

# DDAS Accident Report

## Accident details

<b>Report date:</b> 19/05/2006	<b>Accident number:</b> 360
<b>Accident time:</b> 11:45	<b>Accident Date:</b> 07/06/1998
<b>Where it occurred:</b> Sitkan demolition ground, Nawroeen, Diyana	<b>Country:</b> Iraq
<b>Primary cause:</b> Inadequate equipment (?)	<b>Secondary cause:</b> Unavoidable (?)
<b>Class:</b> Demolition accident	<b>Date of main report:</b> 08/06/1998
<b>ID original source:</b> AF/SB date inferred	<b>Name of source:</b> MAG
<b>Organisation:</b> Name removed	
<b>Mine/device:</b> Fuze	<b>Ground condition:</b> demolition site (explosives)
<b>Date record created:</b> 21/02/2004	<b>Date last modified:</b> 21/02/2004
<b>No of victims:</b> 1	<b>No of documents:</b> 3

## Map details

<b>Longitude:</b>	<b>Latitude:</b>
<b>Alt. coord. system:</b>	<b>Coordinates fixed by:</b>
<b>Map east:</b>	<b>Map north:</b>
<b>Map scale:</b> not recorded	<b>Map series:</b>
<b>Map edition:</b>	<b>Map sheet:</b>
<b>Map name:</b>	

## Accident Notes

no independent investigation available (?)  
protective equipment not worn (?)  
inadequate equipment (?)

## Accident report

An internal accident report was made available by the demining group. It is reproduced below, edited for anonymity.

Location: Sitkan Demolition Ground, Nawroeen, Diyana

Ammunition involved: Pit 2 (WP): (all munitions primed individually with Detcord/3RDX assembly)

Bomb Mortar 82mm WP x 2  
Bomb Mortar 100mm WP x 13  
Bomb Mortar 120mm WP x 17  
Shell 122mm WP x 13  
Shell 130mm WP x 5

**Accident.** At 11:45hrs on the 7<sup>th</sup> of June 1998, an unwarranted explosion occurred during the clearance of pits used to destroy WP filled ammunition. An EOD operator received a small fragment wound in his left thigh as a result.

**Sequence of events.** COR team 1 had laid and fired two pits, one containing HE filled items, the other containing WP filled items. Following a 40 minute safe waiting period (30 minutes mandatory + 10 minutes operator discretion) the EOD operator [the Victim] and his No.2 went forward to check clear before allowing other team members into the area. Pit 1 (HE filled items only) had fired successfully. They dug and raked the area of the WP pit, changing No.1 and No.2 (20m spacing) positions at 10 minute intervals.

Whilst [the Victim] was clearing the pit area of unburned WP with a shovel, something in the shovel-load exploded on hitting the ground causing a small metal fragment to puncture his left thigh. [His No.2] carried out first aid by pouring water on the injury (which was still smouldering) and removing the fragment (steel - 1cm x 0.5mm). He then called the team and medic forward to assist. [The Victim] was given the necessary treatment and taken to Soran Hospital. [The Demining group's] Medical Field Manager removed debris remaining in the wound.

**Most likely cause of accident.** In clearing demolition pits of unburned WP, EOD operators dig out contaminated earth and spread it thinly over the ground. This removes earth from the WP and breaks it up into smaller pieces, exposing more surface area to the air and causing it to burn quicker. It is quite likely that an impact fuze magazine, covered in WP, was exposed and the WP made to burn rapidly. The small HE charge (25g CE) pre-warmed by heat from the ground and surrounding WP then either:

- "Cooked off" as heat from the WP increased rapidly as it was exposed to air.
- Detonated on hitting the ground having been sensitised by heat.
- Detonated as a result of a combination of the above.

This magazine will, most likely, have originated from the incomplete demolition of a WP shell or mortar bomb, caused by:

- The lack of explosive continuity between the demolition charge and the relatively small, and well protected, fuze magazine.
- A weak, and/or uncoupled, demolition charge.

