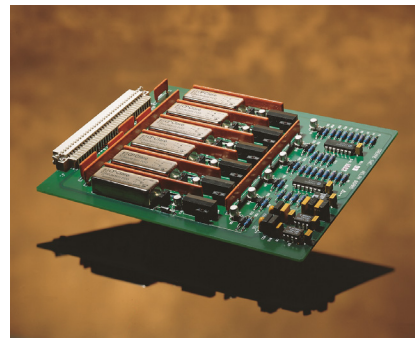
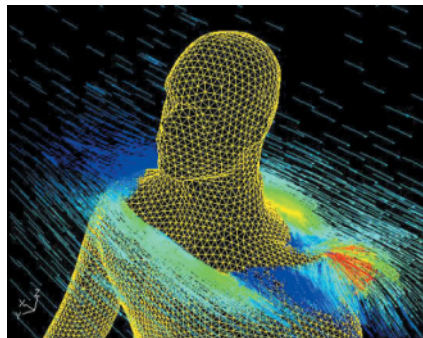
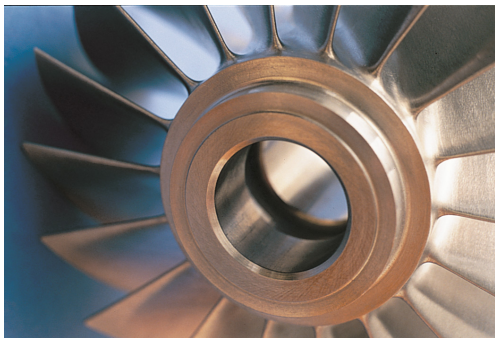


1961-2011

CELEBRATING 50 YEARS OF ENGINEERING EXCELLENCE



ENGINEERING RESEARCH & DEVELOPMENT SERVICES



Creare Incorporated

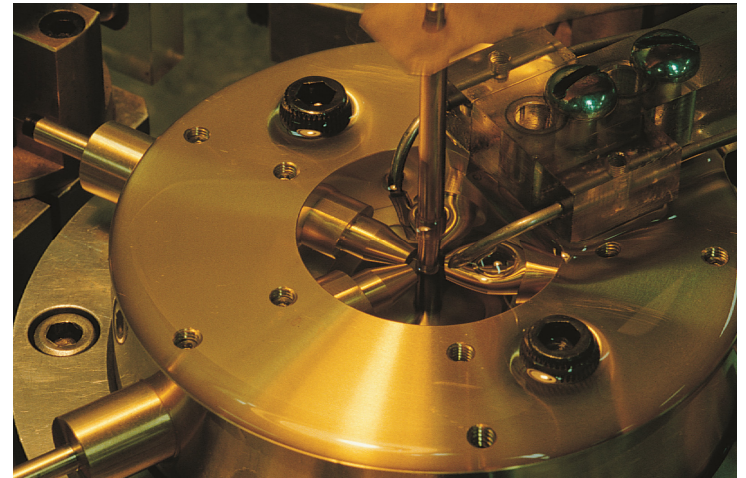
Creare provides engineering services to a diverse international customer base. Our services span applied research, technology development, analysis and modeling, laboratory and field testing, prototype fabrication, and software development. Creare is the forefather of a family of independent high-technology product companies.

Since 1961, we have served industry and government on the frontiers of product and process technology. Combining judgment and sophisticated scientific, mathematical, computational, and experimental methods with an appreciation of the art where science is lacking, we have a reputation for skill and creativity in the solution of difficult problems.

Creare serves diverse industries ranging from aerospace to biomedical to energy to semiconductors. This freedom from traditional industrial bounds is made possible by our strength in a synergistic set of disciplines. We play varied roles from on-call expert to regular R&D outsource, and from co-workers on a team to full responsibility for an entire effort and result.

Past projects have ranged from a day to a decade in length and from a few thousand to over twenty million dollars in funding.

Creare is devoted to quality and excellence. We value our client relationships highly. Our business is to serve our clients, whether we are providing advice, designs, hardware, or software.



Philosophy

The name Creare comes from the Latin verb “to create,” and creativity defines our philosophy. Creare is built on strong scientific foundations and recognition that conventional engineering alone is often not sufficient to meet today’s demands.

Creare engineers hold numerous patents in areas ranging from threaded fasteners to network data servers, and we specialize in innovative solutions to the specific technical challenges faced by our clients. We focus on the ultimate needs of our clients and seek to bridge the gap between scientific knowledge and the profitable utilization of technology.

