

3-D Printing Advances Could Assist Warfighters in the Field

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As 3-D printing grows in efficiency and the associated costs decrease, the new prospects for this technology are limitless. One company, Raytheon Missile Systems, even intends to use additive manufacturing to print missiles. [1] The ability for a warfighter to print a missile in the field may become a reality because researchers at the Massachusetts Institute of Technology (MIT) Computer Science and Artificial Intelligence Laboratory (CSAIL) developed a new, cheaper 3-D printer that can utilize 10 printing materials at once. [2]

3-D printers work by producing heated materials (plastic, metal or other) and layering them to create 3-D objects.

This printer, known as the MultiFab, costs around \$7,000, which is far less than previous multi-material printers that venture into six figure price tags and carry fewer options for printable materials. With advances in 3-D technology, prices are expected to continue to drop, opening availability to more consumers. The MultiFab combines a low price point with a level of 40 microns of resolution accuracy. [2]

Using a 3-D scanner for improved accuracy, the MultiFab has the ability to not only print but embed objects into products. By running a loop of continuous 3-D scans, the machine has built-in self-correction methods to maintain print accuracy. Previous 3-D printing methods required users to fine tune settings. [2]

This feature is of particular interest to the military. Chris McCarroll, the director of the National Additive Manufacturing Innovation Institute,



James Zunino, Picatinny Materials Engineer, displays an object that was created through 3-D printing. 3D printing gives engineers the flexibility to quickly print items of various shapes, materials and structure. (Photo courtesy of the U.S. Army)

said, "Before a warfighter can print a missile in the field, you need quality, controlled processes to fabricate all the component materials: the metallic strongbacks, and the plastic connectors, the semiconductors for processors, and the energetics and propulsion systems. The hard part is then making the connections between these components, as an example, the integrated control circuit that receives the command to light the fuse." [1]

The MultiFab printer addresses these issues with the embedding feature, which allows the complex pieces of missiles, including any sensors and circuits, to be included in the initial printing. [2] This printer also enables the tailoring of prints and multiple material usage for quicker repair. This is of interest to the warfighter who is often deployed without manufacturing capabilities and often with failing equipment. [3] The typical subtraction method of design costs more and produces a large amount of waste.

Additive manufacturing utilizes a minimal amount of material, reducing both costs and waste. [4] "The potential impact in scaling advances manufacturing across the defense enterprise cannot be overstated." [5]

3-D printers, especially one as powerful and versatile as the MultiFab, can make the supply and logistics chain shorter by providing soldiers the ability to machine parts on-site rather than waiting for manufacturing and deliveries from all areas of the globe. [3] This in turn saves the Department of Defense both time and money, as the shipment of physical goods would be replaced with electronic files of design data. Digital supply chains are more agile, secure and improve operational readiness.

References:

- [1] [Raytheon: To Print a Missile.](#) (2015, August 3). Raytheon.

- [1] [“MULTIFAB” 3D-PRINTS A RECORD 10 MATERIALS AT ONCE, NO ASSEMBLY REQUIRED.](#) (2015, August 24).
- [2] [US military invests in 3D printing on the frontline.](#) (2012, November 12). De Zeen.
- [3] Elmers, J. (2014, July/August). [Army Depots and 3-D.](#) Army Technology, 21.
- [4] Louis, M., Seymour, T., Joyce, J. (2014). [3D Opportunity for the Department of Defense.](#)

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3-D scanning technology is used by the Army to create models for visualization, prototypes and reverse engineer existing technologies. (Photo courtesy of the U.S. Army)



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