Theory Lesson # 12

Unit 40 - Cruising on Track

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Aim

This unit covers simple techniques for:

- Selecting a path through the air to improve achieved glide performance
- Selecting and maintaining an appropriate cruise speed
- Using height bands and choosing which thermals to select
- Simple final glides

The aim is to increase your efficiency so you have a better chance of completing a cross country flight

Pre-requisites: You need to be able to thermal effectively; navigate effectively; and fly safely

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Key Decisions

Track selection

- Look into the distance
- Select the best path to your goal with the best thermal opportunities
- Minimise deviations unless you have good reason

Thermal selection and Cruising speed

- Remain in the top 1/3 of the height band if possible (avoid getting low)
- Select thermals appropriately
- Cruise at appropriate speed

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Cruising – Track Selection

- Cruising efficiently:
  - maximises your chances of finding the best thermals
  - reduces the number required
  - increases your average rate of climb
  - improves your speed and opportunity to complete your flight

Cruising – Track Selection

Look ahead to pick lines of energy and identify changing conditions

- Cumulus clouds can provide guidance to where lift will be – look to run along lines of cumulus (streets) wherever possible
- On blue days the same pathways still exist but you have to rely on your feel for all of the improvement. Fly via good thermal Sources and Triggers

Stay generally on track – deviating more than 30 degrees is often a disadvantage. Always deviate upwind instead of downwind given an equal choice.

Fly smoothly and not too fast – to feel the air better

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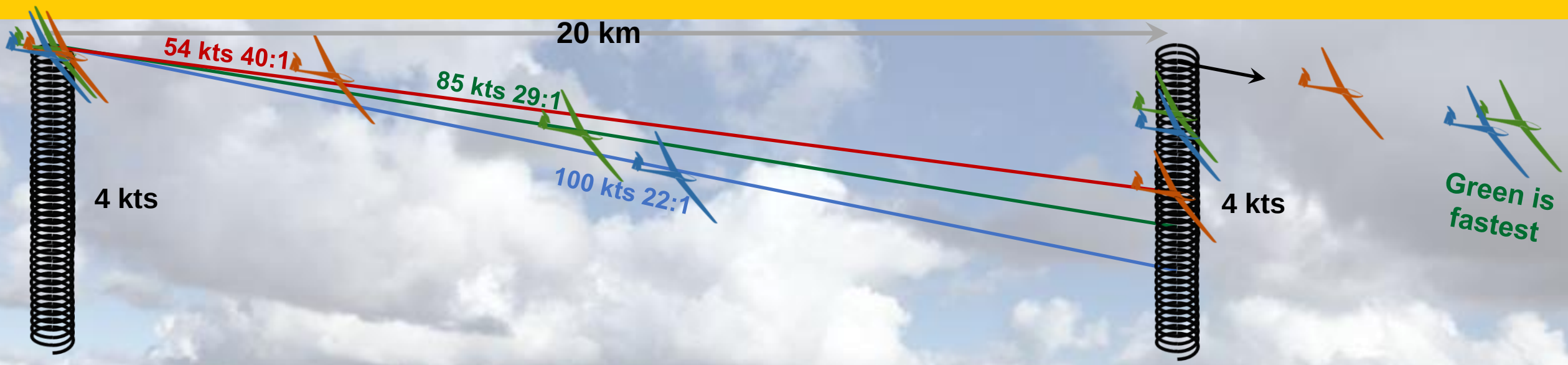
Cruise Speed by Example



All gliders start together

Blue glider flies fast and gets to the next thermal first

Green glider flies at optimal cruise speed and arrives above the blue glider

Red glider flies at best glide speed and arrives last - by then the green and blue gliders have already climbed higher in the thermal

	54 knots best glide speed	85 knots	100 knots
20 km cruise time	12 minutes	7.6 minutes	6.5 minutes
Glide ratio	40:1	29:1	22:1
Loss of height *	1900 ft	2400 ft	3100 ft
Time to climb @ 4 kts	4.7 minutes	6 minutes	7.8 minutes
Total time	16.7 minutes	13.6 minutes	14.3 minutes
Average speed	**72 km/h**	**88 km/h**	**84 km/h**

* Loss of height includes 5% inter-thermal sink

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Cruise Speed

Optimal cruise speed is based on MacCready theory using the **Effective Climb Rate in the next thermal**

