

# **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
<b>1. Straight flight is conducted at various speeds:</b>	<ul style="list-style-type: none"> <li>• <b>Demonstrate:</b> <ul style="list-style-type: none"> <li>○ 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;</li> <li>○ Maintaining a constant airspeed with the Airspeed Indicator covered;</li> <li>○ Maintaining straight flight with wings level and balanced (as per yaw string).</li> </ul> </li> </ul>
<b>2. Trim aircraft:</b>	<ul style="list-style-type: none"> <li>• <b>Demonstrate:</b> <ul style="list-style-type: none"> <li>○ Maintaining nominated attitude whilst aircraft is trimmed;</li> <li>○ Confirmation of correct trim;</li> <li>○ Adjustment of trim whenever speed is varied.</li> </ul> </li> </ul>
<b>3. Maintain straight flight to nominated track:</b>	<ul style="list-style-type: none"> <li>• <b>Describe:</b> <ul style="list-style-type: none"> <li>○ The heading and the achieved track.</li> </ul> </li> <li>• <b>Demonstrate:</b> <ul style="list-style-type: none"> <li>○ Flight towards a nominated distant point on the horizon;</li> <li>○ The nominated track is maintained, with correction for drift;</li> <li>○ Attitude remains stable, with coordinated control movements to maintain wings level without slip or skid;</li> <li>○ Appropriate look-out –cruising and targeted scan.</li> </ul> </li> </ul>

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### 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.

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- 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.

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- 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.

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- 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:

- Always start and finish at the stable platform.
- 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.
- 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.
- 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.
- 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
<ul style="list-style-type: none"> <li>Attitude not stable.</li> </ul>	The student may be watching the ASI rather than horizon – cover ASI.

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	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.
<ul style="list-style-type: none"> <li>Failure to select appropriate attitude.</li> </ul>	Possible confusion with regards to defining nose attitude. Emphasise horizon, question where the horizon cuts the canopy.
<ul style="list-style-type: none"> <li>Difficulty determining attitude when flying towards undulating terrain or in poor visibility when the horizon is not clear.</li> </ul>	Have the student hold the attitude constant to maintain a constant airspeed without worrying too much about the actual airspeed.
<ul style="list-style-type: none"> <li>Speed change is very slow.</li> </ul>	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.
<ul style="list-style-type: none"> <li>Glider wanders off track.</li> </ul>	<p>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.</p> <p>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.</p> <p>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.</p> <p>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.</p>
<ul style="list-style-type: none"> <li>Wandering and sideslipping.</li> </ul>	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.

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- 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