

# DDAS Accident Report

## Accident details

<b>Report date:</b> 15/05/2006	<b>Accident number:</b> 215
<b>Accident time:</b> 09:03	<b>Accident Date:</b> 27/06/1998
<b>Where it occurred:</b> Aleska Santic School, Nedzarici, Sarajevo	<b>Country:</b> Bosnia Herzegovina
<b>Primary cause:</b> Field control inadequacy (?)	<b>Secondary cause:</b> Inadequate equipment (?)
<b>Class:</b> Excavation accident	<b>Date of main report:</b> 29/06/1998
<b>ID original source:</b> WL/FG/WK/SB	<b>Name of source:</b> BiH MAC
<b>Organisation:</b> Name removed	
<b>Mine/device:</b> PMA-3 AP blast	<b>Ground condition:</b> grass/grazing area hard
<b>Date record created:</b> 16/02/2004	<b>Date last modified:</b> 16/02/2004
<b>No of victims:</b> 1	<b>No of documents:</b> 2

## Map details

<b>Longitude:</b>	<b>Latitude:</b>
<b>Alt. coord. system:</b>	<b>Coordinates fixed by:</b>
<b>Map east:</b>	<b>Map north:</b>
<b>Map scale:</b> WGS 84 2782 1 Sarajevo	<b>Map series:</b> M709
<b>Map edition:</b> 9-DMA	<b>Map sheet:</b>
<b>Map name:</b>	

## Accident Notes

inadequate metal-detector (?)  
squatting/kneeling to excavate (?)  
visor not worn or worn raised (?)

## Accident report

It is probable that the team involved in this accident was deploying two-man teams using a one-man drill.

A Board of Inquiry report was ordered by the country MAC and carried out by an ex-pat Technical Advisor. The report and a "lessons learned" paper were made available and the

following summarises their content. The original Bol is under *Related papers* at the "Other documents" tab.

The group were working on an area surrounding the playground of a school. The site was flat with grass up to a meter high. The group decided to concentrate on manual demining because the area had a high concentration of mines. Mine dog teams were used to check access and for QA at the end of each working day. The detector in use was the Schiebel AN19/2. Mines were found in a density of between 4-6 per square meter (according to the statement of the demining group's ex-pat manager).

The victim's partner found two PMA-3 mines and the Team Leader disarmed them and put them in a "mine storage area". The victim took over demining and after 4 minutes detonated a mine. He was squatting or kneeling and prodding at the time. He remained conscious but he had suffered damage to his eyes "due mostly to dirt coming up under his visor". He was evacuated to hospital "immediately", arriving after 18 minutes.

The victim stated that the accident occurred at 09:03 and "at the moment I cannot see". He thought that the uneven ground and the many mole holes in the "very hard" ground implied that the mine had been turned on its side "because I never saw it".

The Team Leader said that he had warned the victim to be careful because they had already found 23 mines in that area. The medic attended the victim in "around 30 seconds". The victim was working properly.

The Lessons Learned document commented that the use of two handed shears should be discouraged - especially in areas where mines with protruding fuses were suspected. The group should consider using other MAC approved detectors and should mark all field areas with tape according to SOPs.

The demining group's Operations Officer said that the victim was probing, that the explosion was not very loud and that the victim could see afterwards.

## **Conclusion**

The investigator concluded that the victim had been "wearing his visor fully down". He thought it was probable that the victim "did not carry out a second sweep of the clearance lane with the metal detector" and decided that the victim had thought that surface laid mines being found nearby meant that any other mines would be surface laid. The detector in use had been tuned to ignore clutter and so could not locate the mine known to be the threat.

## **Recommendations**

The brief report included no recommendations. The Lessons Learned paper recommended that manual clearance drills be reviewed to include a second sweep of the area after the vegetation had been cut. Also that detectors must be turned to find the known threat in an area, deminers should aim at 100% removal of metal in areas where a detector is used, and that every operator should have a detector test piece and he should check the detector every ten minutes.

