editorial

As Mines Grow Old

Once the wooden casing has rotted, the Russian PMD-6 can no longer function as intended.
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In most cases, the mines being cleared around the world were emplaced decades ago; yet the techniques and equipment being used during clearance treat them as though they were new. The author looks briefly at the effects of ageing on mines and considers possible implications.

by Colin King [C. King Associates, Ltd.]

In the early 1990s, humanitarian mine action rose to prominence under a media spotlight, largely fuelled by sensational revelations on the scale and nature of the global landmine problem. Among these was the mines' supposedly indefinite life span, along with the implication that each and every mine would eventually need to be cleared.

The plastic anti-personnel mine was the focus of attention and has become such a powerful stereotype that the many other types are largely ignored. The media—along with a number of technical authorities who should have known better—created an image of a weapon that was both indestructible and undetectable. Yet, it has long been understood that time and environment take a toll on munitions, that a substantial proportion of mines are not made from plastic, and that most plastics degrade under certain conditions anyway.

In the mid 1980s—well before the term "humanitarian demining" was coined—the British Army was struggling with the aftermath of the mines remaining from the Falklands War. Steel-cased anti-tank mines were visible on the tidal beaches of Yorke Bay, where the salt water soon rendered them incapable of being defuzed safely. Meanwhile, a number of plastic mines were found to have split open, presumably through the action of the infamous extreme weather.

Let Sleeping Mines Lie?

The question was (and is): Were these mines still capable of functioning? If not, is it possible that entire categories of mines may, at some point, become less dangerous or even harmless? Surely even the remotest possibility should have justified diverting a proportion of the extensive research and development effort in order to establish the facts.

The understandably conservative attitude toward safety means that deteriorated ammunition is generally presumed to be less stable than serviceable ordnance. This view is reinforced by a few specific examples (such as the tendency of certain explosives to form highly sensitive secondary compounds) and the explosive-ordnance disposal principle: when in doubt, assume the worst.

The truth is that there has been very little formal research into the effects of ageing on mines and other types of ordnance. There are many instances in which it would be difficult or foolhardy to second-guess how a munition may change, and there are many environmental factors and other variables that might prove critical. But while the issue is largely unexplored, there are already several examples that demonstrate the potential rewards of further investigation.

Steel Components

Perhaps the most predictable ageing effect is that ferrous components will eventually rust if exposed to water and air. Where spring-loaded fuze components are involved, the critical issue is whether the mechanism will become more liable to actuation through the failure of a component (such as a retaining pin), or seize and become completely inoperative.

In the case of a simple mechanism, such as the MUV fuze,[1] the latter appears more likely. Combined with the likelihood of foreign material ingress (such as fine silt) around the spring and in front of the striker, long-buried and heavily corroded mechanisms of this sort are rarely viable. That does not make them safe, of course, but it does mean they are unlikely to function as intended and may make them more vulnerable to certain countermeasures.

If a steel-cased mine becomes badly rusted, it may lose its structural integrity altogether. This may, in turn, disable a fuze mechanism that relies on the support of the casing. The main explosive charge may also begin to crumble into the surrounding soil, the consequent loss of confinement making the complete detonation of a cast TNT charge far less likely.

Those mines on the beach in the Falklands combine all of these elements, further heightened by the presence of fine sand, salt water and extreme temperatures, all of which will accelerate their deterioration. As a result, it is almost inconceivable that any of these mines are now functional. That may not be good enough to declare the area safe, but it should at least be a factor in the prioritisation of work and allocation of resources.

Tripwires

Contrary to popular myth, all tripwire-activated mines are issued with metallic tripwire; the use of fishing line and other cords being a relatively rare form of improvisation. With certain exceptions (such as former Yugoslav tripwire, which is plastic-coated, multistrand stainless steel), most tripwire is soft iron or mild steel and therefore liable to rust.

