18 Pilot Guide
- Australian Gliding Knowledge pages 67-70
- CASA AC61-16 V1.0
- GPC Theory Lesson 6.

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Unit 19

Crosswind Take-off and Landing

AIM

The aim of this Unit is to enable the student to assess cross wind conditions and describe their effects on take-off and landing operations with regard to different gliders. The student will describe and demonstrate the safe actions to take in the event of cross-winds on aerotow take-offs and landings.

PREREQUISITE UNITS

- GPC Unit 13 Launch and release
- GPC Unit 14 Take-off
- GPC Unit 15 Break-off and circuit planning
- GPC Unit 16 Circuit Joining and execution
- GPC Unit 17 Stabilised Approach and landing

This unit is a prerequisite for solo crosswind operations but can be subsequent to a first solo in suitable into-wind operations.

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- Unit 14 Takeoff
- Unit 17 Stabilised Approach and landing

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Assess Cross wind conditions and glider limitations.	• **Describe:** ○ The crosswind limitations for gliders flown, referencing the Aircraft Flight Manual (AFM). ○ Any crosswind limitations defined in the Club's Operations Manual (if any). • **Demonstrate:** ○ Assessment of the crosswind component for a particular runway direction using: ● Weather forecasted winds. ● Wind socks. ● The GFA cross-wind chart.
2. Crosswind Take-offs.	• **Describe:** ○ The possible impacts of the crosswind on take-off and mitigators. ○ The actions to take to abort a crosswind take-off. • **Demonstrate:** ○ Safe conduct of a crosswind take-off unaided at least three times.
3. Crosswind Landings.	• **Describe:** ○ The possible impacts of the crosswind on landing and mitigators. ○ The difference between a crabbing and wing-down approach. • **Demonstrate:** ○ Selection of safe approach speeds countering turbulence and/or wind shear. ○ Safe conduct of a crosswind landing unaided at least three times using a crabbing approach.

KEY MESSAGES

- Cross-wind conditions can adversely affect glider operations and pilots need to know when this could occur with reference to:
  - The Aircraft Flight Manual limitations.
  - Personal minima and experience.
  - Club Operations Manual limitations.
- Pilots must be able to assess the cross-wind component for a nominated runway.
- Pilots need to know how to use the aircraft's controls to counter drift in cross-wind conditions on take-off and landing.
- There are two methods for flying a cross-wind approach (crabbing and wing-down) – crabbing approach is taught as the primary method, but either can be used.
- Describe actions to abort a cross-wind take-off safely.

LESSON PLANNING AND CONDUCT

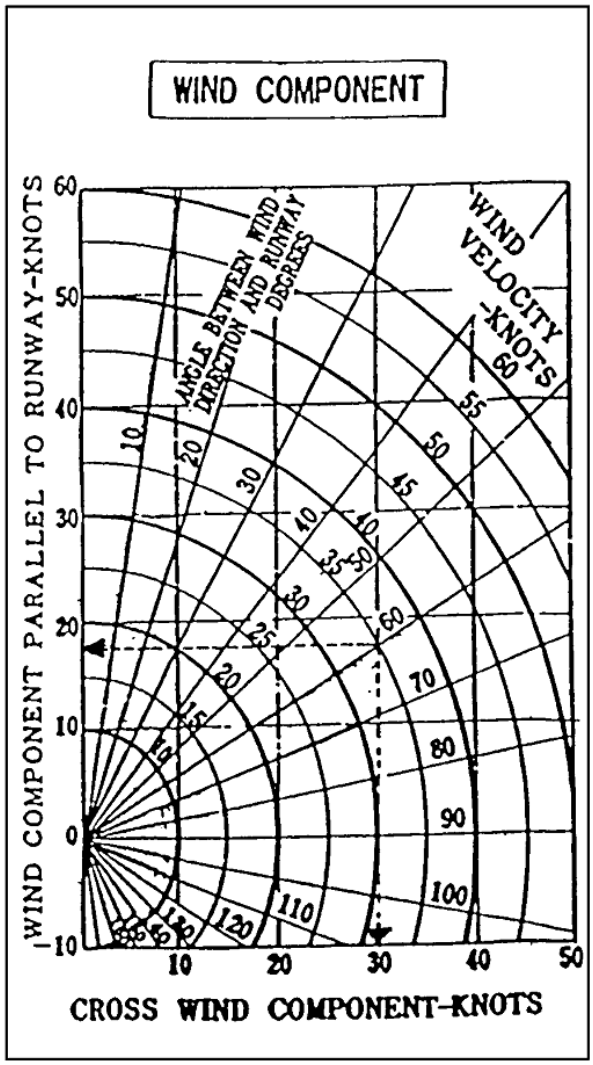
Classroom Briefing

Required Equipment

Whiteboard, model aircraft, PC with Internet access, PowerPoint presentation, GFA Cross-wind Chart, handouts, Videos, AGK, Simulator (if available).

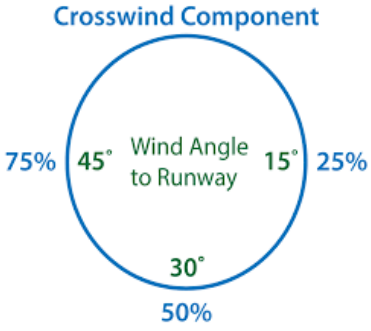
Briefing Points

- Assess the cross-wind component for a particular runway direction using weather forecasted winds by reference to one or more of the following:
  - NAIPS
  - GFA MET
  - Willy Weather
  - Wind socks
  - The GFA cross-wind chart
  - Clock face cross-wind rule of thumb
- List the cross-wind limitations for any given glider using the Aircraft Flight Manual
- List any cross-wind limitations defined in the Club's Operations Manual (if any).
- Use the chart to show how a 30 knot wind at 30 degrees to the runway direction equates to approximately 15 knots crosswind and 26 knots headwind component.



GFA Crosswind Chart

- A simple rule of thumb to estimate the cross-wind using a clock face. If the angle of the wind from the nose is:
- 15º (quarter past the hour), crosswind component is ¼ (25%),
- 30º (half past the hour), crosswind component is ½ (50%),
- 45º (three-quarters past the hour), crosswind component is ¾ (75%).
- 60º (on the hour) or more, use 100% crosswind.



- List the causes and effects of orographic turbulence on cross-wind take off and landings:
    - Trees.
    - Buildings.
- Describe the effect of windshear from such turbulence and how to select a suitable approach speed.

Take-off Techniques

- Wing runner should be holding the into-wind wing.
- Maintain directional control on ground roll with rudder.
- Keep into-wind wing low to counter drift (but not so low as to touch the wingtip).
- Delay lifting the aircraft into the air.
- On take-off on aerotow either:
    - Keep into wind wing low to counter drift or;
    - With level wings, yaw nose into wind sufficiently to keep rope parallel to runway heading behind tug and help tug stay straight on runway heading.
- As soon as the tug is airborne, ease off into-wind adjustments to adopt normal line astern tow position.
- On take-off on winch:
    - The pilot will need to apply some rudder against weathercocking in the early part of the ground run.
    - The pilot must ensure that the cross wind during the early part of the launch does not force the downwind wing onto the ground - if this happens the pilot must immediately release.
    - Once airborne, keep into-wind wing down to counter drift during full climb.
    - The student should be briefed on the operational limitations of the gliding site using winch launching. This may include whether launching in some cross winds is not permitted due to the potential for the winch wire to drift onto power lines, roads or public areas, or the potential for the winch driver to terminate the launch if adequate drift correction is not performed.
- If at any time on the ground roll direction control is lost – release immediately and land on the runway, diagonally across it if needs be.

Landing Techniques

- Crabbing approach:
    - Maintain track line by adjusting heading sufficiently into wind to adjust for drift.
    - During flare and hold off, rudder the aircraft straight on to the landing track line and maintain parallel heading with rudder.
    - If drift is encountered, lower into-wind wing sufficiently to stop drift.
- Wing-down approach:
    - Maintain track by turning the aircraft directly into line with the landing track.

    - Correct lateral drift by applying bank (into wind) and opposite rudder (to remain on approach path) so that the path in line with the landing track is made good.
    - The angle of bank is reduced as the aircraft approaches the ground to avoid any risk of touching the wing tip on the ground.
- Ground roll should be made as short as possible with full airbrake and wheel braking, maintaining directional control with rudder and finishing with into-wind wing touching down at just before the glider stops.
- Note: Approach maybe a combination initially a crab approach and then convert to a wing-down flare and hold off for landing. Ensure touchdown occurs with the aircraft nose pointing in the direction of travel to avoid damage to the undercarriage.
- If the crosswind is extreme, ground roll may be permitted to finish into wind (runway width permitting) to enable safer and easier cockpit exit.
- Be careful with canopy security when exiting the glider.

PRE-FLIGHT BRIEFING

- Compare forecast crosswind with actual crosswind using windsock(s).
- Assess whether the operation is within the cross-wind limitations for the given glider laid down in the Aircraft Flight Manual or the Club's Operations Manual (if any).
- Review the crosswind take-off technique appropriate to launching method.
- Discuss the effect that orographic turbulence and wind shear has on the approach and how to select a suitable approach speed.
- Review the crosswind approach and landing technique to be practiced (crab or wing-down).

FLIGHT EXERCISES

Specific demonstration and practice required:

- Flying for this unit requires at least a five to eight knot crosswind component on the duty runway.
- Trainer demonstrates:
    - Crosswind take-offs.
    - Landings using:
        - Crabbing approach.
        - Wing-down approach.
- Student practice (under supervision):
    - Crosswind take-offs.
    - Landings using:
        - Crabbing approach.
        - Wing-down approach (where opportunity permits)

Notes:

1. Skilled demonstrations by the trainer are essential.
2. Don't let the student be too enthusiastic with keeping the into-wind wing down on take-off and landing thereby touching the wingtip and causing a ground loop.
3. Watch for the tendency to be too early or too late in aligning the aircraft with the landing track when using the crabbing approach.
4. Be vigilant, ready to take over on first signs of mishandling in the student's first attempts.

Advice to trainers regarding their responsibility to maintain safe flight.

- Ensure that the glider does not prematurely lift off on take-off resulting in loss of drift control.
- Ensure that the glider does not drift downwind of the tug on the take-off roll or early airborne phase before the tug is airborne as this will compound the cross-wind effect on the tug.
- On landing ensure that all drift is countered before touchdown to mitigate any adverse strain on the undercarriage.
- If drift is still apparent before touchdown, take over, close airbrakes and eliminate drift prior to subsequent touchdown.
- The flight is not finished until the aircraft is stopped and the into-wind wing is on the ground.

COMMON PROBLEMS

Problem	Probable Cause
• Crosswind conditions exceed student's (or trainer's) capabilities.	Set and don't exceed personal minima. Reschedule exercise for another time. Check potential for using a different runway with more acceptable crosswind component.
• Student is overloaded if they are still mastering normal take-offs and landings.	Allow student to gain pre-requisite skills first. Monitor student closely for overloading and don't hesitate to take over if necessary.
• Student fails to maintain position behind tug (aero-tow).	A thorough ground briefing must be undertaken to emphasise the danger to the tug of the glider drifting downwind after airborne before the tug has taken off on ground roll. The tow pilot may at any time release the glider if the tug is considered in danger.
• Student fails to correct for crosswind drift (winch) and aircraft is approaching position where the cable will fall outside a safe area.	A thorough ground briefing must be undertaken to emphasise how the pilot will correct for drift in the full climb portion of the winch launch. The winch driver may at any time terminate the launch if the glider is considered to be approaching a position where dropping the cable will result in damage or injury.

