



July 9, 2020

Paul Williams
Grant Management Specialist
Vermont Agency of Commerce and Community Development
Department of Economic Development
1 National Life Drive
Deane C. Davis Building, 6th Floor
Montpelier, VT 05620-0501

Subject: Proposal to Strengthen the New England Regional Defense Industry Collaboration's
Supplier Readiness Network

Dear Mr. Williams,

On behalf of the Connecticut Center for Advanced Technology and our New England partners, please accept for consideration this proposal. Our team is confident that we will bring significant value to the New England defense supply chain, particularly the small-medium size enterprises that are so vital to our economic success.

Please do not hesitate to contact me for question or further information. Thank you.

Sincerely,

Ronald F. Angelo

President and CEO



New England Regional Defense Supplier Network Readiness Facilitation

Proposal to the State of Vermont's Department of Economic Development (VTDED)
in support of defense-related small and medium businesses in New England

from

Connecticut Center for Advanced Technology, Inc.
222 Pitkin street
East Hartford, Connecticut 06108

12 months; \$420K

July 9, 2020

CCAT Point of Contact: Thomas Maloney, CTO
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Introduction

Connecticut Center for Advanced Technology, Inc. (CCAT) is pleased to submit this proposal to the State of Vermont's Department of Economic Development (VTDED) to support defense-related small and medium businesses in New England. The proposing team will assist in the creation of a region-wide system that will help defense-related Small, Medium Enterprises (SMEs) to investigate, pursue and ultimately incorporate emerging manufacturing technologies. This will help SMEs to improve their capabilities as suppliers in the defense supply chain and thereby provide more resilience to the defense manufacturing ecosystem. The CCAT-led team will work with VTDED to help SMEs in New England to understand emerging Industry 4.0 technologies and workforce requirements needed to incorporate those technologies. A collaborative, multi-disciplinary approach is proposed to educate New England SMEs on Industry 4.0 technologies, demonstrate how the technologies can be implemented, and identify the skillsets required for utilizing the technologies. The goal is for SMEs to have the capabilities (technology and workforce) to meet OEM and higher tier customer requirements in order to secure more work and to strengthen supply chain resiliency in New England.

The proposing team consists of eight partners. Three partners operate collaborative advanced manufacturing facilities, all of whom also conduct education/workforce development for Industry 4.0 technologies, one of which is part of a University. The other five team members are innovative companies that develop emerging technologies for Original Equipment Manufacturers (OEM) and lower supply chain tiers. These partners will be instrumental in delivering first-hand knowledge, demonstration, and real-world experience with implementation and return on investment for Industry 4.0 technologies. Project team members are:

Connecticut Center for Advanced Technology, Inc.; East Hartford, Connecticut
Team Lead; Advanced Manufacturing Center and Composites Manufacturing Center, conducts education/workforce development

Berkshire Innovation Center; Pittsfield, Massachusetts
Operates state-of-the-art manufacturing R&D facility, conducts education/workforce development

University of Maine; Orono, Maine
Operates Advanced Manufacturing Center and Center for Additive Manufacturing of Metals, education activities

Barnstorm Studio; South Hadley, Massachusetts (materials supplier)
Additive Manufacturing / 3D Printing, sustainable/recycle metal powder production for additive

Ergo Insight; East Hartford, Connecticut
Artificial intelligence (AI) application developer and machine learning; AI-based applications for manufacturing

The Impact Group / SphereGen; Offices in Vermont and Connecticut
Augmented Reality and AI for applications including work instructions and maintenance

Novus Insight; East Hartford, Connecticut
Computer and Information Technology, Cybersecurity, Portal development

RAM Engineering Solutions; South Windsor, Connecticut
Digital technologies and Model Based Definition expertise

Statement of Work

CCAT will lead a team that includes organizations across New England to:

1. Convene new partners and stakeholders
2. Create awareness of Industry 4.0 emerging manufacturing technologies; and introduce educational and informational components of Industry 4.0;
3. Identify and share best practices across the regional ecosystem, including pilot project demonstrations that include cross-state participants.
4. Establish a Regional Defense Industry Portal
5. Devise Process to Sustain the Network

The work will be carried out with partners that are already developing and implementing Industry 4.0 as well as SMEs that could adopt these technologies and/or educate the workforce on Industry 4.0. The proposing team encompasses organizations from private industry, non-profits, and academia. The first activity of team will be to convene new, additional partners and stakeholders. Also, immediately upon project start, the proposing team will conduct outreach via webinars (and seminars if conditions permit) to inform the New England DoD supply chain of the emerging Industry 4.0 technologies. Newly convened partners may also assist in the outreach.

Three of the project members operate state-of-the-art applied manufacturing R&D facilities in collaboration with industry. Information will be catalogued in an IT portal and will be made available the New England network of aerospace and defense manufacturers.

Technical Tasks

1. Convene Existing Experts and Stakeholders

Some key team partners have been identified as the proposing team and the goal of this task is to incorporate additional partners to represent the broader regional A&D ecosystem. Existing Industry 4.0 related assets, initiatives, and innovations, within New England will be summarized via the collaborative approach. Examples of industry initiatives include Stanley Black and Decker's Manufactory 4.0 as well as Munich RE Hartford Steam Boiler's digital IoT initiative, both in Hartford, Conn.

Approach

CCAT and partners have a strong and deep network within the New England DoD supply chain, including OEMs and lower supply tiers. We will seek SMEs in outer parts of New England that embrace leading edge technologies as well as those who are candidates to adopt new technologies. Partners will be linked to disseminate knowledge from the leading-edge institutions and best practices. We will begin with the network of collaborators for each team member, including the formal members of the Berkshire Innovation Center. Organizations including the Aerospace Components Manufacturers, Naval and Maritime Consortium, Manufacturers Association of Maine, Manufacturing Extension Partnerships in New England, and the PTACs will be invited as stakeholders. All New England states will have relevant representation for this effort, including both technology and education/workforce development. The network and partnerships will be documented in a cluster map format. CCAT has prior experience in cluster mapping including lead for the 8-state Northeast Electrochemical Energy Storage Cluster (NEESC) whereby a Supplier Locator was created as part of a Hydrogen Fuel Cell Supply Chain Database. The Supplier Locator can be used to find manufacturers and service providers and/or potential customers for organizations. With approximately 14 supply products and over 100 categories, the Supplier Locator is a searchable online database designed to help support industry growth and increase market opportunities for new entrepreneurs and established technology-based small businesses.

