Patriot fiber optics owe much to Kalomiris

by Stephen Larsen

The fiber optic cable assembly allows soldiers to operate Patriot missile launchers from remote locations, thus reducing the risk from incoming artillery and missile fire.

Patriot missiles were successful in repelling Scud missile attacks during Desert Storm thanks in part to fiber optics cable assemblies that were invented at Ft. Monmouth, NJ.

The co-inventors were Vasilios E. Kalomiris, an electrical engineer for the Army Research Development and Engineering Center, and AT&T Bell Laboratories personnel.

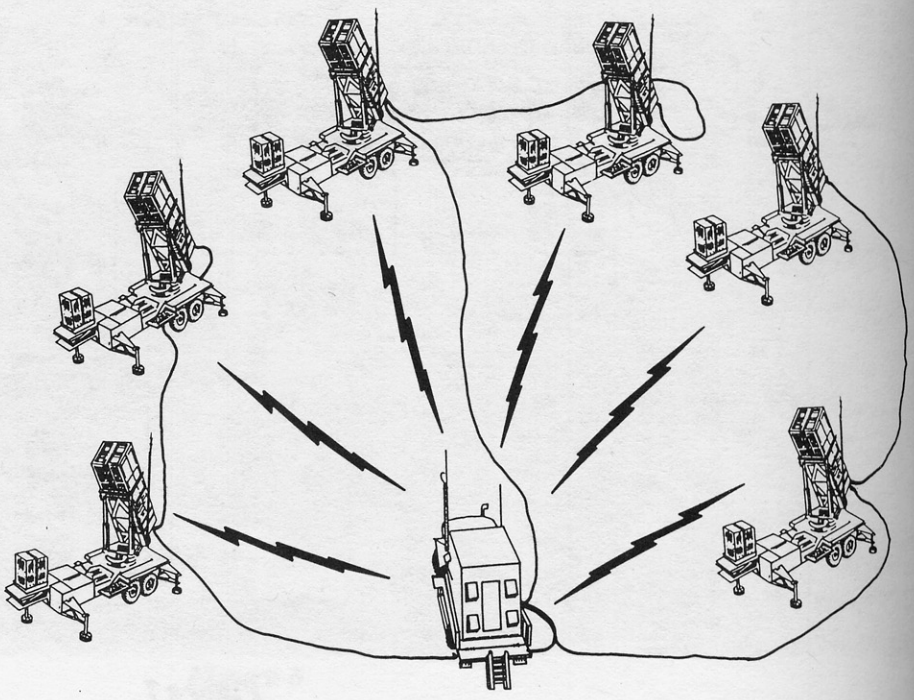
The fiber optic cable assembly—known as the Tactical Fiber Optic Cable Assembly (TFOCA)—allows soldiers to operate Patriot missile launchers from remote locations, thus increasing their chances of surviving incoming artillery and missile fire.

Each Patriot missile battery consists of an engagement control station, usually in a van, from which the incoming missiles are tracked and Patriots are fired, and various launching stations containing the actual Patriot missiles. Previously, very-high frequency (VHF) radio was the primary link between the engagement control station and the launching stations, with a fiber optic link under consideration as a back-up.

"However," said Kalomiris, "the soldiers liked the fiber optic link so much that the fiber optic cable assembly was made the primary link, and the radio became the back-up."

