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### DDASaccident807

HD-AID

*Humanitarian Demining Accident and Incident Database*

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# DDAS Accident Report

## Accident details

<b>Report date:</b> 13/08/2016	<b>Accident number:</b> 807
<b>Accident time:</b> 10:52	<b>Accident Date:</b> 10/07/2015
<b>Where it occurred:</b> MF: HZTJ99 MF6, Sagirdasht Sub- district, Darvaz, Gorno- Badakhshan Autonomous (GBAO) Region	<b>Country:</b> Tajikistan
<b>Primary cause:</b> Field control inadequacy (?)	<b>Secondary cause:</b> Management/control inadequacy (?)
<b>Class:</b> Excavation accident	<b>Date of main report:</b> 11/08/2015
<b>ID original source:</b>	<b>Name of source:</b> Demining group
<b>Organisation:</b> [Name removed]	<b>Ground condition:</b> dry/dusty; grass/grazing area; soft
<b>Mine/device:</b> PMN AP blast	<b>Date last modified:</b> 13/08/2016
<b>Date record created:</b>	<b>No of documents:</b> 2
<b>No of victims:</b> 2	

## Map details

<b>Alt. coord. system:</b> WGS 84	<b>Coordinates fixed by:</b> GPS
<b>Map east:</b> 070° 43' 38.3" E	<b>Map north:</b> 38° 38' 00.5" N
<b>Map scale:</b> Sagirdasht	<b>Map series:</b> Series 1984
<b>Map edition:</b> General Staff	<b>Map sheet:</b> J-42-058-A
<b>Map name:</b> 1:50000	

## Accident Notes

inadequate area marking (?)  
handtool may have increased injury (?)  
visor not worn or worn raised (?)  
inadequate equipment (?)

## Accident report

The accident report was made available by the demining group in 2015. Some of the original formatting and photographs have been removed. The original report is held on file. The report is reproduced below, edited for anonymity. Text in square brackets [ ] is editorial.

This report was jointly produced by representatives of the national mine action authority and the international NGO involved.

## Administrative decision of forming the board

The investigation board was established on July 11, 2015.

Internal investigation board members are as follows:

[Name removed], OM [Demining group] HD Tajikistan (email address removed)  
[Name removed], TFM [Demining group] HD Tajikistan (email address removed)  
[Name removed], TFM [Demining group] HD Tajikistan (email address removed)

External investigation board members are as follows:

[Name removed], QA/QC Officer TNMAC/UNDP (email address removed)  
[Name removed], QA/QC Officer TNMAC/UNDP (email address removed)  
[Name removed], QA/QC Officer TNMAC/UNDP (email address removed)

Board was established on July 11, 2015 one day after the accident occurred.

## **Introduction**

Accident occurred in one of the remote Mine Field (MF) tasks (HZTJ99 MF6) located in Central Region of Tajikistan, Darvaz district: 35km to nearest hospital, 90min of driving by high mountain pass.

Civilian manual demining team (#112) was deployed at west slope of the mountain, supervised by Task Supervisor (TS) [the Victim] and Team Leader (TL) [Name removed]. Additionally, two available TLs [Names removed] were attached to the team to assist the TS.

At 10:50am TL announced a regular ten minutes break and deminers took their rest close to the base line of the MF. TS took one of the deminer's metal detector MineLab F3S and entered 3m deep into uncleared area. He started investigation of subsurface metal signals. TS called TL [Name removed] who was sitting in the safe area in proximity of 15m from TS. When TL took his first step towards TS the explosion occurred. As a result of explosion force, TS's helmet hit TL's chest and TL fell down to the ground. When TL stood up he saw the TS lying on the ground. TS was conscious. TL called medic and moved injured TS to safe area. First aid was provided to the casualty in the cleared safe area of the MF, and later the TS was evacuated by Medevac vehicle to the Hospital in Darvaz.

