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DURABLE FOR DEFENSE

Computers have to be just as tough as the weaponry they help control

By Ross Kerber

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TAUNTON, Mass.

Before computer parts leave the General Dynamics factory here they must battle their way through tests tougher than basic training.

Using metal test chambers the size of refrigerators, managers bake circuit boards to see whether they function at more than 100 degrees. They also fry the boards with electrical signals, place them in vacuum chambers to simulate altitudes above 30,000 feet, and bathe them in salty fogs.

The goal is to weed out faulty chips and connections before they're built into devices for military users not known for babying their equipment.

"You've basically voided the warranty just by selling it to us," said Andy Taylor, a systems engineer at the Army's Natick Soldier Center, which advises units such as the 82d Airborne Division, now experimenting with laptop and handheld computers in Afghanistan.

"In the battlefield you're taking on dirt, sand, and dust," where commercial products don't stand a chance, Taylor said. In recent years the Army and Marines have bought tens of thousands of heavy-duty laptops, which can weigh 15 pounds or more. Lately soldiers have been testing armored personal digital assistants, or PDAs, using Microsoft's PocketPC operating system, running programs that allow them to find their positions using satellite signals or to control artillery fire. With powerful new chips and software, the Army is scheduled to deploy significant numbers of these rugged PDAs this year, though perhaps too late for them to play a role in an attack on Iraq.

Most of these computers use extra seals, bigger batteries, and heavy shells to survive falls from a Humvee, in environments where commercial models wouldn't last a day.

"If you can buy it at the store, it will probably fall apart in two hours," Taylor said.

Making computers more robust is a major goal for the armed services as they adopt more precision weapons and tactics. Upgrading the hardware is known as "ruggedizing" it to meet various US and foreign standards. General Dynamics' C4 Systems is among the largest suppliers of such hardware under a 1995 Army contract, worth \$800 million, to supply systems that are also used by the Marine Corps, Navy, and Air Force.

These sales represent about two-thirds of the Army's total rugged-gear procurements, and about half of that figure is built in Taunton. Often these devices are repackaged civilian products, such as versions of the popular iPaq PDA made by Hewlett-Packard that General Dynamics resells to military customers in configurations such as its "Mission Data Tool," starting at around \$2,000.