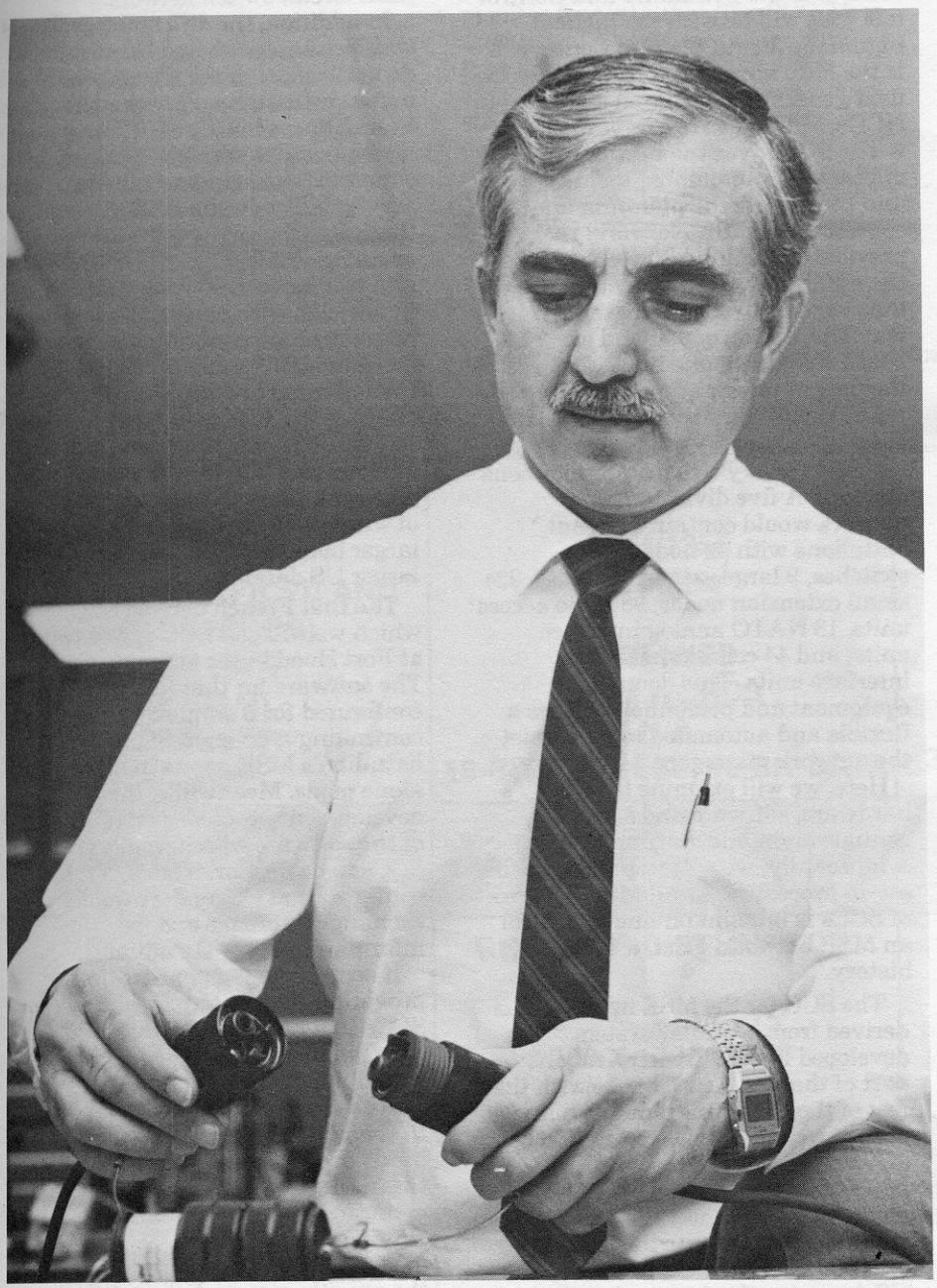
Because the fiber optic cable assembly is completely dielectric (comprised of non-metallic, non-conducting materials), it offers significant advantages to soldiers. It emanates no electro-magnetic signals, and thus can't be picked up by enemy forces attempting to track locations from which Patriot missiles are launched. The dielectric design makes the cable assembly impervious to jamming and electronic countermeasures by the enemy.

Exploratory development on the fiber optics cable assembly was started in 1983, with the objective of replacing twin metallic coaxial cable systems that were previously used for long-haul tactical applications. After a market survey, AT&T was selected as the contractor.



While doing the development work, the Army Communications-Electronics Command's (CECOM) Center for Command, Control, and Communications Systems presented their work to the Project Manager (PM) for the Patriot missile at the Army Missile Command in Huntsville, Alabama. The Patriot project managers liked what they saw and provided funding for prototype cable assemblies.

In 1986, Kalomiris and his people went to White Sands Missile Range, New Mexico, with PM Patriot and Raytheon, the Patriot missile contractor. There, they tested the prototypes by placing them under the plumes of launched missiles. The testing was a success, proving that heat wouldn't destroy the cable assemblies; the system operated before, during and after missile firing.



Vasilios Kalomiris, of the Center for Command, Control, and Communications Systems at the Army Communications-Electronics Command at Fort Monmouth, displays the Tactical Fiber Optic Cable Assembly that he co-invented. The assembly increases the chance that soldiers operating Patriot missile batteries in the Middle East will survive incoming fire (US Army photo by Sam Courlas).

To ensure standarization and interoperability of fiber optic communications—which means the Army, Air Force, and Navy can all use the cable assembly in future tactical systems with no duplication of effort—development of the system was coordinated with the Tri-Service Fiber Optic Coordinating Structure, a group that reports to the Secretary of Defense. This resulted in securing significant funds from the Air Force Development Center in Rome, New York, for the project.

"Fielding of the same product by all services provides logistical advantages and saves money," said Kalomiris. "All services will be able to use the item, and all can stock the same parts, repair kits, and technical manuals."

The fiber optic cable assembly is now in the production phase of its life cycle under the oversight of the Project Manager for Multi-Service Communications Systems (MSCS) at Fort Monmouth.

According to the fiber optic cable assembly's co-inventor, it took less time to develop the system than to patent it: "It took one year to develop, and two-and-a-half years to complete and process the paperwork to patent it," he said.

Work done by engineers and scientists at CECOM's Army Research, Development and Engineering Center has resulted in some 3500 patent awards. Last May, 53 Army inventors were awarded patents for a broad spectrum of technology ranging from permanent magnet circuits with medical applications, to radar devices with military and commercial applications. Two of those patent awards went to Kalomiris—one for the tactical fiber optic cable assembly used in the Patriot missile, and the other for a different fiber optic connector.

Kalomiris, a resident of Holmdel, New Jersey, has worked for the Army for 11 years. He has Bachelors of Arts and Science degrees in Math and Electrical Engineering from New York University (NYU); a Masters of Science in Electrical Engineering from NYU; and a Masters of Business Administration from Fairleigh Dickinson University.

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