



ENGINEERING RESEARCH & DEVELOPMENT SERVICES

**PEOPLE &
TECHNOLOGY**
FALL 2020

ABOUT CREARE



Creare, founded in 1961, is an advanced engineering research and development firm working in a wide range of industries: aerospace, biomedical, cryogenics, and more. For more than 55 years, Creare has served both industry and government on the frontiers of product and process technology. Our *People & Technology* newsletter provides just a sampling of our 100+ active engineering projects.

Creare engineers work on challenging problems requiring multidisciplinary solutions for improved energy efficiency at a time of global need, increased national security, improved medical assessment and delivery systems, and much more.

We are a company of approximately 150 people, including 70 engineers. Find more *People & Technology* newsletters on our website.



To learn more, please contact:
Human Resources
careers@creare.com

Creare is an Equal Opportunity
Employer. Female/Minority/
Disabled/Veteran

Smartphone Citizen Science

Crowd-sourcing environmental measurements and observations from mobile devices has the potential to enable widespread environmental monitoring, improve real-time nowcasts and forecasts, and generate rich datasets for researchers to develop and validate environmental impact models. Collection and management of these observations, however, requires apps, and servers that didn't exist which makes it difficult for citizen scientists to create and administer monitoring efforts.

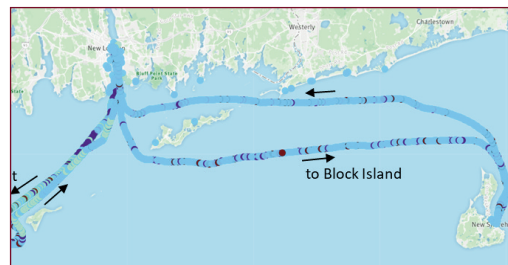
To address this need, Creare has developed WeatherCitizen, a mobile application and back-end storage architecture for collecting, assimilating, and distributing traditional and crowd-sourced environmental observations. The goal of WeatherCitizen is to provide a modular, easy-to-use platform for citizen science communities to collect and analyze geotagged data of interest.

The core of WeatherCitizen is a mobile app that allows users to collect data from built-in mobile device sensors (temperature, pressure), connected Bluetooth sensors (air quality, water quality), or customized input forms that can be shared among citizen science communities. Observations are uploaded to our geospatially aware database and displayed on a web map for exploration and download.

Our Creare team has enjoyed testing WeatherCitizen in the mountains of New Hampshire, the Long Island Sound, and the gulf of Maine. We have tested mobile devices on



Testing the app in Long Island Sound



Data points from above testing

turbulent ferries, windy hikes, and ocean-based buoys to collect a variety of data to inform WeatherCitizen algorithms.

Since deploying WeatherCitizen in the summer of 2019, we have supported citizen science communities to collect data in Alabama, Oregon, North Carolina, and across the globe. We are excited to continue growing the community of users and increase data access to high-quality environmental observations.

Mr. Shapiro received his bachelor's degree in Mechanical Engineering from Dartmouth College and a master's degree in Fluids and Thermal Sciences from Brown University. At Creare, Mr. Shapiro has focused on developing data-centric software systems for geospatial and healthcare applications. These projects include a framework for crowd sourcing weather and environmental observations from mobile device sensors, a cross-platform mobile framework for administering bearing assessments and training, and a mobile application for aural rehabilitation and tinnitus management.

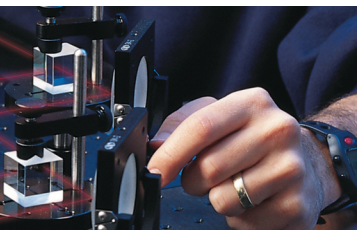
Find more
information and
user stories on our
website.

GET IT ON
Google Play

Download on the
App Store

WeatherCitizen is free and available





MANUFACTURING ENGINEERING AT CREARE LLC



Production of Compact Swaging Machines for U.S Navy aircraft carriers.

Creare's recently-established Manufacturing Engineering Department is comprised of engineers, technicians, and administrators who work closely with Creare's R&D team to transition new technologies from laboratory prototype to the production floor.

We are very excited to have recently completed deliveries of several new products using this expanded technology transition framework. As one example, Creare recently delivered 14 Compact Swaging Machines (CSM) for U.S. Navy aircraft carriers, which are a vital part of the aircraft landing equipment onboard every carrier in the fleet. Other on-going manufacturing programs at Creare include cryogenic refrigerators for spacecraft-based infrared imaging cameras, auditory headsets for assessing hearing loss, life support systems for astronaut spacesuits, and helmets to provide head and hearing protection and communication for aircraft carrier personnel.