Upon arrival at Darvaz the casualty was handed over to hospital doctors for further treatment. Later, after initial surgery (amputation of forefinger, cleaning and stitching of wounds and eye injuries/ lavage), based on doctor's recommendation and by TNMAC assistance, patient was evacuated to Dushanbe hospital by helicopter. This was approved by the [Demining group] CD in an attempt to save the eyesight of the casualty based on the fact that there were no ophthalmologist surgeons available in Darvaz, the nearest being located in Dushanbe.

In Dushanbe, surgery on his eyes was conducted the same day. Later, it was reported by doctors that the right eye was beyond saving. Left eye is still under review by the doctors and they managed to remove some shrapnel and PMN casing fragmentation from his eyes. The left eye is responding to light only and no vision, and to date there has been no improvement unfortunately. Patient is now very stable, he can talk and all main life functions are normal so far.

## **History of the minefield and terrain of the land**

Minefield is relatively remote (35km from Darvaz Hospital) and located on the top of Huborobod mountain pass (3400m above the sea level), in Darvaz district, GBAO Region, Tajikistan.

A chain of minefields were set up on the top of Khuborobod pass during the Civil War from 1992-1995. This area was a front line, and mountain heights were strategically important for both conflicting sides (governmental and oppositional forces). During conflict the area was periodically controlled by both sides, and both sides were setting up minefields. Mines in the

area were laid to protect strategic installations and advantageous mountain height positions. Explosive remnants in the area are Russian types of different AP mines such as PMN; POMZ-2M; and OZM72, and cluster munition type AO-2.5RT.

Minefield TNMAC ID is HZTJ99 MF6. No minefield records are available. NTS size of the task provided by TNMAC is 101,400sqm.

Only one manual demining team was working at the task at once. The operational progress of the task so far is as follows:

Start date of operations: June 17, 2015

Cleared by detector MineLab F3S:3053sqm

TS lanes: 591sqm

Items discovered and destroyed: PMN x6; OZM72 x1; VOG17 x1;

Minefield is located on the western slope of the mountain.

The area on the top of mountain is more or less flat with insignificant hills. However, in some parts of the minefield visibility is limited due to natural obstacles (5-10m high hills, small gorges). Vegetation is dense annual grass, however the vegetation here is not considered as a major obstacle or hindrance to operations. The accident occurred where the slope panned out to a slightly elevated but still more or less flat/ level working surface.

The weather during July 10, 2015 was clear and sunny. Ground was soft and dry.

#### **Location**

Sagirdasht Community, District of Darvaz, Gorno-Badakhshan Autonomous Oblast/Region (GBAO) .

[Map removed]

Task ID: HZTJ99 MF6.

From CP to Kalai-Humb 35km westwards

From CP to Sagirdasht 13km eastwards

The accident occurred at task, 3m outside of cleared and marked area.

GPS coordinates of detonation hole is as follows:

070° 43' 38.3" E 038° 38' 00.5" N

#### **Time and date of the accident**

Accident occurred at 10:52am on Friday, July 10, 2015.

#### **Casualty Background**

Name: [Name removed]

Internal Victim ID: #010

Age: 30

DoB and Sex: March 23 1985, Male

Job Title: Task Supervisor

#### **History of Employment:**

Deminer: (Nov 10, 2010 – Feb 28, 2011)

Team Leader: (Mar 01, 2011 – Jan 31, 2012)

Task Supervisor: (Feb 01, 2012 – up to date)

Previously disciplinary action against him: Yes, one previous written warning on 25/09/13 for not wearing PPE and Helmet during ongoing clearance operations in a MF.

Compensation: Not yet known (with HO HD and IF insurers)

Protection issued: Frontal and back apron. Helmet with visor

Protection used: Frontal and back apron. Helmet with visor up

### **Personnel present at time of accident**

During the accident the whole team was present in the minefield. Below are the employee positions and names of staff present during the accident: [All names removed]

Task Supervisor, [the Victim]

Team Leader

Two Team Leader (assistants)

Eight deminers

At the Control Point were:

Team Medic ; Second demining group medic; Ambulance Driver; Transport Driver.

