



Defense Technology Monitor No. 75

May 9, 2022 Alexis Schlotterback, Richard M. Harrison

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

PERFORMANCE OF CHINA'S J-20 FIGHTER JET STALLS...

China hopes to compete with Western powers using its fifth-generation J-20 fighter jet, but engine problems appear to be keeping the plane from reaching its full potential. As part of Beijing's military modernization, military planners hoped to place advanced weaponry (including directed energy weapons) on the aircraft. However, Chinese engineers are still not yet able to produce a capable engine. According to former PLA instructor Song Zhongping, "the J-20 needs more thrust and stable power generation to fully utilise directed-energy weapons." Furthermore, Ridzwan Rahmat, principal defense analyst at military publisher *Jane's*, assessed that "loading the aircraft with more payloads, such as power systems for DEW, will have an effect on the aircraft's range and maneuverability." For now, it appears that all of the cutting edge directed energy weapons technologies are out of reach for China's premier fighter. (*Business Insider*, February 7, 2022)

...WHILE CHINESE RAILGUN TECH ADVANCES

In the U.S., work on railgun technology has been abandoned in recent times in favor of a focus on hypersonic weapons development. In China, however, railguns are continuing to progress. Rail weapons do not possess an exploding payload, instead relying on electromagnetic energy to thrust projectiles toward a target at seven times the speed of sound, causing a devastating kinetic impact. While less maneuverable than other alternatives, railgun projectiles offer some advantages because they are very difficult to shoot down in flight, cost a fraction of traditional tactical missiles, and are impervious to electronic warfare attack. However, this technology is not without significant issues, particularly the wear and tear on railgun barrels, which can only fire around 20 shots before needing to be replaced. China now aims to rectify this issue by distributing liquid metal on the firing rails to reduce friction and wear, making for more durable and survivable railgun tech. (*Asia Times*, February 21, 2022)

THE BENEFITS OF STRONGER ENAMEL

The strength and elasticity of human tooth enamel could not be beaten by any man-made substance — until now. Tooth enamel cannot regenerate after it has been decayed by acid-produced bacteria in the mouth. However, a group of scientists recently proposed a new design for tooth enamel that exceeds the strength and elasticity of the natural version. In a recent study, co-author Nicholas A. Kotov notes that "all the components are biocompatible and can be expected to perform well in both animal and human trials." Future applications could involve repairing bones, coating artificial implants, or even making body armor or car parts with durable and elastic strength. (*Freethink*, February 13, 2022)

MAKING BODY ARMOR SAFER TO BYSTANDERS

Body armor manufacturer RTS Tactical recently developed a new technology that aims to solve one of the biggest weaknesses in protective gear: fragmentation. Fragmentation refers to the shrapnel effect when body armor stops a bullet from hitting the wearer, but shatters the bullet into tiny pieces that are then projected outward and can wound bystanders. Newly developed RESES Technology stops bullet fragmentation by directing a bullet into a containment chamber within the armor itself. RTS added a steel panel with self-sealing Polyuria coating to body armor that entirely envelops the bullet, preventing any fragmentation. Third party lab tests have confirmed the new armor is effective as long as the bullet hits a minimum of two inches from the panel edge. However, the new plate does increase the weight of the vest by 7.9 pounds. (*BodyArmor News*, February 9, 2022)

DUSTY DEFENSES?

As Russia and China continue to improve their hypersonic weapon arsenals, the U.S. will need to find creative solutions to counter them. Unlike ballistic missiles, hypersonic weapons do not follow an arcing path during flight, and both their detection and interception are much harder due to high levels of maneuverability. To date, the U.S. Missile Defense Agency has not developed any near-term solutions. However, the Center for Strategic & International Studies recently released a white paper that proposes a unique idea. The report argues in favor of area-wide kill mechanisms that fill a hypersonic missile's flight path with small particles such as dust, which may degrade the weapon's performance. According to the report, numerous studies show that particles in the atmosphere, such as dust or even rain, damage the nose cone of hypersonic weapons traveling at high speeds and can disrupt them completely. Proactively seeding an area of the atmosphere the weapon is likely to transit through with such "twentieth century flak" could be a cost-effective technique and cover a large area — and provide a solution far simpler than attempting to target and hit a hypersonic missile with a kinetic interceptor. (*The Drive*, February 7, 2022)