In hot, wet climates, then, the threat from tripwires is likely to disappear within a few years. The HALO Trust, which has worked in Cambodia since 1992, has seen no functional tripwires at all in recent years; with this threat eliminated, they have started to employ handheld brush cutters to clear vegetation, significantly increasing productivity as a result.

Wooden-cased Mines

Many of the early post-war mines were wooden-cased, with common examples (such as the Russian PMD-6[1]) still found in about 30 countries. With so many mine-affected regions being tropical or sub-tropical, it is not surprising that wooden casings tend to rot. Perhaps less obvious is the influence of insects, such as termites, which also attack the wood. In most examples, the wooden casing not only contains the charge, but also activates the fuze when the hinged lid is depressed. If the lid is absent or completely rotten, this mechanism is disabled.

Steel-cased mines like this Russian TM-46 are vulnerable to rust in wet conditions.

Stake mines generally end up laying on the ground once the stake has rotted. Most ferrous tripwire doesn't last long, either.

The vulnerability of wood is also relevant to simple fragmentation mines, which are normally placed on short wooden stakes. Once these stakes have rotted away, the mines fall to the ground. The mine body is no longer upright and anchored, so the tripwire (if still present) will not function reliably. It is also far safer and easier to demolish the mine once it is laying on the ground.

Plastic Mines

As the world agonised over the indefinite lifespan of plastic mines, few people paused to consider the many different types of plastic used and the potential effects of degradation. A worrisome development occurred during the clean-up operation following the First Gulf War, when there were reports of Czech PT Mi-Ba-III[1] anti-tank mines exploding spontaneously due to the degradation of plastic fuze components.

Some fatalities were attributed to that problem, further reinforcing the impression that degradation equates to instability, and therefore danger. While this may be true of mines like the PT Mi-Ba-III with spring-loaded strikers retained by a brittle plastic shear mechanism, this is not always the case. As with a metallic mine, the breakdown of a plastic casing will normally be a good thing, so long as the fuze retains its integrity.

The deterioration of plastic fuze components can also have positive effects. The Italian VS-50 and TS-50 anti-personnel mines,[1] copied by Iran and found throughout the world, are notorious for their resilient casing. However, the ingenious blast-resistant mechanism incorporates a small inflatable bladder that perishes with prolonged exposure to hot weather. Neither fuze will then function fully as intended, the VS-50 losing its blast resistance and the TS-50 effectively being neutralised altogether.

Conclusion

Findings like these are clearly significant to demining programmes, where equipment selection and procedures should take account of changing mine characteristics. Particularly startling is the prospect that some mined areas might already be safe, while others of low priority could possibly be fenced and abandoned for a number of years to gradually self-neutralise. Certification of this ground might then be more akin to area reduction[2] than to full-scale clearance.

Furthermore, if the effects of ageing were better understood, it might be possible to deliberately accelerate the process. Other benefits might include the development and deployment of clearance equipment designed to exploit the mine's vulnerability. For example, the deterioration of a casing may lead to easily detectable explosive contamination in the surrounding area.

In summary, the deterioration of munitions, traditionally regarded with fear and suspicion, may have the potential to revolutionise our approach to humanitarian mine clearance. At the very least, it should be a major factor in the prioritisation of work. Given the existing evidence, it seems foolish to ignore the possibilities.

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Colin King, an EOD consultant, served 14 years in the British Army, mostly in EOD, including operations in the Falklands, Persian Gulf, Bosnia and Kosovo; he also led the first British team to train Afghan deminers. He was an instructor at the British EOD School, and spent six years as an EOD intelligence analyst before his final tour with the Gurkhas and starting his consultancy. King also writes two reference yearbooks, *Mines and Mine Clearance* and *Explosive Ordnance Disposal*, for Jane's Information Group.

Colin King
C. King Associates, Ltd.
Wych Warren House
Forest Row
East Sussex RH18 5LF / England
Tel: +44 1342 826 363
Fax: +44 1342 825 961
E-mail: ck@ckingassociates.co.uk
Web site: www.ckingassociates.co.uk