

VoVC Provplats Karlsborg

Author Dan Englund	Tracking Termitladdningar	Test Range Karlsborgdesignation 094/03	FMV:VoVC designation VoVC 14 764:53376/03	
Date 2003 11 03	classification Open	Material system (MS) MS 117	Order number (AO) 566026	Edition 1.0
Customer FMV:KCVapen	Customer reference (name telephone) Raimo Hyyrynen 08 782 68 24	Customer order Ramses	Carried out Week 336	
Customer order name (RAMSES) 117:30 Evaluation EOD-charge fire (117:30 Utvärdering Röjningsladdning Brand)				

Distribution list: See last page

TRIALS WITH THERMITE LANCES “SMALL AND LARGE” FROM FOI SWEDEN

FOI Swedish defence and research agency

Summary

The FOI Termite Lances was prototypes developed only for this trails. The number of lances was limited to a number of twenty.

The FOI Thermite Lances Small proved to penetrate and put the explosives in mines at fire. The trials against the TMM-1 (the only type of mine used) resulted in two deflagrations and three detonations. The best result was reached with one or two lances aimed to the circumference of the mine.

The Lance Small was not capable to penetrate a 12 cm mortar shell. The Lance Large proved to burn through a 15,5 cm high explosive shell.

One trail was performed against a Swedish 12 cm mortar shell (12 cm svinggr m/58) with two lances of the type large placed on opposite side of the shell. The trail ended in a deflagration six seconds after that the lances were activated.

One trails was performed against a Swedish 15,5 cm high explosive shell (15,5 sgr m/54-77) with two lances of the type large placed close together at one side of the shell. The trail ended in a deflagration 8 minutes and 44 seconds after that the lances were activated.

A total of 18 FOI Thermite Lances were used during the trails, 10 Small and 8 Large.

Author: Dat: ___ ___ ___ _____ Dan Englund Test manager Confirmed by: Dat: ___ ___ ___ _____ Production manager	Audit by: Dat: ___ ___ ___ _____ Gunnar Lindberg Productquality
---	--

VoVC Provpplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 2 (11)



Picture 1. *staff and visitors 2003 09 01. From the left, Curt Larsson (FOI/ITEP), Raimo Hyyrynen (FMV), Sune Kling (SWEDEC), Ilkka Haapamäki (Alphard OY), Lennart Fischerström (SWEDEC), Christoph Thelen (BWB Germany), Daniel Bergqvist (FMV), Conny Frisk (FMV), Ronnie Åkerstedt (FMV)*

VoVC Provpplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 3 (11)

Table of contents

SUMMARY	1
1 DESCRIPTION OF ASSIGNMENT.....	4
1.1 Objective and purposes	4
1.2 Scope.....	4
2 REALIZATION OF ASSIGNMENT.....	5
2.1 Trial area	5
2.2 Trial organisation.....	5
2.3 Classification	6
3 OPERATIONAL REALIZATION.....	6
3.1 Trial realization	6
3.2 Prerequisites and limitations	6
4 TECHNICAL REALIZATION.....	7
4.1 Measurements and recordings.....	7
4.2 Requirement compliance.....	8
5 EVALUATION AND REPORTING	8
5.1 General	8
5.2 Results	8
5.3 Conclusions	9
5.4 Reporting.....	10
6 RECOMMENDATIONS.....	10
7 REFERENCES.....	10
8 OTHER INFORMATION	11
9 DISTRIBUTION.....	11

Enclosures:

- Enclosure 1. Trial protocol
- Enclosure 2. DVD disc with video from the trial detail and survey camera.



Picture 2. Overview of the trial area at Axstål

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 4 (11)

1 Description of assignment

1.1 Objective and purposes

The armed forces have a need for introducing new methods for destruction of unexploded ammunition (OXA).

FMV KCVapen had acquired a number of CLEARANCE CHARGE FIRES (thermite charges) from the FOI Sweden.

The charges was delivered in two models called FOI Thermite Lance Small and FOI Thermite Lance Large, in this document referred to as Small and Large. The lances was prototypes manufactured a year earlier for this trail. Since the trails from the beginning was planed to be done immediately following the manufacturing, FOI was worried about the status of the lances due to the storage time. An ocular inspection gave a positive result and the lances worked as they should, even if a slightly shorter burning time could be noticed.

The primary aim of the trials was to investigate the performance of the charges against various types of unexploded ammunition and mines.