Our approach emphasizes a clear perception of all the critical parameters of a problem. We consider not only the technical dimensions, but also our client’s management objectives, the needs of the marketplace, and the constraints of time and money. At times, we employ complex laboratory experiments or sophisticated computer simulations, but if our perception of a problem can be demonstrated with rubber bands and paper clips, so much the better.

The typical end products of Creare’s work are analytical techniques and results, experimental data, engineering models, design guidelines, software, numerical solutions, prototype hardware, and hardware designs. Creare takes pride in the effectiveness of its technical reports, its continuing client support, and its sensitivity to the confidential nature of our work for clients. Our recommendations are positive, action oriented, and realistic.



Technology Areas

Creare is specifically organized to utilize the talents of exceptionally creative engineers in an environment that fosters responsiveness to client needs and a results-oriented approach. The technical depth of our people enables us to assemble project teams of exceptional skill, experience, and creativity. Our organization is project centered, with a Project Director responsible to each client for meeting the technical, financial, and schedule goals of the project.

Much of our work requires us to draw on expertise in several disciplines, and many of our projects do not easily fit in general categories. As a guide, we have identified the following technology areas:

Fluid & Thermal Systems

Cryogenics

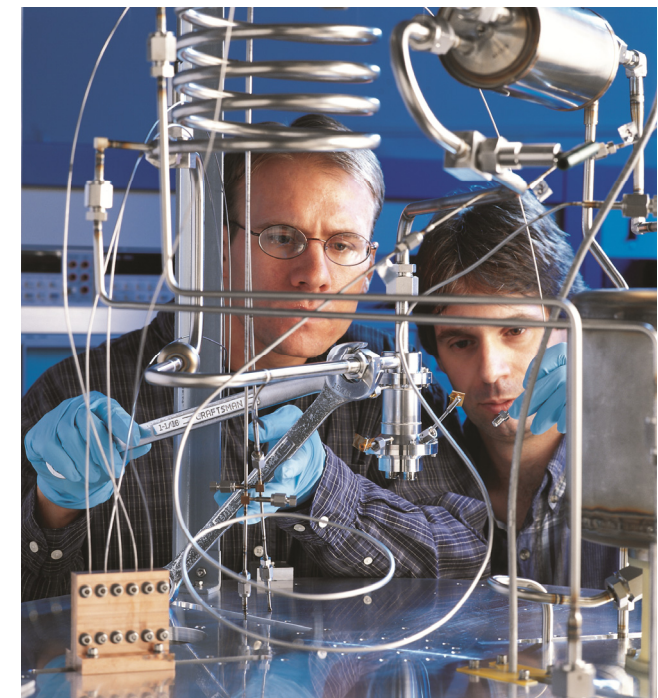
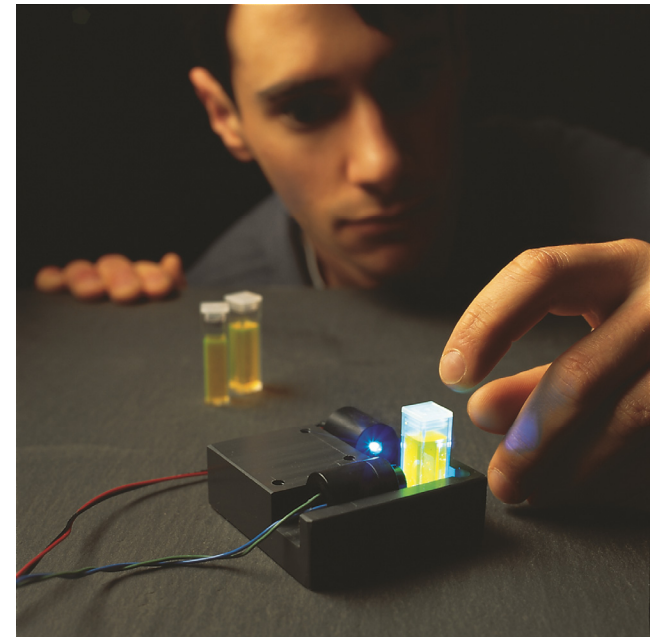
Sensors & Controls

Biomedical & Human Systems

Advanced Manufacturing

Power Systems

Creare engineers frequently branch into new applications, and we thrive on applying our experience and skills in new settings. Our familiarity with the latest technical developments in industry and our unusually broad scope of engineering expertise enable us to bring a unique perspective to our projects. We apply both strong scientific foundations and an understanding of market needs to solving client problems.