### **Actions Leading to the Accident**

Accident occurred by inadvertently activating AP blasting mine type PMN with demining shovel (excavation tool).

TS entered into uncleared dangerous area during the break, while remainder of the team were taking a regular 10 minute rest.

He stepped over the warning tape and penetrated the dangerous area 3m deep.

Casualty applied wrong shovel excavation procedures during investigation of the detector signal avoiding usage of marking system and base stick.

Excavation drills started just above the mine, and not 20 cm back from the signal.

### **Personal Protective Equipment**

Casualty was found wearing his flak jacket. Flak jacket Rofi type PPE Vest (back and front apron) was put on during the explosion correctly. Team medic and deminers assisting in providing first aid confirmed that all belts were fixed and fastened properly. Textile cover of the upper part of the flak jacket that protects chest and neck was covered by soot as a result of explosion. Kevlar material insert is not damaged.

Helmet was found inside the cleared area later on, since during explosion it rebounded and hit TL standing approximately 6m back from the casualty.

Helmet was without visor with signs of blast damage (scratches and soot) on front and inside edges.

Helmet fastening strap clip is absent (torn off). Visor fixture and its rubber rim were found later nearby the place of accident (37 m away from the detonation hole).

### **Monitoring process during clearance**

Internal QA by [Name removed]:

- Date 03.07.2015; No negative comments
- Date 29.06.2015; No negative comments

Internal QA by TFM [Name removed]

- Date 03.07.2015; No negative comments

External QA by TNMAC, Date 17.06.2015 \*;

- Comment: TS/TL did not check deminers lanes;
- Comment: Internal QA inspection is not marked;
- Recommendation: Stricter following of safety rules.

\*Note: It should be noted that there is a confused communication regarding the relay of the findings and recommendations of this external QA which has become apparent during the BOI. TFM reports that the QA leader briefed him verbally at the time of the QA exercise that

all was in order and that there were no negative comments. Subsequently the report recommendation written in Tajik language states the comments and recommendation reported above. The boxes are ticked for the comments in the form which do have a brief English translation under each Tajik reference, yet the report conclusion and recommendation box does not. This report is signed as read and understood by the [Demining group] Tajik TS and is filed accordingly in the task folder. The TFM states that he was not informed of the translation of this report by the QA team members or the [Demining group] TS who signed the report. [Demining group] CD upon review of the BOI has also raised concern over the fact that this information was not passed onto his attention either, as it directly reflects on safety rules being followed in the field. See recommendation section 3.

### **Medevac process**

Medevac map for minefield was developed and prepared jointly with team Medic [Name removed] and TS on April 28, 2014. Distance and time to hospital in accordance with the approved Medevac plan is as follows: 35 km, estimated duration 01 hour 30 minutes.

Casualty was delivered from uncleared to safe area less than 01 minute after explosion occurred.



Medic assessed the casualty, assured that the injured was conscious, and provided immediate first aid as follows:

1. Fixed neck brace/ protector;
2. Stopped bleeding of the right hand and face;
3. Did initial debridement of the wounds and bandaged;
4. Did splinting on the right hand;
5. Administered local anaesthetic pain reliever and antibiotic injections to casualty (Trimeperidine hydrochloride)

Later, casualty was fixed by belts on the stretcher, carried to and placed into ambulance at control point.

While en route to hospital in the ambulance the Medic continuously monitored vital signs of the casualty. Additional pain killer and antibiotics injections were administered as well.

After one hour and 27 minutes of driving, the ambulance arrived at the hospital and handed over the casualty to local doctors.

### **Evidence collected from the accident site**

Hole of detonation was discovered some 2m up from the place where TL found injured TS. Hole of detonation is 3m away from the warning tape distinguishing cleared from unsafe area. Diameter of the hole is 35cm with a depth of 25cm.

Trampled vegetation indicates position of TS on the ground. Blood on the grass is visible 1m from the cleared area.

Some fragment pieces of a PMN blast AP mine were found in the detonation/ fire hole and in a radius of 1 meter from the source of explosion.

