



### The winning edge

To a competitive triathlete, a well designed bicycle frame can be the winning edge. For the designers at IDE Inc., conceptualizing a bicycle frame meant perfecting a challenging geometric design.

When you look at a bicycle frame, mathematics may not come immediately to mind. However, complex mathematics, specifically NURBS surfaces, can be used to develop a bicycle frame that is top of the line in every aspect imaginable. Kestrel's KM40 Airfoil, designed by IDE, is an aerodynamic, lightweight, one-piece, carbon fiber construction incorporating low wind resistance airfoils throughout its form. There is perfection in this world: mathematical perfection.

### The Project

Kestrel's KM40 Airfoil bicycle frame – aerodynamic, lightweight, one-piece, carbon fiber with low wind resistance airfoils

### The Designers

IDE Incorporated  
269 Mt. Hermon Rd Suite 206,  
Scotts Valley, CA 95066  
Ph: (831) 438-2888  
Fx: (831) 438-5448

### The Design Software

Rhino for conceptual design, surfacing, detailing, and model translation.

Pro/Engineer for mechanical design.

### For more information visit

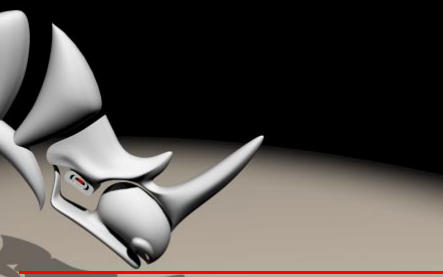
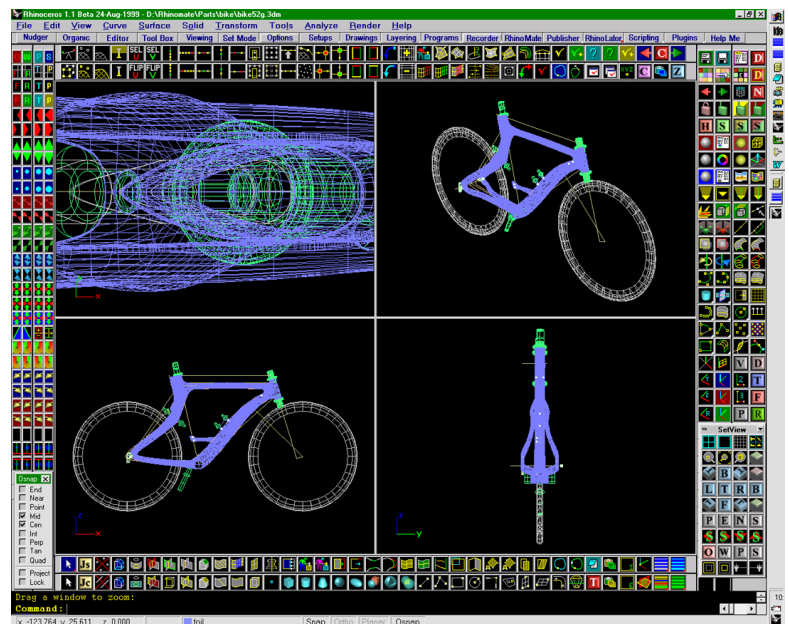
[www.rhino3d.com](http://www.rhino3d.com)  
[www.ideinc.com](http://www.ideinc.com)  
[www.kestrel-usa.com](http://www.kestrel-usa.com)

Moreover, advancements in computer-aided design software like Rhinoceros, NURBS modeling for Windows, provide a creative platform for designers like Doug Jones, IDE CAD administrator and senior design engineer. According to Jones, "With the degree of complex surfacing involved, Rhino software was essential to the development of such a unique product design."

### Custom Rhino

Using his own custom macro/workspace for Rhino, Jones developed a complex network of blended NURBS surfaces.

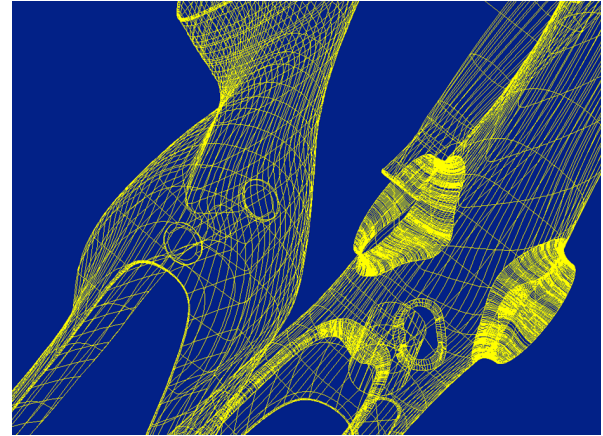
The Rhino solids model was then used by IDE's in-house model and prototype facility to manufacture a full-scale, precision CNC, ABS plastic model. Once Kestrel had assembled wheels and other components with the CNC model, minor adjustments were made to the Rhino model. The final model was imported into Pro/Engineer for parametric mechanical design and then sent to Kestrel's production toolmaker for the manufacturing of a steel tool.





### Mastering the details

For Kestrel-USA, manufacturers of the KM40 Airfoil, performance combined with practical production is the key. According to Kestrel President Kevin Kenney, "This project was a major step forward for Kestrel, and IDE should be credited with masterfully creating the CAD model. With this new frame we tried to define the shape in mathematical terms. IDE had to incorporate these elements, with literally hundreds of small details, into the design. We put a lot of trust into IDE's design talent. One of the biggest challenges was getting the look of the frame right while maintaining a high degree of precision."



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sales.support@cadsoftwaredirect.com  
Ph: +44(0)1206 804894  
Fx: +44(0)1206 804439

### Form equals function

At Kestrel-USA, form is as important as function. The employees at Kestrel not only build top-of-the-line bicycles, they ride them, too. How the bike looks aesthetically is as important as how the bike performs. Neither is less developed or prioritized. Kestrel decisions are made by hands-on, experienced riders, and their bikes look as high-tech as they perform.

Using the same computer-aided design technology as automobile and aeronautical designers, IDE was able to shorten Kestrel's product development cycle while bringing a higher degree of precision to the design, engineering, and manufacturing processes.



According to IDE founder and President Dave Moriconi, "IDE's strength lies in our successful blending of design sensibility, engineering know-how, and manufacturing savvy. We get companies into production with the least amount of headaches."

The experience of IDE's experts goes way beyond that of basic industrial design. Since 1985 IDE has earned a reputation for developing practical, unique, and exciting designs. Taking cutting-edge technology and making it a consumer reality.

