9-21-2002

DDASaccident393

HD-AID
Humanitarian DeminingAccident and Incident Database

DDAS Accident Report

Accident details

Report date:	19/05/2006	**Accident number:**	393
Accident time:	07:36	**Accident Date:**	21/09/2002
Where it occurred:	MF: 466, Jabal Balat	**Country:**	Lebanon
Primary cause:	Unavoidable (?)	**Secondary cause:**	Inadequate equipment (?)
Class:	Excavation accident	**Date of main report:**	08/01/2003
ID original source:	BoI: 009/2002: MJF	**Name of source:**	MACC SL
Organisation:	Name removed		
Mine/device:	No.4 Israel AP blast / frag	**Ground condition:**	bushes/scrub electromagnetic grass/grazing area rocks/stones
Date record created:	23/02/2004	**Date last modified:**	17/03/2004
No of victims:	1	**No of documents:**	1

Map details

Longitude:		**Latitude:**	
Alt. coord. system:	GR: 36 713611 6663854	**Coordinates fixed by:**	
Map east:		**Map north:**	
Map scale:		**Map series:**	
Map edition:		**Map sheet:**	
Map name:			

Accident Notes

handtool may have increased injury (?)

mechanical follow-up (?)

inadequate metal-detector (?)

inadequate equipment (?)

Accident report

The following is the original Board of Inquiry report, edited for anonymity and with excess pictures removed.

REPORT FOR ACCIDENT INVESTIGATION BOARD OF INQUIRY – No009/2002

DEMINING Accident that occurred in OES 1 on 21st September 2002 in which [Demining group] Deminer [name excised] was injured.

Map Reference: UNIFIL Genimap 1:50,000 Sheet A (Tibnin).

References: A. Janes Mines Manual.

Introduction

1. In accordance with the National Technical Standards and Guidelines (TSGs), the MACC SL Programme Manager issued a Convening Order on Saturday 21st September 2002, for an accident investigation Board of Inquiry. Annex A details the Convening Order.

2. This is a comprehensive report by the Board of Inquiry into the Demining Accident that occurred on the 21st September 2002. Based on the investigation, [Demining group]'s internal report, the statements from [Demining group] personnel involved in the accident (see Annex B); visits to the accident site and the photos from the accident site, this accident is considered preventable.

3. The information provided by [Demining group] to the MACC SL QA Section in the "IMSMA Accident Report", attached at Annex C is confirmed. The accident occurred at approximately 0736 hrs on 21st September 2002, in Minefield (M/F) No 466 at Jabal Balat, GR 36 713611 6663854, (Seat of Detonation); Annex D details a map of the general area.

Events leading up to the Accident

4. [Demining group] manual clearance operation commenced in M/F 466 on the 05th September 2002, from the 10th through to the 14th September 2002 inclusive, [Demining group] mechanical BOZINA assets conducted ground preparation and verification in the low threat areas adjacent to M/F 466. At the time of the accident [Demining group] Manual Clearance Team No2 were the only clearance asset operational on M/F 466; from the start of the manual clearance operation at the beginning of September, a total of 2 x access lanes, 1 x base lane and 4 x main clearance lanes had been cut into M/F 466, resulting in the location of the 4 x minefield mine rows as per the minefield record.

5. The mine rows had been designated by [Demining group] as rows "A, B, C and D", starting from the South East with row "A" and moving North West finishing with row "D". The actual mine rows ran from a South Westerly to a North Easterly direction. Clearance had been fully completed in mine row A, 50% of mine row B had been completed and 25% of mine rows C and D had been completed. Annex E details [Demining group] Team No2 Site Clearance Map showing the mine rows (Briefing Map).

6. At the time of the accident [Demining group] Deminer [the victim] was working in the third mine row (mine row C). The actual clearance lane was to the left hand side of the mine rows and due to the high level of metallic contamination in the ground the sapping method of clearance was being used. The mines (located to the right hand side of the lane), were being cleared using both the sapping and the detector / excavation clearance method.

