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Picking the Right Tool for the Right Task: Mine Clearance with the MineWolf Machine in Sudan

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By: Christoph Frehsee [MineWolf Systems AG]

In 2005, Norwegian People's Aid used the mechanical mine-clearance machine MineWolf to aid in the demining process in Yei, Sudan. The MineWolf system combines both the tiller and flail systems. The mine-clearance team overcame several challenges to transport the 25-ton machine to South Sudan. Once there, the MineWolf was used to clear over 280,000 square meters (69 acres) of land, including a school complex, a planned housing complex and a teacher-training centre.

Sudan has been embroiled in a civil war for all but 10 years of its post-independence existence, making its internal battles part of Africa's longest running conflict. The civil war has created a considerable problem with landmines and unexploded ordnance in Sudan. In general, the mines are located along communication and logistical lines and around towns and military facilities. In 2002, the United Nations reported that landmines on key logistical routes were a great impediment to the delivery of humanitarian aid. Consequently, much of the aid has been delivered by air at tremendous cost. The involved parties have specified clearance of the road network as the first priority, the second priority being access to water and the third, food security. Almost four years after setting these priorities, they are still struggling with the first one.

MineWolf, a mechanical mine-clearance machine, working in Yei, South Sudan.
All photos courtesy of MineWolf Systems

In 2005, Norwegian People's Aid decided to support its mine-action program in Yei with a mechanical mine-clearance machine called the MineWolf. The MineWolf is a German machine that combines the advantages of both the tiller and flail systems. It is designed as a multi-purpose toolbox to provide

maximum flexibility for the user, especially in the challenging environment of Sudan. As a result of a feasibility study in January 2005, it became clear that in order to support and move a 25-ton machine in South Sudan, a well-equipped and perfectly organized team must be formed to deliver cost-effective results. The main challenges would be transportation, hard ground conditions during the dry period and dense vegetation after the rainy period. Based on its experience in the Balkans, MineWolf Systems provided NPA with a tailor-made transport and support solution.

Getting There and Moving Around

To achieve operational flexibility and maximum deployment, the system needs its own transport and support assets. Taking into account the poor road conditions *en route* to and within Sudan, the team faced off-road challenges. MineWolf chose an ex-military MAN—an 8x8 off-road truck equipped with a mobile workshop—to pull the 16-wheeled customized off-road trailer from the port at Mombasa, Kenya, through Kenya and Uganda into Sudan. In addition, a Magirus 6x6 crane vehicle with bridging equipment and spare parts was supplied.

The first stage of the journey brought the team from Mombasa to the International Mine Action Training Centre in Nairobi, Kenya, where a demonstration of the equipment was given to various donors and other mine-action agencies. On Oct. 7, 2005, the two trucks left Nairobi to drive to Koboko in northern Uganda.

Getting Started

Ten days after leaving Nairobi, the MineWolf convoy reached its final destination in Yei, South Sudan. Upon arrival, the camp was set up, and training of the Sudanese staff began, conducted in four major stages. First, Michael Kelly, Senior Technical Advisor for MineWolf Systems, and Christoph Frehsee, Director of Products and Services, conducted a general introduction to the MineWolf mechanical mine clearing machine. Second, they gave in-depth lectures on the operating procedures for all team members. After that, specialized case-study modules were taught for field coordinators, section leaders, operators, medics and deminers. Finally, the team had to mechanically prepare a training area as if it were a real minefield.

Only one month after the equipment arrived in Africa, the NPA MineWolf team started operations in the Ronyi community on the Yei-Kaya Road. This first task was covering the perimeters of the abandoned St. Augustine Seminary School complex. Due to heavy fighting in this area, the school was moved to northern Uganda. The whole danger area accounted for more than 150,000 square meters (37 acres). Forces from the government of Sudan protected Ronyi from the Sudan People's Liberation Army operations using landmines. There were numerous reports of stake mines (POMZ[1]), which were only visible in the dry season, as well as mine accidents involving locals gathering building materials from the abandoned school and its gardens. During the first week of operations, the MineWolf cleared 70,000 square meters (17 acres) and activated two fragmentation mines along the main road. On a visit, Aggrey Cyrus Kanyika, Executive Director of Yei River county, and Matata Khamis Charles, the Yei Community Development Officer, inspected the task and confirmed the high socioeconomic impact of the results for the community. Furthermore, Kanyika thanked NPA for deploying the MineWolf in Yei county since "it certainly speeds up the process and gives confidence that the mine problem of Yei will be solved soon."

Let’s Keep Things Running

Yei, South Sudan, after MineWolf clearance.

Within 17 working days, the team completed the task and was ready for the next deployment. The next tasks for the NPA MineWolf team were to clear the area of the U.N. High Commissioner for Refugees’ planned housing compound. The mine-suspected area was located directly next to a major road within Yei town. In order to ensure maximum safety, guards had to block the road and confirm that no one entered the dangerous area during operations. Within five working days, the team had cleared 28,000 square meters (7 acres) and handed the land back to UNHCR.

After several mine incidents near the teacher training centre in Lutaya, 3.5 kilometers (2 miles) west of Yei town, the NPA MineWolf team was deployed as a rapid-response task force.

