

10-1-2014

DDASaccident804

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DDAS Accident Report

Accident details

Report date: 12/08/2016	Accident number: 804
Accident time: 07:17	Accident Date: 01/10/2014
Where it occurred: Mf: #96, Qomsangir District, Khatlon region	Country: Tajikistan
Primary cause: Unavoidable (?)	Secondary cause: Inadequate training (?)
Class: Excavation accident	Date of main report: 09/10/2014
ID original source:	Name of source: Demining group
Organisation: [Name removed]	Ground condition: dry/dusty; steep slope
Mine/device: PMN-2 AP blast	Date last modified: 12/08/2016
Date record created:	No of documents: 3
No of victims: 1	

Map details

Longitude:	Latitude:
Alt. coord. system: WGS 84	Coordinates fixed by: GPS
Map east: 068° 47' 57.586" E	Map north: 37° 17' 29.256" N
Map scale:	Map series: Series 1984
Map edition: 1983	Map sheet: 10-42-101-4 J-42-101
Map name: 1:50000	

Accident Notes

protective equipment not worn (?)
squatting/kneeling to excavate (?)
handtool may have increased injury (?)
inadequate training (?)
no independent investigation available (?)
visor not worn or worn raised (?)

Accident report

This report was made available by the demining group in 2015. Some of the formatting and pictures were removed before inclusion in the DDAS. The report is reproduced below, edited for anonymity.

1. Background

1.1 Administrative decision of forming the board

The investigation board was established on October 01, 2014.

The Investigation of the explosion site and working lane was conducted on the same day as the accident occurred.

Internal investigation board members are as follow:

1. [Name removed] Country Director
2. [Name removed] Operations Manager
3. [Name removed] Technical Advisor

External investigation board members are as follows:

[Name removed], QA/QC Officer TNMAC/UNDP

This report was prepared by [Name removed], Operations Manager [Demining group].

1.2 Introduction

Accident occurred by detonation of AP mine type PMN2 on October 01, 2014 at 07:17am.

Minefield where accident has occurred is located at a restricted border area in Qumsangir district in proximity of Kolkhoz Lenin community. Distance to nearest hospital is 27km west direction.

Task has being executed by one civilian manual demining team. Team was supervised by one task supervisor and covered by one medic with ambulance.

Team started work in the minefield at 06:30am. All personnel were present at the task. Working timing in the field was 50 min followed by 10 min rest.

At 07:17 am a detonation occurred. Since the injured deminer's position was close to the control point, the site medic heard the detonation and noticed explosion wave and smoke after that.

Injured was found in sitting in the middle of his working lane back from the fire hole, cleaning his eyes from dust. Neighbouring deminers reached him and assisted him to come out from working lane.

Medic reached injured deminer in 2 minutes and provided first aid.

At 07:50 am casualty was delivered to the hospital in Qumsangir and admitted to the emergency ward.

Later, at 15:00 pm the casualty was successfully transported to Dushanbe hospital.

1.3 History of the minefield and terrain of the land

Minefield TNMAC ID: TSTM47MF10.

NTS size of SHA: 25000sqm

TNMAC Minefield record ID: #96

Russian border forces MFR ID: #48/8/17

Minefield was set up on December 31, 1994 by Russian border forces.

Minefield is defensive type and was supposed to protect the border watch-tower.

Reference and orientation points indicated in MFR are watch-tower and border land mark #125.

Minefield is combination of several mine belts with different types of AP mines as follow:

- AP blast mine PMN2 x 359 pcs;
- Anti-lifting device ML7 x 424 pcs;
- AP bounding fragmentation mine OZM72 x 45 pcs;
- AP directional fragmentation mine MON50 x 14 pcs;
- AP directional fragmentation mine MON90 x 3pcs;

Note: Contradiction between minefield records and findings on the ground are obvious. The majority of PMN2 AP mines were discovered without anti-lifting devices ML7.

Note: According to Russian border forces source, 6 mine accidents occurred at this minefield between 1995-1998.

Minefield is located in the valley along one of the branches of Panj River. The area is more or less flat with insignificant hills. However, in some parts of the minefield visibility is limited due to natural obstacles (3-5m high hills, small gorges, and separate bushes, high and dense reeds). Originally, vegetation is mixed by thorn bushes on the slope area and dense reeds along the bank of the channel.

