

# **Chapter 13**

## **Anti-Tank**

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Anti-Tank Guns in the Ardennes  
(Report No.27)

Use of Panzerfaust in the NW European Campaign  
(Report No.33)



# **Anti-Tank Guns in the Ardennes**

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## **INTRODUCTION**

1. An attempt has been made to ascertain, where possible, the ability of anti-tank guns to repel attacks by enemy armour.

2. Recapitulation of actions fought in Normandy has not yet yielded sufficiently complete information to be of any value. The data on which this report is based have been collected only from actions fought by American TD units in the Ardennes mostly between 16 December 1944, and 10 January 1945.

3. During the course of the enquiry it was soon realised that no very precise results would come of it. Nevertheless the enquiry was continued since it was hoped that much of the information gathered might be of assistance even though by itself it could not answer any specific question.

## **METHOD**

4. Data were collected from Divisional, Corps and Army records, and by interviewing personally those who took part in the battles including representatives of all ranks from Divisional commanders to section leaders and gunners.

5. In order to facilitate the investigation the evidence has been collected and arranged in such a form that it should, if possible, answer two main questions:

- a) The number of towed or SP anti-tank guns, *unsupported* by infantry, which had stopped given weights of tank attacks.
- b) The number of towed or SP anti-tank guns, *supported* by infantry, which had stopped given weights of tank attacks.

## **RESULTS**

6. Descriptions of the engagements studied are given in Appendix A, the following facts deriving from them:

## Ratio of Tank to A.Tk Gun Losses

(i) Unsupported A.Tk guns.

7. The comparative casualty figures between attacking tanks and defending unsupported A.Tk guns are shown in Tables I and II for towed and SP guns respectively.

<b>Table I - Towed Guns</b>					
Unit	643 TD Bn	801 TD Bn	820 TD Bn	630 TD Bn	Total
Tanks destroyed	0	4	11	1	16
Guns lost	2	12	31	4	49
Total number of tanks destroyed/Total number of ATk guns lost = $16/49 = 0.3$					

<b>Table II - SP Guns</b>			
Unit	814 TD Bn	644 TD Bn <sup>1</sup>	Total
Tanks destroyed	21	4	25
Guns lost	13	0	13
Total number of Tanks Destroyed/Total number of A.Tk guns lost = $25/13 = 1.9$			
<sup>1</sup> No record of infantry presence in this case.			

8. The figures in Tables I and II demonstrate a decided superiority of SP over towed guns. This superiority was explained by both towed and SP teams as due to the greater mobility of the SP guns which were able to withdraw more easily when required and to the greater arcs of fire that could be quickly obtained. No evidence was found to throw doubt on either of these explanations.

(ii) A.Tk Guns Supported by Infantry

9. Tables III and IV give a comparative casualty figures for A Tk guns supported by infantry.

<b>Table III - Towed Guns</b>						
Unit	801 TD Bn	630 TD Bn	802 TD Bn	643 TD Bn	621 TD Bn	Total
Tanks destroyed	2	21	4	1	3	31
Guns lost	3	13	0	0	8	24
Total number of Tanks Destroyed/Total number of guns lost = $31/24 = 1.3$						

<b>Table IV - SP Guns</b>								
Unit	814 TD Bn	702 TD Bn	705 TD Bn	644 TD Bn	703 TD Bn	811 TD Bn	634 TD Bn	Total
Tanks destroyed	33	3	43	16	3	19	15	132
Guns lost	9	0	6	2	0	3	3	23
Total number of tanks destroyed/Total number of guns lost = $132/23 = 6.0$								

10. The superiority of the SP over the towed guns was again explained as due to the former's greater mobility and areas of fire: once again no evidence was found to disprove these explanations.

11. The points that emerge from these tables are that, in the circumstances of the actions concerned,

(a) anti-tank guns supported by Infantry had an advantage 3 or 4 times over those that were unsupported,

(b) SP anti-tank guns had an advantage 5 or 6 times over towed guns.

### Tank Losses the Germans have accepted before retreating

12. In cases where an estimate of the numbers of attacking tanks had been made, the percentages of tanks lost by the Germans in successful and unsuccessful attacks have been derived. The results are shown in Tables V and VI. An unsuccessful attack had been taken as one in which the enemy withdrew and a successful attack as one in which our troops either withdrew or were overrun.