7. From the start of the day's clearance activities (20 minutes had elapsed), [the Victim] had located and marked accordingly, 1x Israeli No4 AP Mine in mine row "C". [the Victim] then continued to extend the clearance lane approximately 1m whereupon he came across a rock to the right hand side of his lane marking rope. As the rock would have been in the approximate location of the next mine, he decided to clear around the rock. Prior to actually clearing around the rock, [the Victim] attempted to detect the mine with the detector, but due

to the high level of metal contamination in the area he was unable to obtain an exact position of the mine.

8. [The Victim] then excavated around the front and right hand side of the rock using his right hand, nothing being located. As it would have been difficult to excavate around the left hand side of the rock using his right hand he swapped hands and started to excavate using his left hand, (something that [the Victim] regularly does). [the Victim] had excavated approximately 15 cms in depth when there was an uncontrolled detonation.

Events following the Accident

9. At approximately 0736 hrs an uncontrolled detonation occurred in clearance lane "C". Following the uncontrolled detonation, Team Leader [name excised] was the first to the accident scene whereupon he saw that [the Victim] had fallen back into a cleared area, he informed Site Supervisor [name excised] and then gave the accident whistle signal; all remaining Deminers then immediately moved out of the minefield to the rest area.

10. On the arrival of Team No2 Medic [name excised], an initial medical examination and on-site stabilisation took place. [Demining group] Senior Medic [name excised] was in the area and also moved to the accident scene to assist with the medical aid of the casualty. After stabilisation had been achieved [the Victim] then walked out of the minefield whereupon he was then transported to Bint Jubayl Hospital for medical treatment.

11. Following the accident Site Supervisor [name excised] passed back the initial accident report to [Demining group] base location. The accident scene was then secured and marked as per [Demining group] current SOPs and National TSGs by Team Leader [name excised]. Annex F details schematic diagrams of the general working area and accident area / scene.

VIEWS OF THE ACCIDENT SCENE

Lane "C" M/F 466 is the one on the right in the picture above.

[The seat of initiation is shown by the red arrow in the picture above. Note inadequate marking.]

BOI Post Accident Activities

12. On arrival at the accident scene in lane "C", due to the effects of the detonation wave the BOI could only gain safe access up to the daily work marker (blue picket), the BOI therefore only initially conducted the investigation to that point. A request was then made to utilise [Demining group] demining assets to clear forward of the blue picket along the original clearance lane, a distance of approximately 2m in order to gain access to the seat of detonation and the demining trowel, this request was granted and the requested area cleared.

[The picture above shows the crater and the damaged trowel.]

13. After the seat of detonation had been investigated, access was then required to [the Victim]'s visor. A request was again made to utilise [Demining group] demining assets to clear forward of the seat of detonation to the location of the visor, this request was granted and the requested area cleared and the visor recovered.

VIEW SHOWING THE SECOND BOI REQUESTED CLEARED AREA

[The picture above shows how the area looked after it had been cleared and marked for the BoI team. The clarity of the marking contrasts greatly with the pictures taken immediately after the accident. The visor is in both, so helping to identify what has been done.]

Work History of the Casualty

14. [The Victim] commenced his employment with [Demining group] in May 2002, whereupon he completed the [Demining group] Southern Lebanon in-country 2 x week demining course, prior to operational deployment at Bayt Yahun. He has previously worked on a demining operation in the Zimbabwean border minefields for 2 years, in 1998 and 1999 as a Deminer and in Mozambique for 1 year in 2001 as a Team 2i/c. He is considered by [Demining group] to be competent, trustworthy and someone who was being observed closely for possible future internal promotion; disciplinary action had never had to be taken against him.

Past History of the Area

15. The Israeli Defense Force (IDF) initially occupied the Jabal Balat, using it as a Brigade location, later the South Lebanese Army (SLA) took over the occupation. The mine contamination around the former position consist of 8 x defensive minefields located around the peripheral (there are 8 x minefields in the Task Dossier, but two of them have the same sketch map and the same supporting information); the total number of reported Israeli No4 AP mines exceeds 2300+.

16. The MACC SL designated the minefield above as M/F 466. IDF Northern Command reported the minefield details on the 12th December 2001, the minefield details reported were:

Reference Point GR 36 713750 666700.
Quantity of mines x 647 No4 AP mines.
Quantity of mine rows x 4.
Minefield map is available.
Date the mines were laid is not known.
No “C” designator detailed.

