# *VIRGINIA FLIGHT SCHOOL SAFETY ARTICLES – NO 01/12/07*

## *HUMAN PERFORMANCE*

DEFINITION

Human Performance can be described as the recognising and understanding of the Physiological effects of flying on the human body and as a result being able to compensate for these effects in the interest of safe flight.

INTRODUCTION

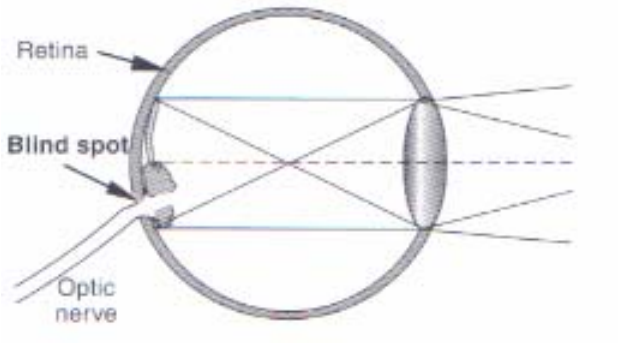
The aspect of physiology that is dealt with in this safety article is the eyes as a sensory organ which provides the brain with images of the environment, critical to piloting an aircraft and the primary sense with respect to aviation. Excellent vision is essential for maintaining spatial orientation, and with the exception of some visual illusions, is the only sense a pilot can trust.

BASIC EYE FUNCTION

Recognising Images. The eye converts light which it senses to impulses which are sent to the brain. The brain converts these impulses to images, which are matched to previously stored data (reference framework) enabling the viewer to recognise what is being seen.

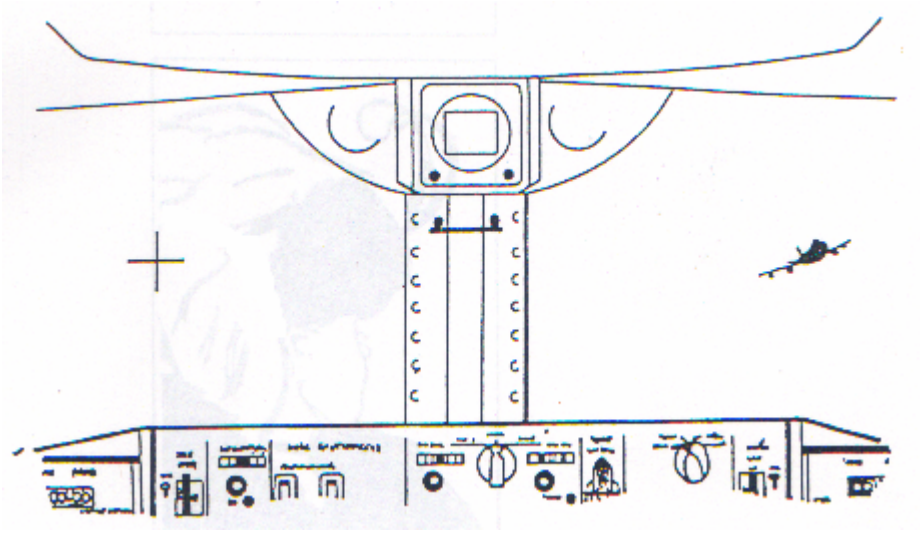
Visual Acuity. Visual acuity is the measure of a person's ability to distinguish fine detail. Although peripheral vision is sensitive to movement, an object must be looked at directly to distinguish identifying detail.

Natural Blind Spot. All eyes have a natural blind spot where the optic fibres from the light sensitive rods and cones lead into the optic nerve. The blind spot does not influence normal binocular (vision from both eyes) as each eye compensates for the other's blind spot.



