

RHINO in Cambodia

RHINO, a large and powerful demining tool geared towards large clearance operations, has been put to the test—both on testing grounds and in the field. The result: a level of performance and operability that alleviates the concerns of critics.

By **Manfred Joehnk**, *Program Manager*

Background

The mechanical demining system RHINO was developed internally by Rheinmetall Landsysteme GmbH (RLS) in Kiel, Germany, to provide a more cost effective and safe demining tool. It is superior to existing systems in terms of efficiency, safety and clearing capacity and is especially well suited for large area demining operations. RHINO is large (9.5 m long, 3.1 m wide and 3.5 m high), powerful (660 kW caterpillar engine), robust (weighs 58 metric tons) and is fully remotely controlled. RHINO is a serious demining machine, as opposed to a mechanical machine whose purpose it is to assist the manual deminers.

This article summarizes RHINO and the user experience during a field test and subsequent demining task conducted in Cambodia from August 1999 to May 2000. The test and the accompanying demining task in support of CARE took place in two remote areas in Battambang province. The main objective of the task was to accelerate the demining process to help accommodate the need for land for returning refugees. This was a major two-year project involving the resettlement of approximately 4,000 families.

The Cambodian Mine Action Center (CMAC), a state run organization, is responsible for the conduct of mine clearance actions. The CMAC staff is assisted by international advisors from the United Nations and NGOs, as well as soldiers from countries such as Canada, Australia, Belgium and the Netherlands. The test and subsequent demining action were managed and performed by CMAC with the technical assistance of two RLS employees. After the initial training, their role was mainly to provide further training on the job for tasks such as unscheduled maintenance. Mine clearing in Cambodia represents a serious challenge. The environmental conditions are tropical and severe. The infrastructure is typical of a developing country. The mine problem itself is further complicated by the fact that there are numerous types of mines and UXOs, and poorly marked mine-infested areas.



Operation by Indigenous Personnel

Training on RHINO began when it arrived by barge at Sihanoukville. The RLS technicians trained three mechanics and two electricians in the operation and maintenance of RHINO. While lacking theoretical knowledge, the trainees were skilled workers and eager to learn. In a few short days they could handle the day-to-day operations and, soon after, maintenance of the vehicle. In a few weeks, they operated the system without the oversight of the RLS technicians. The five trainees were organized in two operation/maintenance teams of two, each with the fifth being responsible for supply operations.

The challenge of leading the demining platoon was given to a CMAC technician who was assisted by a former leader of a mine marking team. They were initially trained and supervised by a French technical advisor. Manual deminers, drivers and guards rounded out the team. The platoon not only clearly demonstrated that indigenous personnel could operate and maintain RHINO, but that they also work hard and perform in a highly proficient manner throughout the initial test and subsequent tasks.

■ RHINO with dozer blade is transported to the test area, just bypassing a bailey bridge.
c/o RHINO

Infrastructure

There is no question that mechanical demining machines are huge. The concern is that they are too big to be transported and will damage the infrastructure of developing nations. While the RHINO is a big machine, ingenuity will go a long way to solve most transportation problems.

The infrastructure of Cambodia is especially weak from our point of entry (Sihanoukville) to the test area (approximately 600 km) and another 80 km to the operational site. The vehicle made the trip to the test area mostly on board a trailer and by rail. The critical parts of the roadway and undersized bridges were by passed through use of the Cambodian railway and by driving the vehicle under its own power. RHINO traveled some 140 km of the trip at about 4 km per hour. The tiller unit, which weighs 14 tons but is easy to remove, was replaced by the dozer blade. As a result, the trip was made without damage to roadway and bridges. RHINO was

able to tow a truck that had been stuck in the road and upright a huge truck, which had overturned because of overloading and very large potholes in the road.

Self-Recovery

RHINO was bogged down twice in muddy, swampy terrain. Two methods of self recovery were:

- In the first case, the vehicle was bogged down in a mine-infested area. In accordance with regulatory procedures, two manual deminers had to clear the surrounding area before the recovery work could commence. An anchor was built by means of a steel plate and long iron rods. A rope was fixed on the anchor as well as on an iron bar, which was fixed to the track plates at the rear of each track. With this arrangement RHINO was able to tow itself out of the mud.
- In the second case, the tiller unit was forced downwards in the ground to elevate the system while the rear of

RHINO track formed the second base of the vehicle. Stones and wooden blocks were placed underneath to provide RHINO with traction to allow it to be driven out of the mud.