This team of stakeholders would focus on development of the necessary strategies needed to support the New England aerospace and defense supply chain by aligning the assets of state, regional, and local economic development organizations to fully support efforts that will result in adjustment and diversification programs. By developing an organizational model that will foster cooperation among key stakeholders, this proposal will enhance the capacity of the region to assist local communities with economic diversification and workforce development. Companies are experiencing a growing need for a more strategic and effective approach to sustaining their business. Many companies lack a formal process and the analytical capabilities necessary to provide a clear line of sight to their current and future operational and workforce needs. Those that have the vision and fortitude to proactively position for growth are those that will realize the economic benefits of being early to market to meet demand for their products and services. Data derived from the process will inform government and education partners about the demand for recruitment, hiring and training support, including program design and investment of public resources. With Connecticut serving as the central "hub" for coordination of participants, facilitation of policy and program development, and dissemination of information, we are developing an organizational model that will foster cooperation among key stakeholders and enhance the capacity of the region to assist local communities with economic diversification and workforce development.

Task 1 Deliverables

1-1. Summary Report and Cluster Map;

Due 6 months after start;
updated 11 months after start

The report will include all partners, capabilities, needs, and identified gaps for technology and workforce.

2. Industry 4.0 Preparedness

The team will develop and incorporate Industry 4.0 educational awareness for emerging technologies to guide what is a ‘future-ready’ capability. We will build awareness and understanding across the regional ecosystem through a series of webinars and (if feasible) in-person seminars on Industry 4.0 topics to help SMEs learn how these technologies can be incorporated to meet their customer’s existing and future requirements.

The overall approach will encompass informational awareness for the wide realm of subject matter within Industry 4.0. A subset of the Industry 4.0 topics will be demonstrated in pilot projects. Cybersecurity will not be a focal point of this effort as the NIST MEPs cover that topic nationally and private industry is firmly entrenched in competitive cyber technologies.



Figure 1. Realm of Industry 4.0 Technologies

a. Educational and Informational Components of Industry 4.0

Create educational and informational components on Industry 4.0 for web-based or in-person (if feasible based on government Covid guidelines) based seminars. Webinars will be hosted by CCAT and other partners on relevant Industry 4.0 technology and education/workforce topics¹. Topics will also be presented at regional events when feasible. At least 20 webinars are anticipated in total by all project partners.

Approach

The team will work with digital technology experts and technology developers to develop and offer educational workshops and trainings on emerging technologies to the New England DoD SMEs. CCAT will identify third-party trainers from organizations such as 3D systems, ATI, 3DCERAM, Autodesk, Siemens, Renishaw to introduce and provide trainings on digital technologies, those that will be demonstrated via pilot projects in Task 3. These digital technology skills workshops will be delivered predominately by CCAT with assistance from project team members.

¹ Note that CCAT presently coordinates Industry 4.0 webinars

Each workshop will provide an overview of the technology, how it helps to improve a process, the benefits and return on investment (ROI), and next steps/additional training/supports needed for implementation. The trainings will assist participants in identifying next steps and tools needed for implementation in their facilities. Advertising to the New England stakeholders will be by email and personal contacts with organizations in New England. CCAT will outreach to the New England DoD SMEs via industry associations to ensure awareness, participation and input into the Industry 4.0 technology introductory workshops and trainings and provide a list of participating manufacturers. Workshops and trainings will be listed on project team member websites and registration platform and bi-weekly eblasts will be sent to manufacturers. Additionally, CCAT will directly outreach to encourage participation and we will leverage industry associations to advertise the webinars.

Webinars that have already been prepared by third party experts and are available to this program are:

- *Industry 4.0 and Smart Manufacturing*
- *Machine Tool Probing for Industry 4.0*
- *High Speed, Automated, 3D Scanning for Part Inspection*
- *3D Scanning for Part Digitization & Parametric Model Creation*
- *Design to Print Technology*
- *Data Dashboards & Applied AI*
- *Predictive Maintenance Technologies*
- *IoT/Cloud & Cognitive Computing*
- *Modernization Strategies*
- *High Speed Contact Metrology*

Additional webinar content will be added with project team input.

Task 2 Deliverables

- | | |
|--|---|
| 2-1. Schedule for Awareness Webinars/Seminars

(webinar/seminar schedule to include presenter, subject matter) | Due: 1 month after start; updated on months 3, 6, 9 after start |
| 2-1. Summary of webinar participants | Due on months 3, 6, 9 after start |

3. Identify and Share Best Practices Across Ecosystem

The team will identify and link best practice across the regional ecosystem from Task 1 and facilitate implementation of new partnerships and pilot projects. As Industry 4.0 encompasses vast and broad technologies, the pilot projects will incorporate near-term technologies for immediate, affordable adoption as well as emerging technologies that may require more capital and training for future implementation. Our approach will cover a large amount of Industry 4.0 topics under Task 2 for educational and informational awareness (including Preventive Maintenance, Data Dashboards, Shop Floor Monitoring, Cloud Computing, Collaborative Robots, among others) and a subset of those technologies will be demonstrated via the pilot projects. The downselection of pilot projects includes those with very near-term paybacks for large number of SMEs that support OEMs as well as more advanced topics with longer-term implementation.

a. Collaborative, multi-disciplinary partnerships

The team will immediately establish collaborative multi-disciplinary partners to educate, conduct pilot projects, and foster implementation of selected Industry 4.0 technologies. Leading edge organizations that are already part of this team form the basis of innovative linkages and partnerships to disseminate knowledge to SMEs in the New England region. The team will review the initial pilot project selections with VTDED for concurrence and revision if needed.

b. Pilot Demonstration Projects

Four pilot projects have been selected that include cross-states; multi-discipline, cross-industry; participants. The goal of these projects is to inform SMEs of the benefits of Industry 4.0, how the technologies work, how they can be implemented, and an estimated time and cost for

implementation. All of the pilot demonstration projects will incorporate education and awareness from Task 2 prior to execution. The Industry 4.0 topic areas that will be covered in the pilot projects are depicted in Figure 2.