The soil composition is hard and dry.

A big number of animals' holes (fox/rat) are visible in the area, including SHA.

Note: Task was opened in March 31, 2014. In accordance to agreement with TNMAC, the initial activity was to identify the polygon of the minefield, set up marking, and establish a control point. Later, according to the operational plan and prioritization, the task was supposed to be executed by another available [Demining group] team.

On September 15, 2014 manual demining team continued operations in the minefield.

The operational progress of the task so far is as follows:

Start date of operations: March 31, 2014

Cleared: 4375sqm

Items discovered and destroyed: PMN2 x 27pcs; ML7 x 7pcs; OZM-72 x 1pc.

1.4 Location

Minefield is located at a restricted border area in Qumsangir district in proximity of Kolkhoz Lenin community, Khatlon Region, South Tajikistan. The distance to the nearest hospital is 27km in a westerly direction.

The area of the minefield is under control of border frontier block post LUNA, which is located almost 4km from accident place.

The accident occurred in the minefield, inside deminers working lane, during excavation drills.

Deminer's working lane (13m) was the closest one to control point. Area from the right side of deminer's line was cleared and marked in accordance to SOP. Sampling of this cleared part of the minefield was conducted by TL and TS a couple of days before accident.

After the detonation, the injured deminer was found in the middle of his working lane, sitting on the ground with his back towards the crater and cleaning his eyes.

1.5 Time and date of the accident

Accident occurred at 07:17am on October 01, 2014.

Timings of accident day:

06:15 Arrival of team to control point

06:20 Daily task and safety briefing by team leader

06:30 Start of operations in the field

07:17 Accident has occurred

07:19 Medic reached casualty and provided first aid

07:20 All operations stopped and teams pulled out from minefields

07:27 Casualty is in ambulance

07:50 Casualty arrived at the hospital and was admitted to the emergency ward.

1.6 Casualty Background

Name: [Name removed]

Internal Victim ID: #068: Age: 27

DoB and sex: November 24 1993, Male

Job Title: Deminer

History of Employment:

April-December 2013: Deminer on secondment contract

May 2014 – to date: Deminer on civilian contract

Previously disciplinary action against him: None

Compensation: Not yet known

Protection issued: Frontal apron. Face mask.

Protection used: Frontal apron. Face mask. [The use of the mask is disputed.]

Total deminer's progress: 12845 sqm

Total deminer's findings: 315 AP mines

1.7 Personnel present at time of accident

Control Point:

Task Supervisor: [Name removed]

Team Medic : [Name removed]

Ambulance Driver: [Name removed]

Minefield: Team Leader and seven deminers ([Name removed]).

1.8 Actions Leading to the Accident

Deminer was tasked by task supervisor to investigate the mound of soil (40cm) above the original hard surface of the ground in deminer's lane. The type and consistence of mound above original ground surface was fine-grained, loose and dry soil.

Note: This mound of soil was scraped out by animal (most likely fox/rat) from its holes.

Deminer investigated the mound by detector, than removed it up to the original surface of the ground. During checking the hard surface by detector the deminer detected a subsurface signal.

As to casualty's statement excavation drills started 20cm back towards the signal target.

Note: Since the mine belt was identified on sloping hill with most likelihood that mines changed original positions, usage of prodding drills were excluded at this part of the minefield.

5cm of first layer of the surface was excavated by shovel and removed.

Deminer again checked the target by detector, and continued the excavation drills.

As to deminer's statement, the mine was not visible.

During the excavation of the second layer the sudden detonation of mine occurred.

Accident has occurred by activating blasting AP mine PMN2 type during excavation drills by shovel [large, short-handled trowel].