## **Victim Report**

<b>Victim number:</b> 277	<b>Name:</b> Name removed
<b>Age:</b>	<b>Gender:</b> Male
<b>Status:</b> deminer	<b>Fit for work:</b> yes
<b>Compensation:</b> not made available	<b>Time to hospital:</b> not recorded
<b>Protection issued:</b> Frag jacket	<b>Protection used:</b> Frag jacket, Helmet, Short visor, Leggings

Helmet  
Short visor  
Trousers/leggings

### **Summary of injuries:**

#### INJURIES

minor Face

severe Eye

#### COMMENT

See medical report.

### **Medical report**

The investigation described the victim's injuries as "minor" from soil blasted "underneath his facial visor" and that the injuries were not serious or permanent.

The site medic's report recorded injury to both eyes with perforation injuries his to left eye. A medical report from the Sarajevo clinic on the day of the accident reported "kerato conjunctivitis" to both eyes with perforation to the cornea of left eye. Tests for the reflexes were restricted because of the oedema. They gave the victim a tetanus injection. No later medical details were available.

On June 22<sup>nd</sup> 1999 the victim's employer reported that he was just finished his training as a Dog Handler and had been back at work after "a week or two".

### **Analysis**

The primary cause of this accident is listed as a "*Field control inadequacy*" because the field management had control of turning detectors and it seems that the detector used was tuned in a way that left it unable to find the mine. It is probable that this old model of detector could not be tuned to find the mine without signalling continuously – in which case the detector was inadequate, so the secondary cause is listed as "*Inadequate equipment*".

The victim's visor must have been raised for the inside of his visor to have been soiled and his eye to have been penetrated by a fragment. The failure of the investigator to recognise this, and of the group's operations officer to recognise any eye injury, may be management failings.

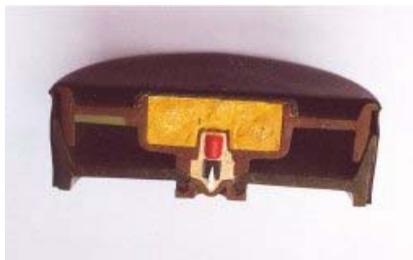
Once again in this theatre, the question of using two-handed shears in tripwire areas was raised by the investigators. This seems to indicate an obsession of the investigators rather than have any relevance to this accident. If tripwire feelers are used beyond the extent of the shears' blades, there can be an advantage in using two-handed shears over one-handed versions. That advantage is one of distance from a blast, with two-handed shears usually putting the hands more than twice the distance from a detonation that a one-handed shear would achieve. The safety issue with shears is not straightforward, and includes considerations of the ease with which the tool breaks up (becoming fragmentation) and the ease of controlled use and of deminer preference.

### **Related papers**

A detailed map, team statements, site sketch, photographs of mine cluster, access route and accident site, crater and victim's helmet & armour were in the Accident file.

A "lessons Learned paper" was published by the MAC because two incidents had occurred at the site within two weeks of each other.

The injuries resulting from stepping on a PMA-3 vary from traumatic amputation to minor bruising. The picture below shows why this happens. It shows a cut-away section through a PMA-3. The 35g Tetryl is in the top and centre of the mine. The area of pressure-plate surrounding the HE is actually larger than the area of pressure-plate over it. If a victim is fortunate, they step on the pressure plate but the explosive charge is not beneath their foot.



## Original Bol report

What follows is the original Bol report, edited for anonymity. There are striking similarities between it and the Bol report for the accident on 10th July 1998.

### REPORT OF BOARD OF INQUIRY INTO ACCIDENT 27 JUNE 1998

29 June 1998

#### References:

Map WGS 84 2782-1 M709 Edition 9-DMA – Sarajevo.

[Demining group] SOPs dated 1 December 1997.

UN MAC Technical and Safety Standards Guidelines Dated 17 June 1998.

### INTRODUCTION

1. As a result of a mine accident on 27 June 1998, a Board of Inquiry was convened by the Bosnia and Herzegovina Mine Action Centre to investigate the accident on behalf of the government and the World Bank, in accordance with the national Technical Guidelines.
2. The Board comprised:
  - a. Chairman - BH MAC
  - b. Member – Acting Deputy Director, Federal MAC
  - c. Member - Assistant EOD Coordinator, BH MAC
  - d. [Name excised], representing [Demining group] Corporation was present throughout the Board of Inquiry investigation and interviews at the task site.
3. A copy of the Board's Terms of Reference are attached at Annex A
4. [Demining group] staff members were helpful and cooperative throughout the course of the investigation. [The demining group were a commercial collaboration between an international and a national company.]

