

THE BOOK

Luck is what happens when preparation meets opportunity.

Seneca

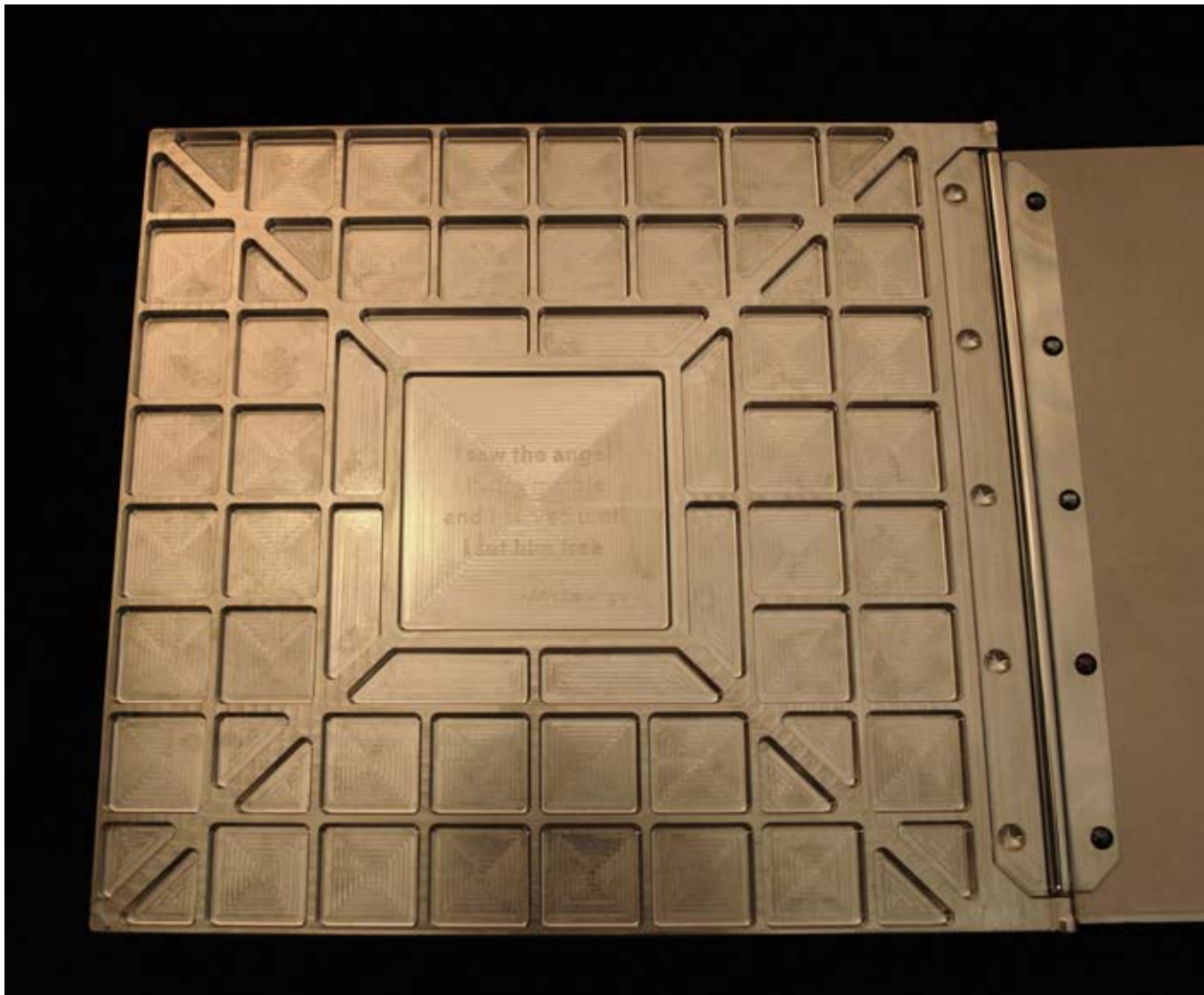


When we finished the car, Larry requested we write a book about the genesis of this project. As the car was completely unique, I decided the book should be unique as well. All the pictures in the book are the raw pictures—nothing was changed, hidden, or fabricated in Photoshop.