The objective was to destruct unexploded ammunition by penetrating the housing of the unexploded ammunition with intense heat and then ignite the explosives, which is then to be destroyed by fire without the unexploded ammunition detonating or deflagrating.

The trials were carried out in co-operation with SWEDEC R/D.

1.2 Scope

1.2.1 Tasks

The task was to carry out controlled trials against various types of ammunition and mines using two types of thermite charges (FOI Small and FOI Large).

There were three different trial series.

- ?? Trials with half shell bodies
- ?? Trials with live shells
- ?? Trials with live mines

Test Range Karlsborg supplied live ammunition, including mines, for the trials, with the exception of a number of TMM-1 mines supplied by SWEDEC. Fixtures and other equipment needed for the trials were manufactured at the Test Range.

VoVC Provpplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 5 (11)

1.2.2 Deliveries

FOI delivered the termite charges to Test Range Karlsborg, together with the operating procedure manual.

SWEDEC supplied live TMM-1 mines for the trials.

1.2.3 Standards

No standards have been applied for the realization.

1.2.4 Deviations

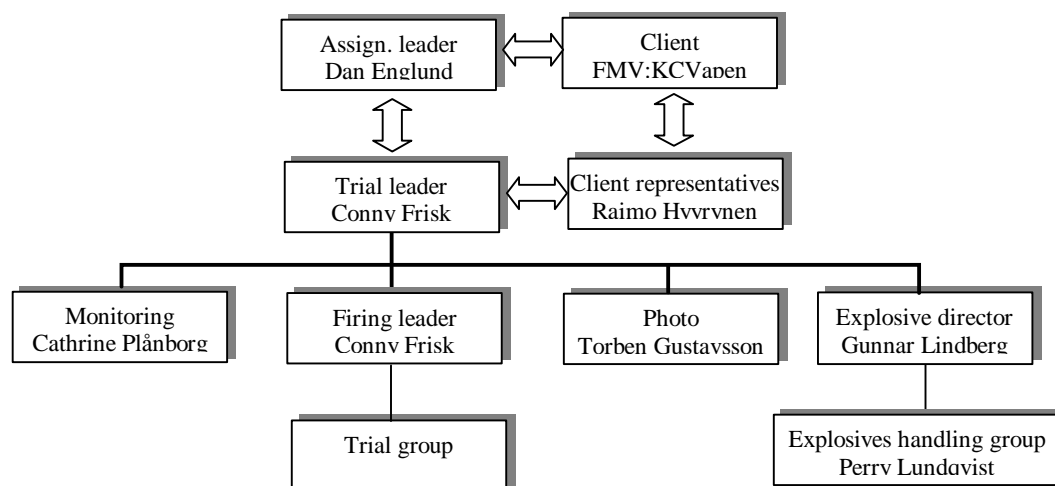
No deviations have been made.

2 Realization of assignment

2.1 Trial area

Test Range Karlsborg and firing range Axstål were used for the realization of the trials.

2.2 Trial organisation



Picture 3. Trial organisation

VoVC Provpplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sida</i> 6 (11)

List of participants.

Function	Name	Note
Test manager	Dan Englund	
Trial leader	Conny Frisk	
Firing leader	Conny Frisk	
Explosive director	Gunnar Lindberg	
EOD	Lennart Fischerström	SWEDEC
Explosives	Perry Lundqvist	
Trial engineer	Daniel Berqvist	
Trial engineer	Ronnie Åkerstedt	1-3 sept.
Trial engineer	Jenny Gunnarsson	Substitute Ronnie 4 - 5 sept.
Photo	Torben Gustavsson	Videoediting
Client representative	Raimo Hyrrynen	FMV:KCVapen 1 - 4 sept.
Client representative	Sune Kling	SWEDEC
Client representative	Abraham Langlet	FMV:KCVapen 2 - 3 sept.
Observer	Ilkka Haapamäki	Alphard OY 1 - 2 sept. Representative för ATK
Observer	Christoph Thellen	Bundesamt für Wehrtechnik und Beschaffung (BWB) 1 - 3 sept.
Observer	Dennis Menning	FOI representative 2 - 3 sept.
Observer	Curt Larsson	FOI/ITEP representative 1 - 2 sept.

Table 1. List of participants.

* SWEDEC = Swedish EOD and Demining Centre
FOI = Swedish defence and research agency
ITEP = International Test and Evaluation Program for humanitarian demining.