Fluid & Thermal Systems

Creare offers a full range of services in fluid dynamics, heat transfer, and related devices and systems. We bring to our clients experience and engineering judgment honed by hundreds of projects and dozens of years of collective experience in the analysis, design, fabrication, testing, and troubleshooting of fluid/thermal systems.

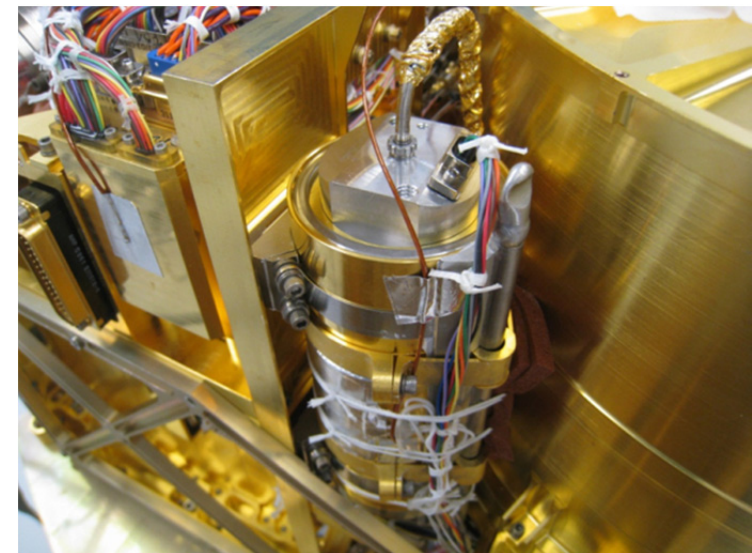
Our work and experience encompass virtually any situation: stationary or rotating machinery; coupled fluid flow, heat, and mass transfer; chemically reacting flows; and micro- and earth gravity. And, we work at scales ranging from microscopic capillary pores to large power plant piping.

Examples of our assignments include:

- Predicting temperature uniformity during processing of integrated circuits
- Calculating the flow field in the Space Shuttle solid rocket motor joints and seals following the Challenger accident
- Development of efficient and compact regenerative blowers for ventilating space suits and chem/bio protective garments
- Developing means to employ gas lift for mining solids from the ocean at three-mile depths



On-Demand Chiller Mounts to Hydration Pack for Hot Climates



Mars Science Laboratory Rover Includes Two Creare-Built Miniature Vacuum Pumps

Cryogenics

Creare is a leading innovator in the design and development of cryogenic components and systems. Our technologies in miniature high-speed turbomachinery, heat exchangers, reverse-Brayton cryocoolers, and J-T cryocoolers are applicable to temperatures down to 4 K and cooling capacities from a few milliwatts to several kilowatts. We have designed and developed cryocoolers for long-life space missions and low-cost terrestrial applications, and we provide complete cryogenic services from conceptual design, analysis, and optimization to hardware development, fabrication, and testing.

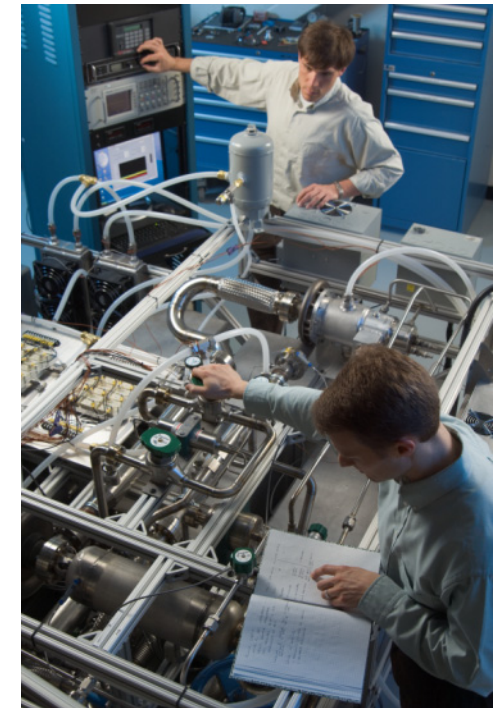
Creare's cryogenic engineering staff enjoys international renown in the areas of miniature high-speed turbomachinery and gas film bearings for cryogenic applications. These specialties are supported by our overall expertise in heat and mass transfer, thermal system design and analysis, and the fluid dynamics of multiphase and multi-component flow systems.