The book is representative of the car itself and is a work of art which stands on its own. The front cover of the book is highly polished aluminum—just like the “cover,” or body, of the car. It is machined from the same aluminum alloy we used to make the chassis, 6061 T-6. The Kirkham logo is an inlay of

304 stainless steel, the same alloy we used to make the heat shields and exhaust. We heated the inlay up to 1300 degrees in our heat-treating oven, the temperature of exhaust gasses, to give the inlay the same color as the exhaust header tubes.

The Kirkham logo is based around the tire marks left on the ground after a driver makes a three-point-turn. If you look closely, even the tool paths of the end mill overlap in the logo, just as if they were made by an actual vehicle executing the turn. The brushed stripe on the left edge of the cover, refers to the racing stripes on the car. The prototype car is reflected in the cover.



Michelangelo's famous quote alludes to man's creativity.

The front, inside cover of the book is CNC milled to look like the machine work on the chassis.

From the beginning, I planned to create “little details” throughout the chassis that would enhance the beauty and functionality of the car. Those details would be seen only by those who truly searched for them in the car.

If you were looking at the car for the first time, you could not see all the pockets and machine work that went into the chassis to remove excess weight—unless you “opened” the hood. Just like the car, you can not see the machine work of the cover—unless you open the book. Careful, up close, observation is required to discover all the secrets of the car. In the center of the inside front cover, we machined Michelangelo’s famous quote, “I saw the angel in the marble and I carved until I set him free.” The letters are barely machined into the cover (only a few thousandths of an inch deep), and it is quite difficult to see them—further representing even more treasures to those who search

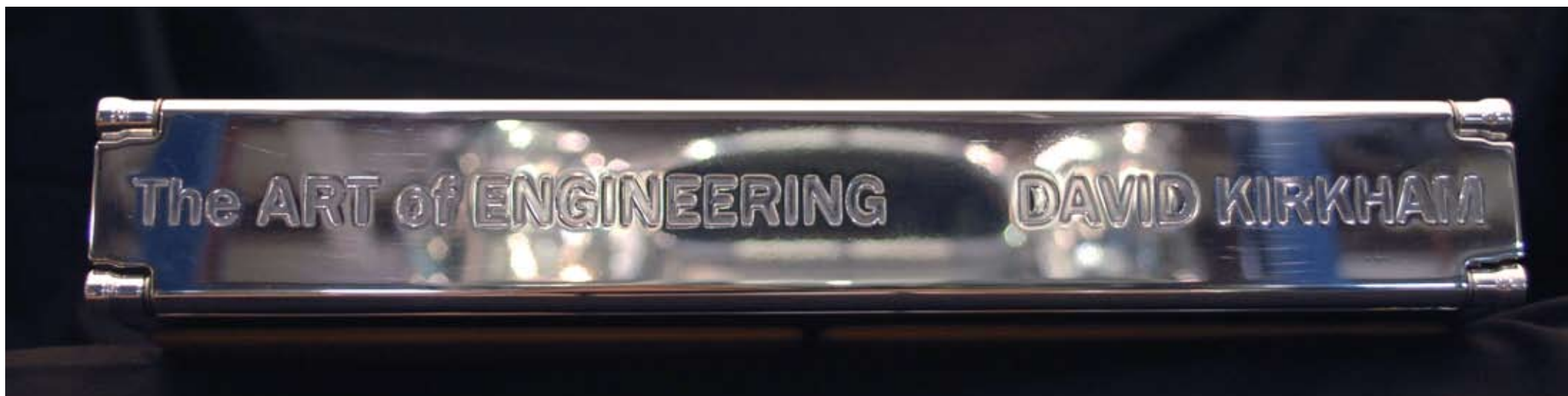
with careful eyes. The letters in the book were carved with a 0.010” end mill. That is only slightly bigger than the thickness of the pages of this book. Such a tiny end mill is extremely fragile so we had to machine quite slowly. We spun the end mill at 10,000 rpms and were able to take a chip load of only 30 millionths of an inch. The covers took 26 hours to machine.

Notice the little recesses we machined into the far right edge of the cover to clear the head of the custom binding bolts we made. Just like the car, everything had to work seamlessly together. We machined the bolts to bind the book from 17-4 PH and heat treated them to H900. 17-4-PH is the alloy all critical parts on the car were machined from. Their bronze color comes from the heat-treating (aging) process.

