

Gliding Australia Training Manual

Trainer Guide



Unit 30 Thermal Centring Techniques

Unit 30 - Thermal Centring Techniques

AIM

To develop the student's skills and ingrained habits in centring thermals effectively.

PRE-REQUISITE UNITS

- GPC Unit 11 Introduction to Soaring
- GPC Unit 26 Assessment of competence for first solo

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 31 Thermal Entry

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Demonstrate glider control and awareness	<ul style="list-style-type: none"> • Demonstrate <ul style="list-style-type: none"> o Good lookout o Consistent bank and attitude in Thermaling turns o Use of coordinated controls in Thermaling turns
2. Thermal centring	<ul style="list-style-type: none"> • Describe <ul style="list-style-type: none"> o Lag limitation of total energy vario and impact on centring o The feel and vario techniques for thermal centring • Predict <ul style="list-style-type: none"> o Where the core is relative to the glider • Demonstrate <ul style="list-style-type: none"> o Centring to achieve positive climb at all points for two Thermaling turns o Effective Thermaling in both directions

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KEY MESSAGES

- Horizontal thermal structure and size
- Awareness of accelerations and gusts and how they feel - feel of vertical accelerations is instantaneous
- The vario always lags because it takes time to accelerate the glider upwards or downwards, typically a glider turns through 45-60 degrees in this time – this must be compensated for when using the vario to centre
- Maintain coordinated control of the glider with consistent bank and attitude (actual angle not critical)
- Use terms vertical acceleration or surge, not lift and sink
- Students who are successful using the feel technique need to understand the vario technique as well

LESSON PLANNING AND CONDUCT

Briefing

Brief the horizontal structure of a thermal with reference to the diagrams in the pilot guide for this unit.

Brief the lag limitations of variometers as discussed in the pilot guide for this unit (gust limitations are covered under thermal entry).

Reinforce the importance of developing a mental picture of the lifting and sinking air while Thermaling and the location of the core.

The two standard techniques below should be trained – each identifies the point of correction by different means but the action in each case is the same.

1. Feel Technique (Ignoring the vario)

Thermaling by feel is by far the best technique and other techniques are secondary. In the ideal situation, we will feel upward and downward accelerations or surges.

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. On the next turn repeat if necessary.

2. Vario Technique

The student may not feel acceleration because the thermal is very wide, the strength is low, the glider has little natural feel, the student is too tense, or for a number of other reasons. For this reason a secondary technique is trained using vario indications. This technique compensates for vario lag. Vario lag will be different for each glider/weight/vario combination and generally equates to around a 45 to 60 degree portion of a typical Thermaling turn.

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. On the next turn repeat if necessary.

Note:

- The period of 2-3 seconds at reduced bank is the time to hold that bank; it does not include the time to reduce and increase bank.

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- Speed and bank angle changes will change the turn radius and centre; unless these are constant when centred, the centre of the thermal will be quickly lost.
- With both techniques, the vario indication is used to confirm that the thermal has been centred. If a positive vario indication remains reasonably constant throughout a turn, then the thermal has been centred.
- Beware of vario installations that have leaks or produce variable lag.
- The yaw string should be a little on the outside of the turn (slight slip). Thermaling with the yaw sting on the inside of the turn risks a spin.

Flight Exercises

Feel Technique

Demonstration. Position the glider in a thermal so that it is not centred. Ask the student to describe what is being felt at each point in the turn and from that identify where the centre of the thermal is most likely to be. Ask the student to identify the surge and correct using the feel technique. It is important to fly smoothly at a constant attitude so that the student has the best chance of feeling the surge.

Suggested Patter

"I'm going to demonstrate thermal centring by feel. On the next turn we should expect to feel a surge as we fly into the stronger part of the thermal. Tell me when you feel the surge... OK that's great, remembering the diagram from the briefing, the thermal is a little to our right when we feel the surge. Tell me again when you feel the surge... lookout in the direction we'll be correcting... OK, reducing bank ...1...2. 3. Back into the turn now and we'll do a full turn to see if it worked... Do you think we need to try again? ..."

Student Exercises. Position the student in the thermal as before and have them repeat the actions demonstrated. Once the student has centred the thermal, take control again and move them away from the core to repeat the exercise.

Vario Technique

Demonstration. Position the glider in a thermal so that it is not centred. Fly a complete accurate circle and ask the student to identify the vario minimum. Emphasise the importance of maintaining lookout – use audio as a cue. Identify a ground feature 45 degrees from that point and correct when at that identified heading.

Suggested Patter

"Now demonstrating using just the vario. We need to keep looking out, listen to the audio and check the vario needle when necessary. On the next turn let me know when you think the vario is indicating the peak and the minimum... OK, that's great. On the next turn we'll pick a ground feature 45 degrees to our right when the vario is at the minimum then reduce bank on that heading... lookout in the direction we'll be correcting ... OK, there's the minimum. That farmhouse looks like about the right angle... reducing bank ...1...2...3. Back into the turn..."

Student Exercises. Position the student in the thermal as before and have them repeat the actions demonstrated. Once the student has centred the thermal, take control again and move them away from the core to repeat the exercise.

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Flight Management

The most effective means of teaching pilots to thermal requires an extensive ground briefing away from the glider. There is too much happening in a short space of time, both in terms of sensory inputs to the pilot as well as required control inputs in relation to what is felt for this to be effectively taught only in the air.

The pilot should not be loaded with other tasks/exercises at the same time.

In their air, students must be prevented from making control inputs without suitable lookout first. This means the trainer needs to be well ahead of the student to be certain the sky is clear and able to see the students head move. Remember, the student could well turn in the opposite direction to what the trainer thinks is best.

Don't introduce thermal centring when there are other gliders in the thermal at similar height (within 500 feet). Once the student has a good grasp of the concepts this can be relaxed.

COMMON PROBLEMS

Problem	Probable Cause
<ul style="list-style-type: none"> Not maintaining constant nose attitude 	<ol style="list-style-type: none"> Flying using airspeed indicator instead of nose attitude relative to the horizon Not trimmed correctly <ul style="list-style-type: none"> Note: Tail ballast may be required to allow sufficient back trim for heavier pilots
<ul style="list-style-type: none"> Not maintaining constant angle of bank 	Not using visual references for angle of bank. Direct the student to visual references such as instrument screws and glare shields.
<ul style="list-style-type: none"> Not feeling surges 	The student may be distracted by the vario (visually and aurally). For this training exercise, consider turning the sound off and covering the vario.

Debrief

Review

- Lookout
- Requirement for precise coordinated flight
- Using acceleration feel to position the glider with respect to the core
- Using the vario as an indicator to identify where the core is
- How to position the glider's circle to where it needs to be
- Using the vario as confirmation the thermal has been centred

THREAT AND ERROR MANAGEMENT

- The primary threats for thermal centring are collisions with other aircraft and stall/spin. Both should be considered for the conduct of the flight exercises and the student should be trained to recognise the threats and mitigating actions.

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- Effective lookout must be maintained at all times with a regular full scan and targeted scan before maneuvering in the thermal. Given the time taken for a full scan this will need to be anticipated and conducted prior to the re-centring trigger. Be wary of not maintaining lookout in particular when training the vario technique and encourage your student to only glance at the vario when necessary.
- Do not change the direction of the turn while Thermaling, even if you think there are no other gliders in the thermal or nearby.
- Skidding turns when Thermaling may not be recognised before a spin develops. Be wary of an increasing skid combined with further back stick to keep the nose on the horizon – the result is likely to be a spin without warning. The yaw string should always be a little on the outside of the turn – in this state the glider is unlikely to spin (and it's also most efficient).