Gliding Australia Training Manual

Pilot Guide

Unit 31

Thermal Entry

Unit 31 - Thermal Entry

WHAT THIS UNIT IS ABOUT

This unit will develop your knowledge and skills for safe thermal entry and the first thermalling turn.

WHAT ARE THE PRE-REQUISITES FOR THIS UNIT?

- GPC Unit 30 Thermal Centring Techniques

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 32 Soaring with Other Gliders

KEY MESSAGES

- Initial turn direction is less important than making the turn – it can be corrected if wrong
- Minimise changes in attitude during entry to maximise feel
- Lookout with respect to thermal entry and ongoing scan
- The vario indication is not particularly useful for thermal entry due to lag and gust sensitivity. In particular the vario indicates rising are with a lag and horizontal gusts instantaneously, so it's very important to learn to enter thermals by feel
- Steps for thermal entry
- Patience

PILOT GUIDE FOR THIS UNIT

Thermal entry is the process of transitioning from cruising flight to thermalling (including the first turn). Ideally the thermal is perfectly centred after entry, but more likely you will need to re-centre as discussed under GPC Unit 30 – Thermal Centring Techniques.

It is important to have a good understanding of the horizontal structure of a typical thermal and identify where you are relative to that structure as you fly through it.

It's also important to understand the limitations of the vario. Total energy variometers respond to changes in total energy derived from altitude and speed. From GPC 30 Thermal Centring Techniques, you should be aware of the lag limitation of varios but they are also sensitive to gusts. The turbulence around thermals causes horizontal gusts that may increase or decrease the total energy – this happens instantaneously and may completely mask vertical indications on a vario. So the vario indicates the good rising air with lag but useless gusts instantaneously making it a poor instrument for judging thermal entry. You will barely feel the horizontal gusts but you will feel vertical accelerations instantaneously – that's why it is very important to learn to enter thermals (and centre thermals) by feel.

When approaching a thermal, there is a good chance others are as well and from any direction. A FULL and TARGETED lookout scan is essential to ensure situational awareness and to predict where each glider is likely to be when the thermal is joined well before actually entering the thermal.

Three key decisions must be made:

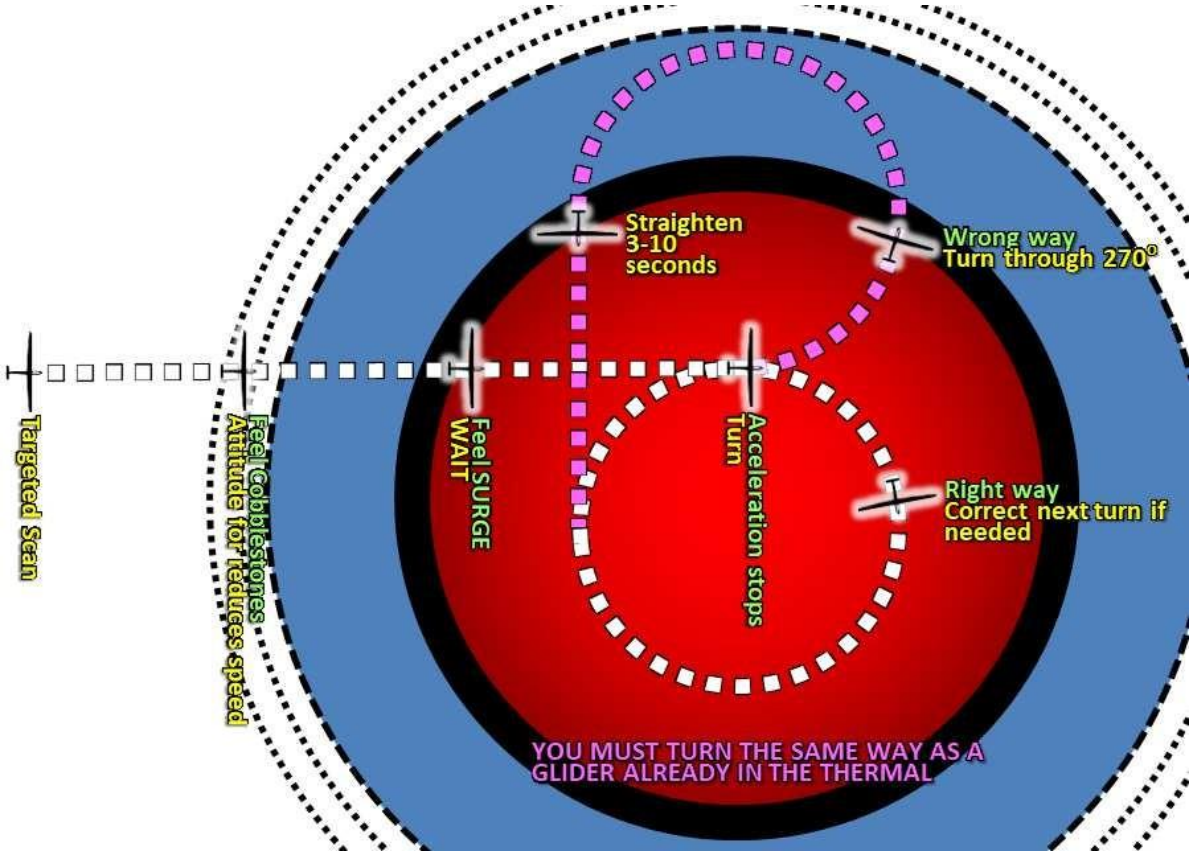
1. Deciding if you will turn;
2. When to turn; an
3. Which way to turn.