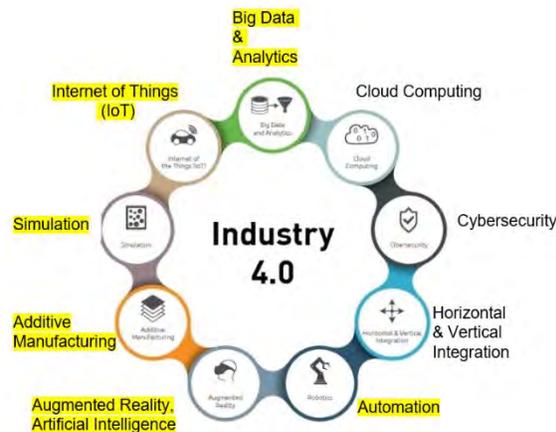


Figure 2. Industry 4.0 Topic Areas to be Covered in Pilot Projects as Highlighted

i. Project #1: Model Based Definition (MBD) (Big Data and Analytics)

MBD (also called Model Based Enterprise) is now firmly being developed by OEMs and the OEMs will require that their suppliers are also MBD capable. MBD is a digital technology that incorporates all design, manufacturing, and inspection information in 3-D format. Incorporation of MBD digital tools requires a disciplined approach, focused skillsets and training, and appropriate hardware and software. OEMs have taken multiple years to establish MBD. and it will take time and resources for SMEs to implement MBD. But it is vital that SMEs do implement MBD.

The goal of this pilot project is to demonstrate a very simple use case for MBD, including what hardware, software, and skills are required for SMEs to adopt MBD. RAM Engineering, a company that currently trains and implements MBD for the supply chain, will lead this project with participation from the project team. The team will select a simple demonstration part. The MBD files will incorporate the part design as well as the manufacturing and inspection information. The process for creating the MBD files will be documented. The actual part that was design will be fabricated in subsequent pilot projects to demonstrate the full chain from MBD design to build and inspection.

Deliverable 3-1: Presentation on use of MBD for part.
Due 3 months after start

ii. Project #2: Automated Inspection on CNC Machine (Automation and Internet of Things)

This project will demonstrate one form of Industry 4.0 automation. This project represents a near-term, affordable technology that can be adopted by SMEs. The project goal is to demonstrate how to save time and money using automated probing for inspecting CNC machined parts. The part that was designed using MBD in Task 1 will serve as the test part to machined and inspected in this task.

CNC machining is ubiquitous across all industry sectors and there are Industry 4.0 tools that can improve cycle time and cost for CNC machining. One of those tools is on-machine probing for part inspection. Final inspection has been identified as the number one priority for needed improvement by one major DoD OEM that has suppliers and machine shops throughout New England. In most cases, the machined part is removed from the machine tool and is inspected separately by a third party. New CNC machine tools incorporate on-machine probes but the probes are not being utilized in most cases. For older CNC machines, low cost probes are now available for retrofit on the machine tool. CCAT and University of Maine will work together on this task to machine the selected part and perform inspection. A probe that is retrofitted no a CNC machine at CCAT will be utilized.

The project team may consider 3D printing the selected part in addition to CNC machining (depends on part selection).

Deliverable 3-2: Presentation on use and results of automated probing for CNC machining of a part.

Due 5 months after start

iii. Project #3: Generative Design + Additive Manufacturing (Simulation and Additive Manufacturing)

This project will demonstrate how to utilize generative design (i.e., design-for-additive) using existing software followed by 3-D manufacture of parts. This technology can save time and money for end-users.

OEMs are increasingly using metal and plastic 3-D printed parts on their products. These parts, including brackets in commercial jetliners, are designed without the customary manufacturability constraints of subtractive machining. The value proposition for the commercial jetliners is in weight savings and short turn-around for part supply schedules. CCAT and a partner in New England (to be identified per task 1) will conduct the generative design activity. The final design file for the part will be transmitted to Berkshire Innovation Center, University of Maine, and to CCAT for 3D printing on different plastic AM machines. A metal 3D print will made if feasible using powders sources from BSS in Massachusetts. BSS uses a process to recycle scarp metals into useable additive powders.



Figure 3. Example Generative Design for Bracket (source: www.siemens.com)

Deliverable 3-3: Presentation on use of and results from generative design and resulting printed parts.

Due 7 months after start

iv. Project #4: Augmented/Virtual Reality (AR) for Work Instructions and Maintenance (Augmented Reality and Artificial intelligence)

Impact Group (VT office) and SphereGen (CT) will co-lead this pilot project. The goal is to demonstrate how affordable, easy to implement AR could be utilized to save time and money for work instructions and remote maintenance operations. The Impact Group and SphereGen will show how to successfully deploy this key Industry 4.0 technology – Augmented Reality - in manufacturing in an expedient, cost-effective manner with a real ROI. This team will demonstrate an easy-to-implement application using HoloLens technology suitable for SMEs. AR for work instructions and maintenance are being utilized by competitors outside of the US. The New England DoD SMEs will be made of this technology and instructed on its use and implementation. AR will also serve to introduce the longer-term concepts for future adoption of AI and machine learning. AR adoption would represent a significant stepping-stone to very high tech future tools for manufacturing competitiveness. The project team will select at least one SME in New England for which the AR will be demonstrated.



Figure 4. AR in Manufacturing (Source: The Impact Group / SphereGen 28-May-2020)

Deliverable 3-4: Presentation on use of AR and associated test case.
Due 6 months after start

v. Project #5: Artificial Intelligence (AI) -

This project will provide insight on current and future ways to implement AI in manufacturing. A project that utilizes a Smart Phone App for sustainable safety solutions in manufacturing environments will be demonstrated at a SME site in New England (site not yet determined).

The Ergo AI software is powered by advanced artificial intelligence technology and uses Smartphone videos to create risk assessment reports automatically in minutes. Ergo Insight Shop Floor is a great technology for enabling small-medium size manufacturers (SMMs) to enter the realm of Industry 4.0 / AI in an affordable, easy-to-implement manner while providing near-term return on their investment.



Figure 5. Dynamic AI in Action on Manufacturing Shop Floor (source: www.ergoinsight.com)

Deliverable 3-5: Presentation on use of Ergo AI Shop Floor and associated test case.
Due 6 months after start

4. Regional Defense Industry Portal

A New England region industry sector portal will be devised to function as a unifying platform for information that highlights emergent trends data, manufacturer information, and valuable resources. This portal information will be viewable as ‘business intelligence’ dashboard.

Novus Insight will lead this task. Novus devised the original Defense Industry Portal RADE platform that served the dynamic requirements of the original customer. Since that time, Novus has incorporated a number of new front-end and back-end tools that help simplify the updating and feature expansion of applications like the RADE portal. They have also now introduced more sophisticated matching algorithms, B2B directory functionality, dashboarding, and other capabilities that could figure into a revision of the portal. The first activity will be to revise the platform requirements in concise format to efficiently serve the DoD SME needs. VTDED will have major input and review of the requirements.

