

# 3D Systems

3D Printing / Additive Manufacturing



Images courtesy of 3D Systems

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Seth Astle  
Senior Industrial Designer, 3D Systems

**3D SYSTEMS** based out of Rock Hill, South Carolina is a pioneer in 3D printing technology. Some of its major accomplishments include inventing 3D printing with Stereolithography (SLA) and commercializing it in 1989, as well as inventing and commercializing Selective Laser Sintering (SLS) in 1992. Today, 3D Systems’ huge range of 3D printers are used for production-grade manufacturing in aerospace, automotive, patient specific medical devices and a variety of consumer, electronic, and fashion accessories.

Recently, the Cooper Hewitt – Smithsonian Design Museum in New York approached 3D Systems with an opportunity to participate in an exhibit. The collaboration centered around creating an exhibit to highlight the new processes in which objects are being made and designed using innovative software and new manufacturing methods. After some initial brainstorming, the team at 3D Systems determined multiple products that it felt should be displayed in the exhibit. One of the products that was decided upon was a 3D printed, structurally efficient skateboard. The goal here was to improve upon a product that has been fairly unchanged for many years. The team at 3D Systems wanted to see how they could change the way a skateboard is designed and produced.

## SOLIDTHINKING INSPIRE IN THE DESIGN PROCESS

Knowing that they wanted to create a skateboard lighter than others on the market, 3D Systems used solidThinking Inspire to optimize the deck and trucks of a traditional skateboard design. Inspire helped 3D Systems to generate the ideal skateboard shape that was used to create the final design.

The first step in this process involved 3D Systems using Inspire to run multiple optimizations with slightly different load cases and percentages of material retention to find the basic form of the product. In the skateboard’s case, no manufacturing constraints were applied as 3D



## INDUSTRY

3D Printing / Additive Manufacturing

## CHALLENGE

Design and 3D print a structurally sound, lightweight skateboard.

## SOLUTION

A process incorporating solidThinking Inspire to generate the ideal skateboard deck and truck material layout.

## RESULTS

- Utilization of Inspire to create structurally efficient designs for a 3D printed skateboard deck and trucks
- Skateboard printed using 3D Systems’ SLS Production 3D Printer
- Newly manufactured skateboard is 55% lighter than a standard skateboard assembly
- Skateboard on display at Cooper Hewitt – Smithsonian Design Museum

printing gives its users the freedom to manufacture shapes that traditional techniques do not. In all, 3D Systems used solidThinking Inspire to generate 20-30 different concepts. Each of these design concepts were then analyzed in Inspire to determine any weak points in the design. After reviewing multiple concepts generated in Inspire, the 3D Systems' team determined the winning concept for the skateboard's deck, as well as trucks.

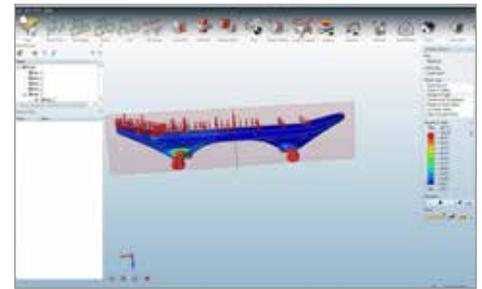
Once the final concept was selected, the team at 3D Systems exported the shape into CAD. 3D Systems refined the shape into the final design that was to be 3D printed.

For the production of the skateboard, 3D Systems turned to its production and professional 3D printing family and its range of materials options. The deck of the board was manufactured with PA-12 Nylon using 3D Systems' Selective Laser Sintering technology, while the trucks were printed in titanium using Direct Metal Printing. 3D Systems' Senior Industrial Designer, Seth Astle noted, "Future plans include using Inspire to redesign and print the wheels of the skateboard. We are also working on a second version of the skateboard that will be printed using glass filled nylon. This will be stiffer than the current board, which due to its material is a bit flexible. Other than the slight flexibility, the board rides just like a normal skateboard, but it is much lighter. The entire assembly weighs just 3.4 pounds, over 50% lighter than a normal board."

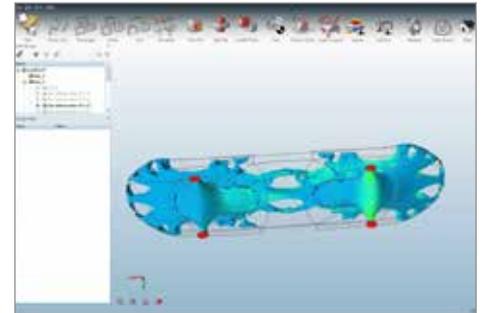
"...what I love about Inspire is that you put in all of your parameters, push 'optimize' and very quickly a completely unique shape for your product is created."

## WHAT'S NEXT?

3DS has future plans to use the tool; upcoming projects include a quadcopter design in Inspire, as well as designing prosthetics. Seth noted, "The software was very easy to use and learn. We are always finding new 3D printing projects where we can use Inspire to optimize designs. The best part about Inspire is that it helps us to create new shapes that you would not be able to create any other way, and that you put in all of your parameters, push 'optimize' and very quickly a completely unique shape for your product is created."



Setup in Inspire including load, supports, and symmetry constraints



Selected deck shape and analysis



Underside of 3D Printed Skateboard

## ABOUT 3D SYSTEMS

3D Systems provides the most advanced and comprehensive 3D digital design and fabrication solutions available today, including 3D printers, print materials and cloud-sourced custom parts. Its powerful ecosystem transforms entire industries by empowering professionals and consumers everywhere to bring their ideas to life using its vast material selection, including plastics, metals, ceramics and edibles. 3DS' leading personalized medicine capabilities include end-to-end simulation, training and planning, and printing of surgical instruments and devices for personalized surgery and patient specific medical and dental devices. Its democratized 3D digital design, fabrication and inspection products provide seamless interoperability and incorporate the latest immersive computing technologies. 3DS' products and services disrupt traditional methods, deliver improved results and empower its customers to manufacture the future now.

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