• Aircraft track departs from runway heading and approaches hazards.	Student has not identified cross wind or has not applied sufficient cross wind correction. If the former, point out visual clues (windsock, dust, wind indications in crops). If the latter demonstrate required correction technique and get student to repeat.
• Aircraft starts to drift laterally on runway during late final.	Student has aligned glider track with runway (crabbing approach) or levelled wing (wing-down approach) too early.

THREAT AND ERROR MANAGEMENT

- If uncurrent on type with some of these exercises trainers should undertake refresher practice with their CFI or a more experienced trainer prior to conducting training in this unit.
- Assess trend of wind strength and direction from multiple forecasting sources allowing for the worst possible case.
- Ensure that the crosswind component is within the Aircraft Flight Manual and Club Operations Manual limitations.
- Set and observe personal minima.
- Maintain at all times situational awareness, aircraft control and safety including action on losing sight of the tug.
- Be alert for orographic turbulence set off from surrounding trees and/or buildings.
- If orographic turbulence or wind shear is expected, adopt a higher approach speed.

TRAINING MATERIALS AND REFERENCES

- Whiteboard
- Model aircraft
- PC/iPad with Internet access
- GPC Theory Lesson 5.
- Video demonstrations
- Handouts
- GPC Pilot Guide Unit 19
- Australian Gliding Knowledge Pages 112-113, 134-135
- Simulator (if available)

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Unit 20A

Launch Emergencies (Aerotow)

AIM

The aim of this GPC unit is for the student undertaking an aerotow to:

- Describe types of aerotow launch emergency.
- Demonstrate actions to safely handle a launch failure.
- Demonstrate approaches to prevent these emergencies, and safe actions in the event of them happening on the ground and in the air.

Competency in this unit is a prerequisite to first solo flight using aerotow.

PREREQUISITE UNITS

- GPC Unit 13 Launch and Release
- GPC Unit 14A Take-off (aerotow)
- GPC Unit 16 Circuit Joining and Execution
- GPC Unit 17 Stabilised Approach and Landing

COMPLEMENTARY UNITS

There are no complementary units for this GPC Unit

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Describes the range of launch emergencies and immediate actions.	• **Describe:** ○ Possible launch emergencies that may occur with ground run, initial climb (to 500 feet AGL) and during full climb above 500 feet. ○ Actions the pilot can take to reduce the risks of launch emergencies. ○ Causes of towplane upset and the actions to prevent it.
2. Ground roll emergencies.	• **Describe:** ○ Appropriate action if the towplane has engine failure during ground roll. ○ Causes of Pilot Induced Oscillation (PIO). ○ How to prevent loss of directional control. ○ How to prevent a Wing drop. • **Demonstrate:** ○ Correct reactions to launch failures hand, visual and verbal signals on the ground. ○ Appropriate actions to take on: ● Loss of directional control. ● Occurrence of Pilot Induced Oscillation (PIO). ● Wing drop, possibly due to cross wind.

3. Initial climb emergencies	• **Describe:** ○ Causes of Tug upsets and actions to prevent these. ○ Suitable landing areas off the airfield for emergency use. ○ Appropriate actions to Towplane problems including low power issues. ○ Options with Launch failure (rope break or engine failure) below 500 feet AGL. • **Demonstrate:** ○ Responding quickly and assertively to tow plane signals. ○ Calling out options on climb out on all flights. ○ Taking appropriate action with simulated launch failure below 500 feet AGL, including landing on airfield or turnback.
4. Full climb emergencies.	• **Describe:** ○ Required actions in the event of a double release failure. • **Demonstrate:** ○ Taking appropriate actions to simulated launch failure above 500 ft AGL. ○ Recognition and correct response to release failure during launch (hook up).

KEY MESSAGES

- Launch emergencies are easily resolved provided thought and planning takes place.
- At all times maintain safe speed near to the ground.
- At all times maintain situational awareness, aircraft control and safety.
- Locate, identify, and operate controls correctly during all phases of practice emergencies.
- Verbalise options for launch failure on all flights, dual or solo.

LESSON PLANNING AND CONDUCT

Classroom Briefing

Ground signals to abort launch prior to ground roll.

- Anyone outside can abort launch – Shouting “STOP! STOP! STOP!” and holding both hands vertically above head.
- Pilot hearing STOP call to immediately release the rope.
- Pilot wishing to abort shouts “STOP! STOP! STOP!” transmitting on the radio and simultaneously releasing the rope.
- Wing-runner, shouting “STOP! STOP! STOP!” and holding both hands vertically above head.
- If a forward signaller is present (recommended), they hold both hands vertically above head.

- O for Options in ABC CHAOTIC pre-flight check list identifies alternative actions at stages of launch if failures occur.
    - In practice, the various stages should be called out on all flights as the launch occurs after this classroom briefing, (e.g. runway, runway, straight ahead, paddock there, paddock there, safe height modified circuit).

On ground roll:

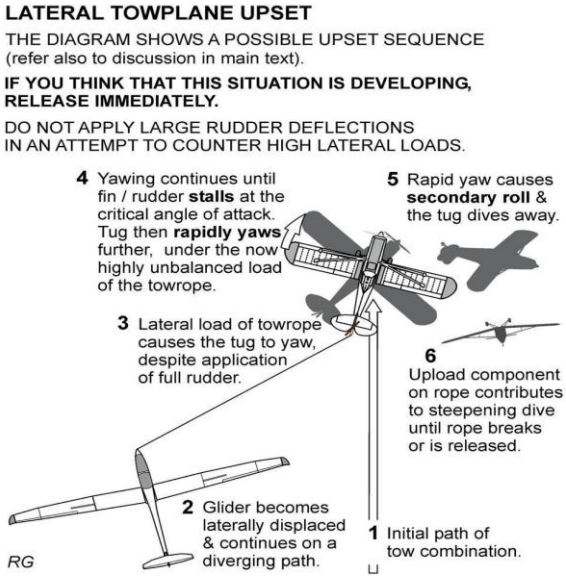
- Release rope.
- Simultaneously maintaining directional control.
- Apply full airbrake and wheel brakes.
- If overtaking tug, avoid it to the right hand side or ground loop right while sufficient speed remains for control effectiveness.

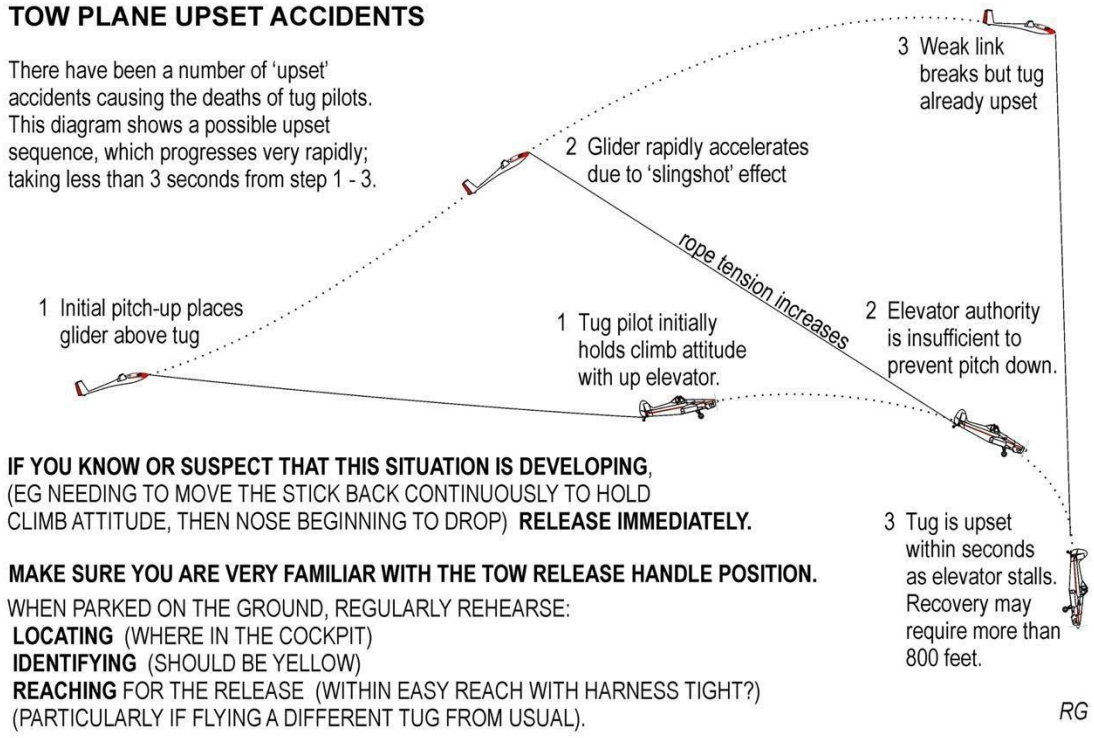
Airborne, runway remaining:

- Lower nose to adopt safe speed.
- Release rope.
- Land straight ahead on runway.
- If overtaking tug, avoid it to the right hand side or ground loop to the right while sufficient speed remains for control effectiveness.
- If over-running the end of the runway, ground loop prior to hitting fence while sufficient speed remains for control effectiveness.

Airborne, no runway remaining:

- Lower nose to adopt and maintain safe speed.
- Release rope.
- Outland straight ahead or within 30 degrees either side of straight ahead.
- If above safe height either 180^{o} turnback or modified circuit to a runway depending on aircraft type, aerodrome layout and/or weather conditions.
- Aerotow low-level rope break with 180^{o} turnback can be simulated at altitude which shows students that they don't need to rush their actions at low level when the adrenalin is racing. This avoids the common error of turning before safe speed has been established.





Tug Emergency:

- Explain Tug Emergency Signals Wing waggle, Rudder waggle.
- Engine failure (e.g. fuel starvation) tug descends without warning or signal and may disappear under nose:
    - Release IMMEDIATELY.
    - Maintain safe speed near the ground.

    - Land ahead if low or manoeuvre for circuit.
- Partial engine failure (e.g. mechanical, fuel vapourisation, magneto failure, carbie heat selection) or about to enter cloud:
    - If Tug pilot signals wave-off by wing waggle, or disappears descending under the glider's nose - Release IMMEDIATELY and avoid the tug – towpilot has a bigger problem than you do.
    - Maintain safe speed near the ground.
    - Land ahead if low or manoeuvre for circuit.

Low rate of climb tug pilot attributing to glider (e.g. airbrakes may be out)

- Tug pilot signals by rapid Rudder Waggle.
- Do NOT release.
- Check glider configuration and correct if necessary.
- If correct already communicate with tug by radio and watch for possible Wing Waggle.
- High powered tugs (e.g. PA25s) can usually maintain 250-300 fpm climb rates with a two-seater with airbrakes open, lower powered tugs may not be able to maintain height.

Release Failure (Hook-up)

- In a real hook-up, if no communication received, fly to the left low tow position, try again to release.
- Maintain rope tension with yaw or/and smooth application of airbrake.
- When Tug pilot acknowledges by hand waving, glider returns to low tow astern, maintaining rope tension and keep attempting to release.
- Tug Pilot flies to suitable area close to landing area.
- Glider climbs to high tow position signalling to tug pilot that they are ready to accept the rope.
- Tug Pilot releases the rope.
- Glider makes a high approach ensuring rope clearance with any obstacles on approach and usually landing farther up the runway.
- Note the possible risk of the rope tangling in wheel/axle on landing roll.