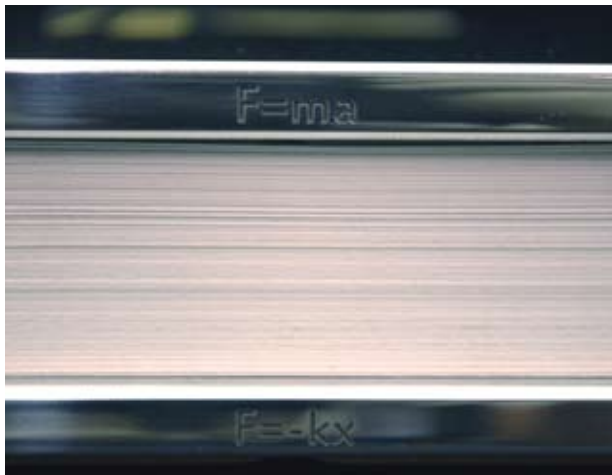
For the hinges of the book, we used 304 stainless bolts, the same alloy used in the heat shields and exhaust.



Aluminum will “stress relieve” as it is machined and move slightly. Because the letters were so delicately engraved into the cover, they had to be machined immediately after cutting the center pocket. Here Sandwich had to use a depth gauge after initial machining to get the depth of the end mill perfect.

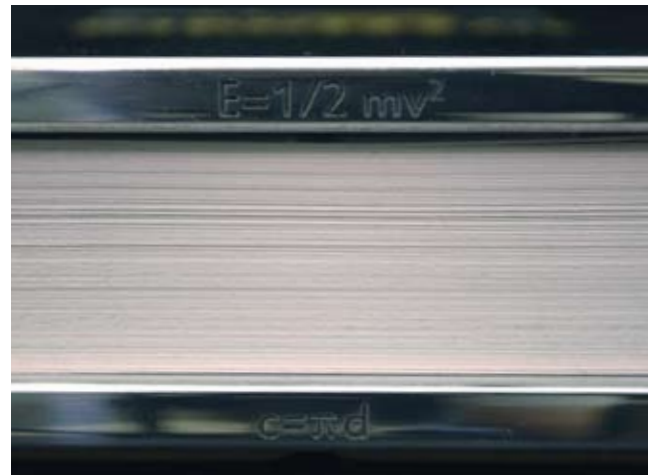


The spine of the book.



$F=ma$, Newton's famous equation, relating Force, mass, and acceleration, is constantly in the engineer's mind when designing a car. We machined our favorite equations for mechanical engineering into the edges of the book.

$F=-kx$ or Hooke's law. Suspension engineers use the spring equation to calculate spring rates for optimal handling. This equation relates Force to a constant x displacement.



$E=1/2 mv^2$ is the famous energy equation. Notice Energy goes up with the square of the velocity. High-revving motors have a tremendous amount of stress on the parts.

$c=\pi d$ describes the circumference of a circle. This is another fundamental equation used in automotive design and engineering. More practically, it describes the circumference of a tire.

