

DDAS Accident Report

Accident details

Report date: 15/04/2008	Accident number: 569
Accident time: 11:40	Accident Date: 18/06/2007
Where it occurred: MF 1580, Area 6-001, Kafer Houna, Jezzine South, District-Jenoud	Country: Lebanon
Primary cause: Management/control inadequacy (?)	Secondary cause: Field control inadequacy (?)
Class: Excavation accident	Date of main report: 27/06/2007
ID original source: 06/2007	Name of source: UNMAS
Organisation: [Name removed]	
Mine/device: No.4 Israel AP blast / frag	Ground condition: hard metal scrap rocks/stones steep slope
Date record created:	Date last modified: 15/04/2008
No of victims: 1	No of documents: 2

Map details

Longitude:	Latitude:
Alt. coord. system: UTM 740744/706896	Coordinates fixed by:
Map east:	Map north:
Map scale:	Map series:
Map edition:	Map sheet:
Map name:	

Accident Notes

handtool may have increased injury (?)
inadequate equipment (?)
metal-detector not used (?)
squatting/kneeling to excavate (?)
visor not worn or worn raised (?)

Accident report

The report of this accident was made available in February 2008 as a collection of files and pictures. Its conversion to a DDAS file means that some of the original formatting has been lost. The substance of the report is reproduced below, edited for anonymity. The original files are held on record. Text in [] is editorial.

BOARD OF INQUIRY (BOI) INVESTIGATION REPORT

Ref: 06/2007

Report compiled by: MACCSL QA Officer, LAF Plans Officer [Names omitted]

Introduction

In accordance with the National Technical Standards and Guidelines (NTSG), the MACC SL Programme Manager, Mr. [Name removed] and Lt. Col. [Name removed], LMAC Representative, issued a Verbal Convening Order on Monday the 18th June 2007, for an accident investigation Board of Inquiry (BOI). The MACC SL Board members are Lt. [Name removed], LAF Plans Officer LAF and [Name removed], QA Officer MACC SL.

This is a comprehensive report by the Board of Inquiry (BOI) team into the (Commercial demining group) Demining Accident that occurred on 18th June 2007 which is based on the MACC SL investigation, statements from (Commercial demining group) personnel involved in the accident, evidence from the accident site and the (Commercial demining group) Demining Accident report. **The accident is considered to be Unpreventable.**

The (Commercial demining group) Demining Accident report was forwarded to the MACC SL BOI team on 21st June 2007 and is at Annex D [Annex not made available]. The accident occurred at 1140hrs (local time) on the 18th June 2007 in Area 6-001 MF (Minefield) 1580 UTM 740744 – 706896, which is situated near the village of Kafer Houna and approximately 7.5 kilometres south from Jezzine.

The BOI is an impartial investigation conducted by the MACC SL on behalf of the Lebanon Mine Action Center (LMAC) Lebanon. The primary objective of the BOI is to examine evidence in order to conclude the cause of the accident and make recommendations for the prevention of further accidents.

Executive Summary

On 18 June 2007 at 1140 hrs (local time), [the Victim] a (Commercial demining group) Deminer, inadvertently caused an item of explosive ordnance (EO), which is considered to be a No. 4A anti-personnel mine, to activate, while conducting the manual mine clearance full excavation procedure.

As a result of the explosion [the Victim] was thrown backwards by the blast wave and suffered a traumatic amputation of the right hand, a fractured right humerus and critical head and eye injuries.

It is of the opinion of the MACC SL BOI team that [the Victim] was conducting manual mine clearance procedures in compliance to the (Commercial demining group) SOP and NTSG, however, the full excavation procedure should be reviewed. Although, it is inconclusive as to the exact cause of the accident, i.e., whether or not a mine was initiated by the application of pressure from above the mine with the hand, trowel or whether the fuze was disturbed; the BOI team QA Officer considers that there is an increased chance of initiating a pressure blast

anti-personnel mine during the excavation process when the ground is excavated from the top of the trench downwards rather than from the bottom upwards.

MF 1580 is a challenging mine clearance task with increased hazards to working deminers due to the steep rocky terrain, hard ground and the type of mines (No. 4A incorporating the No9 fuze). Extreme vigilance, good disciplined and close supervision is therefore essential.

There have been several accidents in Lebanon while conducting manual mine clearance operations in similar terrain and in particular, involving the Israeli No. 4 anti-personnel mine, which highlights the dangers associated to the clearance of these types of mines in these conditions.

Based on all available evidence, the BOI team concludes that the immediate response to the accident by the team leader and the treatment by the medics enabled an effective casevac and subsequent medevac from the task to Jezzine hospital and Hammoud hospital.

At the earliest opportunity, (Commercial demining group) shall conduct clearance of the crater site and recover the visor harness as additional evidence.

(Commercial demining group) shall conduct one day of refresher training for MCT 1 and 5 pertaining to manual mine clearance operations, in particular the full excavation procedure.

Extreme care should be taken when using the trowel for the excavation process, particularly when searching for anti-personnel pressure blast mines in hard ground, such as the No. 4. It is acknowledged that the trowel is used for manual mine clearance operations worldwide and that mines are safely located using this instrument, however its design make it ideal for digging the ground in a prodding / scooping technique and less suitable for the preferred method of scraping / shaving the ground.

Based on the available information, evidence gathered at the accident site and interview statements, it is of the BOI team's opinion that Demining operations at MF 1580 were conducted in accordance to the (Commercial demining group) SOP, NTSG and IMAS and that the accident is therefore considered to be Unpreventable.

Location of Incident: Task No. Area 6-001 MF1580: (Commercial demining group) MCT 05A: Place: Kafer Houna, Jezzine South, District-Jenoud, Lebanon: Grid ref: UTM 740744-706896

Date and Time of Incident: 18 June 2007, 1140hrs (local time)

Person(s) Involved: [The Victim], Deminer Team 5a

Date and Time of Investigation: 18 March 2007, 1250hrs (local time)

Execution of Investigation

Approach to Site

The accident site is located at IMSMA Clearance Task number MF 1580 which is approximately 12 Km north-east of Nabatiah, 2.5 Km south from Kafer Houna and 7.5 Km south from Jezzine.

The MACC SL investigation team comprising Lt. [Name removed] and [Name removed] drove to the accident site separately. Lt. [Name removed] was in the vicinity of MF-1580 at the time of the accident and arrived prior to [Name removed], who was in Tyre. [Name removed] drove to (Commercial demining group) headquarters in Nabatiah and traveled with [Name removed] ((Commercial demining group) Operations Assistant) to MF-1580.

The journey from Nabatiyah to MF-1580 took approximately thirty minutes and the route was primarily paved and in a reasonable condition with parts requiring renovating and some sections under construction.