Double release failure (In the unlikely event of it ever happening)

- Tug pilot communicates failure by radio (or by thumbs down hand signal).
- Glider adopts low tow position.
- Tug descends to circuit height and approach with glider maintaining low tow position and rope tightness with airbrakes.
- Glider lands first in wheeler configuration with full airbrake and applies wheel brake as soon as possible.
- Tug pilot should not brake, allowing the glider to slow the combination.
- If overtaking tug, glider steers right or ground loops right to avoid.

PRE-FLIGHT BRIEFING

- Carefully brief the simulated launch failure to be demonstrated/conducted but note that a (real) failure may occur prior to this in the launch.
- Ensure the student is aware of who is in control of the aircraft at all times.

FLIGHT EXERCISES

Specific demonstration and practice required:

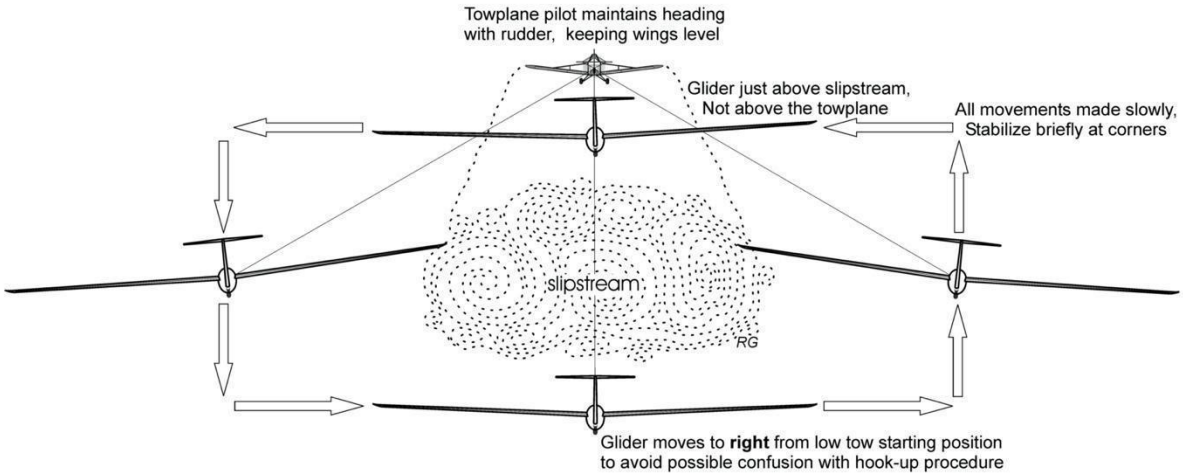
- Flying for this unit requires close coordination with the tug pilot pre-flight and in-flight.
- Tug Pilot should be briefed NOT to turn left while glider is out on echelon left during Hook-up procedure.
- Trainer must radio to Tug Pilot prior to commencing and ceasing Hook-up procedure.
- All configurations except outlanding off low level rope break practice and double hook-up are to be demonstrated by the student and observed by the trainer to be carried out safely and correctly.

Trainer demonstrates:

- Note: Trainer to demonstrate all emergencies including at least one low level rope break to a modified circuit on glider type prior to the student practicing them.
- If student shows reticence or nervousness during practice, more demonstration by the Trainer is advised.

Student practice (under supervision)

- To call options on take-off run and climb out on all flights post classroom briefing.
- Rope break on take-off run, runway remaining.
- Low level rope breaks to modified circuit or turnback depending on club safety policy.
- Hook-up procedures:
    - If the student has problems controlling the glider during the hook-up procedure;
    - Then practice “boxing the slipstream” until competent (See GPC Unit 27 for explanation).



Advice to trainer regarding their responsibility to maintain safe flight.

- Do not exceed your own limitations when setting difficult tasks for the student. They may just say to you – 'you have control'.
- Emphasize to the tow pilot during briefing that the tug should not turn during hook-up practice.
- During hook-up procedures don't let the rope develop a loop, intervene with yaw and/or smooth application of airbrake to tighten rope:
    - Release rope before the loop gets anywhere near the wing.
    - In the event of a large bow in the rope occurring, resulting from a poorly exercised and supervised procedure, the rope may wrap around the wing and on re-tension result in damage to the wing or flight control.
    - This could result in an inability to release or worse; a reduction in, or loss of, control.
    - The trainer must be on their guard to ensure that the above does not eventuate.
- Respond correctly to GFA emergency signals at all times (no practice signals without taking correct action).
- Maintain safe speed near the ground at all times.
- Maintain currency with modified circuits/ turnback procedures.
- Maintain at all times situational awareness, aircraft control and safety including action on losing sight of the tug.
- Ensure student locates, identifies and operates correctly controls and equipment during all phases of operation during practice emergencies.
- During a real (not practice) emergency, the trainer will take command.

Safety Aspects

- Set and don't exceed personal minima.
- MAINTAIN SAFE SPEED NEAR THE GROUND.
- Monitor the student closely for overloading and don't hesitate to take over if necessary.
- A thorough ground briefing must be undertaken to emphasise the dangers to the student of the tug upset.
- It must be understood that high tow position is virtually line astern (behind) of the tug.
- The student must understand that on losing sight of the tug at any time during the exercises, the glider must release immediately.
- The primary reference for low or high tow is the slipstream. When the correct station is established, reference to a feature on the tug will assist maintaining that station.
- The tow pilot may at any time release the glider if the tug is placed in danger:
    - The rope and weak link may add further airworthiness implications should the rope fly back at the aircraft, such as control jamming or impact damage depending on the position or station when the rope is released.

Notes:

1. Don't dramatise exercises; adopt a matter of fact approach to reassure the student and to instil confidence.
2. Students can practice calling out actions sitting in a parked glider responding to trainer calls locating, identifying and operating controls.
3. Don't practice low level rope break exercises in busy circuit traffic sequences.
4. Hook-up early student practice should avoid turbulent conditions.
5. Remember to brief tug pilot and ground crew fully prior to practicing emergencies.
6. Don't organize practice rudder waggles below circuit height as student may misread the signal and release the rope.

COMMON PROBLEMS

Problem	Probable Cause
• Student unskilled so unable to handle the extra workload.	Unit commenced too early
• Student just repeats common phrases without assessing if there is sufficient room to do what is stated	Not understanding how much room is required to land straight ahead or turn back.
• Incorrect decisions following rope break	Insufficient situational awareness
• Student makes basic flying errors under emergency practice	Unskilled. Needs more practice.

THREAT AND ERROR MANAGEMENT

- Do not exceed personal minima.
- If uncurrent on type with some of these exercises undertake refresher practice with your CFI or a more experienced trainer prior to conducting instructing in this unit.
- Student may react much more slowly than you expect, if too slow - take over.
- Don't underestimate the amount of height loss in turnback procedures.
- Turnback or low level rope break practices should not be carried out in busy circuit traffic sequences.
- Watch the rope go before manoeuvring after release is called.
- If sight of the tug is lost at any time, release immediately!!!
- During hook-up procedures watch out for the tug pilot commencing a left turn when the glider is manoeuvring into the left echelon position.
    - This will cause the rope to develop a bow rapidly if the glider does not mirror left turn immediately.
    - Release rope before loop gets anywhere near the wing.

TRAINING MATERIALS AND REFERENCES

- Whiteboard
- Model aircraft
- GPC Theory Lesson 6 – Launch failures
- Video demonstrations
- GPC Pilot Guide Unit 20A
- Australian Gliding Knowledge (AGK) pages 142 - 144
- Simulator (if available).

Gliding Australia Training Manual

Trainer Guide

Unit 20S

Launch Emergencies Self-Launch

Unit 20S - Launch Emergencies Self-Launch

AIM

To describe types of launch emergency and demonstrate approaches to prevent these emergencies, and safe actions in the event of them happening on the ground and in the air. Competency in this unit is a prerequisite to solo flight when this involves self-launch aircraft.

PRE-REQUISITE UNITS

- GPC Unit 13S Launch
- GPC Unit 14S Take-off
- GPC Unit 15 Break-off and circuit planning
- GPC Unit 16 Circuit Joining and execution
- GPC Unit 17 Stabilised approach and landing…

COMPLEMENTARY UNITS

- There are no complementary Units

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Describe the range of Launch emergencies.**	• **Describe** o possible launch emergencies that may occur with ground run, initial climb (to 500 feet AGL) and during full climb above 500 feet; o actions to reduce the chances of launch emergencies.
2. **Ground roll emergencies**	• **Demonstrate:** o Prevention of loss of directional control and taking appropriate actions; o appropriate action with a wing drop, possibly due to crosswind; o appropriate action with engine failure during ground roll.
3. Initial climb emergencies.	• **Describe:** o suitable landing areas off the airfield for emergency use; o options with engine failure below 500 feet AGL. • **Demonstrate:** o Appropriate response to engine problems and low climb rate issues. o Briefing and calling out options on climb out on all flights; o Taking appropriate action with simulated engine failure, including landing on airfield, 180 turn, and explains options re: outlanding.
4. Full climb emergencies.	• **Demonstrate:** ○ Taking appropriate actions to simulated engine failure above 500 ft AGL.

KEY MESSAGES

- Launch emergencies are easily resolved provided thought and planning takes place.
- Maintain safe speed near to the ground at all times.
- Maintain at all times situational awareness, aircraft control and safety.
- Locate, identify and operate controls correctly during all phases of practice emergencies.
- Verbalising options for launch failure on all flights, dual or solo.

LESSON PLANNING AND CONDUCT

Briefing

Classroom Briefing

- *(Consider using a Simulator)*
- Summary of the range of emergencies that pilots need to avoid and to know how to react.
- **Ground signals to abort launch prior to ground roll.**
    - Anyone outside can abort launch:
        - Shouting “STOP! STOP! STOP!” and holds both hands vertically above head.
        - A radio call of “(Callsign) STOP! STOP! STOP!”
- **O for Options in ABCDEF CHAOTIC** pre-flight checklist identifies alternative actions at stages of launch if failures occur.
    - In practice, the various stages should be called out on all flights as the launch occurs after this classroom briefing, (i.e. abort point airborne – continue, runway, runway, straight ahead, paddock there, paddock there, safe height modified circuit.)
- **Engine problem on ground roll or not airborne by abort point**:
    - Close throttle;
    - Maintain directional control;
    - Apply full airbrake and wheel brake(s).
- **Engine problem airborne, runway remaining:**
    - Lower nose to adopt safe speed;
    - Close throttle;
    - Land straight ahead on runway;
    - If over running the runway, ground loop prior to hitting fence.
- **Engine problem airborne, no runway remaining**
    - Lower nose to adopt and maintain safe speed;
    - If time permits, conduct **CFMOST** check:

- **C**arburettor Heat (on if fitted);
- **F**uel (On and correct tank, fuel boost pump is on);
- **M**ixture (Choke Off; Full Rich as required);
- **O**il Temperature and Pressure checked;
  - (if Temperature high and Pressure low, consider possibility of fire);
- **S**witches: (Magnetos switched on or both);
- **T**hrottle & linkage (checked).

- Close throttle.
- If time permits: **Fuel and Switches off.**
- Outland straight ahead or within 30 degrees either side of straight ahead;
- If above safe height either 180 degree turnback or modified circuit to a runway depending on aircraft type, aerodrome layout and/or weather conditions.
- **Remember priorities: 1. Aviate 2. Navigate 3. Communicate.**

- Low rate of climb – check if the airbrakes may be out.
- **Fire in flight:**
  - Adopt glide attitude;
  - Throttle Back;
  - Fuel and Switches off.
  - Land immediately.

Flight Exercises

Specific demonstration and practice required

- All configurations except Fire in flight and Outlanding off low level engine failure practice are to be demonstrated by the student and observed by the trainer to be carried out safely and correctly.

