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Related Categories: Military Innovation; Missile Defense; Science and Technology; Warfare

INCREASING THE SENSITIVITY OF QUANTUM SENSORS

As the field matures, quantum technologies are slowly being adopted for military use. While most reports focus on the eventual applications of quantum computing, technology relating to quantum sensing will actually be available and operational much sooner (see *Defense Technology Monitor* no. 82). Quantum sensing devices are highly sensitive and capable of detecting extremely slight disturbances in their surroundings. As detailed in a new study published in the journal *Nature*, researchers have discovered a method to network quantum sensing devices and increase their measuring sensitivity by a factor of three. This advancement, if further developed and applied on a larger scale, could pay dividends for the military — specifically for underground structure detection. (*IEEE Spectrum*, December 9, 2022)

WHERE ARE RUSSIA'S WONDER WEAPONS?

Prior to the start of Russia's war against Ukraine, the U.S. and its international partners had believed Russia's military to be a modern one with 21st century capabilities. In preceding years, fifth generation fighter jets, nuclear weapon-capable and autonomous battle tanks, and mechanized combat walkers had all been touted by officials in Moscow. Yet none of these technologies have as yet made an appearance in Ukraine, with the exception of Russia's hypersonic Kinzhal missile. And as the conflict has dragged on, Russia's growing reliance on older Soviet-era military hardware suggests that those weapons aren't going to be reaching the front any time soon. This state of affairs is at least partially attributable to crippling Western sanctions, which have had a dramatic impact to date on the country's military-industrial complex. But Russia's battlefield performance in recent months, and the hardware it has employed, also serves as a reminder that — despite official rhetoric and the Kremlin's wartime bluster — Russia's "wonder weapons" remain largely aspirational. (*Popular Mechanics*, December 9, 2022)

U.S. OFFICIALLY JOINS THE HYPERSONIC WEAPONS CLUB

In the race to develop a hypersonic weapon, it's better late than never. The U.S. Air Force recently tested the country's first operationally successful hypersonic missile, designated the AGM-183A — also known as the Air-launched Rapid Response Weapon (ARRW). Based on designs by the Defense Advanced Research Projects Agency (DARPA), the ARRW may be able to exceed speeds of Mach 20. The missile is a glide vehicle, meaning it is propelled by a rocket booster until reaching a high altitude, when the vehicle separates from the booster and glides at extreme speeds, executing evasive maneuvers when necessary, toward its target. It is unclear how much flight path variability the ARRW has while gliding, as this version of the missile is set to "hold fixed, high-value, time-sensitive targets at risk in contested environments," according to the Air Force — essentially meaning that it will be used to attack important immobile targets. (*Space.com*, December 12, 2022)

BIOLOGY-BASED ARMOR ADVANCES

The defense and aerospace sectors may soon benefit from critical armor research conducted at the University of Kent. A new family of synthetic biological materials were created by researchers studying shock-absorption properties of 'Talin' protein cells. Talin Shock Absorbing Materials, or TSAMs, have the potential to replace traditional protective materials, like Kevlar, commonly used by the military and security forces. Researchers claim that TSAMs are able to "absorb projectiles traveling over four times the speed of sound," fully intact. TSAMs are a prime candidate to replace cumbersome body armor used to protect military security personnel, better protect astronauts, and safeguard costly aerospace equipment from dangerous projectiles in space. (*The Debrief*, December 16, 2022)

NEXT UP: NAVAL DRONE DELIVERIES

As the Department of Defense implements new technologies to modernize its operations and increase combat readiness, supply line logistics is one area ripe for transformation. The U.S. Navy is beginning to leverage unmanned aerial vehicles (UAVs) to deliver cargo to moving vessels at sea through the Blue Water Logistics Maritime UAS project. In a first ever demonstration, two types of UAVs traveled 200 nautical miles and successfully delivered cargo onto a moving ship. The drones were only traveling with payloads of less than 50lbs, but according to the Navy, "90% of its cargo shipments fall under that weight threshold." The novel development is significant because the Navy currently relies on larger crewed vehicles to conduct resupply operations, and transitioning to the UAV concept could streamline the process and lower costs. (*Flight Global*, December 30, 2022)