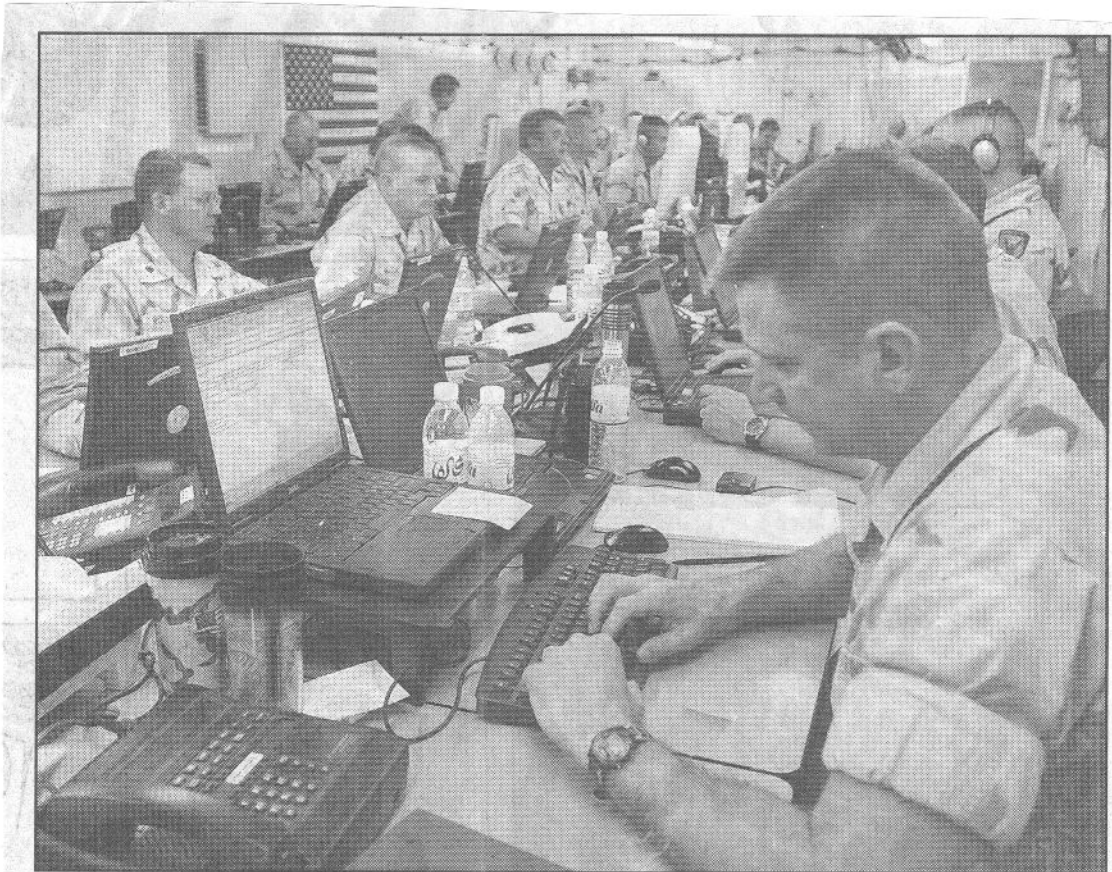
In Taunton, workers encase standard office printers and switching devices in thick aluminum cases so they don't emit electrical signals that could be picked up by spies; others build a 45-pound portable Army PC for stuffy armored personnel carriers, using the old "lunchbox" style with cooling ridges molded into its aluminum shell. (Fans can't be used for cooling in environments where they would suck in too much dust.)

Other computers are built from tweaked common components. Gary Binder, General Dynamics vice president for operations, shows off tricks like using extra cable tie-downs, spraying silicon compounds over circuit boards to protect them from dust, or inserting rubber gaskets between casing parts.

In most settings these tricks would be overkill.

"If you were building these things into a commercial operating system, nobody would care," Binder said.

But in the field even little things can make a difference, such as simple fasteners so personnel can set up or take down a command post in 30 minutes.



Associated Press

Illustrating the demand for computers that will function away from a comfortable office environment is this scene at the U.S. military's Joint Operations Center at Camp As-Sayliyah on the outskirts of Doha, Qatar. The soldiers in the photo, taken earlier this week, were not identified.

"When you buy a system at the store you can take it home, sit down, and scratch your head while you read the instructions all day. If you're a soldier there's no time for that," Binder said.

One of the Pentagon's largest suppliers of heavy-duty laptops is Panasonic Computer Solutions Co., in Secaucus, N.J., which says it expects to sell around \$90 million worth of its Toughbook line of laptop PCs to the US military this year, up from \$9 million in 1999.

Its products are roughly twice as expensive as comparable commercial laptops, but that hasn't held back sales, said Melissa Payton, Panasonic's business-development manager for federal sales.

"Reliability has suddenly become more important to the customer," says Payton.

Recent large orders to Panasonic include one from the Marine Corps, which wanted its Toughbooks painted black, not silver, to take to Afghanistan for what it would only describe as "a

reconnaissance mission," Payton said. The Coast Guard also ordered a special batch designed to resist corrosion. Workers painted the computer cases with a salt-resistant paint, and stuck water-tight extenders over the laptop's serial ports.

Traditionally, military users bought their computers according to strict specifications that were much different than civilian products. But in 1994 the Pentagon formally pressed the armed services to use more "commercial off-the-shelf" parts, to cut costs and to take advantage of rapid advances in private-sector computing power. Now most soldiers' computers carry familiar brand names.

Texas-based Dell Computer Corp., for instance, uses the term "Dell Deployable Solution" for the rugged configurations of its servers, printers and network switches used at locations such as Army airfields in Afghanistan. It also sells a \$100 heavy-duty case for transporting its standard notebook computers.