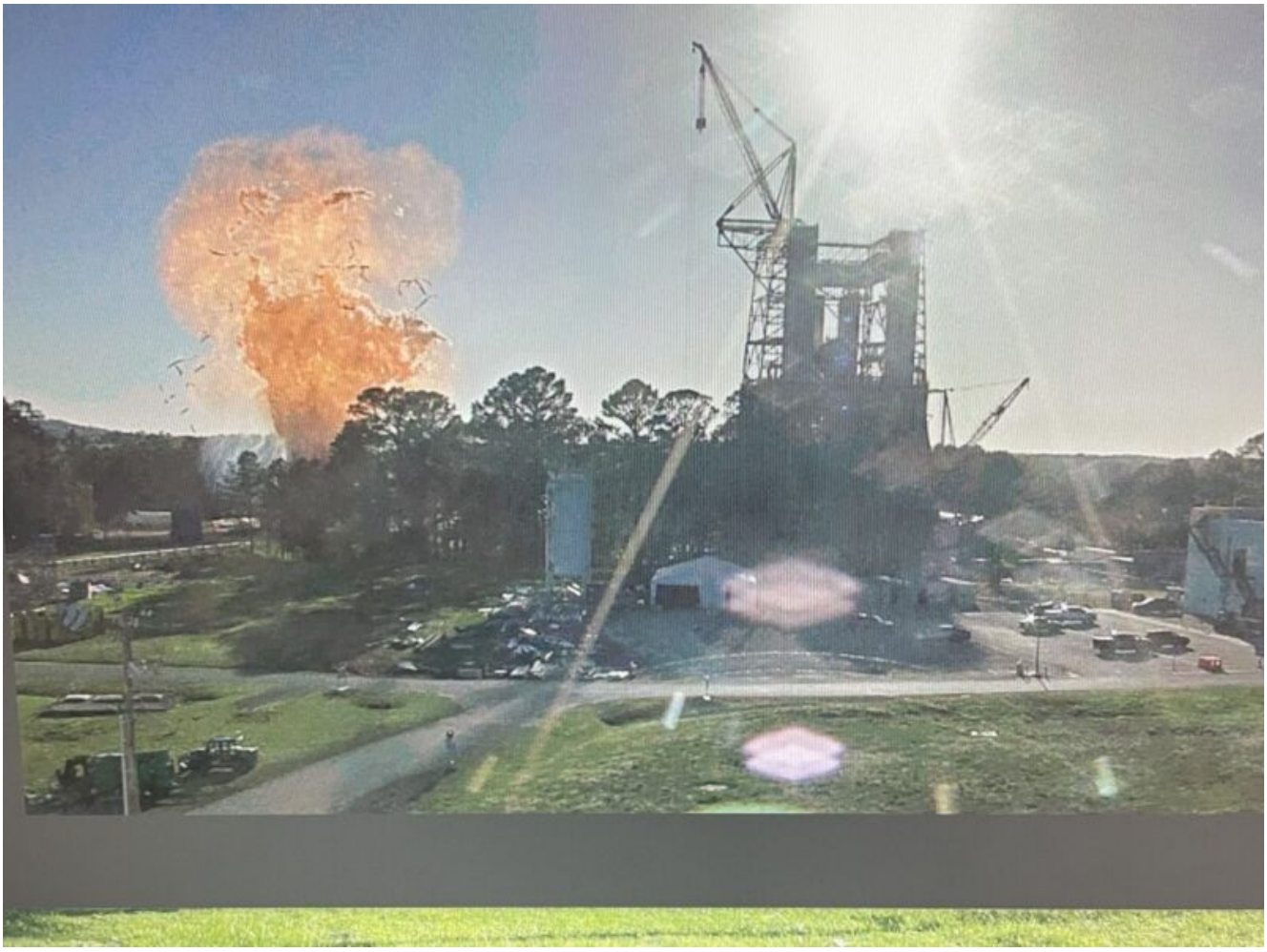
New photo reveals extent of Centaur V anomaly explosion [Updated]



Enlarge / An image of the Centaur V anomaly that occurred on March 29 during testing of the Vulcan rocket’s upper stage at Marshall Space Flight Center.
Anonymous source

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10:30 pm ET Update: Several hours after this article was

published, Ars obtained a still image of the Centaur V anomaly that occurred on March 29 during testing of the Vulcan rocket's upper stage. The photo shows the anomaly—a fireball of hydrogen igniting—to the left of Blue Origin's rocket engine test stand.

