Driving the HD Machine in the African Bush

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Driving the HD Machine in the African Bush

Almost every country in Southern Africa has a mine problem and most of these countries have a tradition of solving their own problems. Because the region is famous for its mine-resistant vehicles, this paper concentrates on some of the innovative mechanical technologies — but it could just as easily have concentrated on PPE or testing facilities where Southern Africa also leads the way.

by Andy Smith, AVS Mine Action Consultants

R&D in Southern Africa

If you measure research and development (R&D) success by the presence of the equipment somewhere in the field, then a lot of useless equipment can be called a “success.” This is because those who supported the R&D want us to be able to claim “success” so they “give” equipment to field users. Sometimes this is a direct gift, sometimes it is formally a “loan” or it is tied to further funding. This equipment would often be wholly uneconomic for the users to buy — because it is far too limited to justify the expense. Sometimes it is not even wanted, but “political” concern leads to it being accepted. If you measure R&D success in terms of the equipment being purchased and used around the world, the number of R&D successes falls dramatically. Moreover, most of the R&D that has achieved this success was “homegrown.” It did not originate in the ivory towers and defence research centers of the developed world. Most of it was also very limited. Often it was the result of inspired lateral thinking that led to improving existing technology and methods.

The most famous — and successful — mechanical mine-detection system was the Pookie, developed in Zimbabwe (then Rhodesia). Unfortunately it was only good at locating large steel- or steel-cased mines recently buried on roads, but that was what it was designed to do and it saved many lives. With its low-weight, “V”-shaped, sacrificial wheels and high-frequency VHF detector, it was truly revolutionary in the 1970s.

Mechanical Assistance

When looking for more sophisticated mines laid a long time before they are cleared, the use of machines had to change. Old minefields in many parts of the world tend to be overgrown, and the vegetation must be cut to allow...
Vegetation Mulchers (Flails)

Cutting (as opposed to "crushing") minefield vegetation was probably started by MgM in Angola but may have been led by Leonard Kawinski's side-mulching tractor in Cambodia, which he came up with at about the same time. In both cases, commercially available off-the-shelf technology was adapted to the purpose. MgM uses the brush-cutting technology available to South African ranchers to mulch the lighter undergrowth in advance of their deminers. They mounted their mulcher on a blast-resistant vehicle which made it much more versatile. Contact: Hendrik Ehlers, Director MgM at ehlers@MgM.org.

Firsts for Africa

- Steel wheels
- Vegetation mulchers on mine-proof vehicles
- Locally made Monster-flail
- Tree shears on mine-resistant vehicle
- Mini-mulcher
- Mini-mulcher processing ground

Mini-Mulch Flail—A locally made monster that was far cheaper to make than any commercially available alternative.

The Hydraflail and Autobhrick flails into their Angola operations in the mid-1990s. They are still apparently operating, although often out of service in a country where logistical support can be tricky.

NPA claims that ground "cleared" with their flails is always covered by a full follow-up with another method (manual or dog). PAD (formerly UNADP) in Mozambique have had a military flail from Finland for several years. It also spends a lot of time unused while the technicians wait for spare parts.

With full follow-up required, the performance and the cost effectiveness of ground-engaging flails has long been questioned. Safety is another issue.

Ground-engaging flails do not clear the ground and so in humanitarian demining a full follow-up is always required. The total cost of running the flail must then be added to the cost of the manual clearance, which makes their use prohibitively expensive compared to other methods.

Large flails do have the advantage of being able to "chew" through big trees, but they have the disadvantage of disrupting the ground, destroying any mine pattern there may have been and leaving damaging mines and ordnance behind.

MineTech has been using a long-chain flail for vegetation cutting since the mid 1990s when they recognized the value of cutting the vegetation in advance of deminers. They made their machine because the cost of the most resistant flails sold commercially was far too high. The MineTech flail could hit the ground, but it is not deployed in that mode.

Locally made also means that the parts required for service and maintenance are available locally which keeps "down-time" to a minimum. If the user relies on the machines, designers should remember that the mean time-to-repair can be far more important than the mean time between breakdowns. Contact: minechfl@mimentech.co.tz

Tree Shears

MgM has a solution to the problem of large trees that make it hard to use their mulchers. They use a tree-sher, which is simpler and cheaper, leaving no carpet of cuttings or fallen trees for the deminers to negotiate. Contact Hans Georg Kruissen on mgmmiz@europe.com.

A long-chanied flail is often much bigger than is needed. Mulchers on extending arms mounted on mine-proof vehicles are smaller, more controllable and less destructive—but the mine-proof vehicle adds a lot to their cost. Back in 1996 it was recognised that the cutting head could be compact enough to allow its carrier to be very small and lightweight—especially if it were radio-controlled so that lighter arms could be used. I devised such a machine to meet MineTech's needs, but the donors were more interested in funding mini-flails that hit the ground.

