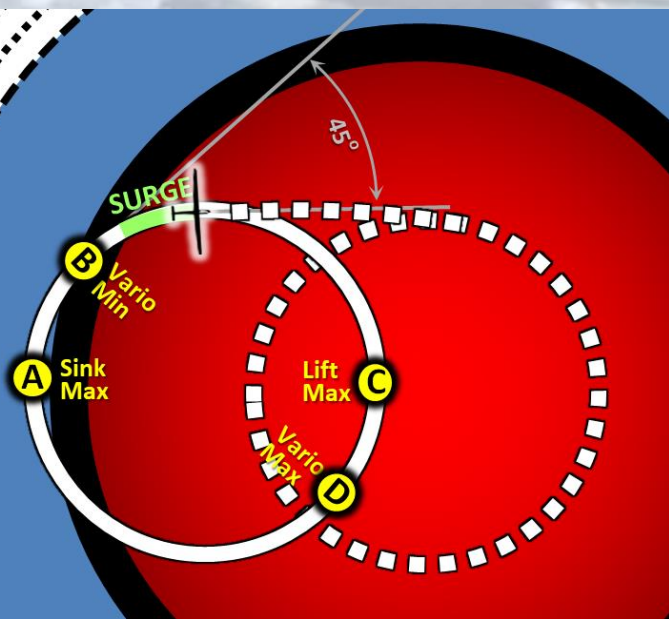


Theory Lesson # 10

Unit 30 – Thermal Centring



Aim

This unit covers:

- **Centring thermals safely**
 - Lookout
 - Speed / attitude control
 - Coordination and bank
- **The horizontal thermal structure**
- **Two techniques for thermal centring**
 - Using Feel
 - Using the Variometer



Safety

Key
elements to
fly safely in
a thermal

- Lookout
- Speed/Attitude control
- Coordination

Lookout

- Good lookout is essential for safety
- Most close encounters between gliders happen when thermalling
- Regularly complete a **Full Scan** to lookout for gliders in and approaching your thermal
- Do a **Targeted Scan** every time you make an adjustment in the thermal to check that you will not cause a conflict with any other aircraft

This will be covered in more detail in GPC 32 - Soaring with other gliders



Speed / Attitude

- The primary reference for your chosen speed is the horizon (the glider's attitude)
- You must use trim effectively to assist in maintaining this attitude

If attitude keeps changing, the circle diameter also changes, and it's difficult to feel the air

▶ difficult or impossible to centre the thermal



Coordination and Bank

- You must have good coordination between aileron and rudder – in a turn the **yaw string should be slightly on the outside of the turn** (high side)
- Check amount of bank with reference to various indicators (instrument screws etc)
- The amount of bank is not critical as long as it is enough and constant

If bank keeps changing the circle diameter also changes

▶ difficult or impossible to centre the thermal



Optimum Bank and Thermalling Speed

- Use the least amount of bank that will keep you in the core of the thermal
 Approx. 40 degrees
- Speed should be the minimum to maintain good control
 Approx. 50 to 55 knots
- Most important is consistency in your attitude and bank

