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Power Dozer Demonstration Trial

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Le Centre canadien des technologies de déminage

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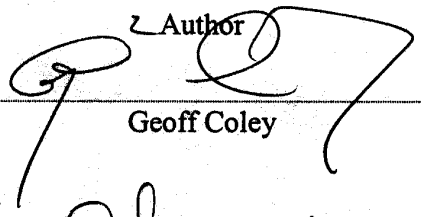
Author



Geoff Coley

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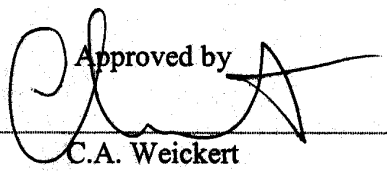

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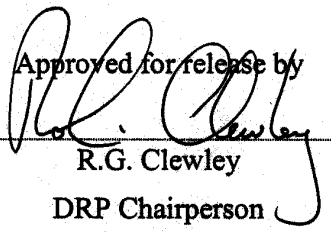

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Abstract

In November 2001 the Power Dozer was tested at Defence R&D Canada – Suffield in a brief demonstration event. Obstacles and mine simulators were placed in the test area. The Power Dozer successfully moved all targets and obstacles into a berm.

Résumé

En novembre 2001, le Power Dozer a été testé durant une brève démonstration, à R & D pour la défense Canada – Suffield. Des simulateurs d'obstacles et de mines avaient été placés dans la zone des essais et le Power Dozer a réussi à déplacer toutes les cibles et les obstacles dans un berme.

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Executive summary

In November 2001 the Canadian Centre for Mine Action Technologies tested the Power Dozer at Defence Research and Development Canada – Suffield in a brief demonstration event. Concrete blocks, steel tetrahedrons and a steel "hedgehog" were placed as obstacles, and a series of antitank and antipersonnel mine simulators were placed in the test area. The Power Dozer successfully moved all targets and obstacles into a berm at the side of the processed area. While not an exhaustive test of the machine's capabilities, this demonstration test provided an opportunity to view the machine's operation, and to evaluate, in a qualitative sense, the possible application of the Power Dozer for military and humanitarian demining operations.

Coley, G.G. 2002. Power Dozer Demonstration Trial. DRDC Suffield TR 2002-117. Defence R&D Canada – Suffield.

Sommaire

En novembre 2001, le Centre canadien de technologies de déminage a testé le Power Dozer à R & D pour la défense Canada – Suffield, durant une brève démonstration. Des blocs de béton, des tétraèdres de béton et des « hérissons » d'acier avaient été placés pour former des obstacles et une série de simulateurs de mines antichar et antipersonnel avait été aussi placée dans la zone des essais. Le Power Dozer a réussi à déplacer toutes les cibles et les obstacles dans un berme, à côté de la zone traitée. Ces essais incomplets ne démontrent pas les capacités de cette machine, mais les démonstrations ont donné l'occasion d'observer la machine en action et d'évaluer, au sens qualitatif, les applications possibles du Power Dozer durant des opérations de déminage à des fins militaires et humanitaires.

Coley, G.G. 2002. Power Dozer Demonstration Trial. DRDC Suffield TR 2002-117. Defence R&D Canada – Suffield.

Table of contents

List of figures

List of tables

Acknowledgements

While this evaluation of the Power Dozer was a simple, brief, one day trial, there was considerable preparation and support required. The author wishes to recognize the efforts of Mr. Al Carruthers in looking after the logistical and contractual issues surrounding the trial, and Mr. Darrell Boechler who ensured the availability of simple, rugged antitank mine simulators. Valuable field support on trial day and on the days surrounding the trial was provided by Mr. Russ Fall and Mr. Matt Ceh.

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1. Power Dozer Test Description

A brief demonstration trial was conducted in which the Caterpillar D8 mounted Power Dozer (see Figure 1) was used against a variety of targets (Figure 2) in virgin Suffield prairie sod. A single pass was made along relatively level ground in which there were:

- 5 antitank mine simulators;
- 8 antipersonnel mine simulators;
- 2 concrete block obstacles;
- 2 steel tetrahedron obstacles; and
- 1 steel “hedgehog” obstacle.