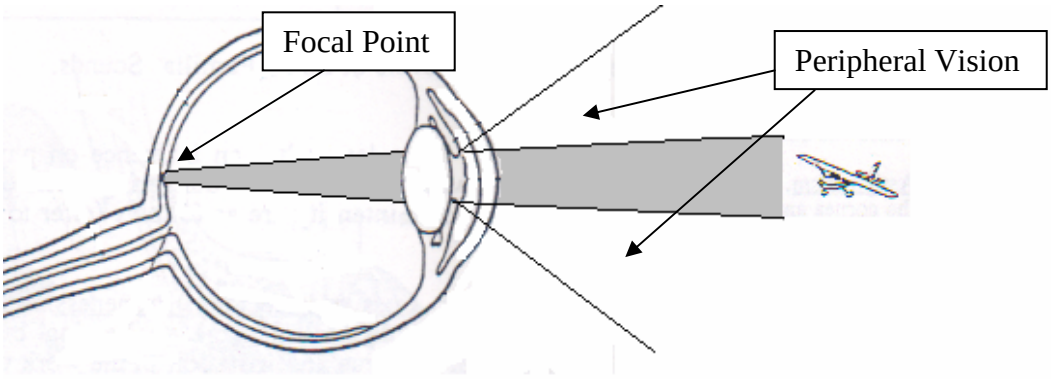

BLIND SPOT

This phenomenon can be verified by looking at the image below. Hold your left hand over your left eye and hold the page at arm's length with the cross directly in front of the right eye. Slowly move the book closer to your face while focusing on the cross. The silhouetted aircraft (B 747) will disappear at one point (your natural blind spot) and reappear later as the book is brought continually closer to your face. Segmented windscreen may interfere with binocular vision. If your aircraft is fitted with a segmented windscreen the object may remain invisible and your head will have to move from side to side to detect the object.

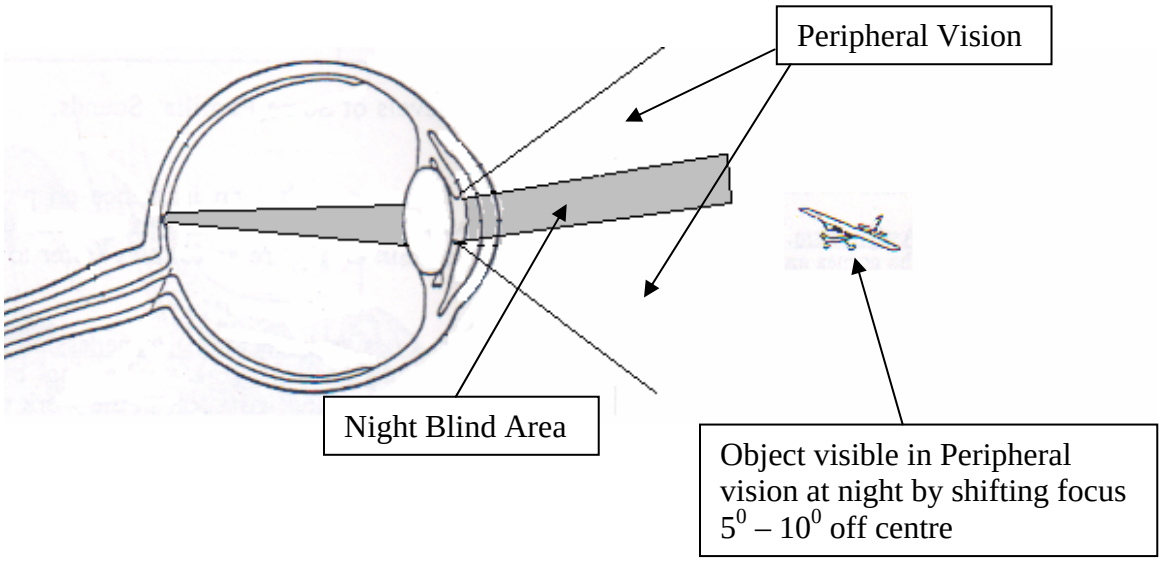


Night Vision. The eye has several limitations with respect to night vision which require understanding in order to avoid illusions and disorientation.