MF-1580 is an anti-personnel minefield surrounding a former Israeli military defensive hill position. The general area is mountainous and the accident site is on the south-west side of the position on a narrow, relatively level area. The ground is hard and rocky with moderate to dense vegetation. The geographical information on the map indicates that the highest point in the area is approximately 1300 metres above sea level.

Lt. [Name removed] arrived at the task control point approximately 18 minutes after the accident had occurred. He was initially requested to remain at the control point while the (Commercial demining group) Operations Manager, Area D, E, F Manager and QA / Accreditation Supervisor were at the accident site. After a few minutes he was informed that he could join them.

Note: The (Commercial demining group) Demining Accident Report, Paragraph 6, details that the accident site was photographed and left untouched for the LMAC/MACCSL investigation team. In accordance to the NTSG, Chapter 16, Investigations; the accident scene should be secured pending the arrival of the BOI team and photographs of the accident scene taken as soon as possible by the BOI team and Demining Organisation together.



[Photographs taken by the internal demining group investigation showed staff not wearing PPE.]

[Name removed] arrived at the task with [Name removed] ((Commercial demining group) Operations Assistant) and the BOI team was briefed at the control point by the (Commercial demining group) QA / Accreditation Supervisor and Task Supervisor prior to commencing the investigation at the accident site. After visiting the accident site and recording pertinent information, the BOI team conducted interviews with relevant (Commercial demining group) personnel at the control point.

Evidence

Accident Site

The general area where the accident occurred is on the side of a hill which was a former Israeli military defensive position. The accident occurred at the front of a manual mine clearance working lane situated on a relatively flat area on the south-west side of the hill. The lane was being cleared in a south-easterly direction.

The clearance lane had been excavated using manual mine clearance full excavation procedures and the BOI team were informed by (Commercial demining group) that this had

been conducted to a depth of 20 cm. The soil in the lane to the rear of where the deminer had been working was compact and consistent with other areas of the task which had been excavated, where soil had been replaced and subsequently trodden. The immediate area of the accident within the clearance lane comprised dry, hard, loose soil which had been moved during the excavation process and explosion. The slope of the hill to the left (north/north-east) side of the clearance lane comprised medium to dense vegetation with loose rocks and large boulders. There were some remains of razor wire fencing on the side of the hill.

The 1 metre wide clearance lane was marked on both sides with red topped wooden pickets at regular intervals with hazardous area marking tape between some of the pickets.

The immediate area ahead (south-east) and left (north-east) were uncleared. The yellow painted wooden sticks which were positioned in the ground at intervals of approximately 1-2 metres to mark the location of mines destroyed during clearance, indicated that the clearance lane was following the contour of the hill and in the general direction that the mines were laid. One yellow stick was positioned approximately 2-3 metres to the rear (west) of the lane. The BOI team were informed that this marked a destroyed No 4 AP mine which had been the most recent mine located by the casualty.

Crater

Photographs of the crater and the accident site were taken during the investigation, however it was not possible to physically examine the crater as the immediate area is pending further clearance as part of the on-going investigation. The crater was partially obscured by an orange bag and comprised loose clumps of earth and there was evidence of burn marks on the inside of the crater which is consistent with the effects of an explosion. The crater was shallow which may be attributed to the hardness of the ground and that the explosive device had been close to the surface. The BOI team had been informed by (Commercial demining group) that the closest mine located had been at a depth of 3 cm and that mines were generally found at a depth of 3-10cm.



[It is strange that people stood this close to the seat of initiation but did not think it safe to move the orange bag.]

Although, it was apparent that some excavation had taken place in the area of the crater, the precise location of the excavation trench face was not obvious due to the nature of the ground.

See Annex B – photographs of accident site and evidence.

Vehicle(s) and Equipment

Ambulance

One ambulance was located at MF-1580 which was supporting this task and a mechanical team working nearby at Task NDO 233. Two medics (MCT 5 and mechanical support) were at the task. After the accident the assistant medical coordinator arrived at the task in the roving ambulance.

Detector

The Minelab F3 Detector was positioned at the beginning of the clearance lane. There was no evidence of damage and the handle and upper shaft were covered in earth, which may have been transferred by the deminer's hands or gloves during the course of his work. The detector was not being used at the time of the accident.

Demining Tools

According to the interviews conducted by the BOI team, [the Victim] had been using a hand-held trowel to conduct the full excavation process. This has not been located. An undamaged set of shears used for cutting vegetation were positioned to the south-west side of the clearance lane, slightly forward and to the right of the orange bag (crater). Wire cutters were positioned near the detector at the beginning of the clearance lane. These were undamaged. A watering can and two empty water containers were situated near the wire cutters and detector. Eight empty water containers and a bucket were situated approximately 2 metres forward of the crater in a cleared area.

The watering can and containers indicate that the information received during the interview process regarding the use of water to soften the ground may be accurate.

Base Stick

According to (Commercial demining group), prior to the accident the base stick had been positioned on the ground before the excavation trench to mark the front of the clearance lane. At the time of the investigation the base stick was located between two large rocks in an uncleared area on the side of the hill approximately 3-4 metres to the rear from the seat of the explosion. The base stick had been broken in two and red lane marking cord was tied to one of the ends.

The damage to the base stick and its position indicate that had been in close proximity to the explosive ordnance at the time of initiation and that it had been thrown by the blast wave.

Personal Protective Equipment (PPE)

Safety Goggles

According to information received during the interview process, the casualty was wearing safety goggles beneath the visor prior to the accident. The lens was intact, slightly scratched on the outside and dirty across the inside. Both of the arms were missing. The goggles had retained their integrity during the explosion. The dirt on the interior lens, injuries sustained to the right eye and information from the medic that both eyes required cleaning, indicates that although, the goggles may have been worn correctly, they were unable to provide complete protection to the eyes during the explosion. It is possible however, that had they not been worn, the damage to the both eyes may have been more severe.



[The goggles did not “retain their integrity” because their arms broke off. They appear to be 2mm thick.]

Ballistic Visor

According to information gained during the interview process, the Team Leader had seen [the Victim] wearing his PPE consisting of body armour, visor and inner safety goggles, correctly. The only visor evidence at the accident site was part of the lens which was positioned in the front / left side of the clearance lane and the harness. The broken lens was dirty and in the proximity of clumps of earth which appeared to be burnt. The visor harness was visible a few metres slightly forward and left of the clearance lane on the bank of the hill in an uncleared area. The lens was not attached.

It should be possible to conduct a thorough examination of the lens fragment and visor harness after additional clearance of the lane has been conducted.



[See Analysis.]

This evidence and the injuries sustained by the casualty indicate that the visor had been worn at the time of the explosion. The colour and shape of the lens fragment indicates that it had been broken off from the edge of the visor during the explosion and the location of the harness signifies that the visor had been pulled from the deminer’s head by the blast from the explosion. There was no other visor evidence in the immediate accident area which suggests that it had either shattered or been thrown into another area.

