3D SYSTEMS

Press Release

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3D Systems' Metal Additive Manufacturing Solutions Selected by Raytheon Technologies and CCDC Army Research Laboratory for Novel Thermal Application

- 3D Systems' DMP Factory 500 solution will be part of research effort to develop topological optimization that accounts for heat transfer

ROCK HILL, South Carolina, February 11, 2021 – 3D Systems (NYSE:DDD) today announced the company has been selected by Raytheon Technologies and the Combat Capabilities Development Command (DEVCOM) Army Research Laboratory (ARL) as part of a research project titled "Research for Virtual Design and Qualification Process for Additively Manufactured Parts Optimized for Multi-Laser Machines"[1] awarded through the National Center for Manufacturing Sciences' (NCMS) Advanced Manufacturing, Materials, and Processes (AMMP) program. Working in conjunction with Raytheon Technologies, the Penn State Applied Research Lab, Johns Hopkins University, and Identify3D, the goal is to optimize a component relative to an Army modernization product to maximize cooling and improve overall system performance. Using additive manufacturing (AM) to address this need is a novel approach to the project that covers the entire part lifecycle including determining performance requirements, topologically optimizing the design, manufacturing the part with attention to process monitoring for quality control, component performance validation, and data security.

Dr. Brandon McWilliams, deputy program manager at the CCDC ARL Weapons and Materials Directorate states, "The novel integration and concurrent design of structures, materials, and processes to create topologically optimized heat exchangers will enable disruptive advancements in munitions technology in support of multiple Army Modernization Priorities."

The size and complexity of this specific application require a large frame AM system. 3D Systems' Application Innovation Group (AIG) designed a bespoke solution built on the company's DMP Factory 500 solution for its best in class build volume (up to 500 x 500 x 500 mm) and its ability to produce parts spanning the entire build area without the need for stitching. The AIG has architected a custom configuration of the DMP Factory 500 that includes multiple modules to meet the unique requirements of this application. This advanced metal production system recently installed and commissioned at Penn State's Center for Innovative Material Processing through Direct Digital Deposition (CIMP-3D) in December 2020, will be powered by the company's 3DXpert® additive manufacturing software and LaserForm® materials. This particular printer will be upgraded with some of the innovative technologies 3D Systems is working on for its 9-laser, 1m x 1m x 600mm metal 3D printer including coaxial process monitoring and a high contrast single-lens reflex (SLR) camera within the build chamber that delivers a comprehensive view of the build in-situ. By using the same optical train included in the even larger frame, 9-laser system, the development activity on the DMP Factory 500 will be directly transferrable to the larger system. 3D Systems' AIG application experts will continue to provide support throughout the project, including design guidance and training.

"Our work with the Army Research Laboratory is taking 3D Systems' technology in new directions," said Chuck Hull, co-founder and chief technology officer, 3D Systems. "We're able to combine our metal 3D printing innovation with unique advancements in process modeling and monitoring, data security, and topology optimization to deliver an unparalleled solution. ARL is strengthening its position as a leader in technology innovation to improve the capabilities of the warfighter and we look forward to continuing our collaboration with them."

In addition to the thermal application, this team will also develop and evaluate new technology for process modeling and defect prediction, process monitoring and defect detection, topology optimization, and cyber-physical security.

"The migration to larger build envelopes significantly expands the domain of Department of Defense applications addressable by additive manufacturing, yet it brings new challenges for process monitoring and quality control," said Ted Reutzel, associate research professor, Penn State's Applied Research Lab, and director, Penn State's CIMP-3D. "The installation of this system at our Center will enable our team to leverage prior developments—funded by the US

Navy, US Air Force, America Makes, and others—to help meet these challenges and rapidly integrate advanced flaw detection technologies."

"The team is establishing a singular fluid architecture that encompasses design optimization, sensing, machine learning, security, testing, and production," said Lisa Strama, president and CEO of NCMS, a cross-industry technology development consortium. "This will result in a prototype-based upon a holistic, machine agnostic, interconnected workflow. Leveraging the NCMS' AMMP program and our trusted collaborative model, this project fully showcases the advancements made possible and efficiencies gained when bringing together OEMs, non-traditional defense contractors, and academia to address the full life-cycle of Army relevant components."

"Identify3D is proud to be part of this program by providing end-to-end protection of the core manufacturing process from build file generation to DMP Factory 500 production and sensor data generation," said Chris Adkins, chief scientist, Identify3D. "In addition to the DMP Factory 500 integration, Identify3D is developing an architecture to securely collect sensor data in the inspection and defection detection workflow as well as secure the design and defect prediction process to ultimately optimize the full digital workflow."

1. *This research was funded by the NCMS contract 202066 (under U.S. Army prime OTA No. W911NF-18-9.000.3). The U.S. Government is authorized to reproduce and distribute reprints for Government purposes notwithstanding any copyright notation thereon. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the official policies, either expressed or implied, of the U.S. Army Research Laboratory (ARL) or the U.S. Government.*

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Certain statements made in this release that are not statements of historical or current facts are forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause the actual results, performance or achievements of the company to be materially different from historical results or from any future results or projections expressed or implied by such forward-looking statements. In many cases, forward-looking statements can be identified by terms such as "believes," "belief," "expects," "may," "will," "estimates," "intends," "anticipates" or "plans" or the negative of these terms or other comparable terminology. Forward-looking statements are based upon management's beliefs, assumptions, and current expectations and may include comments as to the company's beliefs and expectations as to future events and trends

affecting its business and are necessarily subject to uncertainties, many of which are outside the control of the company. The factors described under the headings "Forward-Looking Statements" and "Risk Factors" in the company's periodic filings with the Securities and Exchange Commission, as well as other factors, could cause actual results to differ materially from those reflected or predicted in forward-looking statements. Although management believes that the expectations reflected in the forward-looking statements are reasonable, forward-looking statements are not, and should not be relied upon as a guarantee of future performance or results, nor will they necessarily prove to be accurate indications of the times at which such performance or results will be achieved. The forward-looking statements included are made only as of the date of the statement. 3D Systems undertakes no obligation to update or review any forward-looking statements made by management or on its behalf, whether as a result of future developments, subsequent events or circumstances or otherwise.

About 3D Systems

More than 30 years ago, 3D Systems brought the innovation of 3D printing to the manufacturing industry. Today, as the leading additive manufacturing solutions partner, we bring innovation, performance, and reliability to every interaction - empowering our customers to create products and business models never before possible. Thanks to our unique offering of hardware, software, materials, and services, each application-specific solution is powered by the expertise of our application engineers who collaborate with customers to transform how they deliver their products and services. 3D Systems' solutions address a variety of advanced applications in healthcare and industrial markets such as medical and dental, aerospace & defense, automotive, and durable goods. More information on the company is available at www.3dsystems.com.

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