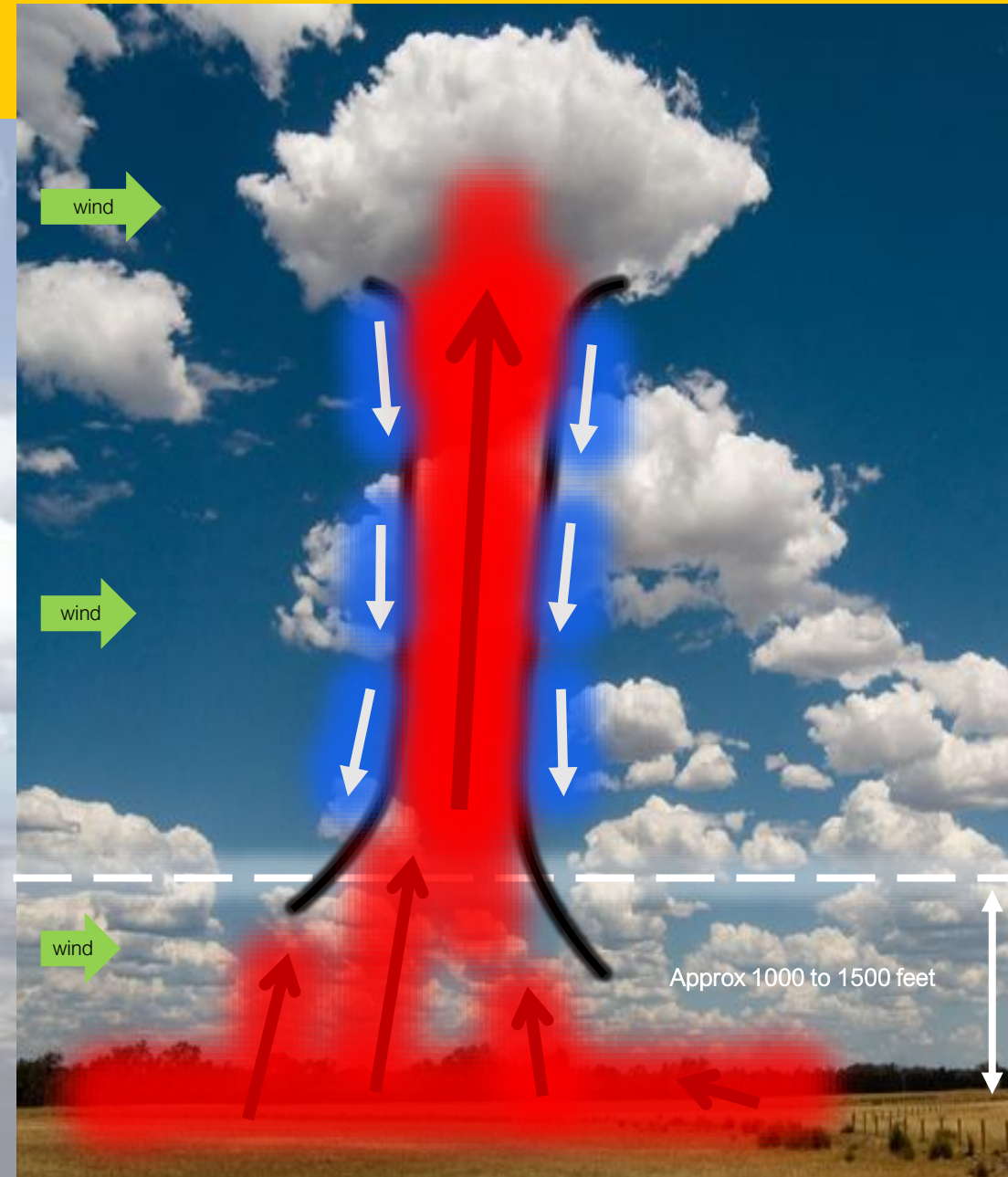
Turn diameter depends on speed and angle of bank

Steep and fast gives the same diameter as shallower and slower

Thermal Vertical Structure*

- **Top** - the widest point
Smooth air with outflow
Possibly a reduced climb rate
- **Middle** - the narrowest point
Highest vertical air movement
(strong lift)
- **Bottom** - bumpy air
Wide, but nothing solid to centre
We want to avoid being here