- Night Blind Spot. The best vision is obtained in daylight by looking directly at an object with the focus falling on the fovea where the cones are most active. At night, however, the cones are less functional and the best vision is obtained by looking $5^0 – 10^0$ off centre of the object you want to see, thereby exposing the rods to the image. This is best illustrated by looking up at the heavens on a clear night. Look directly ahead and observe the stars you see. Now look slightly off centre and stars will become visible that were originally not visible. The two diagrammes on the next page illustrate this phenomena.

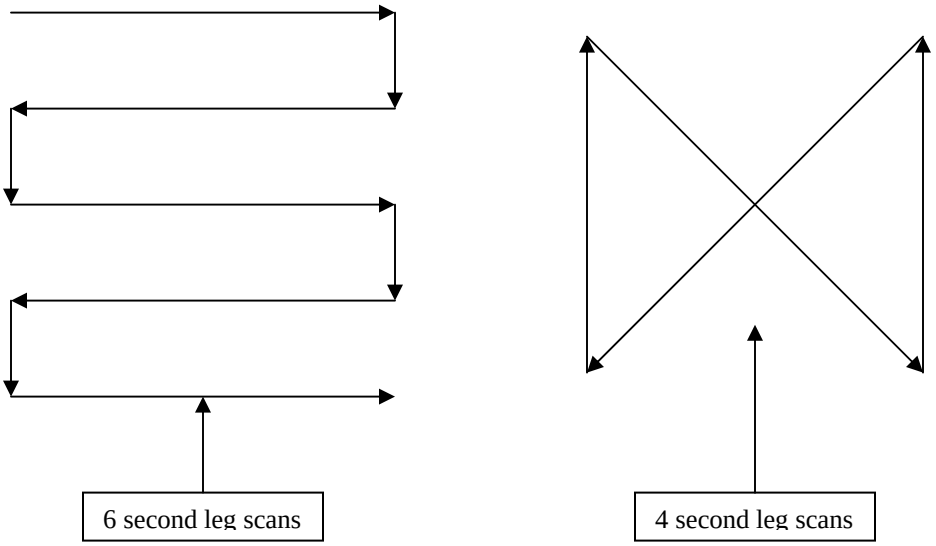



DAY VISION




NIGHT VISION

- Night Scanning. Off center viewing and using a predetermined pattern (Fig 13) will help to facilitate night vision. Blinking eyes frequently will also help to counter blurring.




- Adaptation to Darkness. Cones adapt rapidly to changes in light intensity but rods do not. Adaptation from bright light to darkness, after which sight is again effective, may take up to 30 minutes. A sudden glare can temporarily destroy night vision. The following methods can be utilized to improve and maintain night vision :

  - Avoid bright light 30 minutes before take off.
  - Keep one eye closed when encountering bright light.
  - Use sunglasses if exposure to bright light before flight is unavoidable.
  - Keep the cockpit lighting as low as possible as this will allow ambient external light to enter the cockpit making it easier for the pilot to detect light and therefore objects outside.
  - Reduced Oxygen levels in the blood affect vision so avoid smoking when night flying.
  - Be well rested prior to night flying.

Glare. Glare can be experienced at high altitude flight, flying directly above clouds or directly into a low sun. The contrast in the levels of brightness outside and inside the cockpit may make it difficult for the pilot to read instruments or displays and result in blind flying without realizing it. Good quality anti-glare sunglasses should be used when encountering an environment with glare.

Empty Field Myopia. Myopia means short sightedness and can be experienced by flight at high altitudes or night flying when there are no external objects to focus on. The eyes tend to adopt a resting focal point of about 2 meters distant from the eye instead of naturally focusing at infinity. Straining consciously to focus usually brings the focal point even closer. To break this resting focal condition focus on an object at least 6 meters away if possible such as a cloud or even the aircraft wingtip or edge of the rotor disc in a helicopter.

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