8-8-2003

DDASaccident398

HD-AID
Humanitarian DeminingAccident and Incident Database

DDAS Accident Report

Accident details

Report date:	28/02/2004	**Accident number:**	398
Accident time:	07:07	**Accident Date:**	08/08/2003
Where it occurred:	SHA:18, Al Meri, Hasbaya, Nabiatiyah Province	**Country:**	Lebanon
Primary cause:	Unavoidable (?)	**Secondary cause:**	Inadequate equipment (?)
Class:	Excavation accident	**Date of main report:**	04/09/2003
ID original source:	BoI: 003/2003: SB	**Name of source:**	MACC SL
Organisation:	Name removed		
Mine/device:	No.4 Israel AP blast	**Ground condition:**	
Date record created:	28/02/2004	**Date last modified:**	28/02/2004
No of victims:	1	**No of documents:**	3

Map details

Longitude:		**Latitude:**	
Alt. coord. system:	GPS. GR 36 7461 6908	**Coordinates fixed by:**	GPS
Map east:		**Map north:**	
Map scale:	UNIFIL	**Map series:**	Marjayuun
Map edition:	Genimap	**Map sheet:**	B (Marjayoun)
Map name:	1:50,000		

Accident Notes

vegetation clearance problem (?)

inadequate area marking (?)

inadequate training (?)

pressure to work quickly (?)

inadequate equipment (?)

squatting/kneeling to excavate (?)

visor not worn or worn raised (?)

Accident report

What follows is the original Board of Inquiry accident report, edited for anonymity and with excess pictures removed.

REPORT FOR ACCIDENT INVESTIGATION BOARD OF INQUIRY – No 003/2003
DEMINING Accident that occurred in OES 5 on 8th August 2003 in which [Demining group] Deminer [name excised] was injured.

References:
Lebanon National Technical Standards and Guidelines (TSGs)
International Mine Action Standards (IMAS)
[Demining group] Standard Operating Procedures (SOPs)
Map: UNIFIL Genimap 1:50,000 Sheet B (Marjayoun).
MACC SL Mine / UXO information
Journal of Mine Action issue 7.1 2003

Introduction

1. In accordance with the National Technical Standards and Guidelines (TSGs), the MACC SL Programme Manager issued a Verbal Convening Order on Friday 8th August 2003, for an accident investigation Board of Inquiry (BOI). Board members are Mr [name excised] Deputy QA Officer MACC SL and [name excised] LAF (NDO).

2. This is a comprehensive report by the Board of Inquiry into the Demining Accident that occurred on 8th August 2003. Based on the MACC investigation, [Demining group]'s internal report, statements from [Demining group] personnel involved in the accident (see Appendix 1), visits to the accident site and the photos from the accident site, this accident is considered nonpreventable.

3. An initial [Demining group] investigation report was forwarded to the BOI on 13th August 2003. At the request of [Demining group] the report was returned to them on 16th August 2003. A revised report was submitted back to the BOI on 19th August 2003 and this BOI report is based on the second submission.

4. The information provided by [Demining group] to the MACC SL QA Section in the "IMSMA Accident Report", attached at [Demining group] internal investigation report Annex C is confirmed. The accident occurred at 0707 hrs on 8th August 2003 in Suspect Hazardous Area (SHA) No 18 situated at Al Meri, GR 36 7461 6908, Annex B details a map of the general area.

Background

5. SHA 18 is an Israeli Force (IF) / South Lebanese Army (SLA) laid minefield surrounding a former defensive position. The position itself is now occupied by IND BATT of UNIFIL and is called position 4-30. [Demining group] Manual Clearance Teams 5 and 8A have been tasked with clearance of the minefields.

6. [Demining group] commenced work on site on 25th July and up to the time of the accident clearance assets had been operational in SHA 18 for a total of 15 operational days.

7. Mr [name excised] was the initial site supervisor and on 4th August he handed site over to Mr [name excised], who is the current supervisor. To date a base lane has been cleared completely around the outer minefield fence and the minefield itself has been accessed in three separate areas. This report primarily concerns team 5 Bravo who are working in area / section Echo.

8. Section Echo is accessed from the main road to the south of the UN position. It consists of an access lane running along a the length of terraced olive grove with 4 x 2m wide safe lanes at right angles cutting up a slope, through a dannet coil fence into the minefield. Where the

safe lanes meet the first row of mines working lanes have been opened to follow the direction of the rows.

9. The mines in this particular minefield are laid in four rows, which seems to be standard IDF practice in South Lebanon. However what is different here is the positioning of the individual mines. On this site mines are generally laid transversely (side on) with the fuze / igniter pointing towards the next mine in the row. In addition to this, mines do not all point in the same direction therefore it is proving difficult to continually uncover each mine from the back end. In the case of section Echo and in particular where deminer [the Victim] was working there is an added problem in that mines have migrated down the slope and as a result have been found in a variety of angles and attitudes.

10. Deminer [the Victim] had been working in this lane for most of the week and had located 16 mines. The team leader confirmed that the mines were generally pointing west and that [the Victim] was searching in the correct direction. Both personnel were aware of the fact that there were migrating mines in the vicinity because many of them were visible.

Events leading up to the Accident

11. On the day of the accident deminer [the Victim] arrived on site at approx 0600. He prepared his equipment, tested his detector in the main CP and was then given a site safety brief by the supervisor [name excised]. At approx 0610 Team Leader [name excised] led his team down to section Echo and placed the deminers in their working lanes. Deminer [the Victim] attached his base stick to the red lane picket, which, marked the end of the previous days clearance and began physically clearing in a westerly direction following the first mine row. Vegetation was light however it did consist of low thorny bushes and he was wearing his leather gauntlets (in addition to his Kevlar gloves) to prevent being scratched. The clearance lane was positioned on the left hand side of the mine row and he continued in a straight line until he reached a large bush blocking his path.