1.9 Procedures used (reference to the SOP)

[Demining group] HD Program Tajikistan SOP

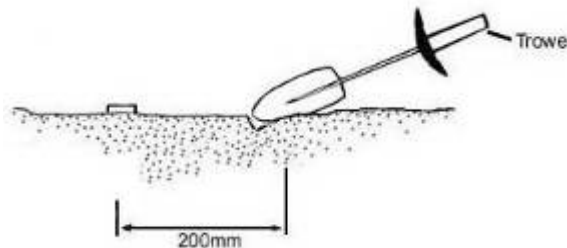
Chapter 7: Manual demining procedures:

7.4 Investigating a metal-detector signal using hand-tools:

7.4.4 Procedure:

The following procedure should be followed to investigate a metal-detector signal:

- 1) The deminer must begin by looking closely at the ground surface for sources of the metal-indication. If any metal is found, the deminer should remove the metal and check the position with the metal-detector. Throughout the investigation, the deminer should be constantly searching the ground by eye, looking for the source of the metal-detector signal
- 2) An investigation should be started by prodding the ground at least 20cm back from the metal detector signal. In most ground, the prod will not penetrate more than a few centimetres. The deminer must not apply excessive pressure to make the prodder go more deeply into the ground. If the prodder will not penetrate 3cm, the deminer should use another approved tool to break the ground surface. Sometimes the ground has a crust with softer spoil underneath. Frequently the ground becomes harder as the investigation gets deeper, and the use of other tools may be required. The ground should be prodded or broken-up over a width of excavation equal to the width of the anticipated threats at the site. If AP mines are expected, a width of 15cm is required. If AT mines are expected, a width of at least 30cm is required.
- 3) The ground that has been loosened with the prodder should then be removed with a trowel. The soil of the investigation area should be cut and removed by trowel for 5cm deep from the top. Layer by layer every 5 cm in depth of excavation, followed every time by metal detector. If metal detector continues reading the signal, deminer should repeat step 2 and 3 accordingly.



Whenever metal is found during the excavation the deminer should check the position of the original indication with the metal-detector.

2.10 Personal Protective Equipment

Casualty was found in his flak jacket [frontal apron]. Flak jacket Rofi type was put on during the explosion correctly. As to team medic and deminers assisting in providing first aid all belts were fixed and locked properly.

Deminer's Rofi face mask was found from left side of the base stick in unsafe area (20cm).

Right side of flak jacket (chest and neck parts) was found with smoke-black soot.

Textile cover of the upper part of the flak jacket that protect chest and neck had small fragments burn holes.

Part of face mask that protects jowl has signs of couple fragments with readable direction of fragments and anticipated blast wave.

First layer of the visor protection layer film was damaged and has a sign of fragment scratch.

Right side of face mask is covered by smoke-black soot.

2.11 Monitoring process during clearance

Last internal QA in the task before accident was conducted by OM on 18/09/2014.

All comments are indicated and documented in [Demining group] internal QA form and attached to Task Folder:

- During the QA one mine PMN2 type was discovered by deminer, [name removed].
- All activities in the task were in accordance to site implementation plan, approved by TNMAC.
- Before arrival at CP all marking system was destroyed by Afghans. It took 2 hours for team to repair the marking and after that to start the work.

Team doctor was aware about deminers' position in the minefield.

2.12 Medevac process

Medevac map for minefield was developed and prepared jointly with team medic and task supervisor on March 31, 2014. Distance and time to hospital according medevac plan is as follow: 27km, 30 minutes.

Casualty was delivered from uncleared to safe area after 2 minutes after explosion occurred.

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

1. Physiological inspection of the injure;
2. Washing of face and eyes by saline solution;
3. Fixed neck fixator;
4. Anesthetise reliever injection to causality (trimeperidine hydrochloride)

Later, casualty was fixed by belts on the stretchers and was placed into ambulance at control point (3 minutes).

After 23 minutes of driving, ambulance arrived to hospital and hand over casualty to local doctors.

2.13 Collected evidence from the accident site

Hole of detonation was discovered some 50cm behind base stick.

Diameter of the hole was 70cm with a depth of more than 30cm.

Detonation didn't produce typical cone shape crater but almost flat surface.

Surface layer of the ground collapsed at the place of detonation and filled empty space in the hole.

Some pieces of fragments of PMN2 mine were found in the explosion hole.

The excavation hand tool (shovel) was not found during investigation of the accident place.

Most likely it was thrown by explosion into uncleared area.

Detector type MineLab F3S was found at the right side of the working lane in safe area, covered by dust.

