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Vermont Manufacturing Collaborative (VT-MC)
FACT SHEET

What is the IBAS Grant award to Vermont Technical College (VTC)

1. Vermont Technical College (Vermont Tech) has been awarded a $11.997 million contract from the **U.S. Army's Industrial Base Assessment and Sustainment (IBAS)** program as part of the **National Imperative for Industrial Skills.** The base award amount is $7.969 million, with an additional $4.028 million option.

2. According to the formal Prototype Project Agreement with Vermont Technical College, ***"The overall objective of this effort is to create the first advanced manufacturing education, research, and product development facility in Vermont through collaboration between higher education and industry."***

3. Vermont **Senator Patrick Leahy** and his staff worked closely with Vermont Tech to identify funding for this important opportunity. Work with IBAS to compete for the contract award began in the spring of 2019, and funding for this program was included in the FY20 defense budget.

4 Advanced manufacturing and associated workforce development have been major priorities within the federal government for the last several years, particularly within the Department of Defense as it continually strives to improve its industrial base in support of developing and sustaining state-of-the-art systems and platforms.

5. The IBAS award will be a critical component and huge boost to the ongoing development of the **Vermont Manufacturing Collaborative (VT-MC),** a public-private collaborative managed by Vermont Tech, and one directly responsive to the growing needs for technical skills in Additive Manufacturing for the industrial supply chains of the U.S. Department of Defense and for manufacturing generally.

What is the Vermont Manufacturing Collaborative (VT-MC) and what is its core Mission?

1. The **Vermont Manufacturing Collaborative (VT-MC)** is a unique, advanced manufacturing program, managed by **Vermont Technical College** on its main campus in Randolph Center, Vermont. It is a collaborative, public-private partnership officially launched in 2019 to enable research, product development, education and training and access to trusted resources to help accelerate innovation in manufacturing enterprises, while also involving students in that practice. It is a value-adding collaborative partnership.

2. **What is the primary *Mission* of VT-MC?** "***To advance Technology-enabled Manufacturing and associated Workforce Readiness in Vermont and beyond through collaborative public-private partnerships and opportunities at work in innovative learning, teaching and manufacturing environments."***

   VT-MC strives to be an exceptional, public-private collaborative that remains a leader in helping to accelerate continuous growth in manufacturing and industry workforce readiness.

3. **What is the *Focus* of VT-MC?** Executing and completing the recent Prototype Project Agreement between Vermont Tech and the National Imperative for Industrial Skills is a high priority focus and one that includes an emphasis on Additive Manufacturing (AM) or "3-D Printing." However, VT-MC is also working to advance complementary areas of technology-enabled advanced manufacturing, education and training. The founding partners involved with VT-MC believe that the combined use of Additive Manufacturing (AM) to create innovative design and production techniques, along with other important "Industry 4.0" technologies and best practices, represent very important drivers of manufacturing's "future state."

What will the IBAS Award do for Vermont Tech and the Vermont Manufacturing sector?

1. The IBAS award closely aligns with and powerfully complements the core mission of the Vermont Manufacturing Collaborative (VT-MC) managed by Vermont Tech.

2. The IBAS award will enable Vermont Tech to improve and expand its advanced manufacturing labs with state-of-the-art Additive Manufacturing (AM) or "3-D Printing" equipment, hire appropriate staff, and continue building and implementing the **"Vermont Manufacturing Collaborative (VT-MC)."** VT-MC further supports the expansion and strengthening of Vermont Tech's position as a leader in engineering, manufacturing education and training.

3. An expanded, well-equipped Vermont Tech lab and training facility will be available on a reasonable fee-for-service basis to small- and medium-sized enterprises to do prototype/test bed development and small batch manufacturing runs during non-teaching hours at the centrally located, Randolph Center campus. There will be renovations at VT Tech to accommodate the expansion of the existing advanced manufacturing labs as well as to accommodate new equipment and training.

4. Vermont Tech has existing Additive capacity on a small scale for limited Additive work. This IBAS contract award will enable large-scale Additive work with an array of materials, expanding the educational opportunities for students.

5. Vermont Tech students will be engaging with participating companies as part of their education, thereby augmenting their exposure to real world manufacturing challenges and opportunities.

6. Accelerated by the IBAS award, VT-MC is creating new working partnerships between Vermont Tech, private sector partners and other educational entities to re-skill adults, train incumbent workers, enhance curricula and educational offerings, and help develop future employment opportunities for students and graduates.

7. Working closely with partners and proven manufacturing resources like VMEC, VT-MC will be helping Vermont manufacturers to remain competitive; continuously learn; innovate and create new products, services and business opportunities, while preparing for the watershed technology and new marketplace challenges and opportunities that Additive and other Industry 4.0 advanced technologies are creating for manufacturing locally and globally.

What is the History of VT-MC?