<b>Table V - Losses suffered by Germans in unsuccessful attacks</b>			
<b>Serial No.of engagement</b>	<b>Number of Tanks Attacking</b>	<b>Number of Tanks Destroyed</b>	<b>Percentage Losses</b>
3	2	2	100%
8	6	1	17%
10	2	1	50%
33	16	14	87%
32	8	1	13%
34	4	1	25%
37	12	4	33%
36	7	3	43%
<b>Totals</b>	<b>57</b>	<b>27</b>	
<b>Percentage based on totals 47%</b>		<b>Average Percentage 46%</b>	

<b>Table VI - Losses accepted by Germans in successful attacks</b>			
<b>Serial No.of engagement</b>	<b>Number of Tanks Attacking</b>	<b>Number of Tanks Destroyed</b>	<b>Percentage Losses</b>
7	10	0	0%
12	10	4	40%
22	25	4	16%
31	30	2	6%
<b>Totals</b>	<b>75</b>	<b>10</b>	
<b>Percentage based on totals 13%</b>		<b>Average Percentage 16%</b>	

13. These figures are too few and varied to be satisfactory. If any deductions are to be made from them, two points should be borne in mind, (a) that the number of attacking tanks was probably never less than that stated and may well have been more, (b) some of the losses were almost certainly suffered after the enemy had decided to withdraw. It was therefore the case that the enemy were not prepared to accept more than 50% casualties without admitting defeat.

14. An attempt was made to examine the strength of the TD element of defence systems incorporating Infantry support against German attacks varying in strength. It did not prove possible to obtain accurate information as to the actual strengths engaged but the estimated figures are shown in Table VII.

<b>Table VII Attacks against Tank Destroyers with Infantry Support</b>						
Serial No.	Unsuccessful			Successful		
	Strength of TDs	Type	Strength of Attack in Tanks	Strength of TDs	Type	Strength of Attack in Tanks
1	Coy	SP	Unknown	-	-	-
2	Coy	SP	Unknown	-	-	-
6	Pl	SP	Unknown	-	-	-
7	-	-	-	Section	towed	10
8	2Pls	towed	6	-	-	-
9	Coy	towed	Unknown	-	-	-
10	Section	SP	2	-	-	-
11	One	SP	Unknown	-	-	-
12	-	-	-	Pl	towed	10
15	-	-	-	Coy	SP	Unknown
17	2Pls	SP	Unknown	-	-	-
19	2Pls	SP	Unknown	-	-	-
20	Pl	SP	Unknown	-	-	-
21	Pl	Sp	Unknown	-	-	-
22	-	-	-	Pl	SP	25
23	-	-	-	2Pls	towed	Unknown
24	-	-	-	Pl	towed	over 15
25	-	-	-	Sec	towed	Unknown
26	-	-	-	6	towed	Unknown
27	-	-	-	Sec	towed	Unknown
32	Pl	SP	8	-	-	-
33	Pl	SP	16	-	-	-
34	Pl	SP	4	-	-	-
35	Sec	SP	16	-	-	-
36	Pl	SP	7	-	-	-

The following points may be noted:

- (a) SP guns were successful on 14 out of 16 occasions and towed guns on 2 occasions out of 9.
- (b) On two occasions an anti-tank defence system, incorporating not more than a platoon of SP guns, were able to fight off 16 tanks, and on one occasion were overcome by 25. There is therefore an indication that in a properly balanced defence system SP guns were able to cope successfully with up to four times their number of enemy tanks.

13. In Table VIII the details are given of an analysis of our tank destroyer losses. In cases where it was not possible to determine by exactly what means individual guns were lost, the principle was adopted that when a number of guns were stated to be lost due to a tank and infantry attack, half that number were credited to the infantry and half to tanks. It can be seen that with towed guns the percentage lost to enemy infantry is much greater than due to enemy tanks and artillery. The reverse state of affairs holds with SP guns. The reason for this can probably be ascribed to the greater mobility of the SP gun, and the protection it affords against small arms fire.

<b>Table VIII - Analysis of tank destroyer losses</b>			
<b>Serial No.</b>	<b>Losses Due To</b>		
	<b>Tanks</b>	<b>Artillery</b>	<b>Infantry</b>
<b>Towed Guns</b>			
7	-	1	1
12	-	1	2
13	-	1	3
14	-	4	4
23	-	-	8
24	-	1	3
25	-	-	2
26	2	-	4
27	1	-	-
28	1	-	1
29	1	-	1
30	not recorded	not recorded	-
<b>Total</b>	5 (12%)	8 (19%)	29 (69%)

<b>Table VIII - Analysis of tank destroyer losses - continued</b>			
<b>Serial No.</b>	<b>Losses Due To</b>		
	<b>Tanks</b>	<b>Artillery</b>	<b>Infantry</b>
<b>Self-Propelled Guns</b>			
1	2	1	-
2	3	3	-
4	-	-	4
5	not recorded	not recorded	not recorded
15	1	1	-
21	-	3	-
30	3	3	-
35	-	-	2
36	1	-	-
<b>Total</b>	<b>10 (37%)</b>	<b>11 (41%)</b>	<b>6 (22%)</b>

16. Only very limited information was available as to the success or otherwise of 57 mm anti-tank guns manned by infantry. It appeared that their losses had been considerable and their successes small. The worst example noted was in X Division when, in 2 days, 21 guns were lost and only one tank knocked out.

17. No evidence was found that the different calibers of guns of the TD battalions had been a matter of any particular significance.