Dirt on the inner lens of the goggles;

Visor lens broken and the location of harness;

Dirt in both of the casualty’s eyes;

Multiple lacerations to face and amputation of upper lip;

Severe injury to casualty’s right eye;

Loss of lower teeth.

Ballistic Body Armour

The body armour is a one-piece 'apron style' design and comprises Kevlar protective material which covers the neck, chest, abdomen and groin regions of the body. The apron was covered in dirt and blackened through the blast effects of an explosion. There were tears on the outer cover primarily in the centre lower, right lower, right upper, right shoulder and right side of the collar which corresponds to the fragmentation effects of an explosion. There is evidence of blood on the right shoulder and around the rim of the collar. The Kevlar retained its integrity and the only evidence of penetration was a small hole on the seam of the collar.



[The apron is not made from Kevlar but a cheaper ballistic aramid. The position of its collar and the STANAG V50 rating of 380 m/s mean that it does not meet IMAS (as formulated in 2007).]

Gloves

According to information gathered during the investigation, Aramid protective gloves had been worn by the casualty prior to the accident. It was only possible to locate the left hand glove at the accident site and its appearance corresponded to information that it was worn by the casualty at the time; dirt on the palm and fingers with evidence of blood stains. The absence of the right hand glove is consistent to the traumatic amputation of the casualty's right arm by the explosion.



[The glove that was not on the Victim's other hand. "Aramid" simply means nylon. There is no evidence that any aramid or Kevlar glove is of any value at close quarters to an AP mine blast.]

Explosive Ordnance

The IMSMA Minefield report indicates that 317 Israeli No. 4 Anti Personnel mines were laid in minefield 1580. The task operations board and the (Commercial demining group) accident report details that 123 AP mines have been located during clearance at MF-1580. In addition, the operations board details two No.9 fuzes and 11 UXO.

The BOI team was informed by (Commercial demining group) that they had located No 4A mines which incorporate the No. 9 'cocked-striker' fuze mechanism. On the day of the

accident, three No. 4A mines had been located which were subsequently destroyed in situation by (Commercial demining group) on completion of the investigation.

The BOI team was informed during the interview process that the mines located at MF-1580 were normally upright however, were found with the fuze facing varying directions. The last mine located by the casualty prior to the accident had been at a depth of approximately 3 cm with the fuze facing away from the hill (southerly direction) and the average depth of the mines located at MF 1580 was 3-10cm. According to the supervisor's witness statement in the (Commercial demining group) Demining Accident Report, the deepest mine located at the task was at 5cm.

During the investigation, part of a No. 9 fuze was located by [Name removed] ((Commercial demining group) QA / Accreditation Supervisor) on a track leading up to the site and to the south of the clearance lane, however, it is not possible to conclude whether this was related to the accident or not.

Casualty(s) Position

It is not possible to confirm the exact position of the casualty at the time of the accident, however, according to information received from (Commercial demining group) during the investigation; during the third shift, the Deminer had been in the kneeling position facing towards the front of his lane conducting the full excavation procedure and, prior to the accident (at the beginning of the fourth shift) the team leader had seen him preparing to start the same procedure. The injuries sustained to the casualty and damage to the PPE indicates that he was at the front of his lane and that his head was close and/or over the explosive ordnance when the detonation occurred.

The injuries sustained to the casualty (amputated right hand and fracture to the right humerus) indicate that the trowel and / or his right hand were in extremely close proximity to the explosive ordnance. Information received during the interview process, the (Commercial demining group) accident report and evidence of blood at the accident site indicate that the casualty may have been thrown approximately 2 metres backwards by the blast. In addition, the BOI team were informed by (Commercial demining group) that following the investigation, they had located the casualty's severed right hand in an uncleared area 40 metres to the north of the accident site, which would substantiate the theory that his right hand was extremely close to the explosive ordnance and in the case of a No.4 AP blast mine it would indicate that the hand may have been directly above the main explosive charge.

Interviews

The following (Commercial demining group) personnel were interviewed in this sequence by the MACC SL BOI team on 18 June 2007 – [See Statements]. MCT 1 & 5 Supervisor; MCT 5a Team Leader; MCT 5 Medic.

Casualty Information: see Medical report

Incident Details (Circumstances / Sequence of Events)

The following information is based on an assessment of the evidence obtained by the MACC SL BOI team at the accident site and from witness statements:

On 18 June 2007 between 1134 hrs and 1140 hrs, [the Victim], a (Commercial demining group) Deminer was involved in a Demining Accident at (Commercial demining group) Task MF 1580 which resulted in him sustaining a traumatic amputation to his right arm, a severe injury to his right eye, a fracture to his right humerus and other injuries. The accident was

reported by the (Commercial demining group) headquarters in Nabatiyah to the MACC SL Operations in Tyre by telephone.

It is uncertain as to the exact time of the accident as there is a discrepancy between the two times. The (Commercial demining group) Radio Operator's initial report to the MACC SL Communicator (which is written in the MACCSL radio log) and the IMSMA casualty report submitted by (Commercial demining group) indicate that it was 1134 hrs although, witness statements and the (Commercial demining group) Demining Accident report indicate 1140 hrs. Additional timings gathered during the interview process indicate that it is most likely that the accident occurred at 1140, therefore, unless proven to the contrary, 1140 hrs shall be detailed as the time of accident.

At 0632 hrs, MACC SL Operations in Tyre received a radio call from (Commercial demining group) Operations in Nabatiyah, informing them that (Commercial demining group) teams had deployed. At 0700, Mine Clearance Teams (MCT) 1, comprising Mozambique deminers and 5 comprising Zimbabwe deminers, arrived at the task MF1580. As there was not enough space to deploy all deminers simultaneously at the task, MCT teams 1 and 5 had been split into 4 smaller teams (1 ALPHA and BRAVO, 5 ALPHA and BRAVO), of which, only two would operate at the same time. Each team was commanded by a team leader. The supervisor, [Name removed] was in overall command of the task. In addition to the MCT 5 medic, a medic from the mechanical team was also located at the control point as mechanical operations were being conducted at NDO 233, which is in close proximity to MF 1580.

Prior to commencing operations a brief was conducted at the control point by the Supervisor, pertaining to Manual Mine Clearance procedures and in particular, the use of water to soften the ground, checking the ground with the detector prior to conducting excavation and a reminder not to use the prodder. Due to the level of metal contamination at the task the primary manual mine clearance procedure being conducted was full excavation, which consisted of the deminer excavating the complete width of the clearance lane (1.2 metres) to a depth of 20 cm.

