New Simulation Software Lights the Way to Better Antilaser Eyewear

AFRL's recent deployment of commercially produced software for assessing antilaser eyewear performance will enable uniquely qualified approval or rejection of a given manufacturer's proposed design for military use. Developed by OPTIS, the novel OptisWorks® software executes accurate simulations of light and color and, further, is completely integrated into Dassault Systèmes SolidWorks Corporation’s SolidWorks® computer-aided design program. Consequently, AFRL's decision to leverage the technology has cut months of costly and time-consuming human testing and simultaneously improved the reliability of findings, with comparisons of real versus simulated results revealing no measurable differences.

Maximizing aircrew combat survivability and effectiveness requires that crew members have a reliable way to protect their eyes from the risk of laser-induced injury. Traditional laser eye protection (LEP) does provide a degree of physical protection by filtering undesirable wavelengths while still transmitting visible light. However, the disadvantage of these conventional designs is that the color filters used to block laser light actually alter the aircrew's entire light environment and can thus interfere with their reading of cockpit instrumentation. Correct color perception is of critical importance in a flight deck, particularly at high speeds and in stressful combat situations.

AFRL deployed OptisWorks® commercial software to aid engineers in better gauging laser eye protection designs for possible military use. The technology enables accurate simulations of light and color as perceived by pilots. Pictured are the results of a geometric coverage simulation, wherein reverse ray tracing techniques reveal possible laser entry paths. (Air Force image)

With the support of optical specialists from TASC, Inc., AFRL employed OPTIS’ software solution to test two LEP design aspects: geometric coverage and impact to user perception of colors viewed through the eyewear. In analyzing LEP geometric coverage, the researchers used the software’s built-in reverse ray tracing techniques, whereby the eye is considered as a source and each ray emitted around the eyewear is deemed a possible entry path for a laser. While this scenario is not a physical reality, it is nonetheless an effective means for determining the LEP’s coverage area. Further, the only alternative—namely, determining the infinite number of positions that a laser could potentially occupy in space to bypass the eye protection—would be an impractical, if not altogether impossible, undertaking.

To address the challenge of analyzing how colors appear to users when seen through the LEP, the researchers used the software’s advanced colorimetric simulation capabilities, which take into account human vision and also include a sunglass filter kit wherein the special LEP filters are defined. Using this functionality, the team was able to ascertain the degree of color change occurring when a specific element of cockpit instrumentation was viewed through the LEP. The capacity to understand such color changes will enable engineers to determine whether pilots will be able to correctly interpret avionic information from displays, warnings, and illuminated controls on the cockpit interface.

AFRL’s deployment of commercially developed OptisWorks® software enables simulations of light and color for assessing antilaser eyewear designs for military use. Pictured are the results of color changes that occur when a pilot views cockpit instrumentation through the particular design. (Air Force image)