



The Navy outfits all of its MH-60R "Romeo" multi-mission helicopters with Daniel H. Wagner Associates' acoustic mission planning system, which uses the contact data from the helicopter to help detect targets.

IMAGE COURTESY | U.S. Department of Defense

DANIEL H. WAGNER ASSOCIATES

Designing and implementing intricate mathematical algorithms that will ultimately be used by the warfighter to better perform their missions isn't a task that many small businesses can accomplish. But at Daniel H. Wagner Associates, mathematics is at the core of everything they do. Founded in 1963 and having utilized the Department of Defense (DOD) Small Business Innovation Research (SBIR) program for nearly thirty-five years, Wagner Associates has continually provided the U.S. military with innovative solutions to the agency's most pressing needs.

PHASE III SUCCESS

Over \$17 million in contracts with the U.S. Navy stemming from the original SBIR-funded technology.

AGENCIES

DOD, NASA, NIH

SNAPSHOT

Through the use of sophisticated mathematical algorithms and advanced programming techniques, Daniel H. Wagner Associates continues to provide the U.S. military and commercial clients with effective solutions, particularly in the areas of data fusion and mission planning.

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The Pennsylvania and Virginia-based small business works in two main sectors: Distributed Data Fusion and Optimal Mission Planning. A recent project with the Navy saw the implementation of Wagner's acoustic mission planner (AMP) on all of the fleet's 286 MH-60R "Romeo" anti-submarine warfare (ASW) helicopters.

"The Navy was developing a new ASW helicopter and they needed a tactical decision aid," explains Dr. W. Reynolds Monach, Vice President of Wagner Associates and Hampton VA Office Manager. "AMP gets all relevant data from the helicopter and uses this data to estimate where the target submarine is likely to be located and to recommend optimal use of the MH-60R sensors. In addition, AMP calculates how likely you are to detect the submarine target."

Since the original AMP SBIR project, the technology has been supported by Lockheed Martin and NAVAIR, and Wagner Associates has received contracts worth \$10 million. Similar mission planning algorithms are used in the Navy's Undersea Warfare Decision Support (USW-DSS) for coordinated ASW mission planning.

The company's distributed data fusion system has also transitioned to two Navy Programs of Record: (1) USW-DSS, and (2) SQQ-89A(V)15 Torpedo Defense Functional Segment (TDFS). Wagner Associates' distributed data fusion system, fully integrated in USW-DSS, allows for multiple ships and aircraft that are sending in data to generate a Common Tactical Picture (CTP). The user can then generate alerts on submarines or torpedoes in the area. Through contracts worth \$7 million, nearly all of the Navy's more than 75 Arleigh Burke



What lies beneath: Daniel H. Wagner's algorithms and specialized search theories are often used by "treasure hunters" or salvage companies to find gold and other valuables on the bottom of the ocean.

destroyers will eventually employ these two systems and their Wagner Associates' data fusion algorithms and software.

These high-demand critical data fusion and mission planning technologies were both bred from the DOD SBIR program, which the company credits as funding critical research and development work that otherwise would not have been realized.

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DR. W. REYNOLDS MONACH
VICE PRESIDENT

"The ability to get innovative research funded was the whole reason we reached out to SBIR in the first place," says Monach. "Somebody has to fund these risky technologies, and SBIR does that when nobody else does. Even after all these years, we still utilize the program, and we have been very successful in transitioning our work to Navy systems."

Over one-third of the technical staff at Wagner Associates hold PhDs in mathematics and another third hold Masters degrees in math or computer science. Since this universal language of mathematics can be applied to many different applications and sectors, it seems fitting that the technology is also utilized in other areas. One of these areas is hunting for treasure on the bottom of the ocean. Using advanced algorithms, private customers including salvage companies, or what most people would call "treasure hunters," have enlisted Wagner Associates' unparalleled expertise to figure out how and where to strike gold.

"You take all of the clues you have about what you already know – where the ship sank or where the ship might be, and you create an optimal search plan with a side scan sonar," adds Monach.

Using a specialized search theory developed by Wagner Associates, Tommy Thompson and the Columbus-America Discovery Group was able to locate the sunken *SS Central America* off the coast of California in 8,000 ft. of water in 1988. The contents of the find, which included nearly \$150 million in gold bars, coins and nuggets, continue to go down as the "greatest treasure ever found" according to *Life* magazine. The resulting book, *Ship of Gold in the Deep Blue Sea*, was written about the expedition.

NASA, wanting to take advantage of the company's ability to "find" lost things using operationally effective mathematical algorithms, also utilized Wagner Associates to support the recovery of virtually all of the pieces of the Challenger Space Shuttle when conducting their accident investigation.

The company also designs and develops controllers for large shipping container cranes and steel mill cranes that use mathematical formulas to provide automatic anti-sway capabilities. In addition, Wagner Associates uses statistical methods to optimize stock and bond purchases.

Back in the SBIR arena, Wagner Associates is working on a project called Detailed Autonomous Surface Vehicle/Unmanned Surface Vehicle (ASV/USV) Modeling and Simulation System (DAMS), a "plug and play" simulator for autonomous vehicles. The system will tell the user what the vehicle will do in a variety of hypothetical situations, without the risk and cost associated with operating in the real world.

Although it's clear Wagner Associates' grip spans a variety of industries, it really boils down to the central company principle that Monach always stresses – "It's all math!"