

# DDAS Accident Report

## Accident details

<b>Report date:</b> 16/04/2004	<b>Accident number:</b> 207
<b>Accident time:</b> 12:55	<b>Accident Date:</b> 01/06/1999
<b>Where it occurred:</b> Between Gajevi and Gornjani villages, RS SAMAC/BRVNIK Region	<b>Country:</b> Bosnia Herzegovina
<b>Primary cause:</b> Management/control inadequacy (?)	<b>Secondary cause:</b> Inadequate training (?)
<b>Class:</b> Missed-mine accident (survey)	<b>Date of main report:</b> 07/06/1999
<b>ID original source:</b> KS/AS/NH/OG/SH/ZP	<b>Name of source:</b> BiH MAC
<b>Organisation:</b> Name removed	
<b>Mine/device:</b> PROM-1 AP Bfrag	<b>Ground condition:</b> agricultural (recent) dry/dusty trees
<b>Date record created:</b> 15/02/2004	<b>Date last modified:</b> 21/02/2004
<b>No of victims:</b> 3	<b>No of documents:</b> 1

## Map details

<b>Longitude:</b>	<b>Latitude:</b>
<b>Alt. coord. system:</b> BQ 0818 8681	<b>Coordinates fixed by:</b>
<b>Map east:</b>	<b>Map north:</b>
<b>Map scale:</b> Map 2785II	<b>Map series:</b> M709
<b>Map edition:</b>	<b>Map sheet:</b>
<b>Map name:</b>	

## Accident Notes

inadequate training (?)  
inadequate communications (?)  
inadequate equipment (?)  
protective equipment not worn (?)  
inadequate medical provision (?)  
inadequate area marking (?)

## Accident report

The following is the MAC's Accident report, edited for anonymity.

### INTRODUCTION

1. As a result of a mine accident on 1 June 1999, a Board of Inquiry was convened by the Bosnia and Herzegovina Mine Action Centre to conduct an investigation on behalf of the State and Entity governments, in accordance with the BiH National Technical Guidelines. The initial report of this accident received on 7 June 1999, is attached at Annex H. [Not made available.]
2. The accident involved a two-man Level One Survey Group from MAC RO [excised] who were collecting information about a suspect area of ground, as requested by a member of the local community. The Level One Survey Group was working in the village of GORNJANI as a continuation of a UNHCR project begun in 1998, it was their first day in the village.
3. The Board of Inquiry comprised:
  - Chairman – QA Advisor BH MAC
  - Member – Co-ordination Office BH MAC
  - Member – Co-ordination Office BH MAC
  - Member – Operations Advisor RSMAC
  - Observer – Co-ordination Office BH MAC

A representative of RSMAC was present throughout the site investigation and at RO [excised] including all interviews.

4. A copy of the Board's Terms of Reference is attached at Annex A. [No annexes were made available.]

### SEQUENCE, DOCUMENTATION AND PROCEDURES OF TASKING

5. The two Level One-Survey deminers were on an authorised task assigned to them by the MAC RO Banja Luka Operations Officer. They were assigned duties in GORNJANI to enhance the RO database of threat information, with a view to enhance the lives of local inhabitants who had been resettled by UNHCR. The task number for their duties is 1000065 the details of which are identified at Annex I.
6. The RO Manager or the Operations Officer task the two MAC personnel involved in the accident as an independent resource. Part of their duties involve surveying areas that are reported by the local populace as being suspect or as being mined.
7. [Victim No.2] who requested that he be followed to an adjacent field approached [Victim No.1], the L1 Svy Group Leader. This adjacent agricultural land was of concern as the local inhabitants believed it to be mined, and he knew of the location of two mines.

### GEOGRAPHY and WEATHER

8. The accident occurred immediately WEST of the village of GORNJANI, in the RS SAMAC/BRVNIK Region, within the Zone of Separation (ZOS), two kilometres SOUTH of the IEBL. The site is located at Grid Reference BQ 0818 8681, Map Sheet 2785II, series M709. Annex B contains a general location map of the accident location and the IEBL / ZOS overprint.
9. The general area where the accident occurred is flat, cultivated, agricultural land. The accident location is surrounded by mature deciduous trees, being divided into fields for crops and rattan canes. To the WEST and SOUTH, approaching the accident site, down the treed black track the L1 Svy Group would have passed fields that are ploughed and have worked in.