The working routine comprised two of the four teams working simultaneously for a one hour shift followed by a fifteen minute break and, each team was supervised during clearance by their respective team leader. After completing two shifts, the two teams rotated. The first shift commenced at 0800 hrs and consisted of teams 1B and 5B.

At 1000 hrs, the initial teams were replaced with teams 1A and 5A for commencement of the third shift. Team 1A comprised five deminers who were working on the east side of the hill and team 5A comprising three deminers on the west side. According to [Name removed], MCT 5A team leader, he had assisted [the Victim] with the application of water to soften the ground to assist with the excavation process. This was conducted prior to the end of the shift to allow it time to soak into the ground prior to the commencement of the next shift. At 1115, teams 1A and 5A put on their PPE at the control point prior to walking to their respective clearance lanes for start of the next shift. [Name removed] reported that he had accompanied team 5A to their individual lanes at the commencement of the shift to ensure that they understood the procedures and that all deminers were wearing their PPE correctly.

[The Victim] was working in a 1 metre wide clearance lane on the south-east side of the former Israeli hill position following confirmed mine rows. The lane had been cleared using the full excavation procedure and [the Victim] had previously located an Israeli No. 4A anti-personnel mine approximately 2-3 metres away and therefore, should have been aware that there may be another mine in the area where he was excavating.

Prior to the accident, the supervisor was at the control point and [Name removed] was checking another deminer. At 1140 hrs there was an uncontrolled explosion at the front of [the Victim]'s lane and by the time [Name removed] arrived at the scene an additional deminer from MCT 5A was already there. [The Victim] was laying a few metres back from the front of the clearance lane and partially inside the uncleared area on the side of the hill. [Name removed] reported that he lifted and pulled the casualty into the cleared area and informed the supervisor by radio of the accident. He subsequently attended the casualty and administered some first aid.

On receiving the message from the team leader, the supervisor informed the medics to go in the ambulance to the accident site. On arrival at the accident site, [Name removed], MCT 5 Medic, with assistance from another medic, assessed the injuries, administered first aid and stabilized the casualty prior to him being transferred by ambulance to Jezzine hospital. After receiving additional medical treatment and an assessment at Jezzine hospital, the casualty accompanied by the (Commercial demining group) medical coordinator and the two medics was transferred to Hammoud hospital in Saida.

The (Commercial demining group) operations manager ([Name removed]), Area D, E, F Manager ([Name removed]) and QA / Accreditation Supervisor ([Name removed]) had arrived at the task after the accident and prior to the casualty being evacuated to hospital. They were at the accident site when the LAF Plans Officer (Lt. [Name removed]) arrived at the task control point. Once the MACC SL QA Officer ([Name removed]) arrived, the BOI team was briefed at the control point by the (Commercial demining group) QA / Accreditation Supervisor and task Supervisor prior to commencing the investigation.

Chronology of Events (According to witness statements, the (Commercial demining group) Demining Accident Report and BOI team records)

18 June 07

0632 MACC SL operations Tyre received a radio message from (Commercial demining group) Base Nabatiyah that all BRAVO ECHO call signs (MCT Teams) had departed the Base location.

0700 MCT Teams 1 and 5 arrived at Task 1580; briefing conducted by Supervisor.

0800 MCT 1B and 5B commenced the first of two shifts before a changeover of teams.

1000 Shift changeover; MCT 1A and 5A commenced the third shift.

1100 15 minute rest period; MCT 1A and 5A returned to the control point.

1115 MCT 1A and 5A commenced the fourth shift.

1140 Uncontrolled explosion and accident occurred.

1144 The two medics arrived at accident site.

1145 Casualty stabilized.

1148 Casualty placed on spinal board.

1149 (Commercial demining group) initial accident report by telephone received by MACC operations.

1150 (Commercial demining group) Operations Manager, Area D, E, F Manager and QA / Accreditation Supervisor arrived at the task.

1155 [Name removed] was informed of the accident.

1156 Casualty evacuated by ambulance from task to Jezzine hospital in one ambulance accompanied by the medical coordinator in another ambulance.

1158 [Name removed] departed Tyre and Lt. Kahil arrived at MF 1580.

1206 Casualty arrived at Jezzine hospital where he was assessed and received additional medical attention prior to being transferred by ambulance to Hammoud hospital in Saida.

1230 [Name removed] and (Commercial demining group) Operations Assistant ([Name removed]) departed (Commercial demining group) base, Nabatiyah for MF 1580.

1250 [Name removed] and (Commercial demining group) Operations Assistant arrived at MF 1580 and the BOI team commenced the investigation.

1252 The BOI team received a briefing from the (Commercial demining group) QA / Accreditation Supervisor prior to visiting the accident site.

1308 The casualty arrived at Hammoud hospital in Saida.

1400 The BOI team commenced the interview process at the control point.

1600 The BOI team concluded the investigation and departed MF 1580 for Tyre.

Medical Assistance and Evacuation (procedure, treatment, equip.)

On 18 June 2007, there were two medics at task MF 1580 control point during mine clearance operations; [Name removed] and a mechanical support medic. Prior to the accident, [Name removed] was speaking with the supervisor and on hearing an explosion the ambulance driver went to the ambulance to prepare the vehicle. [Name removed] heard the team leader informing the supervisor by radio that there had been an accident and that the casualty was now in a safe area. The supervisor requested both medics to go with the ambulance to the accident site. According to statements from (Commercial demining group) personnel; from the time of the explosion to the medics' arrival at the accident site took **4 minutes**.

The casualty was lifted / pulled into the cleared area and the team leader applied a tourniquet and dressing to the casualty's right arm. The casualty was conscious and the team leader informed the BOI team that the casualty had asked if he still had his hand. The medic informed that the casualty was in extreme pain. The medic requested the second medic to attend to the casualty's arm while he checked an injury to the casualty's chin. According to [Name removed], the casualty was stabilized in one minute. The following medical treatment was performed prior to the casualty being loaded into the ambulance:

Right hand bandaged.

IV line and 1 litre of Ringers administered.

15mg / 1cc or morphine (analgesic) administered intramuscularly.

Right arm immobilised with splint.

Eyes cleaned.

Cervical collar applied around casualty's neck.

Oxygen administered.

The medic informed the BOI team that the reason for administering the morphine into the muscle and not intravenously was to avoid any side effects to the casualty such as hypertension.

The duration from the arrival of the medics at the accident site to the casualty's departure from the task had been approximately 12 minutes and therefore, a total period of 16 minutes had elapsed from the time of the accident to the medevac by ambulance from the task.

The casualty arrived at Jezzine hospital by ambulance in 10 minutes and, after an assessment and some additional treatment, he was taken by ambulance to Hammoud hospital in Saida. He arrived at Saida hospital (UTM 0720524-0715885) at 1308 hrs. The total duration of the medevac from the task to Hammoud hospital had taken approximately 1 hour and 12 minutes.