12. Initially deminer [the Victim] did not detect any mines and called his team leader forward for advice. They both noticed that at this point the inner minefield fence veered off uphill towards the UN position. They discussed that perhaps the mine rows also changed direction suspecting that they ran parallel with the fence. The team leader told deminer [the Victim] to change the direction of attack and therefore he started to clear up the slope. The team leader then returned to the end of the safe lane. ([Demining group] are conducting single man clearance drills with a team leader controlling 4 x deminers in his team)

13. Deminer [the Victim] searched ahead with his Mine-Lab Detector and within 2m received a signal. He suspected that it was a mine and marked it 20cm back with a white triangle. He knelt down and proceeded to excavate the signal. Although the ground is hard and dry it is also loose and brittle. Excavation is not difficult therefore he did not need water to assist his drills. As he excavated closer to the position of the signal he stopped and swept again with the detector. After again, pinpointing the signal he continued the excavation drill where upon a short time later there was a detonation at 0707 hrs.

14. Deminer [the Victim] was propelled backwards by the force of the blast and tumbled approx 6m down the slope over some rocks and came to rest on a flat uncleared area by the outer minefield fence.

Events following the Accident

15. Team Leader [Name excised] immediately announced the accident on his radio to the supervisor. He then retrieved a detector from the next deminer and entered [the Victim]'s working lane. He noticed that [the Victim] had fallen into an uncleared area and then proceeded to clear a lane down to him.

16. The team leader found that Deminer [the Victim] was able to stand therefore he assisted him back up into the working lane and along to the safe lane where the team medics dealt with the injuries. At the same time the ambulance was positioned at the entrance to the access lane. After stabilization, at 0723 hrs, Deminer [the Victim] was evacuated to Marjayoun Hospital for further medical treatment.

17. Following the accident site supervisor [name excised] passed back the initial accident report to [Demining group] base location. [Demining group] QA & Trg Officer [name excised] and MACC SL Planning Officer [name excised] arrived and secured the accident scene. Annex D details a schematic diagram of the accident area / scene.

BOI Post Accident Activities and General Observations

18. On arrival at the accident scene and after an initial reconnaissance by the Investigation Officers, it was ascertained that the BOI could gain safe access up to the accident scene without any additional clearance being conducted.

19. On the initial inspection of the accident scene the following general observations were established:

- There had been an uncontrolled sub-surface detonation of an item thought to be an Israeli No4 mine. (Excavation of the blast hole on 11/08/03 confirmed this when the striker and safety pin ring from an MUV fuze, as fitted to other No 4 mines on this site, were located)
- No other No 4 mines had been excavated and left exposed by deminer [the Victim] that morning
- Mines were visible in rows two, three and four and many were facing in different directions. One mine was seen upside down.
- The positioning of the first row of yellow pickets and the position of some visible mines indicated that mines have migrated down the slope.
- The direction of the mine row at the seat of detonation had changed. It had begun to follow the fence line up the slope, to the right at the point where the last mine was located on the previous day.
- The deminers' excavation tool and protective safety goggles were missing. (Safety goggles were located on 19th August 2003 in an uncleared area 4 – 5 metres north west of the seat of detonation. The excavation trowel was also found the same day 70m east of the seat of detonation)
- The minefield marking at the meeting point of the safe lane and the working lane was not in accordance with SOPs.
- It was noted from the daily work sheet for 08/08/03 that the team arrived on site at 0600 and deployed into the minefield at 0610.

20. The breakdown of items and areas are detailed as follows:

- No 1 – Seat of detonation
- No 2 – Final resting place of base stick base stick
- No 3 – Last mine before row changed direction.
- No 4 – Last lane pickets
- No 5 - Mine-Lab detector
- No 6 - Position of Deminer [the Victim] at the time of accident.

An image showing these with overlays on the scene was corrupted in transmission and so is not included.

LOCATION OF VISOR

[The visor is in the top of the bush shown here.]

21. The inspection and excavation of the accident detonation crater was conducted on 11/08/03 and the following specific observations were noted:

- The crater had formed through a sub-surface detonation of an Israeli No4 mine.
- A striker from an MUV type fuze was located along with the safety pin ring.
- Israeli No4 mine primary plastic fragmentation was located.

VIEW SHOWING REMAINS OF MUV FUZE STRIKER AND SAFETY PIN RING

Tools and Equipment

Excavation tool

22. When the accident occurred Deminer [the Victim] was using a small metal excavation trowel. Initially this item could not be found however a post accident search of the site discovered the trowel on 19th August 2003. It had been propelled 70m east of the seat of detonation into an uncleared area. An examination revealed that it is severely bent and deformed which is consistent with being in very close proximity to detonating explosives.

Detector

23. The Mine – Lab detector control box was detached from the main frame and face of the box was damaged by fragmentation.

Prodder

24. This item, although in deminer [the Victim]'s tool kit, was not utilised on this site due to the uncertain positioning of the No 4 mines.

Personal Protective Equipment (PPE)

25. At the time of the accident, Deminer [the Victim] was wearing his protective vest, visor, safety goggles [worn in addition to a visor], Kevlar working gloves and leather gauntlets.

Protective vest

26. On inspection of the protective vest, the following specific observations were established:

- The outer cover was ripped from the top downwards
- The blast debris was concentrated in the upper third slightly right of centre
- There was part fragmentation penetration of the Kevlar lining.
- Neck guard was intact
- The breast plate was broken diagonally however there was no fragmentation penetration into the vest behind it.

VIEW OF [Victim]'S PROTECTIVE VEST

[The torn cotton outer has been peeled back to reveal the ballistic aramid (NOT Kevlar) inner with a pocket containing a sheet of 5mm polycarbonate to raise the protection level over the chest. The polycarbonate insert had snapped in half.]

Visor

27. The visor was discovered lodged in top of the bush 2-3m from the seat of detonation. On inspection the following were noted:

- The vast majority of blast and fragmentation that hit the visor were absorbed by it.
- There is a 2mm hole slightly left of centre mid way up the visor.
- The polycarbonate has cracked around the left hand visor pivot point.
- Small pieces of hot fragmentation have melted the polycarbonate and have embedded into the outer face.

