

Unit 1

Vision and Lookout



Glider/Aircraft collisions

The Bureau of Air Safety Investigation (BASI) provided a report on all accidents involving collisions between aircraft **1980-1991**.

- Four fatal collisions between powered aircraft and gliders
- 11 mid air collisions between gliders
 - 9 of these were between gliders in the same thermal
 - 1 involved two gliders on opposite headings
 - 1 involved a congested circuit pattern.
- This is **one collision every 75,000 hours** of flying.
- **Safety relies on the “professionalism” of pilots**

Lookout – Not so easy!

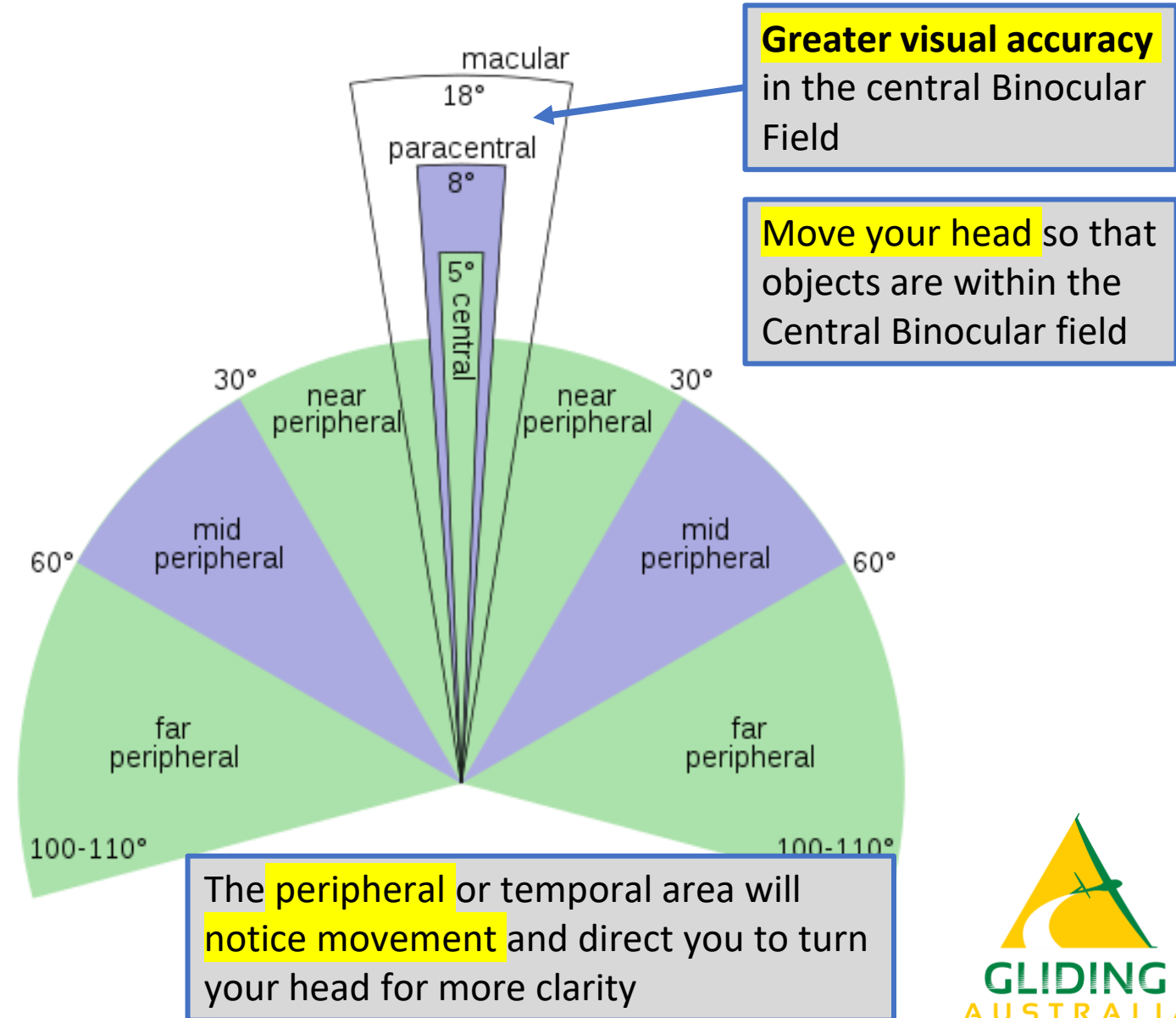
- Lookout is a core skill
 - To improve safety
 - To improve performance
 - To improve enjoyment
- Looking is not Seeing
- Your eyes have limitations
- Vision is restricted by:
 - individual's eyesight performance
 - dirty canopy or crazed canopy
 - poor weather / haze / sun
 - the glider's airframe.