For further details on the injuries sustained and medical treatment received; See the Definitive Casualty Report included in Annex D – (Commercial demining group) Demining Accident Report. [Annex not made available.]

Geography and Climate

Task MF 1580 is located in a mountainous region approximately 12 Km north-east of Nabatiyah, 2.5 Km south from Kafer Houna and 7.5 Km south from Jezzine. No. 4 anti-personnel mines were laid by Israeli forces around their position which was located on a steep rocky hill. The general area is rocky with dry, hard soil and comprises medium to dense vegetation (grass, bushes and trees). The geographical information on the IMSMA map indicates that the highest point in the area is approximately 1300 metres above sea level. The accident occurred within a manual mine clearance lane situated on a relatively level strip of ground on the south-west side of the defensive hill position.

At the time of the accident the weather was sunny and the visibility was good.

Demining Procedures

Manual Mine Clearance procedures were being conducted by (Commercial demining group) at Task MF 1580 which involved full excavation, whereas the deminer excavates across the 1.2 metres wide clearance lane to a depth of 20cm. The full excavation procedure was being employed by (Commercial demining group) at MF 1580 due to a high level of metal contamination in the soil making it impractical to deploy metal detectors when searching for mines.

According to information gathered during the interview process, prior to the accident the casualty had been excavating a trench at the front of his clearance lane which was heading in a south-easterly direction. The procedure normally involves the use of the prodder and trowel however, the prodder had been excluded from the procedure by (Commercial demining group). The supervisor had conducted a brief prior to the commencement of clearance operations at MF 1580 pertaining to the following:

1. The use of water to soften the ground;
2. Using the detector to check the ground prior to conducting excavation;
3. A reminder to the teams not to use the prodder.

The BOI team were informed that the full excavation procedure consisted of the following: Prior to excavating, the deminer checks the ground with the detector. He then uses the trowel to excavate a 20 cm trench and excavates forward and down, commencing at the top of the trench. Water was regularly used to soak the ground to assist with the excavation process.

Demining Equipment

The Minelab F3 Detector and standard (Commercial demining group) manual demining tools were at the accident site. According to information gathered during the interview process, the

trowel was being used by the casualty during the full excavation process however no evidence of this has been recovered yet.

Communications

VHF radios are used to communicate at the task between the Team Leaders, Supervisor and Medics. VHF radios and mobile phones are used for communications between the task and operational base at Nabatiyah.

The MACC SL Operations Room had been informed by The (Commercial demining group) Operations Room at 0632 hrs that all BRAVO ECHO call signs (MCT teams) had departed base location.

Site Layout and Marking

The immediate area of the accident was marked with red topped wooden pickets and with red / white hazardous area marking tape. All cleared areas were marked correctly and mines located and destroyed by (Commercial demining group) were marked with yellow painted wooden pickets. According to the supervisor the blue stick used to marking the point where daily clearance commenced was in the incorrect position in the casualty's lane and should have been further forward.

Command and Control

Four MCT teams were operating at task MF 1580 with two working simultaneously. Each team was commanded by a team leader who was responsible for up to five deminers. A supervisor was in overall command of the task and the control point was situated a safe distance from the nearest working deminer. All deminers were working in close proximity and a safe distance from each other and although, the nature of the terrain may not allow the team leaders to see all the deminers simultaneously, it is possible for them to monitor all deminers regularly during each shift. There were an adequate amount of safe lanes enabling effective access to each working deminer and for casevac purposes.

According to information gathered during the interview process, the casualty had been checked by the team leader at the commencement of the shift prior to the accident occurring.

Quality Assurance and Quality Control

Internal QA

On the day of the accident at MF 1580 two MCT teams were operating simultaneously. Each team was being monitored by a team leader who was responsible for a maximum of five deminers. The full excavation procedure was being conducted. (Commercial demining group) LSOP Section 20.7 QA for Manual Clearance Operations details the following:

20.7.6 Manual clearance without metal detectors using prodding/excavation only will require additional constant supervision and should be checked using mine dogs or a mechanical option of the cleared area. If these options are not available, additional supervision will be required.

During the full excavation procedure, the deminer generally progresses forward slower than the detector search procedure as he is required to carefully excavate across the width of the lane to a minimum depth of 20cm. The blue stick is used to mark the start of daily clearance in individual clearance lanes. In the casualty's lane the blue stick was positioned on the left side at the entrance to the lane at approximately 3 metres back from the front of the lane. The BOI team were informed by the supervisor that this was incorrectly positioned and that clearance had commenced further forward that day. Therefore, the maximum distance excavated prior to the accident would have been approximately 3 metres over a period of

approximately 3 hours (3 shifts). Using this figure as an average for each of the clearance lanes and accepting that the team leaders were in the working area throughout clearance, it can be concluded that there was sufficient QA monitoring conducted at MF 1580.

The team leaders must however ensure that the blue stick is correctly positioned.

(Commercial demining group) QA Forms

The following QA Forms pertaining to MF 1580 were submitted by (Commercial demining group) QA / Accreditation Supervisor to assist with the BOI:

Manual Clearance: 24/03/07: QA Officer's Comments: Excellent standard of work by all team members.

Command and Control: 30/05/07: QA Officer's Comments: Good command and control by supervisor and team leaders. Deminers are to take extra care in loose rocky areas and the supervisor needs to pay attention to this.

Demolition Drill: 05/06/07: QA Officer's Comments: Good demolition drill as per SOP.

Command and Control: 11/06/07: QA Officer's Comments: Command and control as per SOP. Following points were noticed:

Excavate holding the tool by the handle, not by the blade.

Clearance lanes should be marked 1m wide and have the correct overlaps.

Excavate facing the trench and not turned sideways.

Excavate at arms length and with care, especially on this site.

External QA

Prior to the accident, regular QA inspections had been conducted by the MACC SL at task MF 1580. The last QA conducted was on 12 June 2007 which resulted in an Acceptable report. The QA Officer's comments were as follow: Full excavation drills being employed (200mm). Site operational since 23/03/07; to date are found and destroyed 104 x AP No. 4 mines, 2 x No. 9 fuzes and 7 x 40mm rifle grenades.

Planning

Minefield 1580 forms a part of a number of minefield (and BT's) tasks issued to (Commercial demining group) as part of the OES II clearance requirements for Area 6 and commenced clearance on the 23rd March 07.

Accreditation

(Commercial demining group) MCT Teams 5 and 6 have received Full Operational Accreditation from the LMAC/MACC SL.

Training

All MCT 5 and 6 personnel have completed pertinent training courses. The last task casevac exercise was conducted at MF 1580 on 13 June 07 at 0800 hrs.