Significant revision is anticipated to provide a business intelligence dashboard that allows people to stay abreast of emerging technologies and trends. Capacity will be included for eventual profiling of company data and certifications, if and when that need emerges. Prior cluster mapping experience includes leading an 8-state Northeast Electrochemical Energy Storage Cluster (NEESC) whereby a Supplier Locator was created as part of a Hydrogen Fuel Cell Supply Chain Database. The Supplier Locator can be used to find manufacturers and service providers and/or potential customers for organizations. With approximately 14 supply products and over 100 categories, the Supplier Locator is a searchable online database designed to help support industry growth and increase market opportunities for new entrepreneurs and established technology-based small businesses. In addition, for manufacturers, CCAT has very recently catalogued information for approximately 1,500 manufacturers in Connecticut and the team will expand the data to include additional DoD SME manufacturers in all New England states.

a. Establish Requirements for the Portal

Review existing platform requirements and functionality and revise requirements based on VTDED inputs and inputs from cross-states; multi-discipline, cross-industry stakeholders;

Deliverable 4-1 Requirements Document Due 3 months after start

b. Revise the Portal

The RADE portal will be revised to incorporate requirements per Task 4a.

Deliverable 4-2 Interim Review of Portal Development Due 6 months after start
Deliverable 4-3 Final Review of Portal Development Due 11 months after start

5. Devise Process to Sustain the Network

With a goal to sustain, grow and strengthen the New England DoD defense industry, particularly the SMEs, the network established and work conducted within this project must be continued, hence, a sustainable funding mechanism must be put in place. The underlying strategy is to formal the regional collaborative partnership to develop and deploy the best technologies and practices. This proposed program must, at a minimum, be successful to continue onward.

An organized, structured partnership/collaboration/agreement among the six New England States and key regional Defense stakeholders must be established. This will be driven by the Economic Development organizations in each state, large and small firms, possibly investors, government entities, businesses and university researchers to navigate funding, procurement, supply chain opportunities and capitalize on shared strengths. It is expected that project team members will join together to seek additional resources for private, state, and federal sources. A framework for sustainability that leverages private and public funds will be devised that includes emerging technology forecasts, workforce resources and strategies to enhance productivity and build a foundation for sustained regional economic growth.

One example framework that will be explored is modeling after the public-private partnership for the Composites Manufacturing Center of Excellence led by CCAT. This collaboration is one example of how CCAT and the project team members for the New England Regional defense Supplier Network can work together to sustain the network as proposed.

CCAT led a public-private partnership to stand up a state-of-the-art composites manufacturing R&D prototyping facility to support growth in the composites manufacturing commerce in Connecticut. The formal partners include Pratt&Whitney, all of the Connecticut State Colleges and Universities, Goodwin University, University of Hartford and Connstep. Funding and in-kind contributions to set up and run the facility originate from all members. The Center has robotic and automated equipment. It serves to develop new products and to educate and train a workforce for the composites industry. The team has further proposed for new funds from federal programs, including a team proposal to Federal EDA's Investing in Manufacturing Communities (IMCP).

Deliverable 5-1 Sustainability Framework Due 11 months after start

CCAT will submit quarterly technical and financial reports; A Final Report will be submitted at month 12. The project Gantt Chart is shown Figure 6

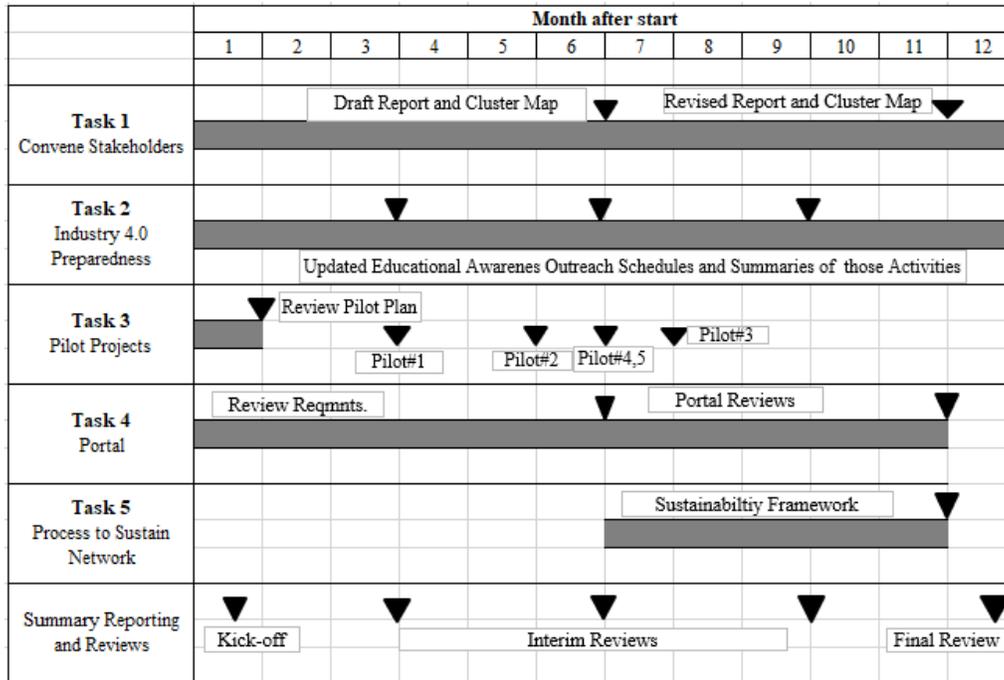


Figure 6. Project Gantt Chart

Background and Experience

The team will be led by Dr. Thomas Maloney, Chief Technology Officer at CCAT. He will be strongly supported by CCAT staff and the expert partners for this program.

The Connecticut Center for Advanced Technology Inc. (CCAT) is an applied technology demonstration and training center that validates, demonstrates, and encourages the adoption of leading-edge technologies into global industrial companies and the advanced manufacturing supply chain, while also providing the training and education necessary to utilize the capability of these advancements and drive efficiency.

CCAT is a 501c(3) nonprofit organization founded in 2004 and headquartered in East Hartford, Connecticut. CCAT leads and collaborates with state, regional, and national partners in manufacturing, academia, government, and non-profit organizations in order to define and strengthen the future of the supply chain in the areas of advanced manufacturing, incumbent worker training, STEM awareness, and energy solutions. Our Vision is to be a national leader and influential resource, committed to ensuring the success of the businesses and organizations we serve by achieving excellence, guiding change and sustaining growth. Our Mission is to develop direct strategies to advance and adopt applied technologies that drive innovation processes and value-driven solutions to businesses. CCAT assists businesses in executing their continuous improvement strategies by:

Demonstrating innovative technologies in our world-class facilities, the Advanced Manufacturing Center and Composite Center of Excellence, for customized solutions.