**Comment.** The initiation of explosive components as a result of exposure to burning WP is an inherent risk of WP clearance operations. However, as WP in the ground can remain hazardous for many years, then for all practical purposes, its complete clearance requires that the EOD operator goes forward and exposes WP to the air before allowing the general public access to the area.

The risk is mitigated by the application of a mandatory 30 minute safe waiting period, which may be extended at the EOD operator's discretion. It is further minimised by the use of the rake and shovel to put some distance between the operator and hazardous material and components, and the wearing of protective clothing and equipment to protect him from the results of an explosion.

**Recommendations.** To minimise the risk to personnel involved in the destruction of WP filled munitions, the following points are to be emphasised to all EOD and CORT team personnel:

1. A demolition charge of sufficient size to guarantee explosive propagation to all explosive components held within the target munition is to be used. The preferred charge is PE4 /C4 moulded to the munition directly above the exploder system.
2. Protective clothing is to be worn whilst clearing the site of a WP demolition.

- a. The helmet is to be worn with the visor down
  - b. Body armour (with integral groin protection deployed) to be worn.
  - c. Only cotton based clothing is to be worn
3. A safe distance of at least 20m is to be observed between the No.1 and No.2 of clearance party. *(Change - from 10m - to EOD SOPs, Part 4, annex L)*
4. All personnel are to be aware of the First Aid treatment for WP burns. Namely:
- a. Immerse the affected area in water. Where this is not possible, water is to be poured over the burn continuously.
  - b. Remove any WP from the wound with a stick or forceps, taking care not to worsen the injury or push WP further into the wound.
  - c. Cover the wound with a wet dressing and keep this dressing wet.
  - d. Treat for shock.
  - e. Give priority in casualty evacuation.
5. All personnel (involved in the demolition of WP filled items) are to be issued with, and carry, full water bottles.
6. The 6 point standard accident message format is to be reiterated to all radio operators and operational personnel and practised regularly.

### Commendations

The No.2 EOD Operator, is to be commended on his swift and effective actions in dealing with the accident.

Signed Technical Advisor and Senior Technical Advisor

### Victim Report

<b>Victim number:</b> 457	<b>Name:</b> Name removed
<b>Age:</b> 24	<b>Gender:</b> Male
<b>Status:</b> deminer	<b>Fit for work:</b> yes
<b>Compensation:</b> not made available	<b>Time to hospital:</b> 30 minutes
<b>Protection issued:</b> Frag jacket	<b>Protection used:</b> none
Helmet	
Short visor	

### Summary of injuries:

INJURIES

minor Leg

COMMENT: See medical report.

### Medical report

A brief medical report and field-medic's interview are reproduced below (edited for anonymity).

## **MEDICAL FIELD MANAGER**

I received the accident message from CORT 1 team leader. He said that they had had a small accident and were proceeding to Soran Hospital. As the accident site was not too far from the hospital and the doctors and hospital staff were soon to finish for lunch I decided to go directly to the hospital. I arrived there and informed the doctor and casualty department staff that that we had had an accident and may need their help. They made the necessary preparations.

The casualty arrived at the hospital ten minutes after I did. I examined him. He was very anxious and in pain. There was a wet dressing on his left thigh, a cannula in each arm and a bottle of fluid attached to one cannula.

I reassured him and examined his thigh. There was a 1.5cm x 1cm wound on the posterolateral aspect of the upper left thigh. The wound contained some black necrotic tissue; there was no chemical material in it. I rinsed it with water and later with antiseptic. His vital signs were normal. I anaesthetised the skin surrounding the wound with local anaesthesia, excised the necrotic tissue, left the wound open and dressed it wetly. We gave 5 million units of Crystalline Penicillin, removed the fluid and one of the cannula and x-rayed his thigh. I prescribed antibiotic and analgesic for him and sent him home as his general condition was stable.

I visited him in the evening He was in a good general condition with slight pain and slight swelling of the skin around the wound. The wound was clean apart from some oedema of the skin. He was taking his treatment regularly.