The targets were laid out as shown in Figure 3. All of the targets were found in the berm along the right hand side of the lane except for those 3 antipersonnel mine simulators which were not found even after digging through the berm with a backhoe.

Figure 1. *Power Dozer*

Figure 2. *Target Types*

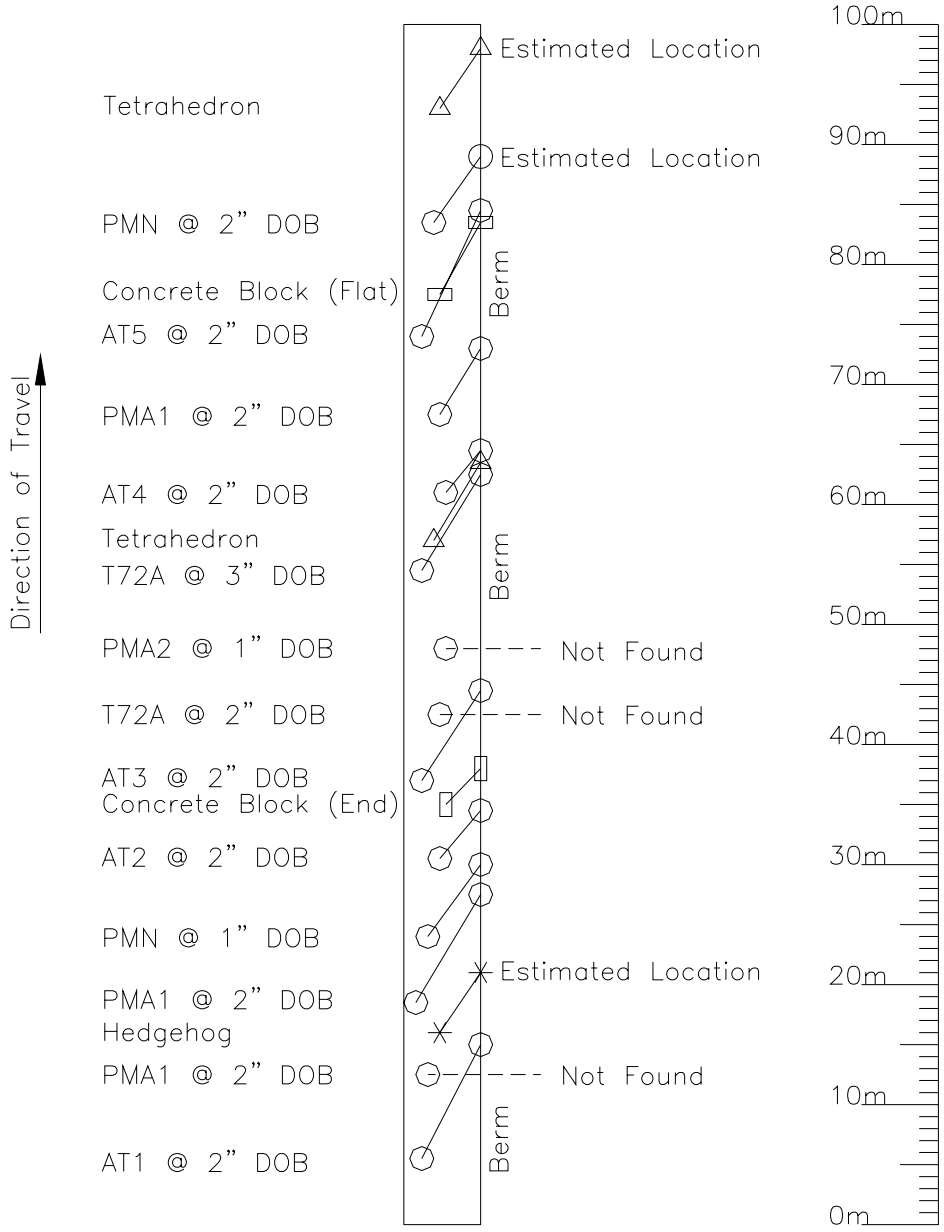

Figure 3. *Target Layout*

2. Power Dozer Test Results

Allowing for some of the berm to roll back slightly on both sides of the path, the total area left "clear" by the Power Dozer measured approximately 105m x 6m. Depth ranged from approximately 0.3m to 0.5m. Average depth is estimated to have been approximately 0.4m. The lane was completed in 8 minutes, 45 seconds for an average rate of 72 square metres per minute (or 29 cubic meters per minute at an average depth of 0.4m). Figure 4 shows typical conditions produced during the Power Dozer test.

Figure 4. *Typical Power Dozer Test Conditions*

Targets were found to have moved forward from their starting positions by anything from 3 to 10 metres. Clearly the distance moved depends on many factors including the forward speed of the system and the initial location of the target. Higher vehicle speed will tend to move the targets further along the lane before being cast into the berm. Targets starting near the left side of the lane (when casting to the right) will tend to travel further along the lane than targets which start near the right side. Other factors will also influence the distance a target is moved. For example, a target which is small, light and easily rolled

may well roll along ahead of the pile more than a target which is caught by the soil being cast to the side. These effects have not been evaluated in detail.

The machine did not appear to have any difficulty with any of the obstacles in the trial, and the hard, dry prairie sod was handled without any apparent trouble. The nature of the antipersonnel mine simulators prevented any determination of whether they had functioned or not, but antipersonnel mines functioning in the vicinity of the Power Dozer blade would be unlikely to cause any damage or injury. The 5 antitank mine simulators were equipped with scratch gauge, spring fuzes (see Figure 5). The scratch gauges showed that the fuzes had been depressed by the amounts shown in Table 1, and the calibration curves for the fuzes are shown in Figure 6. The maximum load experienced by any of the fuzes was only about 66 lbs.