The stronger the thermals the faster you should cruise

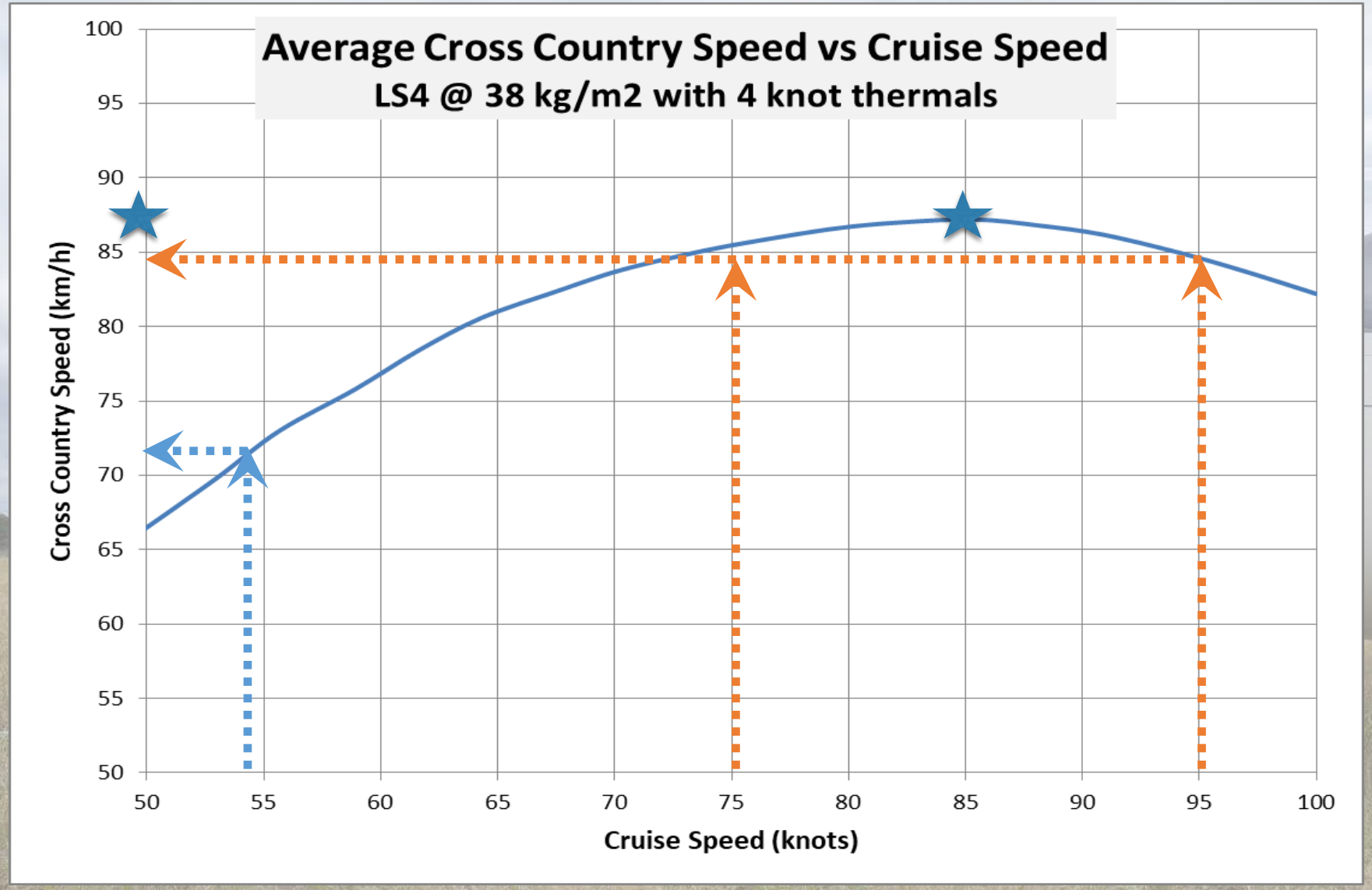
±10 knots from the theoretical optimum makes little difference

It's more important to fly smoothly

Cruising a little slower than the theoretical optimum helps you to stay high and minimise risk of outlanding

