

## LOD Proposal

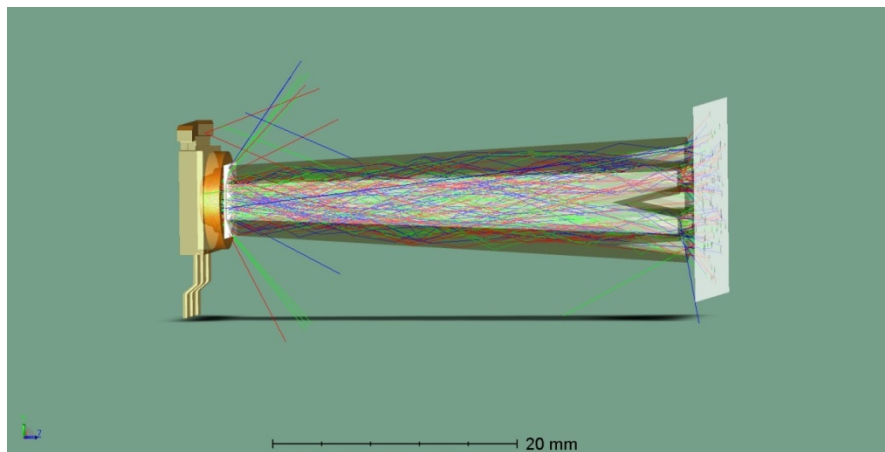
### 1. LOD Background:

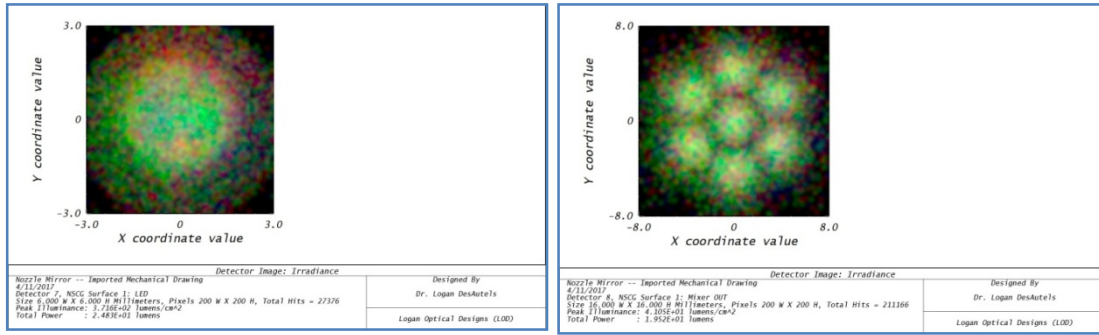
LOD has nearly 30 years experience in optical design, analysis, procurement and other scientific research areas for DoD and the private sector ranging in single element designs to complex multi-spectral imaging system designs. LOD uses Zemax optical design code that is capable of geometrical ray analysis and physical optics propagation. In addition, LOD uses AGI32 Photometric Toolbox software to design and evaluate HID distributions.

LOD also uses Mathcad, Matlab and various other software packages to assist in the design/analysis. LOD will develop an optical system that meets your specifications with a current product or product under development. LOD will work closely with clients on all project issues including opto-mechanical, vendor selection, and procurement. LOD will provide timely response to enable customers to meet project deadlines.