Warped shovel without handle was found 35m away from explosion hole.

Helmet fastening strap clip was found 8m away from detonation hole.

Part of visor fixture rubber rim was found 35m eastwards from the place of accident.

Part of visor fixture clip was found 12m from detonation hole.

Helmet visor is not yet found.

Further detailed evidence of the accident will be updated upon reopening the task in near future.

In the safe area where injured [Victim] was rendered first aid, his flak jacket and helmet were found.

Signs of provision of first aid to casualty were visible: Medic gloves; Small bottle of medical alcohol; Packaging of used bandages; Syringes.

In addition, all picture will be attached to this report.

Foot prints and trampled down grass in the place where he crossed marking towards uncleared area and place of accident were visible.

#### **Chain of events**

06:00 Team wake up at camp in Sagirdasht (13km away), morning routine.

07:00 Departure from camp to the task;

07:40 Arrival of team to control point; Loading off and preparing of equipment;

07:50 Daily task and safety briefing by TS and TL;

08:00 Start of operations in the task;

08:50 First rest 10 minutes break of daily routine announced by TL.

09:00 Second working hour in the field;

09:50 TL announced second regular break to team.

10:00 Third working hour in the field;

10:50 TL announced third regular break to team.

Team (8 deminers) and TL went out working lanes.

10:51 TS took deminer's [Name removed] detector and shovel and entered uncleared area;

10:52 Accident occurred;

10:53 TS was moved from unsafe to cleared area by TL [Name removed].

10:54 Medics reached casualty and provided first aid;

10:54 OM was informed about accident by another TS via phone;

11:00 Team medic finished providing first aid to casualty;

11:06 Casualty reached ambulance;

11:08 Ambulance departure with casualty and medics to Hospital;

12:39 Casualty arrived at the hospital and was admitted to the emergency ward.

15:35 Helicopter evacuation was requested from TNMAC by OM and approved by CD

18:02 Helicopter landed in Darvaz

18:07 Casualty loaded into helicopter

18:08 Helicopter took off

19:00 Helicopter with casualty landed in Dushanbe

19:20 Casualty transported to the hospital in Dushanbe and was admitted to the emergency ward.

### **Accident investigation**

Investigation of accident was conducted next day.

First, upon arrival to control point OM and CD were briefed by TFM about accident.

TFM briefed: WHO. WHEN. HOW. Explanation of position and actions of each team member during and after the explosion were given.

Team members were asked at control point to submit own written statements about the accident. To facilitate easier and safer physical inspection of the area, [Demining group] cleared and marked a safe access lane 3m from the cleared area into the uncleared area location of accident, as well as a buffer area. Inspection included exploring of fire hole, collecting of evidence at the place of explosion, first aid place, and taking coordinates and measuring of the distances involved.

[Photographs showed fragments of Bakelite from a PMN casing were found in the crater.]

[An unclear photograph showing the remains of the “shovel” that was recovered 35 metres away is held on file. The “shovel” is a small trowel made using a single sheet of steel that is curved at one end to form a handle.]



External TNMAC investigation team arrived at the task to conduct official investigation in presence of [Demining group] CD, OM and TFMs. TNMAC team was briefed by TFM about accident then joint investigation team proceeded to the place of accident. Task staff were also interviewed by TNMAC on site, and appropriate written statements were submitted.

Pictures of all evidence was taken and attached to report.

[Photographs showing bloodstained armour and a damaged helmet are held on file.]

### **Conclusion**

Accident occurred by personal mistake of victim. Casualty violated primary safety rules by intentionally and voluntarily breaching marking and entering into uncleared dangerous area, directly into mine belt and excavating a subsurface signal ignoring safe excavation drills. His visor was up.

### **Recommendations**

- Remind, and if required, increase field staff knowledge of safety procedures and respect of marking system in accordance to SOP (chapter #2: safety; and chapter #4: marking);
- Increase supervision of any staff movements in the minefield up to a higher level.
- Taking into consideration the nature of accident, there is no need to conduct refresher training on demining procedures with the teams, however, refresher training for all TS and TL on safety, supervising, and communication in the MF is to be conducted.