If you stay high you have a better chance of finding the best thermals

Cruise Speed



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Height Bands

Split the available thermal height into thirds

Top 1/3 – Optimum height

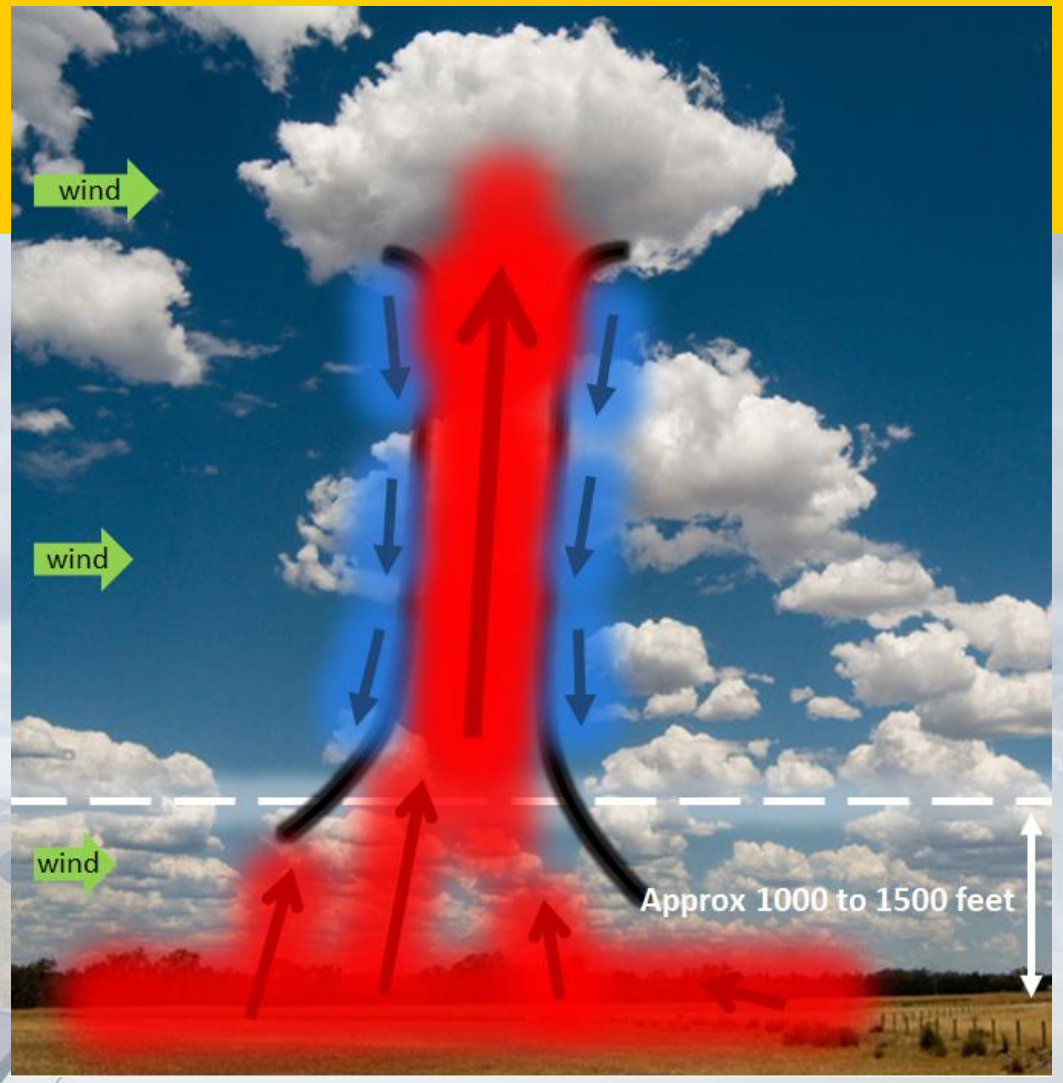
- Higher cruise speed, low risk of outlanding, thermals easier to find and centre
- Only take the strongest thermals

Mid 1/3 (or below 4000’ AGL)

- Up to 10 knots slower cruise speed
- Sample more thermals and possibly climb even if slightly weaker, although you may not climb to the top
- Focus on getting back into the top height band

Bottom 1/3 (or below 2000’ AGL)

- Cruise near to best glide speed and be prepared to take weak thermals to get to middle 1/3



Below 2000’ AGL you should be preparing for a possible outlanding; select and stay within reach of appropriate landing areas

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Cruise – Block Speeds

Typical cruise speed is **75 knots ±10 knots** depending on height and thermal strength

In an extended area of sinking air you should increase your speed by up to 10 knots

