

NAVY SBIR TRANSITION PROGRAM

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Transforming Additive Manufacturing for Defense: Big Metal Additive Partners with BAE Systems, Inc.

By Eric Radulski

Big Metal Additive (BMA) has forged a partnership with BAE Systems, Inc., revolutionizing the field of additive manufacturing (AM) within the defense industry. This collaboration combines BMA's cutting-edge technology and expertise in metal additive manufacturing with BAE Systems' extensive knowledge and experience as a prominent defense contractor. Together, the companies are delivering innovative solutions to produce high-quality metal parts that meet the requirements of defense applications.

Slade Gardner, president and founder of BMA, highlighted the unique capabilities of their AM process. "We're unique in the additive manufacturing industry because we provide five-axis metal deposition and five-axis CNC machining in the same work environment. That gives us a foundationally advanced additive manufacturing process that is building upon the heritage of MIG welding," Gardner said. BMA's AM capability is based on industrial manufacturing technologies, allowing BMA to accommodate large parts with their 12-foot by 6-foot worktables. This expansive work area enables the production of complex and sizable components, a key advantage for defense applications.

What sets BMA apart is their proficiency in

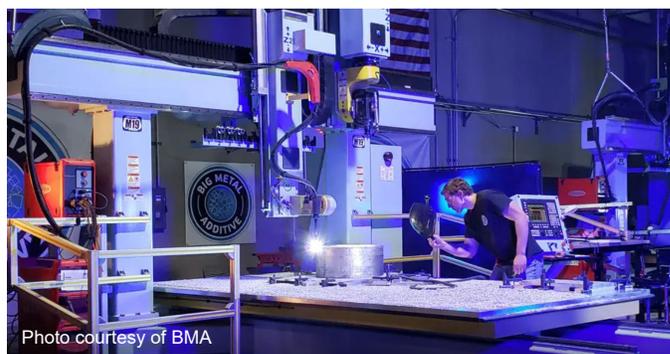


Photo courtesy of BMA

BMA's AM capability is based on industrial manufacturing technologies, allowing BMA to accommodate large parts with their 12-foot by 6-foot worktables

working with a wide range of metals. They specialize in aluminum, steel, stainless steel, and nickel alloys, offering a comprehensive suite of AM solutions. Gardner explained, "Our additive capabilities are based on something called wire arc DED, or directed energy deposition. It's one of the seven recognized modalities of additive manufacturing. Wire arc DED is very similar to gas metal arc welding, commonly known as MIG welding." BMA leverages the heritage of gas metal arc welding, a technique that has been refined over 60 years, to provide AM products that meet the qualifications and requirements of the defense industry.

The partnership between BMA and BAE Systems emerged through the Navy Small Business Innovation Research (SBIR) program. BMA was awarded a Phase I SBIR to create a proof of concept and

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subsequently approached BAE Systems with their results. Recognizing the potential of BMA's technology, BAE Systems became a transition partner for the Phase II follow-on SBIR. Gardner described the collaboration: "BAE Systems engaged with testing support, technical guidance, and business guidance. They were able to test seven pressure vessels for us in their hydrostatic test tank and provided us with a design for a pressurized component for one of their commercially available UUVs."

BAE Systems played a vital role in validating BMA's AM technology. As part of the Phase II SBIR, BAE Systems tested the pressure vessels manufactured by BMA, ensuring their integrity and performance in real-world conditions.

Gardner explained, "When BAE Systems swam one of their Riptide 9 UUVs at sea for 36 Navy-relevant missions, the pressure-containing component on board validated our manufacturing technology to technology readiness level 7." TRL 7 is a critical milestone in technology development, indicating the technology has been tested and proven to perform reliably in relevant environments.

Achieving TRL 7 is a testament to BMA's ability to deliver AM products that meet the rigorous demands of defense applications. "By reaching TRL 7, we show the world

that we are capable of producing articles that can perform in a relevant environment. This speaks loudly to all prime customers, not just in the UUV space, but to all DoD suppliers," said Gardner. The partnership with BAE Systems has positioned BMA as a trusted provider of manufacturing capabilities suitable for service environments, enabling them to cater to the needs of various defense industry stakeholders.

The impact of BMA's collaboration with BAE

Systems extends beyond technology validation. Gardner said, "We are in BAE Systems' procurement system, which has opened up a pathway for revenue and a business relationship. We are able to provide



BAE Systems with manufacturing solutions for other product needs that they have." This partnership has facilitated an ongoing collaboration between the two companies, enabling BMA to contribute its AM expertise to other projects within BAE Systems' portfolio.

The success of BMA's partnership with BAE Systems has had its challenges. Gardner reflected on its early stages. "When we began the project, we didn't know anything about UUVs. For the Phase I SBIR, we needed to design our own demonstration UUV and climb a steep learning curve." Despite BMA's limited expertise in UUV

design, the company successfully produced a 21-inch diameter UUV that integrated multiple subsystems. Transitioning to the Phase II SBIR presented another hurdle, as BAE Systems could not share proprietary knowledge on component configurations. Gardner recalled, “We had to design the test articles ourselves, climbing the learning curve and engaging in conversations with our technology liaisons at BAE Systems.”

BMA’s collaboration with BAE Systems also has opened doors to other UUV manufacturers and the submarine industrial base. The qualification of BMA’s additive manufacturing technology to TRL 7 for UUV pressure vessels has positioned them as a trusted partner for submarine components, particularly for the Virginia class and Columbia class submarines. “Our gas metal arc welding-based wire arc DED process is more mature than other AM modalities. It provides the qualification framework, inspection, and acceptance criteria required by the submarine industrial base to consider additive manufactured parts as casting replacements,” said Gardner.

The Navy SBIR Transition Program (Navy STP) helped facilitate BMA’s growth and success with this project. Gardner acknowledged the support BMA received

through the program. “Our business consultant connected us with dozens of experts, potential customers, and collaborators. She worked with us at trade shows and industry events, bringing people

to our booth and arranging meetings to help us build new relationships.” In addition to the connections made through their business consultant’s assistance, BMA benefited from a comprehensive Market Research Analysis Report which provided crucial insights into the UUV industry and identified key points of contact within relevant organizations, enabling BMA to engage in meaningful conversations



Photo courtesy of BMA

BMA, in a partnership with BAE Systems, is delivering innovative solutions to produce high-quality metal parts that meet the requirements of defense applications.

with industry experts.

Looking ahead, BMA is poised for continued growth. With plans to expand their manufacturing capabilities and workforce, they plan to become a factory of 100 machines. This expansion will allow BMA to serve customers across a wide range of industries and fulfill surge manufacturing needs when required.

For more information on BMA, visit the company’s website at <https://bigmetaladditive.com/>.