Trainer demonstrates:

- Trainer to demonstrate all emergencies including at least one low level engine failure to a modified circuit on glider type prior to the student practicing them.
- If a student shows reticence or nervousness during practice, more demonstration by the trainer is advised.
- Student should identify and perform correct actions for simulated fire on ground and airborne
- Simulated engine failures as appropriate to assess competency.
- When should the engine be stowed and when is too low (leave it out)
- Landing with engine out (if manufacturer allows it)
- Demonstration of glide with engine out but not developing power
- Engine stow failure and troubleshooting at height.

Student practice (under supervision):

- To call options on take-off run and climb out on all flights post classroom briefing;
- Engine failure on take-off run, runway remaining;
- Low level engine failure to a modified circuit or turnback depending on club safety policy.

Advice to trainer regarding their responsibility to maintain safe flight.

- Do not exceed your own limitations when setting difficult tasks for the student. The student may just say to you – 'you have control'.
- Maintain safe speed near the ground at all times.
- Maintain currency with modified circuits/ turnback procedures.
- Maintain at all times situational awareness, aircraft control and safety.
- Ensure student locates, identifies and operates correctly controls and equipment during all phases of operation during practice emergencies.
- **During a real (not practice) emergency, the trainer will take command.**

Notes

Advice on the ease of learning and traps that may be encountered:

- Don't dramatise exercises; adopt matter of fact approach to reassure the student and to instil confidence.
- Students can practice calling out actions sitting in a parked glider responding to trainer calls locating, identifying and operating controls.
- Don't practice low level engine failure exercises in busy circuit traffic sequences.
- Remember to brief any ground crew fully prior to practicing emergencies.

COMMON PROBLEMS	
Problem	**Probable Cause**
• Student does not monitor speed, rate of climb, abort point, engine parameters on take-off	Student not aware of aircraft requirements. Lack of practice, demonstration.
• Student does not recognise reduced performance as an emergency situation.	Lack of awareness of performance minima and potential consequences.

THREAT AND ERROR MANAGEMENT

- Do not exceed personal minima;
- If uncurrent on type with some of these exercises undertake refresher practice with your CFI or a more experienced trainer prior to training this unit.

- Student may react much more slowly than you expect, if too slow - take over.
- Don’t underestimate height loss in turnback procedures.
- Turnback practices should not be carried out in busy circuit traffic sequences.

TRAINING MATERIALS AND REFERENCES

- Powered Sailplane Manual: GFA Ops 0009 Aug 2015
- Australian Gliding Knowledge, pages 140-152
- GPC Pilot Guide Unit 20S;
- Simulator. If available.

Gliding Australia Training Manual

Trainer Guide

Unit 20W

Launch Emergencies (Winch)

AIM

The aim of this GPC unit is for the student undertaking a winch or vehicle (auto tow) launch to:

- Describe types of a winch/autotow launch emergency.
- Understand the actions to take to safely handle a launch failure.
- Recognise the threats and errors that can occur during a launch failure.
- Demonstrate the ability to handle a launch emergency at all stages of the launch.

PREREQUISITE UNITS

- GPC Unit 13W – Launch & Release (Winch)
- GPC Unit 14W – Take-off (Winch)
- GPC Unit 16 – Circuit Joining & Execution
- GPC Unit 17 Stabilised approach and landing

COMPLEMENTARY UNITS

There are no complementary units for this GPC Unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Describes the range of launch emergencies and immediate actions.	• **Describe:** ○ Common causes of launch failures and how these are identified. ○ Actions the pilot can take to reduce the risks of launch emergencies. ○ Actions the pilot must take in the event of a launch failure at different stages of the launch. ○ The direction to turn if a modified circuit is to be performed in the presence of significant crosswind. ○ The Non-Manoeuvring Area (NMA) and how a pilot can enter it and avoid it. ○ The actions required if a cable hook up is suspected.
2. Ground roll emergencies.	• **Describe:** ○ The dangers of allowing a wingtip to touch the ground in the early stages of a winch launch: ○ The immediate actions to take during the ground stage of the winch launch when: ● A wingtip touches the ground. ● The aircraft overruns the cable. ● The pilot loses directional control. ● The aircraft balloons too high. ○ Potential consequences of catching a wing tip on the ground.

	• **Demonstrate:** ○ The correct immediate actions for a launch failure that occurs on the ground.

3. Initial climb emergencies	• **Describe:**
	  ○ The immediate three actions to take during the separation through release stage of the winch/autotow launch when:
	  • There is an immediate loss of power in the launch.
	  • There is a gradual loss of power in the launch.
	  • the subsequent decisions to be made in handling a winch/autotow launch failure.
	  ○ Potential consequences of rotating too steeply in the initial climb phase of the launch.
	• **Demonstrate:**
	  ○ The correct immediate actions for a launch failure that occurs just after separation.
	  ○ The correct three actions and return for safe landing from an abrupt launch failure at a low level and intermediate level (initial climb or early full climb).

4. Full climb emergencies.	• **Describe:**
	  ○ How allowing the aircraft into the NMA will increase the risks during the launch.
	• **Demonstrate:**
	  ○ The correct immediate actions for a launch failure that occurs just after separation.
	  ○ The correct immediate actions and return for safe landing from a both an abrupt and gradual winch/autotow launch failure at an intermediate level (mid full climb or higher).
	  ○ Potential consequences of climbing too shallow or steep in the full climb phase of the launch.

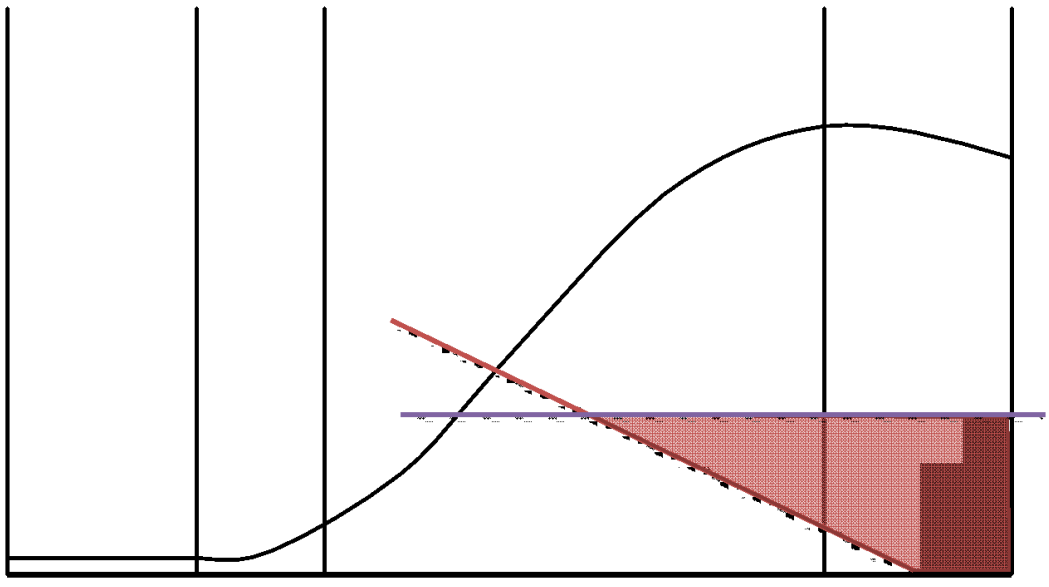
KEY MESSAGES

- Launch failures are easily managed by the pilot provided thought and planning takes place.
- At all times maintain safe speed near to the ground.
- Accidents that occur after a launch failure are generally caused by mismanagement of the aircraft after the launch failure, not through the failure itself.
- Pilots need to recognize that a launch failure can occur at any time from the point of cable hook-on to release. The launch may also be abandoned by the pilot (for example if the airspeed is trending towards the upper winch limit).
- Launch problems do not always manifest themselves as a sudden loss of power – gradual failures can and do occur and require the pilot to recognize that a launch failure is occurring and take appropriate action.
- Pilots must ensure that they never allow the aircraft's airspeed to drop below the minimum launch speed during the launch.
- When a launch failure occurs, no bank must be applied until the aircraft's airspeed is returned to and maintained at or above safe speed near the ground.
- Whilst a launch failure requires specific recovery processes, it is not difficult to recover and providing the aircraft has not entered the NMA it will either be able to land ahead or conduct a modified circuit back to the airfield.
- Locate, identify, and operate controls correctly during all phases of practice emergencies.
- Verbalise options for launch failure on all flights, dual or solo.

LESSON PLANNING AND CONDUCT

Classroom Briefing

- Highlight the stages of the winch/autotow launch.



- Launch failures can occur through a failure of the winching mechanism or a failure of the cable/rope. In the latter case this can also include the failure of the weak link.
- Identify failure modes that can occur in each stage – particularly the immediate and gradual types of failure as well as where the pilot abandons the launch.
- On the ground if a wing drops there is potential for it to catch, yaw the aircraft and potentially roll the aircraft over, therefore if the wing drops to the ground during the initial stage of the launch release twice and steer the aircraft away from the cable using rudder.
- Similarly, if the pilot loses directional control of the aircraft on the ground then also release and steer the aircraft away from the cable using rudder.
- If a launch failure occurs in flight, landing ahead is always the safest option providing there is sufficient remaining runway or field to do so.
- Emphasise how the Options part of the pre-take-off check allows the pilot to self-brief on actions to take in the event of a launch failure and that this must never be omitted.
- Reinforce the need to know the minimum and maximum airspeed range for the aircraft they are flying. Emphasise the need to remain within this speed band when on launch (allowing for a 10% overspeed in the lower third of the launch), and to abandon the launch if it cannot be maintained.
- Describe the three actions the pilot must do after the launch failure (using ATTITUDE-AIRSPEED-ASSESS):
    1. Immediately lower the nose ATTITUDE to below the horizon.
    2. Wait to regain and maintain safe AIRSPEED near the ground (1.5 V_S), operate the cable release mechanism TWICE.
    3. ASSESS the situation, confirm airspeed ≥ 1.5V_S and LAND AHEAD unless it is not safe to do so.
- If the student decides not to land ahead then they should proceed as per the pre-take-off launch failure briefing.
- List the post-launch failure immediate actions and decisions, describing how to carry out the action plan.
- Ensure the student has no doubt as to their responsibility for handing the aircraft in the event of an actual launch failure during these training sequences.
- Effect that the crosswind has on deciding which way to turn in the event the aircraft cannot land ahead.

PRE-FLIGHT BRIEFING

- Carefully brief the simulated launch failure to be demonstrated/conducted but note that a (real) failure may occur prior to this in the launch.
- Ensure the student is aware of who is in control of the aircraft at all times.

FLIGHT EXERCISES

Specific demonstration and practice required:

- Flying for this unit requires close coordination with the winch/auto driver pre-flight.
- Demonstrate to the student the delay in regaining speed after a launch failure in full climb by simulating a launch climb attitude when a glider is in free flight.

- Note how quickly the airspeed decays and how long it takes to return to 1.5 V_S when forward stick is applied.

Launch Failure Instructional Sequence:

- Commence demonstration and student handling at a high point in the winch launch.
    - First ensure the student is competent in lowering the nose ATTITUDE.
    - Then proceed to training the student to regain safe AIRSPEED while operating cable release.
    - Then proceed to training the student ASSESS their situation and decide their subsequent actions.