Lookout Priority

- An **effective lookout** is the most important element of Airmanship and safety in the air
- Lookout is our **highest priority** in avoiding collisions with other gliders and aircraft
- We use lookout to scan for other aircraft that might pose a hazard; this technique is called **“See and Avoid”**
- **Develop good lookout from the beginning of your flying**

Peripheral Vision

- **Peripheral vision**, or *indirect vision*, occurs outside the point of fixation, i.e. away from the centre of gaze or “out of the corner of one's eye”.
- The vast majority of the area in the visual field is included in peripheral vision.
- Near-peripheral vision, sometimes referred to as "para-central" vision, exists adjacent to the centre of gaze



Eyes collect information - the brain interprets

- The brain makes executive decisions about what you "see" without asking for permission
- You can “**prime**” your lookout – get airborne **expecting to see aircraft**
- Vision can't be trusted - "I didn't see him" (e.g. if looking for cars, you often don't see motorbikes)
- **Peripheral vision** detects movement - then instinctively you look – very useful SURVIVAL SKILL (to escape Tigers & Lions), but **cannot be relied on.**
- **Something that is going to collide with you does not move**, it just gets bigger.

[Watch this Selective Attention Video](#)

Empty Space Myopia

- The normal function of the eye lens is to physically focus light from the object onto the retina. To do this, **the eye must be stimulated by an image**
- If the eye lacks this stimulation, the lens can shift to a resting state (approx. 1 metre), and you won't see the object – caution ☹️ **“Empty Space MYOPIA”**.
- **Staring (is bad)** into the distance many Kilometres may cause such a situation and you won't see what is only a few km ahead
- **Focus your eyes on a distant object** (a hill, a town, a forest) on a **regular basis** ☹️ this will help you see conflicting traffic
- You cannot just “look,” you have to get your eyes to focus in order to “see”

Expectation may Defeat Vision

- Your own expectation of what is 'normal' may override what you are seeing ☹️ **EXPECTATION ERROR.**
- Examples:
 - Pilot releases from tow at 1000 feet believing they are at 2000 feet and proceeds to fly away from the circuit.
 - A DC-10 bound for Frankfurt inadvertently landed in Brussels despite the passengers and cabin crew seeing the error through cabin map displays.
- When something is **ambiguous**, relax and take a broader view, identifying key references – **“BIG to small”**

Lookout – Try this!

- Sit in the **glider cockpit** on the ground:
 - You can easily see directly ahead
 - **Vision is blocked by the nose** of the glider so you cannot see below the nose
 - Tilt your head back - you can see above you and directly overhead
 - How far behind each wing can you see, above and below the horizon?
 - With a small movement of your head and eyes you don't see much at all,
 - **Turn your head and shoulders, and move your body** to see more parts of the sky
- In the air:
 - **Rolling and turning the glider** reveals a lot more of the sky
 - Looking ahead through the “cone of vision” gives good vision, and objects are easily seen.

Aircraft coming towards you

- The next slide shows how big another aircraft will look when coming towards you, and how long you have before they could hit you.
- This assumes both aircraft are flying directly at each other at 100 knots. (a glider at 60 knots may have a little more time to take action?)
- When you are circling (e.g. in a thermal) a single turn will take approx. 20 seconds, so if you don't see the 'intruder' the first time you will next see it when it is very close!
- If you are flying straight you need to have looked in the right direction (in the last 20 seconds) to see it coming, so don't stop scanning!

Time to Impact

Approximate
Distance

Approximate
Time to Impact

View

1NM

14 sec.

1/2 NM

7 sec.

1/4 NM

4 sec.

1/8 NM

2 sec.

1/16 NM

1 sec.



Situational Awareness

- “What has happened **recently**?”
- “What is happening **now**?”
- “What might happen (or is going to happen) in the **future**?”

Example:

An aircraft calls downwind on Runway 26

Where do you expect the aircraft to be? How high? Can you see it? What errors could the pilot have made?

