

Anti-Fog Drops

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Introduction

When people think of the safety hazards that deminers face, their minds jump to the most obvious and dramatic - the accidental setting off of mines, with the resulting possible injuries or death. But there are more subtle hazards that can contribute to the likelihood of this or other accidents - small things that sufficiently distract or impede deminers to make them less likely to be safe.

One such subtle hazard, in certain weather conditions, is that of visor fogging. In cold or humid weather, the normal breathing by a deminer on his or her visor can fog the visor to the point that the deminer cannot see properly. This lack of vision can lead to possibly devastating mistakes. To improve their visibility, deminers may be tempted to raise his or her visor, risking face or throat injury or death from shrapnel if a mine is triggered.

We have addressed this problem of visor fogging through the testing of chemical defoggers already available on the market, to determine which, if any, would be suitable for demining needs.

Defogger Selection

Based on reports from the previous group to work on defogging, three chemical defoggers were chosen - Fogtech Advanced Anti-Fog Solution, which was developed for industrial use, TYR Anti-Fog Drops, which were developed for use on swim goggles, and Cat Crap by EK, which was developed for glasses, goggles, and binoculars. These defoggers were tested for anti-fog capabilities and endurance, as detailed in the Testing section.

Both Fogtech and the TYR drops met our qualifications well, but the TYR drops are substantially lower in cost, an important consideration for deminers, and thus were chosen to be sent to the Fort Leonard Wood Humanitarian Demining Training Center for further testing.

Testing

Since the team from last term already tested the effectiveness of the drops, we focused on testing how durable and deployable the anti-fog drops.

To test how durable the drops were, we partitioned a piece of polycarbonate into four sections and coated each section with a different defogger that was recommended from last year. We saved the last section as a control. We then

periodically tested that the defogger was still effective. A few days in, we also tried wiping the polycarbonate and exposing it to water.

Out of the three defoggers we tested, Cat Crap was the only one that allowed fog to form without our physical interference in our test. The FogTech drops stopped blocking fog after it had been exposed to water. As a result, we decided to go with TYR drops for deployment.

Future work

If the results from the testing at Fort Leonard Wood demonstrate that the TYR drops are effective, bottles of the drops will need to be sent to demining organizations so that those organizations may try them in the field. If they prove to be effective in the field, they can be ordered online for less than \$3/bottle by demining organizations. A protocol for the application of the drops will need to be sent to demining organizations to give to their field supervisors, who will be responsible for applying the drops once a week.

Appendices

Appendix 1: Testing Procedure given to Fort Leonard Wood

Chemical Defogger Experiment for Ft. Leonard Wood
MIT Design For Demining
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Purpose:

Determine whether having a chemical defogger on deminers' visors would improve how well they can see when demining.

Experiment Plan:

The plan is to coat half of the inside surface of every visor with a defogging solution. Then let some trainees use the visors. Finally, ask them if they noticed that one side of the visor was easier to see through.

The hope is that the trainees will tell us that the side with the defogging solution was noticeably easier to see through because the other side kept on fogging up when they breathed. However, we have to be careful not to bias their answers for this experiment.

Materials:

1. Defogging solution
2. Clean cloth
3. Visors
4. Paper+Tape (or something to cover half the visor)
5. Questionnaires

Method:

1. Wipe down the visors such that there is no dirt on them.
2. Cover the **right** side of the inside surface of the visor with a piece of paper. If necessary, use tape to hold it in place.
3. Follow the instructions on the back of the TYR anti-fog bottle and apply the solution to the **left** (uncovered) side of the inside surface of the visor. Make sure none of the solution gets on the right (covered) side of the visor.
 - [Copied from back of TYR Anti-Fog Lens Cleaner bottle]
 - 1. Evenly apply spray to inside of lens.
 - 2. Wipe with a clean, soft cloth until the visor is dry and clear.
4. Remove the paper from the right side of the visor.
5. Pass out visors to trainees.
6. Go through standard demining training.
7. Immediately after the training and while the trainees still have access to their visors, ask the trainees to fill out the questionnaire.
8. After the questionnaire has been collected, tell the trainees what we were testing and ask if they have any comments. Ask them to write their comments on the back of the questionnaire.

1. Did you have any visibility issues with your visor during the training? If so, what?

2. Did you notice any visibility difference between the right and left side of your visor?

(The following questions only apply if you noticed a visibility difference.)

3. Which side could you see through better?

4. Was the difference significant?

5. What made it harder to see out of the bad side of the visor? (e.g. scratches, poor fit, fogging)