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Related Categories: Missile Defense; Science and Technology; Warfare; SPACE

U.S. ARMY DEVELOPING MICROWAVE BLASTER WEAPON
A battle is underway on today's battlefields between drone and counter-drone operators. In these contests, the U.S. Army may have found a way to tip the scales in favor of the latter. Defense contractors General Dynamics and Epirus are developing a microwave weapon capable of taking out drone swarms and even incapacitating vehicles in its path. The pulsed waves of electromagnetic energy emanating from the weapon have been equated to birdshot from a shotgun. Despite the weapon's potential, however, there may be drawbacks in the form of negative microwave radiation effects on humans. (*Popular Mechanics*, November 1, 2021)

SEEKING SATELLITE-FREE NAVIGATION
U.S. planners are acutely aware of adversary plans to disable or destroy Global Positioning System (GPS) satellites during times of conflict, and the major impact such a disruption would have on both civilian and military navigation. The GPS system is incredibly effective, and can be relied upon because of its synchronization with precise atomic clocks. Currently, only large devices requiring a significant amount of power and atomic accelerometers can aid navigation without the guidance of GPS, but such systems are not practical. Researchers at Sandia National Laboratory may have found a solution to operating in a GPS-denied environment, however, by using quantum sensing technology. The navigation unit they have developed is a small, portable device constructed of titanium walls and sapphire windows. Due to the use of nuclear materials, the closed system will need to be observed for five years to demonstrate that it is ready for operational use. (*California News Times*, November 7, 2021)

3D PRINTED SMART HELMETS
The U.S. military is increasingly considering 3D printing options to modernize body armor and weapon systems (see *Defense Technology Monitor* no. 69). Researchers at Rice University have been contracted by the Office of Naval Research to develop and improve upon U.S. soldier helmets utilizing 3D printing technology. According to Paul Cherukuri, the executive director of Rice's Institute of Biosciences and Bioengineering, "current helmets have evolved little since the last century and are still heavy, bulky, passive devices... Because of advances in sensors and additive manufacturing, we're now reimagining the helmet as a 3D-printed, AI-enabled, 'always-on' wearable that detects threats near or far and is capable of launching countermeasures to protect soldiers, sailors, airmen and Marines. Essentially, we're building J.A.R.V.I.S. (a reference to the AI used by billionaire inventor Tony Stark in Marvel's Iron Man)." The helmet will be built with nanomaterials and reportedly provide upgraded protection against both kinetic and directed energy attacks. (*Eurasia Review*, November 11, 2021)

PREPARING FOR ROBOWARS
Russia and China are experimenting with the use of robotic vehicles to compliment human soldiers in battle, and the U.S. isn't far behind. For the first time, the U.S. Army recently attempted to simulate future battlefield conditions by having an infantry division with robotic combat vehicles (RCVs) face off against an airborne division at the Joint Readiness Training Center (JRTC). Battlefield scenarios with RCVs included missions that are extremely dangerous for humans, including reconnaissance, denying landing space, and blocking an intersection. The results of the mock conflict were telling, with the intersection scenario completed with only two robots and five soldiers — an 85% reduction of force compared to having the same task carried out by human soldiers alone.

Nevertheless, drawbacks exist. For example, RCVs require excellent network connectivity to ensure they perform properly, and the amount of network traffic with so many forces in a concentrated area caused heavy network congestion. Power is also a problem. As the project's lead, Maj. Cory Wallace, explained, the RCVs "can't have a generator going 24/7 because you need to be able to maintain the low signature associated with the human element in order for it to perform that mission." Overall, the exercise was a success, and a step toward developing "tactics, techniques and procedures, and the doctrine associated with mitigating enemy robotic and autonomous system capability." (*Breaking Defense*, November 15, 2021)

THE RISK OF A VIRAL ALIEN INVASION
U.S. entrepreneurs are blasting into space on reusable rockets with hopes of creating a sustainable space tourism industry – and eventually creating colonies on the Moon and Mars. However, few have detailed the potential danger of bringing alien viruses and microbes back to Earth that accompanies such activity. According to Prof. Anthony Ricciardi of McGill University, space exploration carry a potential risk in this regard. ""[O]wing to their massive costs to resource sectors and human health, biological invasions are a global biosecurity issue requiring rigorous transboundary solutions." Ricciardi further explained that, even while following rigorous protocols at NASA, "bacterial strains exhibiting extreme resistance to ionizing radiation, desiccation, and disinfectants" have found their way into "clean rooms" used for spacecraft assembly. (*Sputnik News*, November 18, 2021)