VIEW SHOWING [the Victim]'S PROTECTIVE VISOR

[Note: these visors are locked in the "down" position with nuts and bolts, so do not "pivot".]

Protective goggles

28. As per [Demining group] SOPs protective goggles [industrial safety spectacles] were worn in addition to the visor. Post accident search of the site discovered the goggles on 19th August 2003. Detailed examination revealed that although they were detached from their frame they did maintain their integrity. Small pieces of fragmentation were imbedded in the lenses but there was no full penetration. [No picture was provided.]

Kevlar working gloves

29. The medical staff removed the gloves during stabilization. They were inspected and the following points were noted:

- The left hand glove did not suffer any damage
- The right hand glove has been generally retained its integrity against the blast and fragmentation. However it was cut severely in the area between the base of the thumb and the forefinger where the excavation tool was gripped.

[The gloves are shown above.]

Work History of the Casualty

30. Deminer [the Victim] has been employed as a deminer for the past three and a half years. He started demining with [another commercial company] and has worked on the border minefields of Zimbabwe and Mozambique. He joined [Demining group] in South Lebanon in Jan 03 and attended and passed the basic deminers course on 10th Feb 03. He has been working in IDF laid minefields for over six months and is considered by [the Demining group] to be competent and reliable. Deminer [the Victim] has not had any disciplinary action taken against him.

Sequence, Documentation and Procedure of Tasking

31. Task Dossier (TD) OES 5B#006 was issued to [Demining group] on 9th July 2003. The TD contains details of 1 x minefield and 2 x suspected hazardous areas (SHA) in the vicinity of Al Meri. Up to the time of the accident a total area of 801 m² of the AP minefield had been cleared by manual assets, resulting in the disposal of a total number of 262 x Israeli No4 AP mines.

Geography and Weather

32. SHA 18 task site is located on a small hill on the northern edge of Al Meri village. Access to section Echo is 50 metres south of the approach road to the UN position via the main road from Al Meri to El Khraibe. The mined area was previously terraced olive groves and the terraces immediately outside the minefield fence are currently planted with trees. The weather at the time of the accident was very warm with a temperature of approximately 20 to 25 degrees Celsius.

Site Layout and Marking

33. The site layout and minefield marking prior to the accident was generally in accordance with National TSGs and [Demining group] SOPs. The exception to this was an area where deminer [the Victim]'s working lane met the safe lane. At this point two rows of yellow pickets were in evidence indicating that the deminer had cut through to the second mine row and that demolition of the mines had taken place. However the minefield safety marking tape and red topped pickets were still in the position for row one. This gave the impression that when conducting clearance and demolitions personnel had stepped or reached over 1m past the tape, which is certainly a dangerous course of action. The site supervisor and team leader assured the investigating officers that this was not the case and that the area was cleared and marked correctly prior to demolitions occurring. The marking was removed for the demolition to save waste, however when reinstalling the tape and pickets, the deminers closed off the previously cleared area by mistake.

Management Supervision and Discipline

34. The [Demining group] clearance operation has recently undergone some management changes. As a result there is a general project admin manager (Non Technical) who is in overall charge. He is supported by an operations officer, a QA and training officer and two senior technical supervisors / managers. An international supervisor controls the site itself and 3 x international Team Leaders are in overall charge of the 3 x half manual clearance teams. There are no reports of disciplinary action being taken against any [Demining group] personnel on SHA 18 so far.

Quality Assurance

35. Internal QA is a continuous process with daily QA checks and evaluations being conducted by [Demining group] personnel. There are no reports of any indifferent evaluation results on the task site.

36. External QA was carried out by the MACC SL QA Section [other Demining group]; the last External QA Evaluation was conducted on 5th August 2003 where medical and command and control were evaluated; all evaluation results were good.

Communications and Reporting

37. Communications between SHA 18 and [Demining group] base location are maintained via the use of vehicle mounted and hand held VHF radios and a cell phone. On site communications between teams are also maintained via VHF handheld radios.

38. On the day of the accident, the site had proper and appropriate communications and managed to pass all relevant accident information back to [Demining group] base location, which in turn passed the information to the MACC SL in a timely manner. Appendix 1 Annex A details the Initial Casualty Report.

Medical Details

39. Deminer [the Victim] suffered blast and fragmentation injuries to his face, right hand, front of right thigh and left forearm. In particular the right eye was bruised and grazed and the right hand received a deep cut from the base of the thumb into to the palm. The right hand middle finger was also fractured.

40. After [Demining group] medics administered medical treatment and stabilisation on-site he was evacuated by road to Marjayoun Hospital. On arrival there he was transferred to the Emergency Department for x-rays and treatment. Later that day he was he was transferred to Hammoud Hospital in Saida. Annex J to [Demining group] investigation report details the medical report from Hammoud Hospital and Annex H details the IMSMA Casualty Report.

Personnel

41. [Demining group] internal accident report dated 13 Aug 03 and written statements from [Demining group] personnel involved in the accident form Appendix 1 and Appendix 1 Annex E this report.

Details of Mine Involved

42. The Israeli No4 AP blast mine consists of a plastic box with a hinged lid that overlaps the sides. The main charge is 188g of cast TNT, housed in an internal plastic compartment, which occupies just over half of the volume of the box at the hinged end. The wall of this compartment is threaded to accept the fuze assembly; the remainder of the box is empty.

43. The metal MUV fuze assembly is fitted through a hole in the end of the mine and screwed into the wall of the charge compartment and sealed with a rubber O-ring. The other end of the striker protrudes through the end of the mine opposite the hinge. The safety pin is attached to a pull ring, which is looped over the fuze body and retained by a plastic cap during transit for additional safety. The spring loaded striker is held back from the detonator by a pin through its shaft. This pin is an integral part of a yoke and retaining pin on which the open end of the mine body rests.