Sequence, Documentation and Procedure of Tasking

17. Task Dossier (TD) OES 1 #018 was issued to [Demining group] on the 04th September 2002; the TD contains details of the 8 x minefields in and around Jabal Balat. Up to the time of the accident a total area of 954 sq.m had been cleared by manual assets, resulting in the disposal of a total number of 204 x Israeli No4 AP mines. (It should be noted that the sq.m for the days clearance activities prior to the accident, are not included in the above total as they were not available at the time of writing this report).

Geography and Weather

18. Jabal Balat task site is located in an open area on a prominent natural hillock (altitude 600m+), to the North East of Marwahin village. Access to the site is via a tarmac road from the main Naqoura / Ayta Ash Shab road (Echo road). The mined area was previously arable agriculture land, used for animal grazing; there are no forested areas within the immediate district. The weather at the time of the accident was fine and sunny with a temperature of approximately 16 to 17 degrees Celsius.

Site Layout and Marking

19. The site layout and minefield marking prior to the accident was in accordance with National TSGs and [Demining group] SOPs; as was the post accident marking.

Management Supervision and Discipline

20. [Demining group] clearance operation is supervised by an International Operations Manager and an International Site Supervisor was in overall charge of Jabal Balat task site. 1 x International Team Leader commands Manual Clearance Team No2. There are no reports of disciplinary action being taken against [Demining group] personnel on the Jabal Balat task.

Quality Assurance and Quality Control

21. [Demining group] Internal Quality Assurance (QA) is achieved through a system of on-site checks by an International QA Team to ensure adherence to National TSGs and [Demining group] SOPs. The last Internal QA Evaluation was conducted on the 20th September 2002, with no major problems being identified. External QA is carried out by the MACC SL QA Section (name of other demining group excised). The last External QA Evaluation was conducted on the 16th September 2002 where Manual Clearance and Command & Control were evaluated; both evaluation results were good.

Communications and Reporting

22. Communications in-between the Jabal Balat task site and [Demining group] base location is maintained via the use of the Cell phone system. On site communications in-between teams is maintained via VHF handheld radios.

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

Medical Details

24. [The Victim] suffered closed fractures to his left 4th and 5th Metacarpal bones, closed fractures to his left 4th and 5th Proximal Phalanges, closed fracture to his right 1st Proximal Phalange, a small laceration to his left leg (mid-shaft of the Tibia) and small lacerations to his left upper arm. [Demining group] Team No2 Medic [name excised] and Senior Medic [name excised] administered medical treatment and stabilisation on-site to [the Victim]; casualty evacuation by road to Bint Jubayl civilian hospital then took place.

25. On arrival at Bint Jubayl hospital, [the Victim] was transferred to the Emergency Department where additional medical treatment was administered; X-ray's were also performed prior to him being released. Annex H details the medical report from Senior Medic [name excised] (a more comprehensive and detailed report than the Bint Jubayl Hospital report). [Medical report not made available.]

Personnel

26. A list of all personnel and their duties is detailed at Annex B. Written statements from [Demining group] personnel involved in the accident and [Demining group] internal report form part an Appendix to the Annex.

Dress and Personal Protective Equipment (PPE)

27. At the time of the accident, [the Victim] was wearing his protective apron and protective visor. On inspection of the protective apron, the following points were noted:

- The outer cover had been torn in several places by secondary fragmentation.
- The inner polycarbonate plate pocket material had been torn by secondary fragmentation.
- The inner polycarbonate plate had spoil deposits on it (secondary fragmentation disintegration).
- The blast debris and damage was concentrated in the centre of the jacket.
- There was fragmentation penetration of the Kevlar lining.

VIEW SHOWING DEMINER'S PROTECTIVE JACKET

[The apron's cotton cover was torn. The polycarbonate chest insert was marked by disintegrated fragments (dust) but not damaged.]

28. On inspection of parts of the protective visor, the following points were noted:

- The visor face had maintained its integrity.
- There was secondary fragmentation damage to the centre of the visor face, but no fragmentation penetration.
- The visor securing bolts had maintained their integrity.