Mini-flails such as the Boeau in Croatia are effective at cutting vegetation, but they also need mines, break mines, bury ordnance and cost a lot to hit and maintain.

Mini-Mulchers

Last year, MgM began to develop a mini-mulcher in Namibia, and it successfully underwent its first trials at the end of May this year. Contact Scott@pmgen.org.

The MgM Mini-Mulcher is much bigger than the machine planned in 1996, but is a major step in the right direction.

Other Ground Processing

Apart from Monster flails, a range of ground processing machinery has been tried in Africa. In Namibia, the ill-favoured Brem-Processor proved impossible to deploy over rough terrain. In Mozambique, the Krohn system failed to perform as designed. In Zimbabwe, the ground-milling MineBuster was used with controversy.
Techology's Promises

Every technology under development makes big promises. Here are five projects that may someday impact the world of mine action.

by J.J. Scott, MAIC

Introduction

Peruse any brochure or website that promotes a developing technology and there is one word that will come up repeatedly: promise. Every new gadget promises to vastly improve, simplify or otherwise revolutionize some aspect of modern life, and the products aimed at mine action practitioners are no different. Each promises to make demining quicker, easier, safer or cheaper, and each breakthrough promises to be more earth shattering than the last. I looked into a variety of devices that promise to have an impact on some aspect of mine action, from new mine-detecting sensors to new types of landmines—even a potential landmine substitute. These projects vary widely in their goals, budgets and feasibility, but all share one common bond: if fed enough money, each promises to forever alter the practice of mine action.

Fido

Dogs are superb at detecting landmines. Their noses are some of the most sensitive detection devices ever created. That is, until they get tired. Or sick. Or just get too hot outside. All case dogs' effectiveness to drop rapidly. Dogs also tend to lose interest in demining as the day wears on, which is an inevitable though particularly dangerous consequence of their assigned task. How might one retain the mine-sniffing benefits of dogs while negating their shortcomings? Nomadics, Inc., with funding from the U.S. Army, is developing a vapor-detecting sensor they call "Fido" that promises to do its mine-sniffing as effectively as a dog but will never get tired, never get sick, never get bored and never get feets.

Ried Mr. John Sikes of Nomadics about his company's aptly named device, its developmental process and its promises for the future of landmine detection.

I can't explain exactly how Fido works, for doing so would require me to accurately use words like "collimator," "bore-sighted," and "penetropics," which I am not prepared to do. However, thanks to Mr. Sikes, I am able to explain what Fido does now and what it might do someday. It turns out that Fido doesn't specifically detect landmines at all. As a vapor detector, it alerts its user to the presence of trace amounts of chemicals such as TNT—which happens to be the most common explosive used in landmines. Fido is by far the most sensitive detector yet tested, capable of discerning units femtogram (that's 10^-15 or 0.000000000000001 grams) of TNT vapor in a millionth of air. According to the company's website, that is equivalent to one drop of fluid in 25 Exxon Valdes-sized tankers. Mr. Sikes said that at this level, "If the best days under the conditions we're up there with dogs." This is quite an achievement, but Nomadics hopes to push Fido even harder, until the device can detect one attogram (10^-21 grams) of matter. At that point, dogs might be able to go back to fetching sticks and lying in the sun all day, leaving the mine detection to sensors and the detectors that use them.

Looking ahead to this inevitable day, I asked Mr. Sikes about the miniaturization prospects for Fido. After all, who wants to carry around a sensor device that is heavier or more awkward than it needs to be? Mr. Sikes believes his company "can get the basic technology down to about a cigarette pack size, roughly a pound or so." Technical problems are not holding them back, he explained, adding, "We probably wouldn't even need to do any custom electronics, just more of a concentrated effort, but we don't really have the funding for that right now..."

As Mr. Sikes puts it, "The problem is that the people who need our technologies the most are going to be able to afford it the least." Obtaining funds is an all too common problem among inventors and developers, leaving projects to fallow until a bit of seed money allows their promises to bloom.

But let us return from this digression to the task at hand: identifying promising technologies. Fido looks like it will be a useful addition to deminers' toolboxes someday, as the basic technology is sound and operable. Mr. Sikes foresees an area-reduction role for Fido, de-claring, "That's the great thing about this system: it can tell you where the mines are not, so farmers can get back to work in a day..." and other redevelopment projects can get started. Further development (as permitted by funding) will lead to smaller, harder and more sensitive detectors of the device. Nomadics is currently designing standard handheld detectors using their technology, but that's not all they are planning. Fido happens to be just the kind of sensor device needed by two other developing technologies: remote explosive detection and robotic

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Biography

Andy Smith is an independent Mine Action specialist who has worked extensively in Africa during the last 10 years.

* All photos courtesy of the author except the Mine Maker, courtesy of Michael Ebner, MgM.