

# MIT Rocket Team shows rocket motor printed from plastic

May 2 2017, by Nancy Owano

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Credit: MIT

(Tech Xplore)—MIT Rocket Team on April 21 successfully fired a rocket motor printed from plastic. They had project support from Markforged for their 3-D printed rocket motor. They put out a video to show it in action.

When asked what motor did they use by a You Tube visitor, they

answered, "This is a low solids composite propellant, approximately 70 grams worth. It produced about 150 Ns of impulse. Larger than any commercial black powder motor, but still quite small in terms of [rocket motors](#)."

The team acknowledged "generous support" from Markforged. The company worked with them in the design and printing of the pieces. Charlie Garcia posted a story about the 3-D printed [solid rocket motor](#) on The Rocket Team site.

How did the tests go? For the first one they used "a less energetic propellant," Garcia said, which was easier on the motor case, less heat and lower pressure. He said the motor got supersonic flow and produced thrust.

"A few millimeters of plastic eroded from the throat."

The case was designed for single use but the team tried it again. This time, he said, they used a more energetic propellant.

"The rocket's combustion became unstable, the flow through the nozzle was subsonic, and little [thrust](#) was produced."

Garcia said only that first test yielded clean pressure data.

The team is now looking at future designs. Erosion of the throat was apparent in the falling pressure. "Future designs will account for this by varying the propellant regression rate to match the nozzle erosion."

Meanwhile, for 3-D printing fans, the story is largely about plastic.

"When you imagine experts at the world's top universities building rockets, you probably picture high-end technology, precise calculations,

and rugged materials. What you probably don't expect to see, what with all the fire and combustion, is *plastic*," said Benedict in *3Ders.org*.

SpaceX and NASA print rocket engines from metal. But this small team hardly has the deep pockets to do the same. (The MIT Rocket Team is described as a group who "explores enthusiasm for rocketry by learning about, building and launching rockets, as well as developing other projects, from a liquid rocket engine to flight electronics.") Their plastic motor was produced on a lower-cost plastic printer.

To print the [rocket](#) motor from plastic, they used a Markforged Mark Two 3d printer.

Markforged is a Cambridge, Massachusetts based 3-D printer company, known for embedding [continuous](#) fiber to create a printed composite part—reinforcing parts with composite fiber while 3-D printing them. In addition to printing Nylon, said the company, the Mark Two prints materials such as Carbon Fiber, Fiberglass and Kevlar.

Why this team effort matters: The *3Ders.org* article commented that "the team proved that firing a [plastic](#) 3-D printed [motor](#) is feasible, potentially paving the way for others to attempt similar [launches](#)."

**More information:** [rocketry.mit.edu/2017/04/100-3 ... -solid-rocket-motor/](https://rocketry.mit.edu/2017/04/100-3...-solid-rocket-motor/)

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