

# **23128     *The First 3-D Printed Rocket Fails Shortly After Launch***

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Following the success of Elon Musk's SpaceX, investors have poured money into new spaceflight companies. A number of these businesses have interplanetary ambitions, including Relativity Space, which announced last year that it would team up with another company called Impulse Space to send a private space mission to Mars, aiming to beat Mr. Musk's company to the red planet.

But many nascent spaceflight companies experience difficulties in their early attempts to get to orbit. In January, a Virgin Orbit spacecraft failed an hour into its flight; the company since has furloughed employees. Another company, ABL Space Systems, lost its first rocket just after liftoff from a base in Alaska. And even established rocket builders lose new rockets on their first flight. Earlier this month, a new rocket built for Japan's space agency by Mitsubishi Heavy Industries, which has produced rockets for decades, failed minutes into its first flight and lost the satellite it was to deploy.

Wednesday's Relativity Space flight failed shortly after launch, but did not lose a customer's satellite. Its only cargo was a wheel-shaped object, the first thing ever made by Relativity's 3-D printers, which was to demonstrate the rocket's ability to carry a payload to orbit.

During Wednesday's launch, the company noted some of the milestones achieved by the Relativity Space rocket. It was the first time a 3-D printed rocket had reached "max-q," the point when the vehicle experiences the strongest stresses, and also stage separation, when the booster used for liftoff drops from the vehicle's second stage.

To make these rockets, Relativity Space has developed massive 3-D printers in Long Beach, Calif., that use robotic arms to craft engines and other parts out of metal alloys that can withstand the heat and pressure of ignited rocket fuel.

Traditional manufacturing processes often slow rocket building. But 3-D printers, which turn code into physical objects, allow engineers to move more quickly from design to testing. Instead of having to create a totally new part, engineers can just instruct the printers to increase the size of existing parts, or modify them in other ways.

Relativity is among several companies building rockets to launch into orbit using liquid oxygen and liquid methane as propellants. In the past, most rockets have relied on hydrogen or kerosene for fuel. Methane — the primary component of liquid gas — is easier to store than hydrogen and offers better performance than kerosene. Starship, the next-generation rocket being built by SpaceX for missions to the moon and Mars, will use similar propellants.

416 words