This season's crops have started their growth and large stands of three metre high cultivated 'rattan trees' enclose the accident site. Recent harvesting of these very mature 'rattan' canes occurred in the month of March 1999 and the cut rattan canes has been

stacked and laid out in rows to dry. As a note rattan is normally cut every year, the subject rattan has not been cut since the military conflicts in the region. The ground was dry at the time of the accident, but the site is located in 'swampy' ground that drains into the intermittent stream the 'BRVNIK'.

10. An unsurfaced black track provides 'SAFE' access to the accident location from the nearest tarmac road in the village of GORNJANI. The tarmac road is approximately 0.5 Kilometres to the WEST, of the accident site. Additionally, an unsurfaced trail, leaving the black track, provides immediate 'safe' access to the accident site.
  - a) The point where the mine detonated was approximately 80 metres north of this second unsurfaced trail, in the rattan canes cutting fields, an area that could not be considered safe.
  - b) The surrounding trees and divisions of the fields for corn and rattan canes shield the accident site from view unless one is standing on the unsurfaced trail.
11. The nearest buildings are approximately 650 metres to the NORTH EAST in the village of GAJEVI, and 500 metres to the SOUTHWEST in the village of GORNJANI. The villages and the black track can be seen in the 1:10 000-scale map print at Annex B.
12. There are lines of defensive trenches immediately adjacent to the area; the closest is approximately 120 metres away from the point of detonation to the SOUTHWEST.

An ammunition box remains in the open in one of the trenches, that must be crossed to access the accident site.

A UXO rifle grenade was found during clearance of the safe lane to provide access to the accident victims.
13. A [name excised] mine clearance operation in 1998 cleared houses in the village of GORNJANI, to the WEST of the tarmac road running NORTH/ SOUTH through the village, as part of a return of [UNHCR] refugees program. Completion of Clearance report is shown at Annex I.
14. The weather at accident site was both very warm and sunny on the day of the accident and on the day of the investigation.
15. Photographs of the area are shown at Annex B. [No annexes were made available.]

#### PRIORITY OF TASK

16. MAC RO Banja Luka assigned the priority for this task, the client can be considered as UNHCR.

A Level Two-Survey Team was clearing a safe lane, around the UNHCR returnee houses, as part of a plan to enlarge the cleared area available to the village inhabitants for their gardens and personal planting.

The Level One Survey Group was working in support of this task, assigned to collect information of the minefield threat to the EAST of the tarmac road.

No priority had been set for eventual demining activities on the area, as it will undertaken by a commercial company once safe lane is cleared around the WEST side of the back of the houses and out buildings.

#### SITE LAYOUT AND MARKING

17. A detailed plan of the site and its access is attached at Annex C. [No annexes were made available.]
18. As this was not an operational demining task site, there was no marking of any kind on the area.
19. The photographs depict the rattan cane plantations that enclose the accident site, show the rows of drying canes and illustrate the site the Level One Surveyors came onto with their civilian escort.

#### SITE SUPERVISION AND DISCIPLINE

20. MAC RO Banja Luka has 1 Level One Survey 'Group' that is separately tasked for their work. The 'Group Leader' is [Victim No.1].
21. The L1 Svy Group is largely independent but their work is driven formal plans for information gathering to add to an understanding of the mine pollution threat in a

particular area. The particular area to the EAST of the GORNJANI road was known to be mined from records but, the delineation of the threat fields had not yet been made.

22. After a visit by a Level One Survey 'Groups' to an area, their verbal and written reports are used as part of the process to decide whether there is a case for demining or a Level Two tasking to take place.

#### QUALITY ASSURANCE

23. There is currently no formal regime of supervision or inspection for the work of L1 Surveyors; their work is regulated by actions taken as a result of their written and verbal reports.
24. MAC RO Banja Luka staff do not visit Level One Survey sites on an occasional basis. This was the L1 Svy Group's first day in the village of GORNJANI.

#### REPORTING and COMMUNICATIONS

25. MAC RO Banja Luka Level One Survey Group communications network is based on VHF radios, mobile telephones, and a satellite telephone.
26. Their vehicle is / is not fitted with a VHF radio as part of their routine equipment. On the day of the accident [the driver], from the L2 Svy Team, used his vehicle radio to inform MAC RO Banja Luka about the accident.
27. Level One Survey Group VHF radios are supplemented by a mobile telephone in areas where there is an operational requirement and when a mobile telephone is available.