18. The subject was discussed with U.S. Army officers as to how far the actions could be regarded as typical. The view expressed was that the nature of the country varied so much that, as regards terrain, a wide range of possibility was covered.

19. It is our belief that many of the actions fought were not typical on account of the thinness of the defenses. This imposed a higher degree of dispersal of anti-tank guns than would normally be considered safe and resulted in inadequate mutual support and lack of all-round defence. It seems likely that the towed guns in particular were put to a serious disadvantage on this account and were made to appear in a worse light than would have been the case had the sector been more strongly held.

20. Most of the facts in this paper have been collected from Tank Destroyer Staffs and Tank Destroyer Battalions of the 1st and 3rd United States Armies. We would like to express our appreciation of the willing help we received from all Tank Destroyer officers and men whom we met.



### Appendix A

Serial No.	Date	Battalion	Towed or SP	Place	Infantry Support	Strength of Enemy Attack	Successful or Unsuccessful	Enemy Losses	TD Gun Losses	Time of Battle	Reference
1	18 Dec	814 TD (Coy)	SP M-36	St. Vith (P 8587)	Present	Not stated	Unsuccessful	14 tanks	3 SP guns	Dusk	Interview with Unit
2	21 Dec	814 TD (Coy)	SP M-36	St. Vith (P 8587)	Present	Not stated	Unsuccessful	16 tanks	6 SP guns	Not stated	Interview with Unit
3	22 Dec	814 TD (1 gun)	SP M-36	Rogery (P 7384)	None	2 tanks	Unsuccessful	2 tanks	None	Day	Interview with Unit
4	23 Dec	814 TD (Pl)	SP M-36	Ottre (P 6585)	None	Not stated	Successful	None	4 SP guns	Day	Interview with Unit
5	26-28 Dec	814 TD (2 Coys)	SP M-36	Meijel (E 7107)	Inadequate	Elements of 2 Pz Divs	Successful	19 tanks	9 SP guns	Day	Interview with Unit
6	Early Dec	814 TD (Pl)	SP M-36	Lindern (K 9367)	Present	Various small attacks	Unsuccessful	3 tanks	None	Day	Interview with Unit
7	23 Dec	643 TD (Sec)	Towed M-3	Manhay (P 5390)	Inadequate	10 tanks; Bn of Grenadiers	Successful	None	2 towed guns	Night	Interview with Unit
8	22 Dec	643 TD (2 Pls)	Towed M-3	Soy (P 4189)	Present	6 tanks	Unsuccessful	1 tank	None	Day	Interview with Unit
9	25 Dec	702 TD (Coy)	Towed M-3	Haversin area Hogne (P 2486)	Present	Not stated	Unsuccessful	3 tanks	None	Not stated	Interview and Bn Rpt
10	25 Dec	703 TD (Sec)	SP M-36	Butgenbach (K 9204)	Present	2 AFVs and Infantry	Unsuccessful	1 tank	None	Dawn (snow-storm)	Interview with Unit
11	25 Dec	703 TD (1 gun)	SP M-36	Regne (P 6086)	Present	Several tanks	Unsuccessful	2 tanks	None	Day	Interview with Unit
12	17 Dec	801 TD (Pl)	Towed M-3	Krinkelt (K 9705)	Present (I Bn 9 Inf)	10 Panthers plus infantry supported by Arty and Mortars	Successful (Forced TD crews to leave guns; tanks attacked from flank)	2 tanks mined & 2 tanks by Arty fire	1 towed gun by Arty fire; 2 towed guns self-destroyed	1900 hrs	Interview and Bn Rpt
13	17 Dec	801 TD (Pl)	Towed M-3	Krinkelt (K 9705)	None	Armour plus infantry	Successful (Gun posn was overrun and our tps withdrew)	None	4 towed guns	Not known	Interview and Bn Rpt
14	17 Dec	801 TD (Coy)	Towed M-3	Honsfeld (P 9698)	None	Armour plus infantry and Arty support	Successful. Overran Honsfeld in about 1 hr	4 tanks & 1 half-track	All guns of Pls 2A & 3A, ie. 7 + 1 gun of 1A (Total: 8 guns)	0500 hrs	Interview and Bn Rpt
15	17-18 Dec	644 TD (Coy)	SP M-10	Krinkelt (K 9705)	Present (Unknown Strength, Probably 1 Regt)	Armour plus infantry made repeated attacks	Successful (Pierced defence line and entered Krinkelt, where battle continued)	5 tanks	2 SP guns	17:2030 to 18:1800	Interview and Bn Rpt
16	19 Dec	644 TD	SP M-10	Krinkelt (K 9705)	Present (Unknown Strength)	Continued armour and Inf attacks; usually 7 tanks with 40-50 Inf	Successful (Forced our tps to make an orderly withdrawal to Elsenborn)	9 tanks & 2 SP guns	None	1400 to 1730	Interview and Bn Rpt