Assessing energy and power solutions that focus on sustainability, reliability, and cost-effectiveness through the industrial base.

Identifying and training highly-motivated talent from under-served groups to ensure a strong future for the supply chain.

Advancing context-based STEM education and promoting careers to meet the needs of the current workforce and inspire the next generation.

Experience

Since our inception in 2004, CCAT has conducted numerous federal, state, and commercial efforts to support the supply chain. Significant experience has been gained in technology, education/workforce and cluster mapping for energy programs that translate directly to the work scope that has been proposed for this effort. Particular experiences include:

\$6M Composites Center of Excellence

This collaboration is one example of how CCAT and the project team members for the New England Regional defense Supplier Network can work together to sustain the network as proposed.

CCAT led a public-private partnership to stand up a state-of-the-art composites manufacturing R&D prototyping facility to support growth in the composites manufacturing commerce in Connecticut. The formal partners include Pratt&Whitney, all of the Connecticut State Colleges and Universities, Goodwin University, University of Hartford and Connstep. Funding and in-kind contributions to set up and run the facility originate from all members. The Center has robotic and automated equipment. It serves to develop new products and to educate and train a workforce for the composites industry. The team has further proposed for new funds from federal programs.

\$75M; 2004-2012 8-year National Aerospace Leadership Initiative funded by USAF

CCAT led a three-state consortium from 2004-2012 to develop and implement emerging manufacturing technologies for the US Air Force supply chain. This included modeling and simulation, precision machining, laser-based additive manufacturing, laser hole drilling for the joint strike fighter engine, STEM activities and workforce

development. CCAT and partners from the states of Ohio and Pennsylvania collaborated with over 60 small-medium size (SMM) companies for this program as well as OEMs.

\$6M 2014-2019 5-year Manufacturing Technology Innovation for Cost Reduction funded by USAF

CCAT led a team with four other small business to develop and prove out industry 4.0 technologies to help the supply chain better understand how to machine materials for hypersonic vehicles, machine refractory alloys, and develop processes for the USAF supply chain for machining a brand new USAF alloy. CCAT and partners used Industry 4.0 sensors, software tools, and data analytics to prove out machining processes that save time and money. Results were transitioned to suppliers that were identified by USAF.

\$350K 2019-2021 2.5-year Machining for Small Turbine Engines funded by USAF

CCAT is a subcontractor to a small out-of-state company that is helping USAF expand their supplier base for manufacturing small turbine engines. CCAT is leading a national outreach effort to improve performance of existing suppliers and to establish new USAF suppliers (can be from any industrial sector) to provide sufficient capacity for part demand surges.

\$1M 2008-2020 Connecticut Manufacturing Supply Chain Initiative funded by state of CT

Focused on small-medium size manufacturers across all industry sectors in Connecticut, CCAT demonstrates emerging technologies in our Advanced Manufacturing Center and transitions solutions to the SMMs.

2018-present Clean Energy Smart Manufacturing Innovation Institute (CESMII) funded by Dept. of Energy

CCAT serves as a national testbed for the CESMII Manufacturing USA Institute to work with small-medium-large manufacturers to implement Industry 4.0 (smart) technologies. To date, our work for CESMII has included testing new sensors in CNC machine tools for power consumption, tool vibration, force, temperature and audio signatures. Data dashboards are being set up for informational display, followed by cloud computing demonstration in the future.

2013 – present Northeast Electrochemical Energy Storage Cluster (NEESC)

CCAT organized and leads this network of industry, academic, government and non-governmental leaders working together to help businesses that provide energy storage solutions. NEESC supports the electrochemical energy storage cluster in the Northeast through business services that include training, counseling, mentoring, technology transfer/commercialization, export readiness, manufacturing assistance, market development, and incubator assistance. These activities lead to increased US based market share, economic activity, productivity, technology deployment, and job creation.

The cluster base includes New York, New Jersey, and the New England States. Its initial formation and development was funded through the US Small Business Administration's Innovative Economies Initiative. CCAT works with regional partner organizations to facilitate the development and use of clean, highly efficient electrochemical technology. Through this initiative the cluster works to:

- Accelerate Innovation
- Improve Development and Production Efficiencies
- Increase Knowledge & Awareness
- Accelerate Adoption and Deployment
- Improve Energy Security & Reliability
- Drive Economic Growth
- Protect our Global Environment

2010 –Connecticut Hydrogen-Fuel Cell Coalition, funded by members

CCAT leads the coalition that is comprised of representatives from Connecticut's fuel cell and hydrogen industry, academia, government, and other stakeholders. Together, the Coalition works to enhance economic growth in Connecticut through the development, manufacture, and deployment of fuel cell and hydrogen technologies and associated fueling systems. In 2018 CCAT led the completion of Hydrogen & Fuel Cell Development Plans for all New England states as well as New York and New Jersey.

CCAT previously earned designations as Innovation Center of Excellence from the states of Massachusetts and Rhode Island for cross-state collaborations

Education and Workforce Development (E&WD)

CCAT has engaged in E&WD since its inception in 2004 on private, state, and federal levels. . We work with the manufacturing community to enhance employer engagement and provide critical assistance to job seekers. As a licensed test center, we also administer basic and technical skills assessments for core manufacturing competencies, resulting in industry-recognized credentials. Some activities include:

INCUMBENT WORKER TRAINING

Digital and Industry 4.0 workshops and trainings for manufacturers

ADVANCED MANUFACTURING EMPLOYER PARTNERSHIP (AMEP)

Employer-led Workforce Solutions Collaborative Metro Hartford Industry Partnership focused on the workforce needs of advanced manufacturing and technology companies in the Hartford and Enfield labor market areas

STUDENT PROGRAMMING & VIRTUAL RESOURCES

Highly engaging virtual resources and student programming opportunities that promote STEM achievement and career interest in manufacturing and technology

EDUCATOR PROFESSIONAL DEVELOPMENT

Workshops and programs for K-12 teachers, guidance counselors, and administrators transform classroom learning

MANUFACTURING CAREER ADVANCEMENT

Committed to ensuring that the manufacturing sector has access to a well-trained and qualified talent pipeline

DREAM IT DO IT

CCAT has led the Dream It Do It initiative for Connecticut to help develop the future manufacturing workforce pipeline.

WOMEN OF INNOVATION

The annual Women of Innovation® awards celebrates Connecticut women accomplished in science, technology, engineering and math and those involved in volunteer efforts within their communities.

Project Partners

Each team partner brings significant experience and strength directly applicable to this proposed effort.