Consider **Threats and Errors** that may impact on you

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Situational Awareness

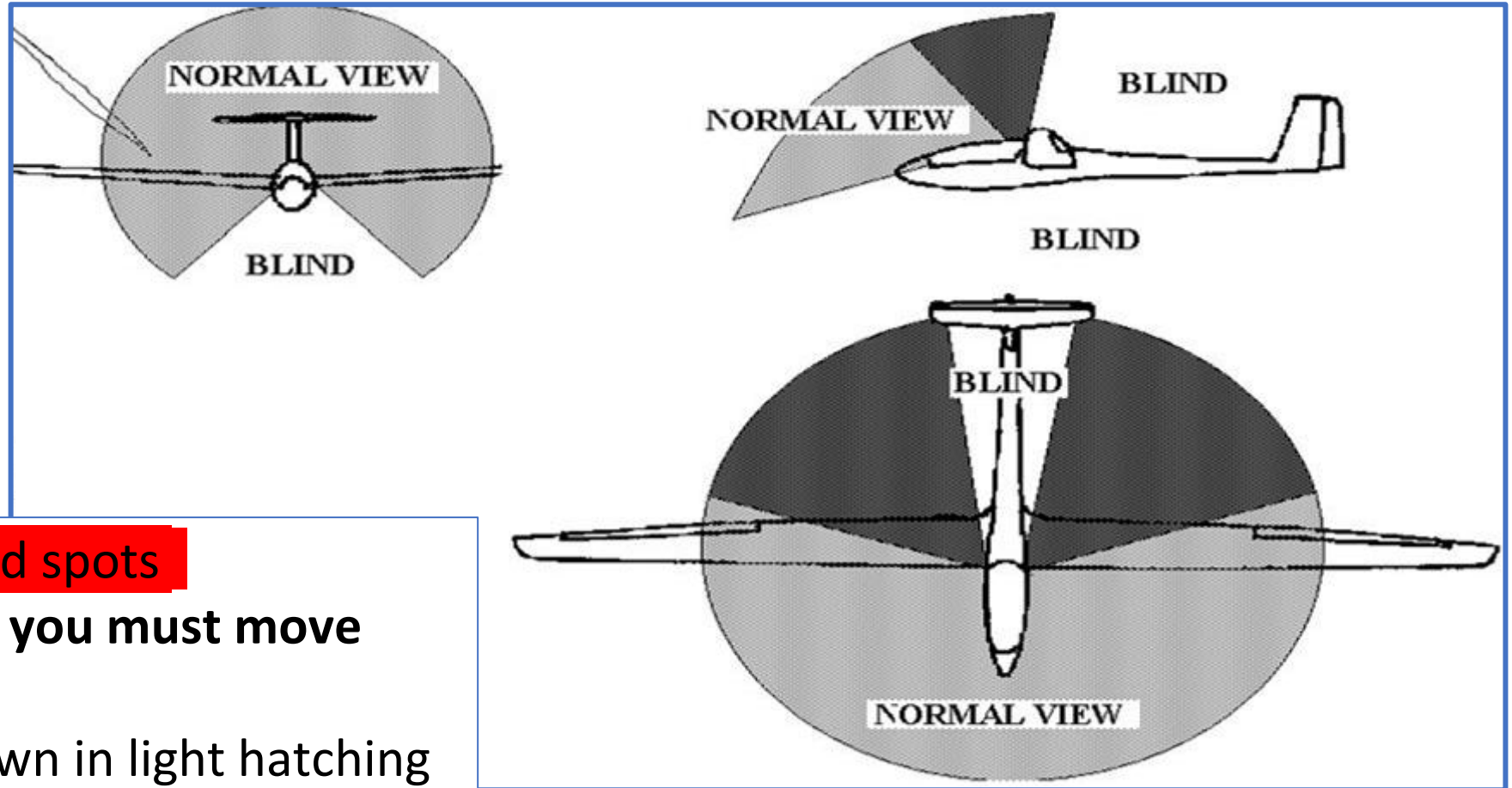
- “What has happened **recently**?”
- “What is happening **now**?”
- “What might happen (or is going to happen) in the **future**?”

Get ahead of the aircraft whenever possible

- The highest standards of lookout are insisted on every flight
- Eyes must be kept mainly out of the cockpit
- Keep your head moving – your eyes will follow your head!

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Blind Spots



- **The glider has blind spots**
- To see effectively, **you must move your head**
- Normal vision shown in light hatching
- Dark hatch is viewable but often missed with poor lookout

So.....“Check-six” &
Watch for the “Bandit
out of the sun”

Lookout in Flight

- When flying, **REPORT any sightings** of other gliders and aircraft to your Trainer. Lookout is a shared responsibility, always
- Gliders and **aircraft can be hard to see**
 - Clouds, haze, smoke, sun glare, a dirty canopy, can degrade the ability to see other aircraft.
 - A clean canopy is a high priority
- Be aware of **blind spots**
- **ALWAYS LOOKOUT** before commencing any manoeuvre.
- **"Head (eyes) must be outside"** the cockpit for the majority of flight.
- Alerted See & Avoid requires **effective radio listening watch** to enhance Situational Awareness. So keep your ears open too!
- How does Flarm assist ?