44. The mine is designed purely for direct pressure operation. To arm the mine the pull ring and safety pin assembly are removed. The spring-loaded striker is retained only by the yoke and retaining pin. Pressure on the lid (in excess of 8kgs), simply pushes the yoke and retaining pin out which in turn releases the spring loaded central striker. The striker then impacts with the integral fuze detonator, which then passes the detonating wave to the main TNT charge causing the mine to disintegrate.

45. It is possible that movement of the mine and / or accumulated pressure over a period of time (especially in heavy soil conditions), can also slowly release the yoke and retaining pin. This will therefore reduce the direct pressure required to activate the mine.

ISRAELI NO4 AP BLAST MINE FITTED WITH MUV FUZE

[Note that although the fuze is described as an MUV type, the pin is not the conventional winged wire sort.]

Account of Activities

46. The following is a description of the events before and after the accident. The information from the investigation forms the basis of the description of events:

08/08/03

- 0600 hrs – The team arrive on site at SHA 18
- 0610 hrs – Deminers deployed into mine field
- 0707 hrs – Uncontrolled detonation at section Echo
- 0715 hrs – Accident information passed to [Demining group] Base Location.
- 0723 hrs – On-site stabilisation of casualty completed.
- 0723 hrs – CASEVAC of casualty to Marjayoun Hospital
- 0737 hrs – Initial accident information passed to MACC SL.
- 0745 hrs – MACC SL Dep QA Officer informed of accident.
- 0747 hrs – Arrival of casualty at Marjayoun Hospital.

- 0815 hrs – BOI Arrives at accident site to conduct accident investigation.
- 1000 hrs – BOI and all [Demining group] personnel leave accident site and move to [Demining group] base due to fighting on the border. SHA 18 placed out of bounds.
- 1030 hrs – BOI continues interviews at [Demining group] base and later that day the casualty is moved to Hammoud Hospital in Saida.
- 1330 hrs – BOI arrives at MACC SL and briefs Programme Manager and Planning Officer at 1500 hrs.

09/11/03

- SHA 18 still out of bounds
- All day - MCT 5A, 5B and 8A conduct refresher training at [Demining group] trg area in Klayaa
- 1300 hrs - BOI arrives at Saida Hospital to visit casualty.
- 1330 hrs - BOI departs Saida hospital. Casualty could not be interviewed.

11/08/03

- 0630 hrs – BOI arrives at SHA 18 to continue the investigation. Clearance continues and an MUV striker and safety pin ring are discovered at the seat of detonation.
- 1200 hrs – Supervisor begins demolitions of mines.
- 1400 hrs – BOI departs for MACC SL

12/08/03

- 1300 hrs – BOI arrives at Hammoud Hospital Saida and interviews deminer [the Victim]
- 1400 hrs – Interview concludes and BOI departs for MACC SL.

Insurance Details

47. Deminer [the Victim] is covered by the standard [Demining group] insurance for all International personnel conducting mine/UXO clearance activities in Lebanon. All insurance policies for [Demining group] are through HMT Insurers of London. A copy of the scale of entitlements is held at the MACC SL QA Section.

Conclusions

48. Based on the investigation, the statements and visits to the site, the BOI concludes the following:

a. No 4 anti personnel mines have migrated down the slope in section Echo where deminer [the Victim] was working and both he and the team leader were aware of the increased danger that they may cause.
b. An Israeli No4 Anti Personnel mine fitted with an MUV fuze detonated whilst Deminer [the Victim] was excavating a previously detected signal.
c. The mine was buried and was probably pointing towards deminer [the Victim]. Evidence to support this is that prior to the change in direction the majority of mines were pointing west and he was correct in his clearance methodology. However at the point where the mine rows change direction the mines themselves are also reversed, and from that point on are laid pointing east. (The next mines in the row were discovered in an east facing attitude towards him. This came to light when the area was block searched as part of the investigation.)
d. The BOI agrees with the assessment (Appendix 1Para 5.6) of the [Demining group] accident investigation officer. The mine may have become unstable due to migration coupled with accumulated pressure from previous demolitions, which in turn may have caused the retaining yoke and pin to partially disengage from the striker. It probably functioned when the excavation trowel struck either the plastic lid or body of the mine. This in turn would have released the striker retaining yoke and pin allowing the cocked striker to move forward, hit the integral detonator and detonated the mine. However there is no firm evidence to support this at present because [the Victim] does not remember striking anything and the excavation trowel cannot be found.

e. He was correctly wearing his full complement of PPE as per [Demining group]'s SOP. (Safety goggle frames were uncovered in the uncleared area on 14/08/03) The good quality of the PPE has undoubtedly saved [the Victim] from very serious injury. The protective jacket maintained its integrity.
f. Visor was breeched on the left side but maintained sufficient integrity as to ensure that no serious facial injuries were sustained to him.
g. The Kevlar gloves kept their integrity against the mine blast. However the tear/cut in the fabric between the base of the thumb and forefinger and the resulting deep laceration was caused by the blast wave forcing the shoulder of the excavation tool into the hand.
h. Evidence reveals that contrary to his statement, he was also wearing his leather gauntlets in addition to his Kevlar gloves when excavating the mine. His right hand gauntlet was discovered to have sustained burns and blast damage consistent with being in close proximity to a detonation.
i. Deminer [the Victim] normally removes his gauntlets after cutting vegetation because if worn with Kevlar working gloves dexterity and sensitivity are reduced when excavating. The BOI agrees with this view. The Gauntlet provided no significant protection against the blast or fragmentation and may well have been instrumental in the fact that [the Victim] did not think that he struck the mine before it detonated.
j. [Demining group] SOPs do not detail the circumstances under which leather gloves are to be worn. Post accident it was ascertained on a visit to the training team that deminers were being taught to remove them for excavation and prodding drills.
k. The protective breast plate was snapped when deminer [the Victim] fell down the slope amongst the rocks.
l. The blast wounds to his face were due to the positive blast effects resulting from the disintegration of an Israeli No4 mine, on the detonation of the high explosives. Other injuries to his left forearm and front of right thigh were sustained from secondary fragmentation, resulting from the disintegration of the Israeli No4 mine, on the detonation of the high explosives.
m. The on-site stabilisation and treatment of the casualty was conducted in a professional and expedient manner.
n. Prior to the accident happening the new medic, Mr [name excised] should have carried out a CASEVAC drill and should have been intimately familiar with the exact location of all demining lanes on the site.
o. The team arrived on site at 0600 hrs and were then deployed into the minefield at 0610 hrs. The BOI has cause for concern in that, if these timings are accurate then preparation for work and in particular the testing of 12 x detectors could not have been completed in accordance with [Demining group] SOPs.
p. The passage of information in between the accident site and [Demining group] base location was good with all information being passed in a timely manner.
q. The BOI disagrees with the following aspects of the [Demining group] Accident Report:
    - Para 3.7 “A detailed visual examination of the Mine Lab F1A4 metal detector was used by Mr [the Victim] was carried out by the team leader before the deminer went to work”. Given the ten minutes that the team were in the CP before deployment it is very doubtful whether this occurred.
    - Para 4.1 “SHA 18 where this accident occurred is not considered a difficult task” The BOI considers that this **is** a difficult task and should be treated as such. Migrating mines, mines facing different directions, unexplained changes in the mine pattern and loose soil on some steep slopes make it so.
r. The BOI agrees and accepts [Demining group] IMSMA Accident and Casualty Reports.