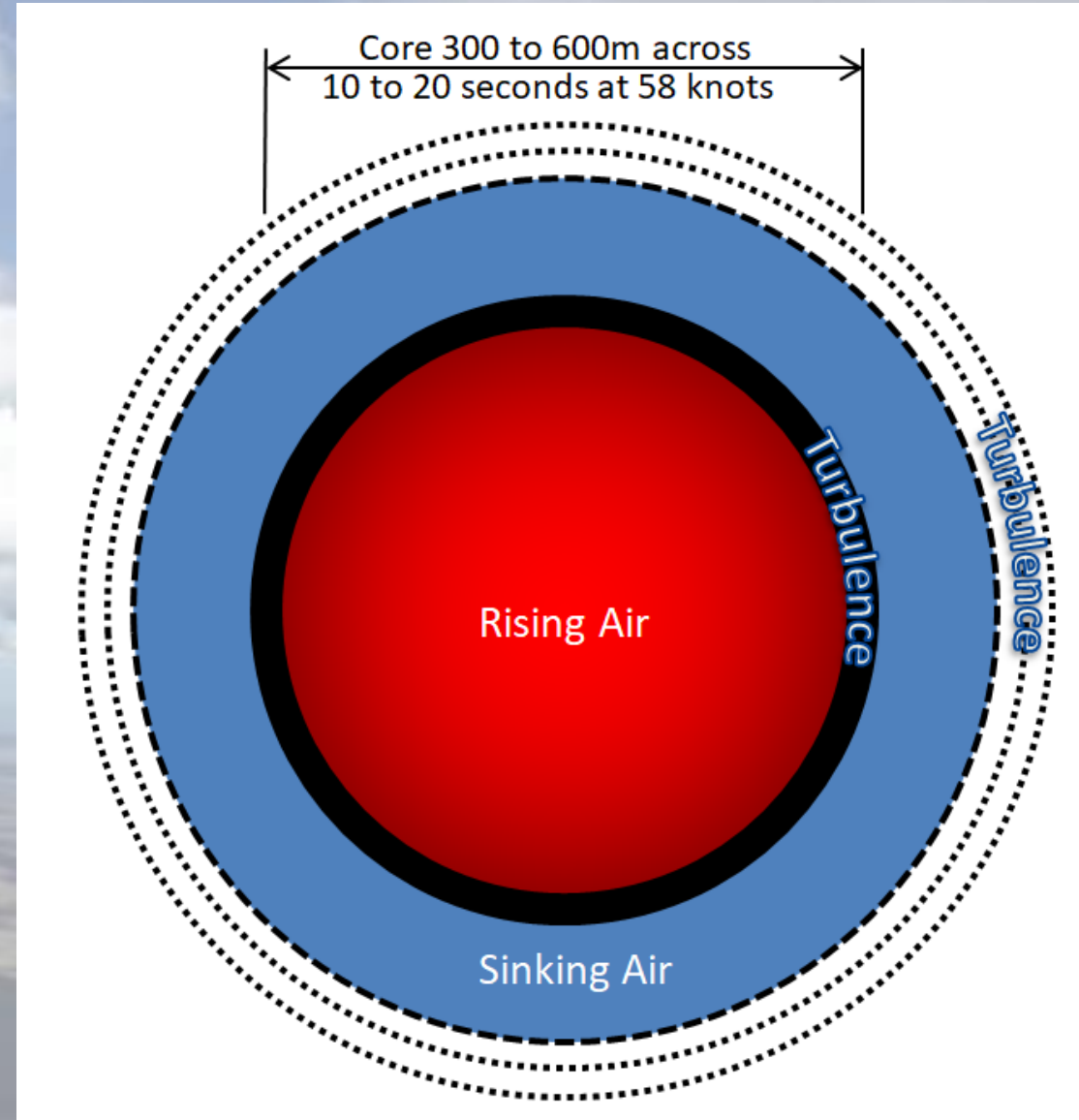
* Covered in more detail in GPC 33



Thermal Horizontal Structure

- Usually circular with a core of rising air (strongest in the middle) and a ring of sink around the outside
- The area of shear between the sinking air and lifting air is turbulent
- Less severe area of turbulence outside the sink, caused by shear between the sinking air and the still air – **when flying through this area it can feel like driving over cobblestones**
- **Thermals are large** (at the altitudes that we thermal): typically in Australia 300m to 600m across and potentially much larger under large cumulus