Launch Failure in various Launch Stages:

- Demonstrate and train the student to handle launch failures at all stages of the launch, starting at height and progressing lower.
- Ensure that both cases of modified circuit and land ahead are covered. For a modified circuit ensure the correct turn direction is briefed and executed.
- Ensure that the student verbalises their decision whether to land ahead as part of their ASSESS step.

Repeat demonstration as many times as needed for the student to recognise the launch failure and undertake the effective recovery. Ensure the application of ATTITUDE AND AIRSPEED is always present with clear reasoning for the decision in ASSESS being evident.

Student practice (under supervision):

- Student to practice immediate actions following a launch failure at particular levels (starting high and progressing lower in the launch as skill and proficiency permits).

Notes:

- Flight demonstrations and exercises must include recovery from a launch failure at all launch stages.
- Launch failures should be both ‘hard’ (sudden failure such as a cable break) and ‘soft’ (slow failure such as gradual loss of power) so that the student does not associate launch failures with just one type of event.
- Ensure that the aircraft is never placed in a situation that will endanger the aircrew, other traffic or other personnel on the ground.
- Always refer to the Aircraft Flight Manual or approved placard to determine the maximum winch speed for any glider.
- Practice launch failure is carried out by the trainer pulling the cable release (simulated cable-break) or arranging for the winch driver to cut the power at varying rates (simulated engine failure).
- Brief winch drivers (either directly or indirectly) prior to flight exercises so that they are prepared for the likely events during the flight exercises.
- Ensure launch failures are demonstrated to and flown by the student from a variety of positions during the launch, commencing from higher levels in the full climb stage down to ground run and separation stages.

- Ensure that the student understands the different situations that they are being expected to handle. I.e. when conducting simulated launch failures at height the trainer must make it clear that the student will not be expected to handle launch failures at a low level.
- Do NOT rush this training. The student must be confident and capable of correctly handling a launch failure at any stage of a winch/autotow launch.

COMMON PROBLEMS

Problem	Probable Cause
• Inability to detect a gradual failure of the launch.	Failure to monitor airspeed during work cycle of launch.
• Failure to move control column forward fast enough to ensure airspeed is promptly regained to 1.5 V_S.	Misunderstanding about the rate of speed decay and time needed to recover. G sensitivity.
• Failure to wait for sufficient airspeed to build up after lowering nose ATTITUDE.	Student feels rushed or panics. Emphasise the need for attaining safe speed and that student has time to make considered decisions about how to handle the failure.
• Student fails to correctly assess decision to land ahead (or not).	Student needs to understand the space required to land the aircraft type and how to estimate this from the launch failure point.

THREAT AND ERROR MANAGEMENT

- Poor speed control allows aircraft to enter a stalled condition.
- Failure to confirm adequate airspeed (1.5 VS) prior to turning the aircraft.
- Poor decision-making places aircraft in difficult position to land ahead or conduct modified circuit.
- Poor Options launch failure briefing in the pre-take-off check.
- Other traffic in the circuit during the recovery process.
- Failure to terminate the launch prior to entering the NMA.
- Student confusion and disorientation.

TRAINING MATERIALS AND REFERENCES

- GFA Winch Manual (OPS 0007)
- GPC Pilot Guide Unit 20W
- Videos – BGA winch launch accidents

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Unit 21

Radio Use & Endorsement

AIM

The aim of this unit is to:

- Develop the skills and knowledge required to operate aircraft radio equipment during flight in the local area; and
- Ensure that the student's use of the radio conforms to CASA and GFA requirements including relevant terminology.

This Unit is a prerequisite for first solo.

PREREQUISITE UNITS

There are no prerequisite units for this GPC Unit.

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 23 Basic Rules of the Air.
- GFA Unit 15 Break-off and Circuit Planning

RECOGNITION OF PRIOR LEARNING

The possession by the student of one of the following satisfy the requirements for this Unit:

- A CASA Flight Radiotelephone Operator Licence.
- An RAAus Radio Operator (R) Endorsement.
- A GFA Radiotelephone Operator's Logbook Endorsement

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Practical standards	• **Demonstrate:** ○ Operation of a VHF radio controls to: ● Select and change frequencies. ● Set volume & squelch levels. ● Press to transmit and use microphone. ○ How to communicate using standard phraseologies, with correct enunciation and articulation on a VHF radio. ○ Achievement of a pass grade on a practical examination on the above conducted by a GFA Level 1 or higher instructor (see Appendix 1 for Practical Exam Performance Standard). ○ Achievement of a pass grade on the Radio Telephone endorsement online theory examination.
2. English language proficiency.	• **Demonstrate:** ○ A general English Language Proficiency assessment where English is a second language of an applicant to be conducted in accordance with the requirements of GFA MOSP2, Section 15.3.

KEY MESSAGES

- The primacy of AVIATE-NAVIGATE-COMMUNICATE priorities.
- The responsibility of flight crew to see and avoid.
- The advantages of alerted see and avoid.
- How radios are used to resolve conflict and alert aircraft traffic.
- Use of standard procedures and phraseologies are essential for effective radio communication.

LESSON PLANNING AND CONDUCT

Classroom Briefing

- Pilots who do not hold a CASA private pilot licence, commercial pilot licence, multi-crew pilot licence, air transport pilot licence or a recreational pilot licence with a flight radio endorsement must obtain the above endorsement prior to flying solo.
- Describe the radio horizon and how this expands with altitude. How calls made in a local area may be received over a wide area.
- List the Radio call requirements for CTAFs referring to CASA CAAP 166 Operations in the vicinity of non-controlled aerodromes.
- Describe the use of radio frequencies in the Aeronautical Communication band.
- Pilots of aircraft with a GFA registered competition mark are permitted to use the registered competition mark as a callsign on the primary gliding frequencies or on any additional temporary gliding frequency. On all other frequencies the aircraft registration is to be used [MOSP 2 19.5.2 Competition Marks].
- Demonstrate radio procedures and terminology, including the phonetic alphabet and standard phraseology.
- Describe procedures associated with In-Flight emergencies:
    - Mayday and PAN PAN calls.
    - The International Distress Frequency.
    - The “Stop Transmitting” Call.
- Describe procedures associated with Radio failure procedures.
- Describe heterodyning (multiple stations transmitting at same time producing squealing).
- Demonstrate radio diagnostic calls and responses.
- Demonstrate operation of a VHF radio controls to:
    - Select and change frequencies.
    - Set volume & squelch levels.
    - Press to transmit.
    - Use the microphone.
- Demonstrate the correct procedure prior to transmitting such as:

  - Think about the phrasing of what you are going to say.
  - Assess microphone position.
  - Monitor the channel prior to transmitting.
  - Press the PTT button with a short pause prior to talking.
- Construct standard radio transmission, such as taxiing & takeoff (for self- launchers), and circuit calls.
- The reference document is the GFA "Airways and Radio Procedures for Glider Pilots".
- Following study of this document, an online theory examination is required which the student accesses through the Online Exams and Courses option in the Member Area of Go Membership. The student will require their GFA Number to log in and attempt the online exam..
- The practical assessment will be carried out by Level 1 or higher rated instructor, who will assess the applicant's ability to operate the controls of a VHF Radio, communicate, annunciate and articulate using the radio (where English is a second language, refer also to GFA MoSP 2 Section 15.3). The practical assessment should also test the applicant's knowledge of local procedures at the training airfield.

RADIOTELEPHONE OPERATOR AUTHORISATION

Candidates who successfully pass the online theory examination and practical assessment will have their GFA Radiotelephone Operator authorisation issued as per GPC logbook endorsements.

PRE-FLIGHT BRIEFING

Trainer points out the radio equipment fitted to the aircraft and explains the effect of and how to operate each control.

With the student seated in the cockpit, describe the optimal boom mic position and PTT operation.

FLIGHT EXERCISES

Demonstrates practically or in simulation:

- Radio procedures and terminology, including the phonetic alphabet and standard phraseology.
- Practice radio calls associated with:
  - In-Flight emergencies:
    - Mayday and PAN distress phases.
    - The Stop Transmitting Call.
  - Radio failure procedures.
  - Radio diagnostic calls and responses.
- Phrasing what you are going to say before transmitting.
- Monitoring the radio channel prior to transmitting so as not to cross transmit with other users.
- Operation of the VHF radio controls to:
  - Select and change frequencies.
  - Set volume & squelch levels.

    - Listen out before transmitting.
    - Press to transmit and to inject a short delay prior to speaking.
- Standard radio transmissions, such as taxying & take-off (for self-launchers) and circuit calls).

Student practices (under supervision):

- Radio procedures and terminology, including the phonetic alphabet and standard phraseology.
- Radio calls associated with:
    - Radio diagnostic calls and responses.
    - Taxiing & take-off (for self-launchers).
    - Circuit calls.
- The correct procedure prior to transmitting, such as phrasing what you are going to say, microphone position, listen out prior to transmitting, press PTT button prior to talk.
- Operation of a VHF radio controls to:
    - Change frequencies.
    - Set volume & squelch levels.
    - Transmit.
    - Effectively use a microphone.

Notes:

1. Ensure that the student has been given a thorough brief on the key messages prior to attempting to operate the VHF radio.
2. Ensure that the student is competent to set-up and operate all the radio controls prior to their first operation especially:
    a. Correctly setting the volume and squelch levels.
    b. Correctly setting and changing the desired active frequency.
3. Ensure that all parts of this unit are fulfilled, and the logbook endorsement has been entered before approving a first solo.

COMMON PROBLEMS

Problem	Probable Cause
Student talks too quickly.	Student may be nervous or distracted. Trainer may choose to take over flying duties to allow student to correctly use the radio.
Student fails to transmit.	Student fails to depress PTT or does not press sufficiently.
Incorrect phraseology used.	Student has not recalled correct phraseology. Practice with student on the ground using a model of airfield area prior to next flight.
Student transmission not legible by other aircraft	Student is speaking too softly or does not have the microphone correctly positioned.
Student does not respond to other calls directed to aircraft.	Student may be overloaded with flying the aircraft, leave radio use for a future lesson after sufficient skill in aircraft operation is achieved.

THREAT AND ERROR MANAGEMENT

- Poor radio configuration or damaged equipment will reduce radio effectiveness. Ensure that a full radio check has been carried out from both seats at the daily inspection or before first flight.
- Low battery voltage will affect radio operation. Check that the aircraft battery is charged sufficiently or be easily changed for a charged unit for flight operations for the day. Switch off the master switch if the aircraft is parked between sorties to preserve battery charge.
- Incorrect setting of volume and squelch may impede the trainer's reception of transmissions. Check these settings before each flight.
- Heavy radio traffic may cause distraction and difficulty in transmitting, consider rescheduling the lesson to another time.
- If the student is getting overloaded with flying and using the radio, take over the radio duties to lighten their load especially where a busy frequency is experienced (e.g., CTAF or 126.7).

TRAINING MATERIALS AND REFERENCES

- GFA MoSP 2 Operations
- CASA AIP ENR 10.1.17 Radio Calls
- CASA CAAP 166 Operations in the vicinity of non-controlled aerodromes
- GFA "Airways and Radio Procedures for Glider Pilots" Manual
- Pilot Guide GPC Unit 21
- GPC Theory Lesson 7 – Radio use and endorsement

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Unit 22

Use of Situational Awareness Aids

Unit 22 - Use of Situational Awareness Aids

AIM

The aim of this GPC Unit is to enable the student to:

- Describe the operation of the different electronic aids to situational awareness available to the pilot.
- Demonstrate the effective use of situational aids in combination with effective lookout procedures.
- Describe the limitations of electronic situational awareness aids.
- Describe the operation of a range of electronic aids to situational awareness and their use in supporting effective lookout; and to describe the limitations of these aids.

