

Look Out and Collision Avoidance

Joerg Stieber
Graphics from Aero kuier



The Eye Field of Vision

- < 210 Degrees – Center 60 Degrees
 - < Center
 - , Area covered by both eyes, sharp focus, colors, but no night vision.
 - , 1 sqmm of retina is mapped to 10,000 sqmm of brain surface
 - < Periphery
 - , Fuzzy, weak colors (brain compensates), night vision, better movement recognition than the center (movement in the periphery triggers eye reflex)
 - , Outer periphery only covered by one eye
-



The Eye Field of Vision

- < Stereoscopic Vision
 - , Only effective under 100m
 - , For airspace observation not relevant.
 - , To gauge distance the pilot relies on apparent size of the object. This can lead to surprises if the object is different in size than expected
 - kid's balloon vs. hot air balloon
 - model airplane vs real airplane
 - model airfield vs real airfield
-



The Eye Blind Spot

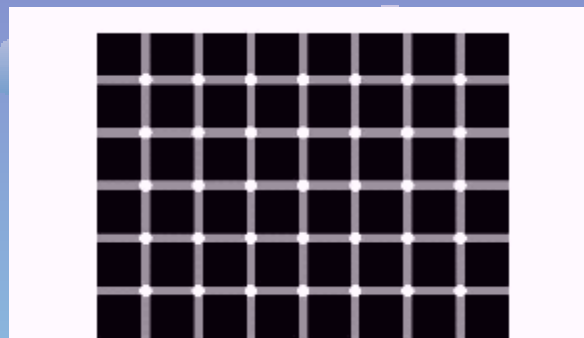
- < We all have one in each eye
 - < One eye compensates for the other eye's blind spot
 - < The brain fills in the background
 - < Demonstration
-



The Eye Blind Spot



[www.ttc.gc.ca/aviation/syssafe/newsdette rs/vortex/vort5-99/engli sh/515e.htm](http://www.ttc.gc.ca/aviation/syssafe/newsdette%20rs%20vortex/vort5-99/engli%20sh/515e.htm)



Count the black dots :-)



The Brain

- < Filters
 - < Recognizes Shapes
 - < Controls Eye Movement Reflexes
 - < Compensates for Color Weakness in the Periphery and Blind Spot
-



The Brain

Since the brain plays such a prominent role

Seeing Can be Learned



Collision Course

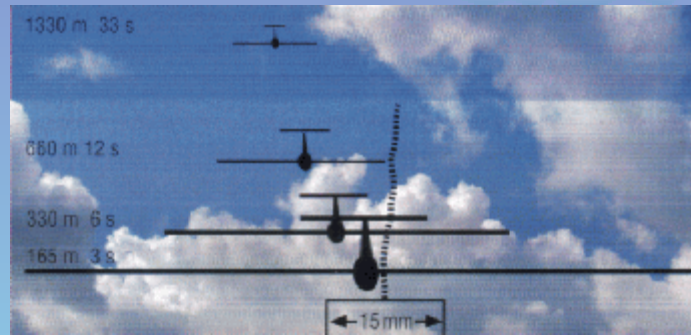
If you are flying straight and are on a collision course with another aircraft flying straight and level as well:

- <The target will not move on your canopy
 - <It will just slowly grow at first, then explode
 - <Since there is no relative movement it will be difficult for your motion sensitive peripheral vision to pick up
 - <A clean canopy and frequent eye movements are important
-



Conflict Situations and Reaction Time

Head On



Conflict Situations and Reaction Time

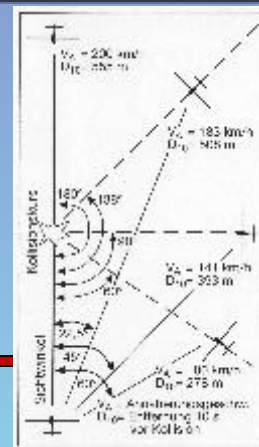
Converging



Convergence Angles and Closing Speeds

60 degree convergence is the most dangerous:

- < In your peripheral vision, No relative movement
- < Yet high closing speed



How can we prepare ourselves?

- < Keep your head out of the cockpit at all times!



How can we prepare ourselves?

- < Practice Scanning
 - , Use the horizon as anchor to sweep back and forth in a 120 degree arc. This is the zone with the highest probability for conflict
 - , Do not focus on singular points on the horizon (trees, towers, hills)
 - , Aircraft below the horizon are much harder to spot than above
 - , Be very alert if you spot an object with no relative movement do not take your eyes off it until you are satisfied there is no danger of collision
- < Try to use and train your peripheral vision



Scanning Techniques

Novice



Experienced Pilot



Shape Recognition

- < One of the brain's functions is to filter the dazzling stream of information provided by the eyes
 - < From childhood on, you have been trained to recognize the shapes of letters and words. As a consequence, you can read a word within a split second
 - < We have to teach our brains to pick out and recognize airplanes and their direction of flight just as quickly
-



Shape Recognition

SOARING



Shape Recognition



Shape Recognition



Shape Recognition

Which of the shapes and words do you remember?



Shape Recognition



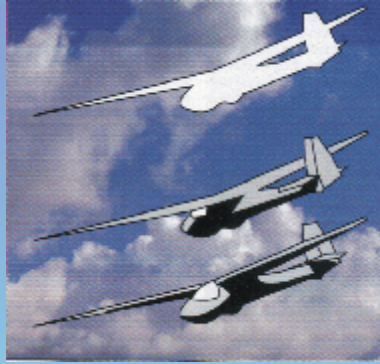
Is the glider flying away from you?



Shape Recognition

CAUTION!

Your first assumption might be wrong!!



Anticipation

- < It is much easier to spot targets if you know where to look.
- < Anticipate whether or not a conflict situation can develop
 - , You spot a tow taking off – where will it be in a minute?
 - , A towplane just released – what route will it take from here?
 - , You are heading for a gaggle of circling gliders. Which ones are more likely to be a problem? Above or below the horizon?
 - , You are in a thermal and see other gliders heading for it.



Other Factors

- < Head Gear
 - , It is important to wear a hat that does not obscure the field of vision. Wearing a ball cap is like painting the top third of the canopy black.
- < Sunglasses
 - , Our eyes cannot focus in the UV spectrum. When selecting sunglasses make sure you get good UV filter characteristics.
 - , On a bright day distant objects appear much clearer when the UV portion of the light is filtered out.
 - , The same effect makes thermals visible on hazy days.



Other Factors

< Brain Fitness

, Since the brain is so central to vision and recognition you should make sure it is running in high gear. The following factors degrade brain performance:

- Lack of oxygen (hypoxia)
 - Dehydration
 - Alcohol, drugs (hangovers)
 - Lack of sleep
-



Fly Safely

Although there is no absolute protection against mid-air collisions, practicing good lookout techniques, knowing how to look and where to look and recognizing potentially dangerous situations will help us to reduce the risk. Soaring is a visual experience. Being at a high level of alertness not only increases the intensity of the experience it also makes it a safer one.