Details of Non / Compliance to Agency SOP / NTSG / IMAS

Demining operations at MF 1580 were conducted in accordance to the (Commercial demining group) SOP, NTSG and IMAS.

Background Information

Minefield 1580 is situated around a former Israeli Forces defensive hill position and forms part of a number of minefield (and BT's) tasks issued to (Commercial demining group) as part of the OES II clearance requirements for Area 6. [Another demining group] previously conducted limited manual mine clearance operations at the task to enable the operations of their mechanical asset to be viewed from a safe viewing area prior to suspending the task.

The IMSMA Minefield report indicates that 317 Israeli No. 4 Anti Personnel mines were laid in minefield 1580. The task operations board and the (Commercial demining group) accident report details that 123 AP mines have been located by (Commercial demining group) during clearance at MF-1580. In addition, the operations board details two No.9 fuzes and 11 UXO.

There have been reports of several accidents involving the No4 mine in other areas of Lebanon. The No4A mine is fitted with the No9 fuze (cocked striker mechanism incorporating a spring assisted striker retained by a recessed firing pin). These mines are frequently located during demining operations in an extremely sensitive condition, which may be the result of soil / rock movement or the displacement of the mine itself.

Conclusions

- a) [The Victim], a (Commercial demining group) Deminer, inadvertently caused an item of explosive ordnance (EO), which is considered to be a No. 4A anti-personnel mine, to activate, while conducting the manual mine clearance full excavation procedure. Information gathered during the interview process indicates that [the Victim] was using his trowel to excavate the ground at the time of the accident, although no evidence of the trowel was located at the accident site to substantiate this.
- b) As a result of the explosion [the Victim] sustained a traumatic amputation of his right hand, a fractured right humerus and critical head and eye injuries.
- c) [The Victim] has pertinent manual mine clearance experience, was employed by BAC in Lebanon in 2002-4 and re-joined (Commercial demining group) in January 2007. He has worked in other minefields with similar conditions such as MF 356, Sowaida position.
- d) MF 1580 is a challenging mine clearance task with increased hazards to working deminers due to the steep rocky terrain, hard ground and the type of mines (No. 4A incorporating the No9 fuze). Extreme vigilance, good disciplined and close supervision is therefore essential.
- e) There have been several accidents in Lebanon while conducting manual mine clearance operations in similar terrain and in particular, involving the Israeli No. 4 anti-personnel mine, which highlights the dangers associated to the clearance of these types of mines in these conditions.
- f) No mine or UXO parts were located during the investigation of the accident site, however, the IMSMA minefield report and evidence from clearance conducted at the task indicates that there is a strong possibility that the accident was caused by a No. 4A AP mine. There have been reports of improvised AP mines being laid in other task, e.g., with addition blocks of high explosive to increase the explosive effects, however, there has been no evidence of this at task MF-1580.
- g) It is of the opinion of the MACC SL BOI team that [the Victim] was conducting manual mine clearance procedures in compliance to the (Commercial demining group) SOP and NTSG, however, the full excavation procedure should be reviewed. Although, it is inconclusive as to the exact cause of the accident, i.e., whether or not a mine was initiated by the application of pressure from above the mine with the hand, trowel or

whether the fuze was disturbed; the BOI team QA Officer considers that there is an increased chance of initiating a pressure blast anti-personnel mine during the excavation process when the ground is excavated from the top of the trench downwards rather than from the bottom upwards.

- h) The blast wave from the explosion threw [the Victim] backwards at least two metres where he may have struck the rear of his head on a rock. The visor lens was broken, the harness thrown a few metres away and his hand thrown a distance of 40 metres. Blast takes the route of least resistance and the ground conditions and depth of the mine would have been a principle factor in determining the direction of the blast wave. Other factors which may have contributing to this and to [the Victim]'s injuries may have been that the ground above the mine was wet after being soaked, his hand had been over the pressure blast mine and that his head was in close proximity to the explosion.
- i) The mine may have been damaged or in an unstable condition due to earth / rock movement.
- j) It is not possible to confirm the exact position of the casualty at the time of the accident however according to information received from (Commercial demining group) during the investigation [the Victim] had been conducting excavation while in the kneeling position. It is the BOI team's opinion that the casualty was working at the front of his lane and that he was possibly positioned diagonal to the front of lane with his body turned partially to the left and/or that the explosive ordnance was slightly forward and to his right side.
- k) [The Victim] had been wearing his PPE (visor, body armour and safety goggles) at the time of the explosion. It is not possible to conclude whether the visor lens was completely down or tilted at the time of the explosion, however, based on damage to the visor, the location of the harness and injuries sustained, it can be concluded that the casualty's head was in close proximity and maybe over the seat of detonation.
- l) The condition of the apron indicates that it had been worn correctly and that the right side took the brunt of the explosion.
- m) There is no evidence to suggest that the PPE was worn incorrectly by the casualty at the time of the accident. The type of PPE is in compliance with the NTSG and IMAS.
- n) Based on all available evidence, the BOI team concludes that the immediate response to the accident by the team leader and the treatment by the medics enabled an effective casevac and subsequent medevac from the task to Jezzine hospital and Hammoud hospital.
- o) The detector and tools used by (Commercial demining group) during manual mine clearance operations are in compliance to the NTSG.
- p) There was sufficient communications at the task.
- q) Generally, the task was marked in accordance with (Commercial demining group) Standard Operating Procedures (SOP) and in compliance to the NTSG.
- r) There was sufficient command and control at task MF 1580.
- s) The QA was in compliance to the (Commercial demining group) SOP and NTSG and good / objective QA has been conducted by the (Commercial demining group) QA / Accreditation Supervisor.

- t) Demining operations at MF 1580 were conducted in accordance to the (Commercial demining group) SOP, NTSG and IMAS.
- u) During the course of the investigation the MACC SL BOI team received full cooperation from (Commercial demining group).
- v) (Commercial demining group) have temporarily suspended MF 1580 as the teams are on stand-down.
- w) The accident is considered to be Unpreventable.