#### MEDICAL

28. The injured deminer, [Victim No.1], received extensive bone and tissue injuries to both legs. Following evacuation to BRCKO, hospital immediately after the accident, it was decided to transfer him to BANJA LUKA on 3 June 1999.
29. The injured civilian, [Victim No.2], suffered a severed artery in his upper left thigh, after the mine detonated behind him. He was evacuated to the hospital in DOBOJ.
30. After the mine detonated at 12h55, to render first aid and recover the injured:
  - a) The Level Two-Survey Team, working in GORNJANI, estimated the location of the explosion, rapidly moved down the 'black track' from the village to the source of the explosion.
  - b) [Victim No.2], the injured civilian, calling for help permitted the Level Two-Survey team to locate the victims off the unsurfaced trail, in the rattan cane cutting field.
  - c) The Level Two Survey Team cleared a lane to the mine detonation site and provided access to the victims for the medic.
  - d) The medic pulled out the injured [VictimNo.2] to the safe area and gave him first aid assistance . He also stated that [Victim No.3] was dead.
31. A Level One Survey Group does not normally carry medical equipment with them and are not trained as medics. There was a standard first aid kit in the team's car but this was not used as the Level Two-Survey team came to their assistance. The MAC RO manager had briefed the L1 Svy Group to work in the immediate vicinity of the L2 Team as they had full medical cover.
32. The casualties were removed from the area in the Level Two-Survey Team's ambulance.
33. The accident occurred at approximately 1255 hours.
  - Mr [Victim No.1] was received into BRKCO hospital at about 1400 hours.
  - Mr [Victim No.2] was received into DOBOJ hospital at about 15,00 hours.
  - Mr [Victim No.3] was pronounced dead at Samac medical facility at 16,00 hours.

#### PERSONALITIES INVOLVED

34. MAC RO Banja Luka personnel directly involved in the accident were a two-man Level One Survey group, and a local civilian who was showing the team around the area.
  - Mr [Victim No.1]- Level One Survey Group Leader.
  - Mr [Victim No.3] - Level One Survey Group Number 2.

Mr [Victim No.2] - Civilian escort.

35. Both members of the Level One Survey Group Leader are experienced in mine activities, had two years experience and have attended training in first aid, demining, L1/L2 survey and EOD.  
Their job descriptions state that part of their duties is the collection of information on new minefields, UXOs and making reports of suspect minefields and UXOs.  
They are not required to remove or recover mines and UXOs as part of their tasks. Their job duties and a Level One Survey Group Leader job description is shown at Annex F [No Annexes were made available].
36. The team has recently participated in Level 1-minefield surveys, including during a period of several weeks before the accident. They had been trained in their duties on formal courses run by RSMAC in BANJA LUKA.
37. This group reports their activities as 'Level One Survey Group No. 1', to the MAC RO BANJA LUKA Operations Office. An example of one of their weekly reports is shown at Annex J. [No Annexes were made available.]

#### EQUIPMENT AND TOOLS

38. The personnel involved in this accident were not carrying or issued with any demining tools or equipment, but used their hands to excavate and remove a PROM from the ground, in the immediate area of the mine that subsequently killed one and injured two.
39. Neither member of the team was carrying a map or binoculars, with them at the time of the accident. The available map plots from the database at least six threat minefields surrounding the accident site. Both team members were carrying task site documentation.
40. A Red Task Folder had been issued for the Level Two Survey Team working in the village. The Level One Survey Group had full access to minefield information of the threat in the local area, from BHMAL or MAC Regional Office for this area.  
Additionally a series of minefield records and Dayton FWF mine lifting records were enclosed. These were available in local languages and in English.  
Traces of an anti-tank mine burial 'hole' were found, marked and cleared by the L2 Svy Team that eventually rescued the accident victims.

#### DETAILS OF MINE INVOLVED

41. The mine involved was a PROM-1, bounding anti-personnel fragmentation mine. It was possible to recover the base plate, and the black powder fuse rod, to confirm this during the course of the site investigation work. These items were bagged, are now held in the AD Co-ordination Office at BHMAL Sarajevo.
42. Mines have been suspected and recorded on second half of the black track (to the SOUTH of the accident site), as it has not been in use for some years. Records and plots show that there are minefields across this part of the black track and in the area of the accident.  
A the PROM removed by the L1 Svy Group, and the second mine reported were known to have found during the cutting and subsequent, stacking of the rattan canes in the field. Harvesting of rattan remains unfinished in the plantation due to the confirmed identification of one the PROM-1 and by the presence of a series of stakes and trip wires along the length of the western, uncut, rattan canes.