Clock Code describes Where to Look

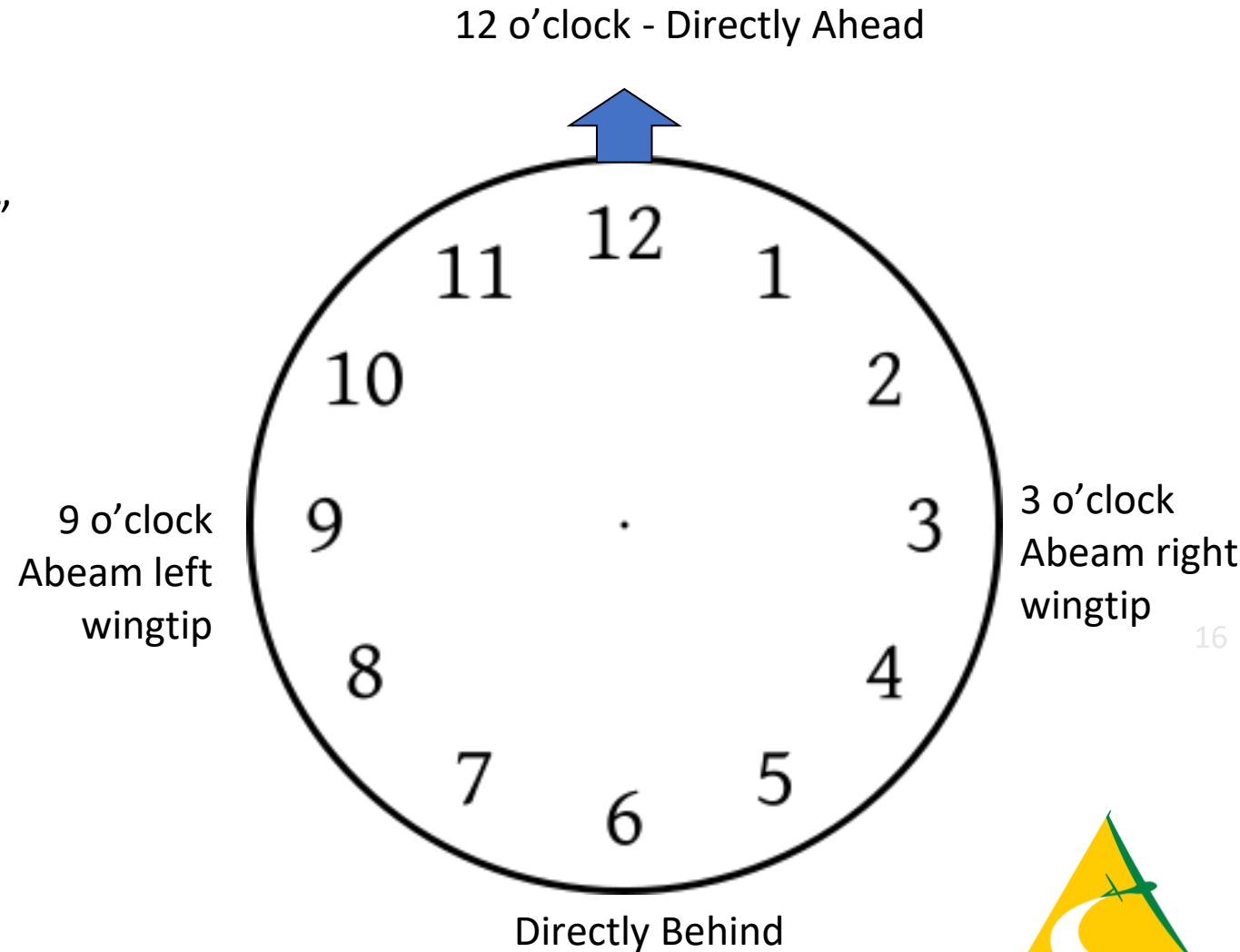
- Examples:

Calling a glider relative to you:

- “One glider at 10 o’clock – level/high/low”
- “two gliders 11 o’clock, high,”

Call your position relative to another glider:

- “I am your 9 o’clock, low”
(how is this done?)



Effective Lookout

- **Look where you are about to fly:**
 - **Flying straight** – look ahead, and sideways, above and below
 - **Turning** - looking in the direction of turn and behind the wing
 - **Diving or climbing** - look below and above
- [“Clear Left, Ahead, Above, Right”; “clear below”]
- Look for other aircraft flying towards you, from ahead or the side or even over your shoulder
- **Identify and call** any aircraft that could come in conflict
- **Move your head**, not just your eyes
- Identify **Blind spots**, and make changes so you can see there also
- **Focus your eyes** on distant objects to maintain focus

Effective Lookout

- Lookout
- Lookout
- Lookout

• **Lookout**

- Never stop.....!

Review

Questions



Theory Lesson

GPC Unit –# 9

Lookout Scanning



Aims

- Explains the limitations of sight
- Explains Alerted See and Avoid
- Apply a range of Scanning techniques



Why Lookout?

- Collision with other aircraft is a major risk on any flight
- An effective lookout
 - Reduces this risk significantly
 - Is an important element of Airmanship in improving flight safety
- Throughout training, the highest standards of lookout are insisted on every flight

Recap from Theory Lesson 1

- Vision is restricted by:
 - individual's eyesight performance,
 - dirty canopy,
 - poor weather / haze / sun,
 - the gliders airframe.
- Take actions to improve these deficiencies

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Alerted See and Avoid

- Listening to radio traffic helps to identify other aircraft that might pose a hazard [eg. An aircraft calls inbound to your airfield]
- An aircraft radio call at a circuit position will direct your attention to the threat
- Turn your head - focus eyes outside the cockpit
- Report sightings of other gliders and aircraft to the trainer [Remember the clock code]
- Stationary aircraft on a constant relative bearing will be on a collision course with you
- Aircraft that move across your vision are much easier to see

Limitations of the Eye

- The human visual system is exquisitely adapted to life on the African savannah, not gliding
- The brain makes executive decisions about what you "see" without asking for permission
- If you can't see something your brain thinks it doesn't exist – BUT there may be something actually there.



