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Related Categories: Science and Technology; SPACE

THE SHORTCOMINGS OF SYNTHETIC TRAINING
The Pentagon has grasped the potential benefits of virtual training for soldiers, and as a result has invested in synthetic training environments like the One World Terrain (OWT) system (see *Defense Technology Monitor* no. 47). However, major concerns remain about the realism of such virtual environments - a shortcoming which can hamper the effectiveness of training. For example, the problem of "dynamic occlusion" occurs "when virtual projections within a player's view of the world are not layered appropriately with real-world objects," a state of affairs that makes the experience feel "unnatural," notes an Army statement on the subject. This represents a major potential problem; "in military scenarios, [it] can adversely affect the learning experience or lead to negative habit transfer if a soldier can't realistically take cover or if a vehicle crew is hindered from accurately aiming and firing on an enemy position." Army scientists are actively working to fix the problem, testing new sensors, developing new algorithms, and working with video game developers to improve the virtual environment and make it more realistic. (*Defense News*, December 2, 2019)

A SUCCESSOR TO THE SAND TABLE?
Preparing for an attack on a military target could soon get a great deal easier, thanks to technological breakthroughs. Military planners are accustomed to designing rudimentary terrain models known as sand tables, using whatever random items can be found nearby, in order to assess tactical scenarios. However, heavily-improvised tactical models may soon be replaced by Microsoft's Integrated Visual Augmentation System (IVAS), a set of augmented reality glasses that allow soldiers to more readily view training information, tactical maps, and are equipped with low-light and thermal sensors (See *Defense Technology Monitor* no. 44).

These advances are made possible by the fact that we can now use small drones to fly over military operations in urban terrain (MOUT) and collect terrain data. That information, once aggregated, will allow soldiers to view a three-dimensional, holographic replica of the training environment via the IVAS system. The project still needs some improvements before it's ready for deployment on the battlefield. However, those changes are expected in short order, and the system will go through final testing in July 2021. (Military.com, December 16, 2019)

3D PRINTING CRITICAL PLANE COMPONENTS
The service life of U.S. Air Force fighter jets and bombers is measured in decades, but what happens when parts and critical components of these aircraft begin to fail? Many aircraft components serve critical purposes, but require highly-specialized engineering, manufacturing equipment, and stress-testing. Moreover, they have long lifespans, so there could be no demand for a replacement for years or decades - and as a result manufacturers are disincentivized from continuing to make them. The Pentagon is hoping that 3D printing could soon offer a solution. The U.S. Air Force already prints parts with metals and polymers, but there are currently major hurdles to larger-scale printing due to differences between printers. Given that aircraft components are so technical and complex, the certification process must change in order for 3-D printing to become a legitimate alternative. The Air Force hopes that changes to the certification can occur in the near future, and is hosting an advanced manufacturing Olympics this summer to hasten the process. (*Washington Post*, December 26, 2019)

POST-NUCLEAR SPACE CLEANING
A nuclear incident in space - whether from the detonation of an atomic bomb or as a result of a solar flare - would place satellites (and consequently, countries) in increasing danger. After such an event, nuclear radiation trapped in the atmosphere would affect orbital satellites, thereby impacting everything from communications to GPS. Yet if a nuclear or large-scale geomagnetic event does take place, scientists will need a plan for space cleanup. Since the Earth is already regularly bombarded with radiation from outer space, scientists hope to mimic the planet's natural scrubbing processes, whereby radiation is scattered by radio waves. Several possible methods are currently being explored, such as using satellites to beam very low frequency (VLF) microwave beams into radiation belts, or using barium as part of a process to emit VLF waves. Such waves could even one day be used as shielding for spacecraft, making interplanetary or interstellar travel a legitimate possibility, since passing through highly radiated environments is one of the largest impediments for human long-term spaceflight. (*Popular Mechanics*, December 27, 2019)