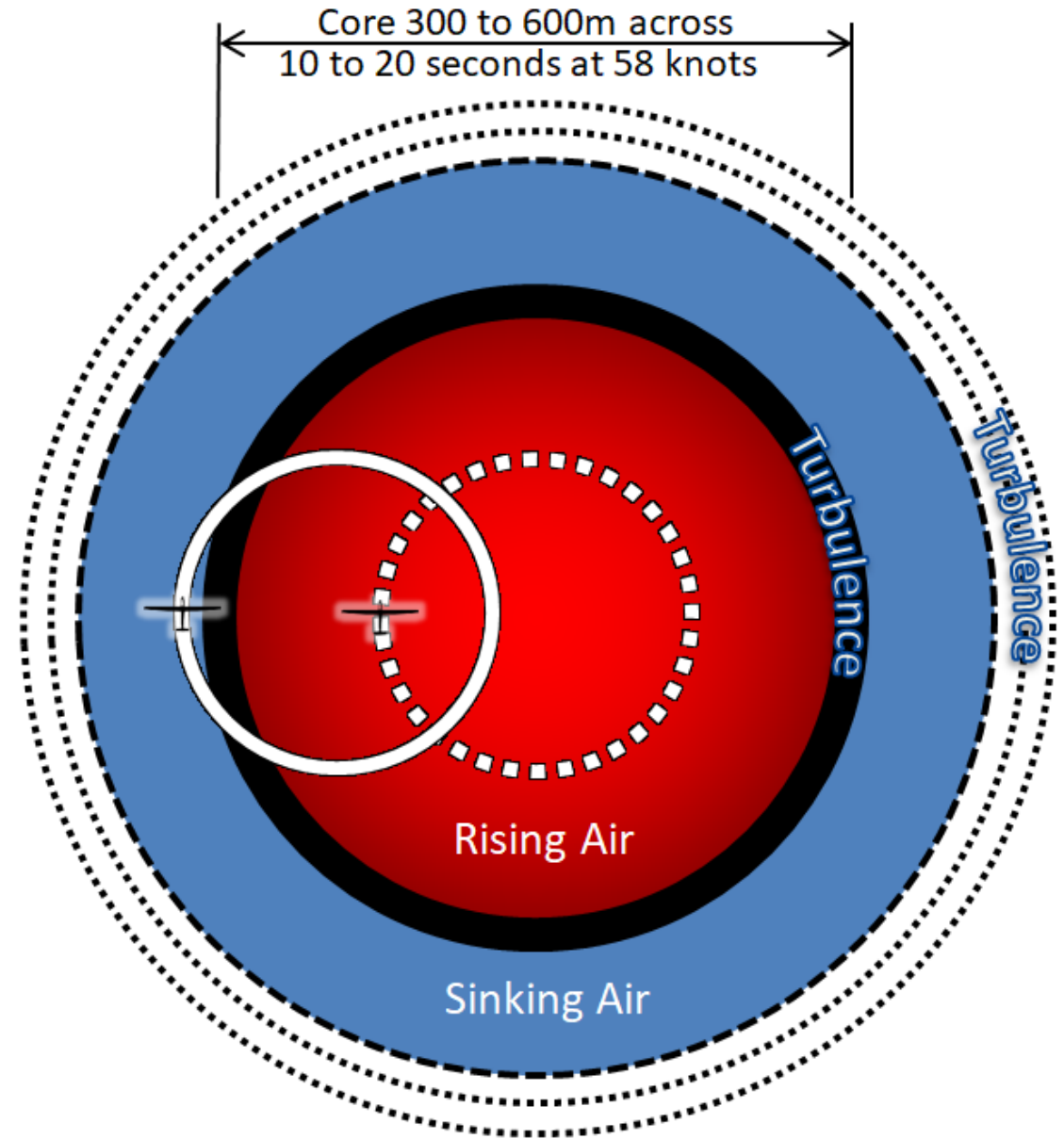
It takes 10 to 20 seconds to fly across the core at a slow cruise



Centring

- Remember LOOKOUT
- Circle the glider in the core close to the centre of the thermal
- If you are not 'centred' the goal is to move the circle to the core as quickly as possible
- No more than one adjustment per complete circle

Develop a mental picture of the lift and the location of the core by feeling the surges and monitoring the instruments