1. The idea to form the collaborative, VT-MC public-private partnership is a direct result of an idea and needs expressed in 2018 by a small group of proactive Vermont manufacturers. To remain competitive, these innovative leaders expressed a desire to collaboratively learn and accelerate their use of state-of-the-art Additive Manufacturing *design, prototyping* and *production* resources, especially in Additive Manufacturing metals deposition. There was also high interest in applied learning opportunities for their employees, ideally in a Vermont-based, higher education environment, with education and training programs that include recognized “credentials” - coupled to degree programs if possible - with continuing education offerings in well-equipped facilities.

2. In July 2019, the **Vermont Manufacturing Collaborative (VT-MC)** was officially launched at Vermont Tech with initial funding support from an **Office of Economic Adjustment (OEA**) grant award administered by the **Vermont Agency of Commerce & Community Development (ACCD).**

3. During a period of discovery and initial strategy development that included meetings with Vermont industry leaders, it soon became clear that a collaborative partnership would help support important local and regional growth in use of Additive Manufacturing, and over time, in additional advanced “Industry 4.0” technologies and resources. VT-MC could thereby support and help influence the ‘future state’ of Vermont’s manufacturing sector and ecosystem. For the State of Vermont, this new effort would clearly help to accelerate and secure the proven, high economic multiplier impacts of a modern manufacturing sector.

    - Jobs Impact: Every 1.0 manufacturing job = 4.0 jobs elsewhere
    - Economic Impact: Every $1.00 spent in mfg. adds at least another $1.82 in Economic activity

4. A VT-MC "Steering Committee" worked together throughout the early OEA grant phase. The Committee included volunteer leaders from Vermont Tech and a number of Vermont manufacturing companies, plus from VT-MC partners ACCD, VMEC, AIV and the VT Chamber of Commerce.

What is "Advanced Manufacturing" and "Smart Manufacturing"?

"Advanced Manufacturing" has no hard and fast definition. The Vermont Manufacturing Center (VMEC) generally considers "advanced manufacturing" to include the use of digital connectivity and/or a family of activities that include: (a) depending on the use and coordination of information, data, automation, computation, software, sensing, networking, and/or, (b) making use of cutting-edge materials and emerging capabilities enabled by the physical and biological sciences. This aligns with the definition of Advanced Manufacturing presented by the President's Council on Science and Technology in 2011.

Advanced Manufacturing may involve both new ways to manufacture *existing* products and the manufacture of *new* products supported by advanced or so-called "Industry 4.0" technologies, such as: Additive Manufacturing, Robotics, Artificial Intelligence (AI), Augmented Reality (AR), Virtual Reality (VR), Wearables, Cloud Computing, Internet of Things (IoT), Big Data, and more.

"Smart Manufacturing" is a more recent term that is also being widely used. In simple terms, "Smart Manufacturing" is connecting a manufacturer's information technology across their total value chain, both inside and outside the manufacturing company or enterprise.

What is Additive Manufacturing (AM)?

1. **Additive Manufacturing or "3-D Printing" is the building of products layer by layer with high precision, and it can involve multiple materials, including various metals, ceramics, plastics, and much more.** This technology enables the manufacture of designs not possible with traditional "subtractive" manufacturing that involves machining parts away from base materials.

2. Additive Manufacturing (AM) has evolved and matured rapidly in recent years, making high volume production a reality.

What are some Potential Additive Manufacturing (AM) Advantages?

- **Increased Innovation** – Print prototypes in hours and obtain feedback.
- **Improved Communication** – Holding a full color, realistic 3D model in your hands imparts far more valuable information than a computer image.

- **Win More Business** – Bring realistic 3D models to prospective accounts.
- **Reduced Time to Market** – Design cycles are compressed to create multiple, on-demand prototypes.
- **Accelerated Development with Reduced Costs** – Cuts down on traditional prototyping and tooling costs.
- **Reduced Production Cost & Time** – AM can be cost-competitive with traditional manufacturing, particularly with low volume runs, but also into thousands of units. For example, AM can be less expensive than plastic injection molding even up to 10,000 units. No need for lengthy manufacturing of tooling.
- **Personalized Products** – Personalize to customer requirements. Custom medical implants – hip or knee replacements.
- **Mass Customization** – "nvisalign" teeth aligners or hearing aids, for example.
- **Structures, Shapes and Materials that Cannot Be Made Any Other Way**
    - Part performance improvement – Wide open design space - more creative designs, more complex geometry possible – lattice and organic structures. Software-driven design to maximize performance (topological optimization).
    - Part consolidation – Reduce an entire assembly of parts down to a single part. Eliminate assembly cost, increase strength, eliminate leaks, etc.
    - Multi-material parts.
- **Rapidly Create Tooling with High Performance & Reduced Cost** – Conformal cooling channels in injection molds to reduce cycle times, sand casting molds made without a pattern, investment casting patterns, ergonomic aids produced in hours with worker input.
- **Reduce Waste** – Less waste while creating sturdier and often lighter products.
- **Build on Demand** – Less inventory, procure parts when the original factory / manufacturing process no longer exists. B52s still need replacement parts, but factories are shuttered.

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