### 2. LOD Design Examples

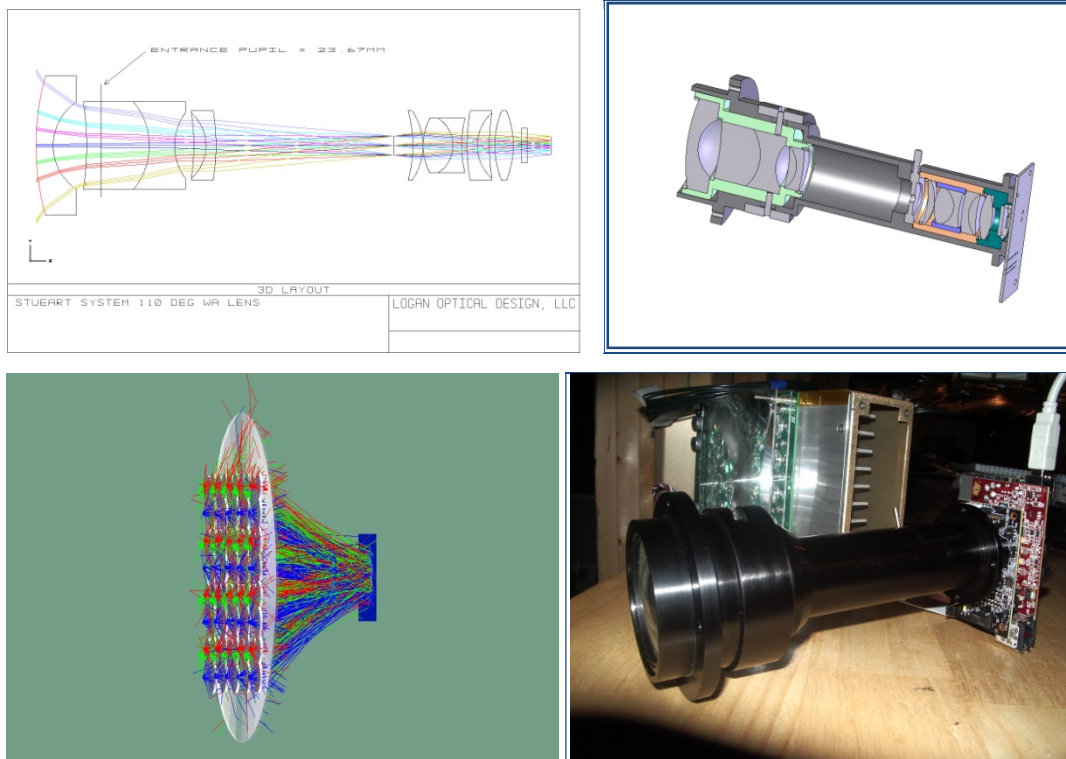
Some LOD design examples can be found in the following figures below, and also on the Logan Optical Design website. Below are a few examples of previous work done by LOD.





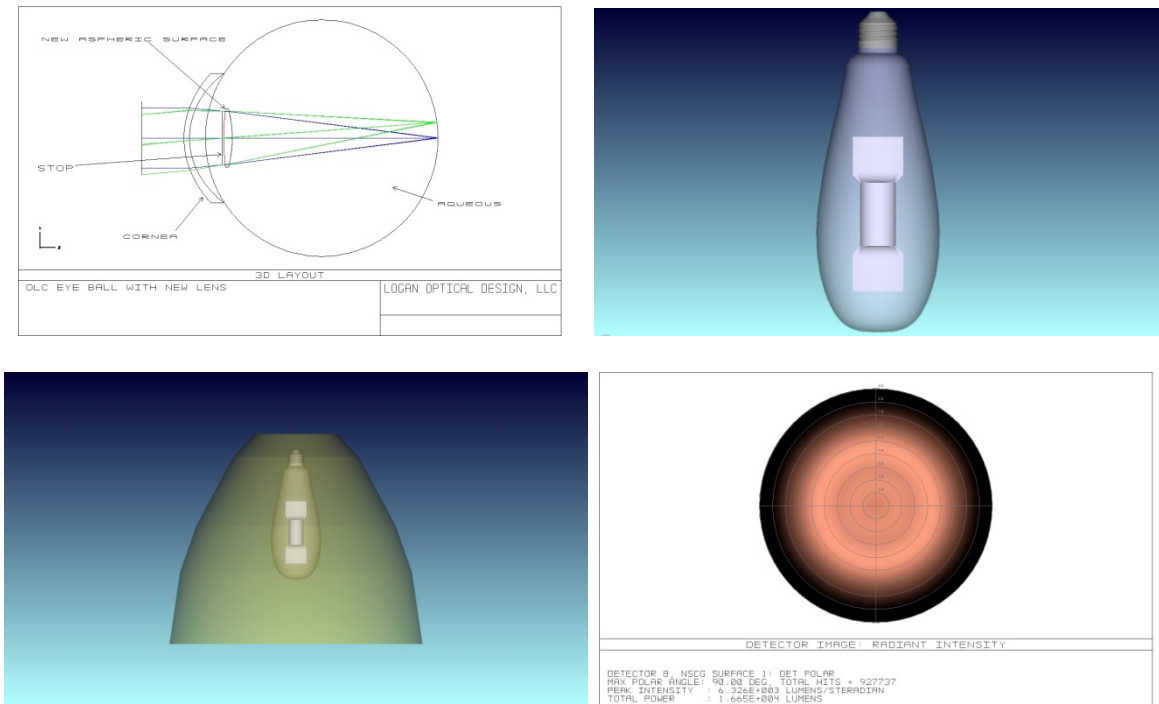
**Figure 1:** This figure shows some example of previous LOD RGB mixing light pipes.