Figure 5. *Antitank Mine Simulator Scratch Gauge "Fuze"*

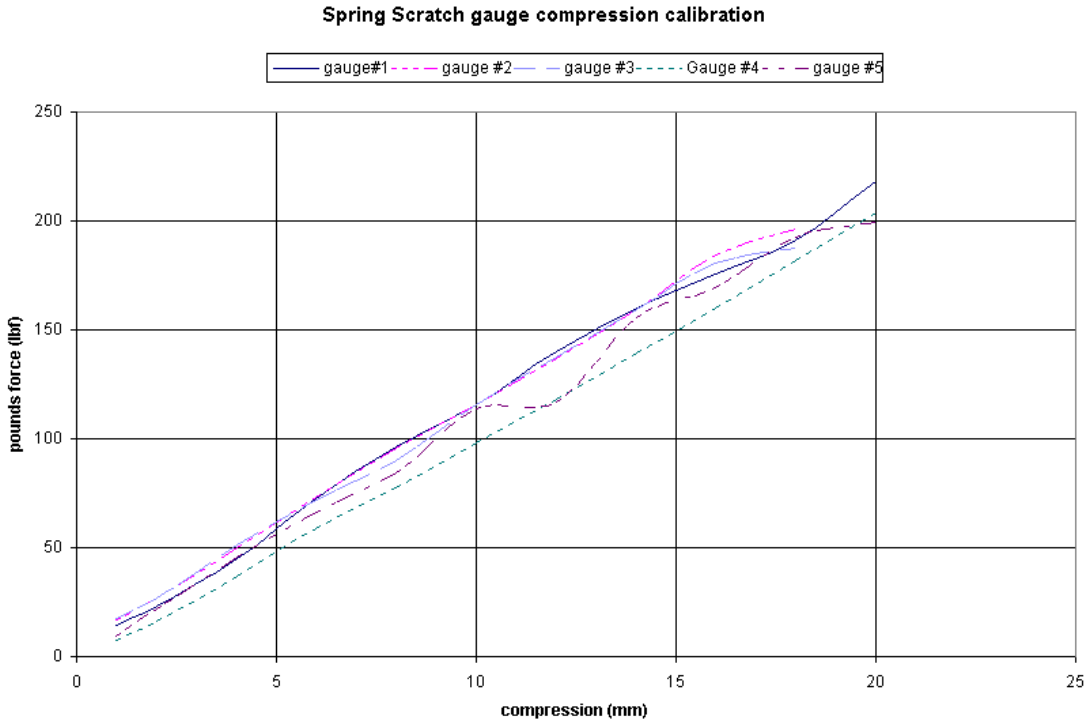

Figure 6. *Scratch Gauge "Fuze" Calibration Curves*

Table 1. *Antitank Mine Simulator Results*

ANTITANK SIMULATOR	DEPTH OF BURIAL	FUZE DEPRESSION	LOAD EXPERIENCED (APPROX.)
	(inches)	***(inches)***	***(lbs)***
#1	2"	0.135"	38
#2	1"	0.120" **	39
#3	0"	0.124"	41
#4	1"	0.155"	36
#5	2"	0.234"	66

** Antitank mine simulator #2 scratch gauge parts had separated by about 0.11" but a scratch of 0.120" was noted. This may mean that the 0.120" scratch is not representative of the actual fuze depression. The components of the scratch gauge may have become misaligned during use.

3. Applications

3.1 Humanitarian Demining Operations

The utility of the Power Dozer in humanitarian demining might be compromised by several factors. The size, complexity, expense, and logistics burden of the machine might make it impractical in certain demining operations.

One of the advertised uses of the Power Dozer is in topsoil stripping. Unfortunately, in the conversion of minefields back to agricultural land, the topsoil stripping might have negative consequences from a soil fertility point of view. Even with the soil replaced, the mix of topsoil with the underlying soil might significantly diminish the fertility of the soil for agricultural uses.

In casting large amounts of soil to one side, the Power Dozer effectively just moves the (landmine) problem from one location to another. Any landmines or UXOs which are not detonated during the operation may become much more deeply buried and therefore harder to find unless an additional berm processing operation is performed to extract the targets of interest. It is conceivable that a berm processing attachment might be developed which would replace the Power Dozer blade on the same host vehicle. At this time, this is a matter of speculation however, as no such berm processor was available for test.