#### EVIDENCE OF MINING / RE-MINING

43. The full mine pollution threat picture is difficult to determine in the SAMAL / BRVNIK region due to the shifting of confrontation lines and the eventual reporting of mining. There was no evidence or suspicion of re-mining at any part of this area.  
Extensive fighting took place in this area between the HVO (to the north) and the VRS (in the south) and both combatants laid the mines around this area during 1992 - 1995. Extensive records of mining were available from the National database.  
There are no known controversial UNHCR returnees to the area and groups do not dispute the ethnicity of the area.

#### DRESS & PERSONAL PROTECTIVE EQUIPMENT

44. Both members of the L1 Survey Group were not equipped with issue footwear. The deceased deminer was wearing lightweight running shoes, as shown on the Photograph at Annex E.
45. Each member of the team was wearing only personal clothing; nothing issued by the MAC.
46. No other protective equipment was worn or carried by the two MAC RO personnel involved.



[The photograph shows the start of the uncut canes.]

#### DETAILED ACCOUNT OF ACTIVITIES ON DAY OF ACCIDENT

47. The following summarises the events as understood at the time of the report writing.
48. The Level One Survey Group's visit to the village of GORNJANI was planned as part of their work schedule and they had been tasked by MAC RO Operations. The Level One Survey Group left BANJA LUKA at approximately 08h00 on Tuesday 1 June 1999. They arrived in the area at about 1045hrs on the day of the accident, it was their first day in the village.
49. It has yet to be determined what they did from 10h30 to 12h00. It was anticipated that they were orientating themselves to the village, as this was their first visit to the GORNJANI.
50. [Victim No.2] identified himself to the deminers as they were having a noon break snack. He indicated to them that he knew of the location of two mines that were of concern and could they come and collect it. As a local inhabitant he then escorted the team to the site.
51. The Level One Survey Group and [Victim No.2] walked in an easterly direction, up the unsurfaced black track, from the village of GORNJANI, towards the area of concern and crossed onto the unsurfaced trail, continuing to the EAST. Arriving at the location of the accident, they left the unsurfaced trail and proceeded NORTH into the 'rattan cane field, up to a line of uncut canes. At this point they were pointed out a mine located by its three-prong cluster, sticking out of the ground. The Level One Survey Group members then proceeded to remove the mine from the ground, having it neutralised with a clip.
52. Having dealt with this first mine they continued in a northerly direction walking, in single file spaced by one metre, along the edge of the plantation: The Civilian, No.2 Surveyor and Group Leader towards the site of the second 'known' mine. Fifteen metres from the excavated mine they were shown further evidence of mining, stakes with attached trip wires. The civilian confirmed he had cut the series of three or four trip wires and had placed them into the bushes while harvesting the rattan canes. They continued to walk up the cutting, to the NORTH, with [Victim No.2] leading, followed by [Victim No.1], and [Victim No.3]. Fifteen metres further along, up the first row of cuttings, [Victim No.3] stepped on the mine that killed him. [Victim No.2] walked over the mine, which subsequently exploded, not aware of it. Having stepped over it he was leading the L1 Svy Group forward to 'his' second mine.

53. After leaving the village, the Level One Survey Group used a black track, coming from the WEST, walking on a unsurfaced track that had not been previously been certified cleared, but could have been considered 'SAFE'.  
When they approached the rattan cane plantation and cutting field, they used an unsurfaced trail that could have been judged 'safe'.

[Victim No.2] asserts that he had walked up the first cutting row several times, had seen the mine that was removed and would have walked over the second mine before.

