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D-MINE Training System: Safer and More Efficient Training Aid for Manual Deminers

by Hans L. Johnsson [Arne Nordstroms Mechanical Inc.]

D-MINE™ is a training system that organizations can utilize to simulate situations deminers will actually face in the field. It has proven to be an effective and efficient means of preparing deminers both technically and mentally before they encounter any real mines.

In 2005, when Göran Jysky, Bo Thunström and Arne Nordström visited the Swedish Army's EOD and Demining Centre in Eksjö, Sweden, they realized something important was missing from the manual deminers' training. The trainers needed an efficient, modern training device capable of organizing feedback from trainees in the field, especially their success/failure rates, in order to measure the effectiveness of their real-time training.

After contacting other leading demining organizations, Jysky and Thunström discovered that every training camp faced the same dilemma. Measuring the real results of the trainees' skills through surveying and charting was difficult and time-consuming. If a technology existed to perform this task quickly and easily, however, these demining organizations could keep a high level of skilled trainees while simultaneously reducing trainer numbers.

The necessary technology would:

- Be easy and safe (for safety reasons, gunpowder and smoke signals were not included in the development or construction of this new training system)
- Produce measureable results
- Be robust
- Contain minimal metal amounts
- Behave realistically
- Be modern (e.g., wireless, digital electronic-signal system)

So, in close consultation with the training staff at SWEDEC and the Azerbaijan National Agency for Mine Action, and following intensive testing, the D-MINE Training System was developed by Arne Nordstroms Mechanical Inc. around the specified parameters. Today, a number of militaries and demining organizations, including the Norwegian Army, the Swedish EOD and Demining Centre, and ANAMA, use the system in manual demining courses for their own staff and for trainees from many different countries. Trainees practice with D-MINE before embarking on their demining missions to feel more secure and mentally prepared for the important tasks in the real minefields. For example, Elnur Gasimov, the Division Leader at ANAMA Training, Survey and Quality Control Division, describes his organization's training method: "We use our D-MINE sets to prepare a realistic-looking demining work line in a safe area for a deminer to work inside." ANAMA uses this equipment not just for training, but also for testing the present field personnel from deminer up to site supervisor.

How Does D-MINE Work?

Every D-MINE kit contains 10 training mines, a control panel, tripod, a heavy-duty transport case, battery charger,

The complete D-MINE Training system.
All photos courtesy of Chris Ericson

The D-MINE Training AP Blast Mine.

cable for a 12-volt cigar lighter plug and a user's manual. The training mines communicate individually with the control panel through a wireless radio link.

When it was first introduced into the global market, the D-MINE Training System was mainly designated for manual trainings such as mine-detector drills, prodding and excavating. However, together with two new products—the Tripwire Stake Mine and the IED—Improvised Explosive Device—the system makes a complete training aid. It also covers additional activities such as house-clearance operations, dog training, booby-trap handling and mine-risk education. The system is very flexible and can be used for both military demining and humanitarian demining. Each system is delivered in a heavy-duty transport case (PELI 1630), making the equipment convenient for mobile training teams.

The D-MINE Training AP Blast Mine (like PMN A/P) is a training anti-personnel mine made in a durable plastic material called Delrin$^{®}$ with a top cover of camouflage-green rubber. The diameter of the training AP mine is 115 millimeters (4.52 inches), and its height is 63 millimeters (2.48 inches) with a triggering pressure of 1.5 kilograms (3.30 pounds). Other triggering pressures can be offered upon customer's request.

Each triggered mine is individually indicated by a light-emitting diode and an additional sound alarm on the control panel illustrating which mine(s) has been triggered. A control-panel button also allows the triggered mines to be reset and used again without being uncovered. The training mines can be placed up to a distance of 30 meters from the control panel, which under the right conditions makes it possible to mine more than 2,500 square meters (2,990 square yards). The digital-transmitted radio signals reach the control panel perfectly, even when the mines are buried in the ground as far as 0.2 meters (7.87 inches) in any type of soil. The in-valve situated at the casing's bottom is made of Gore-Tex$^{®}$, a breathable, waterproof fabric. It prevents vacuum and protects the sensitive electronics from moisture.

The training mines can be buried inactively in the ground weeks or months before a planned training without loss of battery power. Battery consumption occurs only during activation—by prodding or stepping, for instance. During normal usage, the 9-volt battery will last up to a minimum of two years.

All training mines are operated at a radio-transmitting frequency of FM 433 megahertz and run by a single 9-volt battery (PP3) except the IED, which is run by a 3.6-volt AA battery. The control panel is equipped with a rechargeable, sealed 12-volt battery. No extra maintenance is required, except changing the 9-volt battery after two years and on the rare occasions when the control-panel battery will need recharging. A light-emitting diode on the control panel's front indicates low battery power.

In order to reduce the metal occurrence, the 9-volt battery has a unique plastic cover, as opposed to traditional metal-covered batteries. Other components, including the body, lid, cover and trigger mechanism, are also made of non-metal material. However, a metal detector can still detect the built-in electronic components.

The D-MINE Training Tripwire Stake Mine (like POMZ) is based on the same mine casing as the Training AP Blast Mine. It also works electronically and integrates with the regular D-MINE system. The Tripwire Stake Mine consists of a training mine attached to a stake which can be fixed in the ground or to a tree, etc. After connecting the tripwire to the releasing pin, the trip-wired stake mine is ready to use. The use of an attached arming pin gives the training method a more realistic and complete scenario. It is 495

The D-MINE Training Tripwire Stake Mine.

The D-Mine Training IED (previously known as the Anti-Disturbance Device.)

millimeters (19.48 inches) tall, 147 millimeters (5.78 inches) wide and weighs 1.1 kilograms (2.42 pounds).

The D-MINE IED-Training Improvised Explosive Device (like MS4 & ML7) is a new, sophisticated electronically-operated device used at booby-trap training and has beendeveloped in close cooperation with ANAMA. The IED device offers anti-lifting, anti-tilting, anti-vibration and tripwiring functions. Buttons with LED-indications for the chosen functions easily activate settings. All four functions can be set in advance or, if chosen, one at a time. Because of the compact measures of the construction (90x90x30 millimeters or 3.54x3.54x1.18 inches), the IED can be easily hidden for the trainees under a missile at anti-handling/tilting/vibration trainings or in a bag during house-clearance operations.

The Training IED can be used for training humanitarian or military deminers. However, since the IED threat against the civilian society grows rapidly, other civilian organizations have found this IED simulator equally useful at counter-terrorist trainings.

RONCO Consulting Tests

RONCO has conducted trial studies at its Mine Detecting Dogs training area in Kabul, Afghanistan. Tests determined whether the MDD could detect the D-MINE Training Blast Mine and if the rubber seal over the casing could prevent any TNT odor from escaping. Mines were prepared with 200 grams (7.05 ounces) of TNT and with 30 days soak time. Weather conditions were cool and sunny (16.8° C or 62.2° F), with a wind speed of 0.8 meters per second (1.79 miles per hour). They were 5 centimeters (1.96 inches) deep in hard, dry soil. The MDD easily found the item.

Conclusion

All three training mines have a high educational value, not only for training deminers but also during MRE demonstrations because of the visible effects. The AP training mine can easily be planted in the ground on a path for stepping. The IED shows realistic results with light and sound alarms when presenting booby-trap anti-handling at MRE courses for nongovernmental organizations or vulnerable civilians. ◆

Biography

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