These considerations would not necessarily eliminate the Power Dozer from all humanitarian demining operations but would be factors to consider before attempting to apply the system in these applications.

3.2 Military Operations

There may be applications for Power Dozer use in military operations. This might include minefield breaching operations, or military engineer tasks. The requirements for such military tasks are well beyond the scope of this report or this test, but it is noted that testing has been conducted under the sponsorship of the US Marine Corps. Further information should be sought from the manufacturer:

Viking Power Dozer Ltd.

Box 204 Viking, AB, Canada, T0B 4N0

780-336-3032

4. Summary

The Power Dozer had no trouble with any of the obstacles used in this trial, and successfully removed all mine simulators to the berm (except for the 3 antipersonnel mine simulators which were not found). Results suggest the ant-tank mine fuzes would have experienced loads ranging from 36 lbs to 66 lbs. These loads are not likely to be sufficient to initiate any antitank mines. Damage susceptibility of the Power Dozer was not evaluated in any way. Ground processing speed under the conditions tested was 8 minutes, 45 seconds for an area 105m x 6m x 0.4m deep (approximately), for a value of 29 cubic metres per minute.

Further information regarding the Power Dozer and other trials which have been conducted should be sought from the manufacturer at:

Viking Power Dozer Ltd.

Box 204 Viking, AB, Canada, T0B 4N0

780-336-3032

List of symbols/abbreviations/acronyms/initialisms

DND	Department of National Defence
DOB	Depth of Burial
CCMAT	Canadian Centre for Mine Action Technologies
m	Metres

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