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Nothing “Sheepish” About Fire-Safe Fabrics

After a recent announcement prohibiting leathernecks from wearing certain polyester and nylon clothing on forward operating bases and camps in Iraq, Marine Corps Systems Command’s Infantry Combat Equipment (ICE) section and commercial manufacturers have taken the initiative to develop flame-resistant, high performance apparel for deployed troops at risk of fire danger.

Recently released MARADMIN 252/06 describes MARCORSYSCOM’s newest ICE program, which addresses the Marines’ need for protection against burn injuries associated with improvised explosive devices and other similar devices. This program, called Flame Resistant Organizational Gear (FROG), is currently in the research and development phase and is targeted at identifying “items that can be worn with the Marine Corps combat utility uniform (MCCUU) to eliminate or reduce the severity of flame induced burn injuries.”

When exposed to extreme heat and flames, clothing containing some synthetic materials, like polyester, will melt and can fuse to the skin. This essentially creates a second skin and can lead to horrific, disfiguring burns, said Navy Captain Lynn E. Welling, First Marine Logistics Group head surgeon, in an American Sheep Industry (ASI) interview.

“Burns can kill you and they’re horribly disfiguring. If you’re throwing [a melted synthetic material] on top of a burn, basically you have a bad burn with a bunch of plastic melting into your skin,” said Welling. “In Iraq, hidden explosives [which trigger fires] are the No. 1 killer of servicemembers.”

According to Daniel Fitzgerald, ICE program manager, the armor that Marines wear over their uniforms is as important, if not more important, than their base layer.

“The Interceptor system [an outer tactical vest with small arms protective plate inserts or SAPI plates] has been proven in lab tests to protect Marines. If you look at [lab test] videos, flame damage doesn’t penetrate the armor,” said Fitzgerald. “The key is the outer garment.”

Preliminary tests confirm Fitzgerald’s assertion and indicate that the burn and melt hazard from synthetic undergarments is low in areas covered by a ballistic vest.

ICE section officials have been testing the next-generation Interceptor system, the Modular Tactical Vest, but are closely guarding specifics about the prototype vest's design.

"Basically, the vest is going to address a few issues that we have received via the Marine Corps Center for Lessons Learned," said Fitzgerald. "It will have better supportability, better load-carrying capabilities, integration of the side SAPI carriers and an integrated communication-gear wiring system."

Fitzgerald also said the vest will have a new load-bearing weight distribution set-up, effectively reducing strain on the back, and quick release points so Marines can immediately remove the vest in water or casualty situations.

"We have 98 Marines right now in North Carolina doing marches, going through combat town and shooting in the vest," said Fitzgerald. "Marines are going to start seeing the next-generation personal ballistic protection out there soon."

ICE researchers are working to incrementally create more effective, safer gear. While the current MCCUU and vest inherently provide a certain degree of fire protection, John Hernandez, FROG project officer, said Marines can further enhance their safety by tucking in their blouses, blousing their boots and buttoning up their collars.

Hernandez and his team are currently testing base-layer improvements like flame-resistant balaclavas and neck gaiters, and already have released 60,000 fire-resistant combat gloves to Marines in the field.

Fitzgerald said the next challenge is developing a self-extinguishing outer layer of protection that's light enough for Marines to operate in effectively "every time they go outside the wire."

"We know that Nomex® works in the flight community … but it's too hot, does not breathe well and lacks durability. It is very difficult to operate in extreme temperatures wearing Nomex," said Fitzgerald. "We have to give Marines something comfortable that they're going to want to wear."

According to ASI, sheep may be the solution. Wool is a natural, high-performance fiber and an unparalleled replacement to synthetic garments. The innate characteristics of wool provide the superior protection required by troops in the field. Wool naturally resists flames, and it also provides comfort because, by design, wool absorbs moisture from the Marine's body. Wool products are far different and diverse from the heavy sweaters of yesteryear. With better processing technology, fiber blending and the use of proper wool types, today's wool fabrics can be as light as lace or tough, fire-retardant fabrics.

The ASI Association's Wool Council, along with select partners, has been proactive in developing high-tech wool products that offer protection and comfort to military personnel. An enzyme-treated wool fabric is already being worn by soldiers and airmen, and a wear test with the Marine Corps is pending on a wool/Nomex blend. These fabrics are fire-retardant and comfortable, as well as cost-effective.

"We are excited about the new products we have developed to protect our soldiers when exposed to fire dangers and to keep them ready for action," said Rita Kourlis Samuelson, director of wool marketing for ASI. "Due to the advancements in textiles, the Wool Council has developed washable wool underwear that meet military criteria, durable socks which wick away moisture and fire-retardant fabrics."