**Appendix A - continued**

Serial No.	Date	Battalion	Towed or SP	Place	Infantry Support	Strength of Enemy Attack	Successful or Unsuccessful	Enemy Losses	TD Gun Losses	Time of Battle	Reference
17	20 Dec	634 TD (Prob. 2 Pls; see 19)	SP M-10	Dombutgenbach (K 9202)	Present (1 Bn)	Armour attack (Coy of SS tanks)	Unsuccessful	2 tanks (total of 8 KO'd by this Pl & others during the day)	None	0500 hrs	Bn Reports
18	17 Dec	644 TD (Pl)	SP M-10	Wirtzfeld (K 9504)	No record	Armour attack	Unsuccessful	4 tanks & 1 half-track	None	0800 hrs	Bn Reports
19	20 Dec	634 TD (Prob. 2 Pls; see 17)	SP M-10	Dombutgenbach (K 9202)	Present	Armour attack	Unsuccessful	2 tanks (total of 8 KO'd by this Pl & others during the day)	None	1400 hrs	Bn Report
20	20 Dec	634 TD (Pl)	SP M-10	Walk (K 8407)	Present (2 Bn, 16th Inf)	Details not known	Unsuccessful	1 tank	None	1700 hours	Bn Report
21	21 Dec	634 TD (Pl)	SP M-10	Dombutgenbach (K 9202)	Present (2 Bn, 16th Inf)	Armour plus Inf	Unsuccessful. Initial attack was severely mauled but Inf plus Pl of Tks pressed on and posn was not restored until 1400 hrs	4 tanks and 2 probables	3 SP guns (KO'd by Arty fire)	1000 hrs	Bn Report
22	22 Dec	634 TD (Pl)	SP M-10	Butgenbach (K 9204)	Present	Armour and Inf (25 tanks + Inf)	Successful. Took high ground from which they were not evicted for remainder of day.	4 tanks	None	0700 hrs	Bn Report
23	17 Dec	612 TD (2 Pls)	Towed M-3	Honsfeld (P 9698)	Present	Armour and Inf	Successful	2 SP A/Tk guns & 1 tank	8 towed guns (overrun by enemy inf)	no record	Battalion Reports
24	16 & 17 Dec	630 TD (1 Pl)	Towed M-3	Hupperdange (P 7987)	Present	Armour and Inf	Successful	14 tanks & 1 SP	4 towed guns	varied	Battalion Reports
25	18 Dec	630 TD	Towed M-3	Wiltz (P 7053)	Present	Armour and Inf	Successful	None	2 towed guns	during the day	Battalion Reports
26	19 Dec	630 TD (6 guns)	Towed M-3	Wiltz (P 7053)	Present (3 Bn, 110 Inf)	Armour and Inf	Successful	6 tanks	6 towed guns	1400 hrs	Battalion Reports

**Appendix A - continued**

Serial No.	Date	Battalion	Towed or SP	Place	Infantry Support	Strength of Enemy Attack	Successful or Unsuccessful	Enemy Losses	TD Gun Losses	Time of Battle	Reference
27	19 Dec	630 TD (Sec)	Towed M-3	Wiltz (P 7053)	Present	Armour and Inf	Successful	None	1 towed gun	1700 hrs	Battalion Reports
28	18 Dec	630 TD (Sec)	Towed M-3	Eschweiler (P 7156)	None	Armour and Inf	Successful	None	2 towed guns	1400 hrs	Battalion Reports
29	18 Dec	630 TD (Sec)	Towed M-3	Defernbach (K 6758)	None	Armour and Inf	Successful	1 tank	2 towed guns	1700 hrs	Battalion Reports
30	25 Dec	705 TD	SP M-18	Bastogne (P 5657)	Present (Approx 1 Bn to 1 Pl of TDs)	Armour and Inf	All attacks unsuccessful	27 tanks	6 SP guns	0300 hrs	Int summary and visit to unit
31	3 Jan	705 TD + other unit	SP M-18	Bastogne (P 5657)	Present	Armour and Inf (1 Regt + 30-40 tanks)	Partially Successful	2 tanks	None	1400 hrs	Visit to unit
32	20 Dec	811 TD (Pl)	SP M-10	Waidbillig (P 9534)	Present but stated to be less than 1 Coy without hy weapons	Armour and Inf (8 tanks + 1 Bn)	Unsuccessful	1 tank	None	afternoon	Visit to unit; explained by CO
33	Jan	705 TD (Pl)	SP M-18	Bastogne (P5657)	Present	Armour and Inf (16 tanks + 1 Regt)	Unsuccessful	14 tanks	None	unknown	Visit to unit
34	21 Dec	811 TD (Pl)	SP M-10	Waidbillig (P 9534)	As for Serial 32	Armour and Inf (3-4 tanks + Bn)	Unsuccessful	1 tank	None	dusk	Visit to unit
35	17 Dec	811 TD (Sec)	SP M-10	Ouren (P 8673)	Present	Armour and Inf (16 tanks + Bn)	Inf Successful; Tanks Unsuccessful	14 tanks	2 SP guns	night (artificial moonlight)	Visit to unit
36	1 Jan	811 TD (Pl)	SP M-10	Chenogne (P 4857)	Present (1 Coy)	Armour and Inf (7 tanks + 2 Coys)	Unsuccessful	3 tanks	1 SP gun	not known	Visit to unit
37	?	802 TD	Towed M-3	Unknown	Present	Armour attack (12 tanks)	Unsuccessful	4 tanks	None	not known	Visit to unit
38	Dec	820 TD	Towed M-3	Varied	Not present	Armour and Inf	No record	11 tanks	31 towed guns	varied	Visit to unit