Further Actions and Recommendations

- a) (Commercial demining group) conduct clearance of the crater site and recover the visor harness as additional evidence. This shall be conducted as soon as possible
- b) When possible, (Commercial demining group) and the BOI team conduct an interview with the casualty.
- c) (Commercial demining group) shall conduct one day of refresher training for MCT 1 and 5 pertaining to manual mine clearance operations, in particular full excavation.
- d) The BOI Team QA Officer recommends that the excavation procedure is revised. When excavating the ground in areas which may contain pressure blast mines, the ground should be excavated starting from the bottom of the excavation trench towards the top and not from the top downwards. To avoid unnecessary ground movement during the process / disturbance of any mines, the ground should only be excavated forward a few centimetres at a time and the complete face of the trench excavated the same distance forward (bottom to top) prior to repeating the process.
- e) Extreme care should be taken when using the trowel for the excavation process, particularly when searching for anti-personnel pressure blast mines in hard ground, such as the No. 4. It is acknowledged that the trowel is used for manual mine clearance operations worldwide and that mines are safely located using this instrument, however its design make it ideal for digging the ground in a prodding / scooping technique and less suitable for the preferred method of scraping / shaving the ground.
- f) Extreme vigilance and regular monitoring of deminers should be enforced when excavating the ground for mines particularly, where the area has been subjected to earth movement and the mines may be in a less stable condition.
- g) It is acknowledged that there may be a requirement to apply water in hard ground conditions to ease the excavation process, however, after the ground has been soaked extra vigilance shall be taken when excavating to avoid removing too much soil at a time which may disturb a mine or other ordnance.
- h) Supervisory staff should ensure that the excavation process is conducted in a controlled and methodical manner with the emphasis on marking, the dimensions of the trench and the excavating technique.
- i) Supervisory staff should ensure that PPE is worn correctly at all times when working in the hazardous area. Consideration should be given to the use of helmets in conjunction with the visor when operating in mountainous / rocky conditions. It is however, understood that the balance between comfort and safety is a key factor when selecting appropriate PPE.

- j) The one hour shift should be reduced in length during hot / humid conditions especially when conducting laborious procedures such as full excavation.
- k) In circumstances where the accident site is pending an investigation by the LMAC/MACC SL, such as a BOI, the task commander shall ensure that scene of the accident is immediately secured after the casualty or medical evacuation. Investigation of the scene of the accident by the Demining Organisation, including the taking of photographs shall not commence before the arrival of the LMAC/MACC SL investigation team or without authorization from the LMAC/MACC SL. Failure to comply with this may result in the withdrawal of the Organisation's Accreditation.

Signed: QA Officer, MACC SL:

LAF Plans Officer, LMAC/MACC SL

Victim Report

Victim number: 743	Name: [Name removed]
Age: 31	Gender: Male
Status: deminer	Fit for work: no
Compensation: Not made available	Time to hospital: 28 minutes
Protection issued: Frontal apron Long visor Safety spectacles	Protection used: Frontal apron,

Summary of injuries:

minor Leg

severe Arm

severe Face

severe Head

AMPUTATION/LOSS

Arm Below elbow

Eye

COMMENT: See Medical report

Medical report

IMSMA report gives date of birth as 23/09/76. The sketch records loss of right eye and right arm. Other injuries were indicated on head/neck, upper limbs and lower limbs. It records the time to reach the first hospital as 28 minutes.

The following information regarding [the Victim]'s injuries was obtained by the BOI team during the interview process at the accident site:

Medic's diagnosis at accident site 18 June 07

4. Right hand severed above the wrist with some of the hand attached to the arm.

5. Small wound to the chin.
6. Eye injuries.
7. Wound to rear of head (5cm).
8. Fracture to upper right arm.

Treatment at accident site 18 June 07

1. Tourniquet applied to right arm.
2. Right hand bandaged.
3. IV line and 1 litre of Ringers administered.
4. 15mg / 1cc of morphine (analgesic) administered intramuscularly.
5. Right arm immobilised with splint.
6. Eyes cleaned.
7. Cervical collar applied around casualty's neck.
8. Oxygen administered.

The following information regarding [the Victim]'s injuries was obtained from the (Commercial demining group) Demining Accident report submitted on 21 June 07:

Description of Injuries

1. Amputation of the right forearm with fracture of the right humerus.
2. Multiple lacerations to the face with amputation of the upper lip.
3. Right eye injury with deep laceration.
4. Superficial right thigh skin abrasions.
5. Loss of many lower mandibular teeth.

The following information regarding [the Victim]'s condition was reported to the BOI team by (Commercial demining group) between 19 to 22 June 07: The casualty is unconscious and remains in a critical condition.

Statements

ANNEX C - WITNESS STATEMENTS

During the course of the BOI, the MACC SL BOI team conducted interviews with (Commercial demining group) personnel regarding the BAC Demining Accident that occurred on 18 June 2007. The interviews were conducted in English as all persons involved in the process had sufficient knowledge of the language.

The interviews were conducted by Lt. [Name removed], LAF Plans Officer and [Name removed], MACC SL QA Officer. Also present during the interview process was [Name removed], (Commercial demining group) QA / Accreditation Supervisor.

The information below is written with the purpose of replicating the verbal statements submitted by BAC personnel during the interview process. Written statements shall be included in the (Commercial demining group) internal investigation report:

1. [Name removed] MCT 1 and 5 Supervisor

Date and Time: 18 June 2007, 1400 -1600hrs (local time).

Location: (Commercial demining group) Task, MF 1580, Kafar Houna, Lebanon.

Organisation: (Commercial demining group).

Position: MCT 1 and 5 Supervisor

Employment in Lebanon: (Commercial demining group) Lebanon 2002-04 and Jan 07-present.

I arrived at the task at approximately 0700. The deminers calibrated their detectors and I briefed the teams regarding the following:

- The use of water to soften the ground;
- Using the detector to check the ground prior to conducting excavation;
- A reminder to the teams not to use the prodder.

Teams 1 (comprising Mozambique Deminers) and 5 (comprising Zimbabwe Deminers) were split into four teams; 1 ALPHA, 1 BRAVO, 5 ALPHA and 5 BRAVO. The working routine comprised two teams operating simultaneously for 1 hour followed by a 15 minute break. The first teams conducted two x 1 hour shifts before changing over with the second teams.

At 0800 Teams 1 BRAVO and 5 BRAVO commenced operations and the third shift, comprising 1 ALPHA and 5 ALPHA commenced at 1115, which was from the time they left the control point. The deminers were conducting full excavation following the mine rows and 3 Deminers from team 5A were on the side of the hill where the accident occurred and 5 Deminers from 1A were on the opposite side of the hill. One Team Leader was supervising each of the teams and the other two Team Leaders were at the control point. On the previous shift, I had seen him applying water to the ground in his working lane.

The accident occurred at 1140 and at the time I was at the control point and was alerted to the accident by an explosion. I called Team Leader 5A ([Name removed]) by radio and he replied that there had been an accident in lane 3 and that the casualty was in a cleared area. I dispatched the two Medics (MCT and mechanical) to the accident site with the ambulance. The mechanical team Medic was at the control point as the mechanical operations were being conducted at a task nearby. I remained at the control point. The casualty was treated in the cleared lane and stabilized by the Medic.

The Medics arrived at the accident site at 1144 and the casualty was stabilized at 1145. The casualty was placed on the spinal board at 1148 and evacuated from the task at 1156 to Jezzine hospital which is 11.2 km from the task. I remained at the control point and sent the initial accident report to the (Commercial demining group) headquarters.

