



Aerospace

## Case Study: Landing on the Moon With the Help of 3D Printed Rocket Engines

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*Space startup Triton Space Technologies is designing highly complex rocket engine parts for an upcoming 2021 lunar landing mission with the help of the MakerBot METHOD X™ 3D printer.*

**Triton Space Technologies** is a Boston, Massachusetts-based engineering design and manufacturing company which specializes in producing rocket propulsion systems. In addition to manufacturing its own line of high-pressure fluid system components and propulsion solutions, it provides contract engineering and prototype manufacturing services for customers requiring bespoke products, which it manufactures onsite in its state-of-the-art CNC machine shop.



## 3D PRINTING ROCKET MOTOR VALVES

"We have a customer going to the moon in 2021 who commissioned us to build some valves for them," said Luke Colby, President and CEO of Triton Space Technologies. "We wanted to create a functional prototype of the valve, to check that all the parts fitted together properly, and that the internal parts could slide and move as they should. We went into it not really expecting that the METHOD X would be able to keep the tolerances needed for the sliding parts to move, but it did."

Colby founded Triton Space Technologies in 2014, following 10 years as Lead Propulsion Engineer for Virgin Galactic's suborbital space tourism vehicle. Despite using large-scale industrial 3D printing machines throughout his career, it was not until the launch of the MakerBot METHOD X™ 3D printer that he considered the possibility that a desktop machine could be used to produce truly functional prototypes.

"The METHOD X 3D printer has evolved as a tool, providing us with a high level of reliability during part production. In our line of business, this is essential – especially in comparison to other 3D printers where there's a risk that the final part will not come out as you'd expect. METHOD X mitigates risk by helping us to answer questions much earlier on in the design phase, so that's very valuable," said Colby.

***See how Triton uses additive manufacturing to machine prototypes for aerospace customers in this short video.***

Previously, Triton had to machine prototypes from sheet aluminum in its machine shop, a costly and inefficient process that took 2-3 days per prototype and created a lot of material waste. The alternative was to outsource to a 3D printing service bureau. However, this took even longer – up to a week for each prototype – and didn't always result in a usable part.



Makerbot used the METHOD X to create a prototype of an injector head assembly for the manifold of a small rocket engine.

## PRINTING COMPLEXITY WITH DISSOLVABLE SUPPORT

The ability to print with Stratasys® SR-30 soluble support material is key to enabling Triton Space Technologies to produce functional prototypes with the tolerances required for the demanding aerospace industry. If produced without supports, or using snap-off supports, parts would have to be filed and sanded, greatly reducing their utility. Harnessing 3D printing's ability to produce complex geometries, with fewer individual parts, the company is able to create increasingly sophisticated prototypes capable of meeting the diverse needs of its customers.

"We also used the METHOD X to create a prototype of an injector head assembly for the manifold of a small rocket engine," explained Colby. "The idea was that it should have one common, sliding surface that would open up flow passages for both propellants at the same time. That would not have been possible with traditional manufacturing methods, as you end up with an assembly of many different parts coming together with a whole lot of seals in between them."

The option to print prototypes in durable real engineering-grade ABS is another benefit of using the METHOD X. However, Colby is excited about the possibilities offered by MakerBot's rapidly expanding materials portfolio, in particular MakerBot Nylon Carbon Fiber.

"The modularity of the METHOD extruders will enable us to continually expand and improve what we are able to do with different materials. That's really important to us, because most products become obsolete almost as soon as you buy them," concluded Colby.

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