## SUMMARY

54. As part of an authorised Level One-Survey task, this L1 Survey Group was talking to a local resident and visiting areas of suspect ground collecting information. As authorised, this part of a deliberate process of assessment to decide whether the area warranted the deployment of mine clearance teams. The two-man group was walking over an uncleared piece ground towards an area that was known to be mined. It is the opinion of the BOI that this L1 Survey Group must have assessed the ground they were walking towards as of low risk.
55. The L1 Group had not sought out additional evidence to suggest the local community could consider the ground, on which they were walking, to be an area with low risk, even if it was in use. The Survey Group left an area of ground that had not been cleared, which may have been considered 'safe', into an mined area an area of known 'high risk' an action in contravention of MAC SOP 5.2.1.
56. The Survey Group removed a mine, thought to also be a PROM-1, from the ground, using an unauthorised procedure, an action that is in contravention of MAC SOP 9.
57. The team was not using demining tools or equipment and was not deployed on demining operations, proceeding well beyond the stated aim of Level One Survey, an action that is in contravention of MAC SOP 5.1.2.
58. The Survey Group removed a mine from the ground, while not wearing PPE, an action that is in contravention of MAC SOP 2.
59. In addition to database minefield threat information and the mine they had removed, the team had further information to suggest that there were additional mines at the accident site. As they walked, along the WEST side of the cuttings, they were shown at least three stakes in the ground with trip wires and hooks still attached.
60. A recovered mine and signs of mining having been ignored the L1 Group proceeded forward into an area of extreme 'high risk'. The L1 Svy Group did not confirm to their supporting L2 team both their location and plans before moving forward of a 'safe' area.

## CONCLUSIONS

61. This Level 1 Survey Group was employed as part of MAC RO BANJA LUKA's 1999 Demining Programme in the RS BRVNIK region of the Zone of Separation.
62. On the day of the accident they were carrying out duties that constituted a minefield Level 1 Survey, in accordance with the Terms of Reference for their jobs.
63. They had tacitly assessed the area of ground that they were walking over at the time of the accident as being of no obvious risk, despite clear evidence to the contrary.
64. In addition to both members of the L1 Survey Group being widely experienced as deminers, they were additionally trained in EOD and Survey but were not properly equipped to carry out mine clearance tasks.
65. A MAC deminer was killed, a second deminer and a civilian were both injured by a PROM-1.

## RECOMMENDATIONS

66. Complete and clear distinction should be made between Level One Survey assessments to gather general evidence of mining activity and Level Two-Minefield Survey operations to reduce the scope of the mine pollution problem in an area before demining begins.

67. When L1 Survey teams leave known cleared areas, walking into areas that they assess as 'safe' (low risk / no obvious risk) they should maintain at least five metres of separation, walk abreast and only if restricted by the terrain walk in single file.
68. In order to ensure that all known minefield / threat information is studied, before field work begins, team leaders should undertake a full Red / Blue Folder file review and produce a detailed survey plan, that is briefed to their Operations Officer.
69. Level One Survey investigations should be coordinated in consultation with multiple agencies Entity Army, Civil Protection and Local Police that may have information about the mines threat in an area, before proceeding to visit sites.
70. Confidence should never be placed on a single-source or unconfirmed information, especially that provided by local inhabitants, stating an area as being 'safe' and is of 'no obvious risk'.
71. In order to conduct Level One Minefield Surveys, and to be able to properly carry out the full range of tasks stated in their job description, personnel should be equipped with blast boots and have PPE with them when visiting sites.
72. The EMACs should revise their training and qualification standard for personnel involved in Level One-Survey tasks. This standard should be in accordance with Appendix 4 to Annex to MAC SOP No 1 Training, and be made available to the full demining community.
73. Personnel tasked to carry out Level One Surveys should work in accordance with BHMALC SOP No 5 (Mined) Area Survey, or with their own SOPs, which should be accredited by BHMALC before they are implemented.
74. The SOPs held and used at the EMACs and MAC ROs should be identical to those versions issued by BHMALC Sarajevo in Feb 1999, at the MAC QA symposium.
75. For all MAC demining operations and survey tasks only SOPs currently originated by BHMALC Sarajevo should be used.
76. Local translations of MAC SOPs should be passed to BHMALC Sarajevo for confirmation and acceptance as technically correct, before they are used in training and tasking of demining and L1/L2 survey.
77. All MAC deminers should have complete and continuous access to the full library of the most recent MAC SOPs, in the language of their choice.
78. As they carry the greatest burden of daily responsibility at task sites, guidance provided in revisions to MAC SOPs and at the monthly BHMALC Technical Working Group (TWG) should be fully and immediately distributed to all team leaders, by the EMAC Operations Officers.
79. Level One Survey Groups / Teams should carry a copy of MAC SOP 5 (Mined) Area Survey with them, for continuous reference, when deployed from their RO.
80. Personnel deployed on Level One Minefield Survey assessments should not walk off known cleared areas (while not always possible) and should never proceed forward of a point that has not been fully assessed by all personnel of the survey team as 'safe', with no obvious risk.
81. As team leaders are the first level of supervision at work sites, accident 'Lessons Learned Summaries' should be distributed to every survey and clearance team leader within BiH.
82. The distribution of 'Lessons Learned Summaries' should be individually recorded and their full distribution acknowledged to BHMALC Sarajevo.
83. The Lessons Learned Summaries template should be adjusted to reflect the full and intended distribution.