Centring Techniques

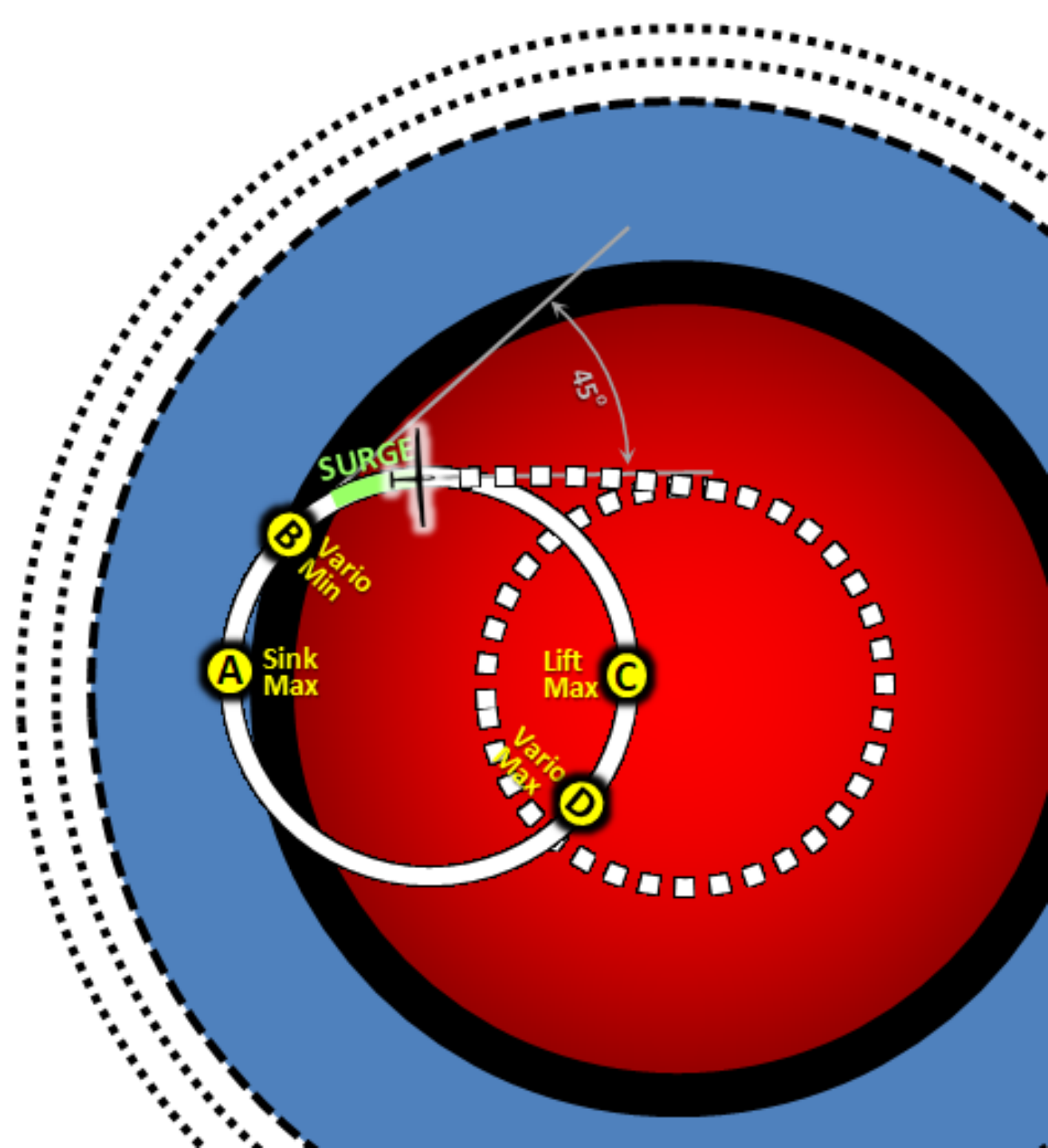
We train two standard techniques for centring

1. **Feel technique** (no vario) - the feel of the rising and sinking air and turbulence
2. **Vario technique** (vario only) – using the audio and visual indication

Using feel is by far the best

Avoid mixing these techniques at this stage

As you become more experienced you will develop variants to these techniques that work best for you under various conditions



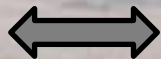
Your butt!