Operation in a Tropical Environment

RHINO was designed to operate in a tropical environment, so the high temperature and humidity, dust and very heavy rain in Cambodia did not have an adverse impact on it. RHINO proved its ability to work through huge termite hills as well as dense vegetation including any kind of bamboo. Trees up to 20 cm in diameter were processed by RHINO. All materials are ground between the two tilling drums. Some of the vegetation was worse than anticipated, almost inaccessible due to thick vines and trees up to 30 cm in diameter. RHINO was slowed down but not stopped. The grinding process continued. While our customer in Croatia clears 20,000 m² per day, RHINO was able to clear 4,000-6,000 m² per day in a very challenging environment. This is significantly more than a platoon of manual deminers can clear in a week. We learned that RHINO's level feelers, which control the clearing depth, needed stronger protection for driving in reverse in such a challenging environment as Cambodia.

Quality Rate

The situation in Cambodia confirmed the operational results of our customer in Croatia who has cleared some 2 million m² in just over a year without a single mine found intact in the treated soil. PMN mines without boosters were used in the Cambodian test to get information regarding the size of residuals of mines, which could

not detonate. All mines treated during the special test were destroyed completely. All parts in the treated soil are passed through the small gap between the rotating drums. After successful completion of the test, CMAC's Risk Assessment Committee agreed to place the system into operation.

After RHINO cleared the first area, the area was checked completely by manual deminers in accordance with regulatory procedures. As a result of this first recheck and test results, the manual recheck was reduced by 50 percent. Only harmless mine residuals and fragments were found by the manual deminers.

Survivability

RHINO got a chance to demonstrate its survivability characteristics early in the severe conditions in Cambodia. During the first week of operation, a booby trap consisting of two AT mines detonated at approximately 30 cm under RHINO's left track. Later, a single AT mine detonated between the two tiller drums near the bearings, and another AT mine detonated under RHINO's right track. In less than two days, the detonations from the single mines were repaired in the field by the CMAC maintenance personnel. The double mine explosion caused more severe damage to mechanical parts and was repaired in the field in about a week.

There was no threat to human life with these explosions because RHINO is unmanned and remote controlled. An operator sitting in the cab of any manned clearing system would have been severely injured or killed by the double mine explosion.

Too Costly to Operate?

RHINO's deployment in Cambodia has demonstrated that if

the system is used as intended and is operated in a day-to-day demining operation, its clearance speed is outstanding. Our cost study can demonstrate the cost effectiveness of RHINO when compared to a manual demining operation. RHINO is superior in that it:

- can be operated and maintained by

Conclusion

RHINO is a real demining machine. In the Cambodian operation, it has proven to be both safe and cost effective. If the world is going to make serious progress in solving its mine problem in a reasonable time frame, cost effective and efficient demining



■ RHINO and crew emerge from typically dense vegetation found in Cambodian mine fields.

indigenous personnel after a qualified training on the job.

- can be transported without damaging the infrastructure, even under the conditions of a developing country, by smart and flexible use of the available resources.
- disposes of sufficient self recovery means even in real swampy ground.
- is working reliably also in tropical environment.
- is one of the first reliable demining machines, which is much more efficient than manual deminers, and which makes manual rechecking of the ground unnecessary.
- has an outstanding survivability against AT mines, UXO and booby traps and offers excellent safety due to its remotely controlled operation.
- will speed up the demining process and reduce the costs per cleared square meter.

systems such as RHINO must be part of the solution.

The crucial requirements to use RHINO are an open mind, good planning, logistic as well as site management, and the international will to set up a long lasting demining project with multinational sponsorship. ■

Contact Information

Manfred Joehnk, Program Manager
Rheinmetall Landsysteme GmbH
Falckensteiner Str. 2, D-24159
Kiel, Germany
Phone: +49 431 3999 2292
Fax: +49 431 3999 3278
Mobile: 0171 7217649
E-mail: Birgit.Baumgart@rheinmetall-s.com
Website: www.rheinmetall-ls.de

All photos courtesy of the author.

■ RHINO bogged down before self-recovery.