The blind spot of the eye



Try this exercise:

- Print out this paper
- Cover your right eye
- Move the paper slowly towards your eye
- The red star disappears at a particular point and then returns

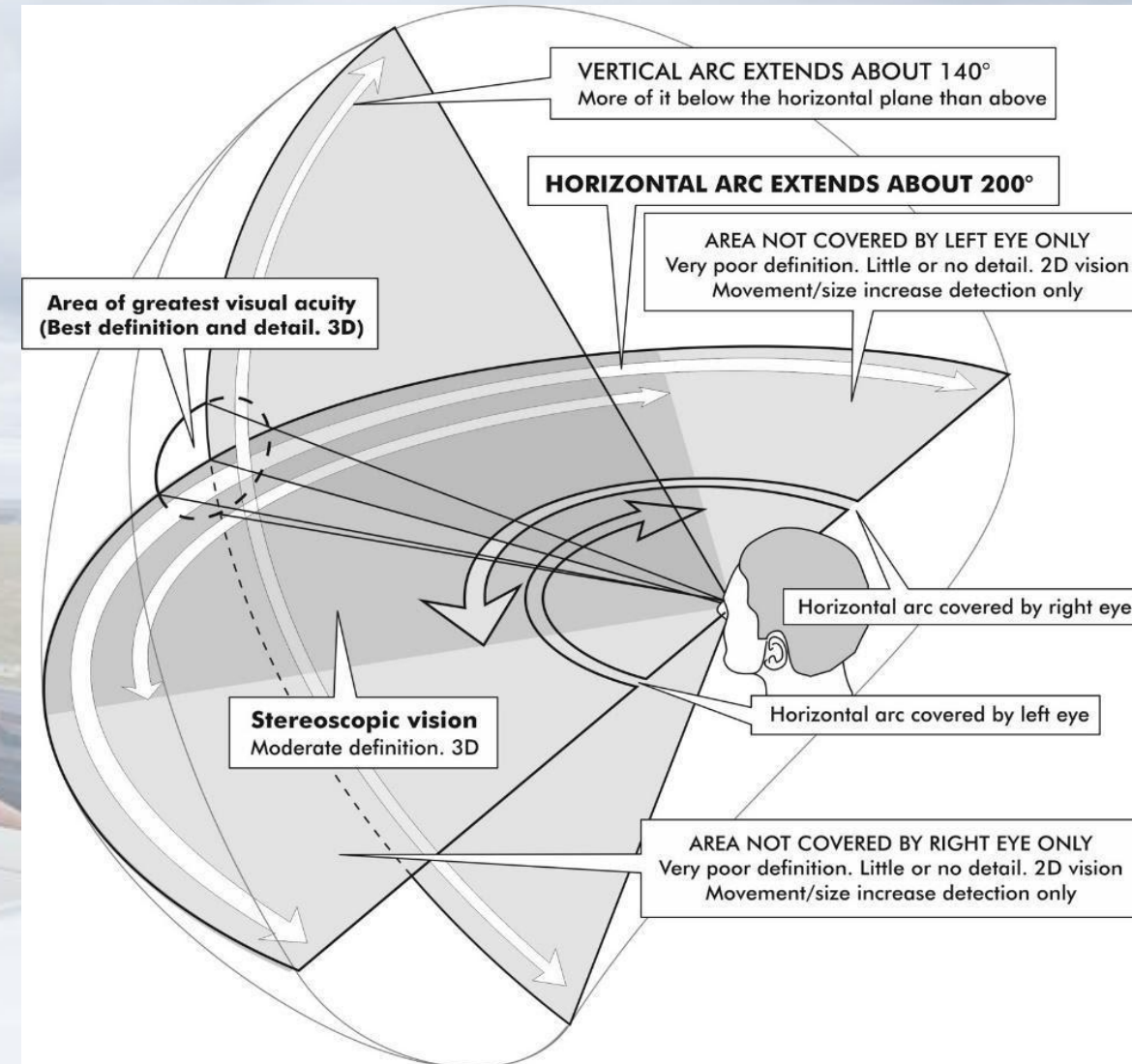
Vision can't be Trusted

- An immediate threat blocks other information:
 - You enter a thermal
 - You see a glider which holds your attention
 - But you don't see another glider you are flying in company with
- Your brain is hard wired to prioritise threats
- Moving your head and changing your focus can reveal the other glider

[Watch this video](#)

Your Field of Vision

- Outside of the central cone, the clarity and focus decreases
- Something that enters the cone should be easily visible, but you need to move your head up and down and to each side to see aircraft that may come into conflict
- If you are going to turn to the right, the glider will fly into the area that is currently not visible, behind the wing tip.
- To avoid conflict, turn your head and shoulders and look behind the wing as you fly into the turn. An aircraft that is overtaking you should then be visible
- A random movement and change of focus may work, but it is better to do a planned scan of the airspace that you are flying, or about to fly in.