PPE jacket was found in the middle of working lane together with deminer's gloves. His face mask was found from left side of the base stick in unsafe area.

Working line was marked correctly in accordance with TNMAS and [Demining group] SOP.

Summary of injuries

Severe Injuries: Injured did not suffer serious injuries which could result in permanent disability.

Minor Injuries: Majority of injuries are skin scratches on left side of casualty's face; Dust and dirt in both eyes.; Lightly ragged upper lip from left side and small left eyelid bruise; Shallow cut of skin between thumb and forefinger on right hand.

2 Accident investigation

Investigation of accident was conducted same day after explosion.

First, upon arrival to control point members of investigation team were briefed by TS about accident.

TS shortly briefed: WHO? WHEN? HOW? Explanation of position and actions of each team member during and after explosion were given.

Investigation team reached place of explosion by using same line cleared by injured earlier.

Physical inspection of the area, included exploring of fire hole, collecting of evidence at the place of explosion, first aid place, and taking coordinates and measuring of the distances.

Task staff were interviewed by TNMAC, appropriate written statements were submitted.

Pictures of all evidence were taken and attached to report.



Place of accident



Crater



Face mask.



Casualty's face



Casualty's right hand.

3 Conclusion and recommendation

3.1 Conclusion

Accident occurred by activating AP mine type PMN2 during excavation drills by shovel by deminer's mistake.

According to shape of the mine explosion hole, its size, and depth of fine-grained, loose and dry soil in the hole, it is obvious that mine was not in original normal position, but most likely turned upside down.

Insignificant damage of PPE and light injuries of deminer are additional evidences that direction of blast wave was down, not upward.

The face mask was used at the moment of accident. Blast found its way between the mask and flak jacket causing light injures on the deminers face.

3.2 Recommendation

- Remind, and if required, increase field staff knowledge of safety procedures during applying excavation/full excavation drills by hand tool (shovel) in accordance to SOP (chapter #7: manual demining procedures/ 7.4: Investigating a metal-detector signal using hand-tools/ 7.4.4: Procedure);
- Review the SOP and update excavation drills chapter with focus on safety based on best [Demining group] practices;
- Develop and conduct refresh training with the focus on excavation drills for all teams.

3.3 Action Points

Accident happened last day of the regular working shift. Teams are sent home for one week rest. Operations at the task will continue in one week.

All field staff was briefed about accident and its reasons.

Separate learning session only for task supervisors and team leaders on increasing of safety in the task was conducted.

[Minefield maps and other photographs are held on file.]

Victim Report

Victim number: 1001	Name: [Name removed]
Age: 27	Gender: Male
Status: deminer	Fit for work: presumed
Compensation: Not made available	Time to hospital: 33 minutes
Protection issued: Frontal apron mask visor	Protection used: Frontal apron

Summary of injuries: minor Eyes; minor Hand; severe Face

COMMENT: No detailed medical report was made available. Eye injury may have been more severe.

PSYCHOLOGICAL ASSESSMENT REPORT

Patient: [Name removed]

Date/Time: 07.10.2014, 14.30-15.30

Location: National Clinical Hospital

[The Victim], 21 years, [Demining Group] deminer. On 01.10.2014 at 7:17 am, during mine clearance operations, in the MF#10 in Kumsangir district, in result of AP mine PMN2 explosion, he got many injures in a face, eyes and right hand.

Immediately after explosion, he got necessary treatment by medic and psychological support by colleagues. After that, he was evacuated to the Kumsangir central hospital, where he got emergency medical aid. The same day, in the evening he was transported to the Republican medical center in Dushanbe.

According to the patient, after the explosion, he lost consciousness for a few seconds. However, he remembers clearly that, when he identified the signal with detector, he started excavation with small shovel and explosion has occurred.

During the interview, he is in consciousness, adequate, answers the questions correctly. Retains the intelligence, corresponds to the level of educational attainment and life experience. Memory of the past and current events is not broken. Thinking is normal.

During a conversation, he was calm, says he has always been ready, because he knows the dangers of his profession.

He was working as a deminer from May 2014, after passing exams and short-term training. Has a certificate. Currently, he's not thinking about the future.

Sleep and appetite are normal.

Recommendation: Next week to conduct re-examination and interview.

