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Quality Assurance: Evaluation and Certification of Humanitarian Demining Detection Equipment

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Evaluation and Certification of Humanitarian Demining Detection Equipment

Quality Assurance

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An extensive number of humanitarian demining detection equipment (HDDE) in the development phase requires a well-established set of testing facilities. A combination of enthusiastic and scientific testing exists throughout the majority of these facilities. During the last several years, the process of humanitarian demining (HD) in Croatia has begun under the intense effort of the Croatian Mine Action Center and other institutions. The success in starting and performing the clearance of various mine-affected regions was a combination of mechanical demining and a systematic approach. Mechanical demining has given good results on the agricultural terrain and in the fields of homogeneous soil compositions with smooth surfaces. In other situations, where the terrain is impenetrable, the pyrotechnicians have conducted manual demining. Manual demining, however, is a risky task that requires more time and results in more victims.

The slowest part of the demining process is the actual detection. Anti-personnel landmines are harmful because of their unknown positions. To lower the risk in HD, the anti-personnel landmine positions need to be determined slowly and carefully. The languid speed of this demining process has prompted the scientific community to consider existing detecting methods, and to try to establish new ideas and suggestions using its scientific potentials in HD speed increment. The community's response united experts and groups on the development of various methods, equipments and procedures for HD needs, but only few of the methods and equipments reached the implementation phase. The procedures, although sometimes contradictory, were used for their detection methods or equipment reliability. A question arises, then, how to perform the capability test in order to have a reliable, globally accepted procedure for HDDE assessment? Unfortunately testing methods do not always follow the HD procedures. For example: a demining machine which is frequently damaged and pieces of high metal content fall into the soil, make metal detectors more difficult to use.

Procedure for performance demonstration of metal detectors is one of our main focal points because such a procedure should be considered as a part of a complex HD process. In designing a procedure we have to consider many different aspects, including peculiarities of a soil type, the details of the equipment performance demonstration, and the equipment needed for the demining process control. In other words, after thorough testing in laboratory conditions, the personnel involved in the development of the demining equipment should go to the field and apply the technique and equipment in a real mine-affected area.

Organization of Humanitarian Demining Detection Equipment Testing

Generally accepted HD detection methods and techniques do not exist yet, as all prospective candidates are still subjected to theoretical and experimental work in various proportions. While the theoretical part of research and development is a never-ending process, the experimental part, the key part of the development process, incorporates the two mutually. Researchers must perform experiments in an atmosphere of complete concentration in order to accurately guage the development and improvement of the equipment. Researchers' maneuvers must be limited as little as possible, and therefore testing should occur at HDDE testing sites. The highly controlled experimental environment minimizes the risk for equipment deterioration during its testing.

Experiments, however have to be carried out in conditions that closely follow those of the mine-affected areas. In such circumstances, risk is augmented considerably and the researchers' concentration on the equipment performance could be lowered drastically, influencing the overall observation and opinion essential for conclusions regarding the equipment's performance and development. The safety procedures invoke additional limits to the researchers' mobility, but all the relevant characteristics of the system consisting of the landmine and its environment are still unknown. Only by means of this type of experiment can the insight into reliability performances be estimated in HD.

Experimental testing, therefore, should consist of two parts. First, experiments are to be performed in a controlled laboratory environment or related test sites. Then, experiments are to be conducted in the representative setup of real mine fields. With that combination, we expect predominant conclusions about the equipment development and a strong rate of effciency on reliability. The second part involves tallying every possible and unintentional variable. For the equipment tested, this part serves as a final control point. The testing laboratory should be organized according to the experience gained, taking into consideration each parameter influencing mine-affected areas. Relatively soon we will be in the position to combine laboratory and field condition results.

Need for the Standardization of the Demining Equipment Testing

There is a clear difference between scientifically based equipment testing and testing out of necessity. In order to minimize risk and maximize the reliability result, relevant results existing already in the scientific field should be incorporated with the new testing. This method should give a clear view of the particular set of testing equipment, which serves both its manufacturer and end-user. Additionally, it gives the final user preliminary confidence in the equipment performance. Past casualties in various performance testings were caused by the improper usage of equipment or by unprepared personnel. The scenario of the proper experiments designed for the equipment testing, described in the previous section, will minimize these accidents.

In HDDE testing, we worked by using the iterative approach so that quality improvement of our procedures is constant. The basis of this approach is a collaboration of expert groups, members of scientists with experience in those fields that conincide with HDDE needs. In order to establish the quality assurance for HDDE preliminary testing, a confirmed relationship between the laboratory and field part of testing was created. The testing of important parameters defining landmine detection equipment is covered in all important aspects, and the evaluation of this testing is judged by a critical mass of experts. HDDE testing should be performed only by using a controlled laboratory and test sites to establish the quality assurance for all HDDE.

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