Berkshire Innovation Center (BIC), Pittsfield, MA

Located in Pittsfield, MA the BIC is a collaborative initiative between private industry, academia, and government. The BIC's mission is to expand the innovation capacity and growth potential of private industry by providing advanced capabilities to manufacturers in the Berkshires and surrounding area - primarily small and medium sized companies in advanced manufacturing, life sciences, the life sciences supply chain, and technology. The goal is to enable and accelerate the growth of the manufacturing sector with the ultimate objective of spurring economic growth, job creation and retention, and investment in the region. Through LinkedIn, the BIC will provide news, updates, invitations to upcoming events, and encourage connections with potential members, partners, and users of the Berkshire Innovation Center.

University of Maine Advanced Manufacturing Center (AMC), Orono, ME

The Advanced Manufacturing Center is part of the University of Maine's College of Engineering. The mission of the AMC program is to link the traditional University of Maine activities of education and research with the University's active industrial support and economic development programs.

The Advanced Manufacturing Center is an engineering support and service center that is dedicated to promoting economic development in Maine and supporting the research programs at the University of Maine. The AMC is also readily accessible to businesses, entrepreneurs, and researchers throughout Maine, and North America. The

AMC program is committed to maintaining a first-class facility equipped with the latest manufacturing technologies. The Advanced Manufacturing Center will design and build prototype and development projects ranging from large scale fabrications to machined parts with micro-millimeter tolerances. It has the ability to expand its range of expertise by working with engineering faculty, other UMaine research centers, and our partners in private industry. UMaine also operates The Center for Additive Manufacturing of Metals (CAMM). CAMM is a center focused on additive manufacturing of metals based at the Advanced Manufacturing Center (AMC) on the campus of the University of Maine.

Ergo Insight, East Hartford, CT

Through the application of artificial intelligence (AI) and machine learning, integrated with the science of ergonomics, we have created a fast, accurate, and easy risk assessment methodology that is repeatable, sustainable and affordable for all. Once the risks are identified that lead to musculoskeletal injuries and poor human performance, solutions can be implemented to create a safe and healthy workplace that optimizes human efficiency and company goals.

Ergo Insight Shop Floor allows customers to upload a video of an operator performing a task, and using Ergo Insight's powerful artificial intelligence engine will analyze the video and in a matter of a minutes, produce the following easy to understand color-coded reports. This technology offer direct benefits for manufacturers.

The IMPACT Group and SphereGen Teams (Vermont and Connecticut)

We accelerate the innovation and growth of companies and add significant value for manufacturers. The IMPACT Group is a small-by-design firm made up of a collaborative group of experienced senior executives from diverse industry backgrounds. This team brings a combination of consulting, investment and leadership expertise to strategy-driven business transformation. We are prepared to demonstrate our Augmented Reality / Virtual Reality technology to benefit the New England DoD supplier base, an important program provided in conjunction with SphereGen Inc. SphereGen is a new generation, leading software and applications development, consulting company which provides high-quality, cost-effective and business critical solutions. Our innovative and client-centric approach helps us to understand our clients' business objectives and create quality business solutions which provide added value to clients' businesses. 'Our clients' success is our success' has been our mantra. SphereGen Technologies develops custom applications on multiple platforms including web, mobile, iOS, surface, iPad, Virtual Reality Headsets, Windows Mixed Reality and HoloLens. The majority of SphereGen's clients are in healthcare, but we also have clients in manufacturing, higher education, finance, and construction/engineering. We hold the following certifications with Microsoft: -Microsoft Gold Partner for Application Development -Microsoft Mixed Reality Partner -Azure Partner

Novus Insight, East Hartford, CT

Novus Insight emerged in 2010 from the IT department at the Connecticut Center for Advanced Technology, a nonprofit headquartered in East Hartford, CT. We started business operations as a managed IT service provider for the types of organizations that we know best – K-12 Education, nonprofits, and local government. Our philosophy was – and still is — to always do the right thing for clients, whatever it takes. Then, through strong relationships, business will flourish. Our employees are thrilled when they solve problems and help their clients. We don't let anything get between our consultants and our clients and it is why client's stay with us year after year and refer Novus to others.

Our approach has worked. Today, we have grown to over 50 employees, with offices in Connecticut and Florida and clients across the country. We have expanded our services to include cybersecurity, application development, and technology consulting. Our strategic relationships continue to provide value for our clients. Our clients continue to provide us with new opportunities including work in insurance, legal, crisis communications, and councils of government.

RAM Engineering Solutions, South Windsor, CT

Established in 2002, RAM Engineering Solutions LLC has serviced the commercial product design, medical, petroleum, and aerospace industries. Our innovation-driven staff has several patents to their credit, with a wide array of practical engineering problem solving experience. With flexible and adaptive solutions, we provide an ease of doing business that you won't find with other Engineering Support Service companies. Our recent technology focus has been on Model Based Definition (MBD). We have supported OEMs to learn how to implement and use MBD and we recognize the need for MBD proficiency in each supply chain tier. RAM Engineering was recently notified that we will receive a significant contract to support MBD implementation at Connecticut small-medium size businesses.

REFERENCES

1. Colin Cooper
Chief Manufacturing Officer
State of Connecticut
450 Columbus Boulevard
Hartford CT 06103
(860) 500-2300
2. Paul Murphy
President
Aerospace Component Manufacturers
P.O. Box 736
Rocky Hill, CT 06067 USA
(860) 513-3205
3. Giovanni Tomasi
President, Connecticut Technology Council
(and President and CEO RSL Fiber Systems)
222 Pitkin St Ste 113,
East Hartford, CT 06108
(860) 289-0878

CERTIFICATE OF COMPLIANCE
This form must accompany your Bid

For a bid to be considered valid, this form must be completed in its entirety, executed by a duly authorized representative of the bidder, and submitted as part of the response to the proposal.

- A. **NON-COLLUSION:** Bidder hereby certifies that the prices quoted have been arrived at without collusion and that no prior information concerning these prices has been received from or given to a competitive company. If there is sufficient evidence to warrant investigation of the bid/contract process by the Office of the Attorney General, bidder understands that this paragraph might be used as a basis for litigation.
- B. **CONTRACT TERMS:** Bidder hereby acknowledges that it has read, understands and agrees to the terms of this RFP, including the terms outlined in the sample State of Vermont Standard Contract for Services and associated attachments.
 - 1. Bidder agrees to the provisions set forth in the State of Vermont's Standard Contract Attachment C – Standard State Contract Provisions, and Attachment D – Other State of Vermont Contract Provisions
 - 2. Bidder (except an individual doing business in his/her own name) agree to register with the Vermont Secretary of State's office <http://www.sec.state.vt.us/tutor/dobiz/forms/contract.htm>
 - 3. Bidder agrees to obtain a Contractor's Business Account Number issued by the Vermont Department of Taxes <http://tax.vermont.gov/>.