VIEW SHOWING PROTECTIVE VISOR

Tools and Equipment

29. At the time of the accident, a standard [Demining group] excavation trowel was being used by [the Victim] ([Demining group] currently have a policy of not using demining probes, therefore probes are not part of the Deminers equipment).

30. On inspection of the trowel, the following points were noted:

- The trowel tip (last third of the blade), had been deformed quite considerably.
- There was a small crease on the underside of the trowel, 13cm from the blade / handle joint.
- There was heavy blackening confined to the second third of the trowel blade, around the location of the small crease as detailed above.

VIEW SHOWING EXCAVATION TROWEL

[This trowel is made in Zimbabwe and featured in several accidents there. In two cases, it caused severe injury to the user, in one case the injuries resulted in death. The inadequacy of the trowel has been observed before.]

Details of Mine Involved

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

32. The metal fuze assembly, which incorporates a lead-shear arming delay, is fitted through a hole in the end of the mine and screwed into the wall of the charge compartment and sealed with a rubber O-ring. The arming pin protrudes through the end of the mine opposite the hinge. The arming pin is attached to a pull ring, which is looped over the fuze body and retained by a plastic cap during transit for additional safety. The striker is retained and secured by a square shaped slotted plate on which the open end of the box rests.

33. The mine is designed purely for direct pressure operation. To arm the mine, the plastic cap on the end of the fuze is removed to release the pull ring; the arming pin is then removed. The spring-loaded striker is retained until it has sheared through a lead wire, which runs

through holes in the end of the fuze. The arming process normally takes several hours. Once armed, the striker is retained only by the slotted plate; pressure on the lid (in excess of 8kgs), simply pushes the slotted plate out which in turn releases the spring loaded central striker. The striker then impacts with the integral fuze detonator, which then passes the detonating wave to the main TNT charge causing the mine to disintegrate. (Paragraphs 31 – 33 inclusive extracted from Reference A)

34. There have been instances reported where foreign bodies have embedded themselves in between the recess in the striker mechanism and the slotted striker retaining plate, therefore allowing the partial downward release of the plate. The spring-loaded striker is now therefore only being held by the foreign body. Accumulated pressure over a period of time (especially in heavy soil conditions), can also slowly release the slotted striker retaining plate. This will therefore reduce the direct pressure required to activate the mine.

Account of Activities

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

21/09/02

- 0736hrs – Uncontrolled detonation at M/F 466.
- 0737hrs – Accident Information passed to [Demining group] Base Location.
- 0739hrs – [Demining group] informs MACC SL Operations Officer of accident.
- 0745hrs – Casualty on route to Bint Jubayl Hospital.
- 0750hrs – Accident site secured.
- 0750hrs - MACC SL Operations Officer informs MACC SL QA Officer of accident.
- 0800hrs – Initial accident report received at MACC SL.
- 0811hrs – Casualty arrives at Bint Jubayl hospital.
- 0815hrs – BOI Convened.
- 0820hrs – BOI leaves MACC SL on route to accident site (via Naqoura to pick up QA Assistant).
- 0920hrs – BOI Arrives at accident site and informs [Demining group] QA Officer of BOI convening order.
- 1030hrs – Casualty is discharged and departs Bint Jubayl Hospital on route [Demining group] base location at Host.
- 1110hrs – Casualty arrives at [Demining group] base location at Host.
- 1230hrs - Casualty leaves [Demining group] base location to move to accommodation at Jabal Balat.
- 1315hrs – Casualty arrives at Jabal Balat accommodation.
- 1335hrs – BOI Leaves accident site to move to [Demining group] accommodation at Jabal Balat
- 1340hrs – BOI arrives at [Demining group] accommodation at Jabal Balat to see casualty.
- 1400hrs – BOI leaves [Demining group] accommodation at Jabal Balat to move to MACC SL.
- 1450hrs – BOI arrives at MACC SL and briefs Programme Manager and Operations Officer.

22/09/02

- 0945hrs – BOI departs MACC SL to move to [Demining group] base location at Host.
- 1000 hrs – BOI arrives at [Demining group] base location at Host to conduct witness interviews.
- 1330hrs – BOI leaves [Demining group] base location at Host to move to MACC SL.
- 1340hrs – BOI arrives at MACC SL.

