

## **Annex E – Manufacturer Comments**

---

The following material was received from the machine manufacturer in response to a draft version of this report.

---

**MineWolf Tiller Test and Evaluation Report**

**Manufacturer's comments**

**Introduction**

MineWolf Systems have reviewed the draft MineWolf Test and Evaluation Report produced by the ITEP testing and evaluation team and have identified several shortfalls and inaccuracies in the current draft. MineWolf Systems find the factual results acceptable within the tests conducted but recommend that the suggested amendments are made to the current report or that the list of observations made are at least noted in the manufacturer's comments.

**General comments on the report**

In general the report leaves question as to the research carried out by the team as it seems very apparent that they have not fully understood the capabilities of the machine when used in various scenarios. The MineWolf operates both with tiller and flail depending on the given threat yet nowhere in the report does it consider or even mention the option of using an alternative tool in different ground conditions.

MineWolf Systems would also like to remind the author that when the request was placed to test the machine, it was intended that both tiller and flail would be tested. ITEP choose not to test the flail due to limitations on resources and time constraints. As it stands the MineWolf System has only been tested to 50% of its capability. This is not referenced in the report.

The report consistently refers to the machine being used in Croatia with a tiller, yet this is just one area of operations in the global context of the MineWolf machine use. The ITEP report is designed to test machines in various ground conditions to give an overview of its performance for deployment globally. When reading the report it appears very focused on how the machine operates and functions in Croatia, with no mention made of its deployment in other theatres such as Africa or the Middle East.

Several comments appear throughout the report that seem to be based on opinion rather than fact and remarks appear to be loosely written. For example, in one of the opening narratives it states that, "because the MineWolf is commonly used with tiller (and not flail attachment) in Croatia, only the tiller configuration was evaluated". If the report is for global use, then it should be mentioned that the flail is used in conjunction with the tiller in Southern Sudan to defeat M15 anti-tank mines with a Net Explosive Content (NEQ) of 10kg.

Other comments refer to some of the terms used. Accompanying figure x, the label, "debris collected around tracks" they show part of a "WORM" body on the track system, yet it does not state the condition of the WORM, leaving some doubt in the readers mind. If such a photograph is to be shown then it should clearly state the condition of the WORM as the photograph certainly leads to some miss-interpretation. In this particular instance the WORM had functioned and as the WORMs have no explosive content then the bodies will always remain in some shape

or form. Again what is slightly misleading is the photo showing "Typical debris Throwing" clearly it shows the WORM being forward of the machine but fails to state the condition of the WORM. Are these WORMS really throw-outs as the author leads you to believe or are they mechanically neutralised or triggered WORMs that have been processed through the tiller system.

The machine is deployed with several other major organisations both commercial and NGO. MKA Demining is just one user of the machine and its activities should not be solely used as a reference to the compiling of the report.

MKA Demining is a commercial mine clearance company and does not represent MineWolf Systems. The machine tested is **owned** by MKA Demining, MineWolf Systems do not have any control over how the machine is operated (**Speed**) and modifications made (**Depth control**). No reference was made in the report on the instructions given to the operator before and during the testing procedure. The test report should focus on the machine performance and not the operator's performance. Certainly in this instance would it not be reasonable to ask for a written brief to be produced for the operator, to prevent any misinterpretation as to what is required of him/her. Having read the report and followed up with the operator it seems very clear that he did not understand what was required of him in the first few test runs.

Considering this whole report has taken eight months to produce MineWolf Systems finds the final draft to be lacking in factual descriptive content, in certain instances the report refers to "flail" as opposed to "tiller" indicating that the author has not given the required level of diligence that a test of this magnitude requires. Also if the author had researched the product before conducting testing he would know that the machine cabin had been officially certified and tested by the German Army (See report attached) and would not be using opinions from a commercial operator as to its suitability.

MineWolf Systems recommend that the comments below are used to amend the draft report before the final draft is submitted.

**Specific comments and suggested amendments to the report**

**1. Abstract**

It is not mentioned that MineWolf Systems requested that the whole "system" (i.e. Tiller and Flail) be tested by ITEP not just the tiller, and that ITEP did not test the flail due to limited resources and time limitation. As MineWolf Systems always deploy both tiller and flail and never just the single tool, it is suggested that the beginning of the first sentence of the abstract be reworded to say:

- "A test of the MineWolf tiller (which is part of the MineWolf machine's tiller and flail system) was performed .....

**2. Executive Summary**

The last sentence of the first paragraph is factually incorrect as both tiller and flail are used both in Croatia and on other global operations. It is suggested that this sentence be reworded to,

"The MineWolf Machine is provided with both tiller and flail attachments to be used as part of a System, interchangeable dependent upon conditions. Only the machine with the tiller attachment was evaluated by ITEP for this report."