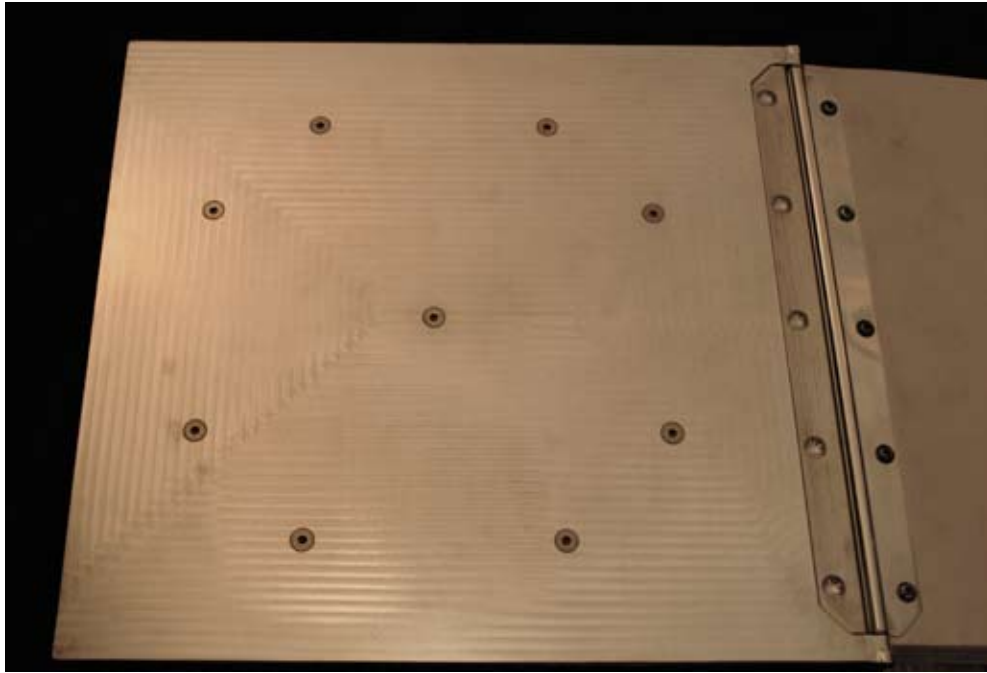


$hp=t \times rpm/5250$ is the horsepower equation relating torque to horsepower. Horsepower goes up with RPM. Torque is mostly a function of the length of the arm on the crankshaft. If you increase the RPM, you increase horsepower. This is why F1 engines spin up so high.

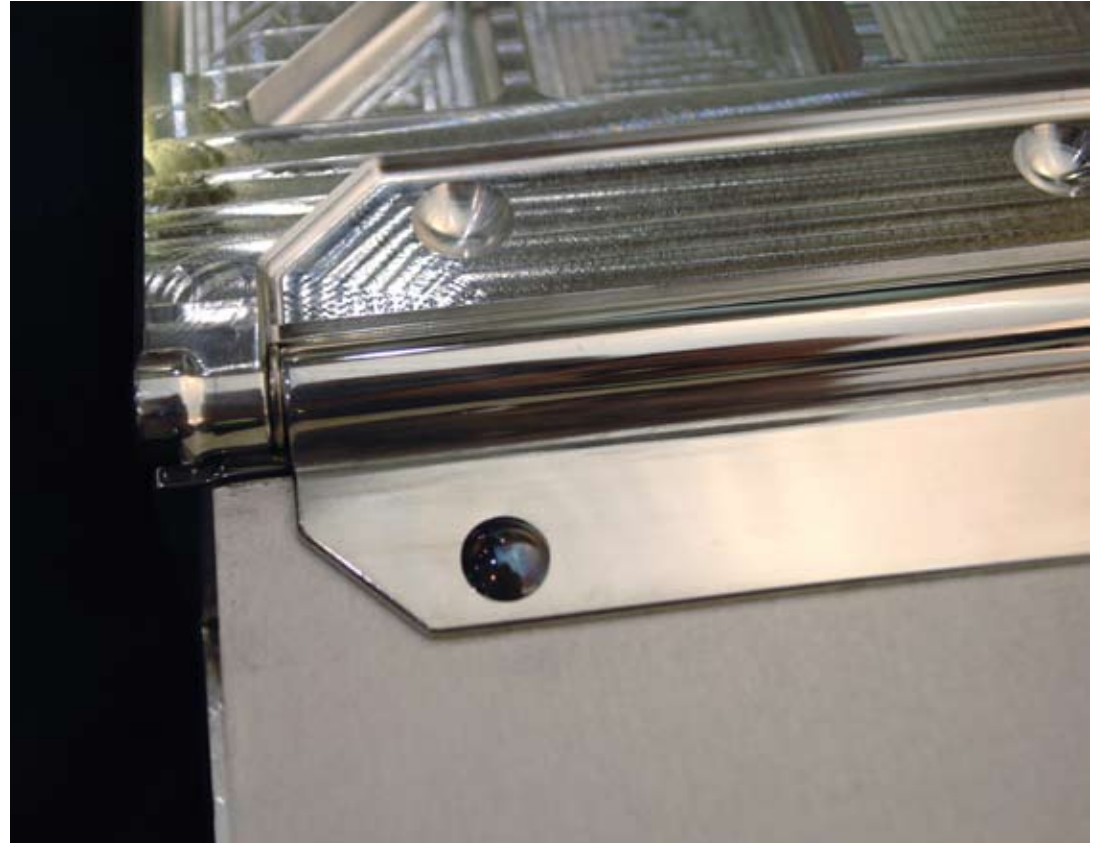
$V=IR$ relates Volts, Amps, and Resistance. Early in the project, we worked on designing an electric car for Larry. This is the fundamental equation used in electricity.