Peripheral Vision

- Peripheral vision detects movement then directs you to look at it
 - if something has no relative movement this doesn't work .
- Pattern recognition means that once you see one glider you can see others:
 - in the bush - see one kangaroo then see seven
 - the brain is good at this - let's use it

Lookout in Flight

- Human vision is attuned to seeing
 - movements,
 - edges,
 - contrasting colours,
 - sunlight glinting,
 - changes in position.
- Pilots must use a systematic scan to look for other aircraft.

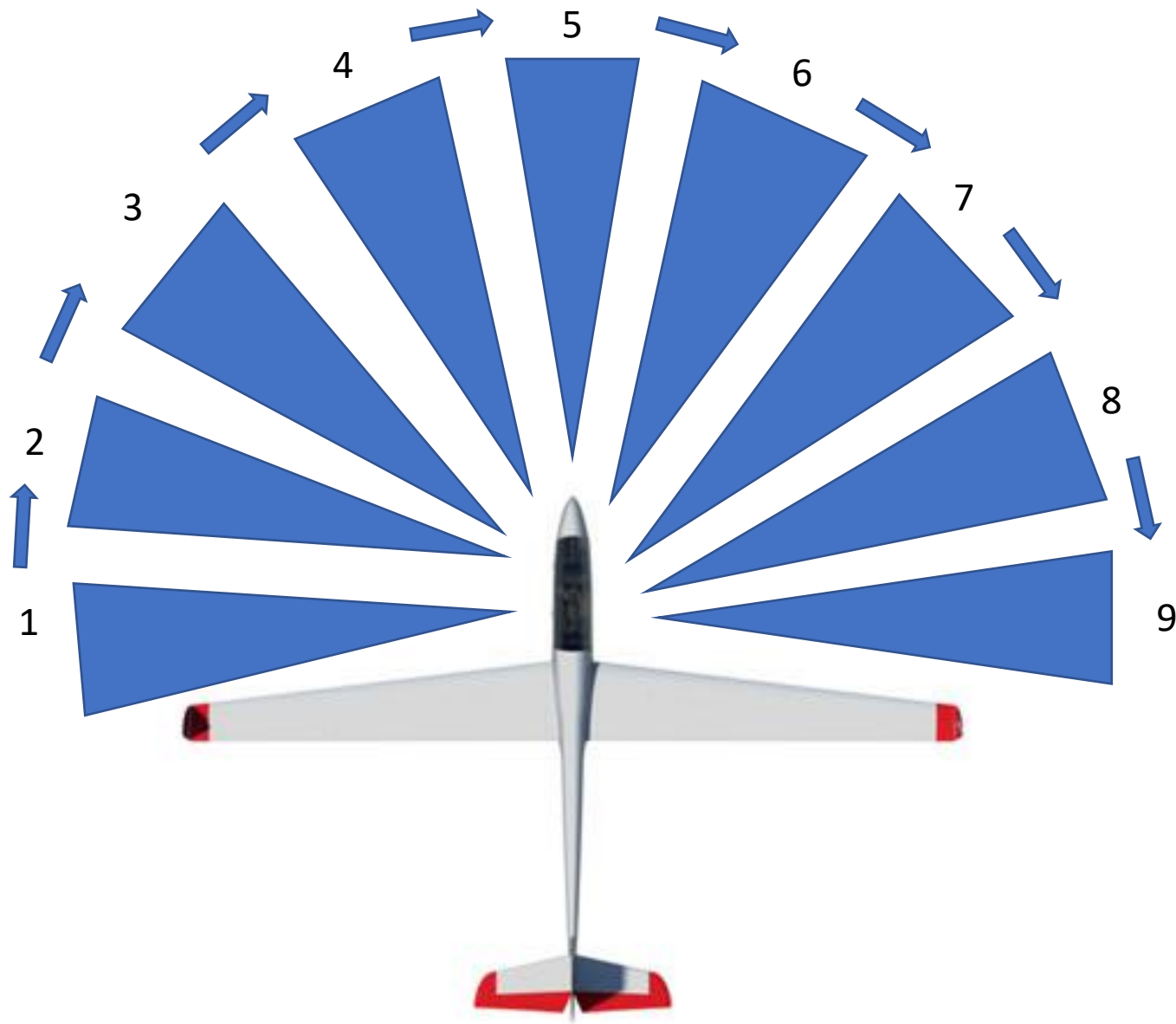
3 Types of Scan

- Full Scan
 - Systematic scan along the horizon from behind the left- wing tip, directly ahead through to behind our right- wing tip
- Cruising Scan
 - Focus on the cone of airspace 60°-120° in front
- Targeted Scan
 - Focus on a smaller area of the sky which has potential for increased traffic or risk