The summary reflects that the machine is used in "Croatia" and fails to mention its other global deployments, and makes general assumptions based on these facts. It is suggested that the following sentence be inserted to inform the reader of its global deployment, saying,

"The MineWolf is deployed in Bosnia and Herzegovina, Croatia, Jordan and Sudan and has been tested on live mines in the United Arab Emirates."

Paragraph 2 refers to the operational test conditions and makes mention of the "WORMs". It is suggested that an additional explanatory sentence be added here stating that,

"These WORMs have no explosive content and will always be visible on the test site after the test has been conducted."

If this is not highlighted in the report it will appear to the uneducated reader that the machine has "missed mines" and has failed to achieve its objective.

The first sentence of paragraph 4 states that "the depth control on the MineWolf **appears** to be effective when used." It should actually mention that "the depth control **is** effective in other operations in Sudan and Jordan. Paragraph 4 also states that the depth control skids are removed due to frequent damage. It is strange that the test was conducted without the depth control system activated, as it was fully serviceable as shown by the later tests and in operational deployments the depth control skids are used by all users of the MineWolf machine. It is appreciated that the skids do get damaged occasionally but this is not a frequent occurrence as indicated in the report. Based on lack of evidence, it is suggested that the second sentence of paragraph 4 be removed.

**3 Introduction Page 1**

The introduction purely reflects the machine is only being used in the Balkans and again does not mention its global activities. As the machine is deployed with several other major organisations in a variety of countries, MKA Demining should not be solely used as a reference to the compiling of the report.

Survivability tests have been conducted previously by CROMAC CTRO and the German Army.

Given the above the following amendments are suggested:

- Re-word the last sentence of the second paragraph of page 1 be re-worded to, "Only a performance test was conducted since this machine is already certified for use in Croatia and survivability tests have been carried out by CRMAC CTRO and the German Army."
- It is suggested that the third paragraph of page 1 be completely reworded to say, "The MineWolf Machine is provided with both tiller and flail attachments to be used as part of a System, interchangeable dependent upon conditions. Only the machine with the tiller attachment was evaluated by ITEP for this report."
- Remove "and survivability tests" from the last sentence of page 1 as they were not conducted.

**4. 2.1. MineWolf Tiller Pages 2 and 3**

The shaft rotates at 480 rpm, this has been left out of report. Please include it in paragraph 2.

The machine can be operated both manually and by remote control, when operating by remote control means the operator cabin is normally removed. Please include this in the text.

In paragraph 3 the report states that "MKA Demining considers the level of protection provided by the cab to be sufficient for the types of threats encountered during their commercial demining operations". MKA Demining are not experts on armoured cabins. MineWolf Systems have gone to get expense at having the cabin tested by the German Army, and an official test report is available upon request. It is suggested that this sentence be removed and a sentence saying that, "The German Army survivability test shows that the level of protection provided by the armoured cab is ....*within the admissible and acceptable range.*"

**5. 4.1.1 Tabular data and explanations Page 6**

The third paragraph states that , “ The reasons for the poorer performance are unknown..... This is not the case, the reasons are well known to the manufacturer and in Jordan and the UAE where the machine operates in sand conditions the tiller rotation speed (RPM) has been increased to address this problem. This would be unknown to the MKA Demining operator who would not have encountered sand conditions in Croatia. It is suggested that the sentence be replaced with ,

“The reasons for poor performance in sand conditions are known to the manufacturer and in Jordan and the UAE where the machine operates in sand the tiller rotation speed (RPM) has been increased to address this problem.”

**6. 4.1.3 Debris and Scatter Pages 10 and 11**

The last sentence of the second paragraph states that , “ The reader is invited to draw his or her own conclusions about the type of debris left in and around the area where the MineWolf has been used.” This sentence is not necessary as the whole report should be facts upon which the reader makes his/her own conclusions. It is suggested that the sentence be removed.

In general it is felt that there are too many photos which do not tell the reader much. As the series of photographs in figures 5 to 13 are not proportionally representative of the results and are not taken in situ, it is suggested that only one example from each of the four categories (live, live damaged, Mechanically neutralised and triggered) be shown to better reflect the actual test results. Otherwise it is rather misleading.

In figure 7, the photo showing an ‘unknown serial thrown outside of test lane’ is not clear what this means. What does an unknown serial mean? Which of the four categories does it fall into? If the category is known please re-word accordingly. If it has been triggered or mechanically neutralised then it should not be considered a throw-out. If the category is unknown it should not be included in the report as it is misleading.

On page 17, the first paragraph implies that pushing targets forward of the machine may be a negative result, whereas this is to be expected from a tiller. It is suggested that some additional explanation for the reader be inserted. Please add the following to the end of the second sentence,

“...forward of the machine..... once they had been processed by the tiller. This is to be expected when using WORMS rather than live mines which explode upon impact.”

The second paragraph of page 17 mentions vegetation but no vegetation was encountered during the test and therefore this is an invalid assumption and should be removed. The use of ‘is prone to’ implies repeatedly over a long time, not for the test duration. It is suggested that the second clause in the last sentence be re-worded to:

“..., the MineWolf did throw soil and mine fragment debris (see figure 14) to a limited extent.