Cryogenics projects at Creare have included:

- Production of slush hydrogen for hypersonic aerospace vehicles
- Probes for cryosurgical treatment of cancer
- Superconducting electrical buses for the space station
- Shipboard liquefaction of helium to cool advanced propulsion systems
- Cryogenic fluid transfer and management in space
- Cryogenic cooling systems and packaging for superconducting electronics



Creare-Built NICMOS Cryocooler before Installation on the Hubble Space Telescope



Air Separation and Liquefaction System Development for Aircraft

Sensors & Controls

Creare develops technology for a wide range of sensor, instrumentation, and control applications for clients in the aerospace, biomedical, military, and energy communities. Much of this work, which is based on innovative and multi-disciplinary approaches, lies at the frontier between the physical world of motion, flow, temperature, and chemistry and the electronic world of signal processing and computers.

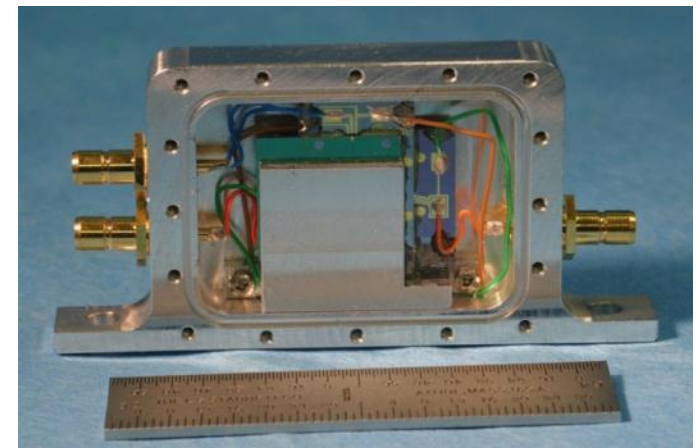
Creare engineers combine a sound understanding of the fundamentals of physics with experience and skills in state-of-the-art control algorithms, data acquisition, real-time signal processing, computer and digital signal processing hardware, software development, materials, and fabrication processes. At the same time, we focus on practical and cost-effective solutions to the most challenging measurement, control, and instrumentation requirements.

The following examples illustrate our depth and diversity:

- Low cost, wireless physical activity monitor for quantifying and evaluating human movement for patients with certain medical conditions
- Wireless sensor networks based on both IEEE 802.11 and 802.15 standards
- Micromachined bone conduction transducers
- Control algorithms and software for immersive environments
- Feedforward active noise reduction for communication and hearing assessment headsets
- Next generation catapult slot width measuring system for US Navy aircraft carriers.



*Airdrop Test with Creare's SODAR
Height Sensor*



*MEMs Nano-g Accelerometer for
Sensing Orbital Drag*

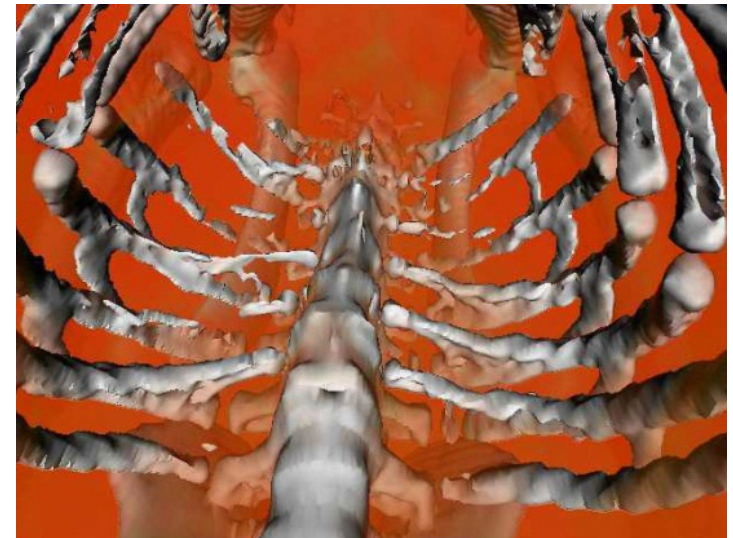
Biomedical & Human Systems

Creare works across a broad spectrum of biomedical and human-related applications, building on core capabilities in precision fabrication, software development, signal and image processing, sensor design, control systems, and thermal/fluid technology. Our diverse blend of engineering skills is well matched to the demanding multidisciplinary requirements of our biomedical clients, whether these involve computer simulation, novel fabrication techniques and materials, fundamental understanding of physical processes, or interfacing with the clinical environment.

