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The ability to locate unexploded ordnance remotely and accurately increases the safety and efficiency of clearance efforts. To achieve maximum effectiveness, UXO manufacturers and removal groups should coordinate resources and information to create new and practical technologies to assist in efforts to identify failure rates and prevent civilian casualties. The Lost Puppy Proposal is one example of a life-saving technology that could result from such collaboration.

by Jack Imber [Imber Demining International]

Long-term danger from unexploded ordnance is a major concern for our generation and future generations. As war and military training continues, the number of munitions used increases, resulting in increased UXO contamination. As new ordnance is deployed, mine action companies will likely fall even further behind in clearance efforts, leading to more threats from explosive remnants of war to civilians and a further reduction in useable land.

ERW causes casualties and prevents land usage long after war is over. For example, in the 32 years (1975–2007) following the end of the Vietnam War, the Ministry of Labor, Invalids and Social Affairs in Vietnam reported that landmine and ERW-related incidents killed 38,849 people and injured 65,852 in Vietnam.[1,2] The total number remains unknown, due to the absence of a nationwide casualty-data collection system. According to the *Landmine and Cluster Munition Monitor*, in 2011 there were 31 reported casualties (14 killed/17 injured) and in 2010, there were 42 casualties (8 killed/34 injured).[2]

These casualties are reminders that ordnance life cycles do not always end at military deployment. If ordnance fails to explode as planned against military targets, it may later explode on civilian or explosive ordnance disposal contact, resulting in noncombatant casualties.

Contemporary civilian mine-clearance initiatives began in the late 1990s, in part with MAG's (Mine Advisory Group) survey efforts in Afghanistan after Soviet withdrawal.[3] Only recently has traditional thought involving the use and subsequent failures of deployed ordnance shifted. Since UXO decay leaves behind explosive, chemical, biological and/or nuclear hazards, as well as heavy metal residue, failed ordnance is considered hazardous waste.[4]

Ordnance manufacturers have not been held accountable like other manufacturers that produce hazardous waste. Ordnance consumers—militaries and nation states—bear responsibility for failed ordnance if they are used contrary to the specifications for the product given by the manufacturer. However, if munitions are used in line with the manufacturer's specifications, and their failure rates are higher in the field than in testing, the manufacturer should be held accountable. At this point, there is no accurate recording of actual failure rates in the field, and thus this reality is not clearly known.

As any failure may result in post-conflict civilian casualties, even "acceptable" rates that are within the purchase specifications require swift and effective remediation. The absence of sufficient recording of field failure rates has contributed to the largely undocumented deployment of ordnance globally over the last century. In addition munitions have been dumped or abandoned following conflict. This points to the reality that current methods of location, identification and disposal must evolve in order to progress toward efficient land clearance.

Collaboration Across Sectors

The primary goal of a weapons manufacturer is efficiency: Munitions should be safe for the handler and do what they are supposed to do with minimal failure rates. Exact failure rates in real world conditions, historically and currently, are largely unknown. The results seen in testing ordnance are significantly better than the wide variance seen in actual field rates. Where this is not the result of variant factors in the field, UXO contamination remains from ordnance that failed to perform to standard, that is, failed to explode as intended.

Ordnance manufacturers need to know overall failure rates in the field, beyond the limits of their testing. Subsequent reporting of clearance efforts is one of the only ways manufacturers/users can verify failure rates. Knowing these failure rates will help manufacturers improve their product, and eventually reduce these rates. As a result, cooperation between manufacturers and UXO-clearance companies is the next logical step to achieving increased efficiency and safety.

Manufacturers and clearance companies are related by their work with ordnance. The absence of manufacturers in the clearance process is problematic and contributes to contamination challenges today. Collaboration between ordnance manufacturers and clearance firms may lead to the following outcomes, which would benefit all parties involved:

1. Decreased failure rates and thus increased effectiveness
2. Increased safety protocols for handlers and remediation teams
3. Limited hazardous waste from failed ordnance
4. Decreased casualties from failed ordnance
5. Increased avenues to analyze effectiveness of copycat munitions systems not subject under law to the same scrutiny as original models
6. Decreased long-term expenses, as clean-up time and effort would be greatly reduced

Assorted unexploded ordnance. What are they? What lies beneath them?
Photo courtesy of the author.