Prepared by:

M.D., PhD. [Name removed], Disability Support Unit Officer, TNMAC.

Statements

Statements of the staff who were in the task when accident has happened were written and submitted to OM same day.

Deminer (casualty): I declare, that I'm [Demining group] deminer from MDT#1 [the Victim] living in Khatlon region, Kurgan-tube city, street Vahdat #1. I was working as a deminer from April 2013 till December 2013 as a seconded staff. From May 2014 till now I'm working as a civilian deminer.

On 01.10.2014 approximately at 6:15 am, we arrived to CP of MF#10. Till 6:30 am, we were briefed about safety procedures by our TL [Name removed]. At 6:35 I started my activities in my working lane. During finding signal, I marked place of signal with red plastic triangle and started excavation with small shovel. I was moving the soil slowly, and explosion has occurred.

After explosion, I was in shock. I backed up 2-3 steps, and then Deminer [Name removed] came to me and helped me to go out from my working lane. After it, I was moved to CP to medic on stretcher. The medic provides to me first medical aid, and then I was transported to Kumsangir central hospital. On the way to the hospital, medic checked me and did injection for anesthetic.

On 30.09.2014 during field monitoring, TS [Name removed] tasked me to check small hill before place of explosion, remove it up to original level and check it again. Because it was possibility that mine is deeper. I was wearing PPE and facemask in a proper way. After identifying signal, I measured 20 cm back from the signal and start excavation, in accordance with the procedures. Then I started to excavate first layer of ground (5 cm), when I finished first layer, I checked with detector and the signal was in same place, and I started to excavate next layer of ground (5 cm). During excavation the first layer of ground (5cm) was medium hard, after that next layer of ground was hard and that's why I put more effort during excavation. When I was removing second layer of ground excavation, the explosion has occurred. During excavation with small shovel, I didn't feel and I didn't see the mine.

Task Supervisor: I declare, that I'm [Demining group] TS [Name removed] on 01.10.2014 approximately at 6:10 am arrived to CP of MF#8. The female team was operating in this minefield. At 6:25 am, after safety briefing female team entered to the field, at 6:35 I entered to the minefield #10 to conduct monitoring, and I left from the field at 6:50 am. Then I went to the minefield #9, at 7:10 am I left from the field towards minefield #10. When I reached CP of MF#10, at 7:17 am I heard explosion sound, in this moment TL [Name removed] informed by radio that, explosion has occurred. After that, I was going to the field fast; I saw that, in [The Victim]'s working lane explosion has occurred. The TL and deminers were providing to casualty first aid, and I gave the order by radio for the rest of teams (to stop operations and going out to CP). Approximately at 7:35 the casualty was loaded on into the ambulance and sent to the Kumsangir central hospital.

Then by mobile phone, I informed frontier post about what's happened and asked them to don't stop the ambulance. After that, I call to the Kumsangir central hospital to inform, but nobody is reply. I informed about accident OM and TA.

Team Leader: I declare, that I'm [Demining group] TL from MDT#1 [Name removed] on 01.10.2014 from 6:15 am, till 6:30 am, was giving briefing to deminers about safety procedures, after that we entered to the field. As usual, deminers were working on their working lanes. During first working hour, I was monitoring each deminer in his working lane. After monitoring deminer [Name removed]'s working lane, I was going to check deminer [Name removed]'s working lane, and approximately at 7:17 I heard explosion from [The Victim]'s side. I saw that, in [the Victim]'s working lane occurred explosion. In this moment, I informed medic [Name removed] by radio. I told to her that, (explosion has occurred in the field, the casualty [the Victim], blood group is A(II)Rh+ and his working lane is #2). After that, I went to [the Victim]'s side and I saw that, he's coming towards me. I asked him about his health condition and he answered to me that, he's ok. I together with deminers [Name removed] and [Name removed] provided to him first aid. After finishing first aid, we put the casualty into the stretcher and went to CP. In this time from CP towards us was coming medic, when we reached each other, medic provide to [the Victim] first medical aid. Approximately at 7:30 we put the casualty into the ambulance and send him together with medic and one deminer [Name removed] to the Kumsangir central hospital.