### SEQUENCE, DOCUMENTATION AND PROCEDURES OF TASKING

5. [Demining group] were tasked by the PIU in accordance with the provisions of their contract and had been provided with information on known minefields in the area by the UN MAC prior to the commencement of work. This Task was number 570.

### GEOGRAPHY

6. The task site where [Demining group] were operating is a rectangular grassed area next to the Aleksa Santic children's school in Nedzarici, West Sarajevo.

7. The site is generally flat and grassed, with a line of trees on two sides, and occasional bushes throughout the area. The nearest buildings are on two sides of the area, approximately 20 metres and 200 metres away. The ground was hard and dry.

#### PRIORITY OF TASK

8. The site is next to the Aleksa Santic children's school and close to a residential area. Priority was set by the Federation PIU.

#### SITE LAYOUT AND MARKING

9. A plan of the site is attached at Annex B showing the areas of clearance. Marking in clearance lanes was adequate.
10. The team was split into three parties and worked in different sections of their allocated areas of the site.
11. The Control Point for the team was situated next to the children's playground at the school. The CP was not marked in accordance with [Demining group] SOPs. It was stated that this was because the team had cleared the area at the start of the task.
12. There was no marked Access Route from the Control Point to the clearance lanes. From the ground markings it was obvious that a single route was used between the Control Point and the Start Points.
13. Marking of the area between cleared and uncleared areas was by use of one-metre high red topped stakes. Red and white nylon cord was fixed between the stakes.
14. Points where mines had been discovered earlier were marked with one-metre high blue topped stakes.

#### SUPERVISION AND DISCIPLINE ON SITE

15. [Demining group] have three teams working in the Sprind regional area. Sites are currently several kilometres apart. Managerial staff visit sites regularly and a supervisory structure as shown below assists in the maintenance of standards. These supervisors were either permanently stationed at the task site or visited the task site frequently, daily or every second day. The [Demining group] Regional Manager, [name excised], last visited the site on the morning of the accident at approximately 0830hrs. The site was running normally at that time.

Sprind Regional Manager - Regular visits.  
Operations Officer – Regular visits.  
Deputy Operations Officer – Regular visits.  
Team Leader – Permanently on site.

16. Operations Manager [name excised] [Demining group] Operations Manager also visited the site from time to time as part of his operational responsibilities.
17. PIU Representative. PIU monitors rotate between sites and teams on a monthly basis. Every task site has a PIU monitor deployed to it at all times when operations are in progress. The current Site Monitor, [name excised] had been monitoring the team since the day before the accident.

#### QUALITY ASSURANCE

18. Part of the Quality Assurance process is the presence at each site of Site Monitors employed by the Regional PIU, as stated above. The role of the Site Monitor is to ensure that the contractor carries out the work as agreed with the PIU, particularly with respect to working methods, safety and effectiveness.

#### COMMUNICATIONS

19. [Demining group] radio communications network is comprehensive and works well. Each team leader has a hand held VHF radio and are able to speak direct to all levels of Supervision including [Demining group] base at Sprind.
20. VHF radios are supplemented by vehicle-mounted HF radios. [Demining group] regional office is equipped with a base station and PTT telephones.

21. On this site the medic was responsible for radio communications to the [Demining group] Regional Office. [Demining group] Radio log shows that on the morning of the accident the medic had confirmed communications at 0615hrs.

#### MEDICAL

22. The Team medic, [name excised] is a qualified medic with wartime experience. [The medic] responded to the scene of the accident from the Medical Aid Point at the Control Point, approximately 100 metres away. He had a full trauma medical kit and stretcher. After initial first aid the casualty was evacuated to the Sarajevo Emergency Hospital and then on to Kosovo General Hospital.
23. The injured deminer was [name excised]. Injuries were minor damage to [the victim]'s eyes from soil blasted up, underneath his facial visor. No serious or permanent injuries were sustained.
24. Casualty Evacuation after the accident was reported as successful and efficient.

