3D-Printing in the Defense Industry

3D-printing is unique in that nearly every industry reliant on manufacturing can benefit from using it. Medical researchers can use 3D-printers to create new organs, drugs, and prosthetics (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4189697/), and tool and die operations can cut down on both costs and manufacturing time when 3D-printing is employed (https://www.mmsonline.com/articles/is-3d-printed-tooling-a-solution-for-die-casting). Though much of the press covering 3D-printing applications refer mainly to civilian and professional applications, the defense industry is beginning to see the value in it as well.

The utility of 3D-printing undertaken in a defense-minded capacity comes from the drastically shortened travel and assembly time for essential supplies and equipment. Even at this relatively early stage in its use, 3D-printing is already being used to craft an item as simple as a Humvee door handle, all the way up to state-of-the art engines for military aircraft (https://all3dp.com/1/3d-printing-military-applications/).

For the sake of context, included below is a simplified guide to how 3D-printers work, with the addendum of additional writing describing which specific materials are used in crafting 3D-printed items for military purposes.

It begins with creating a blueprint for an item with the use of computer-assisted design software. Once a design is finalized, the printer is loaded up with the desired materials, like plastic, adhesives, or metal. Before proceeding further, the base on which the 3D-printed object

is going to be deposited needs to be stabilized in order to avoid warping or deforming under the heat of the printing process.

The materials are melted down and pushed through a specially made nozzle. Several successive layers of processed plastic and other materials are built atop the base platform; while the majority of manufacturing processes require raw materials to be retooled post-construction to remove excess bulk, the 3D-printer is able to engage in what is called subtractive manufacturing, wherein the unique contours and fine details of the product are already integrated with the final product. What would have been removed following traditional manufacturing procedures is entirely removed via 3D-printing processes.

When the process is finished, final touches are made to the product, which can include, but are not strictly limited to, removing powders, removing extra adhesive and support structures left over from the printing process, and extricating the end product from its support base (https://www.energy.gov/articles/how-3d-printers-work).

The basic process is the same across all spheres. What separates the utility of what a private corporation derives from 3D-printing compared with the military is the scale of the product needed, and the malleability of military-grade ballistic/ballistic-resistant compounds created for such a purpose. At present, a number of experiments have been undertaken, each confirming the feasibility of 3D-printing being incorporated into all areas of defense manufacturing, one of which culminated in 3D-printing technology being used to create a concrete bunker in 36 hours. Beyond this, however, lies the possibility of utilizing blockchain in tandem with 3D-printing for the purpose of transmitting vital replacement parts for aircraft and specialized weaponry (https://all3dp.com/1/3d-printing-military-applications/).

What would have sounded like a piece of science fiction as recently as twenty-years ago is now becoming both possible and practical. By relying on cheap materials, precise, computer-aided design, and ease of post-construction retooling, 3D-printing is becoming the go-to method for nearly every established and viable industry, private and domestic.

Sources

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