In an extended area of lifting air you should decrease your speed by up to 10 knots

Block Speeds – Unballasted LS4		
Thermal strength	**Cruise Speed Mid height band**	**Cruise Speed Upper height band**
2 knots	55 knots	65 knots
4 knots	70 knots	80 knots
6 knots	75 knots	85 knots

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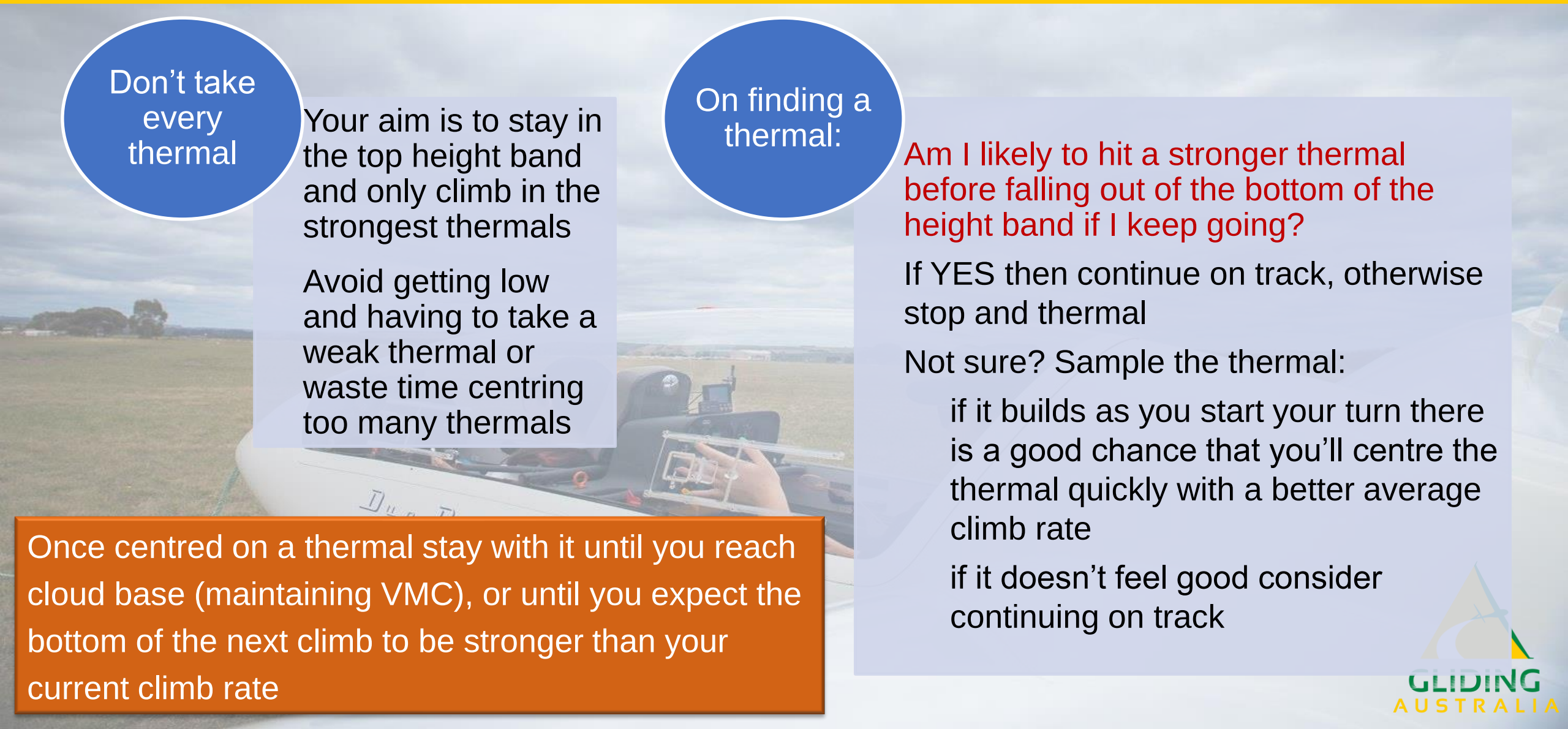
Thermal selection



Don't take every thermal

Your aim is to stay in the top height band and only climb in the strongest thermals

Avoid getting low and having to take a weak thermal or waste time centring too many thermals

On finding a thermal:

Am I likely to hit a stronger thermal before falling out of the bottom of the height band if I keep going?