#### PERSONALITIES INVOLVED

25. Team involved in the accident was Team No. 5. This team comprised more members than is usual for a [Demining group] demining team. Two extra deminers were deployed to the team because it was anticipated that, due to the amount of mines known to be on the area, most of the work involved would be manual clearance drills.
- a. Team Leader
  - b. Deputy team Leader
  - c. Medic
  - d. No. 1 Deminer sustained injuries.
  - e. No. 2 Deminer
  - f. Deminer
  - g. Deminer
  - h. Deminer
  - i. Deminer
  - j. Deminer
  - k. Deminer
  - l. Dog handler
  - m. Dog handler
  - n. Mine Detection Dogs

#### EQUIPMENT AND TOOLS

26. [Demining group] reports that the manual prodder the injured deminer was equipped with was blasted away from his hand during the explosion, into the long grass adjacent to the point of the accident. This prodder has not been recovered at the time of writing.
27. The injured deminer was not carrying a trowel or digging tool.
28. The injured deminer was using garden hedge-cutting shears to cut the grass in the clearance lane.
29. Metal detector used by the team was a Schiebel AN 19/2. During an on-site test it appeared to function correctly. No test-piece was packed with the detector in its standard packaging. [Demining group] Regional Manager stated that it is normal practice for the team leader to hold the test-piece. Team members state that the Team Leader carries out required sensitivity and operational checks on metal detectors throughout the working day.
30. An informal on-site evaluation showed that the Schiebel would detect a PMA-3 fuze buried in the ground at a depth of 10 centimetres. Deminers stated that the Schiebel would not always detect all PMA mines because it was normally tuned to a level of sensitivity that would not signal for small amounts of metal in the ground. This was because the deminers considered that there was so much shrapnel in the ground that it would be impossible to clear it all. During an on-site test approximately four signals were transmitted by the Schiebel for each square metre of cleared area of ground tested at the site, next to the clearance lane where the accident occurred.

## DETAILS OF MINE INVOLVED

31. The mine involved was a PMA-3 Anti Personnel blast mine. This was confirmed by fragments around the crater, other mines found nearby and the size and shape of the crater.
32. Blue-topped stakes were placed in the ground at the site, approximately 30 metres from the point of the accident, to show exact locations where approximately 25 similar mines had been removed. These were all within an area approximately fifteen metres long by one metre wide.
33. A total of approximately forty PMA-3 mines had been found at this task site. Approximately four or five of these mines were buried, the remainder were surface-laid mines.
34. Deminers at the task site stated that the mine was laid on its side under the surface of the ground and that the injured deminer probably initiated the mine during normal prodding drills. The presence of moles under the ground at the task site is stated to support this theory.
35. The crater left after the explosion was symmetrical in shape and depth, commensurate with a conventionally laid mine at a depth of approximately 5 centimetres.
36. A PROM-1 bounding fragmentation mine had also been found by [Demining group] on this area. A TMRP-6 Anti-Tank mine, fitted with two tripwires was also found nearby, approximately one hundred metres from the point of the accident.

## EVIDENCE OF RE-MINING

37. There was no evidence or suspicion of re-mining at any part of the task site.

## DRESS & PERSONAL PROTECTIVE EQUIPMENT

38. Each member of the Demining Team was equipped with a helmet with a visor attached and a ballistic jacket. The injured deminer was wearing a helmet with visor, ballistic jacket and ballistic trousers at the time of the explosion. He was also wearing industrial working gloves, one of which was missing, presumed blasted away during the explosion.
39. Examination of these items of protective equipment showed that they were in generally good condition but the visor is probably unusable because of scarring and scratching from the explosion.

## USE OF DOGS

40. Because of the amount of mines known to be in the area, Mine Detecting Dogs are used at the site only first thing each morning, to check access lanes and last thing each afternoon, as a quality control measure.

