



WHITE PAPER

How Black Diamond Prototypes Crowd-Pleasing Gear on the Form 3L

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Introduction

For decades, Black Diamond Equipment has created innovative climbing, skiing, and mountain gear. Known for comfort, durability and performance, Black Diamond's products go through a rigorous design, testing, and iteration process before they come to market.

Historically, this has meant that the company outsources the manufacturing of full-size prototypes — for everything from climbing helmets to emergency tools — as a way to give engineers and designers a chance to interact with potential products on a human scale during the design process. This helps create crowd-pleasing, high-performance products at launch, but it can also slow down innovation (and increase production costs) as the company waits for third parties to deliver full-size prototypes.

But recently, the development team at Black Diamond has brought full-size prototyping in-house at a fraction of the cost of traditional manufacturing techniques, thanks to the Formlabs Form 3L large format 3D printer.

The company has incorporated 3D printing into their design workflow for years, using four Form 2 desktop 3D printers to create smaller prototypes or scaled-down models in-house. But full-scale prototypes were never an option because of the standard build volume of desktop 3D printers. However, when Black Diamond learned about the Form 3L — a stereolithography (SLA) 3D printer with a build volume that can handle human-scale prototyping — they sensed that they could bring a new kind of innovation in-house.

R&D Technician Matt Tetzl recently went hands on with the Form 3L, printing in both Grey Resin and Tough 2000 Resin, to see how the printer could handle full-size prototyping. Read on to hear why Black Diamond Equipment is looking to bring large-scale SLA 3D printing in-house, and how this will impact product development at the company.

Closing the Gap Between Feedback and Design

“The Form 3L makes the product design process more cohesive. Making tweaks in CAD and starting the printing process - it’s going to help us close the gap between feedback and design.”

Product creation at Black Diamond is driven by a passionate team that tests and uses their own products. Each product is a labor of love, with rigorous internal feedback loops to guarantee nothing gets shipped until it’s considered exceptional. Working with product design and engineering, Matt is responsible for testing and creating new prototypes for all of the company’s major product categories.

Problems emerged when working on larger products, such as a pickaxe, shovel, or helmet. For these items, the final shape and feeling in a user’s hand is paramount to its success. Since these parts exceed the size of the Form 2 build platform, Matt’s team was forced to use an outside service bureau to print their prototypes. For each print, this would cost the team ~\$425 and at least one week of downtime as they waited for the prototype to be shipped back.



A 3D printed avalanche shovel alongside the final product.

The Form 3L allows Matt to create to-scale models in-house at a size five times the build volume of the Form 2 or Form 3. The benefits are immense: the turnaround for large prototypes is cut to three days or less depending on print time. Being able to hold a full-size 3D printed avalanche shovel enables the design teams to immediately start visualization and ruminating ways to improve the design. Those ideas can quickly be implemented in CAD to start the next print.

“We have reduced our costs on full-size prototypes from \$425 a print to \$70 a print. With that savings, Form 3L would pay for itself in only three months.”

	OUTSOURCING	IN-HOUSE
Time	7 Days	3 Days
Cost	~ \$425	~ \$70

Often, Matt will receive new STL files from engineering shortly after printing has started. Small tweaks are common in the design process. With outsourcing, there is no way to incorporate them once the file has been sent to the service bureau. With the Form 3L, the team can easily cancel and restart prints, saving a significant amount of time and money incorporating the latest changes.

“The quality of Grey Resin on the Form 3L was higher than on the Form 2. Even minute features came out at very high clarity on the Form 3L. We also printed with Tough 2000 and were blown away by how good the surface quality is on the Form 3L.”

That’s what has Matt the most excited about using the Form 3L. It is now possible to receive real-time feedback from engineers and users, make edits in CAD, and start a new print on the same day. The high quality prints and lack of outsourced parts reduce time spent prototyping. This means more time testing and tweaking parts, leading to better products for customers. With the Form 3L, many businesses will be able to print large parts in-house for the first time, with a low cost per part and fast turnaround.

“If we had this printer over the past two years, then we could have saved a lot of money on aluminum lobe prototypes! Using the Form 3L now, there are a lot of projects I can see us utilizing it on.”

A Familiar Ecosystem, An Intuitive Workflow

“We had the Form 3L printing within an hour of being delivered. Since we have other Formlabs printers, and are familiar with the ecosystem, we booted it up and I knew how to use it without any additional training.”

Because Matt had worked previously with Form 2 3D printers, getting the Form 3L up and running was easy. The Form 3L uses the same pre-print software, PreForm, that the team was accustomed to, making the printer approachable and easily incorporated into a pre-existing process. Matt quickly had the Form 3L running on a 24/7 schedule, allowing for the nonstop throughput the team was accustomed to with other Formlabs printers.

Formlabs designs all of its printers to be intuitive and easy to use, even for newcomers to the world of 3D printing, and the Form 3L is no exception. For those already familiar with our ecosystem, it’s easier than ever for the Form 3 or Form 2 to work in conjunction with the Form

3L. Matt has already begun working on projects across multiple printers, creating a large base print on the Form 3L while small clips print on the Form 2. This further accelerates the design process, allowing for multi-part projects to be completed simultaneously.

“We have also tested printing small parts on the Form 3L, and the quality came out better than on our Form 2. The Clear Resin specifically had more clarity.”

Matt has begun creating a new internal design guide for Form 3L parts to address some post-processing and support removal concerns that come with large prints. This includes steps for hollowing prints such as the Vapor helmet to reduce resin use and improve post-processing. For projects like the Vapor helmet, hollow 3D printing allows the team to experience a more looks-like prototype that is closer to the final object.





Learn More About Black Diamond And The Form 3L

Black Diamond has a slew of innovative, exciting outdoor sports and mountaineering equipment in the works based on their work with the Form 3L. Stay in touch with their team below.

Learn More: www.blackdiamondequipment.com

Scale up your in-house print production with the Form 3L, an easy-to-use large format 3D printer for reliable production of industrial-quality parts. The Form 3L is now shipping, order yours today.