On the morning of November 30, the fully mobile team left the NPA camp. After the team arrived onsite, the equipment was unloaded, a control point installed and a site reconnaissance conducted. The MineWolf then cleared 13,000 square meters (3 acres) and activated five AP mines. The next evening, only 36 hours after deployment, the whole team arrived back at NPA’s main camp with all its equipment.

For the next task, the NPA MineWolf team was called to extend the Yei airfield. With Yei having become the most important entry point from Uganda, the 1.2-kilometer-long (3/4-mile) runway was too short for bigger cargo or personnel airplanes. To maintain its important role in transporting the food supply into South Sudan, the runway had to be extended by another half a kilometer (about a third of a mile) into the bush.

Based on these first promising results, the NPA MineWolf Team was deployed by the U.N. World Food Programme to open the Yei-Juba Road, one of the most important transport lines from Uganda into South Sudan. With Juba becoming the new capital of South Sudan, it is of great importance that the road is opened for safe passage not only to distribute food but also to develop infrastructure and enable local trade. The danger area was located on the old demarcation line between government of Sudan and Sudan People’s Liberation Army forces and was heavily mined from both sides. Within the first 13 working days, the MineWolf detonated five heavy anti-tank mines, crushed eight AT mines to pieces and activated 14 anti-personnel mines while clearing more than 62,000 square meters (15 acres) of road.

Hard Ground, Heavy Vegetation and AT Mines

Depending on ground conditions and the mine threat, NPA could choose to operate the MineWolf with either the open tiller or a standard flail. The use of quick couplings facilitates replacement of the demining tool attachments in less than 30 minutes. Both tools are equipped with a proven depth-control unit for quality control.

After the team tried both methods, it concluded that the tiller proved its sustainability and had a clear advantage over the flail, especially against heavy vegetation and hard ground. Furthermore, a tiller has the advantage of continuously penetrating the ground to the required depth since, in contrast to a flail, the rotor is a solid piece mulching the ground. Consequently, the deployment of the tiller allows ground-processing results unmatched by common flail systems, particularly with respect to vegetation and ground penetration.

The patented open-tiller design showed unprecedented results when used against both AP and AT mines. The basket-type segment structure allows the mine blast to expand through the tiller to avoid or reduce damage. Nevertheless, the tiller is designed in such a way that every 43.4 millimeters (1.7 inches), a chisel with a diameter of 44 millimeters hits the ground, ensuring that every piece of soil is processed. This guarantees that even the smallest AP mines like the M14[2] or the PMA2[3] will be hit.

In total, the machine cleared more than 280,000 square meters (69 acres) within the first nine weeks of operation. The tiller successfully withstood several Type 72,[4] M15[5] and TM-57[6] AT mines and also reliably destroyed 21 AP mines, like the M14, and bounding fragmentation mines like Type 69.[7] No intact mines have been found behind the machine. The clearance result of the MineWolf allows safe and fast manual quality control as well as mine detection dog follow-up.

In a recent issue of the *Journal of Mine Action*, A. Griffiths of the Geneva International Centre for Humanitarian Demining stated, “Demining should be about reducing the extent of the world’s mined areas in as short a term as possible. Machines are here to do just that.”[8] MineWolf Systems is committed to putting this statement into practice.

Biography

Christoph Frehsee is a Senior Technical Advisor with MineWolf Systems. Responsible for products and services, his field of expertise is to set up sustainable mechanical support and training infrastructures. He has gathered mine-action experience in Serbia, Bosnia-Herzegovina, Croatia and Sudan.

Endnotes

1. USSR-manufactured stake mine with six rows of fragments. For more information, visit http://www.eng.warwick.ac.uk/DTU/pubs/wp/wp48/appendixcminesandordinance.html. Accessed March 24, 2006.
2. American-manufactured plastic AP mine. For more information, visit http://www.eng.warwick.ac.uk/DTU/pubs/wp/wp48/appendixcminesandordinance.html. Accessed March 24, 2006.
3. Common and virtually undetectable AP mine. For more information, visit http://thirdangle.com/viewphoto.asp?perpage=200&area=-1&CurrPage=9&pid=1794. Accessed March 24, 2006.

4. Chinese-manufactured, hard-to-detect AP mine. For more information, visit http://www.eng.warwick.ac.uk/DTU/pubs/wp/wp48/appendixcminesandordinance.html. Accessed March 24, 2006.
5. Circular, steel anti-tank mine. For more information, visit http://science.howstuffworks.com/landmine3.htm. Accessed March 24, 2006.
6. USSR-manufactured anti-tank mine that can have an anti-handling device. For more information, visit http://www.eng.warwick.ac.uk/DTU/pubs/wp/wp48/appendixcminesandordinance.html. Accessed March 24, 2006.
7. Chinese-manufactured bounding AP mine. For more information, visit http://members.iinet.net.au/~pictim/mines/messages/69.html. Accessed March 24, 2006.
8. Griffiths, A. "Machines Can Get the Job Done Faster." *Journal of Mine Action*. Issue 8.2, November 2004. pp. 105–107. Also available online at http://maic.jmu.edu/journal/8.2/rd/griffiths.htm. Accessed March 24, 2006.

Contact Information:

Christoph Frehsee
Senior Technical Advisor
MineWolf Systems AG
Seedammstrasse 3
8808 Pfäffikon SZ
Switzerland

Phone +41 55 417 46 85
Fax +41 55 417 46 86
Mobile +49 177 56 36 533

www.minewolf.com