Figure 1 is showing previous work of LOD light pipe design. LOD recommends using a light pipe to translate the light from a white LED through the protective enclosure and to the space environment. The light will be confined in the light pipe using total internal reflection (TIR); the pipe can be manufactured out of polycarbonate or glass.



**Figure 2: (TOP)** this figure presents the optical design of one of the latest LOD designs (on the left), which is a 110° diffraction limited f/3.8 optical system. On the right is the mechanical design which implemented this lens. **(Bottom)** On the bottom is the implemented Stewart Systems LOD wide angle lens along with the LOD Fresnel lens collimator array and Fresnel focusing lens.

Figure 2 show other LOD examples using Fresnel lenses and diffraction limited wide angle custom lenses. LOD has a variety of experience ranging from DoD, university (University of Dayton Research Institute and Auburn University), the automotive industry, to the medical industry as shown below designing intra-ocular lenses (IOLs). Also shown below is some work LOD has performed in industrial lighting using high intensity discharge (HID) lamps; modeling HID and designing HID reflectors.



**Figure 3: (Top)** figure presents the work LOD has performed in the medical industry. Above is the design of a new IOL for humans as well as canines. **(Bottom)** three represent HID modeling and reflector design that LOD has adequate experience. LOD uses AGI32 Photometric Toolbox software to design and evaluate HID distributions.