C. **ADDENDA:** Acknowledge receipt of Addenda associated with this RFP:

Addendum No.:	_____	Dated:	_____
Addendum No.:	_____	Dated:	_____
Addendum No.:	_____	Dated:	_____

D. **VERMONT TAX CERTIFICATE:** To meet the requirements of Vermont Statute 32 V.S.A. § 3113, by law, no agency of the State may enter into, extend or renew any contract for the provision of goods, services or real estate space with any person unless such person first certifies, under the pains and penalties of perjury, that he or she is in good standing with the Department of Taxes. A person is in good standing if no taxes are due, if the liability for any tax that may be due is on appeal, or if the person is in compliance with a payment plan approved by the Commissioner of Taxes, 32 V.S.A. § 3113

In signing this bid, the bidder certifies under the pains and penalties of perjury that the individual or company is in good standing with respect to, or in full compliance with a plan to pay, any and all taxes owed the State of Vermont.

II. BIDDER INFORMATION & CERTIFYING SIGNATURE

Vendor Name:	Connecticut Center for Advanced Technology, Inc.	Contact:	Dr. Thomas Maloney
Address:	222 Pitkin Street	Telephone:	860 282 4038
City/State/Zip:	East Hartford, CT 06108	Fax:	860 282 4074
email:	tmaloney@ccat.us		
Vendor Website:	www.ccat.us		
Signature:		Date:	July 7, 2020
Printed Name:	Ronald F. Angala, Jr.		

END OF CERTIFICATE OF COMPLIANCE

Company Name:

(Without Cover Memorandum Referral, etc.)

Attachment 

Executive Order 05 – 16:
Climate Change Considerations in State Procurements Certification

Bidder certifies to the following (Bidder may attach any desired explanation or substantiation. Please also note that Bidder may be asked to provide documentation for any applicable claims):

1. Bidder owns, leases or utilizes, for business purposes, space that has received:

- Energy Star® Certification
- LEED®, Green Globes®, or Living Building Challenge™ Certification
- Other Internationally Recognized Building Certification:

2. Bidder has received incentives or rebates from an Energy Efficiency Utility or Energy Efficiency Program in the last five years for energy efficient improvements made at bidder's place of business. Please explain:

3. Please Check all that apply:

- Bidder can claim on-site renewable power or anaerobic-digester power ("cow-power"). Or bidder consumes renewable electricity through voluntary purchase or offset, provided no such claimed power can be double-claimed by another party.
- Bidder uses renewable biomass or bio-fuel for the purposes of thermal (heat) energy at its place of business.
- Bidder's heating system has modern, high-efficiency units (boilers, furnaces, stoves, etc.), having reduced emissions of particulate matter and other air pollutants.

Company Name:

Connecticut Center for Advanced Technology, Inc.

3. Please Check all that apply (continued):

- Bidder tracks its energy consumption and harmful greenhouse gas emissions. What tool is used to do this?
- Bidder promotes the use of plug-in electric vehicles by providing electric vehicle charging, electric fleet vehicles, preferred parking, designated parking, purchase or lease incentives, etc.
- Bidder offers employees an option for a fossil fuel divestment retirement account.
- Bidder offers products or services that reduce waste, conserve water, or promote energy efficiency and conservation. Please explain:

program provided energy efficiency assessments for small to medium-sized businesses to increase energy efficiency, reduce air and carbon emissions, and reduce the cost of energy.

Bidder was formerly the administrator and contractor for the State of CT for the CT Biodiesel Program to fund biodiesel facility manufacture, production, distribution and quality control testing.

Bidder was formerly under contract with the US DOE and US SBA to develop hydrogen fuel cell "Roadmap" for all northeast states including the State of VT. attached. Bidder is now under contract with the US DOE and National Renewable Energy Lab (NREL) to develop a Hydrogen Fuel Cell ZEV Roadmap for the State of Michigan.

4. Please list any additional practices that promote clean energy and take action to address climate change.

The Connecticut Center for Advanced Technology, Inc. through its Energy Initiative is committed to the development and adoption of renewable energy sources. CCAT has implemented programs to assist in the development of alternative energy sources and administered the Connecticut Hydrogen Fuel Cell Coalition to bring awareness and understanding to the use of hydrogen technology. CCAT continues to evaluate and support the development of other energy sources such as offshore wind energy storage, "Green" hydrogen and biodiesel. In addition to supporting the necessary supply chains for implementation of these technologies.

PRICE SCHEDULE

Connecticut Center for Advanced Technology, Inc.			
Pricing - valid for 45 days			
Job Title	Hourly Rate	Hours	Subtotal
1 Chief Technology Officer	\$ 158.44	160	\$ 25,350
2 Advanced Manufacturing Center Director	\$ 254.35	60	\$ 15,261
3 Associate Education Director	\$ 94.43	220	\$ 20,775
4 Associate Workforce Director	\$ 92.93	220	\$ 20,444
5 Education / Workforce Staff (various - blended rate)	\$ 62.34	950	\$ 59,221
6 Advanced Manufacturing Center Engineering staff (blended rate)	\$ 167.25	400	\$ 66,900
Subcontracts			
7 Berkshire Innovation Center			\$35,000
8 University of Maine			\$30,000
9 RAM Engineering			\$15,000
10 Impact Group			\$20,000
11 Ergo Insight			\$15,000
12 BSS (Additive Powders)			\$5,000
13 Novus Insight			\$40,000
14 Facility rental (TBD)			\$2,500
Travel			
15 Travel (mileage, hotel, per diem)			\$2,500
Supplies/Misc			
16 Supplies/Misc			\$1,000
17 G&A			\$45,981
Total Project Cost:			\$ 419,932
Renewal Option 1 (Year 2) rate or percent increase not to exceed	3.0%		

PARTNER SUPPORT LETTERS



July 9, 2020

Ronald Angelo
President and Chief Executive Officer
Connecticut Center for Advanced Technology, Inc. (CCAT)
222 Pitkin Street, Suite 101
East Hartford, CT 06108

RE: Industry 4.0 for the New England Regional Defense Supplier Network

Dear Mr. Angelo,

Berkshire Innovation Center (BIC) is pleased to team with CCAT and other partners throughout New England to assist small and medium sized defense-related businesses in building new skills and capabilities that will strengthen their competitiveness for pursuing business from higher tier contractors in the defense supply chain.