Recommendations

49. The following are recommendations based on the BOI conclusions:
    a. Team Leaders are to closely supervise manual clearance drills in areas where mines are known or suspected to have migrated. If a Team Leader cannot achieve this then the two man drill should be adopted on a site / lane specific basis.

b. The Supervisor and Team Leaders are to exercise better control and ensure that the team prepare for work correctly and do not enter the minefield until all equipment checks are fully completed.
c. Leather gauntlets should not to be worn on top of protective working gloves when conducting excavation and prodding drills. [Demining group] are to state in the company SOPs the criteria for wearing leather gauntlets.
d. Team Medic, Mr [name excised] is to be given refresher training and reassessed on his emergency drills by the [Demining group] medical coordinator. He is to carry out a CASEVAC drill and is also to ensure that he is familiar with the site.
e. [Demining group] are to disseminate to all demining personnel the danger of accumulated pressure on the MUV fuze as fitted to the No 4 AP mine. Prior to the accident there was a train of thought that this fuze could be difficult to activate due to corrosion and [Demining group] introduced a neutralization method for use where necessary. The accident itself and **unreported** sympathetic detonations on SHA 18 indicate that fuze can be as sensitive as a No 9 igniter.
f. Minefield / team management refresher training is conducted for site supervisors and team leaders and should include the following:
    - Prodding and excavation drills.
    - Correcting errors/faults
    - Detector testing
    - Marking systems.
    - Site and team preparation
    - Task appreciation and lane placement.
g. [Demining group] should consider replacing their current excavation trowel with one that will cause less damage to a deminers hand should there be an accident in the future. (Refer to Reference F)
h. The conclusions detailed in this report be distributed and discussed among all [Demining group] Operational Field Staff.

Signed: QA Officer, MACC Southern Lebanon

Annexes:
A. Summary of interview with [the Victim]
B. Map of the General area
C. Interim accident report
D. Schematic diagram of the accident area / scene.
E. MACC SL Initial Casualty Report
Appendix 1. [Demining group] internal investigation report.

Copies to:
MACC SL Operations Department.
NDO.
[Demining group] (2)

Comments by the MACC SL UN Chief Operations Officer

It is evident from the BOI report findings that this accident did not involve any major breaches of [Demining group] SOPs. The fact that the accident happened forward of the base stick indicates that the deminer was working in accordance with the same.

I am concerned however that there appears to be some confusion within [Demining group] on their policy on wearing of leather gloves. I would like [Demining group] to confirm in SOPs their policy in this regards as soon as possible. I feel that the wearing of the heavy leather gloves during excavation and prodding may have contributed to this accident, as the deminer I believe will not have the same “feel“ for any target that he may encounter during prodding or excavation drills. Any vegetation should have been removed prior to him excavating the specific spot and therefore negates the reason for wearing heavy leather gloves. The

wearing of Kevlar finger gloves is still to be applauded as these provide a layer of protection for the hands from blast injuries and in particular burns resulting from any explosion.

I would also request that [Demining group] look at the selection of demining hand tools being used and in particular the trowel that was used by the deminer in this instance. With some local modification to the rear shape of the trowels this could reduce the seriousness of the injuries sustained to the deminers hand. Refer to the JMU Journal of Mine Action articles in issue 6.2 and 7.1 on this aspect.

I'm also concerned at the penetration of the ballistic visor. This is the second such incident in-country and if it had not been for the fact that the deminer was wearing additional safety goggles under his visor ([Demining group] SOP) more serious eye injuries would have occurred. I therefore request that [Demining group] seek the manufacturers written confirmation of the blast and fragmentation capabilities of their visor with supporting test results and provide a copy of this report to the MACC SL QA Section.

Supervisors and Team Leaders are to be made aware once again of the importance of constant vigilance when their deminers are encountering mines that are not in their original position or have been disturbed by other causes; natural or man made.

All Medics assigned to a new site are to undergo a physical on-site orientation and a CASEVAC exercise prior to clearance operations taking place. This is a mandatory requirement and should not be "overlooked" by the Site Supervisor. Failure of the Site Supervisor to meet any of his responsibilities in the future will result in his accreditation being reviewed.

I concur with the BOI conclusions and recommendations of this report and request that all recommendations as well as those detailed above are completed by [Demining group] as soon as possible and feed back to the MACC SL QA Officer is provided once complete.

Signed: Chief of Operations, UN Component, Mine Action Co-ordination Centre Southern Lebanon

Comments by the MACC SL UN Programme Manager

Whilst I concur with the Board of Inquiries findings and agree that this accident was unfortunate but non-preventable, there are a number of peripheral issues which give concern and if not addressed without delay may lead to further, preventable, accidents.

