

Creare offers a full range of services in fluid dynamics and heat transfer; core disciplines since our founding. Our experience enables us to use many tools and to choose the best combination to address the needs of our clients. These include:

First-principles analysis and mechanistic modeling

Computational fluid dynamics (CFD)

Flow visualization experiments

Scale model, prototype, and full-scale testing

We apply these tools in concert with engineering judgment honed by hundreds of projects and dozens of years of collective experience in the analysis, conceptualization, design, fabrication, testing, and troubleshooting of fluid/thermal devices and systems. Our work and experience encompass virtually any situation: single or multiphase flow; convective, conductive, and radiative heat transfer; laminar, transitional, or turbulent flow; unsteady fluid/thermal phenomena; stationary, reciprocating, or rotating machinery; coupled fluid flow, heat, and mass transfer; multicomponent and chemically reacting flows; micro- and earth gravity. And, we work at scales ranging from microscopic capillary pores to large power plant piping.

Examples of our work include:

- Analyze potentially damaging flow oscillations and instabilities in nuclear reactors.
- Develop lightweight absorption refrigeration devices for cooling of spacesuits.
- Analyze thermal management in home appliances.
- Design, build, analyze, and flight-test two-phase flow systems for reduced gravity.
- Perform full-scale, experimental investigation of flow stability limits in nucleate boiling.
- Assess the flow in the Space Shuttle solid rocket motor joints and seals following the Challenger accident.
- Develop gas lift concepts for mining solids from the ocean at three-mile depths.
- Analyze and experimentally evaluate novel cooling systems for notebook computers.



Our work ranges from operations issues in manufacturing to development and testing of hardware for extreme performance requirements for defense applications. We deliver specific recommendations and solutions backed by scaling analyses, CFD calculations, prototype hardware, and test data. Creare brings a unified perspective, combining the strengths of the various tools – theory, analysis, computer simulation, and testing – to yield accurate and cost-effective results for our clients.

Techniques at our disposal range from flow visualization tests to computational fluid dynamics simulations.

Analysis, design,
fabrication, testing,
and troubleshooting of
fluid/thermal systems.



Miniature Turbo-molecular and Turbo/Drag Pumps

Under funding from NASA, Creare has developed specialized analytical tools, vacuum pump test and fabrication facilities, and a series of miniature, low-power, very high-speed electric motors. These capabilities allow Creare to develop unique vacuum pumps that are tailored to challenging customer requirements.

For example, Creare has developed the world's smallest hybrid turbo-molecular/molecular drag vacuum pump to support portable, battery-powered analytical equipment such as mass spectrometers. This miniature turbo/drag pump is about the size of a D-cell flashlight battery: it has a diameter of 3.4 cm and a length of 8 cm. It weighs only 130 grams, and can develop an ultimate pressure in the 10^{-8} torr range, while working against a foreline pressure as high as 10 torr. The pumping speed is 4 L/s at a nominal rotational speed of 200,000 rpm. Substantial efforts were made to minimize power consumption, and the pump draws less than 2 W at foreline pressures of 1 torr or less, and only 7 W at a 10 torr foreline pressure.

Creare is currently designing and building a series of miniature turbomolecular and molecular drag pumps for installation in an instrumentation package for an upcoming Mars lander.



We analyze, design, build, and test both large fluid/thermal systems and individual components.

Facing imminent regulatory action, a large electric power utility sought Creare's assistance in assessing the risk of pressure locking in safety-related valves. Within a single week, Creare assembled a test facility, performed critical experiments, and developed an original prediction methodology. The results of this work provided our client with a compelling technical basis for its timely and successful response.



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