# The Use of Panzerfaust in the NW European Campaign\*

## INTRODUCTION

1. The present report deals with the operational importance and use of German hollow charge weapons in the NW European campaign. Because of difficulties in collecting evidence on the subject only a limited quantity is available. Attacks with hollow charge infantry weapons are often made with such surprise and in such out of the way places that little can be discovered.

## RESULTS AND DISCUSSION

### A. Operational importance of German Hollow charge infantry weapons.

2. The following table gives estimates of the proportion of tanks knocked out by enemy action that were disabled by hollow charge infantry weapons in the various stages of the campaign. Except for those suffered after crossing the Rhine, for which evidence could still be collected after the end of hostilities, the estimates are based only on samples.

Area	Size of Sample	Tanks lost by HC	% lost by HC
Normandy (June-Sept. 44) <sup>1</sup>	83	5	6%
N. Belgium and Holland (Sept. 44 - 8 Feb. 45)	76	7	9%
Germany, west of Rhine (8 Feb.-24 Mar. 45)	30	2	7%
Germany, east of Rhine (25 Mar.-3 May 45)	274	94	34%
(German tanks in Normandy by British HC weapons)	(81)	(8)	(10%)

<sup>1</sup> Losses for 7th Armoured Division in the Bocage country are not included since it was impossible to collect a representative sample owing to our partial withdraw. From hearsay it is thought these losses may be higher than those quoted for the rest of Normandy. The explanation for such higher losses given after the partial withdrawal was that the woody nature of the district gave excellent cover to the German infantry. This was the universal opinion of those interviewed.

\* All data on crew casualties and most of the facts used in this report concerning tank casualties East of the Rhine were collected by the Medical Research Council team for Survey of Casualties Amongst Tank Personnel. Their help and co-operation is gratefully acknowledged.

3. Except for East of the Rhine, tank losses due to hollow charge infantry weapons are fairly constant at slightly under 10%. The causes for the increased percentage after the crossing of the Rhine are thought to be a decrease in the number of A.Tk guns at the disposal of the enemy and possibly a large number of woods making Panzerfausts easier to use. There was also almost certainly an increase in the numbers of Panzerfausts available but it is by no means certain that more quantity has at any time been a limiting factor. It is more probable that the availability of men of sufficiently high morale is the true limit. This problem is discussed in more detail later.

4. The figures in Table I indicate only tank losses actually suffered and not the indirect effects of defence by Panzerfausts. From conversations with squadron and troop commanders, etc., the following two indirect effects are thought to be important:

- (a) Delays due to the need for obtaining infantry support.
- (b) Delays due to avoiding woods and other areas where hollow charge infantry weapons may be used.

5. It is felt that the operational importance of the Panzerfaust should not be measured merely in terms of the casualties they inflict but also in terms of the caution and delay they impose upon striking troops. Because of the number of Panzerfausts available, the latter role may well be the more important of the two. For instance, after crossing the Rhine our tanks were often held up by strong detachments armed with Panzerfausts for periods of 12-24 hours. Had there been enemy SP guns available to be called up as reinforcements such delays might have been extremely serious.

It is thought that the rate of advance of our armour after crossing the Rhine was in fact reduced by about one third though this estimate is based upon only a limited number of examples. It suggests however, that it would be unwise to ignore the Panzerfaust because for long periods it only produced 10% of tank losses, and that a broader basis of judgement should be accepted.

## B. Operational use of Panzerfausts

### (a) Ranges used

6. Panzerfausts have scored hits at ranges between about 10 and 100 yards though beyond 40 yards the frequency falls off rapidly. A sample of the frequency with which hits have been made at various ranges on AFV's East of the Rhine is given in Table 2 and similarly for misses in table 3.

