

Gliding Australia Training Manual

Pilot Guide



Unit 8

Sustained Turns, All Controls

Unit 8 - Sustained Turns, All Controls

WHAT THIS UNIT IS ABOUT

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.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

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

COMPLEMENTARY UNITS

- NIL

KEY MESSAGES

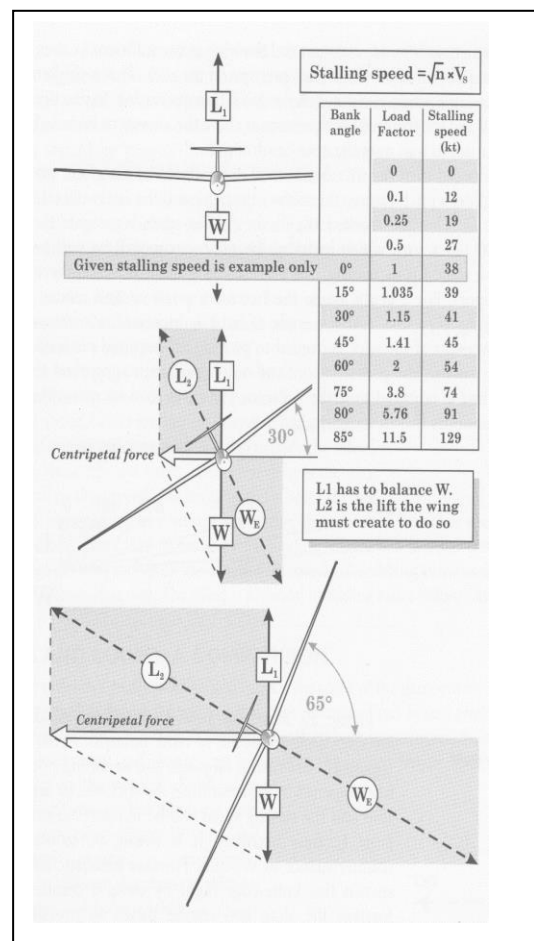
- Gliders spend most of their time aloft in sustained turns.
- Lookout is essential – before entering, during and before exiting the turn.
- Have a relaxed grip on the control column.
- Correct hand-over/take-over procedure and expected action and verbal response to each.
- Lookout to clear any airspace before turning into it.
- Use of all controls must be coordinated.
- 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.

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PILOT GUIDE FOR THIS UNIT

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 you 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. The more the glider is banked over, the greater the rate at which the glider will turn.
- You need more elevator to provide the extra lift required for the turn.
- 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 into 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.
- Higher angles of bank require greater control inputs.

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- 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.
- Each time you scan towards the glider's nose, check the nose attitude.

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 "ARE".

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.

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- Use elevator trim for the new configuration.
- Maintain cruise scan and regular full scan to maintain situational awareness.

FLIGHT EXERCISES FOR THIS UNIT

- Turn entries
- Sustaining Turns
- Correcting coordination or attitude errors in the turn.
- Varying the angle of bank.
- Varying the speed
- Exiting the turn pointing to a specific heading
- Reversing turns

- The table below gives a guide to the various factors to be considered in making turns.
- The table represents a modern training two-seater of about 600kg All Up Weight (AUW) and 34 to 1 glide angle.

To complete a 180 degree turn at 65 knots

Bank angle	Time (Secs)	Height loss(ft)	Turn radius (ft)
10 degrees	60	240	2,100
20 degrees	30	120	1,000
30 degrees	20	75	650
40 degrees	13	55	450

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THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS

- Failure to look out properly before turning.
- Insufficient rudder with aileron at turn entry.
- Not looking ahead while rolling into the turn.
- Not scanning while turning.
- Not removing rudder once bank achieved and aileron is neutral.
- Failure to maintain back pressure in the turn.
- Looking at ASI instead of monitoring nose attitude (The Nose Knows!)
- NEVER try to turn a glider in flight by using rudder alone. Only on the ground is this acceptable when steering the glider.

HOW DO YOU DEMONSTRATE COMPETENCE?

- Describe how you use the primary flight controls to turn the aircraft.
- Show how you enter and exit a coordinated turn.
- Maintain a coordinated turn with varying bank and airspeed.

RESOURCES & REFERENCES

[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.

SELF-CHECK QUESTIONS

Use these questions to test your knowledge of the unit.

1. What action must never be omitted before turning the aircraft?
2. What are the controls used to turn the aircraft?
3. Why does the nose drop in a turn?
4. What controls the airspeed in a turn?
5. What does the mnemonic "ARE" stand for and when is it used?
6. What does the "Nose Know"?
7. What is adverse yaw and what causes it?

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8. What is the secondary effect of rudder?
9. What does being "coordinated" mean in a turn.
10. If the yaw string is to the right of centre, which control is used to correct it?
11. If you are turning and the glider starts to noticeably increase its bank angle without any input from you, what is the problem and what would be your action?