Creare frequently collaborates with leading clinicians at nearby Dartmouth-Hitchcock Medical Center, a 400-bed teaching and research hospital, and at institutions such as Harvard Medical School, Johns Hopkins University, Memorial Sloan-Kettering Cancer Center, and Duke University. Prototype devices are typically built and tested in our own laboratories and are validated in a clinical environment when appropriate.

Examples of past or ongoing development efforts include:

- Innovative signal processing algorithms and software for cardiac electrophysiology
- Image processing methods for early detection of disease and monitoring of therapy
- Rebreather systems for use in aircraft at high altitude
- Aerosol technologies for mass vaccinations
- Hearing protection systems for extreme noise environments
- Portable cryogenic systems for producing medical grade oxygen



Reconstructed Image from MRI Data



Nebulizer for Treating Chem/Bio Agent Casualties

Advanced Manufacturing

Creare is active in development and application of advanced materials processing and component fabrication techniques, both as end products for our clients and as means to build components and devices for our project needs.

Our work blends our strength in fluid flow and heat transfer, control systems, experience in hardware design, and innovative ideas in fabrication operations. Our services range from analytical support to the complete design, construction, and testing of prototype equipment. We work across technologies ranging from thin film processing for electronics to precision stamping and forming.

Examples of our results include:

- Thermal spray process innovations and exotic coating deposition
- Thermal and fluid design of chemical vapor deposition reactors
- Envelop® protection systems for the prevention and mitigation of marine corrosion
- Laser metrology for measurement of precision aerospace components
- Processes and equipment for superplastic forming
- Laser-assisted machining of ceramic matrix composites to increase material removal rate and part quality
- Methods to compact and tailor the pore size in porous and foamed metals



*Compact Swaging Machine for Aircraft
Carrier Purchase Cables*



*Creare's Cryogenic Machining
Technology Replaces Flood Coolants*

Power Systems

Creare addresses critical issues across a breadth of power systems and related technologies based on our fundamental skills in fluid flow, heat transfer, combustion, cryogenics, machine design, and power electronics. Our focus can range from detailed design and prototyping of a specific component to overall thermodynamic analysis of alternative system configurations. We can work to improve the efficiency or increase the performance of an existing power system, or we can develop an innovative new system to meet challenging specifications.

Creare's experience in power systems encompasses scales ranging from large power plants to compact portable units and applications from deep oceans to outer space. We work in generation of power as well as its efficient transmission, storage, and ultimate usage. While some of our assignments simply result in reports and studies, most culminate in the construction and testing of laboratory or fieldable prototypes.

Examples of our work include:

- Design, construction, and testing of an ammonia/water bottoming cycle for gas turbines based on a recuperated Rankine cycle
- Development of evaporators and condensers for alkali metal thermal-to-electric conversion cells
- Design, fabrication, and demonstration testing of a compact inter-turbine burner for an aerospace gas turbine engine
- Development of heat exchanger technology for a pressurized-air energy storage system



