interactions, negative energy is not known to exist in meaningful quantities and would require hypothetical exotic matter, a no-go for

physicist reviewed the scientific literature on warp drives, and he noticed mathematical pathways that had not yet been tried to construct space-time solitons that avoid the burden of exotic matter.

"There are two other classes that hadn't really been explored in the literaturePparabolic and hyperbolic relationships between shift-vector components," which relate to the geometry of solitons, HentD said. Fe "ultimately Bust pursued one of them in the paper, the hyperbolic relationship, to see if within that class of solutions a subset of solutions could be found that satisfied this positive-energy moving-warp-drive condition."

F is study garnered significant attention from the day it was published on March 9. A

Fe said that HentDs warp drive is "very unlikely" to be correct because it is in violation of his theorem.

believes existsU"

The J ermany-based researcher acknowledges some missing details and shortcomings in his design that he hopes to pursue and improve in future research. The paper doesn't tackle how the warp drive would accelerate, decelerate or be constructed out of real-world materials. And although the drive's gargantuan energy requirement may be reduced with shortcuts, they are also dramatic approaches C one includes bending space-time to make a spacecraft appear microscopic to an outside observer before moving faster than light

The published warp drive also struggles with the "horiDon problem," HentDsaid, which concerns the spacecraft's inability to communicate with the rest of the warp-drive soliton while traveling at faster-than-light speeds.

Andrew DeGenedictis, a professor of physics at Vimon Fraser I niversity, in Canada, said that the warp drive's avoidance of negative energy is "quite interesting" and has advantages over previous designs, despite the massive energy requirements. DeGenedictis, who in a 2018 paper similarly avoided negative energy in warp drives in a modified theory of general relativity, said he did not try to reproduce the calculations but found no reason to believe HentD made any errors.

The professor also observed that scientists generally treat warp drives as an "academic curiosity" but do not believe they will realistically be built in the future. Previous studies have also shown that warp drives may be unstable and be destroyed by minor external disturbances, he said.

"As an avenue towards a realistic propulsion system, there is no

chance that with anything even remotely associated with our current technology that we could produce such things," DeGenedictis said.

HentDagrees with DeGenedictis on the perception of warp drives in the scientific community, and he believes that the transformative technology has a long road ahead before it could be feasible. Gut following his eWorts to circumvent the assumed negative-energy requirement, HentDsaid he wants to see what other theoretical progress can be made, and whether experiments can at leac