## **Victim Report**

<b>Victim number:</b> 265	<b>Name:</b> Name removed
<b>Age:</b>	<b>Gender:</b> Male
<b>Status:</b> surveyor	<b>Fit for work:</b> not known
<b>Compensation:</b> DM100,000 (less sick pay)	<b>Time to hospital:</b> 1 hour 5 minutes
<b>Protection issued:</b> None	<b>Protection used:</b> none



**Summary of injuries:**

severe Chest

severe Eye

severe Legs

AMPUTATION/LOSS

Toes

Eye

COMMENT

See medical report.

**Medical report**

No formal medical report for Victim No.1 was made available.

Telephone follow-up on 23<sup>rd</sup> June indicated that Victim No.1 was still in hospital. He had had two operations to remove fragments from his chest and one operation on his eye. He had lost three toes and the hospital was not sure that they would save his lower leg.

Follow-up report on 9<sup>th</sup> August 1999 was that one fragment passed close to the heart of Victim No.1, that he still had his leg but had "probably lost the sight in one eye".

The researcher was informed on 12th November 1999 that the Victim received DM100,000 compensation, less the sum already paid in sick-pay.

**Victim Report**

<b>Victim number:</b> 266	<b>Name:</b> Name removed
<b>Age:</b>	<b>Gender:</b> Male
<b>Status:</b> deminer	<b>Fit for work:</b> presumed
<b>Compensation:</b> not made available	<b>Time to hospital:</b> not recorded
<b>Protection issued:</b> None	<b>Protection used:</b> none

**Summary of injuries:**

severe Legs

COMMENT

No medical report was made available.

**Victim Report**

<b>Victim number:</b> 267	<b>Name:</b> Name removed
<b>Age:</b>	<b>Gender:</b> Male
<b>Status:</b> surveyor	<b>Fit for work:</b> DECEASED

**Compensation:** not made available  
**Protection issued:** None

**Time to hospital:** 3 hours 5 minutes  
**Protection used:** none

**Summary of injuries:**

FATAL

COMMENT

Victim sustained severe fragmentation injuries and died at the scene. No medical report was made available.

**Analysis**

The primary cause of this accident is listed as a *"Management/control inadequacy"* because the system of sending out Level 1 survey teams without protection is inherently and obviously dangerous. To expect the surveyors to always be able to correctly assess an area prior to entering it implies a lack of knowledge and/or thought on the part of those who devised the system. The parameters of survey seem to have been confused, with inadequate SOPs and the surveyors having no clear idea of the limitations of their work. With the work ill defined, the training cannot have been appropriate, so the secondary cause is listed as *"Inadequate training"*.

For example, the Surveyors were carrying a PROM-1 clip (clothes-peg) with which to render the first mine safe. From this it is reasonable to infer that they anticipated a need to make mines safe and considered that part of their job. An exchange about the accident with the MAC included the revealing line "nationals feel that the relevant internationals do not understand the subject of survey".

The injuries to Victim No.1's leg may imply that he stepped onto the mine, although the statements from others present imply that it detonated between the victims and so was tripwire triggered.

The country MAC and its QA department were reported to be considering revising the survey SOP in August 1999.

The recommendation to supply blast boots was peculiar. Blast boots would have served no purpose at all in a PROM-1 accident such as this. One member of the Board suggested that the recommendation was there because another Board member had a commercial interest in the supply of blast-resistant boots.

Trials of blast boots in the USA during 1999 (reported in 2000) found that there was little advantage in wearing any of the currently available boots when stepping on a charge the size of that in a PMA-3 and no advantage with a charge the size of that in a PMA-2. All of the boots limit mobility over rough or overgrown ground (some worse than others) and could make the wearer clumsy.