<b>Table 2 - Hollow charge hits against AFVs</b>						
	<b>Range in yards</b>					
	<b>0-20</b>	<b>21-40</b>	<b>41-60</b>	<b>61-80</b>	<b>81-100</b>	<b>&gt;100</b>
<b>Frequency of hits</b>	35	22	9	4	3	3

<b>Table 3 Hollow charge misses against AFVs</b>						
	<b>Range in yards</b>					
	<b>0-20</b>	<b>21-40</b>	<b>41-60</b>	<b>61-80</b>	<b>81-100</b>	<b>&gt;100</b>
<b>Frequency of misses</b>	15	14	13	5	4	7

7. The sample used in Table 2 is not the same as that in Table 3 since it includes certain cases where only hits were recorded. In consequence it is unsafe to compare tables 2 and 3 in terms of proportion of hits to misses. In order to overcome this difficulty those cases where only hits were recorded have been eliminated in Table 4. Even here, however, it has been impossible to trace all misses so that it is only the comparative, and not the absolute, values for the ratio of hits to misses which can be accepted.

<b>Table 4</b>			
	<b>Range at which attack was made (yards)</b>		
	<b>0-20</b>	<b>21-40</b>	<b>41-100</b>
<b>Number of hits</b>	17	13	10
<b>Number of misses</b>	15	14	22
<b>% of hits at given range</b>	53%	43%	31%

8. The most noticeable feature in the above table is the disproportionately large number of misses at short range. This may perhaps be explained by the fact that a close shot is nerve racking for the firer or that the increased angular velocity of a crossing tank is liable to make him miss. Whatever the explanation the fact of a disproportionately high ratio of misses to hits at short range remains. If the causes of this cannot be eliminated then the most hopeful line for improvement might be to adopt shooting at longer range and to make such shooting more accurate. It is likely that accuracy and other trials would assist in deciding which of these courses is preferable.

(b) Effect of a moving target

9. A moving target is apparently more difficult to hit than one at rest. The figures for a sample of attacks on armoured cars are given in Table 5. The number of such attacks is small and the results can only be taken as an indication.

This statement might at first sight appear obvious but it does in fact need proof. For instance, the normal advantage of protection by movement might well have been counter-acted by the greater difficulty the commander has in spotting from a moving, and thus unsteady, tank.

<b>Table 5 Armoured cars attacked</b>			
	<b>Moving</b>	<b>Stationary</b>	<b>Total</b>
<b>Hits</b>	4	5	9
<b>Misses</b>	12	5	17
<b>% hits of total for each class of attack</b>	25%	50%	35%

In this case movement halved the chance of hitting so that if this is typical it would appear that one form of defence against hollow charge infantry weapons is speed.

(c) Proportion of hits obtained

10. In Table 5 the proportion of hits to total rounds fired is 35%. Owing to the difficulty in most cases of recording misses, only a rough estimate can be given. The estimated proportions recorded from other battles in NW Europe lie between 10% and 50%. It is thought that the most likely average figure is somewhere between 20% and 30%.

(d) Cause of missing

11. Little is known of why or how the firers of Panzerfausts miss. Tank crews have been asked as to whether the miss was in elevation or traverse but their estimates are open to doubt as they have to judge both where the bomb fell and whence it came. The following figures therefore, should be accepted only as an indication of what happens.

<b>Table 6 - Causes of missing</b>			
	<b>Over</b>	<b>Short</b>	<b>Direction incorrect</b>
<b># of misses</b>	16	13	19
<b>% of total misses</b>	33%	27%	40%

Therefore misses were due 60% to errors in elevation and 40% to errors in line. The reason for this difference is not known, though it may be due to difficulties in estimating range.

(c) Distribution of hits.

12. The following distribution of hits from Panzerfausts on tanks east of the Rhine was obtained.

<b>Table 7 - Aspect of the tank</b>				
	<b>Front</b>	<b>Side</b>	<b>Rear</b>	<b>Roof</b>
<b>Number of hits</b>	33	54 Ave. hits per side - 27	10	9
<b>Percentage of total hits</b>	31	51% Ave. hits per side - 25.5%	9.5%	8.5%

The corresponding distribution of AP hits during the same period is given in Table 8.

<b>Table 8 - Aspect of the tank</b>				
	<b>Front</b>	<b>Side</b>	<b>Rear</b>	<b>Roof</b>
<b># of hits</b>	52	82 Ave. per side - 41	5	0
<b>Percentage of total hits</b>	37%	60% Ave. per side - 30%	3%	3%

13. The distribution is roughly of the same order for hits of Panzerfaust and AP shot. Moreover, this order is approximately that which has been found with AP for battles in Normandy, Belgium and Holland. Since the ranges, tactical use, etc. of AP guns and Panzerfausts are totally different it would almost seem that the distribution of hits on a tank depends less upon the attacking weapon than upon opportunity, terrain, etc. If this is so it would simplify the problem of deciding, as far as NW Europe was concerned, the best position for armour on a tank eliminating the variable, namely the distribution of hits.

(f) Damage to tank

14. In order to measure the damage the Panzerfaust is capable of inflicting on a tank the results have been compared to AP during the same period, namely the armoured attacks after crossing the Rhine. (See Tables 9, 10).