The ten minutes stated in the site log (06.00 to 06.10) is clearly not long enough to have completed all of the mandatory start up procedures and checks, particularly the calibration and balancing of twelve detectors.

The incorrect marking at the start of the lane is also a cause for concern, as is the supervisors' lack of corrective action.

Although the injuries in this case were light, the medics' apparent confusion, lack of necessary site knowledge and failure to perform a recent CASEVAC exercise may have been critical if the injuries had been more serious.

Whilst varying degrees of seriousness may be applied individually to each of these instances, combined they demonstrate a clear lack of appropriate supervision on this difficult mine clearance site. [Demining group] are therefore advised to take immediate corrective action to address this potentially dangerous lack of on site management and ensure that similar occurrences do not arise on their other sites.

Now that this situation has been identified, further reoccurrence will result in an immediate recommendation to withdraw the operational accreditation of the team involved and a further review of the organisational accreditation that allowed it to happen.

I also support the MACC SL Chief of Operations view that [Demining group] amend their SOP regarding the wearing of two sets of gloves. The MACC SL Chief of Operations is also to prepare an appropriate draft amendment for National TSGs for submission to the NDO.

The Conclusions of this Board of Inquiry are fully concurred with and the Recommendations should be put into practice as soon as they are endorsed by the NDO.

Signed: UN Programme Manager, MACC SL

Victim Report

Victim number:	513	**Name:**	**Name removed**
Age:	25	**Gender:**	Male
Status:	deminer	**Fit for work:**	not known
Compensation:	not made available (insured)	**Time to hospital:**	32 minutes
Protection issued:	Frontal apron Long visor Safety spectacles Gloves	**Protection used:**	Frontal apron, Long visor, safety spectacles

Summary of injuries:

INJURIES

minor Arm

minor Face

minor Leg

severe Eye

severe Hand

COMMENT

See medical report.

Medical report

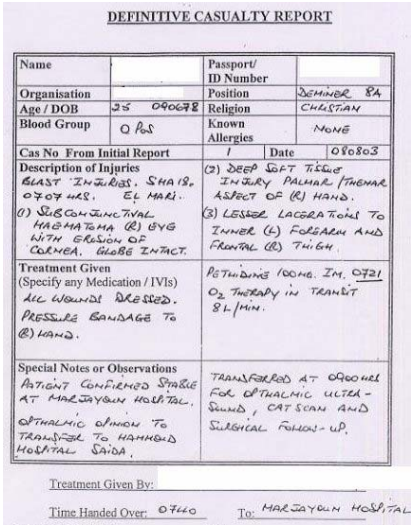
The BoI report stated that the Victim “suffered blast and fragmentation injuries to his face, right hand, front of right thigh and left forearm”. His right eye was “bruised and grazed” and his “right hand received a deep cut from the base of the thumb into to the palm. The right hand middle finger was also fractured.”

An Interim accident report listed his injuries as:

- Blast injury to face and right eye
- Blast injury to right hand
- Laceration to the right hand palm.
- Blast lacerations to the left forearm.
- Blast lacerations to front of right thigh.

An IMSMA record sheet gave the Victim’s DoB as 09/06/78 and his time to arrival at hospital as 40 minutes. It described his injuries as “Sub conjunctival haematoma R eye with erosion intact. Deep soft tissue injury palmar/themar aspect of R hand. Lesser lacerations to inner L forearm and frontal R thigh.”

Two demining group accident reports are reproduce (from scanned pages) below.

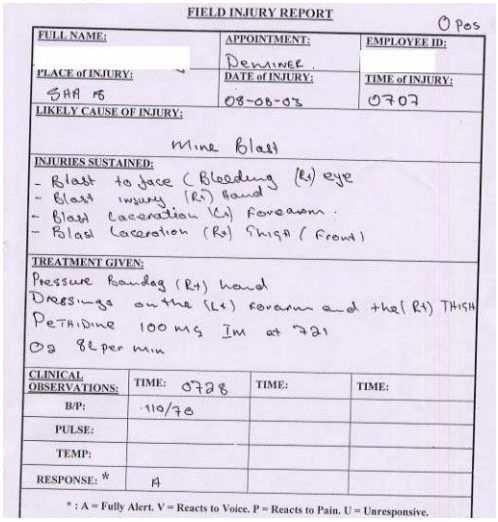


DEFINITIVE CASUALTY REPORT

Name		Passport/ ID Number	
Organisation		Position	DEMINER BA
Age / DOB	25 090678	Religion	CHRISTIAN
Blood Group	O Pos	Known Allergies	NONE
Cas No From Initial Report		1 Date	080803
Description of Injuries	BLAST INJURIES. SHA 18. 0707 HRS. EL HARI. (1) SUBCONJUNCTIVAL HAEMATOMA (R) EYE WITH EROSION OF CORNEA. GLOBE INTACT.	(2) DEEP SOFT TISSUE INJURY PALMAR/THENAR ASPECT OF (R) HAND. (3) LESSER LACERATIONS TO INNER (L) FOREARM AND FRONTAL (R) THIGH.	
Treatment Given (Specify any Medication / IVIs)	ALL WOUNDS DRESSED. PRESSURE BANDAGE TO (R) HAND.	PETHIDINE 100MG. IM. 0721 O_2 THERAPY IN TRANSIT 8L/MIN.	
Special Notes or Observations	PATIENT CONFIRMED STABLE AT MARJAYOUN HOSPITAL. OPTHALMIC OPINION TO TRANSFER TO HAMMOUD HOSPITAL SAIDA.	TRANSFERRED AT 0900HRS FOR OPTHALMIC ULTRASOUND, CAT SCAN AND SURGICAL FOLLOW-UP.	