Compact Heavy-Fuel Burners for Heat and Power Generation



Hydrogen-Air Fuel Cell Designed and Built by Creare

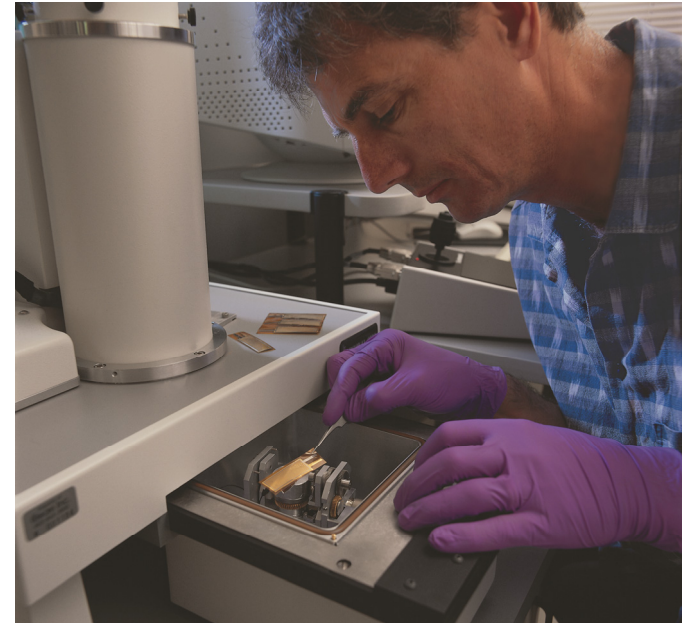
Facilities

Although our people are our most important asset, we have established facilities and systems that allow us to do our work in an efficient manner with a quality consistent with the needs of our clients. Creare's campus of interconnected office and laboratory buildings contains over 60,000 square feet.

Our laboratories and experimental facilities allow us to perform work ranging in size from the microscopic to large outdoor experiments, and at temperatures ranging from those of liquid helium to plasmas. In addition to multipurpose labs we have a chemistry lab, materials lab with a scanning electron microscope, cleanroom, electronics lab, cryogenic test facilities, and outdoor test pads.

Creare's fabrication facilities support the full spectrum of work we perform. The machine shops are equipped with CNC and manual lathes and mills, as well as extensive welding, soldering, and brazing equipment. Our standard machine shop is augmented with a high-purity vacuum furnace, electroplating equipment, precision stamping presses, and proprietary custom electric discharge machining centers. Specialty fabrication facilities include sputtering systems, a mask aligner, and a reactive ion etcher. We place special emphasis on precision work, and the development of innovative fabrication techniques.

Extensive, up-to-date computer facilities provide support for software development, numerical simulation, computer-aided design and fabrication, and laboratory data acquisition. Additional in-house support facilities include a fully equipped electronics shop, still cameras, and video imaging systems. Creare also maintains a computerized Technical Information Service, and has access to the extensive library collections of Dartmouth College.



Industrial Clients

Creare has served hundreds of industrial clients ranging from Fortune 500 companies to fledgling small businesses. This list provides a cross section.

A

ABB Group
ABIOMED, Inc.
Advanced Technology Materials Ltd.
Aerotherm, Inc./Acurex Environmental Corp.
Air Products and Chemicals, Inc.
Alcatel-Lucent
Alcoa Inc.
Allied Healthcare Products, Inc.
Anderson-Greenwood & Company
Applied Materials, Inc.
Aptech Engineering Services
APV Gaulin, Inc.
Arthur D. Little
Astronautics Corp. of America
Atlas Copco AB
Aurora Pump

B

The Babcock & Wilcox Co.
Barber-Nichols Inc.
Battelle Memorial Institute
Bechtel Corporation
Bell Helicopter Textron
Bemis Co., Inc.
The Boeing Company

Bombardier Inc.
Borg-Warner Automotive, Inc.
BP Amoco
BTU International, Inc.

C

Cargill Fertilizers, Inc.
Carleton Technologies
Caterpillar Inc.
Chevron Corporation
Chrysler Group LLC
CIBA Corning Diagnostics Corp.
Clausen Miller P.C.
CNH Global N.V.
Colgate - Palmolive Company
Columbia Gas System, Inc.
Conceptronic, Inc.
Consolidated Edison Co. of New York, Inc.
Cooper Industries, Inc.
Cordis Corporation
Crystal Solutions
Cummins Engine Co., Inc.
Curtiss-Wright Corp.

D

Dartmouth College
Dartmouth-Hitchcock Medical Center
Deere & Company
DEICON Inc.
DePuy Orthopaedics, Inc.
Dominion Engineering, Inc.
Dresser, Inc.

E

Eaton Corp.
Easton Aluminum Inc.
EMD Millipore Corporation
E.I. du Pont de Nemours and Company
Electric Power Research Institute, Inc.
Elliott Company
Excel Dryer Inc.
Exelon Corp.
Exxon Mobil Corporation

F

Fafco, Inc.
Florida Power & Light Co.
FMC Corporation
Ford Motor Co.
The Foxboro Co.

G

Galil Medical, Inc.
Gas Technology Institute
GenCorp Inc.
General Dynamics Corp.
General Electric Company
General Motors Corp.
Allison Transmission Division
Georgia Power Co.
The Gillette Company
Goulds Pumps

H

Harris Corporation
Hispano-Suiza
H.J. Heinz Company
Honeywell International, Inc.