<b>Table 9 Tank Casualties</b>							
Type of Tank	Hollow Charge						
	All Hits				Single Hits		
	ZW	Z & Y	Non-Penetrating <sup>1</sup>	Totals	ZW	Z & Y	Totals
Cromwell	8	13	10	31	7	12	19
Challenger	0	1	1	2	0	2	2
Sherman 75 mm	10	8	4	22	9	7	16
Sherman 17-pdr	2	6	5	13	2	5	7
Comet	2	13	5	20	5	12	17
Stuart	3	2	0	5	1	2	3
<b>All Tanks</b>	<b>25</b>	<b>43</b>	<b>25</b>	<b>93</b>	<b>24</b>	<b>40</b>	<b>64</b>
Type of Tank	Armour-Piercing						
	All Hits				Single Hits		
	ZW	Z & Y	Non-Penetrating <sup>1</sup>	Totals	ZW	Z & Y	Totals
Cromwell	7	5	6	18	4	5	9
Challenger	1	0	3	4	1	0	1
Sherman 75 mm	25	14	3	42	13	12	25
Sherman 17-pdr	13	5	2	20	10	5	15
Comet	14	6	2	22	6	5	11
Stuart	2	3	2	7	2	3	5
<b>All Tanks</b>	<b>62</b>	<b>33</b>	<b>18</b>	<b>113</b>	<b>36</b>	<b>30</b>	<b>66</b>

<sup>1</sup> Most of the casualties caused by non-penetrating projectiles were relatively minor

<b>Table 10 Percentages of Different Types of Casualty</b>				
Type of Tank	Hollow Charge			
	Percentage of total tank casualties for each class of tank			Percentage of ZW casualties on tanks penetrated once
	ZW	Z & Y	Non-penetrating <sup>1</sup>	
Cromwell	26%	42%	32%	37%
Challenger	0%	50%	50%	0%
Sherman 75 mm	46%	36%	18%	56%
Sherman 17-pdr	15%	46%	39%	29%
Comet	10%	65%	25%	29%
Stuart	60%	40%	0%	33%
<b>All Tanks</b>	<b>27%</b>	<b>46%</b>	<b>27%</b>	<b>37%</b>
Type of Tank	Armour-Piercing			
	Percentage of total tank casualties for each class of tank			Percentage of ZW casualties on tanks penetrated once
	ZW	Z & Y	Non-penetrating <sup>1</sup>	
Cromwell	39%	28%	33%	45%
Challenger	25%	0%	75%	-
Sherman 75 mm	60%	33%	7%	56%
Sherman 17-pdr	65%	25%	10%	66%
Comet	64%	27%	9%	55%
Stuart	29%	42%	29%	40%
<b>All Tanks</b>	<b>55%</b>	<b>29%</b>	<b>16%</b>	<b>55%</b>

<sup>1</sup> Most of the casualties caused by non-penetrating projectiles were relatively minor.

Table 11												
Type of Casualty	Hollow Charge Penetration											No. of penetrations
	Killed		Wounded		Wounded and Burnt		Burnt		Unhurt		Total exposed to risk of injury	
Type of Vehicle	No.	%	No.	%	No.	%	No.	%	No.	%		
Cromwell	9	15%	12	20%	2	3%	3	5%	35	57%	61	15
Sherman 75 mm	15	24%	9	14%	-	-	4	6%	35	56%	63	12
Sherman 17-pdr	10	37%	7	26%	-	-	-	-	10	37%	27	7
Comet	12	17%	19	27%	2	3%	1	1%	37	52%	71	14
Stuart	3	27%	2	18%	-	-	-	-	6	55%	11	3
Challenger	3	30%	4	40%	-	-	-	-	3	30%	10	2
<b>Total, all vehicles</b>	<b>52</b>	<b>21%</b>	<b>53</b>	<b>22%</b>	<b>4</b>	<b>2%</b>	<b>8</b>	<b>3%</b>	<b>126</b>	<b>52%</b>	<b>243</b>	<b>53</b>
Type of Casualty	Armour-Piercing Penetration											No. of penetrations
	Killed		Wounded		Wounded and Burnt		Burnt		Unhurt		Total exposed to risk of injury	
Type of Vehicle	No.	%	No.	%	No.	%	No.	%	No.	%		
Cromwell	7	15%	11	24%	1	2%	7	15%	20	44%	46	10
Sherman 75 mm	15	20%	20	27%	-	-	2	3%	38	50%	75	17
Sherman 17-pdr	8	19%	12	29%	-	-	9	21%	20	48%	49	11
Comet	21	42%	9	18%	6	12%	10	20%	14	28%	60	12
Stuart	-	-	-	-	-	-	-	-	-	-	-	-
Challenger	-	-	-	-	-	-	-	-	-	-	-	-
<b>Total, all vehicles</b>	<b>51</b>	<b>22%</b>	<b>52</b>	<b>23%</b>	<b>7</b>	<b>3%</b>	<b>28</b>	<b>12%</b>	<b>92</b>	<b>40%</b>	<b>230</b>	<b>50</b>
Note: The number of tanks on which data are given in Table 11 is less than the number in Tables 9 and 10. This is because information could not always be obtained on casualties in tanks which had been examined.												