## **Medic interview**

Q. *What did you do when the accident happened?*

A. When the Operator 2 called the team leader and informed him about the accident we hurried towards the accident site with the medical bags and the stretcher. The team leader asked me to stop some distance before the accident site to stay in a safe area and they went with the stretcher to bring the victim out. During that period I prepared the medical materials from the bag to be ready for providing first aid.

Within a few minutes they returned back with the injured EOD Operator on the stretcher. He was conscious, in pain and there was a wound in the left thigh that had been wetted with water by the Operator 2. I asked the other member of the team to keep the wound wet whilst I put the cannula in for him. I put 2 cannulas in, one in each forearm whilst they prepared plasters and connected fluid to the infusion set. I gave him 500cc of Normal Saline rapidly and a 30mg ampoule of Sosegon (by IV) as he was in pain. I dressed the small wound with a wet dressing. Then I checked the vital functions, which were normal.

We then transferred him to the ambulance and took him to Soran Hospital. In the ambulance I kept the dressing wet using water. I checked the vital signs once, they were normal and his pain had lessened.

Q. *How much time did you spend in giving first aid at the accident site?*

A. Bringing the victim to me, giving him first aid and transferring him to the ambulance took 15 minutes.

Q. *How long did it take the ambulance to get to the hospital?*

A. 15 to 20 minutes.

Q. *How much fluid had he received by the time he got to hospital?*

A. 600cc Normal Saline

## **Analysis**

The primary cause of this accident is listed as *"Inadequate equipment"* because it seems likely that the explosives available to those engaged in the demolition were not ideal for the

job. The secondary cause is listed as *"Unavoidable"* because the demining group may not have had any access to better explosives and were under pressure to destroy the munitions (see Related papers and Statements).

It is not recorded whether the individuals involved were wearing any PPE, but the investigators stress that they should in their recommendations. From this it is inferred that PPE was probably not worn. While its utility in protecting against a major demolition blast is recognised as highly questionable, this accident shows how it could be useful when clearing up, or when a fuze burns off.

## **Related papers**

A letter from the Senior Technical Advisor to Technical Operations Manager dated 15 July 1998 is reproduced below (edited for anonymity).

Subject:- Accident Report for Sitkan Demolition Ground dated 07 June 1998.

### **Senior Technical Advisors Comments General**

The accident report concludes that the injuries sustained were most likely caused by a small unidentified explosive charge, possibly an impact fuze magazine exploding due to a combination of the effects of burning (WI) or impact with the ground, or both.

I accept that this is what happened based on the evidence found at the scene and the statements given.

However the report fails to explain in detail why the demolition of the unfuzed 130mm shells was unsuccessful. A total of 50 WP shells were being destroyed at the same time, 5 of these shells were 130mm shells, after the demolition had been carried out it was found that 2 of these shells had been "thrown out" in an undamaged state, and 1 had been only partially destroyed and the remains were still in the pit. Therefore the demolition technique used on these particular shells had proved unsuccessful, as less than 50% of the 130mm shells had been destroyed. All 45 of the other WP items had been destroyed completely.

This could be due to the fact that the team had only RDX explosive in solid form and not as they would like PE4 or C4. [The Victim] had tried to ensure the detonation of the 130mm shells by supplementing the exterior charge with detcord placed into the fuze well to ensure that the shell casing was destroyed. The placement of the RDX charges may well have been more effective if they had been placed in the fuze well instead of on the exterior of the shell.

This however would not have appeared to be what caused the accident, as these shells were unfuzed. It is entirely possible that fuzes from the other shells in the pit were not completely destroyed, and were consequently dug out by the operator when "raking the pit", or that some old explosive material was present in the area where the WP was being deposited.

Unfortunately this situation is one which is part of the hazards of dealing with WP, and even though the operator waited for 40 mins until the smoke from the demolition had cleared, as soon as WP is uncovered it will pose a threat. The minimum waiting time of 30 mins as laid down in SOPS is sufficient, as it is up to the operator to use his judgment after this time on when it is safe to approach the pit, therefore he can wait as long as he likes at his own discretion.

## **CONCLUSIONS**

It would appear from the evidence provided that this was indeed an unfortunate accident, that illustrates the potentially dangerous situation of dealing with WP items of UXO.