Treatment Given By: _____

Time Handed Over: 0710 To: MARJAYOUN HOSPITAL



FIELD INJURY REPORT

O Pos

FULL NAME:		APPOINTMENT: DEMINER	EMPLOYEE ID:
PLACE of INJURY: SAA 18		DATE of INJURY: 08-08-03	TIME of INJURY: 0707
LIKELY CAUSE of INJURY: Mine Blast			
INJURIES SUSTAINED: - Blast to face (Bleeding (Rt) eye - Blast injury (Rt) hand - Blast Laceration (Lt) forearm. - Blast Laceration (Rt) thigh (Front)			
TREATMENT GIVEN: Pressure Bandag (Rt) hand Dressings on the (Lt) forearm and the (Rt) THIGH Petidine 100 MG IM at 721 O2 8L per min			
CLINICAL OBSERVATIONS:	TIME: 0728	TIME:	TIME:
B/P:	110/70		
PULSE:			
TEMP:			
RESPONSE: *	A		

* : A = Fully Alert, V = Reacts to Voice. P = Reacts to Pain. U = Unresponsive.

Analysis

The primary cause of this accident is listed as *"Unavoidable"* because it seems that victim may have been working as directed and following approved SOPs when the accident occurred. However, if his visor was worn raised and the area was inadequately marked, it is also possible that other rules were being broken and that the primary cause should have been listed as a *"Field control inadequacy"*.

The secondary cause is listed as inadequate equipment because the trowel in use was probably the cause of the Victim's hand injury. It has been involved in several accidents involving severe hand injury, and has caused at least one fatality listed in this database.

The "inadequate training" referenced in the notes refers to the lack of appropriate training of the medic.

It is not at all clear why the demining group issued both Visors and simple (unrated) industrial safety spectacles to their deminers. Clearly if one or other worked well and met the IMAS, the second was redundant. In this case, eye injury resulted anyway.

In paragraph 28 of the Board of Inquiry report the investigators state that "protective goggles [industrial safety spectacles] were worn in addition to the visor….. Detailed examination revealed that although they were detached from their frame they did maintain their integrity. Small pieces of fragmentation were imbedded in the lenses but there was no full

penetration…" The fact that the safety spectacles had small pieces of fragmentation embedded in their lenses proves that the Victim's visor was worn at least partly raised so that fragments had a direct line of flight to the spectacles beneath.

The issue of thin "Kevlar" working gloves is a novelty. They may have helped to prevent superficial hand damage. However, Kevlar in itself is a nylon, and thin Kevlar could make severe burns worse by trapping the burning fragments (fragments "weld" themselves inside body armour at times). In order to be flexible, the gloves have to be thin. The protection offered by Kevlar varies by weave and by the number of layers used (12-16 layers is common), so the fragmentation protection the gloves offered must have been very low.

Related papers

The following "Note" was found among the files provided. It has been edited for anonymity.

> "Add to BOI if required:
>
> "The BOI is very concerned by the comment from the team leader [name excised] on page 2 of his statement " When the other two teams at SHA 18 were not locating many mines we were encouraged by the former SHA supervisor [name excised] and the current supervisor [name excised] to clear more mines to keep the numbers up". [Demining group] are to provide an explanation as to the exact meaning of the terms "encouraged" and " keep the numbers up"."

MINE ACTION COORDINATION CENTRE, SOUTHERN LEBANON: INTER OFFICE MEMORANDUM

To: See Distribution.
Fm: MACC SL QA Officer.
Ref: QA-3
Date: 08 August 2003.

SUBJECT: INTERIM ACCIDENT REPORT (003/2003)

1. Please find attached the Interim Accident Report (003/2003), the information contained in the report will be disseminated by myself at this Saturdays MACC SL Operational Co-ordination Meeting.
2. If you have any more questions or queries, please do hesitate in contacting me.

Signed: Deputy QA Officer, MACC Southern Lebanon

Distribution:
NDO Representative
MACC SL Operations officer
MACC SL Planning Officer

Attachments:
Annex C to accident report 003/2003

INTERIM ACCIDENT REPORT (003/2003)

ACCIDENT DTG	08.08.03 0707 Hrs.
CLEARANCE ORGANISATION	[Demining group]
LOCATION OF ACCIDENT	SHA 18 Al Meri

BRIEF DESCRIPTION OF ACCIDENT.	The accident occurred whilst a Deminer was excavating a No 4 mine.
DESCRIPTION OF INJURIES SUSTAINED	The injuries sustained to the deminer were: • Blast injury to face and right eye • Blast injury to right hand • Laceration to the right hand palm. • Blast lacerations to the left forearm. • Blast lacerations to front of right thigh.
EQUIPMENT FAILURE DETAILS.	Presently no indication of an equipment failure.
IMMEDIATE ACTION TAKEN.	MACC SL operations were informed. The casualty was initially transferred to Marjayoun Hospital for stabilisation and from there transferred to Hammoud Hospital in Saida on the same day. Immediately following the accident the Accident Site was closed pending the arrival of the BOI Team.
INTENDED FOLLOW UP ACTION	Team suspended for one working day period to conduct refresher training. Return to work Monday 11.08.03 Initial site investigation visit was cut very short due to fighting in the local area. The site should be revisited by the BOI on 11.08.03 and the investigation will continue.
BOI FINDINGS	BOI Report will be completed in full by cease works Fri 15.08.03.

Demining group comment

[Demining group] COMMENTS ON MACC SL REPORT ON THE DEMINING ACCIDENT 8th AUGUST 2003 ON SHA 18

GENERAL TEXT

1. Para 6. ***Check start date*** Assets start dates Mech 21 July MCT 22 July not the 25 July as stated
2. Para 11 ***Time*** At least 2 mins minimum should be allowed per detector and accurate times reflected in the Daily Diary, I feel this is an inaccurate record on the Daily diary and not an error in drill on the set up and operation of the Minelab. This point has been highlighted to all Supervisors, an accurate time of these drill is to be recorded.
3. Para 48.h. ***Leather Gloves*** Proposed changes to [Demining group]'s is attached.
4. Para 48.o. ***Time*** As para 2 above. Must reflect what is happening in the CP.