I

IAP Research Inc.
IBM Corporation
Ingersoll-Rand Co.
Intel Corporation
Iris Technology Corporation
ITT Corporation

J

Jacobs Engineering Group Inc.
Jersey Central Power & Light Company
Johnson Controls Co.
Johnson & Johnson
JX Crystals Inc.

K

Kidde-Fenwal, Inc.
Kimberly-Clark
Kobe Steel, Ltd.

L

Life Sciences Advanced Technologies
Lockheed Martin Corporation
Long Island Power Authority
LyondellBasell Industries

M

MacMillan, Sobanski, and Todd LLC
MAG Industrial Automation Systems
Manitowoc Beverage Systems

Medtronic Navigation, Inc.
Metallulics Systems Co.

N

Nebraska Public Power District
Nordson Corporation
Northeast Utilities
Northrop Grumman Corporation
Novellus Systems, Inc.
Nuclear Fuel Industries, Ltd.
Nuclear Regulatory Commission
Nuovo Pignone S.p.A.

O

Orbital Sciences Corporation

P

Parker Hannifin Corporation
Parkson Corporation
Parvus Corporation
PhilipMorrisUSA
PPL Corporation
Proctor & Gamble, Inc.

R

Reliant Energy
Remy International Inc.
ResHydro LLC
Rockwell Automation, Inc.

S

Schlumberger Limited
Science Applications International Corp.
Schott Fiber Optics
Sealed Air Corporation
SEMATECH Inc.

Shell Oil Company
Slypner Athletic Horseshoes
Snap-on, Inc.
Southern California Edison Co.
Southern Natural Gas Co.
The Spencer Turbine Co.
Stanley Black & Decker
SustainX, Inc.

T

Teledyne Technologies, Inc.
Textron Inc.
Thermal Dynamics Corporation
Thermo NESLABS, Inc.
The Trane Company

U

Union Carbide Corporation
United Technologies Corporation
Hamilton Sundstrand
Pratt & Whitney

V

VT MAK

W

Wakefield Solutions
Waukesha Kramer Inc.
Westinghouse Electric Corp.
Williams International
Wyle Laboratories, Inc.

X

Xerox Corp.

Z

Zurn Industries NEPCO

Federal Clients

Creare has worked for a broad spectrum of federal agencies, as shown below.

Department of Commerce

National Institute of Standards and Technology

Department of Defense

Defense Advanced Research Projects Agency

Missile Defense Agency

Defense Special Weapons Agency

Defense Threat Reduction Agency

Department of the Air Force

Air Force Research Laboratories (AFRL)