The fact that over 50% of the 130mm shells were not destroyed, could either be because of poor quality explosive or poor placement of charges. I tend to think it was the latter as all the other shells had been completely destroyed using the same placement method. However from the report it is unclear if all the other shells and mortars were fuzed or not, and whether

they contained bursting charges. As the ratio of explosive to metal in WP munitions is high the size of charge in this case was possibly too small for the task.

## **RECOMMENDATIONS**

The amendment to SOPS recommended by the investigating Technical Advisor is accepted, and should be implemented immediately.

The other recommendations should be actioned.

The provision of PE4 when necessary for destruction of WP items, this may not always be possible due to the shortages of PE4 in-country. However priority should be given in the supply of PE4 for the C.O.R.T teams to use for this purpose.

Signed: Senior Technical Advisor

## **Statements**

The following statements have been edited for anonymity.

### **The Victim**

We set off before 07:00. Some of the team laid the cable and some went to collect the ammunition from the store. During this time I helped [No.2] prepare the charges. [Two other EOD Operators] prepared the HE pit and [No.2], [Team Leader] and I set up the WP pit. When we had prepared the pits we sent the sentries out. After everything was confirmed OK I sent the message that I was about to attach the detonators.

We fired the pits at 10:30hrs, first the HE, then the WP. During the 30 minute waiting period, one of the sentries informed me that the pit was still burning and that there was a grass fire. I looked from behind the hill, saw the fire and could see smoke from the pits. I went back to the firing point and decided to wait a further 10 minutes.

After 10 minutes, I went to the pit. I could see two shells (130mm WP) easily and one with difficulty. They had not functioned. I looked at a single shell and could see a little WP inside it. Then I told [my No.2] to come down and act as my No.2. First I was No.1 and then [he] was. We took turns in holding the small water container.

I was clearing WP outside the pit. I cleared 3 shovel loads and, as the third shovel load hit the ground, it exploded. I think the item that exploded was on the ground already and, when the WP hit it, it exploded.

After the explosion I felt something hit my leg. I went back 10 - 15 steps and [my No.2] came over to help. I showed him where the wound was and he helped me to take the fragment out of my leg. Then [my No.2] informed the rest of the team. When [Team Leader] got there they put me on the stretcher and took me to where the doctor was waiting.

I think that something was in the ground from a long time ago as we have used this demolition ground a lot and the explosive item may have been missed in the pit. If the explosion had been inside the pit I should think it was a fuze but this was outside the pit so I don't know what it was. I think that what caused this accident was not using PE4. This is the best explosive and has a better chance to destroy everything. We have asked at least twice for better explosives but have been refused. They ask us as a COR team to destroy things. We should get the right explosives to destroy things safely and effectively.

### **Deminer No.2**

Usually we set off at 07:00hrs but today we set off at 06:45hrs. When we arrived on site at Sitkan we loaded all the shells onto the IFA. Because we had WP and HE ammunition to

destroy, [two others] prepared one pit and [the Victim] and I prepared the other. I prepared the charges, I can't remember how many, a lot.

After we prepared the pits we sent out the sentries. I was stationed on a hill approximately 1km away. At 10:30hrs, after we had ensured that the area was clear and under our control, we fired the pits, first the HE and then the WP. After we fired the pits, [name excised] told [the Victim] that there was a grass fire. [The Victim] told him to leave it for 30 minutes. The drill is to wait 30 minutes before returning to the pits. After this time, [the Victim] called the sentries to see if it was clear and [name excised] and I told him that there was still some burning. He told us that he was going to wait another 10 minutes.

After 10 minutes [the Victim] told me to come down off the hill and act as his No.2. When I got there, [he] was waiting for me. [The Victim] started working as No.1, I was No.2. As it was hot we changed over maybe 2 or 3 times as No.1/No.2. [the Victim] had been working as a No.1 for about 3 to 4 minutes when the explosion occurred. When the explosion happened, I went to [the Victim]. He was OK. We walked a few metres and I told him to sit down whilst I poured water over the wound as it would burn more if he moved. [The Victim] took off his trousers and I took the fragment out.