The label for the photograph in figure 14, currently reads 'Typical debris throwing'. As it is usual to throw debris forward after processing with a tiller, it is recommended that the label be reworded to, "Debris thrown from the tiller after processing."

**7. 4.2.5. Depth and consistency of penetration – Discussion Pages 24 & 25**

The fourth paragraph on page 24 mentions, "Clearly the digging depths achieved were less than what has been observed from machines of this weight, class and power. The results for the test lanes with the targets at 10cm were the worst; if these results are excluded, the machine successfully penetrated to a minimum depth of 24cm in the remaining test lanes."

The only lane which achieved poor results was the sand 10 cm lane. This was one of the first lanes to be conducted and was due to a poor briefing of the required task given to the operator. The fact that the MineWolf tiller achieved 24cm and 30cm depth in the remaining test lanes means that the statement "Clearly the digging depths achieved were less than what has been observed from machines of this weight, class and power" is unjustified.

The three following bullet points in the fourth paragraph are all attributable to operator issues not the machine. Given the comment above that the performance in the 10cm lane is not a real issue, these bullet points focus too much of the reader's attention on the performance in the Sand 10cm lane and it is recommended that the entire paragraph 4.2.5.4 be replaced with a simple statement saying that,

"The results for the first test lanes conducted in the sand 10cm lanes achieved relatively poor penetration. As the machine successfully achieved a penetration of 24 cm in other lanes this could be attributed to operator error."

**8. 4.3 Depth consistency along the path Pages 25, 26 & 27**

This test report is supposed to evaluate the machine not the operator. The fact that MKA Demining chose not to operate the automatic depth control system, was an operator error, which was outside the control of the manufacturer in this instance. The automatic depth control system should have been used throughout the test and when it was used it clearly gave good results.

MKA's opinion on perceived efficiency of the use of the depth control system is just one operator's opinion and should not be reported. In fact, the depth control skids are used by MKA, as well as all the other users of the MineWolf machine. It is appreciated that the skids do get damaged occasionally but this is not a frequent occurrence as indicated in the report. Before quoting MKA's opinions on the use of the depth control skids, perhaps their use in other programmes should be looked at. Based on total lack of evidence, it is suggested that the whole of the last two sentences in the first paragraph be removed.

Whilst it is felt that too much emphasis was given to the machine operating without the automatic depth control system, given that this is unusual in actual 'real-world' situations and it was a factual record of the test and thus should be left in. The last

paragraph on page 26, "Consider a real world situation....." is however entirely opinion and should be removed. The text also in this paragraph is inaccurate as it refers to "flail" where it should read attachment of tiller.

The second paragraph on page 27, "Clearly the depth control skids..... Refers to MKA's use but not to other users. Also, as stated above MKA do actually use the skids in the field. In this instance it was an operator decision not to use the skids as he felt confident that he could perform the task without them.

**9. 4.5 Survivability Test Page 28**

The second paragraph of page 28, The MineWolf has been proven.... Does not take into account other global operations and does not mention the survivability testing by the German Army. It is therefore suggested that the first sentence be re-worded to say:

"The MineWolf has been proven in over 8 million square metres of mechanical demining in Croatia, Bosnia, Jordan, and Sudan and has been certified for use against anti-personnel mines and anti-tank mines by the Croatian Mine Action Centre and by the German Army."

**10. 4.6.3 Speed Page 28**

The report states that, "the speeds used during these trials were higher than typically expected for a machine of this type by a factor of two or three." Since this machine is quite unique, please could you define what the expected speeds are here and why? If the comment cannot be justified by using similar machines of design and construction then it is suggested that the comment is removed.

**11. 4.6.5 Debris traps Page 29**

This whole paragraph is entirely based on opinion. The WORM had been neutralised by the tiller. If it had been a live mine it would have exploded and not been trapped under the track. So speculation as to whether it had been a live mine is unjust as it would have detonated. With regard to this matter, the use of the WORM in the test does not reproduce realistic conditions and therefore this whole paragraph should be removed altogether or the last two sentences re-written to say that, "This target had been neutralised and on a live mine would have exploded".

**12. 5.1 Positive observations Page 32**

Again the machine is being evaluated purely on its operational capacity in Croatia, it is recommended that the machine should be evaluated on its global capacity.

**13. 5.2 Areas requiring attention Page 32**

Given the above observations, please remove the first paragraph, as stated before, the depth control is effective when used.

**14. Recommendations**

**Page 32**

In light of all the above comments it is suggested that this paragraph be re-written to reflect the rest of the report. MineWolf Systems would certainly recommend constructive criticism in this paragraph relating to machine modifications and improvement. For instance, tiller rpm speeds when operating in sand and protective measures for the depth control.



Paul J Collinson  
Director Operations  
MineWolf Systems