When we fly into faster rising air we feel an upward acceleration



When we fly into air rising less fast (or sinking) we feel a downward acceleration

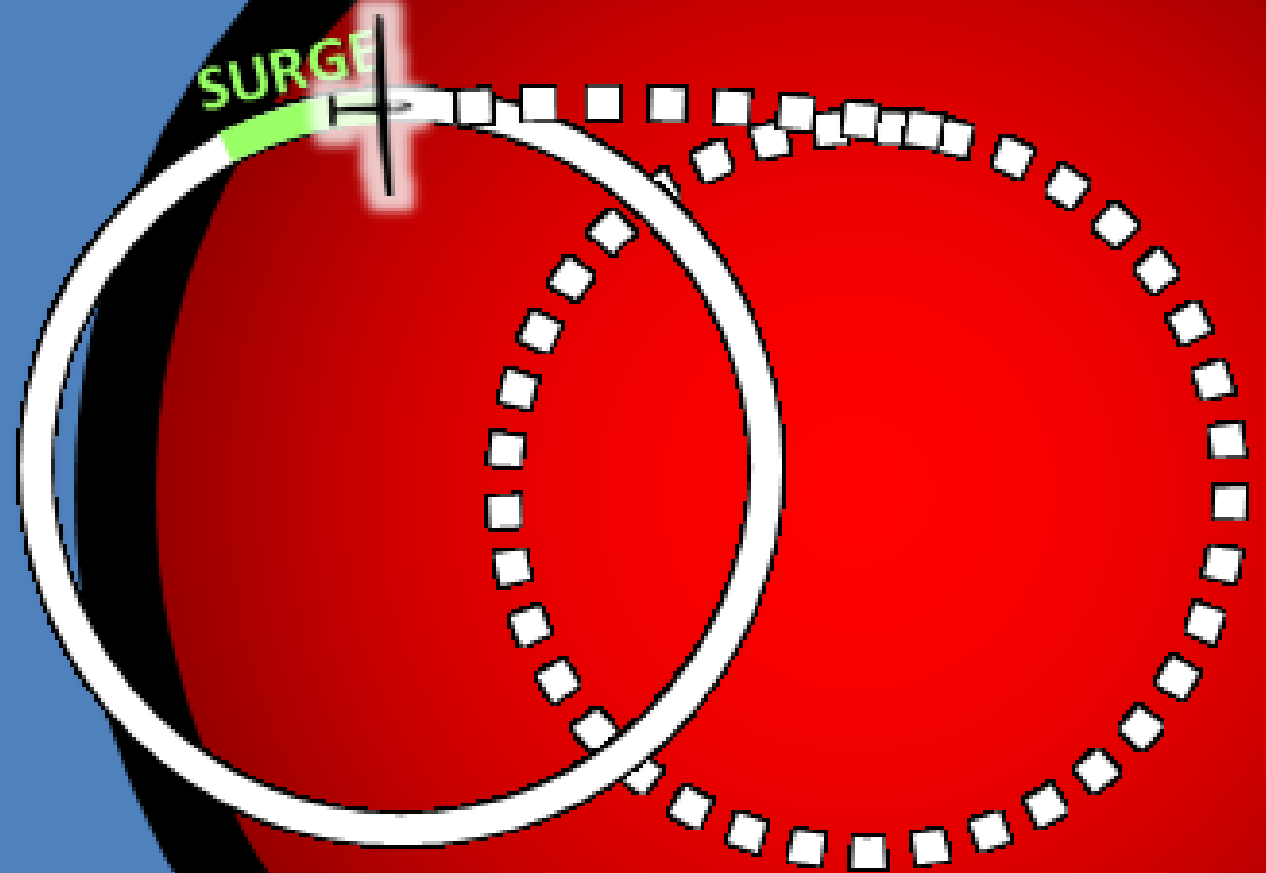


If we are in air that remains constant (rising or sinking air) we feel nothing

- With practice you will get good at feeling these vertical accelerations (also known as surges)
- By feel you should be able to tell the difference between a short gust and sustained acceleration