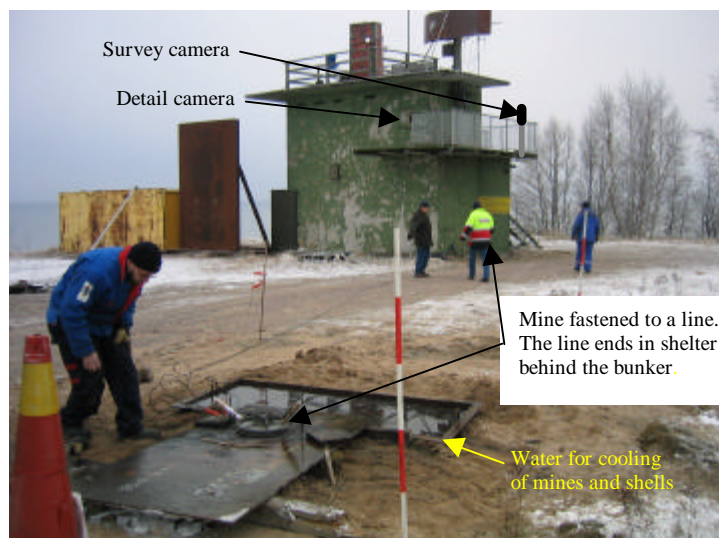
2.3 Classification

The trials and the trial results are unclassified.

3 Operational realization

3.1 Trial realization

Before the trials with live ammunition started, a water tub was placed with its upper edge at ground level. By placing the ammunition on a steel plate, which was provided with a line that ended behind shelter, the ammunition could be



Picture 4. Video cameras positions and arrangement for cooling of shells and mines.

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datam</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 7 (11)

chilled with the personnel still behind shelter. In case the explosives did not ignite, or the shell did not deflagrate or detonate, when the thermite charge had burned out, the shell could be chilled with the personnel still behind shelter. Also when the shell had been burned out or had deflagrated it could be chilled with water after the fire had gone out.

Initially the plan was to use only one survey video camera for these trials. The camera was protected against splinter by being placed inside the bunker at Axstål. It soon turned out to be advantageous to have more detailed images of the trial objects however. A video camera was therefore installed on the gangway of the bunker.

The gangway camera was used as a survey camera, while the camera inside the bunker was used for detailed images of the trial objects.

The time from the ignition of the shell's/mine's explosives, and up until the fire was out, was measured using the time data in the video film. The measured times were used as background data for the subsequent trials, and made it easier to determine if all of the explosives had burned or not.

3.2 *Prerequisites and limitations*

The trails have been made during a warm and sunny autumn week. The prerequisites have with other words been excellent and there have been no limitations.

4 Technical realization

4.1 *Measureings and recordings*

The total burn times for the charges were measured with accuracy better than ± 5 seconds.

Observations during the realisation were noted in the records (see enclosure 1) for each of the part trials. The records also contain data on type of thermite charge, type of trial object, time, fusing distance, results and general event observations.



Picture 5. Test control room with monitors for surveillance of the trails and video recorders.

VoVC Provlats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 8 (11)

Thermite charges and trial objects were photographed before and after each trial.

The trial events were recorded using video cameras. Videocassette recorders and monitors were arranged in the room from which the trials were monitored and controlled.

4.2 Requirement compliance

The requirement with regard to the measuring accuracies specified in the trial directives, have been met.

5 Evaluation and reporting

5.1 General

The number of charges available for carrying out the trials has been limited. Trials have been carried out using the following types of ammunition.

Type of shell/mine	Swedish material-no.	No trails	Note.	Thickness
15,5 cm high explosive shell 155 sgr m/54-77	M4155-002220	3	Of which 2 half bodies	15 mm
12 cm high explosive shell svinggr m/58	M4120-802234	3	Of which 2 half bodies	9 mm
Anti tank mine TMM-1	M4730-001001-1	6	Of which 1 without fuse	2,3 mm

Table 2.

5.2 Results

FOI Thermite Lance has been used in two variations.

?? "FOI Large".

?? "FOI Small", half the size of "FOI Large"

As table 3 below shows, did the lances work well at 12 cm mortal shells and 15,5 cm high explosive shells.

Of the five trails against the Yugoslavian anti tank mine TMM-1 with a live detonator, two ended in deflagration and three in detonation. The trails

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 9 (11)

indicated that one or two lances aimed at the circumference of the mine gives the best result.

One trail against the circumference of a TMM-1 without fuse resulted in a totally burned out mine in 14 minutes and 44 seconds. A hole, 20 mm in diameter was burned in the mine body.