PREREQUISITE UNITS

- GPC Unit 9 – Lookout Scan Procedures
- GPC Unit 21 – Radio Use and Endorsement

COMPLEMENTARY UNITS

- GPC Unit 39 – Advanced Soaring Instruments and Flight Computers

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Knowledge of different situational awareness aids.	• **Describe:** ○ Different types of situational awareness aids available to glider pilots. ○ The basic principles of how these situational awareness devices operate.
2. Effectively use different situational awareness aids.	• **Describe:** ○ How these situational awareness aids must be used in conjunction with other situational awareness processes. ○ The setup of situational awareness aids available to the pilot. ○ How to interpret and respond to information provided by the situational awareness aids.
3. Mitigate the limitations of situational awareness aids.	• **Describe:** ○ The limitations of electronic situational awareness aids, in particular the threats associated with: ● Incorrect configuration. ● Incorrect calibration or updates. ● Loss of electrical power. ● Readability of displays. ● Sterile cockpit operations. ● Distraction from the primacy of lookout.
Different aircraft will be fitted with different electronic situational awareness aids. *The student needs to be able to effectively operate the situational awareness aids that are present in the aircraft that they will be flying as well as understand the general principles for aids they may encounter in other situations.*	

KEY MESSAGES

- Modern electronics and radio communications have delivered a variety of devices that can assist the pilot in obtaining and maintaining situational awareness.
- These devices are not perfect and have multiple failure modes. This means they are an adjunct to, not a replacement of the main situational awareness processes. Always maintain lookout as the primary means of maintaining situational awareness.
- Pilots need to understand how these devices operate, how they are configured and used, how to interpret the information they provide.
- Pilots also must understand their limitations and how to know that they are configured and operating correctly.
- These devices must not be allowed to distract from the prime duties to lookout, see and avoid.

LESSON PLANNING AND CONDUCT

Classroom Briefing

There are different types of equipment providing aids to Situational Awareness. Each comes with different displays and configurations. The manual appropriate to the device used in the aircraft must be consulted for the correct setup, usage and diagnostic procedures.

These aids can (if working and configured correctly) aid situational awareness of other traffic.

The types of devices that aid in situational awareness include:

- Aeronautical Radio (VHF).
- Basic use of Aeronautical radio (VHF) is covered in GPC Unit 21.
- FLARM.
- Transponders (XPNDR).
- ADS-B (Automatic dependent surveillance–broadcast).
- Moving Map displays (discussed in GPC Unit 39).

Limitations of these devices

- Range of communications.
- Need for electrical power and the continuous drain on the aircraft's battery.
- Readability of displays / clarity of audio output.
- Trying to display complex data on a limited display area.
- The need for configuration and calibration.
- The need for regular updates for some devices.
- Failure due to overheating, display malfunction, radio failure, failure of equivalent device in other aircraft.

Note that there are two situational awareness aids that are always available that require no electricity and are free to use: the sun and the compass.

Operation

For all device types – how to power cycle the device and how to determine that it is operating correctly.

For all devices – how to configure and determine the calibration and update status of the device.

Personal Electronic Devices

- Oudie, iPad, iPhone, PDA, Tablets with Associated Soaring/Aviation software:
- SeeYou, XCSoar, LX Nav, WinPilot, Avplan, OzRunways (more operational detail in GPC 39).
- Tracking Equipment and Software: Spot; Skylines; OGN, Flightradar24.

Set up in pre-flight preparation so that minimal distracting input in-flight is required.

Refer to a Club Cross Country Coach for more in-depth tutoring in the available club equipment.

Aircraft Equipment

Radio – correct frequency use, monitoring of broadcasts, responding only if required with information to avoid conflicts.

FLARM or POWERFLARM – as with FLARM plus Transponder targets.

Transponder (XPNDR) – ensure correct operation with correct mode and code set prior to take-off. Transponder indications received will be on a POWERFLARM or similar display. Air Traffic Control and TCAS equipped aircraft can view the glider so equipped.

ADS-B (Automatic dependent surveillance–broadcast) – New portable low-cost transceiver equipment has recently been approved by CASA. Air Traffic Control, TCAS equipped aircraft and Flightradar24 can track the glider so equipped.

Moving Map – how to distinguish and help avoid airspace and aircraft targets on the display.

PRE-FLIGHT BRIEFING

- Ensure the situational awareness devices are operating correctly.
- Student to be shown how to check and configure the situational awareness devices, confirming the same during the pre-launch checklist ‘I-instruments’ item.

- On ground, note what indications may be provided from the situational awareness aids. Student to describe the information being displayed or received though radio broadcasts.

FLIGHT EXERCISES

- In flight, note indications from situational awareness aids and confirm these represent actual situations. Demonstrate responses to these indications.
- Repeat demonstration as required depending on level of situational awareness indications received at that location with the installed instruments.

Student practice (under supervision)

- Student to verbalise the meaning if information is received from situational awareness devices to their trainer.
- Student to respond to situational awareness inputs as required to maintain situational awareness and provide conflict avoidance.

Notes:

- Use of training figures or computer simulations of instruments may be required to provide the student with some guidance on what to expect from instruments that are not mounted in the aircraft they fly.
- Ensure that the student maintains sufficient external look-out and awareness during all flight exercises.

COMMON PROBLEMS

Problem	Probable Cause
• Failure to fully know the operating procedures for situational awareness displays.	Encourage set and forget functionality, trying to change settings while flying could be detrimental to Lookout and Survivability!
• Student is 'head down' in the cockpit and failing to maintain an adequate lookout.	Student is trying to understand what the instruments are conveying instead of looking out and using the instruments as an aid to SA. Reinforce the need for lookout.

THREAT AND ERROR MANAGEMENT

- Focus of attention on the situational awareness device/s distracts from maintaining good SA.
- Situational awareness aids do not operate as expected due to incorrect setup, configuration or failure to apply updates.
- Situational awareness aids may reduce aircraft electrical power below effective level for use.
- Situational awareness aids are assumed to be working (or assumed to provide better capabilities than they actually do).

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 22

Gliding Australia Training Manual

Trainer Guide

GLIDING
AUSTRALIA

Unit 23

Rules of the Air

Gliding Australia Training Manual

Trainer Guide

GLIDING AUSTRALIA

Unit 24

Human Factors and Pilot Limitations

Unit 24 - Human Factors & Pilot Limitations

AIM

To develop the Skills and Knowledge to:

- Describe the non-technical skills and knowledge that underpin all GPC units and aviation activity;
- Assess the impact of Human Factors on operations of an aircraft; and
- Develop personal limitations on operating aircraft.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- Nil

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 25 Threat and Error Management

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Self-assessment of fitness to fly.**	• **Demonstrate:** ○ An assessment of daily medical fitness using the IMSAFE mnemonic.

2. **Hazardous Attitudes (HAZATTS) and strategies to counter them.**	• **Describe:**
	  ○ the five HAZATTS.
	  ○ the strategies to counter the HAZATTS.

3. **Describe a Model of aviation decision making.**	• **Describe:**
	  ○ The difference between fast and slow decision thinking.
	  ○ The aviation decision making (ADM) model using the mnemonic of DECIDE.
	• **Demonstrate:**
	  ○ The use of an ADM model in aviation activities.

4. **Additional factors that affect pilot performance.**	• **Describe:**
	  • Effects of:
	  ○ Eyesight limitations.
	  ○ Ear problems.
	  ○ “G” forces.
	  ○ Oxygen in flight operations.

5. **Factors of Airmanship.**	• **Describe:**
	  • Bedrock Principles:
	  ○ Discipline.
	  ○ Skills.
	  ○ Proficiency using currency barograph diagram.
	  • Pillars of Knowledge:
	  ○ Self.
	  ○ Aircraft.
	  ○ Team.
	  ○ Environment.
	  ○ Risk.
	  • Capstone Outcomes:
	  ○ Situational Awareness.
	  • Judgement.

KEY MESSAGES

More than 75% of incidents/accidents are attributed to human factors:

- All pilots are affected by human factors issues that can become threats to safe aviation.
- All pilots must learn to recognise and mitigate these issues in themselves and others as part of their TEM actions.
- HF issues are physical, cognitive and interpersonal.

LESSON PLANNING AND CONDUCT

It is recommended that the theory involved with this unit be split and delivered in several sessions.

This could be delivered as on-line sessions, part of a ground school or on non-flying days due to weather.

A GFA PowerPoint is available to assist in presenting this unit (see Theory courses) and the *GFA Human Factors for Gliding* is available on the GFA Website under Safety/Reference Materials.

BRIEFING

Fitness to Fly

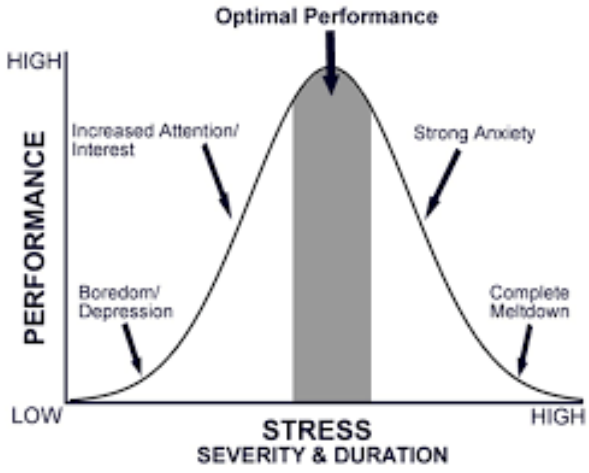
Medical fitness to fly is not just a doctor's assessment, it is beholden on every pilot to self-assess their fitness to fly before and during each flight. The following mnemonic is an aid to that self-assessment:

IMSAFE

- Illness:

- Have I any illness that can affect my performance in flight? e.g., Colds may block sinuses leading to eardrum pain and damage.
- Do I feel unwell?

- Medication / Drugs:
  - Am I taking any prescribed or over the counter meds or drugs that can affect my performance in flight? eg Pain killers, codeine, anti-histamine, beta-blockers.
  - CASA Drug and alcohol testing.
  - Air Sports Australia Confederation Anti-Drug Policy.
- Stress:



  - Underload.
  - Optimum (Eustress).
  - Overload (Distress).
  - Where personal problems fit.
- Alcohol:
  - Legal limitation.
  - 8 hours between bottle and throttle may not be enough after heavy alcohol consumption.
- Fatigue:
  - Adequate rest and sleep.
  - Long flights/ days.
  - Accumulation of fatigue over time (sleep debt).
- Eating:
  - Healthy and regular diet.
  - Hydration.

- Glucose control throughout flights.

The 5 Hazardous Attitudes All Pilots Should Avoid

Anti-authority ("Don't tell me!") - Don't like anyone telling them what to do. Resentful of rules & regulations.

- Antidote: Follow the rules, they're usually right (and written in blood!)

Impulsivity ("Do something - do it now!") - Need to do something, anything, quickly. Don't stop to think about better alternatives.

- Antidote: Not so fast... think first.

Invulnerability ("It won't happen to me.") - Accidents happen to other people, not to me. Therefore, I can take chances.

- Antidote: Consider that it could happen to me.

Macho ("I can do it.") - Always trying to prove themselves better than others. Take risks and try to impress others.

- Antidote: Taking chances is foolish.

Resignation ("What's the use?") - I really can't make a difference. It is going to happen anyway, why bother? Leave it to others.

- Antidote: I'm not helpless, I can make a difference. Never give up.

Aviation Decision Making (ADM) Model

The accuracy of fast decisions may be improved with preparation and prior deliberation, for example choices about launch-failure options during the pre-take-off check.