Creare's Manufacturing Engineering Department complements our R&D group to provide highly specialized capabilities across the technology development spectrum ranging from initial concept development through refinement and productization and, finally, to manufacturing and product delivery.

Automating Vascular Access

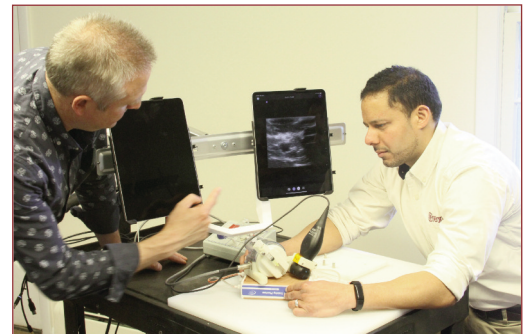
Gaining rapid and reliable central venous cannulation access is one of the most important and first steps in restitutive care of critically injured warfighters in-the-field, as well as patients within civilian health care settings. Traditional vascular access uses "landmark" techniques and blind needle insertion becomes exceedingly difficult in many situations, particularly in patients who are volume-depleted from blood loss or dehydration.

Ultrasound (US) guidance improves the speed and accuracy of vascular access and is the current standard of care for many trauma centers. However, US-guided vascular access requires specialized equipment and advanced medical training, which is currently unavailable in austere environments and remote medical care settings.

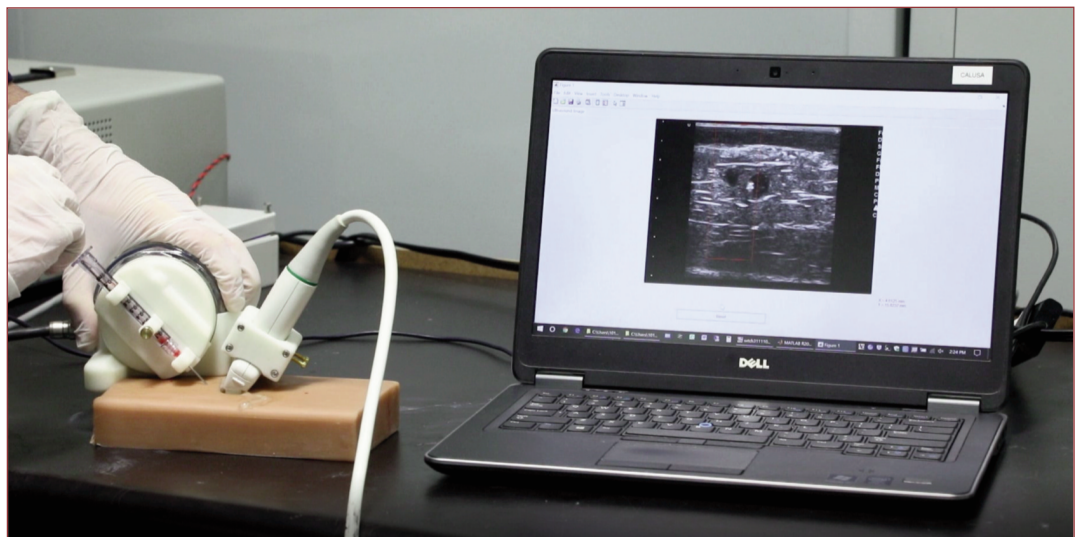
We are working with the Defense Health Agency and the Dartmouth Hitchcock Medical Center (DHMC) to develop a self contained and portable device that automates the skill intensive steps for vascular access. Our approach combines US-image processing, neural networks, machine learning, and a miniaturized electromechanical actuator to locate and gain access to a targeted blood vessel. We recently completed prototype device testing with vascular phantoms, and are preparing for in vivo device testing at DHMC. This program encapsulates the core Creare culture and mission where we form interdisciplinary teams including electrical,

mechanical, and design engineers, software developers, analysts, and clinicians to solve challenging engineering problems for the betterment of society. 