During the trail's only one fuse was used on the TMM-1. The fuse was mounted on the top of the mine. No fuse at the side or in the bottom of the mine was used.

Typ av OXA	Burningtime (min:sek)	Notes	No. charges	No of trails
Anti tank mine TMM-1	00:24 – 09:46	Detonation/deflagration (violent)	10	5
12 cm mortar shell svinggr m/58 Half body	00:41	No penetration.	2	2
12 cm mortar shell svinggr m/58	00:11- 00:13	Deflagration	2	1
15,5 cm high explosive shell 15,5 sgr m/54-77 Half body	00:20 00:20	No penetration at 45 degree. Penetration at 90 degree.	2	2
15,5 cm high explosive shell 15,5 sgr m/54-77	8:44	Deflagration	2	1

Table 3. Approximately time to disarm different types of OXA with FOI Thermite Lance.

5.3

Conclusions

As the number of trials has been limited, the report shall only be considered as an indication with regard to the possible use of thermite lance for clearing mines and shells.

The trials have only been carried out in order to check what effects the charges have on a number of different types of mines. The trials have not taken the methods that will be used when destructing unexploded ammunition into account.

The Thermite Lance Small is efficient for mines but is not capable to penetrate shells with thick bodies.

VoVC Provlats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sida</i> 10 (11)

The Termite Lance Large is however capable to penetrate shells with a body thickness of 15 mm and set the explosives inside on fire.

The FOI thermite lances is the only type of termite charges that has been tested so far, that is ignited in the rear end of the charge. This was experienced as an advantage during the trails.

5.4 *Reporting*

The assignment is accounted for by means of this written report, including its enclosures.

6 **Recommendations**

If the thermite charges are to be used in connection with international missions, we recommend that trials are conducted using the kinds of mines and ammunitions that Swedish personnel can be expected to encounter in such situations.

The trails that has been carried out against the TMM-1 mine during this mission endorse this recommendation. TMM-1 proved to be more difficult to fight than the Swedish equivalence.

Since the Termite Lances from FOI is the only ones that meets the requirements in the PTTEM, the Test Range recommends that the condition for a further development is discussed with FOI.

As FOI stated before the trails, the igniting system needed careful installation (it was a prototype system). It was easy to produce a short cut when installing the igniters into the lance. The Test Range recommends some kind of filament to ignite the lances, a system that needs more power to initiate and thereby makes it safe from static electricity.

7 **References**

No	Designation	Title
1	SWEDDEC 13 345:60559/01	MS117 SWEDEC.s förslag till PTTEM för RÖJNINGSLADDNING BRAND
2	ProjMark 34 720:19408/02	Transport- och förvaringsföreskrifter för icke fastställd explosiv vara.
3	ProjMark 13 345:25968/02	FÖRSÖK TERMITLNG
4	VoVC 23 384:43788/03	Provdirektiv (test directive)
5	VoVC 14 764:49610/03	Provrappport (test report in Swedish)

Table 4.

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Test Range Karlsborgdesignation</i> 0/03		<i>FMV:VoVC designation</i> VoVC 14 764:53376/03
<i>Datum</i> 2003 11 03	<i>classification</i> Open	<i>Order number r (AO)</i> 566026	<i>Edition</i> 1.0	<i>Sidea</i> 11 (11)

8 Other information

This report is an extract from the Swedish report (VoVC 14 764:49610/03) which include results from two more types of termite charges.

The scope of this report is the results from the test with termite charges "Thermite Lances" from FOI.

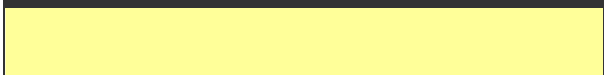
The trail numbers in enclosure 1 has not been changed from the trail numbers in the enclosure of the Swedish version.

9 Distribution

Distribution list:

Raimo Hyyrynen	FMV:KCVapen
Reine Adolfsson	FOI Grindsjön
Petri Keituri	DFMC
	P.O Box 69
	FIN- 335 41 Tampere
	Finland
Christoph Thelen	Bundeswehr Bundesamt für Wehrtechnik und Beschaffung K61
	Postfach 30 01 65
	560 57 Koblenz
	Deutschland
Abraham Langlet	FMV:KCVapen
Daniel Arvidsson	FMV:ProjMark
Sune Kling	SWEDEC
Curt Larsson	SWEDEC
Gunnar Lindberg	FMV:VoVC Karlsborg
FMV:VoVC Provplats Karlsborg	Arkiv