Full Scan

- Scan along the horizon from behind the left wingtip, directly ahead through to behind the right wingtip, including the area above and below the horizon, and directly overhead and below the glider.
- Takes a few minutes to do this correctly and repeat regularly, depending on traffic density.
- Pause every 20°-30° to enable your eyes to focus on any object within the view - otherwise you will not see it.
- When flying in a set direction, keep performing this scan to make you aware of other aircraft that are around.
 - Maybe a glider flying across your path, or
 - a power plane taking off, or
 - a gaggle of gliders thermalling.

Full Scan

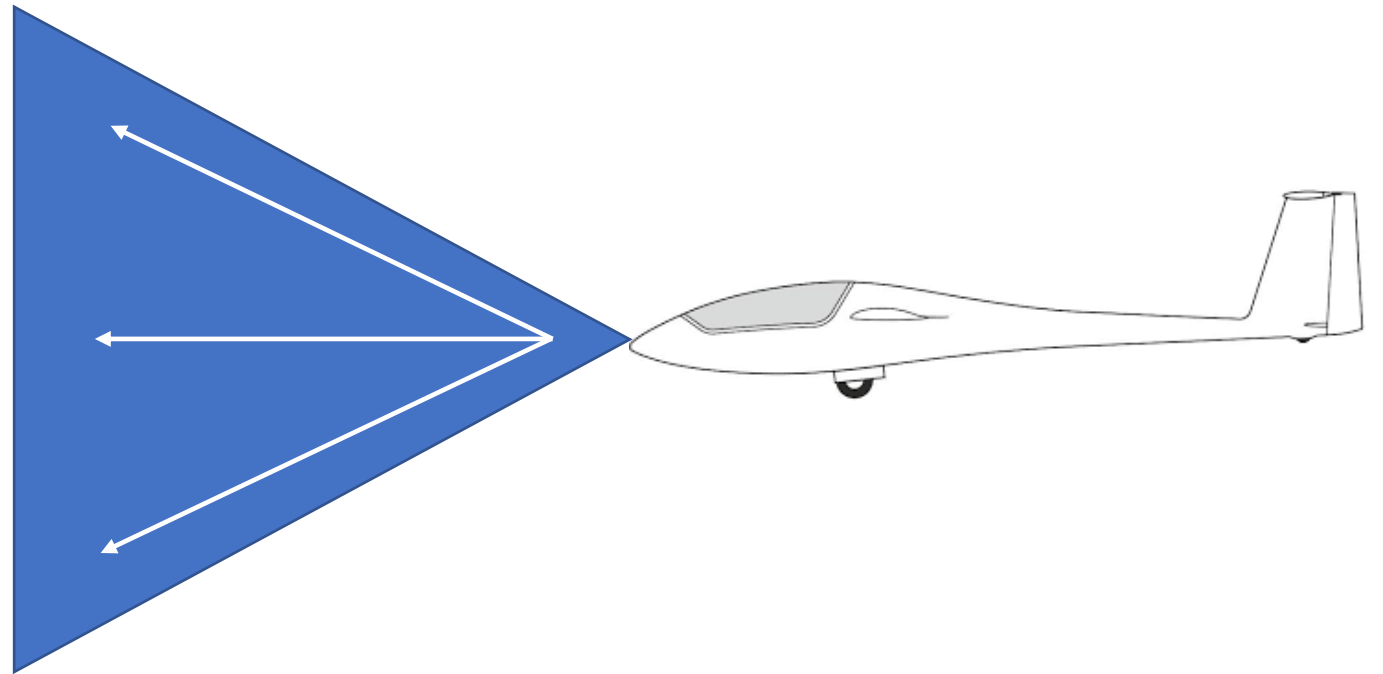
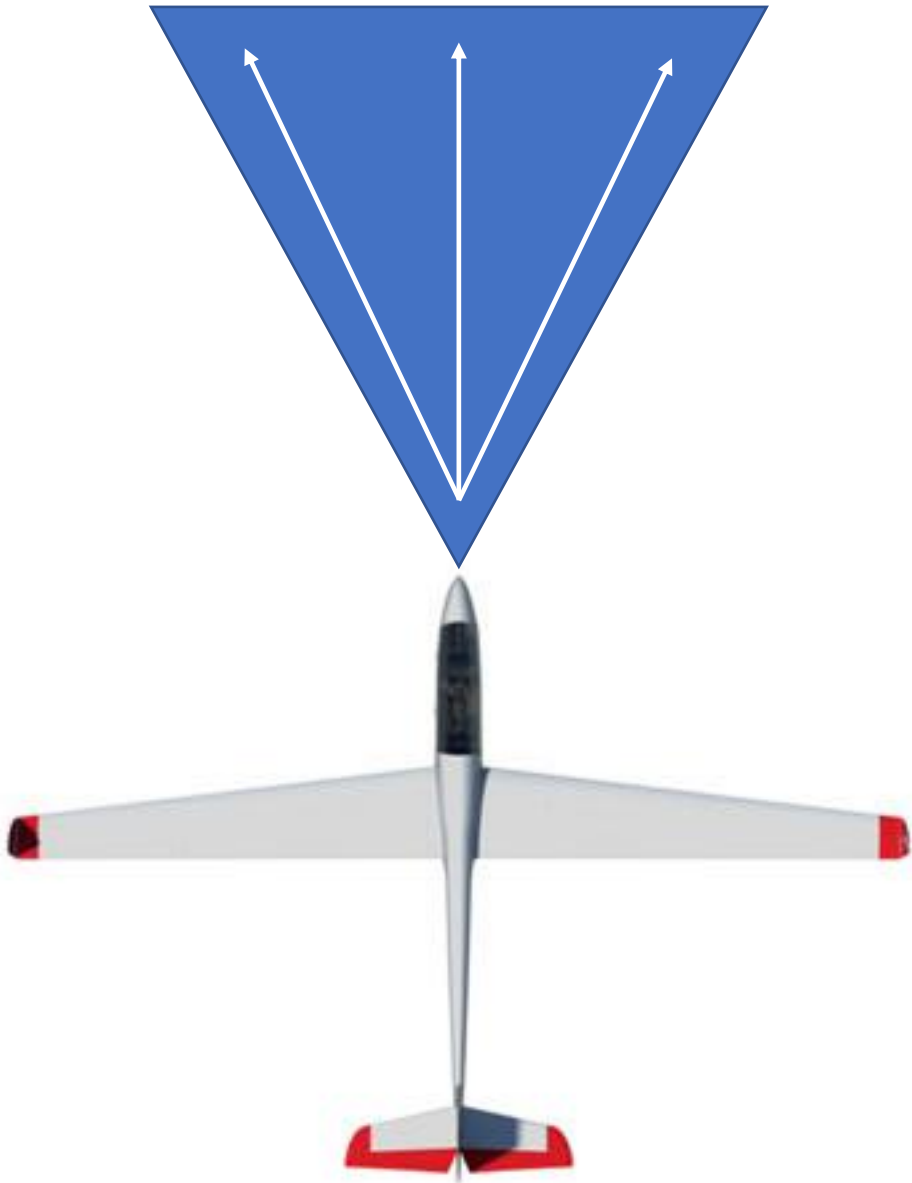


