Gliding Australia Training Manual

Trainer Guide

GLIDING
AUSTRALIA

Unit 33
Thermal Sources and Structure

Unit 33 - Thermal Sources and Structure

AIM

To develop the student's knowledge and skills related to thermal sources, thermal structure, and thermal lifecycle.

PRE-REQUISITE UNITS

- GPC Unit 31 Thermal Entry

COMPLEMENTARY UNITS

This unit should be read in conjunction with:

- GPC Unit 38 Meteorology and flight planning
- GPC Unit 40 Cruising, speed to fly, height bands and thermal selection

COMPETENCY ELEMENTS AND PERFORMANCE STANDARDS

ELEMENT	PERFORMANCE STANDARDS
1. Describe thermal structure and lifecycle	• **Describe** o The difference between thermal sources and triggers o The vertical thermal structure o How thermals cycle and variations with terrain and time of day
2. Identify and navigate to sources and triggers	• **Identify** o Potential thermal sources and triggers taking into consideration sun, wind, terrain, vegetation, time of day, cloud cover • **Demonstrate** o Navigation to relevant thermal sources and triggers in a search for thermals

Unit 33 - Thermal Sources and Structure

KEY MESSAGES

- Thermals are rising buoyant air from a thermal source.
- The ground is a thermal source when it is heated by the sun. Darker and hotter surfaces generate better thermals.
- Thermals have a lifecycle and may have a bubble structure.
- There may not be a thermal at the 'perfect' location relative to sources and triggers since you need to be at the right point of the cycle (the bubble may be below or above).
- When navigating to likely locations of thermals relative to sources and triggers the effect of wind drift needs to be considered.
- Thermaling at low level increases the risk of a spin – maintain safe speed near the ground and have a clear break-off point at a safe height for a circuit and landing.

LESSON PLANNING AND CONDUCT

Briefing

Brief:

- Air buoyancy due to surface temperature and humidity relative to the surrounding air.
- Thermal sources through heating of the ground by the sun and the ground heating the air. Discuss the effect of terrain, surface, sun and wind with reference to variations with time of day.
- The lift, sink, and turbulence structure of a thermal and variation with height.
- Thermal triggers and the difference in size between thermal sources and triggers.
- Thermal cycling and bubbles through exhaustion and replenishment of a pool of buoyant air.
- The impact of wind.
- The relationship between convection height, thermal strength and horizontal spacing.

Advise that care must be taken when Thermaling at low level (in the turbulent super-adiabatic layer) due to the possibility of an inadvertent spin under these conditions. Safe speed near the ground must be maintained when Thermaling at low-level, and a clear break-off point at a safe height is essential for a circuit and landing.

Flight Exercises

The flight exercises for this unit are best combined with flight exercises for one of the other units (such as Thermal entry or Meteorology and flight planning).

Demonstration

- Point out ground features and discuss their likelihood as a thermal source
- Point out potential triggers

Student exercises

- Ask the student to identify potential thermal sources and triggers, and sample as many as practical to develop understanding of how to use them and the cycling behaviour.

COMMON PROBLEMS

Problem	Probable Cause
• Confusing sources with triggers	• Thermal source areas are large • Triggers are small • Only a small amount of experience with which to judge – the student needs to devote the time to watch and learn.

THREAT AND ERROR MANAGEMENT

- Thermals in the super-adiabatic layer are disorganised and turbulent. Thermaling in this layer creates increased risk due to these conditions.
- Combined with the likely high stress of the situation for the student potentially causing mishandling of the glider, particularly when on a cross country flight, there will be increased risk of inadvertent spin.
- Be aware of this when training at low level and discuss the effect and mitigation strategies with the student – for example breaking off the flight at increased altitude, being aware of the effect of stress on concentration, and increasing Thermaling speed at low level.
- At a minimum, safe-speed-near the ground should be maintained when Thermaling at lower level.