Brooks City Base

Kirtland AFB

Rome Research Site

Tyndall AFB

Wright-Patterson AFB

Department of the Army

Army Aviation & Missile Command

Army Cold Regions Research & Engineering
Lab

Army Medical Research & Materiel Command

Army Soldier & Biological Chemical Command

Army Soldier Systems Command

Army Space and Missile Defense Command

Army TACOM - ARDEC

Dugway Proving Ground

Edgewood Chemical Biological Center

Department of the Navy

Naval Air Warfare Center

Naval Sea Systems Command

Naval Surface Warfare Center

Naval Supply Systems Command

Naval Undersea Warfare Center

Office of Naval Research

Space & Naval Warfare Systems Command

United States Marine Corps

Department of Energy

Argonne National Laboratories

Brookhaven National Laboratories

Fermi National Accelerator Laboratory

Lawrence Livermore National Laboratory

Los Alamos National Laboratory

National Renewable Energy Laboratory

Sandia National Laboratories

Department of Health and Human Services

Centers for Disease Control and Prevention

National Institutes of Health

National Cancer Institute

National Eye Institute

National Heart, Lung, and Blood Institute

National Institute on Aging

National Institute of Biomedical Imaging
and Bioengineering

National Institute of Child Health and
Human Development

National Institute on Deafness and Other
Communication Disorders

National Institute of Dental & Craniofacial
Research

National Institute of Diabetes, Digestive, &
Kidney Disorders

National Institute on Drug Abuse

National Institute of Mental Health

National Institute of Neurological Disorders &
Stroke

Department of Homeland Security

Department of the Interior

Department of Transportation

Environmental Protection Agency

National Aeronautics & Space Administration

Ames Research Center

Dryden Flight Research Center

Glenn Research Center

Goddard Space Flight Center

Jet Propulsion Laboratory

Johnson Space Center

Kennedy Space Center

Langley Research Center

Marshall Space Flight Center

National Science Foundation

Technology Transition and Commercialization

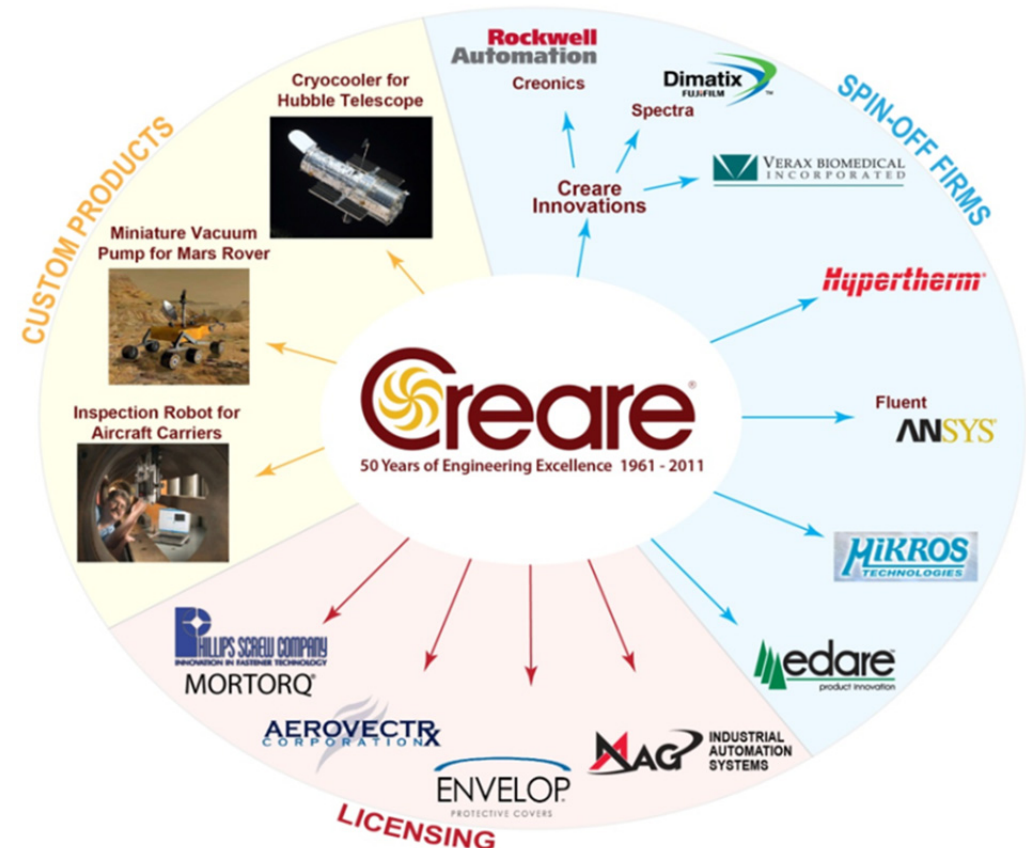
Technology commercialization has been a key part of Creare's mission since our founding in 1961, resulting in the founding of several independent product firms. Since the advent of the Small Business Innovation Research (SBIR) program in 1982, Creare has been highly successful in commercializing the results of our SBIR projects through licensing of our technology to other firms, creation of spin-off organizations and new ventures, and sales of custom or specialized products. A few of the many examples of our SBIR successes include a cryocooler for the Hubble Space Telescope, a spin-off dedicated to micromachining, licensing of Envelop® protective coverings, and delivery of specialized equipment for aircraft carrier catapults. To date, we can trace over \$720 million in revenues at Creare, our technology licensees, and spin-offs to commercialization of Creare SBIR projects.



Creare-Invented MORTORQ Screw, used on Boeing 787 and Space Shuttle



20 mm Gun Protected by Envelop Anti-Corrosion Cover, Over 33,000 Sold



Contact Us

Contact us for an assessment of ways that Creare can help to address your challenging engineering problems and R&D requirements. Whether your need involves an immediate crisis or long-term technology development, Creare engineers can assist you in achieving your goals and minimizing the risks. We will consider your objectives, constraints, and resources and recommend a plan that meets your specific needs.

Creare Inc.
16 Great Hollow Road
P.O. Box 71
Hanover, NH 03755
603-643-3800
www.creare.com