If YES then continue on track, otherwise stop and thermal

Not sure? Sample the thermal:

- if it builds as you start your turn there is a good chance that you'll centre the thermal quickly with a better average climb rate
- if it doesn't feel good consider continuing on track

Once centred on a thermal stay with it until you reach cloud base (maintaining VMC), or until you expect the bottom of the next climb to be stronger than your current climb rate

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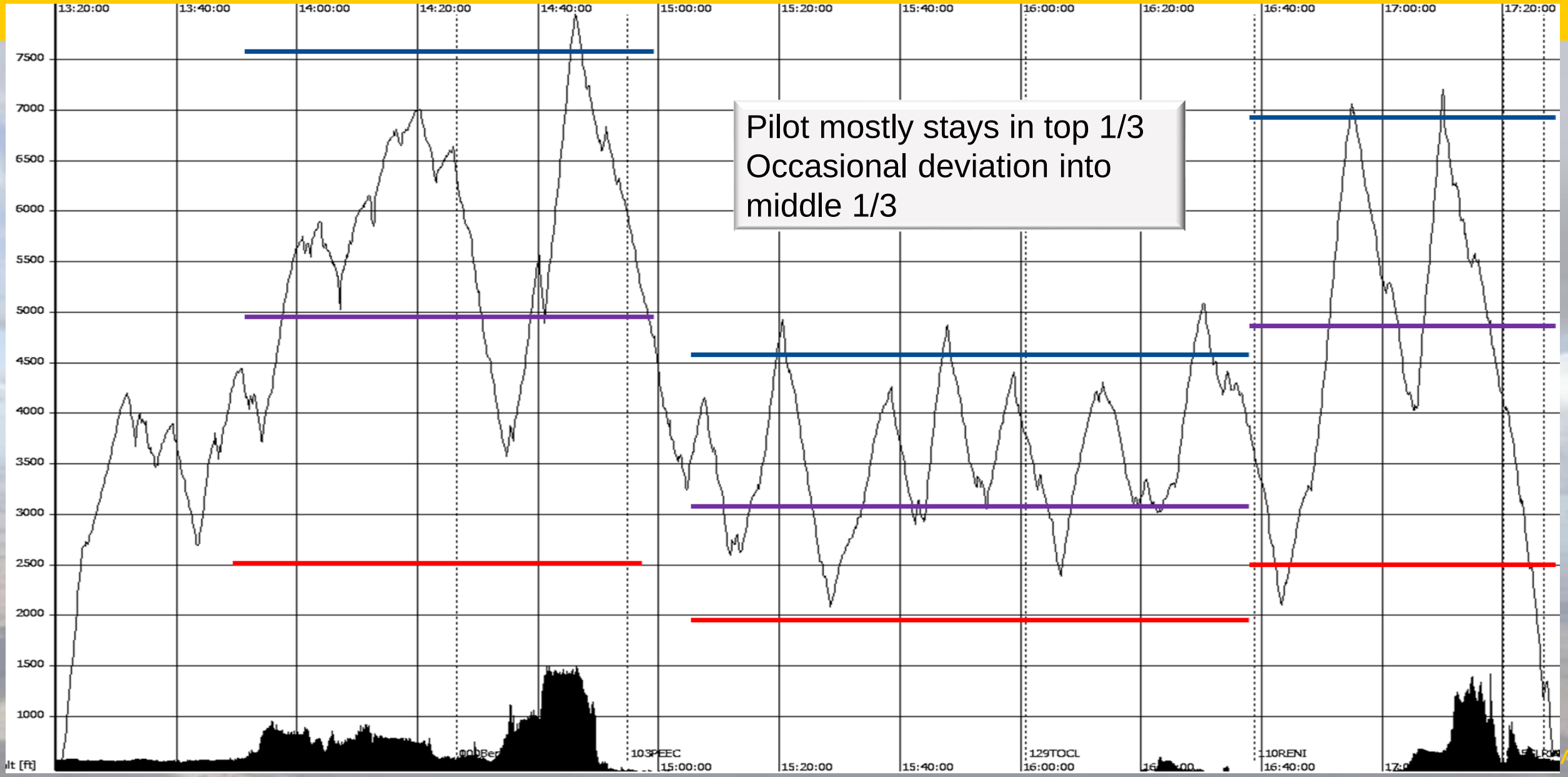
Example Flight