Team Medic: I declare, that I'm [Demining group] medic [Name removed] on 01.10.2014 approximately at 6:25 our TL [Name removed] briefed deminers about safety procedures. In deminers behavior, nothing was suspicious. All deminers were in good mood. I asked them, do they have any problem with health, and they are answered that, they don't have any problem. Especially [the Victim] was answering clearly and lively. At 6:30 am, before starting operations in the minefield, TL as usual did radio check with me.

At 7:17 am, explosion has occurred. In that moment, I was in ambulance in CP.

At 7:17 am, TL informed me about incident.

At 7:19 am, I did medical examination to the casualty [the Victim].

At 7:23 am, I was providing first medical aid.

During traumatology examination, was not found any fracture. Fragments wound to the head, face and right eye. Airways free, blood pressure = 100/70, pulse = 89, respiratory rate = 24.

The measures taken:

1. Cerukal 2.0 intravenously.
2. Promedol 1.0 intravenously.

3. Novokain 5.0 intravenously
4. Ceftriakson 2 gr intravenously
5. Flushing eyes and face with water and saline.
6. Sulfacil natriy per 4 drops in both eyes.
7. Oxygen therapy.

At 7:27 am, ambulance with the casualty drove to the Kumsangir central hospital.

At 7:35 am, on frontier post Luna, I stopped the ambulance and did second medical examination. The casualty has complained for headache and pain in eyes. Condition was stable.

The measures taken:

1. Analgin 3.0 intravenously.
2. Dimedrol 1.0 intravenously.

At 7:50 am, the casualty was delivered to the Kumsangir central hospital.

Ambulance Driver: I declare, that I'm [Demining group] driver from MDT#1 [Name removed] on 01.10.2014 approximately at 6:10 am, we arrived to CP of MF#10 and our TL [Name removed] briefed deminers about safety procedures. After briefing, deminers did check their detectors in the test pit and entered to the minefield. I started to make maintenance inside the vehicle. Approximately at 7:17 am, explosion has occurred. The TL informed by radio that, deminer [the Victim] blown up on mine. I drive medic to access lane with ambulance. The medic wore her PPE, helmet and took medical bag and went towards casualty. The medic provides to casualty first medical aid, and the casualty was loaded into the ambulance. Approximately at 7:27 am, we left from the field to the Kumsangir central hospital. On the way to the hospital I stopped once and medic did injection to casualty, after that we continue. At 7:54 am, we reached to the hospital, and together with medic and deminer [Name removed] we transported the casualty up to surgery department, and there we hand over him to doctors.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:10 am, we arrived to CP of MF#10 and our TL [Name removed] briefed us about safety procedures. Approximately at 6:30 am, we started our activities in the field. I started my activities in a first working lane, and approximately at 7:15, 7:17 explosion has occurred. When I stood up, I saw that explosion was in [the Victim]'s working lane, and I went to his working lane. While I reach to him, he stood up and went out from his working lane. We provide to him first aid and with the stretcher transport him to CP to medic. In the CP, medic provides to him first medical aid and approximately at 7:32, 7:33 the ambulance left to Kumsangir central hospital.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:15 am, we arrived to CP of MF#10 and our TL [Name removed] briefed us about safety procedures. Approximately at 6:30 am, we started our activities in the field. After starting my activities at 7:15 I heard explosion. When I stood up, I saw that explosion was in [the Victim]'s working lane, and then I went to his working lane. When I reached to him, our TL [Name removed] also arrived. T[The Victim] was coming towards us and he was asking me (what's happened with me, [Name removed]?), and I answered to him (nothing, you are ok). We put him on the ground and took out his PPE. Then we cleared his face and hands with his scarf, after that together with deminers we put him onto the stretcher and transported to medic. The medic provides to him first medical aid,