After the author posted this photo on Twitter, United Launch Alliance chief executive Tory Bruno offered a more detailed assessment of the anomaly. "Most of what you're seeing is insulation and smaller bits from the test rig. One piece of the hydrogen tank's dome, about a foot square, ended up a few feet away. The test article is still inside the rig and largely intact, which will significantly help with the investigation", Bruno said via Twitter.

Original post: On the evening of March 29, at Marshall Space Flight Center in Alabama, United Launch Alliance started pressurizing the upper stage of its new Vulcan rocket. But then, suddenly, something went wrong with this Centaur upper stage.

Shortly after the incident, to his credit, the chief executive of United Launch Alliance, Tory Bruno, was quick to acknowledge on Twitter that something had happened: "Keeping you posted: During Qual testing of Centaur V structural article at MSFC, the hardware experienced an anomaly."

Unpacking this tweet a little bit, Bruno is saying that during qualification testing—the process of testing rocket engines and stages on the ground to determine their behavior during flight-like conditions—the Centaur stage had a problem. More than a week later, however, there are more questions than answers about the accident.

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A mushroom cloud

Multiple sources confirmed to Ars that there was a large explosion on that Wednesday evening, resulting in multiple first responders coming to the scene at NASA's field center where the company has a test stand. No one was injured, but the accident made for dramatic visuals.

"A column of burning, clear hydrogen shot up into a mushroom cloud that dwarfed the test stand," one source said. "Their test article is definitely more than just 'damaged.'"

The anomaly was captured on video cameras operated by Blue Origin, which is restoring a nearby test stand. Located about 100 meters from the United Launch Alliance facility, Blue Origin has invested more than $100 million in NASA's old Test Stand 4670 for acceptance testing of its BE-4 and BE-3U rocket engines.

A Blue Origin source confirmed that a mushroom cloud formed from the anomaly. Afterward, United Launch Alliance asked Blue Origin to delete the explosive video footage from the company's computers, which Blue Origin agreed to do.

(**Note**: After publication of this article, when asked about the video deletion, Bruno tweeted that this "didn't happen." However, two sources told Ars that after the incident, United Launch Alliance asked Blue Origin to "secure" the video for its investigation. Blue Origin did so, but also removed the video from its own internal servers, reserving access only for a few officials at the company).

The loss of the Centaur upper stage raises questions about ULA's schedule for the debut launch of its much-anticipated heavy-lift Vulcan rocket. For a couple of years, ULA has said it was waiting on Blue Origin to deliver BE-4 engines for the rocket's first stage. The fact that ULA was still doing qualification testing of the Centaur upper stage suggests it

was also a pacing item for the new launch vehicle.

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Although this Centaur V upper stage is based on a heritage design, the new version nonetheless has significant upgrades. Previously, Bruno said Centaur V would be able to operate for 40 percent longer in flight and has two-and-a-half times more energy than the Centaur upper stage ULA currently flies.

Another unanswered question concerns exactly what Centaur stage ULA was testing in Alabama. Was it a fully flight-like stage to be used for a future mission? Or was it more of a prototype stage used for development testing, which might be more susceptible to failure? ULA would not comment on this.

Vulcan's debut

Publicly, ULA has set a May 4 target date for the debut launch of the Vulcan rocket. However, last month, even before the Centaur anomaly occurred, Ars reported that this date was already likely to slip into the summer based on the company's internal timelines. The effect of the Centaur anomaly is yet unclear on Vulcan's schedule.

"We are conducting an investigation and will fly when we believe it is safe to launch," ULA spokesperson Jessica Rye told Ars this week. "We will not know the impact to the launch date until we learn more information from the investigation."

ULA has asked the primary customer for the Cert-1 mission, Astrobotic, to refrain from shipping its Peregrine lander to the launch site. The lunar lander remains at the company's facilities in Pittsburgh, waiting for a green light from the rocket company.

After the accident, Bruno speculated on Twitter that it was "very unlikely" to have implications for the Centaur V upper stage that is currently in Florida and planned for use on

Vulcan’s Cert-1 mission. However, any determination on this will need to wait until ULA completes its accident investigation and consults with the US Space Force, which will ultimately certify the rocket for national security launches.

Time is running out for ULA to complete the development of Vulcan and fly two certification missions this year. This would allow the vehicle to begin flying national security payloads for the Space Force. ULA had hoped to fly its first national security mission in 2023, but now that seems virtually impossible.

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