- Suspend accident minefield for one week.
- External QA forms to be signed by [Demining group] Tajik TS and TFM with English translation at the time of the QA conclusion and brief. This must include [Demining group] comment and feedback as well. All known reported negative QA comments must be communicated to the [Demining group] Country Office.
- Regular one week rotations of TSs between ongoing tasks to be applied, so as to promote heightened vigilance and objectivity of this internal QA function within the operations.
- Consider shorter work shift durations where possible and logistical constraints are not an issue.

### Action Points

Minefield was suspended the same day. Team was sent to camp and next day all teams returned to Dushanbe since it was the last day of the working shift.

All field staff were briefed about the accident and its cause.

Separate learning session only for Task Supervisors and Team Leaders on increasing of safety and supervision in the task was conducted on July 20, 2015.

CASEVAC exercises with supervisors as casualty will be conducted during the year as well as CASEVAC with deminers.

Signed: Operations Manager and two Technical Field Managers for the Demining group and by the TNMAC's Land Release Advisor and Director.

### Victim Report

<b>Victim number:</b> 1004	<b>Name:</b> [Name removed]
<b>Age:</b> 30	<b>Gender:</b> Male
<b>Status:</b> supervisory	<b>Fit for work:</b> no
<b>Compensation:</b> US\$95k	<b>Time to hospital:</b> 107 minutes
<b>Protection issued:</b> Frontal apron; Helmet; Short visor	<b>Protection used:</b> Frontal apron; helmet

**Summary of injuries:** minor Arm; minor Hand; minor Leg; severe Face; severe Hand

AMPUTATION/LOSS: Eyes; Finger

COMMENT: No formal medical report was made available. See a report comprised of information drawn from the accident report.

### Medical report

No formal medical report was made available.

#### From the accident report:

##### Severe Injuries:

Complete loss of right forefinger (pointing finger, partially severed by blast and surgical amputation required); partially severed middle finger (has been sutured and set surgically).

Complete loss of right eye, and severe loss of eyesight in left eye. [Three months later, it was reported that no useful sight had been recovered in the left eye.]

Deep cut wound/ laceration of the right cheek from corner of mouth to under right ear requiring sutures (most likely caused by excavation shovel/ tool). [On further investigation it was decided that this was probably caused by the broken metal helmet fastening which was in the correct position to inflict the injury.]

#### Minor Injuries:

Blast burns to the face (2<sup>nd</sup> degree). No apparent damage to respiratory or genital organs, brain, senses of smell and taste, nerve loss or hearing as yet. Face, right upper arm and left hand have superficial lacerations from blast fragmentation; right leg has deep contusions and superficial lacerations (no surgery or suture required).

#### **Paramedic statement:**

*I, [Name removed] [Demining group] medic team#12 want to inform, that in 10.07.2015 at 07:50 a.m. after safety briefing at 08:00 a.m. deminers has started their work in HZ\_TJ99MF6. There is 50 minutes work and 10 minutes break in the field. At 10:50 a.m. was announced break, and then at 10:52 a.m. occurred detonation. Deputy of TL [Name removed] informed me by radio, that happened accident and [the Victim] injured. After that, TL of [Demining group] team#12 [Name removed] informed me by radio that happened accident and [the Victim] injured, also he informed that [the Victim] lost his finger in right hand and his face burned by blast.*

I put my PPE and Helmet and went to the place of accident with my assistant [Demining group] medic [Name removed] . At 10:54 a.m. we arrived to casualty [the Victim], immediately we fix neck lock, then we stop bleeding in his face, he lost one finger on right hand and we stop bleeding by bandage. We cleaned his face with aerosol, injected painkillers (promedol, analgin, diphenhydramine and tserukal). Then we put him into stretcher and went towards ambulance. At 11:08 a.m. we start to drive to DCH (Darvoz Central Hospital). After 15 minutes of driving we check his blood pressure. At 12:30 p.m. we arrived to the hospital and handover to surgery department.

