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THE SUSTAINABILITY QUESTION

X-59 will test community tolerance for the noise of supersonic travel, but what about possible atmospheric damage? Here's the science. PAGE 22

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THE FUEL BEHIND VULCAN'S DEBUT

Methane is an increasingly attractive fuel for new rocket designs, including the United Launch Alliance Vulcan, the first of which is shown lifting off from Florida on Jan. 8 in a flight that delivered the doomed Peregrine lander to space. As for the rocket's performance, "A perfect mission," declared CEO Tory Bruno on X.

The blue and violet flame you see is the result of the combustion of liquefied natural gas, a form of methane, with liquid oxygen in the first-stage BE-4 engines. "When these excited molecules return to their ground state, they release energy which is observed on the visible spectrum as blue light," explains Trevor Elliott, a professor at the University of Tennessee at Chattanooga.

What makes LNG an attractive fuel over kerosene or the liquid hydrogen that fuels NASA's Space Launch System rockets? Just as your gas stove burns cleaner with natural gas, so does a rocket fueled by LNG. This fuel also delivers more thrust per unit of mass than kerosene, and it has a higher energy density than liquid hydrogen. That means smaller fuel tanks are required to fly the same distance, according to Bill Anderson, a professor at Purdue University. — *Cat Hofacker*

Photo by John Tylko