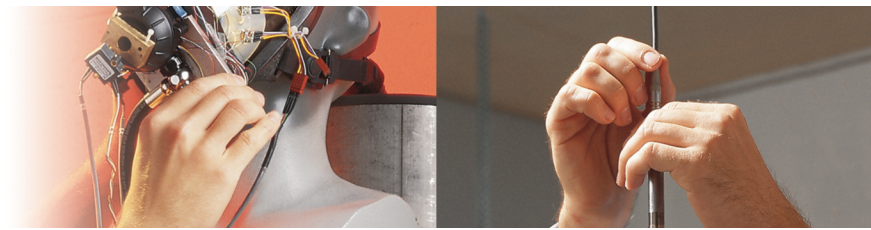
Mike Barton holds a Master's degree from Dartmouth College and a Bachelor's degree from the University of New Hampshire, both in Mechanical Engineering. His graduate research included the development of a microwave-thermokeratoplasty medical device to correct for myopia. In addition to his effort highlighted above, his work at Creare includes the development of laser assisted techniques for the production of carbon-fiber composites, cryogenic and high-temperature superconducting systems, automated tools for shipboard applications, and multiple biomedical device development projects.



Vascular phantom testing with the prototype device



Automated Vascular Access Device - Benchtop Demo



Inside Perspective



Author and fiancé hiking in the White Mountains



Author enjoying a snow storm

After four years of juggling engineering classes and competing as a Division I collegiate athlete, I decided to work for a few years before potentially going back to school to specialize in biomedical engineering. Born and raised in Alaska, I had come to New England to attend and ski for UNH. Struggling through the first week of team practice in the heat and humidity of late summer, I remember thinking “this was a terrible decision; it’s way too hot here!” Four years later though, I wasn’t ready to leave New England and I began my job search here. One of my main criteria was to be “somewhere further north and closer to the mountains.”

When I saw the posting for an opening at Creare and started researching the company, I knew it was the perfect job. At Creare, I have had the opportunity to pursue my interest in the medical-applications of engineering, specifically related to hearing protection and auditory assessment. At the same time, I also work on a variety of other technology areas including laser metrology and battery thermal management. I have seen projects through from start to finish, from the design and analysis stage to a working prototype: I have learned the fundamentals of signal processing; I have honed my programming skills, learning the Python language among other tools.

I am thankful to be able to work with a wonderful group of intelligent, motivated, and supportive colleagues. Everyone’s unique background and set of skills forms the backbone of the collaborative environment at Creare. My colleagues’ support and willingness to provide mentorship has allowed me to learn and grow in my technical and project management roles. After almost 5 years at Creare, each week still brings a new challenge and new opportunities.

With a “work hard, play hard” vibe, Creare is full of fun and adventurous people. It’s location in the Upper Valley provides small town New England charm and local outdoor access: perfect for mid-week adventures, along with easy access to the White Mountains (NH) or the Green Mountains (VT) for an epic weekend adventure.

Through the work, people, and location, Creare provides a truly unique employment experience and an extraordinary home. 🇺🇸

Tristan Ramey holds a Bachelor’s degree from the University of New Hampshire in Mechanical Engineering. Since joining Creare in 2015, she has focused on acoustics, contributing to projects on improved bearing assessment and bearing protection for extreme noise, as well as laser scanning systems for precision inspection.

BUILDING FOR THE FUTURE

Creare maintains outstanding facilities that provide an optimal environment for our engineers and support staff to innovate and work collaboratively. As part of our continual efforts to improve our facilities, over the past year Creare has conducted several major renovation and addition projects to improve and expand our office and laboratory facilities.

To provide a more collaborative, collocated environment for our administrative staff, we fully renovated a 4000 ft² building on our campus. Moving the majority of our administrative staff to this new building has created space for our growing software engineering team.



Creare’s Newly Renovated Engineering Building

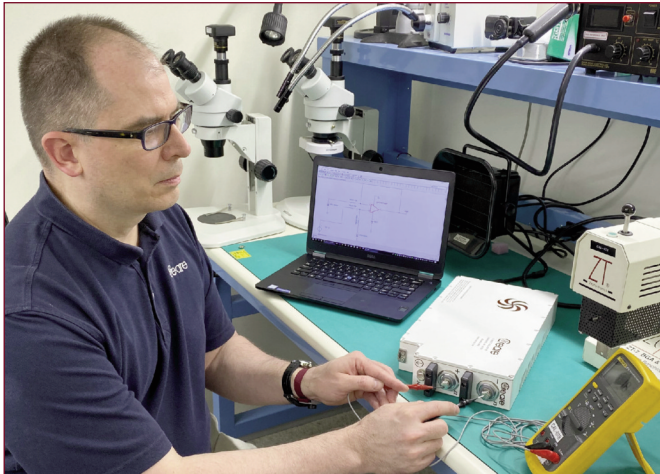
In a second effort, over the past year we fully renovated one of our main engineering buildings and added approximately 4000 ft² to the building. This effort included many improvements in energy efficiency, the addition of collaborative work spaces, and new office spaces for engineers. Many of our design engineers, manufacturing engineers and electrical engineers will be located in the new facility as well as a diverse range of other engineering disciplines represented at Creare.

