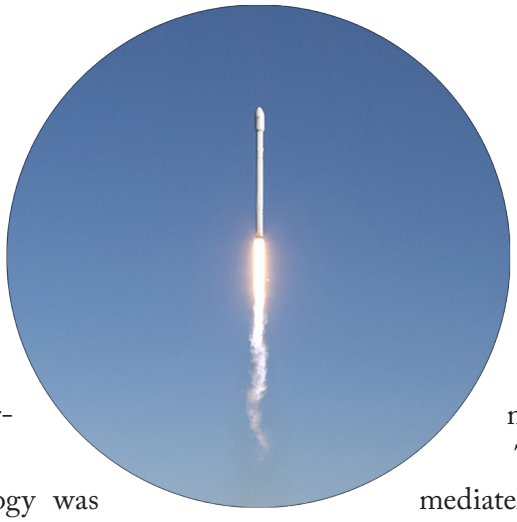
ROCKET BOOSTERS

SBIR-BACKED COMPANY DEVELOPS A NOVEL ROCKET PROPULSION SYSTEM FOR NASA, DARPA



In the early 2000s, the U.S. Air Force issued a Small Business Innovation Research (SBIR) contract for work on a monopropellant augmented solid rocket motor—a new way to control and steer rocket engines. That contract was secured by Adelanto, California-based Exquadrum.

The idea behind the technology was simple: By introducing a liquid monopropellant to the existing fuel base of a solid rocket engine, one could control the power and angle of thrust of the rocket, making it more flexible and controllable. Imagining current solid rocket motor technology like a firework rocket, said Exquadrum founder Kevin Mahaffy, where you light the fuse and run away, the monopropellant system would be like adding a joystick to the firework so you could control where and how fast it traveled.

"What we're able to do is have a fixed nozzle and, injecting this liquid, we can steer the plume inside the nozzle and move it from one side to another, and so provide steering to the rocket," Mahaffy said. "By injecting this monopropellant, we can throttle it up and throttle it down. One motor can provide for a variety of missions."

The technology took off almost immediately, buoyed by a number of successful SBIR contracts.

The company received related SBIR contracts from the Missile Defense Agency (MDA) in 2008, the Army in 2010, and NASA in 2012 for advanced rocket propulsion developments, which then evolved and eventually culminated in a DARPA prime contract to develop a hypersonic boost glide delivery propulsion system.

The contract fell under the umbrella of DARPA's Operational Fires program. In the OpFires program, DARPA hoped to develop and demonstrate a novel ground-launched system that enabled hypersonic boost glide weapons to

The OpFires technology from Exquadrum went through a rigorous testing process.

penetrate modern enemy air defenses and rapidly and precisely engage critical, time-sensitive targets.

"The objective of DARPA's OpFires program is to deliver an intermediate-range surface-to-surface missile in line with the Department of Defense's push to field hypersonic platforms," said Major Amber Walker (USA), the former DARPA program manager for OpFires.

Exquadrum was recently awarded a Phase 2 contract, through which it has developed and demonstrated a full-sized, working prototype in preparation for a flight test program. The technology was tested successfully on a large rocket motor test platform, according to Mahaffy.

"It is proven to be ready to move forward," he said.

Mahaffy added he is proud of what he and his company have managed to achieve. And he doesn't shy away from crediting the SBIR program with giving Exquadrum a much-needed boost.

"We built this company on the back of the SBIR program," Mahaffy said. "I'm so grateful to the program because no one would have given us these opportunities without the experience, the record of innovation, and the success we garnered through the SBIR program. It just wouldn't have happened the way it did."

Exquadrum • Adelanto, CA

Modernization Priority: Hypersonics

SBIR contract: FA9453-04-C-0315 • Agency: Air Force • Topic: MDA03-072, Dual Mode Propulsion Module Technology for Space Control
SBIR contract: HQ0006-08-C-7917 • Agency: MDA • Topic: MDA06-021, Advanced Miniature DACS Propulsion
SBIR contract: W31P4Q-10-C-0128 • Agency: Army • Topic: A08-040, Accurate and Reliable Rocket Thruster Technology