I sent a message to the other member of the team. The medic was approximately 100 - 150m from the team. We put [the Victim] on the stretcher and took him to the medic. I poured water on the wound as we walked. Then the medic treated him. He told me to continue using the water. The medic gave him the first cannula in one arm. He wanted to put the second cannula in his neck but [the Victim] refused so he put it in the other arm. The medic gave him an IV and 1 ampoule of Sosogen.

From the explosion to the hospital took only 30 minutes. When we got to the hospital we took him to the Emergency Room and [the doctor] took over.

Q. *Why did you not use the HE shells to destroy the WP filled munitions?*

A. Two reasons:

1. They were too old. Sometimes they do not detonate enough to destroy themselves let alone WP shells.

2. We did not have enough large calibre HE shells. I have a few suggestions to make.

1. It is very necessary to use PE4/C4, rather than RDX blocks, to destroy WP shells. Because it is soft, sometimes we put it over the fuze area to destroy the fuze itself.

2. All operators should do a course to teach them about demining and deminers should be taught about EOD.

3. A EOD Supervisor should be in charge of the COR team as he would have a better knowledge of EOD techniques.

4. If there is no chance of having an EOD Supervisor in the team then the EOD Operator should have the authority to override the Team Leader's decisions. For instance, if the Team Leader wants to destroy 50 shells in one pit and the EOD Operator says that we should destroy only 30, the EOD Operator should have authority. This would avoid problems with the locals.

Q. *Do you have problems with the locals?*

A. Yes. Today, some locals from Sitkan came to the demolition ground to complain that large explosions on the demolition ground affect their houses, especially the windows.

Q. *When did they come to the demolition ground?*

A. After firing the pits and before the accident.

### **Team Leader**

We set off at 06:50hrs for Sitkan and arrived before 07:30hrs. We used the IFA (4 tonne truck) to transport shells from the store to the pits.

We prepared 2 pits, 1 HE and the other WP. [Two operators] prepared the HE pit and [the Victim and his No.2] prepared the WP pit. The deminers helped in the preparation of both pits. After everything was prepared we sent the sentries out, cleared and controlled the area and [the Victim] attached the detonators. The pits were then fired.

We waited 30 minutes which is the standard drill for WP. We could not see the pits from the firing point so we contacted the sentries. After 30 minutes the sentries reported that the pits were still burning slightly. I do not have much experience in destroying WP so [the Victim] made the decision to wait a further 10 minutes.

[The Victim] went to the pit and called [his No.2] forward to act as his No.2 whilst clearing the pits. [The Victim] sent a message to all sentries to return to the rest area by the main road. [The Victim and his No.2] spent some time at the pits. I called [the Victim] twice to see if he was all right and if he needed any help. [He] said "No, we're OK".

An hour and a quarter after firing the pits, the second explosion occurred although I did not hear this myself. [The Victim's No.2] called me on the radio to send the medic to deal with a simple injury. We all went down to the pits with the stretcher. We left the medic, [and two other EOD operators] 150-200 metres from the pits and 2 deminers and I carried on to where [the Victim and his No.2] were. We put [the Victim] on the stretcher.

After that we used a lot of water to clean his wound and the medic did as much as he could. He put in 2 IV drips, one in each arm. From the accident site to the hospital took 30 minutes.

I checked his vital signs then transferred him to the ambulance carrying the fluid bag. It took about 15 minutes from the time of the explosion to get him in the ambulance. The explosion happened at 11:45 hrs and it was exactly 12:00 hrs when we put him in the ambulance. It took between 15 and 20 minutes to get him to hospital. I gave him 1 bottle of Normal Saline and another 100m before he got to the hospital (600m1 in all).

When we got to the hospital [the Victim] was in a very good condition. We gave him 5g of Crystalline Penicillin. Then [the Doctor] took over. To open and clean the wound, I believe [the Doctor] gave him a local anaesthetic.

I should just like to add that everyone in the team worked hard in helping the casualty, especially [the Victim's No.2].