Insurance Details

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

Conclusions

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

A. Following a full and detailed examination of Mine Lab F1A4 detector (Serial Number 60978), no defects were discovered.
B. The Israeli No4 Anti Personnel mine detonated whilst [the Victim] was attempting to excavate around a rock using a trowel with his left hand.
C. The mine functioned when the bottom side of the demining trowel pushed down on the plastic lid of the mine. This in turn would have released the slotted striker retaining plate and subsequently released the cocked striker mechanism. Evidence to substantiate this conclusion are detailed below:
    - The small crease on the underside of the trowel, 13cm from the blade / handle joint was part of the trowel that was in intimate contact with the mine lid when the mine detonated. The crease formed on the detonation of the high explosive fill.
    - The trowel tip had deformed quite considerably because this is the weakest part of the trowel and the part of the trowel that would have been closest to the mine main explosive fill when it detonated.
    - The heavy blackening confined to the second third of the trowel blade (around the location of the small crease), is a residual effect of detonating high explosives.
D. If the clearance lane had been placed on the opposite side of the mine row, [the Victim] would have been excavating on the back side of the mine as opposed to the fuze side of the mine, this was a conscious decision made by the Team Leader as the terrain was more suitable for manual demining operations.
E. There was a sub-surface detonation of the mine, evidence shows that the crater had heavy blackening to the sides, was of a bulbous shape and contained primary fragmentation.
F. The vast majority of the blast effects were directed away from [the Victim] due to his body position in relation to the direction that the detonating wave was travelling, the result being a 270^{o} directional effect as opposed to a 360^{o} omni-directional effect. This in turn actually reduced the seriousness of the injuries he sustained.
G. The fracturing of [the Victim]'s left hand 4^{th} and 5^{th} fingers were due to the positive blast effects resulting from the disintegration of the Israeli No4 mine, on the detonation of the high explosives.
H. The fracturing of [the Victim]'s right hand 1^{st} finger occurred when he was forced backwards by the blast wave and placed his hand on the ground to arrest his fall, following the detonation of the high explosives.
I. [the Victim]'s other injuries to his arms was sustained from secondary fragmentation, resulting from the disintegration of the Israeli No4 mine, on the detonation of the high explosives.
J. The on-site stabilisation and treatment of the casualty was conducted in a professional and expedient manner.
K. The post-accident marking of the accident site was carried out in accordance with current TSGs and [Demining group] SOPs.
L. The passage of information in between the accident site and [Demining group] base location was good with all information being passed in a timely manner.
M. The BOI agrees with and accepts [Demining group] Accident and IMSMA Reports, in particular the conclusion detailed at Para 4.5 (PPE and medics).
N. The protective jacket maintained its integrity following the uncontrolled detonation of an Israeli No4 AP mine.

O. The protective visor maintained its integrity following the uncontrolled detonation of an Israeli No4 AP mine.
P. The use of a demining probe to investigate signals, in conjunction with a more lightweight demining trowel may reduce the risk of any uncontrolled detonations occurring. When used correctly, Deminers have a tangible and physical indication of any hidden object prior to any excavation actually being undertaken.
Q. Deminers adopting the prone position when investigating signals will minimise the injuries sustained, should an uncontrolled detonation occur.
R. Paragraph 4.19 to Chapter 4 of National TSGs does not cover in sufficient details the action to be taken when clearing around rocks.

Recommendations

38. The following are recommendations based on the BOI conclusions:

a. [Demining group] should introduce a probe and a lightweight excavation trowel procedure into their current SOPs. The International Deminers currently working for [Demining group] should have access to the full range of manual clearance tools and equipments that are available.
b. [Demining group] should strongly consider the introduction of the prone position when conducting the excavation drill into their current SOPs.
c. When the terrain permits and detailed information is known on the minefield lay out, clearance lanes should be ideally located on the side of the mine row where the rear part of the mine will be the first thing located during excavation.
d. An amendment is made to [Demining group] SOPs detailing that following any accident, Medics can enter the M/F (escorted), without actually wearing PPE, in order to administer first aid and stabilisation to a casualty.
e. An amendment to National TSGs is drafted for NDO approval, detailing additional information regarding the drill to be followed when clearing around rocks.
f. The conclusions detailed in this report be distributed and discussed among all [Demining group] Operational Field Staff.
g. A period of refresher / confidence training is conducted with all [Demining group] Manual Team No2, to include the following:
    - Manual excavation drills.

