

Brother Dealer Develops Sewing Technique that Could Help Technology of the Future

They say, "A stitch in time saves nine," but the researchers at Ohio State Electrical Engineering Department never dreamed they would be stitching their way to a solution by using the crafts of sewing and embroidery to solve a radar and surveillance problem for Unmanned Aerial Vehicles (UAV's.)

When the team of researchers at Ohio State's ElectroScience Laboratory realized they needed to develop a non-conventional method to sew electrically conductive fibers onto flexible materials, they turned to Westerville Sew-N-Save, an Authorized Brother Innov-is Dealer in Westerville, Ohio for the answer. Because conductive fibers are not twisted fibers and larger in diameter than

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standard sewing thread, they had to use the fibers in the bobbin case as if they were doing machine bobbin work, rather than traditional sewing.

Since smaller UAV's require large antennas for the long-distance communication of surveillance and data collection, the task was to determine how to transfer the complicated antenna design into the structure of the UAV's.

Susan Hart, owner of Westerville Sew-N-Save and her friend and loyal customer, Shirley Harding, took on the venture of working with Yakup Bayram, senior research associate and project manager for fiber research and Zheyu Wang, a graduate student, to find the right sewing machine and technique for this process.

"It was definitely a team effort," said Hart. "Shirley's engineering background and her hours of devotion to this project were instrumental in establishing the results," she said. After one year of trial and error and a process of elimination, it was determined the Brother Duetta® 4500D was the best sewing machine for the job. "We are a multi-line store, but it was Brother's technology and ease of use that made our decision. It was imperative that it worked," Hart said.

After 25 years in the sewing business, Hart describes the year-long process as a good learning experience. "It gave me the opportunity to not only use and test particular machines, but also to test their capabilities. I discovered the limits of what a machine can do,

but also found ways to get a machine to do what the customer needs it to do."

When Bayram was asked about the final decision to purchase the Duetta® 4500D, he replied emphatically that, "Brother's sewing machine gives us the many options that we need for our research - now and in the future. We wouldn't be at this point in our research if it weren't for Susan's inquisitive nature and Shirley's time, patience and engineering background. We owe it all to them."



Bayram described the initial phase of this project when they would hand-stitch the conductive fibers as proof-of-concept for research purposes; but they soon felt the need to consult with a sewing expert for the complicated designs. Depending on the electrical and geometrical quality and shape of the UAV design, Bayram explained that Susan and Shirley would determine whether sewing or embroidery would be used to accomplish the task. He says they needed to find a way to transition the concept from the lab to the industry for mass production purposes. This concept, he says, can be used for the military, but its applications for the future are far-reaching.

This research project is part of a three-year, \$3.5 million GameChanger program, which is funded by the Air Force Office of Scientific Research (AFOSR). The objective of the program is to develop new antenna technologies for UAV's. Leading the GameChanger program is Principal Investigator Professor John Volakis, Program Manager Dr. Yakup Bayram, Postdoctoral Researcher Dr. Lanlin Zhang and PhD student Mr. Zheyu Wang. Part of the grant money was used to purchase the Brother Duetta® 4500D sewing and embroidery machine. The Ohio State University ElectroScience Lab is currently working with the National Science Foundation (NSF) to further develop a program for flexible and stretchable electronics for the next generation. "NSF creates the future with their funding," Bayram commented. "Future technologies funded by NSF will have a big impact on society."

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The technique of sewing and embroidering with conductive fibers could be part of the next medical and military breakthroughs. Wearable electronics is in the research phase now, but the clothing of the future could have conductive fibers sewn in to monitor vital signs such as blood pressure, heart rate and even insulin levels. On the battlefield, antennas could be sewn into uniforms to aid soldiers in communicating more effectively. Funding for these potential groundbreaking concepts is provided by The United States Department of Defense.

Whoever thought two university researchers would find their solution to a military dilemma by stepping into an Authorized Brother Innov-is Dealer in Westerville, Ohio? The answer lies within every Brother dealer who knows their products, believes in their capabilities and has the patience and desire to meet their customer's demands.

"It's been a rewarding experience," said Susan Hart. "The project interests me and has great potential for the future. As a Brother dealer, I'm amazed how the craft of sewing has such far-reaching capabilities and how we can profoundly affect so many lives."



GameChanger researchers

(back row, from left) Yakup Bayram, senior research associate and project manager for ESL's e-fiber research, discusses the challenges faced in embroidering conductive e-fibers with John Volakis, principal investigator for the GameChanger program; Lanlin Zhang, postdoctoral researcher; and Zheyu Wang, graduate student in electrical and computer engineering.

ElectroScience Laboratory researchers worked with Shirley Harding (front) and other embroidery experts from the Sew-N-Save in Westerville, Ohio, to develop a process for embroidering conductive e-fibers so the threads could withstand the frictions of embroidery machines.