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Drum magazine developed by Center engineer becomes Army standard

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After Soldiers have spent a long hard day out on maneuvers or on patrol in Iraq or Afghanistan, the last thing they want to do is go to the ASP (Ammunition Supply Point) or BLAHA (Basic Load Ammunition Holding Area) to return ammunition carried during the day.

Quite often that ammunition is left in vehicles, placed in arms rooms or even placed in living quarters — all of which are safety and security violations. The ammunition is not returned to safe and secure storage areas because of the distance and time required to complete the turn-in process, especially when the convoy escorts or units returning from patrols will need the same ammunition the next day or even later in the same day.

Now there is an Army-approved standard for 40 mm ammunition storage thanks to Dr. Michelle Crull, a structural engineer in the Advanced Technology Branch, Engineering Directorate, U.S. Army Engineering and Support Center, Huntsville, and Greg Heles, a logistics management specialist with the U.S. Army Technical Center for Explosives Safety, Defense Ammunition Center, McAlester, Okla.

Headquarters, Coalition Forces Land Component Command (CFLCC), asked the U.S. Army Technical Center for Explosives Safety to develop temporary storage of 40 mm linked grenades for the MK 19 grenade launcher.

"This project originated because Soldiers asked some questions in the field," Crull said. Those questions led to conversations between Huntsville Center, Defense Ammunition Center and the Department of Defense Explosives Safety Board.

"There was a need to store linked 40 mm grenade cartridges in a real estate deficient location," Heles said. "Standard solutions would not apply in this case. We needed a solution that would use minimum real estate; would be convenient to use because if it isn't convenient, it won't be used; and constructed using easy to obtain materials in theater."

Crull, with the assistance of Heles, and with this design criteria in mind was instrumental in designing a storage solution for this linked 40 mm ammunition. And with the cooperative efforts of all three organizations, the process was greatly shortened.

"We started working on this in June 2007. I worked directly with USATCES from the beginning," Crull said. "Normally explosive safety designs are submitted through an organization's safety chain. In this case because I was working directly with USATCES, they were able to send it directly to the DoD Explosives Safety Board for review and approval. We received approval from the DDESB in November 2007. It took six months almost to the day."

Although it sounds like it was easy to develop a solution, it wasn't. The first concept developed and sent to the field was rejected.

"It was based on false information about the equipment available in the field," Crull said. "We had to ask a lot of questions to come up with a concept they could build." Crull developed an inexpensive solution that used materials available in any deployment environment. The design uses a 55-gallon drum, hence the name drum magazine, placed on its side and covered with two feet of dirt or sandbags. A 24-inch diameter corrugated steel pipe could be used in lieu of the 55–gallon drum. The concept behind this design is that the two feet of cover will stop any fragmentation generated by an explosives accident from escaping out the back, sides or top. Fragments that exit out the front would be controlled by orienting the front of the magazine toward uninhabitable terrain such as a mountain side or out to sea from a beach.

If the drum magazine cannot be oriented toward uninhabitable terrain and there is a possibility that personnel might be "downrange" of the front of the drum magazine, then a front barricade is necessary.

The storage of one case of 40 mm grenades normally requires a safety separation of 200 feet in all directions. By constructing and using this specialized drum magazine, the required safety distances can be reduced to as little as 69 feet in all directions, a savings of almost two thirds the required distance.

This design standard has Army and DDESB approval allowing it to be used on any Army site to provide reduced quantity distance storage for small amounts of 40 mm linked grenades. Since it has DDESB approval, any other service can opt to approve it for use on any of their sites.

The final outcome of the project was a positive experience for both Crull and Heles.

"I love to work on projects that require thinking outside the box like this one did," Crull said. "It's always good to feel that I've helped solve an issue for the Soldiers."

Heles agrees. "The small details of crossing every T and dotting every I aren't fun, but the concept phase is (what about this solution … that won't work … what about this … what if I turn it 90 degrees); and the writing/reviewing the analysis is fun. I expect there will be other cooperations between our respective organizations in the future."

Cutline -- This is an artist's rendering of a 55-gallon drum storage unit for 40 mm ammunition. This new Army standard for ammunition storage was developed by Huntsville Center engineer Dr. Michelle Crull.

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