



The Technology Behind PerriQuest Laser Defense Eyewear™

When PerriQuest Defense Research Enterprises was approached to solve the serious threat of laser strikes to commercial aircraft, they were faced with two well-known technology barriers. First, existing commercial-grade laser blocking eyewear relies on absorptive dyes that obscure color vision. This technology approach is therefore not appropriate given the heavy dependence of commercial pilots on their color vision for recognition and decision making based on illuminated instrumentation and external navigation lights. Second, known military solutions using precision active and passive filters were focused on ultra-high-power battlefield lasers, emitting mainly in the infrared region of the spectrum. The result was an expensive solution that is uncomfortable to wear, and inappropriate for the handheld laser strike threat in many ways.

A new solution was needed that focused specifically on the threat to pilots of commercial and law enforcement aircraft and that leveraged the considerable know-how from the many millions of dollars of investments made in laser protection technology for the military. Fittingly, and as so often happens in the ebb and flow of technology between the military and civilian sector, the innovations forged in the development of PerriQuest Laser Defense Eyewear for commercial and law enforcement pilots can now be leveraged back into solutions for the military battlefield.

Laser strikes against commercial and non-combat military vehicles typically occur with lasers that emit in the visible region of the spectrum. Green, blue, and red handheld lasers are now inexpensive and ubiquitous throughout the world. The visual thrill of seeing laser light reflections off an aircraft is at least part of the appeal to those who commit these attacks. Thus, for commercial and non-combat military situations, the solution must address issues related to the visible part of the electromagnetic spectrum.

The problem with attenuating laser emission in the green, blue, and red parts of the spectrum is that color perception will be severely degraded or lost. Pilots, in particular, need keen color perception. Consequently, any laser protection solution for this market segment must use a solution that incorporates a deep understanding of color vision and color perception.

The complex field of color science dates back more than 300 years, to the time of Sir Isaac Newton. PerriQuest engaged experts that understand how the brain processes different wavelengths of light to perceive color, to see clearly, and to perceive depth. PerriQuest then used this knowledge to invent a precision filter technology that targets and blocks the attacking laser wavelengths, yet passes enough visible light at important wavelengths to ensure good color discrimination



and meet other visual metrics. The PerriQuest filter technology also provides high visibility for key wavelengths associated with important illumination sources, such as cockpit screens, handheld devices, indicator lights and various navigational lighting.

Past research and development projects have tried and failed to produce precision filters for military laser strike threats. See, for example, Edwards, et al., "Robust Fixed-Wavelength Laser Eye Protection," Natick Technical Report, Natick/TR-94/106, 1994. PerriQuest scientists were able to bring various manufacturing expertise and filter design techniques in a variety of industries to address some of the known challenges in coating curved substrates, and managing various material mechanical stresses, to overcome these past limitations.

PerriQuest Defense Research Enterprises, LLC expects the innovations behind the commercial Laser Defense Eyewear product will assist current and future developments toward battlefield solutions for laser protection. Leveraging these innovations will help the military establish requirements for visible laser protection, human factors, and vision and develop lower-cost solutions for the battlefield.