

Blood Box: Battlefield Life Saver

Kevin Diaz, Star Tribune Washington Bureau Correspondent June 16, 2005

After a deadly battle on an Afghanistan mountaintop three years ago, U.S. military commanders renewed debate on a question that has nagged them for decades: How do you keep blood that's badly needed for combat victims from spoiling in extreme conditions?

Tinkering in his basement near White Bear Lake, retired Minnesota scientist Bill Mayer came up with an idea for thermal-insulated boxes to protect front-line blood supplies from being ruined by the harsh climates of Iraq and Afghanistan.

The Pentagon likes his invention so much that Congress is expected to send Mayer's newly created Plymouth company, Minnesota Thermal Science, \$5 million to develop thousands of blood boxes for soldiers.

The money is part of a \$409 billion defense spending bill the House is scheduled to vote on this week to pay for new weapons systems and ongoing military operations in Iraq and Afghanistan.

The military has historically discouraged bringing blood supplies onto battlefields because it is so difficult to keep supplies from spoiling, especially in desert heat. But Mayer's invention, a

response to a competition sponsored by the military, may change that doctrine and could help save many soldiers' lives.

"I hate to see an 18- or a 19-year-old guy bleeding to death on a battlefield," Mayer said, just because someone "didn't know how to get blood to him."



Bill Mayer
photo by: David Brewster, Star Tribune



George Flora & Bill Mayer
photo by: David Brewster, Star Tribune

Mayer, the 75-year-old retired chairman and chief operating officer of Minneapolis high-tech instrument maker MOCON, does not own a computer. He worked out the mathematical formulas on paper, did some work in his basement, and assembled a team to assess his invention in an environmental test chamber at a local lab.

The result: a new "Golden Hour" container that can keep blood fresh for three days or more under extreme temperatures, replacing the Vietnam-era cardboard and Styrofoam technology that keeps blood at the required 38 to 50 degrees Fahrenheit for about eight hours.

'It's just a box'

Minnesota Thermal Science's Golden Hour technology -a reference to the first hour of injury, when 85 percent of combat deaths occur -is a portable 10-inch square container. It combines insulation similar to that in a store-bought cooler and an internal liquid similar to freezer packs people take on picnics.

"It's not really all that complicated," Mayer said.

Its very simplicity, he said, is probably the reason that larger scientific labs have not already invented it.

"It's not real exciting," Mayer said modestly. "It's just a box."

But it's a box that has the potential to alter military policy against carrying blood far forward into combat.

Field medics have increasingly ignored that rule, particularly in some of the more remote regions of Iraq and Afghanistan, where timely medical evacuations aren't always possible.

"Obviously, medics and soldiers in the field do what they have to do," Victor Macdonald, a physician at Walter Reed Army Medical Center, told the Army News Service. "If they think they need to get blood forward, they will get it forward."

Fierce battle

The Golden Hour box was designed to address the concerns of forward surgical team commanders that arose after a storied March 4, 2002, battle on Roberts Ridge, on a 10,000-foot peak in eastern Afghanistan. It was given that name in tribute to Navy SEAL Neil Roberts, who fell out of a stricken MH-47 Chinook helicopter and was killed by Al-Qaida fighters.

Among six would-be rescuers who died in the 14-hour firefight that followed was Air Force combat pararescue jumper Jason Cunningham, who brought blood supplies with him to the mountain battle, where temperatures plunged to 15 degrees Fahrenheit.

Cunningham's decision is credited with saving the life of at least one severely wounded Army Ranger, although Cunningham himself was wounded and died before help arrived.

"He literally bled to death because of the inability to get a sufficient amount of blood into the theater of operation," said George Flora, president of Minnesota Thermal Science.

Later, Flora said, the Army "put out the mandate to solve this problem."

Invention awarded

In tests run by Walter Reed in 2003, the company's Golden Hour box kept red blood cells good for more than 97 hours at minus 9 degrees Fahrenheit outside. At 105 degrees Fahrenheit, it kept the blood good for more than 78 hours and at room temperature, it lasted 121 hours. The device won the year's Army's Greatest Invention Award.

That same year, Congress earmarked \$1 million to get the Golden Hour box to the military for field testing in the Middle East. The new \$5 million appropriation, aided by two Minnesota congressmen, will move the project from research and development to production.

"We were looking at designing a container that would not require ice, batteries or electricity," said Lt. Col. Francisco Rentas of the Walter Reed Army Institute of Research, which has led the search for a new way to get blood to wounded soldiers. "This technology has decreased blood spoilage and allows blood transfusions far forward in the battlefield."

Until now, getting blood supplies to the battlefield, "was just accepted as one of the things you couldn't do," said Rep. John Kline, R-Minn., a former Marine helicopter pilot who evacuated battle casualties in Vietnam.

"We couldn't believe that the old system of transporting blood was as old as it was," said Rep. Martin Sabo, D-Minn.

Sabo, on the Appropriations Committee, and Kline, on the Armed Services Committee, helped draft the Golden Hour earmark and get it in the defense spending bill.

Already, some investors are thinking about civilian medical applications, such as transporting vaccines and body organs.

According to Flora, the potential market is in the "hundreds of millions."

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