From these tables it will be seen that the Panzerfaust has been less effective in brewing up tanks. For each penetration it has been one third less effective than AP (ie. 37% to 56%), and operationally where the AP gun is in a position to continue to fire at the tank the Panzerfaust has been only half as effective (i.e. 27% to 55%).

(g) Crew casualties

15. Table 11 gives details of crew casualties caused since the Rhine crossing by AP and hollow charge projectiles penetrating different types of tank. In order to compare the effectiveness of these two weapons in causing casualties only those hits which penetrated into the crew compartment have been considered.

Note: Tables 9, 10 and 11 are reproduced by courtesy of the Medical Research Council team. The facts on which these tables are based will be dealt with by them more fully in a later report.

16. Table 11 shows little difference in numbers killed and wounded by Panzerfaust and AP projectiles but it does show a higher proportion of burned casualties in tanks penetrated by the latter. This is in agreement with the figures given in the previous section for tank brew-up casualties, as would be expected from the fact that the same tanks are considered in both sections.

## C. Tactics Against Panzerfaust Attacks

### (a) Effect of terrain, etc.

17. Judging from first hand accounts, the firer of a Panzerfaust normally requires cover if he is to be successful. He hides behind this cover, if possible, the whole time and, if not, before and after firing. Because of this requirement Panzerfausts are usually fired from:-

- (a) Wooded and close country
- (b) Buildings
- (c) Slit trenches in country that is partially enclosed.

A few cases have been found of Panzerfausts fired in the open either by soldiers standing up or from unconcealed slit trenches. The following table gives recorded instances of the frequency with which various firing positions were used and the successes obtained from them.

Site from which fired	Hits	Misses <sup>1</sup>	Total	% of Grand Total	% hits for each class of site
<b>House or built-up area</b>	4	6	10	23%	40%
<b>Slit trench with ground cover</b>	7	12	19	43%	37%
<b>Trees or bushes</b>	2	9	11	25%	18%
<b>Open ground</b>	0	4	4	9%	0%

<sup>1</sup> Once again the number of misses is probably an underestimate so that the derived percentages should only be used for comparative purposes.

18. The above figures support the generally accepted view that in open country Panzerfausts are less effective than A.Tk guns; in built-up and wooded areas they are efficient. Thus by suitable combination, defence against tank attacks has become possible in almost all terrains. Only in quickly rolling country where A.Tk guns have limited fields of fire and the firers of Panzerfausts are too exposed have tanks been helped by terrain; as for example the German tanks were helped in their attacks in certain parts of the Ardennes. Unfortunately the number of such areas is extremely small and it would normally be impossible to plan tank attacks to use such areas only.

19. Because of these facts it is considered unlikely that tanks will defeat the Panzerfaust by a better use of terrain.

### (b) Tank Tactics and Supporting Arms.

20. Judging again from first hand accounts the usual tactics adopted by armoured formations when Panzerfausts are encountered are:-

- (i) The call-up of supporting infantry.
- (ii) Infantry riding on tanks.
- (iii) Heavy HE or SA fire against all likely targets.
- (iv) Rush tactics.
- (v) The use of covering fire and observations by mutually supporting tanks.

21. All of those have at one time or other proved successful and it is considered that a fully trained tank crew should be conversant with all these methods. The choice of which is to be used must depend upon the situation of the moment.

(c) Morale needed to fire a Panzerfaust operationally.

22. It is generally believed that only troops of excellent morale will fire a Panzerfaust at a hostile tank. The majority of those who do fire will fire only once and then give themselves up or try to get away even if they have missed. A few cases occur where people have fired two or even three times at a tank.

The following figures which were all that were obtained illustrate the above points. Owing to the smallness of the numbers concerned too much reliance should not be placed on the percentages.

<b>Table 13 - Fate of Firer of Panzerfaust</b>				
<b>Result of shot</b>	<b>Not put out of action</b>	<b>Put out of action by</b>		<b>% chance of escape</b>
		<b>Tank</b>	<b>Supporting Infantry</b>	
<b>Hit</b>	4	3	1	50%
<b>Miss</b>	4	7	4	27%
<b>Totals</b>	8	10	5	average 35%

These figures support the fairly obvious view that there is more chance of escaping when the tank has been hit than when it is missed. They also show that only in about 1 in 3 cases does the firer escape *when he himself or the round he has fired is observed*. This figure, however, cannot be taken as the chance of the firer escaping since it is not known how often such observation occurs, although an upper limit of 50% for the chance of escaping can be set since it is safe to argue that no hit will pass unobserved.

23. These figures indicate that the danger when firing at a tank may be high. Thus the solution to countering the Panzerfaust may lie as much in still further attacking the morale of the firer as in any other method.