Feel Technique

- 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



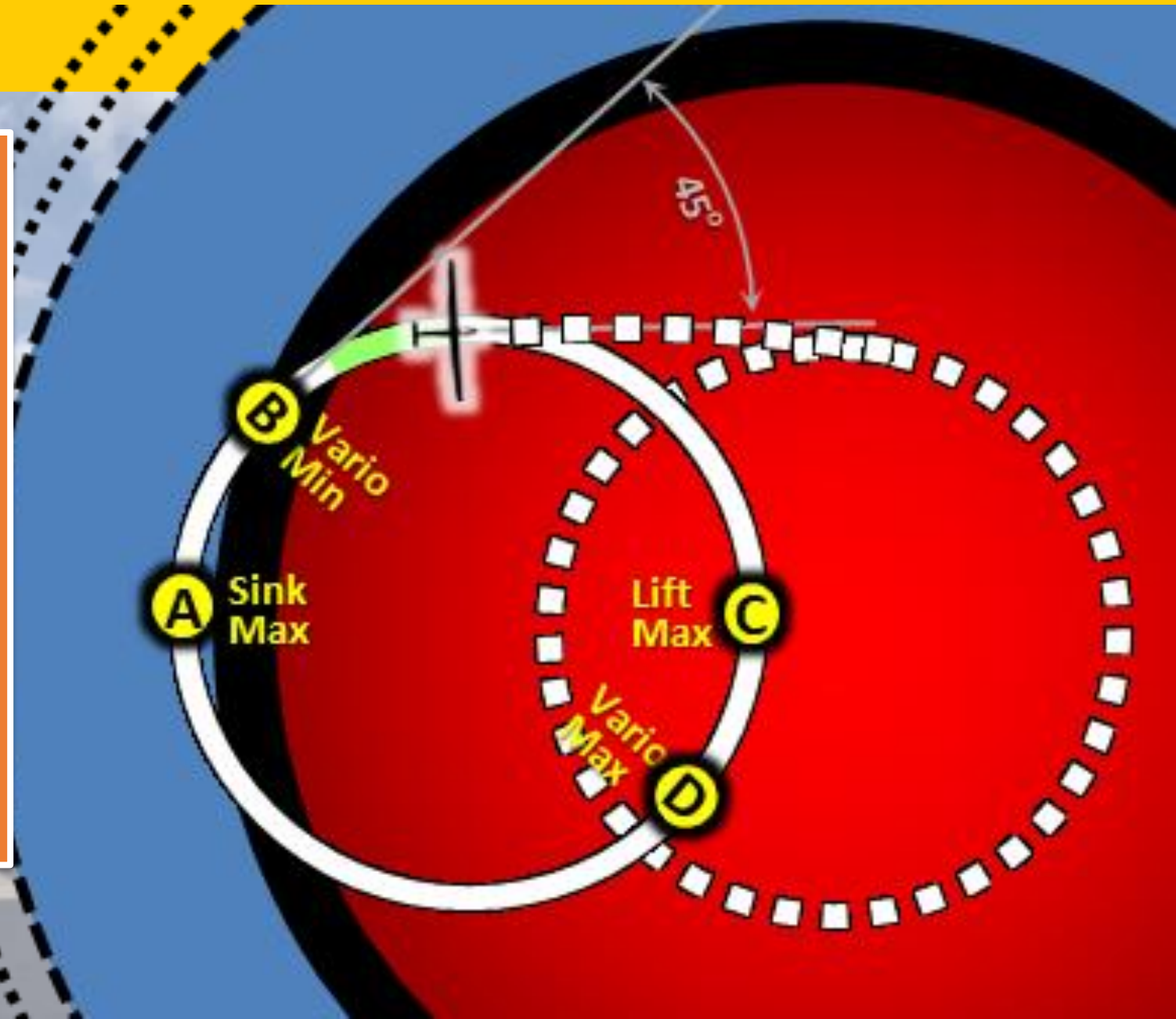
Vario Lag

- All varios have lag
 - typically 2 to 4 seconds
- It's mostly due to the inertia of the glider (it takes time for the air to accelerate the glider before the vario can indicate the change)
- It will be different for each glider/weight/vario combination
- The lag is around a 45 to 60 degree portion of a typical thermalling turn
- We need to compensate for lag when thermalling by vario alone



Vario Technique

- 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



KEEP PRACTISING

We never stop learning to thermal!