Non sequential modeling

A small firm providing lighting system to the automotive repair market was building a new system based on LEDs. The firm has mechanical and industrial design expertise but needed design assistance to model the uniform illumination pattern they hoped to achieve. During this project we worked exclusively with software design tools. The customer delivered their mechanical designs and the constraints on the reflector and we built a Zemax model using the non sequential tools in that program. The model we built was later outputted as an IGES file and prototyped.

Using their requirements we provided, design ray tracing and tolerancing for an elliptical reflector, and made determinations on:

- Shape of reflector,
- Optimized surface texture of reflector,
- Tolerance regions of LED position relative to reflector,
- Recommended mechanic dimensions of reflector optical (reflective)surface
- A calculation of light distribution to verify final results

The actual deliverables were: AutoCad drawings to show the mechanical features, image files based on Zemax output to show the expected illumination pattern, MathCAD files to give a mathematical representation and an IGES file for use by the customers rapid prototyping vendor

We also provided design suggestions and gave design trade offs. For example we found reflector height was critical for this construction (17mm). This height allowed to capture entire main wing of directional diagram. However, it was possible to reduce this height to 14mm if acceptable losses of total LED light power are 12% versus the current calculated yield of 92%.