## **Statements**

### **Staff statements**

Statements of the staff who were in the task when accident has happened were written and submitted to OM next day. On July 20, casualty's statement was taken by OM with relevant witnesses present (casualty's statement is attached in both Tajik and English translation).

### **Team Leader:**

*I, [Name removed] TL team #12 at 05:00 a.m. woke up and had a breakfast in Sagirdasht [Demining group] field base. At 07:00 a.m. with other staff we start to drive to the task. At 07:30 a.m. in Control Point we put our PPE and Facemasks and did safety briefing to staff, after safety briefing we checked our detectors in a test pit and at 08:00 a.m. we enter to the minefield. At 10:50 a.m. I announced break and collect deminers in a resting area. In this moment Task Supervisor [the Victim] took [Name removed]'s detector and shovel and went from clear area into unclear area to do survey. At 10:52 a.m. occurred detonation and I saw*

*[the Victim] lying in the field, I went to [the Victim] with deminers and provide first aid. Then we put him into the stretcher and went to the Ambulance.*

*Question: How long, you were acting as a Team Leader in a minefield HZ\_TJ99MF6?*

*Answer: I was acting as a Team Leader in a minefield HZ\_TJ99MF6 from 07.07.2015.*

*Question: Were you with Task Supervisor [the Victim] during handover of the minefield by previous Task Supervisor [Name removed] ?*

*Answer: No, I was not.*

*Question: Did [the Victim] brief you about minefield?*

*Answer: Yes, after handover of the minefield Task Supervisor [the Victim] brief us about minefield.*

*Question: During land release operation, the canister from anti-personnel fragmentation mine OZM72 was visible around the place of accident?*

*Answer: No, I did not see the canister from anti-personnel fragmentation mine OZM72 till date of accident.*

*Question: Did you see how [the Victim] entering from cleared area into unclear area during land release operation?*

*Answer: No, I did not see.*

#### **Team Leader:**

*I, [Name removed] deputy TL team #12 at 08:00 a.m. after safety briefing conducted by Team Leader [Name removed] enter to the minefield. In accordance with Team Leader order I went to the left side of the minefield with three deminers. At 10:50 a.m. was announced break and I sit on cleared area. On the top of the minefield Task Supervisor [the Victim] was doing something. The distance between me and him was approximately fifteen meters, in this moment [the Victim] call me to come closer. I stand up and did three steps; suddenly I heard detonation and saw a lot of smoke and soil and I felt down to the ground. When I stand up I saw [the Victim]'s helmet close to me I check my hands and foots, is I am injured? When I noticed that I'm Ok, I went toward [the Victim]. I pull him out from unclear area into clear area and removed his PPE. [The Victim] asked me, how many fingers he lost? I answered to him, everything is Ok. Then I stand up, took radio and informed medic. We put him into the stretcher and went to the Ambulance.*

#### **Deminer:**

*I, [Name removed] [Demining group] deminer, team #12 on 10.07.2015 at 07:00 a.m. we start to drive to the task from [Demining group] field base in Sagirdasht. At 07:30 a.m. in Control Point we put our PPE and Facemasks and our Team Leader [Name removed] together with Task Supervisor [the Victim] conduct for us safety briefing. At 08:00 a.m. we enter to the minefield and started our work. During our third break Task Supervisor with my working tools enter to the field, suddenly happened detonation. By our Team Leaders order we put the casualty into the stretcher and went to the Ambulance.*

*Question: What was the distance between your working line and place of accident?*

*Answer: Approximately three meters from the right side place of accident.*

*Question: Did you see how [the Victim] marked trip wire with warning tape?*

*Answer: No, I did not saw.*

*Question: Explain, what happened before third break in your working line?*

*Answer: When our Team Leader [Name removed] announced break, [the Victim] approach to me and asked. Do I have many signals in my working line? I answered: yes I do.*

*Then he took my detector and shovel and went to my working line, I went to the resting area.*

*Question: Did you see, how [the Victim] doing survey in unclear area during land release operation?*

*Answer: No, I did not saw.*

## **Analysis**

I investigated this accident with the demining group three months after the accident had occurred.