Decision making is divided into Fast (instinctive) and Slow (deliberate) thinking models. Pilots need to know when to use each system.

Fast thinking is useful in emergencies and when decisions must be made quickly, generally from predetermined options (such as launch emergencies or spin recovery). Slow thinking is useful for deliberate decision making where time is available to consider different options and outcomes.

DECIDE

A formal model (based on the mnemonic 'DECIDE') is used to provide structured decision making that encourages deliberate decision-making.

- **Detect** – the fact that a change has occurred.
- **Estimate** – the need to react to or counter the change.
- **Choose** – a desirable outcome for the flight or situation.
- **Identify** – actions to control the change successfully.
- **Do** – take the necessary actions.
- **Evaluate** – the effects of the action to react to or counter the initial change.

Additional Human limitations

Discuss the following items with reference to GFA Human Factors for Gliding.

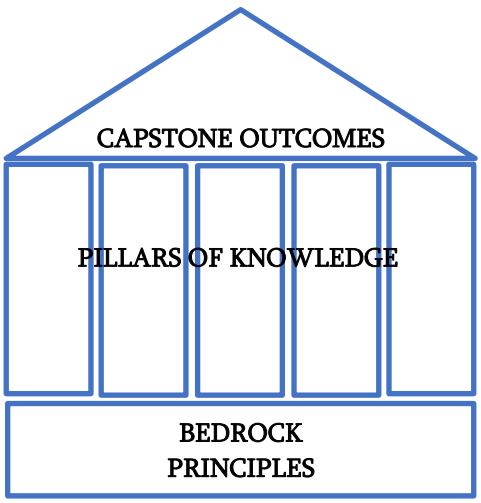
- Eyesight:
  - Limits;
  - Spectacles usage;
  - Sun glasses.
- Ears:
  - Vertigo;
  - Eardrums;
  - Sinus blockage.
- “G” forces:
  - “G” increase in turns/aerobatics:
  - “G” induced Loss of Consciousness (GLOC);
  - Sub-gravity (i.e. 0-1 G) testing.
- Oxygen:
  - Hypoxia with altitude;
  - Legal requirements.

AirManShip (an easy proword)

- AIR –good aviators that have good technical skills.
- MAN (kind) – people that can be an inspiration to their students and provide quality instruction.
- SHIP – personnel that respect the aircraft and work within the systems that support them.

To be practiced both in the air and on the ground.

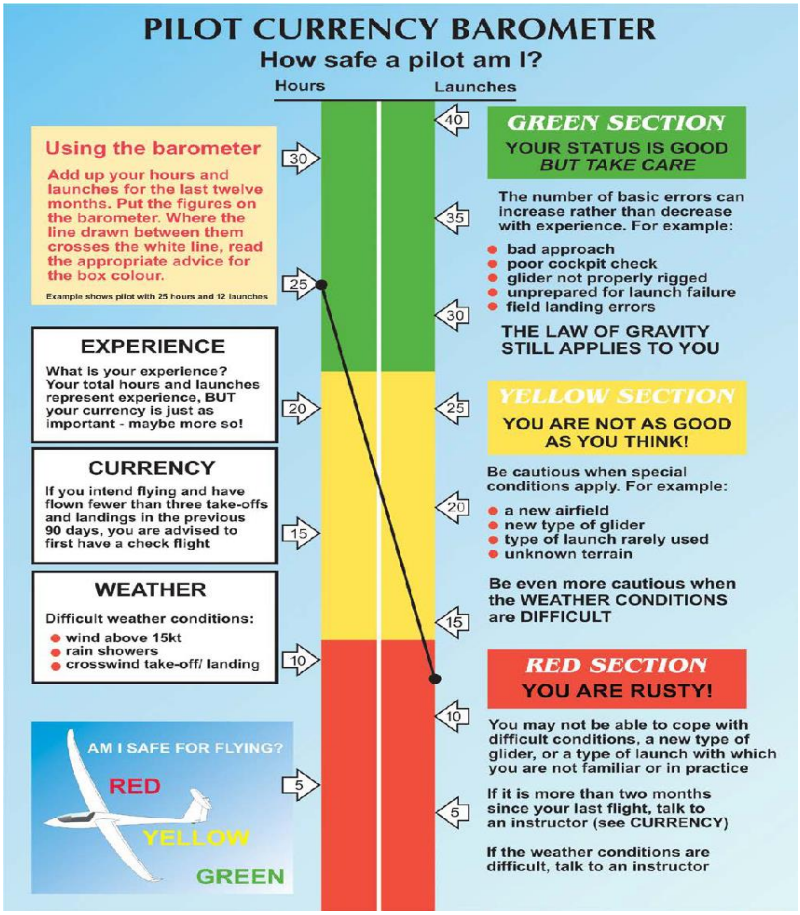
Airmanship is like a building:



- Capstone Outcomes:
    - Situational awareness:
        - PERCEPTION - What is happening?
        - COMPREHENSION - What does it mean?
        - PROJECTION - Projecting what might happen in the future? I.e. Getting ahead of the situation.
- Judgement:
        - Using skills, knowledge, experience and intelligence to analyse a situation and decide a course of action.
- Pillars of Knowledge:
    - Self.
    - Aircraft.
    - Team.
    - Environment.
    - Risk.
- Bedrock principles:
    - Discipline.
    - Skills.
    - Proficiency.

Pilot Currency

Discuss Skills and Proficiency associated with Pilot Currency.



FLIGHT EXERCISES

Apart from demonstrating the performance standards, specific inflight demonstration and practice are not required, this is an underpinning theory unit.

Choose appropriate occurrences from the Occurrence Summaries on the GFA website to analyse for Human Factors.

Student should demonstrate and identify human factors affecting them pre, during and post flight.

Advice to Instructors regarding their responsibility to maintain safe flight.

Identify when the student's performance is affected by human factors and take action to mitigate the factors affecting the safety of the operation.

Notes:

- The theory in this unit should be given relevant context and practical examples, and/ or reference to appropriate SOAR occurrence reports.

COMMON PROBLEMS

Problem	Probable Cause
• Student does not recognise a medical condition such as fatigue, hydration, illness.	Student's eagerness to fly is biasing other judgement. Discuss their feeling and potential issues with flight, potentially reschedule sortie.
• Student exhibits one of the HAZATTs during training.	Student may not be aware of HAZATT or may be copying behaviours noted from other members. Reiterate the need to continually assess our attitudes and behaviours to prevent creeping erosion of standards.

THREAT AND ERROR MANAGEMENT

- Errors arising out of human factors must be detected, estimate the alternatives, choose the best course of action, do it, then evaluate the action.
- Such errors must not be allowed to result in undesired aircraft states (UAS).

TRAINING MATERIALS AND REFERENCES

- GPC Pilot Guide Unit 24
- GFA Human Factors for Gliding OPS0010
- Occurrence Summaries on the GFA website under Documents/Forms /Operations

The following are recommended further reading on the subject:

- Aviation Decision Making: FAA Advisory Circular 60-22 1991
- Flight Discipline: Tony Kern February 1998
- CASA Human Factors in sport, recreation and general aviation Course (https://www.casa.gov.au/education/elearning-catalogue)
- Introduction to the Generic Pilot Proficiency Program: Mark W Riley: Aviation Safety Foundation Australasia (ASFA) 2007
- Risky Business: WA Department of Local Government, Sport and Cultural Industries, Website 2020
- Safe Work Australia website glossary 2020
- Safety Management Kit: Booklet 3: Safety Risk Management: CASA December 2014
- SKYbrary website Eurocontrol: 2020

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Unit 25

Threat and Error Management

Unit 25 - Threat & Error Management

AIM

To develop the skills and knowledge required to:

- recognise and minimise the impact of threats; and
- manage any subsequent errors in an aircraft in order to prevent these leading to an undesired aircraft state.

This unit develops non-technical skills and knowledge that underpins all GPC units and aviation activity.

PRE-REQUISITE UNITS

There are no pre-requisite GPC units to this unit.

COMPLEMENTARY UNITS

This unit should be delivered in close conjunction with:

- GPC Unit 24 Human Factors and Pilot limitations.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS

1. **TEM definitions.**	• Describe:
	  ○ Pristine flights,
	  ○ Threats,
	  ○ Errors, and
	  ○ Undesired Aircraft States (UAS).

2. **Prepare for flight using TEM strategies.**	• Demonstrate:
	  ○ A briefing for flight using TEM strategies:
	  ○ Daily self-assessment (IMSAFE);
	  ○ Assessment of the weather;
	  ○ Identifies if there are any NOTAMed Threats;
	  ○ Assessing what tasks are achievable;
	  ○ Identification of any other threats (e.g. Airspace, bush fire risk, landable terrain, known traffic etc.).

3. Conduct flight using TEM strategies.	• Describe:
	  ○ How biological functions create threats and;
	  ○ Mitigation through effective nutrition, hydration and waste management strategies;
	  ○ How to recognise and mitigate fatigue.
	• Demonstrate:
	  ○ Monitoring and positive strategies to identify and manage in-flight threats and aircraft handling, procedural communication or committed errors before an UAS occurs;
	  ○ Diligently using Standard Operating Practices (SOPs) / Procedures / Checks;
	  ○ Not succumbing to time or other perceived pressure;
	  ○ Conducting a Situation Awareness review after a period of high workload or interruption;
	  ○ Observing personal limits:
	  ▪ Particularly with respect to transition from Soaring Pilot to Landing Pilot or;
	  ▪ In cross wind conditions or:
	  ▪ When feeling fatigued.
	  ○ Performing post-flight evaluations and describing:
	  ▪ What threats were mitigated?
	  ▪ What errors were exhibited but managed?
	  ▪ What was learned?
	• What can be improved on in future flights?

KEY MESSAGES

- Threats come at you, while errors come from you.
- Our aim is for Pristine Flights - any variation to a straightforward pristine flight is a threat.
- Mismanaged threats can lead to errors.
- Errors can lead to Undesired Aircraft States (UAS).
- A UAS can lead to an aircraft incident or accident.
- Pilots must use TEM strategies to mitigate against Threats and Errors.

LESSON PLANNING AND CONDUCT

Briefing

Definitions

Pristine Flight:

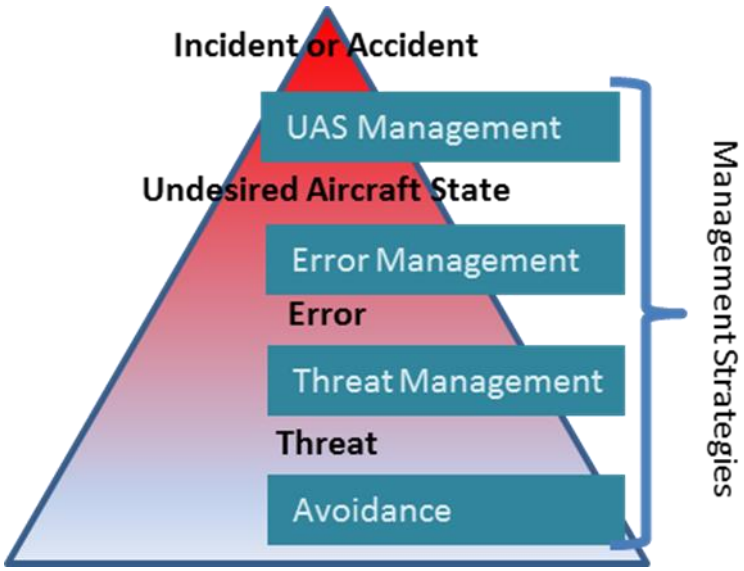
- Flight carried out entirely in a normal manner from pre-flight initiation to post-flight completion.