We’re excited to start settling into our new facilities over the coming year.



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Advanced Combat Vehicle Electronics



Inspecting a low-voltage power controller unit


The U.S. Army is developing next-generation combat vehicles to upgrade or replace the Bradley and Stryker platforms. One of the supporting requirements is to develop a new electrical system architecture. This new electrical architecture is important on several counts. As with civil vehicles, electrical loads are increasing—with more radios, displays, computers, and cameras—and vehicle electrical capability must be upgraded to support them. The Army seeks to replace hydraulic and engine-driven systems with electric motors to reduce size and improve maintenance, adding new electrical loads. An advanced vehicle electrical system enhances tactical capability through quiet operation, improved acceleration, and increased efficiency. Additionally, highly electrified vehicles enable advanced energy management in the field, for example, using vehicle battery storage capability coupled with solar power generation in an encampment to form electrical micro-grids.

Creare has developed multiple subsystems to support the next-generation combat vehicle electrical power architecture. We have designed and built several power conversion systems and solid-state circuit breakers for system battery voltages of 28 VDC and 600 VDC. These units must function reliably in a demanding operating environment with thermal extremes ranging from arctic cold to 105°C liquid coolant, high shock and vibration, and tolerance of unique battle-related conditions like chemical agent washdown.

Furthermore, the Army demands high performance in a compact package.

Creare's Low-Voltage Power Controller (LVPC) is one product developed for the Army's next-generation combat vehicle electrification. The LVPC switches electrical loads on a military 28 VDC system to up to 24 channels using transistors rather than electromechanical devices. The LVPC provides circuit breaker operations on each channel, meaning that the switch channels will open to protect the load and bus if too much current flows for too long (based on a programmable current versus time characteristic curve). Multiple channels can be paralleled via

commands to form a single channel with a larger total current capability. The LVPC is configurable and load switching can be controlled via redundant automotive J1939-compliant buses. The LVPC is an air-cooled design and units can be quickly swapped out as needed through a quick-change mechanical and electrical interface.

Products like the Creare LVPC build on Creare's broad ranging technical capabilities including: power electronics, advanced thermal management, firmware development, and design for manufacturability. Creare provides a unique environment where these various aspects of the design can be tightly integrated from the start. We have already provided two deliveries of a total of 32 LVPC units and have new projects that continue to support the U.S. Army in their next-generation combat vehicle electrification. 

Ted Beach received his BSEE and MSEE from Ohio University in Athens, Ohio and a PhD, also in electrical engineering, from Cornell University. His graduate research focused on space physics and the impacts of the ionosphere on GPS. Prior to Creare, he was a Senior Electronics Engineer with the Air Force Research Laboratory working on space systems. At Creare, he has continued to work on space systems, including several CubeSat projects and the next-generation NASA portable life support system, as well as electronics for air, ground, and naval applications.

UPPER VALLEY LIVING



Creare's location in Hanover, New Hampshire, offers the best of four-season living in a New England college town. The area offers excellence in medical centers and schools, a wide range of affordable housing options, and cultural amenities offered by Dartmouth College.

Creare's location in the midst of this pristine area offers a wonderful array of fun activities for all ages and interests and a beautiful drive to work for all.

Activities change with the seasons. The casualness of Creare promotes collegial opportunity to enjoy hiking trails on our back 30 acres, mountain biking, cycling, running, skiing, or snowshoeing during lunch, after work, and on weekends. Lunchtime activities include on-site exercise classes and team sports like volleyball, football, and soccer. After work, paddling is a favorite summertime outing.

Travel to and from the area is made easy by the I-89/91 interstates, Dartmouth Coach daily service to Boston and New York, the Lebanon airport (a small jetport), and easy access to Manchester, New Hampshire, and Boston Logan international airports.

You can balance lifestyle and personal interests with a challenging and rewarding engineering career at Creare.