RECOMMENDATIONS

5. Para 49.
    a. Support this recommendation.
    b. CASEVAC exercise must be conducted when any new member is employed on a task site. All medics must walk the site on a regular basis to keep up to date with where deminers are working.
    i. States unreported sympathetic detonations, during my time as supervisor of SHA 18 several sympathetic detonations took place and they were

reported to [name excised] and these are referred to in his report para 4.8

j. Team refresher training
   (1) Prodding and excavation drills.
   (2) Correcting errors/faults.
   (3) Detector testing.
   (4) Marking system.
   (5) Site and team preparation.
   (6) Task appreciation and lane placement (no problem as the team leader and the deminer assessed where the mine row had changed direction, this would indicate that this was at an acceptable level).

k. Replacement of Trowel. 150 arrived 7th September 2003 and will be issued 8th September 2003.

UN CHIEF OPERATIONS OFFICERS COMMENTS

6. Paragraph 2 States that we should look at our policy on when to wear leather gloves and state in our SOPs as soon as possible.
7. Paragraph 3 Trowels; JMU Journal of Mine articles issue 6.2 and 7.1 (can we get these?).
8. Paragraph 4 Penetration of the visor (second time), Has requested written confirmation from the manufacturer on the blast and fragmentation capabilities, and some test results. Copy to MACC SL QA Team.
9. Paragraph 6 All medics to conduct CASEVAC drill, when new on site, this should also happen and be documented every time a new team member arrives on a site, if this does not happen they may remove the supervisors ticket.

MACC SL UN PROGRAMME MANAGERS COMMENTS

10. Paragraph 2 States that 10 mins to set up and test 12 Minelab F1A4 detectors, conduct a safety brief and deploy deminer would and should take longer than the 10 mins as stated in the daily diary. All Supervisors/Team Leaders are to accurately record the time these drill start and are completed.

INTERVIEWS

11. As I was not present at the interviews I can offer no comments.
12. Paragraph 1.2 Is incorrect in that it states that team 5B started work on the 4th August 2003, this team had been deployed on SHA 18 from day one and had its team number changed on the 4th August 2003. The team in question had completed the whole of section Alfa and some of section Bravo and had cleared a lot more mines and m^2 than is stated in the [Demining group] report.
13. When the Medic changed a CASEVAC drill should have been conducted, there is no excuse why this did not happen. When the medic change did [name excised] driver change as well, the reason I ask is that during my time on SHA 18 he acted as Interpreter as well as ambulance driver. This is not an excuse but could have been a contributing factor due to the lack of communication.

RECOMMENDATIONS

14. I agree with all the recommendations in the [Demining group] report.

MISSING ARTICLES FROM THE [Demining group] REPORT

15. Annex J Accident Report Doctor?

SUMMARY

16. I agree with most points in both the MACC and [Demining group] reports however the points raised in this document should be raised at the wash up meeting 10th August 2003.

Signed: QA / Training Manager, [Demining group] SL

Statements

Annex A to accident report 003/2003

Summary of interview with [[the Victim] conducted at Hammoud Hospital Saida dated 12 Aug 03

In attendance:
Dep QA Officer MACC SL
LAF
[Demining group] QA & Trg Officer
B Stirling [Demining group] Senior Medical officer
[Demining group] Medic

The following is a summary of an interview with [the Victim] who was the [Demining group] deminer injured in a mine accident at SHA 18 on 08 Aug 03. It must be taken into account that due to the blast and shock and the fact that he is being treated with strong pain killers his memory of events although good is vague in certain areas.

[The Victim] states:

He arrived at the site with the rest of the team at approx 0600. He prepared his equipment and tested his detector along with the rest of the team. Mr [Name excised] (site supervisor) then gave his daily site safety brief. He then got onto the bus and was taken to the beginning of the access lane of section E. He then walked to the forward rest area where he put on this PPE.

He stated that he was wearing his ballistic vest, Kevlar gloves, safety goggles and visor.

The team leader then walked with him to his lane and positioned him. He began vegetation cutting and clearance in his working lane from the crossed pickets that he had inserted at the end of the previous days work.

He carried on searching in a direct line towards the bush and telegraph pole. When he reached the bush he had not discovered any mines so he stopped clearing in that direction. He then decided to search further to the right up the slope nearer to the inner minefield. This was because the direction of the mine row and the minefield fence seemed to have moved in that direction.

Asked if he reported this to the team leader he states that he does not remember [the] (team leader) being there in the lane with him.

He states that there are many metal pieces in the ground.

He began searching again and after a short time he located a reading with his detector. He thought that it was a mine because it was where he suspected that the row had changed direction.

[The Victim] was then asked to describe his next actions in detail.

He states that he knelt down and placed his marking triangle 20cm back from the reading. He then began to excavate with his trowel in a sideways motion. The ground was not hard so no water was needed. After another short period of time excavating he picked up his detector and checked for the position of the reading again. He then carried on excavating for the mine. He did not see or uncover any part of the mine and does not remember hitting anything with his trowel. The next thing he remembers is the detonation.

After this he remembers falling backwards down the rocky slope, coming to rest and then trying to stand up. He also remembers the team leader arriving, clearing a lane to him and then assisting and walking with him to the safe lane where the medics took over.

[The Victim] also states that:

He thought that he was still following row No1of the minefield.

He had personally cleared the entire lane up to the point where the detonation occurred and was aware that mines were in migrating and were facing in many different directions

He was not wearing leather gauntlets in addition to his Kevlar gloves for excavation because he thinks it is difficult to excavate with two pairs of gloves on.

He was in a secure position when he knelt down to excavate and he did not slip or over balance when excavating.

He had not consumed alcohol the previous evening and went to bed at approx 2100 hrs.

Interview began at 1315 and concluded at 1400. Unfortunately due to his injuries [the Victim] is not able write and sign a statement himself.

Signed: Dep QA Officer MACC SL