Threats:

- Any variation to a straightforward pristine flight is a threat;
- Every threat increases the likelihood of an error being committed;
- Every threat requires a positive strategy to manage it and prevent errors.

Errors:

- Slips
    - Observable externally;
    - Inadvertent fall to a lower level.
- Lapses
    - Observable internally only;
    - e.g., Lapse of memory.
- Mistakes
    - Rule or knowledge-based error.
- Violations
    - Deliberate avoidance of rules/Standard Operating Procedures (SOPs) such as not conforming to minimum distance from other aircraft, thermalling rules or conducting checks.



Uncorrected errors can lead to an Undesired Aircraft State (UAS):

- Pilot induced aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration, associated with a reduction in margins of safety,
- e.g. wheels up, stall, spin, Airprox (near miss), in-flight break-up, fuel exhaustion.
- A UAS can lead to an aircraft incident or accident, which could have been prevented if the original threat, or the resulting error had been handled better.

Threats come at you, while errors come from you

Every glider flight, whether local, cross-country or competition, involves some threats, and all pilots must ensure they recognise these and have a strategy to manage the threats and prevent errors, and/or have a process to catch errors that may have occurred.

Remember we ALL make some errors on every flight - the important thing is to ensure they are not critical ones, or that they are captured before they lead to an UAS.

Useful Strategies

The following are just a few examples of TEM strategies that should become automatic to be a skilled and safe pilot:

- Prepare for flight:
    - Daily self-assessment (IMSAFE);
    - What's the weather?
    - What are the NOTAMed Threats?
    - Is the aircraft serviceable and prepared?
    - What task should be achievable?
    - What other threats are there? (e.g. Airspace, Bush fire risk, Landable terrain)
- Take advice from other pilots, especially experienced glider pilots.

- Use SOPs / Procedures/Checks diligently.
- Maintain sterile environments when necessary.
- Don't succumb to time or other pressures (get-home-itis, more people to fly, aircraft unserviceability),
- Plan the flight, fly the plan.
- Always fly the glider first – and always be thinking ahead of the aircraft.- anticipating not reacting.
- Maintain effective nutrition, hydration and waste management.
- Recognise the potential for fatigue and if fatigued be more careful and conscientious.
- After interruptions, say "Where was I?"
- Always carry out a Situation Awareness review after a period of high workload.
- Set limits and stick to them - particularly with respect to landing decision making;
    - Make an effective and clear transition from "Soaring" Pilot to "Landing" Pilot.
- Don't "see what you expect to see" – look for threats and errors.
- Listen to "that little voice" that questions what you are doing.
- Always evaluate after flight:
    - What threats were mitigated?
    - What errors were exhibited but managed?
    - What was learned?
    - What can be improved on in future flights?
- Check your personal ATTITUDE:
    - safety above all else;
    - it is after all a sport and should never become a life-or-death situation.
- Acknowledging your vulnerability to errors is actually a sign of strength.
- In flying, you never stop learning.
    - Every flight, whether you have 50 hours, 500 hours, or 15,000 hours, presents you with the threats that must be recognised and managed.
- On every single flight you need to ask:
    - What are my threats today?
    - How will I manage and mitigate these?

Notes:

- It goes without saying that the onus is on trainers to demonstrate good standards of TEM.
- Never deliberately induce threats to the environment, particularly interfering with aircraft systems. That is dangerous and unlawful. Instead, discuss scenarios where the student needs to consider Threats, Errors and mitigation strategies.

- Gather examples of experiences to describe where TEM has been applied (or not applied) in local flying operations if pristine flights are experienced.
- Use the Human Factors input as a key source of threats. Pilots must use TEM strategies to mitigate against Threats and Errors.

Flight Exercises

Trainer to:

- demonstrate how to prepare a day's briefing using TEM strategies;
- identify during flight operations when TEM is used.

Student to:

- demonstrate how to prepare a day's briefing using TEM strategies;
- identify during flight operations when TEM is used.

Post Flight:

- Debrief to identify all threats – which were expected, which were not;
- Did these lead to errors and how were these handled?
- Did the errors progress to a UAS?

THREAT AND ERROR MANAGEMENT

- Management of threats and errors specific to the safety of training this unit (if any)
- Student training on threat and error management for competencies in this unit

TRAINING MATERIALS AND REFERENCES

- Gliding – Threat and Error Management: Arthur Gatland; Soaring: June, August, October 2010.
- Human Error; James Reason; Cambridge University Press: 1990.
- Human Factors for Pilots; Package; CASA: 2012
- Threat and Error Management in Flight Operations: SKYbrary webpage: Flight Safety Foundation.
- Theory Lesson 8 PowerPoint Presentation

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Unit 26

Assessment of Competence for First Solo

Unit 26 - Assessment of Competence for First Solo

AIM

To:

- Assess whether the student is competent to safely carry out a successful first solo flight;
- supervise the safety, conduct and debriefing of the first solo flight; and
- promote continuance of further training towards the GPC.

PRE-REQUISITE UNITS

- GPC Units 1 through 25.

COMPLEMENTARY UNITS

There are no complementary units to this GPC unit.

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. **Pre-solo flight review and briefing.**	• **Demonstrate:** ○ Meeting the experience and training criteria through inspection of the student's training record and logbook to ensure Units 1-25 are signed as competent - particularly GPC Unit 22 (Rules of the Air). ○ Units 11 and 19 only if conditions allow, Units 21 and 22 if aircraft equipment allows. Units 24 and 25 rated 4 or 5. ○ That the Student's logbook includes the GFA Flight Radiotelephone Operator's Logbook Endorsement. ○ Consistently safe take-offs, circuits and landings. ○ Application of lookout scanning techniques ○ Recent successful practice in abnormal and emergency procedures. ○ Assessment of weather and traffic conditions as suitable for the flight. ○ Identification of and briefing on possible threats and errors. ○ Assessment of the student's medical, attitude and physical suitability for solo flight. ○ Acknowledgement of the solo flight approval, parameters, limitations & instructions set by the authorising Trainer.
2. **Solo glider flight.**	• **Demonstrate:** Solo flight conducted in accordance with: ○ CASA/GFA Regulations, airframe operational procedures & limitations and local aerodrome procedures. ○ Briefed procedures with a normal aircraft landing.
3. **Post solo flight review and briefing.**	• **Demonstrate:** ○ Self-evaluation in debriefing on the solo flight performance with the authorising Trainer. ○ Recording of solo flight details in the student's training record and logbook. ○ Knowledge of the specific limitations and requirements for further solo flight set by the authorising Trainer.

Unit 26 - Assessment of Competence for First Solo

KEY MESSAGES

- The student should be instructed to repeat the last successful performance and stay within specifications of the solo flight plan approved by the authorising Trainer.
- Whilst solo is an important step in a pilot's development, it is only an intermediate point and that further training will lead to a GPC with the privileges associated with that achievement.
- Safety before polish with the skill to handle the degree of responsibility given them, is the standard a student must attain before first solo.

LESSON PLANNING AND CONDUCT

Briefing

There is no ground briefing component for this Unit.

Flight Exercises

The main requirement is not for polished flight but for consistently safe flight with general competence, ability to identify threats, prevent or mitigate errors before the safety of the flight is affected.

The Trainer must be satisfied that the student can:

- Conduct all checks correctly without prompting.
- Conduct a take-off and launch without instructor intervention.
- Cope with low level launch failures without panic.
- Maintain adequate lookout and situational awareness.
- Brief on the emergency procedures for the launch system in use.
- Identify symptoms of an approaching stall.
- Recover from a stall with minimum loss of height.
- Safely convert from Soaring Pilot to Landing Pilot without prompting
- Conduct the pre-landing check correctly.
- Maintain a safe speed near the ground.
- Conduct balanced turns without excessive bank onto base and final.
- Fly several consistently safe circuits and landings in a row.
- Maintaining stabilised approach on each flight.
- Exhibit no faults on landing such as holding off too high or bouncing.
- Cope with the prevalent traffic and weather conditions.
- Maintain directional control of the aircraft on the ground after landing.

Notes:

- Trainers should not submit themselves to any pressure of persons, time or weather conditions to send any student solo that they still have doubts over.
- It is recommended that where there are lingering doubts, another Trainer is asked to conduct an assessment flight with the student to more clearly identify any problem areas.
- Ideally the student should be given minimum notice of their first solo as anticipation can lead to apprehension and deterioration of skill.
- Everything should be in readiness so that the student can be sent off after a dual flight with the minimum of delay and in the same aircraft.
- Briefing prior to first solo should be kept to a minimum and only those things which they will find different (e.g., aircraft ballast configuration, improved rate of climb on the launch, lower rate of sink, different trim positions and glider "feel") when flying solo.
- If the student shows distress at the prospect of going solo, under no circumstances should they be forced to fly solo against their will.
- The Trainer should ascertain then from the student any sequence about which they feel apprehensive, and further dual flights should be made with emphasis on the sequence in question until the doubt in the student's mind as to their ability to handle the sequence is eliminated.
- The authorising Trainers should also report the student's progress to the CFI and Training Panel to ensure follow-up with further GPC training.
- The Trainer should ensure that any remedial training/action, where required, is noted in the Student Training Record.
- The Trainer must ensure that they do not send a pilot solo in deteriorating light or weather conditions.

Advice to Trainers regarding their responsibility to maintain safe flight.

Can the Trainer sit back relaxed on several flights with the student, without having to handle the controls or cue the student at any stage?

If the trainer feels it necessary, at any part of the flight, to be very close to the controls or give advice during any sequence or stage of the flight, the student requires further training before solo.

Ground, launch and support staff must be briefed by the authorising Trainer prior to the solo flight.

The authorising Trainer should closely monitor and supervise the solo flight from beginning to end with access to a VHF Flight Radio.

COMMON PROBLEMS

Problem	Probable Cause
• Nervous / under confident student.	Student may feel they are not ready for solo flight.

	Trainers can go through training record to demonstrate competence and ask student what concerns or questions they have. If still uncertain, additional pre-solo assessment flights can be made to show student that they are sufficiently skilled. However never force a student to fly solo if they do not wish to.
• Overconfident / demanding student.	Student may feel they are being 'held back' from going solo as their perception of their competence is higher than the Trainer's. Identify and discuss the areas of concern with the student so there is no doubt about the areas of competency that require improvement. An assessment flight with a different trainer may assist in identifying areas requiring improvement.

Debrief

Ensure the student is congratulated on their accomplishment and advised on the limitations of future solo flight such as the need for check flights and maintaining currency.

Discuss any issues:

- Identified by the student during their flight.
- Noted from the ground by the supervising Trainer.

THREAT AND ERROR MANAGEMENT

- Threats presented by prevailing environmental conditions (weather, traffic, etc.) are critical issues to be considered for the solo flight. The student and Trainer should independently assess these.
- Aircraft loading limitations may present a threat that the student is not used to due to the weight of the back-seat Trainer not being present for the solo (explain the glider may get off the ground quicker etc; landing may be slightly different). The student will need to understand how to fit ballast securely in the aircraft.
- It is recommended that if possible, the authorising Trainer has access to a handheld radio for the duration of the solo flight to alert unexpected conflicting traffic or conditions. However calls should be kept to the minimum required for important information to avoid this being a distraction to the student.

TRAINING MATERIALS AND REFERENCES

- GPC Unit 26 Pilot Guide.
- Flight Instructor Manual – Aeroplane Issue 2: CASA 2006.
- Flight Instructor Reference Manual: Recreation Aviation Australia 2017.