Signed: QA Officer, Mine Action Co-ordination Centre Southern Lebanon

Annexes: [Most not made available]

A. MACC SL convening order for accident investigation Board of Inquiry.

B. List of personnel involved with attached statements as Appendices.

C. IMSMA Mine/UCO accident report.

D. Map of the general area.

E. [Demining group] Team No 2 Briefing Map.

F. Schematic diagrams of the general working area and accident area/scene.

G. Initial Casualty Report

H. [Demining group] Senior Medic Medical Report.

Comments by the MACC SL UN Programme Manager

I have read the BOI's report and the Company's investigation report and I concur with the conclusions and recommendations made.

The correct application of appropriate tools is an essential element of manual mine clearance operations. In this case, it is evident that the deminer did not have available to him all of the appropriate tools, in the case a mine probe. With years of experience acquired from many different countries in often difficult terrain the mine probe has always formed a part of the deminer's basic tool kit.

The recommendation of the BOI, paragraph 38 a, is strongly supported. The company should introduce the use of the mine probe as a part of the basic demining tool kit and instruct their deminers in the correct use of this tool as soon as possible.

The question of the physical position of the deminer when conducting excavation or probing drills is often determined by the ground in which the deminer is working. However, experience has shown that the prone position offers the best protection to the deminer and this position should be applied wherever possible.

Care must be taken when working in areas of rough terrain, especially with the presence of rocks in the immediate area of the deminer's working site.

The completion of the BOI Report has been delayed by the UN Programme Manager. However notwithstanding this, all actions required to be undertaken as detailed in the BOI report have been carried out.

Signed: UN Programme Manager, MACC Southern Lebanon

Victim Report

Victim number:	508	**Name:**	**Name removed**
Age:		**Gender:**	Male
Status:	deminer	**Fit for work:**	not known
Compensation:	not made available (insured HMT)	**Time to hospital:**	35 minutes
Protection issued:	Frontal apron Long visor	**Protection used:**	Frontal apron, Long visor

Summary of injuries:

INJURIES

minor Arm

minor Leg

severe Hands

COMMENT

See medical report.

Medical report

[The Victim] suffered closed fractures to his left 4th and 5th Metacarpal bones, closed fractures to his left 4th and 5th Proximal Phalanges, closed fracture to his right 1st Proximal Phalange, a small laceration to his left leg (mid-shaft of the Tibia) and small lacerations to his left upper arm. [Demining group] Team No2 Medic [name excised] and Senior Medic [name excised] administered medical treatment and stabilisation on-site to [the Victim]; casualty evacuation by road to Bint Jubayl civilian hospital then took place.

Analysis

The primary cause of this accident is listed as “Unavoidable” because it seems likely that the Victim was working in accordance with approved SOPs when the accident occurred. The secondary cause is listed as inadequate equipment because the victim was not given appropriate tools with which to probe and excavate safely.

The “inadequate equipment” referenced under “notes” refers to the demining trowel in use, and the lack of a probe. The “trowel” was used as a sole probing/excavating tool and has featured in several accidents in this database. It’s inappropriate design has caused severe injuries to several users and it may well have contributed to the injuries sustained in this accident.

The suggestion by the senior MACC staff that “experience has shown that it is safer to lie prone when probing” is unwarranted. The evidence of this database, and the experience of most demining groups around the world, indicates that it is both safer and more practical to kneel or squat when probing or excavating a detector signal. The investigators also failed to recognise that the PPE is use was designed for the deminer to be in an upright position and if the deminer were to lie down, the top of his head and shoulders would be exposed. He would also be lying on top of most of his protection – which would be wasted. The researcher designed this body armour (and apron) in 1998 and established its production in Africa in a successful technology transfer programme. The shoulder protection is less than that required in the IMAS.