[Name removed] (Commercial demining group) Operations Manager, [Name removed] (Commercial demining group) Area D, E, F Manager and [Name removed] (Commercial demining group) arrived at the task at 1150 (prior to the evacuation to hospital).

The casualty had worked for (Commercial demining group) in Lebanon from 2002-4 and was again employed in January 2007.

According to [Name removed], the casualty had completed a manual deminer refresher course prior to commencing operations in 2007. The casualty had previously worked in Sowaida position minefield and some booby-trap (BT) tasks including BT-04.

The casualty had primarily conducted full excavation during mine clearance operations in 2007 and had located several No. 4A anti-personnel mines at task 1580, including the closest one to the accident site, which was at a depth of approximately 3cm. The mine had been in the upright position with the fuze facing away from the hill and to the right as the casualty would have been facing.

The main difficulties at the task are that the ground is hard and the mines seem to be laid in varying directions, therefore, it was unknown as to the direction of the fuze. [The Victim] (casualty) is a good Deminer and there has never been any reason for him to receive any disciplinary action from (Commercial demining group).

2. MCT 5A Team Leader

Date and Time: 18 June 2007, 1400 -1600hrs (local time).

Location: MF 1580, Kafar Houna, Lebanon.

Organisation: (Commercial demining group).

Position: MCT 5A Team Leader

Employment in Lebanon: (Commercial demining group) Lebanon 2002-04 and Jan 07-present.

My first shift started at 1000 and second at 1115, which was when the deminers left the control point for the working area. Prior to the end of the first shift I had seen [the Victim] (casualty) conducting full excavation and had assisted with applying water to his excavation trench. I left the control point for the second shift with the deminers and went with each of the three deminers to their individual working lanes and explained the procedures to them as the terrain was varying, e.g. flat and undulating. They were all wearing their PPE correctly. Teams 1A and 5A were working; I was responsible for team 5A and a second team leader for team 1A, who were working on the opposite side of the hill. Prior to the accident, one of the deminers had located a mine and I was in the process of moving him to another area to work when I heard a 'big bang'. By the time I arrived at the accident site, one deminer was already there, who had brought a detector with him. I called the Supervisor by radio to inform him of the situation. The casualty with half in / half out of the lane and I lifted him and pulled into the safe area. An additional deminer arrived at the accident site to assist. The casualty asked if he still had his hand and I noticed that only part of it was still attached to his arm. The casualty was stabilized and recovered to the ambulance.

[The Victim] is a good deminer and I have had no problems with his work.

[Name removed] explained to BOI team that the full excavation procedure consisted of the following:

Prior to excavating, the deminer checks the ground with the detector. He then uses the trowel to excavate a 20 cm trench and excavates forward and down, commencing at the top of the trench. The BOI team asked why excavation was not conducted from the bottom upwards as they are searching for pressure blast mines. [Name removed] replied that this was the normal procedure. [Name removed] (Commercial demining group) Operations Assistant) explained that it was safer to excavate from the surface of the ground downwards rather than from the bottom as the mine is more likely to be disturbed if it is excavated from below and that from above is safer. [Name removed] also explained that it is less likely to initiate a No 4 AP mine while conducting this procedure as the mine requires too much pressure to be applied to the pressure plate than could be exerted by the deminer excavating from above. Lt. [Name

removed] agreed and confirmed that this was the standard practice when clearing No 4 AP mines in Lebanon.

3. MCT 5 Medic

Date and Time: 18 June 2007, 1400 -1600hrs (local time).

Location: (Commercial demining group) Task, MF 1580, Kafar Houna, Lebanon.

Organisation: (Commercial demining group).

Position: MCT 5 Medic

There were two medics at the control point at the time of the accident; myself and mechanical team medic, as another task was nearby. Prior to the accident I was at the control point speaking with the supervisor when I heard an explosion. The ambulance driver immediately went to the ambulance to prepare the vehicle. I heard the team leader shout on the radio that there had been an accident and that the casualty was in a safe lane. The supervisor instructed both medics to go to the accident site.

When I arrived I noticed that the casualty was in the safe lane and that the team leader had already applied a tourniquet to the casualty's right arm. I asked the other medic to attend to the casualty's injured hand while I checked his face. I wiped some blood from a wound on his chin. I reassured the casualty and he informed me that he was in a lot of pain. I administered 1 litre of Ringers IV fluid and 15mg / 1cc of morphine (analgesic). This was administered intramuscular rather than intravenous to avoid any side effects such as hypertension. I applied a cervical collar around the casualty's neck and a deminer prepared the oxygen. The casualty had a small wound to his rear of his head approximately 5cm in size. The casualty sustained a fracture to his upper right arm and I immobilised it with a splint. Both the casualty's eyes contained dirt and were injured, therefore, I cleaned them. The casualty was placed onto a spinal board and carried by the deminers to the ambulance. The casualty had sustained injuries to his head and the fracture from falling down. He was then transported to Jezzine hospital.

The duration of the casevac (from the moment of the accident to the casualty being placed in the ambulance) was 16 minutes and the casualty arrived at Jezzine hospital with approximately 30 minutes. Both the medics went with the ambulance and three medical personnel (medical coordinator and 2 medics) accompanied the casualty to Hammoud hospital in Saida. The casualty had sustained injuries to his head and the fracture from falling down.

Analysis

The primary cause of this accident is listed as a "*Management control inadequacy*" because the demining group appear to have been using an excavation process that digs down onto the mine (as identified by the investigators). It is unfortunate that this process was approved by a National investigator who was clearly ignorant of the accident record using it. Digging down onto a mine puts the hand and arm in the worst possible position. A second Management failing is the fact that the deminer had been issued with protective equipment that did not meet the requirements of the IMAS. See editorial comments with photographs in main report. (The editor designed the apron and visor in 1997.)

The secondary cause is listed as a "*Field control inadequacy*" because the Victim suffered severe facial injury, including amputation of a lip, loss of teeth and loss of at least one eye. This indicates that the visor was not being worn correctly. It was raised and the field supervision should have corrected this.

The demining group's provision of industrial safety glasses to wear inside the visor follows several other accidents among their men when visors have failed. This has only occurred with this demining group. Investigations into the age and condition of the visors they are using suggests that they are either very old and have sun-hardened, or they are not made from polycarbonate. If very old, they are probably also either impossible to see through or have been subjected to polishing processes that thin the material and change their ability to flex in a blast.

See also DDAS accidents nos. 00383, 00398, 00566, 00380, 00381, 00392, 00393, 00563, all of which involve this demining group in Lebanon.

The issue of thin "aramid" working gloves is a novelty. Aramid is a nylon, and thin aramid 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 aramid 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.