Manufacturers and clearance personnel have been engaged in dialogue while attending various conferences. By attending each other's conferences, understanding of perspectives will improve and may develop into effective and collaborative clearance strategies beneficial to all affected parties. By expanding existing technologies and collaborating in clearance efforts, ordnance manufacturers and UXO-clearance personnel may make a post-conflict country safer within a matter of months rather than several decades.

Lost Puppy Proposal

A potential solution that may effectively address the inability of manufacturers to detect failure rates and facilitate clean-up efforts is a theoretical concept referred to as the Lost Puppy Proposal. To facilitate the collection of failed ordnance, or "lost puppies," a radio-frequency identification microchip would be placed in both the ordnance and the fuze at the time of manufacture. After deployment of the ordnance, personnel would be able to locate the chip from a distance within any UXO with a compatible detector. The detector receives a numbered code from the chip, which corresponds to information in a secured database that identifies the item for the UXO technician and suggests how best to deactivate it. Similarly, most commercial explosives are required to have "taggets" or other labeling processes so that origins of explosives may be identified when used in commission of a crime. Even if involved military or national actors would not agree to share render-safe procedures with appointed clearance teams, the tool would still be useful as it would significantly ease efforts to locate UXO and would facilitate UXO identification and the calculation of failure rates.

Potentially, manufacturers would adopt this procedure once their customers—i.e., nation states—require it. This proposal's implementation is dependent upon the collaboration and cooperation between manufacturers, state actors and UXO-clearance technicians. The specific process, technology and databases will evolve through needed communication and understanding of the processes required in each field.

Accountability, responsibility and profitability will be key components of the process:

1. Accountability: identifying ordnance that failed to function, tracking transfers, identifying unused stockpiles of munitions
2. Responsibility: following international humanitarian laws, preventing hazardous waste in the environment, clearing post-conflict countries
3. Profitability: developing more efficient technologies, reducing ordnance failure rates, increasing efficiency and decreasing cost of clearance

Operation Lost Puppy Proposal—Maximum Accountability of Explosives (MAX).
Drawing and photo courtesy of Julie Pollock.

The increased cost of production to implement this procedure is transferred directly to the customer, as are all costs of manufacturing. Controlled testing of a prototype technology is the best way to prove the economic viability of this process. Once developed, increasing the volume will decrease the cost. Additionally, as this technology will significantly ease clean up, it will pay for itself many times over through the reduced need for surveys, EOD clearance teams, victim assistance, mine risk education, etc.

As the ordnance consumer becomes familiar with these new protocols of cooperation, certain advantages could be gained from tactical and safety perspectives. For example, with the proposed radio detection chip and the correct detector, quickly assessing the contamination level of a carpet-bombed battlefield of cluster munitions would be possible before sending in a military unit. Statistically, individual bomblets have extremely high failure rates and create a situation similar to scatterable landmines. Another advantage of the proposal is that EOD units responding to improvised explosive devices may be able to remotely locate and identify a piece of ordnance used as the main charge of a booby trap, a major safety advantage.

Using this protocol, which enables clearance teams to gather failure rates and facilitates clearance, the military can discover which ordnance companies deliver the best performing products. This information will help determine who will obtain contracts and ultimately who will assist the military in performing its operations efficiently. The collaboration between ordnance manufacturers and UXO clearance personnel can help all parties reach goals with greater efficiency and, more importantly, save innocent lives.

Where We Are Today

The Lost Puppy Proposal is very timely. Recent advances in microships with radio-frequency technologies, to aid in post-deployment detection, may be suitable for installation in newly manufactured ordnance. The microchip currently is used for inventory of ordnance and nuclear-facility equipment. The technology used in the microchip and detection system has been promoted as explosive- and fuze-safe. It can be easily detected at length through metal and water, should withstand the rigors of deployment and can pass the very crucial Hazards of Electromagnetic Radiation to Ordnance (HERO) standards.[5] Including microchip technology in munitions could contribute to

1. Quickly locating failed and hazardous weapons in the field
2. Identifying UXO items before excavation begins
3. Efficiently eliminating harm to civilian populations

UXO professionals worldwide acknowledge the concept of Lost Puppy as a possible and viable solution. It was presented at the 2011 Parari ordnance conference centered on safety in Brisbane, Australia, to ordnance manufacturers and those involved in UXO remediation.[6] While questions remain about the implementation of such protocol, the consensus at this conference was overwhelmingly positive for the need of a similar solution and for dialogue between related industries.

See endnotes page 65.

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