

# LIVING SWAGE

A PORTABLE AND EFFICIENT SWAGING DEVICE SAVES THE NAVY TIME, MONEY

Around a decade ago, the U.S. Navy needed a way to improve the arresting gear purchase cable terminals on aircraft carriers. The 1.5 to 2-inch diameter cables, designed to stretch across the deck to grab and quickly slow aircraft when they land, are critical to aircraft safety but were prone to failure. The Navy hoped to find a better way to repair them while on the water.

Specifically, the Navy required a swaging tool for attaching arresting gear purchase cable terminals on ships. Swaging is a widely used metalworking technique that forms or bends metal using a rapid succession of hammer strikes. However, typical swaging machines for such large-diameter cables are large and cumbersome. Ships that require swaging work often must return to shore. In issuing an SBIR topic for a new swaging mechanism, the Navy aimed to alleviate this issue.

Creare LLC, a small, New Hampshire-based, innovative technology and product development firm, answered the call. The company had experience working with Navy aircraft carriers going back 15 years, having previously developed, transitioned, and supplied a robotic tool to enable the inspection of the catapult gap—a hyper-precise system that assists in launching aircraft from the ships. It also had experience with the SBIR program, dating back to its first award in 1992, and several successful technology transitions, licenses, products, and spin-offs as a result of

that SBIR work. That work, according to Creare Principal Engineer Dr. Jay Rozzi, “engendered a relationship” with the Navy that it was later able to build on with the SBIR project focused on improving the shipboard repair of the arresting gear terminals.

Dr. Bruce Pilvelait, also a Principal Engineer, and a team of Creare engineers proposed a portable swaging machine that could be used while the aircraft carriers were out on the water. “The general idea,” Dr. Rozzi said, “was to, rather than swage the cable all in one shot, to take very small bites—to do multiple, lower force swaging operations over an extended time period.”

Creare engineered their Compact Swaging Machine (CSM) to be much smaller and lighter than existing swaging machines, enabling its below-deck use aboard aircraft carriers. It reduces workload and dramatically increases the quality of life for sailors. The machine

allows one sailor to accomplish in just over an hour what used to require multiple sailors more than eight hours to complete. It’s estimated that the CSM reduces V-2 Division’s (the division tasked with the responsibility to safely launch and recover aircraft on the flight deck) workload requirements by up to 500 man-hours per deployment.

“When it comes to SBIR, you not only need to have good technology, but you need to formulate your technology transition paths and develop a business plan early,” Dr. Rozzi said. “Even at the proposal stage, establishing stakeholder alignment early in the process helps



The compact swaging machine operating aboard CVN76 USS Ronald Reagan.

you outline the transition pathway at the outset. Then comes the technical work and continued engagement to make it happen.”

For Dr. Rozzi, the end goal, though, was always the same: “To get a product out there that can benefit the Warfighter in terms of performance, cost, or lethality.”

The final product included a high-pressure hydraulic system which minimizes the actuator size, an efficient swaging schedule which reduces the force required to yield the terminal material, and innovative machine design features to maximize the strength of the structural components. Perhaps most importantly, the machines were small (less than 3 x 4 x 7 feet, and less than 5,000 pounds) and powerful (capable of up to 1,000 tons of force). They could be easily loaded onto aircraft carriers and used while the carriers were deployed.

The legacy program CSM replaced involved pouring molten zinc at 1000 degrees Fahrenheit into a socket, requiring a full day’s work for a group of anywhere from four to six sailors, according to Mark Husni, Science & Technology Lead, SE and ALRE at the Naval Air Warfare Center Aircraft Division Lakehurst. In contrast, CSM “eliminates the safety and health risk to the sailors,” Husni said, and takes only a single worker one hour to complete.

“The Navy Fleet is very supportive of the CSM,” Husni said. “I think I can speak for everyone in the Navy’s Aircraft Launch and Recovery Equipment community when I say that we appreciate the job that Creare has done in developing this technology through production, installation, and support. And we appreciate the SBIR program for providing the initial R&D funding to meet this Navy need.”

Between 2018 and 2021 Creare has executed a \$30M program to produce and deliver 28 CSMs to the U.S. Navy. Thus far 26 CSMs have been delivered on time and within budget by Creare and are now in active use on several carriers. Moreover, Naval Air Systems Command has labeled the CSM as “the single biggest quality of



life improvement in 20 years for V-2 Division.

The U.S. Navy plans to install two CSMs on each of the eleven active aircraft carriers in the fleet, and some U.S. allies are also considering CSM use.

Through their diverse technical work, Creare has developed business relationships with multiple primes, program managers, and government representatives. One key relationship that has been built by Creare through SBIR is focused on developing technology for F-35 production and sustainment. Craig Owens, Corporate and Aeronautics Program Manager for Lockheed, has worked with Creare for nearly 15 years. “I like to think of the SBIR program as not necessarily where you collaborate with suppliers in the traditional sense, but more where you are building up a base of technology suppliers and solution providers. That is exactly the type of relationship we’ve developed with Creare on the many SBIR efforts we’ve collaborated on with them. Almost anyone can supply parts; Creare has provided innovative solutions and key technologies and we hope to continue to build on that relationship”.

Overall, Rozzi said, the SBIR program was paramount in taking the CSM and other technologies from concept to design, manufacturing, transition, and eventual implementation.

“SBIR is so intensely competitive and all of the awards are merit-based, which means that the Warfighter, the government customer, and the taxpayer are getting the maximum value for their dollar,” Dr. Rozzi said.

“DoD partnerships with small businesses through SBIR can help the DoD be agile, grow the defense industrial base, and leverage the best and most capable innovators and entrepreneurs in the United States. In addition, this leveraging occurs with minimal risk to the stakeholders, and the technology development is accelerated,” he added. “SBIR is critical in terms of getting the best technology in the hands of our Warfighters, who deserve nothing less.” 🌟



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