



DEFENSE TECHNOLOGY MONITOR

The American Foreign Policy Council's Review of
Developments in Defense Technology

Defense Technology Monitor No. 93

November 13, 2023 **Richard M. Harrison, Kyle Wilgus**

Related Categories: Arms Control and Proliferation; Military Innovation; Missile Defense; Science and Technology; Warfare; SPACE; Border Security; China; United States

IS "RODS FROM GOD" A FRAUD?

In a recent report, researchers from the North University of China have challenged the usefulness of America's plan for kinetic bombardment weapons. A space weapon concept, the program, colloquially known as "rods from god," theorized that tungsten rods launched from space could cause catastrophic damage to hardened targets — mimicking the effect of nukes, but doing so without the attendant spread of radioactivity that accompanies an atomic blast. However, a Chinese experiment conducted in the Gobi Desert reportedly demonstrated that high-velocity projectiles are not a viable means of ground penetration for attacking subterranean facilities after all. (South China Morning Post, August 7, 2023)

UPGRADING QUANTUM INFORMATION STORAGE

The age of quantum computing is just over the horizon, and when it arrives it will be accompanied by huge capabilities — as well as huge challenges. One such complication is how, precisely, to store and retrieve voluminous amounts of quantum information. Researchers at the California Institute of Technology have attempted to address the problem by keeping quantum information in the form of sound waves. Specifically, researchers believe that it is possible to store quantum information on phonons (the sound counterpart to a photon, which is a particle of light) and stored as mechanical waves in a small piece of hardware. According to the project's lead researcher, the "method enables the storage of quantum information from electrical circuits for durations two orders of magnitude longer than other compact mechanical devices." (SciTech Daily, August 11, 2023)

MAKING DIRECTED ENERGY MORE EFFICIENT

Directed energy weapons offer a distinct advantage over traditional kinetic missile defenses with a near-infinite amount of ammunition. But they also possess limitations. One major hurdle is the need to improve the efficiency of heat dissipation inside the laser's chamber because beam quality degrades due to the increased temperature of gas in the air near the beam's origin. However, scientists at China's National University of Defense Technology may have developed a new cooling system to correct this deficiency. The innovative Chinese system eliminates excess heat by pushing new gas through the laser chamber. According to Chinese researchers, the increased effectiveness allows the laser to fire indefinitely — a significant development, and one that possibly surpasses the capacity of existing U.S. lasers. (Business Insider, August 14, 2023)

HYPERSONICS GET PLASMA PROTECTION

In a development with the potential to improve hypersonic weapons, researchers at the University of Virginia believe they have developed an innovative technology to shield advanced electronics from the scalding temperatures reached as a result of traveling at Mach speeds. While experimenting with a laser probe, researchers determined that a beam of focused plasma can initially cool the surface of a material. UVA professor Patrick Hopkins specifically noted that "through plasma, there could be novel, lightweight ways that you could have a directed cooling solution that could now help to cool electronics on airplanes, on satellites, on hypersonic vehicles, that would not compromise size, weight, and power." By using focused plasma to protect sensitive electronics, these researchers believe that they can drastically improve the precision and effectiveness of these weapons systems. (Defense One, August 17, 2023)

CHINESE GETS BETTER AT SUB-SCANNING

U.S. submarines rely on stealth for effective intelligence and surveillance and have experienced massive success for decades. That, however, may be changing. Chinese researchers are experimenting with new drone-mounted sensor systems that operate in the terahertz frequency to track inconsistent ripples in waves at the sea surface (as little as 10 nanometers in height). The new technology seeks to identify if the perturbations at the surface were generated by enemy submarines transiting the area deep underwater. According to the project team at China's National Defense University, "by detecting acoustically induced surface vibration signals, it is possible to invert the information conveyed by underwater sound sources" due to the technologies' "high signal resolution." In turn, the successful deployment of this technology would challenge the ability of American submarines to operate in international and Chinese waters. (South China Morning Post, August 29, 2023)