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Systematic Test & Evaluation of Metal Detectors: Interim Report Field Trials Mozambique

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The EC JRC conducts trials of metal detectors through the STEMD project.

The Joint Research Centre of the European Commission published at the end of 2005 another interim report for the STEMD project.[1] This article gives background on the project and report and some results and recommendations of the trial. The authors hope this article will pique interest in the full report.

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The concept of the Systematic Test & Evaluation of Metal Detectors project is to conduct tests relevant to specific mine and UXO problems in different regions of the world. STEMD can be regarded as a trial making use of the experience distilled into the Centre European Normalisation Workshop Agreement (CWA) about testing of metal detectors and giving an overview of the state-of-the-art of the current metal-detector fleet. The project consists of laboratory tests, field trials and training of interested parties in testing methods. Lab tests are being carried out in the laboratories of the JRC–Ispra. A trial in southern Africa was planned from the outset. Mozambique was favoured because of previous experience and because of the existence of a dedicated training site with different types of soils and the availability of local test targets. The report describes the second field trial of the STEMD project. Some basic information from the STEMD *Interim Report Field Trial Laos* is repeated so the present report may be understood independently.[2]

The purpose of the trials in Mozambique was to:

- Assess recent commercial off-the-shelf detectors believed to be appropriate to Mozambique and for humanitarian demining generally
- Make the data available for the humanitarian-demining community

Objectives of the trials were to:

- Compare performance of detectors in different types of Mozambican soils
- Measure sensitivity of detectors to typical local targets of interest and standard targets
- Train local staff in the CWA
- Collect site information for International Test and Evaluation Program for Humanitarian Demining

The report gives an overview about the preparation and describes in detail the methodology and procedures used to achieve comparable results. The technical details of the detectors described in the report are divided into two categories: technical information that is relevant to users and that which is relevant to technical personnel. A full chapter explains the main factor influencing metal-detector performance—the ground. A simple method to measure and gain knowledge about the magnetic soil properties is explained.

In this trial, we were able to take advantage of seven prepared lanes used for training purposes by the Accelerated Demining Program. Lane 1 contained builders' sand from a sandpit. Lanes 2–6 contained five different soil types from the zone around Moamba. Lane 7 contained soil from Namaacha, adjacent to the Swaziland border. With those seven lanes and increasing detection difficulties from one lane to the other, the results reflected the influence of soil on the detection abilities of the current metal-detector fleet. The detectors being tested included the 12 latest models from the following manufacturers:

- CEIA S.p.A.
- Ebinger GmbH
- Guartel Ltd.
- Institute Dr. Foerster GmbH and Co. KG
- Minelab Pty. Ltd.
- *Schiebel Elektronische Geräte* GmbH
- Shanghai Research Institute of Microwave Technology
- Vallon GmbH.

The results of the trial are laid out in two chapters of the report. One describes the direct comparison of all detectors versus the 13 targets and the seven soil types, and the other is an individual assessment of each detector. For sensitivity comparison in air, the detectors were

set up in Lane 1 to maximum sensitivity, and in the other lanes the ground compensation[3] was carried out (where available) and then the max sensitivity test in air carried out. For establishing the influence of the ground, the targets were buried in the lanes and the achieved maximum depth was registered.

The following targets were included:

- PMN-2[4] and PMN mines with neutralised fuzes
- Type 72 and Gyata AP simulants, locally used and produced
- R2M2 fuze mounted in 60-mm[5] diameter clear plastic holders[6]
- ITOP fuze inserts Mo, Ko, Io
- 100Cr6 chrome steel balls, 5-, 7-, 10-, 12- and 15-mm diameter, placed in wooden containers.

Conclusions and recommendations of the report include:

- The sensitivity loss from L1 to L7 for the detectors without ground compensation was so large that some targets that could be comfortably detected to the required depth of 130 mm in L1 could not be detected even much nearer to the surface in the higher numbered lanes.
- For detectors[7] with very substantial sensitivity loss from L1 to L7, it is important that the users are aware of the ground conditions and check the reliability of the detector's ability to sense the expected mines in the working area.
- In general, in air maximum detection heights, measured with the detectors set up for a particular type of ground, are not equal to the in-soil maximum detection depth in the same ground.
- Minimum-metal mines are still the main detection problem. Even the detectors with good soil compensation could not always detect the smaller targets to the required depth in all lanes.
- Ground magnetic properties (magnetic susceptibility, ground reference height) should be measured and recorded as a survey task because they have to be known for planning and proper use of the detector fleet.

For the execution of the trial, we received excellent support from the Mozambican National Demining Institute the Accelerated Demining Program and other national organisations. Note: There are a very limited number of hard copies of the report available for people that have limited access to the Internet. If you do not have access to the Internet, please contact Adam Lewis to obtain a printed copy.

See Endnotes, page 112

Dieter Guelle is a former professional soldier and colonel. Having been in charge of technical minefield surveys, mine clearance and quality assurance of mine clearance operations, he is an experienced and technically competent Mine Clearance Manager. He is also involved in testing and assessing different demining equipment such as mechanical clearance techniques, detectors and protective equipment.

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News Brief

Colombian Police Train Mine-sniffing Rats

With the highest number of landmine-related deaths and injuries in recent years, Colombia has a vested interest in seeking cost-effective demining methods. Consequently, the government recently trained six rats to locate explosive devices, which are often emplaced by rebel forces and drug dealers.

Recent interest in training rats arose not simply because the animal has an uncanny aptitude for the task, but also because training mine-detecting dogs is more costly and time-consuming. Dog handlers are often injured if their canines set off an explosive device nearby. Unlike their heavier canine counterparts, rats are usually too light to detonate landmines.

Mines in Colombia are the result of decades of conflict between government forces and guerrillas protecting lucrative coca fields, which provide much of the world's cocaine supply. The irregularly emplaced minefields are designed to keep Colombian and international forces from eradicating or disrupting the production of coca.