The primary cause of this accident is listed as a *Field Control Inadequacy* because the Victim was the senior field manager and he was knowingly breaking critical safety rules when he suffered the accident. The secondary cause is listed as a *Management Control Inadequacy* because the safety concerns expressed in the independent Quality Assurance visits were not passed up the command chain in a way that allowed them to be addressed. The demining group's international Technical Advisors failed to notice that the crucial part of the Quality Assurance report had not been translated and so failed to act on it. The Programme Manager recognised these failings and has taken measures to correct them.

This demining group issued face-masks to the deminers and helmet/visor combinations to supervisors. The unpopularity of the face mask and the restricted vision when wearing it were reported as the reasons for this difference.

Helmet visors are usually too short to provide appropriate demining protection. They are not designed to prevent blast ingress from below (which is the main demining threat). The helmet mounted visor provided to the Victim did not allow throat coverage and even when closed, allowed the wearer to look out beneath it to work. When the wearer can look out beneath a visor, the debris from a blast that is low down has a direct line to the eyes and the blast can lift the visor. So, while it is probable that the visor was raised, it may have been raised by the blast event. The metal helmet fastening broke and inflicting a deep facial cut as the helmet was torn away, so providing further evidence supporting the view that fastening a helmet may lead to increased injury.

The helmet and visor issued to the supervisor who was the Victim in this accident was unfamiliar, so the researcher made enquiries of the supplier and found that it was not designed for purpose, the visor was not made using untreated polycarbonate and had not been blast tested, so did not meet the requirements of the International Mine Action Standards (IMAS). [This is the "Inadequate equipment" referenced in the accident notes.] The fracture lines on the polycarbonate visor parts implied a variation in hardness across the thickness of the material that seemed to confirm that the material was not, as required in the IMAS, "untreated". Informal non-destructive testing of another helmet visor confirmed that it was polycarbonate, but could not assess its hardness.

The Demining Group programme manager made an immediate decision that the helmet and visor combination would no longer be used.

In an exchange with the European supplier (supplying PPE made in a variety of countries), it was agreed that the sale of PPE that did not meet the requirements of the IMAS was irresponsible. The supplier could not provide any evidence that its body armour, mask visor or

the helmet visor has been blast or fragment tested as required in the IMAS. They agreed to correct this. [Tests conducted by CTRO in Croatia were carried out in early 2016.]

The IMAS recommend that “hand tools should be constructed in such a way that their separation or fragmentation resulting from the detonation of an AP blast-mine incident is reduced to a minimum. Hand tools should be designed to be used at a low angle to the ground and should provide adequate stand-off from an anticipated point of detonation.”

The hand tool provided was made from a single piece of material that prevented separation into component parts but did not meet any of the other recommendations for blast resistance. It did not provide adequate “stand-off” and was so short that the accident record indicates that finger loss in the event of the detonation of a large anti-personnel mine was almost inevitable.

The tool had been subjected to an in-house test by the demining group before being issued. It failed that test dramatically, separating into many parts. However, the test was conducted using a large amount of explosive that was not representative of any mine threat, and this appears to be why the test result was ignored. The use of the tool was stopped by the Programme Manager following the researcher’s investigation. Blast resistant tools are being used pending the design of a locally produced alternative.

The demining group’s unusually high (for national staff) insurance payout reflects the fact that the Victim’s disability was effectively “total”. Their insurance schedule compensates total disability at approximately double the compensation for death, so acknowledging the high ongoing cost of medical care and the need for the victim to invest for a pension income. This is the most responsible insurance schedule for national staff I am aware of in humanitarian demining.

The senior management of the demining group showed great responsibility in seeking to address issues raised by the accident and has been commendably transparent in its willingness to share and address the findings.