checked his pressure, and washed his face. During providing first medical aid, medic asked the casualty (how he feeling himself?) The casualty answered that's (he is ok), and by medic's order we loaded on the casualty into the ambulance and send him to the Kumsangir central hospital.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:10 am, we arrived to CP of MF#10, kolkhoz Lenin and till 6:30 our TL [Name removed] briefed us about safety procedures. After briefing we started our activities in the field. I was working in working lane #7 (last lane), and approximately at 7:15 I heard explosion. Then I stopped my work and went towards place of explosion. There, I saw that deminer [the Victim] injured, our TL [Name removed], deminers [Name removed] and [Name removed] providing to him first aid. After that we transported him to CP, to medic. In the CP medic provide to him first aid, and at 7:33 the ambulance with casualty left to Kumsangir central hospital.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:15 am, we arrived to CP of MF#10 and our TL [Name removed] briefed us about safety procedures. Approximately at 6:30 am, I started my activities in my working lane. After starting my activities at 7:15 I heard explosion. When I stood up, I saw that explosion was in [the Victim]'s working lane, and then I went to his working lane. When I reached to him, our TL [Name removed] with deminers [Name removed], I [Name removed] and I put him onto the stretcher and transported to medic. The medic provides to him first medical aid, checked his pressure and together with deminers loaded on into the ambulance and transport to the Kumsangir central hospital.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:10 am, we arrived to CP of MF#10 and till 6:30 our TL [Name removed] briefed us about safety procedures. Approximately at 6:30 am, I started my activities in my working lane. I was working in working lane #5, and approximately at 7:15 I heard explosion. After it I was going towards place of explosion. There, I saw that deminer [the Victim] injured, our TL [Name removed], deminers [Name removed] and [Name removed] providing to him first aid. After that he was transported to CP, to medic. I went out with the rest of deminers from the field. Approximately at 7:30, ambulance with the casualty left to Kumsangir central hospital.

Deminer: I declare, that I'm [Demining group] deminer from MDT#1 [Name removed] on 01.10.2014 approximately at 6:15 am, we arrived to CP of MF#10 and till 6:30 our TL [Name removed] briefed us about safety procedures. Approximately at 6:30 am, I started my activities in my working lane. Approximately at 7:15 I heard explosion. Then I stood up, and went to place of explosion. When I reached, I saw that the rest of deminers also arrived and providing first aid. After that the casualty [the Victim] was put on the stretcher, moved to the ambulance, and send to Kumsangir central hospital.

Analysis

The primary cause of this accident is listed as "Unavoidable" because it seems that the deminer was working as directed when the accident occurred. The secondary cause is listed as "Inadequate training" because the internal investigators decided that refresher training in safe excavation methods was needed.

The investigators believed that if the mine were upside down the blast would be directed downwards, so reducing its force: this is not the case. As with all High Explosive blasts, the expanding gases expand most rapidly in the line of least resistance (the mine casing cannot resist 4000°C and the expanding gases). The line of least resistance is always to the air rather than the ground. The parts of the mine casing found were of its base, which supports the view that it was the right way up. There is 100g TNT/RDX in the PMN2 mine, meaning that it has less destructive force than the larger PMN (200+g).



It is probable that the mine was undisturbed in the ground beneath the loose spoil left by “rats”. The injuries to the deminer and the face-mask imply that his face was over the blast at the time. The severity of his injuries to his eyes – and possible long-term loss of sight – is uncertain.

The loss of the mask during the event is a cause for concern, especially because the Victim’s forehead was severely damaged by fragments that could have blinded him had they struck a few centimetres lower. The damage extends across the forehead, down his left cheek and across his chin so it appears that the mask was not present when the fragments struck. The marks appear to have been caused by unburned TNT (common).

The fragments associated with an AP mine blast have generally overtaken the expanding blast gases by the time they strike a deminer’s face protection, so the face protection is marked by fragments and the protection is often then torn away by the expanding blast front as it passes. This does not usually matter because the damaging fragments have already been stopped. However, in this case, it seems that the mask was torn away BEFORE the fragments struck, which is unique amongst the recorded accidents.

In discussion with the demining group it was agreed that either the mask design allows fragments to enter or the mask was not being worn at the time of the accident: If it were in the deminer’s hand, that would explain the damage it sustained. If the mask was worn properly and still allowed this much facial damage, the mask would be inappropriate for use when excavating mines. The demining group asked the manufacturer to conduct tests on the mask’s performance in an AP mine blast. The testing was carried out by independent specialists in Croatia in 2016 and it was found that the mask performed appropriately, from which it can be reliably inferred that the Victim in this accident was not wearing the mask.