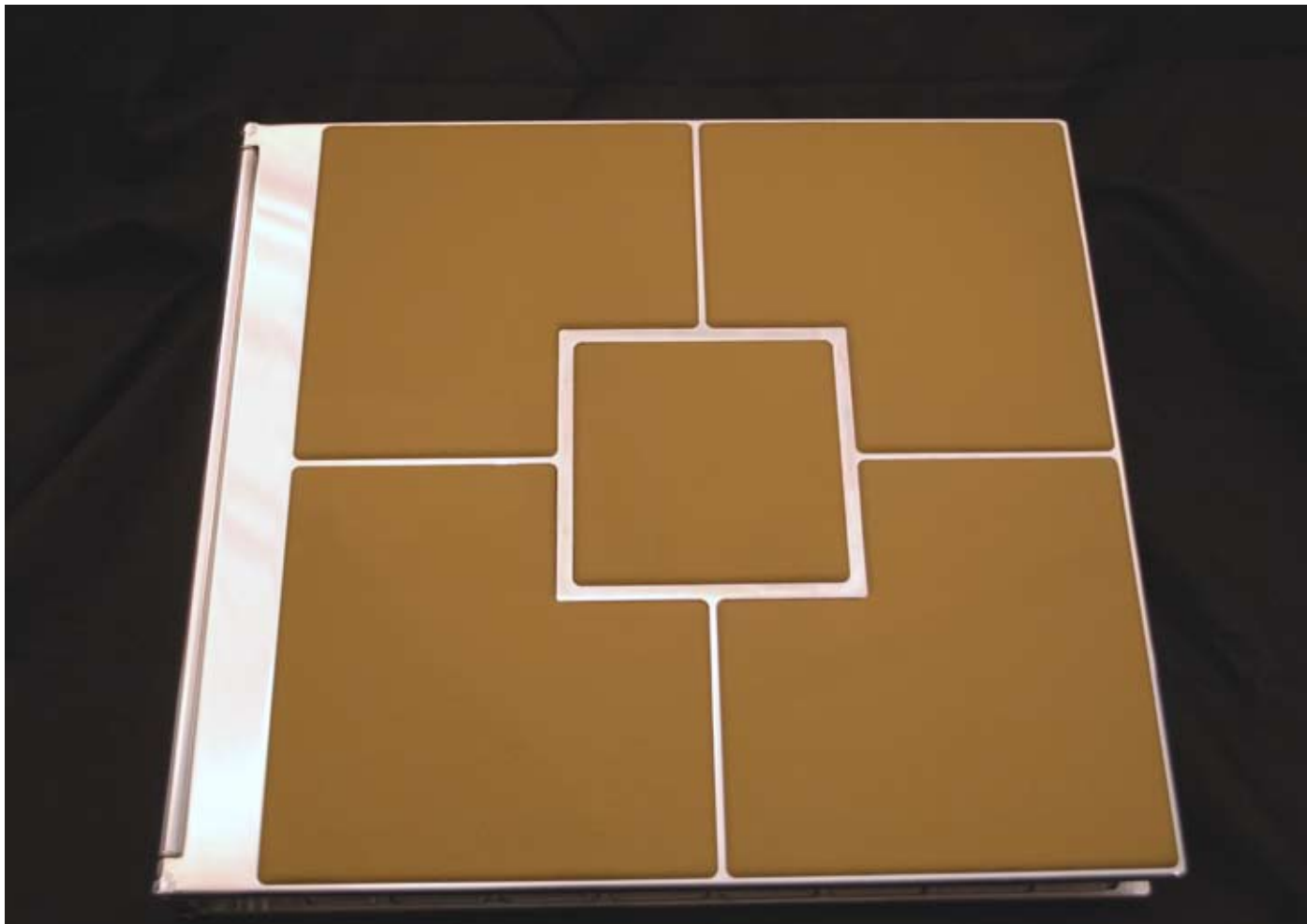
The hinge pins are made from 304 stainless steel bolts, the same bolts used throughout the chassis.



On the inside of the rear cover, we used stainless flat-head screws to secure the leather-covered panels on the back of the book. They are the same screws we used in many places in the interior of the chassis.



The page-binding pins are made from 17-4 PH, the same high-strength stainless steel used in critical applications throughout the car. We heat treated the pins so they matched the hubs.



We covered the back of the book with the same leather used on the interior of Larry's car.