Cruising Scan

- When flying straight the most dangerous area is straight ahead and 60 degrees cone around the flight path, including the area above and below the horizon.
- We need to see aircraft in this region quickly so we can avoid any collisions risk. So we would focus on this cone of airspace
- In situations where there is random traffic (cross country, training area, etc) it may pay to broaden the size of the Cruising Scan cone to 120 degrees.

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Cruising Scan



Targeted Scan - turning

- You will be turning into an area that you may not have had clear vision of previously.
- Firstly look in the opposite direction to the planned turn to identify threats from behind and the side.
- Then scan around the horizon through straight ahead and finishing behind the wing in the direction you are turning.
- This will progressively let you see any aircraft that may be coming from behind you.
- You will need to twist your head and neck to see behind the wing.
- Then you can turn.

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Targeted Scan - thermals

- **When Joining a thermal** with other gliders. Identify all of the gliders in the thermal and other gliders joining the thermal, from any direction.
- **In the Thermal:** Look at the horizon to identify any aircraft that is approaching you. You will not see this view again for another 20 seconds.
- **Leaving a thermal:** Before straightening up to leave, first focus on the area outside the turn to detect if another glider is joining or overtaking in that area.

Targeted Scan - Circuit

- Joining the circuit for landing - there is likely to be increased traffic, arriving from many different directions.
- Conduct a TARGETED scan of the circuit joining area and downwind leg.
- Monitor radio and visually identify any aircraft that calls.



Other Considerations

- The glider's blind spots prevent you seeing conflicting aircraft - for example, following another directly astern and higher. The glider that is behind and can see the glider ahead is responsible to maintain separation.
- A glider doing a pull-up can be in a double blind situation where you cannot see the glider above and behind you, and you may be below the nose of the glider behind you and therefore not visible to it—there is no obvious fix for this so prevention is the only defence.
- Avoid flying directly above or below another glider with less than 500 ft clearance.
- Do not overtake another glider by flying underneath it – another double blind situation.

Further Reading

[SkyLibrary - Visual Scanning Technique](#)

[CASA CAAP 166-2\(1\)](#)