Final Glides

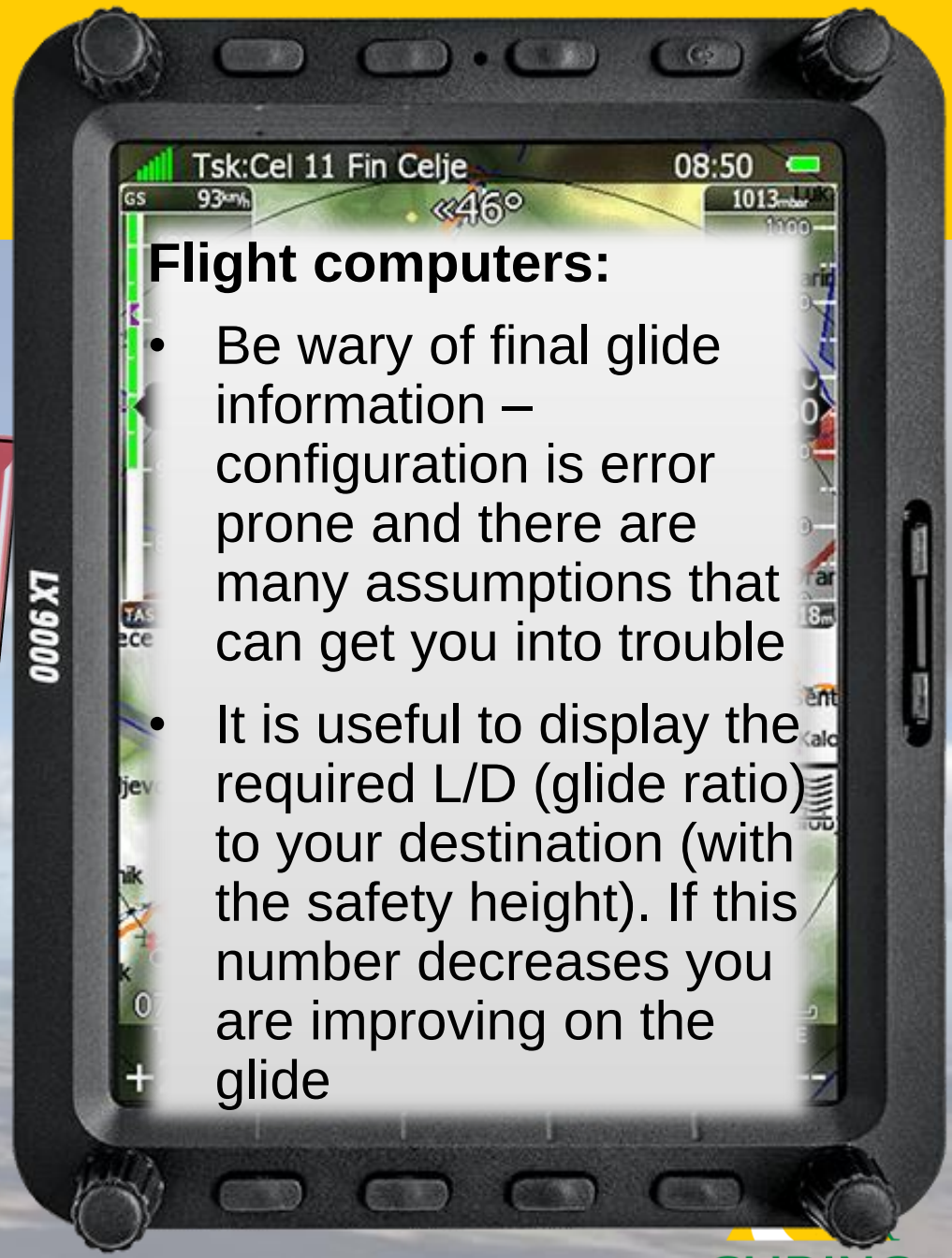
Maintain normal cruise (speed and track deviations)

Simple rule of thumb for final glide height:

1000 feet per 10 km plus your safety height

Climb higher for head wind

If you are falling below glide: **take another thermal - do this early!**
Slowing down to increase the glide angle rarely works!



Flight computers:

- Be wary of final glide information – configuration is error prone and there are many assumptions that can get you into trouble
- It is useful to display the required L/D (glide ratio) to your destination (with the safety height). If this number decreases you are improving on the glide

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