Deciding if you will turn is covered in detail in GPC 40 – Cruising, speed to fly, height bands and thermal selection. When to turn is covered below. Which way to turn is far less important than turning at the right time (assuming that there isn't another thermalling glider defining the direction).

Experienced pilots turn the 'wrong' way almost half the time – don't expect to do better!

If joining a thermal with other gliders, the turn must be in the same direction as the other gliders regardless of what height the other gliders are at, and if at similar height the glider should be positioned opposite. The direction of turn of other thermalling gliders can take a while to establish when approaching. Once the direction of turn is clear, aim to arrive outside of the turn being used by other glider(s). They need to be concentrating on climbing and not avoiding you! See also GPC 32 – Soaring with Other Gliders.

The diagram below shows a single glider with an exemplar approach to a thermal, described in the steps below.



1. Complete your FULL and TARGETED scan and identify other inbound or thermalling gliders.

2. As you approach a thermal you may fly through turbulence that feels like driving over cobblestones. At this point or when you know you are close to the thermal using visual cues (other gliders or cumulus cloud) raise the nose to reduce speed and keep that constant attitude as you enter the thermal. Entry speed for optimal feel and manoeuvrability should be 10-20 knots below cruise speed. Re-trim for your new cruise speed.

3. It is normal to fly through an area of sinking air (but this isn't always the case) followed by turbulence just before the rising air. As you fly into the rising air you should feel a surge (vertical acceleration) – do NOT turn when you feel this or you will turn before the core.
4. Before turning you must complete a thorough TARGETED SCAN. This takes time so anticipate and do this before you expect to turn.
5. Wait until you feel a sustained surge for at least five seconds or have a sustained vario indication for at least five seconds. Another cue is that at the peak of the lifting air the feel of the vertical acceleration will cease – that is the time to turn. If this doesn't happen or you just get short gusts then resume cruising.

6. If you've turned the 'right' way you should feel a wonderful surge as you fly into the stronger lifting air near the core. This is shown on the diagram in white.
7. If you've turned the 'wrong' way you'll get that horrible sinking feeling. Continue the turn through ¾ of a turn (270o) relative to your original heading and then straighten out. This is shown on the diagram in pink. Depending on how far away from the core you were when you turned you will need to fly straight for between 3 and at most 10 seconds to move the circle significantly across the thermal. If you feel a sustained surge for at least three seconds then resume your turn, or if you don't feel a surge then resume the turn after 10 seconds.
8. Re-trim to thermalling speed.

On the next turn re-centre the turn as necessary.

Notes

- Do not enter a thermal if there is any collision possibility with other gliders. Do not assume that other pilots have seen you.
- Cues for which way to turn such as a wing lifting are not reliable. Other factors are more important and are covered in the post-GPC advanced training syllabus.
- Practice thermal entry at every opportunity, you'll never stop learning.

FLIGHT EXERCISES FOR THIS UNIT

Your instructor/coach will demonstrate a number of thermal entries and the correction if the turn is away from the core. You'll discover that your instructor/coach will turn the 'wrong' way about half the time – this is normal. Keep that in mind when you fly and try not to get frustrated!

You'll then get an opportunity to practice thermal entry. Try to feel what the air is doing – you'll have best success at this if you keep your movements on the controls smooth (particularly the elevator).

Keep a constant nose attitude as much as possible. Remember to maintain a good lookout and wait for a sustained surge (or vario indication) before turning.

THINGS YOU MIGHT HAVE DIFFICULTY WITH

COMMON PROBLEMS	
Problem	**Probable Cause**
• **Turning in a gust**	Not waiting for a sustained surge of at least 5 seconds
• **Turning too late**	Taking too long to decide which way to turn – pick a direction before reaching the thermal
• **Turning too early**	Not waiting for at least 5 seconds or until the surge subsides before turning

HOW DO YOU DEMONSTRATE COMPETENCE?

- Demonstrate good lookout
- Identify the difference between a thermal and a gust
- Demonstrate appropriate nose attitude during thermal entry
- Wait for the peak before turning
- Identify if the turn is away from the core and correct appropriately

SELF-CHECK QUESTIONS

Use these questions to test your knowledge of the unit.

1. When should you reduce speed in the thermal entry sequence?
2. Is it acceptable to ‘pull up’ as you enter the core?
3. Can you turn the opposite direction to another glider if it is at a very different height?
4. How do you know when to turn?
5. If you’ve turned away from the core, what angle should you turn through before flying straight and how do you know when to resume the turn?