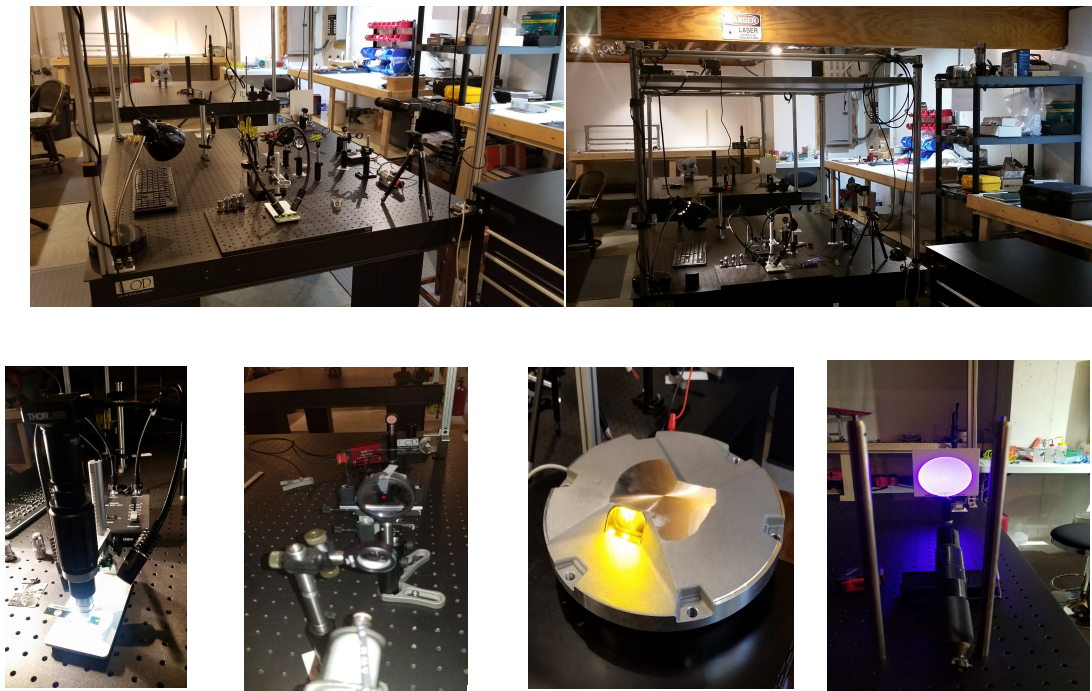
Figure 3 shows IOL and eye modeling; LOD has researched published refereed medical/optical journals for the best way to model the human eye with accurately measured values for the Aqueous, cornea, lens, and vitreous materials. Figure 3 also displays LOD’s ability to model and design non-imaging light sources and uses Zemax and AGI32 code.

**3. Facilities/Equipment**

**5.1 Logan Optical Design (LOD) – Dayton, OH**

Dr. Logan DesAutels is the owner of LOD. [LOD](#) has over 20 years experience in optical design, layout and optical analysis in the private industry, medical industry and the Department of Defense.

LOD has more than adequate real estate to accomplish the above tasks. All facilities are compliant with local, federal, and state environmental laws and regulations. The optical elements, and if needed, the mechanical housings, will be manufactured by a list of relative vendors (optical and mechanical) that LOD and [North Pointe Associates](#) have used for years. LOD uses Zemax optical design code for the optical design and analysis and Mathcad/Matlab mathematical software packages to assist in the design/analysis. LOD has years of experience of not only lens design, but various analyses, procurement and implementation/characterization of multiple designs. LOD’s laboratory can assist the customer with test and characterization of current or prototyping new products.



**Figure 4:** (Top) figure presents the work LOD laboratory quick view showing two optical tables with various experiments running in parallel. (Bottom) shows a couple of experiments; LOD’s digital microscope, various experiment, a customer design verification prototype testing of a new high-power LED runway lighting system, and the LOD beam profiler imaging the LOD beam shaper.

### **5.1.1 Zemax Optical Design Code**

The design and optical tolerance analysis will be done using [Zemax](#) optical design software. LOD has ownership of an engineering grade version (top Zemax grade) of Zemax with yearly technical support and monthly updates. LOD currently uses four different computers to run various analyses in a feasible time. LOD has multiple optical designers who can also be called upon to assist or to check the final design for any possible errors. This is a valuable asset in order to properly design any optical system that will be put into production.

### **5.2 North Pointe Associates**

North Pointe Associates is a small; minority owned and operated mechanical engineering and design firm. NPA was founded in 1985 by José M. Bouza II, who has over 30 years of proven electronics packaging experience. His vision for NPA was to offer economical mechanical engineering and product development design services to private, commercial and government industries. Through the years, we evolved into design, product development and low-run manufacturing specialists.

#### **5.2.1 SolidWorks Mechanical Design Code**

[Solid Works](#) is the standard in 3D mechanical design software, allows for rapid prototyping, design modification and quicker turnaround time from manufacturing houses. Additionally, our engineering team is well versed in the use and application of Solid Edge ® and AutoCad® software. We assist with testing such as shock and vibration, temperature and EMI. Our products are designed meet or exceed FCC, CE and SAE specifications.