

LEP glasses can also skew the perception of colors on instrument displays, with the most common problem being a yellow shift.



Figure 4: A flight control panel and weather radar without LEP visor.



Figure 5: The same panel as seen through an LEP visor.

Safety Precautions

- Aviators are encouraged to familiarize themselves with color perception through their LEP devices prior to flight by viewing lighting in the airport environment before departure.
- During flight operations, pilots are advised to cross-check signal lighting information with other visual cues, ground and traffic warning systems, and flight deck displays.
- Choose laser safety glasses after consulting with a qualified optical expert for consideration of wavelength and optical density (a measure of the saturation permitted to pass through a filter for the laser in use).

References

1. Gildea, K. M., & Jack, D. (2018). Laser eye protection and the effect of two types of light-emitting diodes (LEDs) on color perception. Washington, DC: Office of Aerospace Medicine; 2018. https://www.faa.gov/data_research/research/med_humanfacs/oamtechreports/

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Laser Eye Protection (LEP) Perceptual Effects on Aviation





Laser Eye Protection Perceptual Effects on Aviation Signal Lighting¹

Reports by aircrew indicate that aircraft in the U.S. are illuminated by lasers in excess of 6,000 times every year. The distraction and potential for temporary blindness places the aircraft at risk. As a countermeasure, some aircrew wear laser eye protection (LEP) glasses. Most laser strikes are caused by green lasers with a smaller percentage being from blue lasers. Red laser events are rare. Because of this, LEP glasses have colored filters that substantially reduce the amount of light reaching the eye within the wavelengths of the most common handheld lasers. This reduces the potential for distraction and temporary blindness while allowing the pilot to perceive most colors.



Laser Eye Protection (LEP) Glasses



Most common LEP glasses filter green and blue wavelengths. LEP is available both as eyeglasses and visors. No single LEP eyeglass or visor offers protection against ALL laser wavelengths. In addition, LEP glasses may cause physical and optical interference with Night Vision Goggles (NVG).

LEP Glasses And Color Perception

Because LEP glasses with green filters reduce the amount of green light present, any remaining light will become more dominant. Depending on the type of light being viewed (incandescent with various filters or different LEDs), a green light might appear more blue or more yellow, and a white light may appear more yellow or red.

By blocking some of the light from the green and blue areas of the spectrum, laser eye protection devices produce color perception changes that are similar to what is observed by those with mild color vision deficiencies. For example, those with a green color deficiency would encounter difficulty in reading the number “6” in this image.

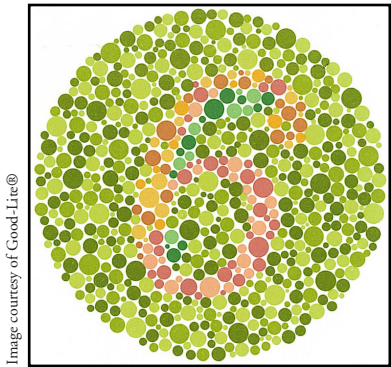


Image courtesy of Good-Lite®

Figure 1: Ishihara color blindness test plate

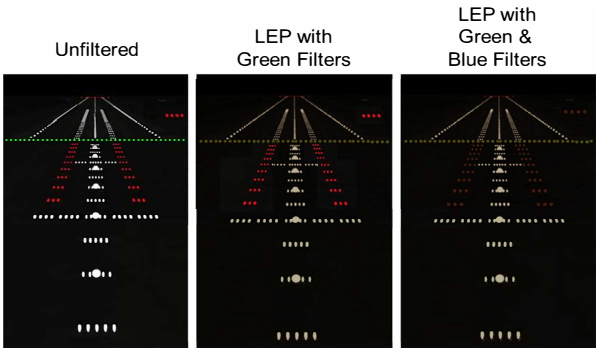


Figure 2: Potential approach and runway light color perceptual challenges based on LEP filters.

Similarly, in the case of a green filter in a laser eye protection device, green lights may appear dimmer and more yellow in color. This can lead to green lights being confused with aviation white and yellow lights.

LEP glasses with a green filter will cause white and yellow lights to appear red and could potentially interfere with some green and blue lights.

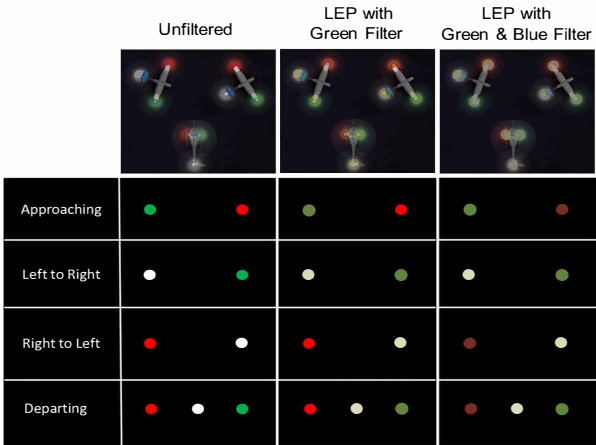


Figure 3: Navigation and position lights under filtered and unfiltered conditions.

Safety Precautions

To offset the loss of color cues, pilots should rely on visual cues such as the general pattern of lights, which can provide additional information to the flight crew. However, during times of high workload, distraction, or degraded visibility such as haze, the additional visual cues may be more difficult to discern and properly interpret.