The BIC's mission is to accelerate innovation and growth of its members, affiliates and academic partners, through technical skills training, employment support and manufacturing innovation throughout our region. Our world-class R&D facilities, classroom spaces and member network will be utilized the proposed effort in areas including additive manufacturing, robotics, materials development, cybersecurity, safety training and manufacturing integration.

As such, BIC will work with CCAT and project team members pending a mutually agreeable work scope and subcontract from CCAT to support this important effort. BIC will help form the extended New England team partners to participate in a pilot demonstration project and share in the educational outreach efforts to bring awareness of Industry 4.0 technologies to the New England DoD supply chain.

I am confident that together our team will execute a terrific program.

Thank you for the opportunity to work with CCAT and please contact me if you require additional information.

Sincerely,

A handwritten signature in black ink, appearing to read "S. Longpre".

Steven Longpre
Operations Manager
Berkshire Innovation Center
45 Woodlawn Ave
Pittsfield, MA 01201



1790 ANIC HALL
 Orono, Maine 04469-5700
 TEL: 207-581-5770
 FAX: 207-581-5770
www.umaine.edu/AMC
www.umaine.edu/umc/cammm



July 8, 2020

Ronald Angelo
 President and Chief Executive Officer
 Connecticut Center for Advanced Technology, Inc. (CCAT)
 222 Pitkin Street, Suite 101
 East Hartford, CT 06108

RE: Industry 4.0 for the New England Regional Defense Supplier Network

Dear Mr. Angelo,

University of Maine, through its Advanced Manufacturing Center (AMC) and Center for Manufacturing of Metals (CAMMM) is pleased to team with CCAT and other partners in New England to assist small and medium sized defense-related businesses to build the new skills and capabilities that are required to strengthen their competitiveness for pursuing business from higher tier contractors in the defense supply chain.

The AMC and CAMMM accelerate the innovation and growth of companies and adds significant value for manufacturers. Our world-class applied R&D facilities and interactive training can be utilized in support of the proposed effort. As such, University of Maine will work with CCAT and project team members pending a mutually agreeable work scope and subcontract from CCAT to support this important effort. University of Maine will help form the extended New England team partners, we will participate in a pilot demonstration project and share in the educational outreach efforts to bring awareness of Industry 4.0 technologies to the New England DoD supply chain. I estimate that the budget for this work scope would be about \$30K. I am confident that together our team will execute a terrific program.

Thank you for the opportunity to team with CCAT and please contact me if you require additional information.

Sincerely,

John A. Belding, P.E.
 Director, Advanced Manufacturing Center
 Co-Director, Center for Additive Manufacturing of Metals (CAMMM)



July 8, 2020

Ronald Angelo

President and Chief Executive Officer

Connecticut Center for Advanced Technology, Inc. (CCAT)

222 Pitkin Street, Suite 101

East Hartford, CT 06108

RE: Industry 4.0 for the New England Regional Defense Supplier Network

Dear Mr. Angelo,

Ergo-Insight is pleased to team with CCAT and other partners in New England to assist small and medium-sized defense-related businesses to build the new skills and capabilities that are required to strengthen their competitiveness for pursuing business from higher-tier contractors in the defense supply chain.

We strongly believe that our Ergo-Insight Shop Floor artificial intelligence (AI) app for worker safety and risk assessment can save significant time and money for manufacturers. Our industry standard reports, management dashboards, training, consulting and equipment solutions make SMM safety solutions sustainable. The software is powered by advanced artificial intelligence technology and uses Smartphone videos to create risk assessment reports automatically in minutes. Ergo-Insight Shop Floor is also a great technology for enabling small-medium size manufacturers (SMMs) to enter the realm of Industry 4.0 / AI in an affordable, easy-to-implement manner while providing near-term return on their investment.

In addition to improving operator safety, our talented team of eight (8) full-stack developers and two (2) AI architects can also create customized solutions to meet other Industry 4.0 objectives by combining our patented advanced AI computer vision system with other additive technology disciplines to improve product quality and production efficiency. We will be happy to share with you the work that we have done in these other all-important areas of manufacturing.

Ergo-Insight will work with CCAT and the project team members pending a mutually agreeable work scope and subcontract from CCAT to support this important effort. We will lead a pilot demonstration project for how our technology can be implemented in manufacturing and show that the technology is affordable and useable for small-medium size enterprises. I estimate that the budget for this work scope would be about \$15K. I am confident that together our team will execute a terrific program.

Thank you for the opportunity to team with CCAT and please contact me if you require additional information.

Sincerely,

Ted Kaszuba, CMJE

President, Founder

Ergo-Insight, Inc.

222 Pitkin Street

East Hartford, CT 06108

222 Pitkin Street, Suite 109, East Hartford, CT 06108



¶
July 8, 2020¶

¶
Ronald Angelo¶
President and Chief Executive Officer¶
Connecticut Center for Advanced Technology, Inc. (CCAT)¶
222 Pitkin Street, Suite 101¶
East Hartford, CT 06108¶

¶
RE: Industry 4.0 for the New England Regional Defense Supplier Network¶

¶
Dear Mr. Angelo,¶

¶
The IMPACT Group, LLC is pleased to team with CCAT and other partners in New England to assist small and medium-sized defense-related businesses to build the new skills and capabilities that are required to strengthen their competitiveness for pursuing business from higher tier contractors in the defense supply chain.¶

¶
We accelerate the innovation and growth of companies and add significant value for manufacturers. The IMPACT Group is a small-by-design firm made up of a collaborative group of experienced senior executives from diverse industry backgrounds. This team brings a combination of consulting, investment and leadership expertise to strategy-driven business transformation. We are prepared to demonstrate our Augmented Reality / Virtual Reality technology to benefit the New England DoD supplier base, an important program provided in conjunction with SpheraGen Inc. The IMPACT Group will work with CCAT and the project team members, pending a mutually agreeable work scope and subcontract from CCAT to support this important effort. We will help expand the partners in New England for this program, particularly here in Vermont. We will lead a pilot demonstration project for how Virtual Reality can be implemented in manufacturing and show that the technology is affordable and useable for small-medium size enterprises. I estimate that the budget for this work scope would be about \$10K. I am confident that together our team will execute a terrific program.¶

¶
Thank you for the opportunity to team with CCAT and please contact me if you require additional information.¶

¶
Sincerely,¶

¶
Kevin Morris¶
The Impact Group, LLC¶
27 Waterside Lane¶
Ludlow, VT 05149¶