VoVC Test Range Karlsborg



<i>Author</i> Dan Englund		<i>Tracking</i> Termitladdningar		<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03	
<i>Date</i> 2003 11 03	<i>classification</i> Oppen	<i>Material system (MS)</i> MS 117	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>Side</i> 1 (13)
<i>Customer</i> FMV:KCVapen		<i>Customer reference (name telephone)</i> Raimo Hyrynen 08 782 68 24		<i>Customer order</i> Ramses	<i>Carried out</i> Week 0336
<i>Customer order name (RAMSES)</i> 117:30 Evaluation clearance charge fire (117:30 Utvärdering Röningsladdning Brand)					

Trial with thermite charges from FOI

(FOI Swedish defence and research agency)

Introduction

This enclosure contains all the trial records from the trials that were carried out with the Thermite Lance from FOI.

The records are sorted in the order in which the trials were carried out, and photographs have been added afterwards.

Since this report is an extract from the Swedish report (VoVC 14 764:49610/03) which include results from two more types of termite charges, the trail numbers in this enclosure has the same number as in the original report.

The time in the head of each record show the time when fire is visible from the lance. All times under the caption "Observations/notes" refers to the time in the head.



FOI Thermite Lance Small



FOI Thermite Lance Large

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar			<i>Sida</i> 3 (13)
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **8**

Date: **2003 09 02**

Time: **13:11:00**

Thermite charge: **FOI Small with bakelite nozzle. 1 st.**
Type designation

Type of ammunition: **Tankmine TMM-1 (with live fuse)**
(half 15,5, live 15,5, etc.)

Distance: **3 cm**

Photo before trail: **Yes**

Fuse temperature: **--- °C**
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

The termite lance was aimed against the circumference of the mine with a small angel against the mine body. The lance was fixed with a half body of a 15,5 cm high explosive shell.

About 7 seconds after that the lance was initiated, the explosives in the mine was burning. The fire went on with only light smoke until the mine detonated, 9 minutes and 46 seconds after the lance was ignited.

Only a small number of fragments was found within a radius of 30 meter.



VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar			<i>Sida</i> 5 (13)
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **10**

Date: **2003 09 03**

Time: **07:29:30**

Thermite charge: **FOI Large with bakelite nozzle. 1 st.**
Type designation

Type of ammunition: **15,5 cm half body high explosive shell (15,5 sgr m/54-77)**
(half 15,5, live 15,5, etc.)

Distance: **3 cm**

Photo before trail: **Yes**

Fuse temperature: **--- °C**
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

To check the ability to penetrate the body of a 15,5 cm high explosive shell, a lance was aimed at a half body at approximately an angle of 45 degree (recommended by FOI representative). The lance was fixed with a half body of an 15,5 cm high explosive shell.

18 seconds after that the lance was activated, a glowing spot was observed at the inside of the shell body.

20 seconds after the lance was activated, its intensity starts to fade and is burned out soon thereafter. Flames from the slag, is visible a while longer.

Afterwards it stood clear that the lance had not penetrated the shell body, but it was close.



VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar			<i>Sida</i> 6 (13)
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **11**

Date: **2003 09 03**
Time: **08:37:30**

Thermite charge: **FOI Large with bakelite nozzle. 1 st.**
Type designation

Type of ammunition: **15,5 cm half body high explosive shell (15,5 sgr m/54-77)**
(half 15,5, live 15,5, etc.)

Distance: **2,5 cm**

Photo before trail: **Yes**

Fuse temperature: **--- °C**
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

The lance was aimed to the half body with a right angel. The lance was fixed with a half body of a high explosive shall

15 seconds after that the lance was activated, a glowing red spot was visible inside the shell body. About 200 mille seconds later the lance penetrates the shell body.

20 seconds after that the lance was activated, the intense of the lance is fading and is burned out after a few more seconds. The slag remaining continued to burn for about 30 seconds more and finely fades out.

Afterwards the hole in the shell body is measured to about 20 mm in diameter.



VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Sida</i> 8 (13)		
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **13**

Date: **2003 09 03**

Time: **10:59:01**

Thermite charge: **FOI Small with bakelite nozzle. 1 st.**
Type designation

Type of ammunition: **Half 12 cm mortar shell (12 cm svinggr m/58)**
(half 15,5, live 15,5, etc.)

Distance: **2,5 cm**

Photo before trail: **Yes**

Fuse temperature: --- °C
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

The lance was aimed to the half body at an right angel and was fixed with sand behind the lance.