## DETAILED ACCOUNT OF ACTIVITIES ON DAY OF ACCIDENT

41. The following account summarises the responses to questions by members of the Board, directed to members of the team involved, Supervisors and the Site Monitor.
42. The team started work on the morning of the accident at the usual time of 0600hrs.
43. Demining operations progressed as normal throughout the morning before the accident.
44. At approximately 0815hrs, the then No. 1 deminer, [name excised], reported that he had discovered two surface-laid PMA-3 mines close together in the clearance lane. The team leader dealt these with these and [the victim] then took over as the No. 1 deminer in the clearance lane. Approximately four minutes into his shift [the victim] activated the mine that injured him.
45. [Demining group] Regional Manager reports that normal manual clearance operations on this site involved the following sequence:
  - Metal detector sweep over top of high grass. Although this would not find any PMA mines, this was used in order to locate any PROM mines.
  - Cut grass and vegetation using two-handed garden shears.

- Second metal detector sweep.
  - Search with manual prodder over entire area. It was stated that this was because the metal detector would not always find buried PMA-3 mines.
46. Manual and visual searching throughout supported this procedure.
47. During an interview on 29 June, the injured deminer stated that the standard drill at the site *did not* involve a second sweep with the metal detector.
48. The No. 2 deminer stated that the standard drill *did* involve a second sweep with the metal detector.

#### SUMMARY

49. This demining team was working normally at task site that presented no significant problems. A high concentration of mines had been found on the area and most of these were laid on the surface. There was some disagreement between deminers' statements about correct drills that should have been used in clearance lanes. Schiebel metal detector in use at the site could have located the mine involved in the accident. Evidence shows that the mine involved was probably laid conventionally. Injuries sustained by the one deminer involved were minor and a full recovery is expected.

#### CONCLUSIONS

50. It is probable that the injured deminer did not carry out a second sweep of the clearance lane with the metal detector.
51. The injured deminer may have anticipated that, because mines found a few minutes before the accident were surface-laid, any mines close by would also probably have been surface laid. This may have had an effect on his clearance drills.
52. Clearance drills vary between different deminers.
53. The Schiebel AN19-2 metal detectors in use at the site are capable of finding PMA-3 mines on this area.
54. The mine involved was a PMA-3 mine; it was probably laid conventionally.

#### RECOMMENDATIONS

55. Manual clearance drills should be reviewed. They should include a second sweep of the ground with the metal detector once the vegetation has been cut away. All personnel should understand the clearance drills and they should not be varied without permission from the [Demining group] Regional Manager.
56. The metal detectors used on this site were capable of finding the mine involved in this accident. Because of the level of fragmentation in the ground, detectors were tuned to a level of sensitivity that disregarded mines. Where metal detectors are used they should be tuned to a level of sensitivity commensurate with the local threat.
57. 100% metal clearance should be aimed for in all areas where metal detectors are used. All signals given by the metal detector should be investigated.
58. Every operator should be in the possession of a test-piece for the metal detector. It should be the operator's responsibility to check the sensitivity of his own detector every ten minutes.
59. Deminer No. 1 should be equipped with a trowel or small shovel for investigating signals from the metal detector.

#### COMMENTS BY THE BOARD

60. All areas used by a demining team as administrative areas, rest places, control points etc. should be marked with pickets and tape, in accordance with page 16 of the National Technical Guidelines.
61. The use of two-handed shears for cutting vegetation should be discouraged. This should especially be the case in areas where mines with protruding fuzes or tripwires are

suspected. The use of two-handed garden shears provides less control than smaller, one handed shears.

62. Consideration should be given to the use of metal detectors approved by MAC. MAC recommends only the following metal detectors.

Minelab F1A4

Foerster MINEX 4

Guartel MD8

Vallon ML1620B

Signed: Operations Coordinator, BH MAC, Deputy EOD Coordinator, BH MAC, Acting Deputy Director Federal MAC

Annex A – Terms of Reference.

Annex B – Sketch map of site.

Annex – Details of detector test.

Annex – Details of crater analysis.

Annex – Statements of team members.

Annex – Photographs of site.

#### DISTRIBUTION

Senior Technical Adviser BH MAC

Director Federation MAC

[Demining group]

US State Department

World Bank

Federation PIU