The lances burned for approximately 26 seconds. Thereafter only flames from slag and paint could be observed.

Afterwards it could be noticed that the gap between the shell body and the lance was filled with slag. Maybe that's way there was no penetration of the shell body. Only a small mark had been accomplished at the body surface.



VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Sida</i> 9 (13)		
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **14**

Date: **2003 09 03**

Time: **11:19:30**

Thermite charge: **FOI Small with bakelite nozzle. 1 st.**
Type designation

Type of ammunition: **Half 12 cm mortar shell (12 cm svinggr m/58)**
(half 15,5, live 15,5, etc.)

Distance: **3 cm**

Photo before trail: **Yes**

Fuse temperature: **--- °C**
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

The lance was placed a bow the half body of the mortar shell, at a 45 degree angel. The goal with this approach was to get the slag to pore down from the shell body to prevent the slag from weakening the effect of the lance.

24 seconds after that the lance was initiated, it fades out and die out.



Flames was visible for about two more minutes before they fades out for god. The space between the lance and the shell body is even this time filled with slag. A small cavity (< 2 mm deep) hade been accomplished at the shell body, far from a penetration.

VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar	<i>Sida</i> 10 (13)		
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03

Trail with thermite charge from FOI

Trail no.: **15**

Date: **2003 09 03**

Time: **11:57:42**

Thermite charge: **FOI Large with bakelite nozzle. 2 st.**
Type designation

Type of ammunition: **12 cm mortar shell (12 cm svinggr m/58) with live fuse**
(half 15,5, live 15,5, etc.)

Distance: **3 cm**

Photo before trail: **Yes**

Fuse temperature: --- °C
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

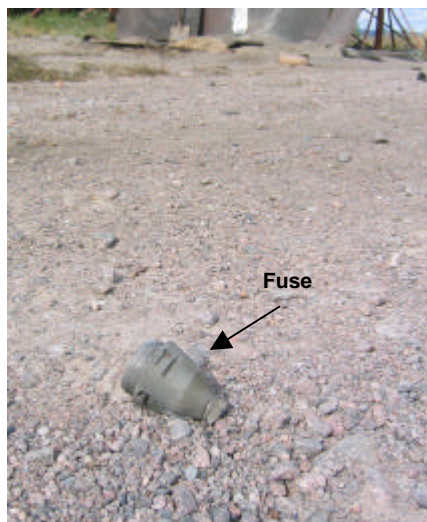
Observation/notes:

The lances were placed on each side of the shells rear part, with a slight downward angel.

6 seconds after that the lances was initiated, the shell deflagrates. Most of the shell was left at its original position as one large splinter (more then half shell). Close to the original position another large splinter was found. A smaller splinter was found about seven meter away.

In connection with the deflagration the explosives was feed and some of it continued to burn for about 2 minutes.

The fuse was found intact about nine meter away from the shells original position. The fuse were destroyed by EOD personnel using conventional methods.



VoVC Provplats Karlsborg

<i>Author</i> Dan Englund	<i>Tracking</i> Termitladdningar				<i>Sida</i> 13 (13)
<i>Date</i> 2003 11 03	<i>classification</i> Open	<i>Order number (AO)</i> 566026	<i>Edition</i> 1.0	<i>FMV:VoVC designation</i> Enclosure 1 of VoVC 14 764:53376/03	

Trail with thermite charge from FOI

Trail no.: **20**

Date: **2003 09 04**

Time: **09:15:54**

Thermite charge: **FOI Large with graphite column nozzle. 2 st.**
Type designation

Type of ammunition: **Tankmine TMM-1 (with live fuse)**
(half 15,5, live 15,5, etc.)

Distance: **3 cm**

Photo before trail: **Yes**

Fuse temperature: **--- °C**
(Max. temp)

Photo after trail: **Yes**

Video recording made: **Yes** **Yes**
(Detail) (Survey)

Observation/notes:

The lances was placed evenly distributed around the circumference of the main and headed with a right angel against the main. The lances were fixt with sand at the rear end.

When the lances were initiated, a inferno of fire occurred around the mine and it was hard so see what was happening. After 22 seconds, it could be verified that the explosives in the mine was burning. Probably the lances faded out at that time.

3 minutes and 25 seconds after that the lances was ignited, the mine detonated after a quite violent fire with heavy smoke.

Two large fragments were thrown out in opposite directions. One of the fragments is found about 10 meters from the mines original position. The other fragments were thrown away twice as far. Only a few more small fragments of the mine was found within a radius of 40 meter.

