

## **Chapter 4**

# **Fighter and Fighter-Bomber Attacks on Forward Troops**

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Rocket-Firing Typhoons in Close Support of Military Operations  
(Joint Report No.3)

German Flak and Allied Counter-Flak Measures in Operation VARSITY  
(Joint Report No.4)



# **Rocket Firing Typhoons in Close Support of Military Operations**

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## **Introduction**

1. An attempt has been made to assess the value of attacks by rocket-firing Typhoons used in close support of military operations. The following aspects have been considered:-

- (a) Accuracy.
- (b) Material damage and casualties to the enemy.
- (c) Morale effects on the enemy.
- (d) Morale effects on our troops.

## **Method of Investigation**

2. A number of targets in France, Belgium and Holland have been thoroughly examined. Prisoners of war captured after rocket attacks have been interrogated. Opinions have been collected from officers of units which assaulted positions that had been attacked by RP. These units include 3rd Canadian, 3rd and 43rd British and 15th Scottish Infantry Divisions.

## **Accuracy**

3. By far the best source of data for assessing and analysing accuracy would be photographic records made in the attacking aircraft. As such records are not yet available the method adopted has been to study the distribution of fall of shot in target areas or to obtain the percentage of strikes on specific targets.

4. Distributions of fall of shot have been obtained as a result of a detailed examination of 12 target areas in the Breskens Pocket. Some details of these attacks are given in Table 1, and maps showing the fall of shot are at Appendix A. In all cases the examination showed no clearly definable target and it is difficult to assess accuracy, as the aiming points are not known, nor whether individual pilots in one attack used the same aiming point.

<b>Table I</b> <b>Targets in the Breskens Pocket</b>							
Serial	Targets		Rockets				
	Description	Map Ref	No. Fired	Craters and Unexploded heads in target area	Probable strikes on buildings and in water	Total RP accounted for	Radius of 90% circle in yards (+)
1	Houses	018132	32	23	8	31	73
2	Cross rds & MG Post	024127	30	5	3	8	46
3	Def Posn & Guns	002174	30	17	4	21	39
4	Def Posn & Bldgs	997177	32	27	5	32	109
5	Def Posn & Bldgs	994183	24	10	1	11	35
6	Strong point	006180	54	42	8	50	90
	Road junction	004185					
7	Strong pt in houses	007154	63	38	2	40	113
8	Def Posn & Str Pt in buildings	996167	64	30	10	40	103
9	Houses	976176	30	39	1	40	96
10	Houses	972172	32	19	5	24	115
11	Field gun & def posns	974164	96	52	12	64	78
12	Gun on roof	922158	32	15	1	16	55
(+) The 90% circle includes 90% of the craters and unexploded heads in the target area.							

5. Maps showing the fall of shot for attacks on the church towers at Venray and Orloo are shown at Appendix B. In these cases the targets were clearly defined but on account of their height, the distribution of shots on the ground exaggerate the actual dispersion about the aiming points. A further example of the distribution of shots about clearly defined though multiple aiming points is given in BAU Report No.14 on an attack on a German 4-gun site.

6. The numbers of strikes were counted on clearly defined though multiple targets in attacks at Boulogne and on Walcheren Island. The results are as follows:

Target	No. of Rockets Fired	No. of Strikes	% Strikes
4 Large gun emplacements 6 Medium gun emplacements	216	2	1%
3 Large gun emplacements 4 Medium Gun emplacements	104	9	9%
4 Medium gun emplacements	62	2	3%
4 Large gun emplacements	47	1	2%

7. Those various results are analysed and compared at Appendix C. Although the data are insufficient to be able to give a precise assessment of the accuracy of RP in the attacks that have been examined, there is every indication the mean displacement was no less than 46 yds but was probably not very much more. This implies, as would be expected, that RP attacks are more accurate than bombing but fall far short of the precision of cannon and machine gun.

8. Average accuracy for all pilots in a number of squadrons whilst at Practice Camp is of the same order as that given in para.7. The best attainable with the weapon as it is at present is probably represented by the performances of the four best pilots in each squadron; their mean error was about 20 yards.

9. The table below is reproduced from Appendix C and may serve as a practical guide to the effort required to obtain direct hits on typical targets.

<b>Table II</b>					
<b>Target</b>	<b>Size</b>	<b>Horizontal projected area (45° dive)</b>	<b>% Shots Hitting Target</b>	<b>For 50% Chance of Hit</b>	
				<b>RP Needed</b>	<b>Sorties</b>
Small gun position	5 yds diameter	19 sq yds	.2	350	44
Panther tank	22'6" x 10'9" x 9'10"	50 sq yds	.5	140	18
Large gun position	10 yds diameter	80 sq yds	.8	88	11
Army hut	60' x 30' x 20'	270 sq yds	2.8	24	3
Large building	120' x 54' x 50'	1000 sq yds	10.0	7	1

## Material Damage and Casualties

10. Material damage and casualties are naturally closely associated with accuracy. What follows is principally concerned with what RP have done to the objects that have been hit; it supplements what has already been produced in an earlier report by 83 Group, RAF.

1. Observed results of strikes by 60 lb SAP rocket are as follows:

- (a) Wooden huts and barns are completely demolished.
- (b) Brick built houses and barns have a large hole knocked in the wall and considerable havoc is wrought inside.
- (c) 20 mm AA gun blown to pieces.
- (d) Height and range finder blown to pieces.
- (e) Enemy tanks are knocked out and usually set on fire. (Among the hundreds of abandoned and knocked out tanks that have been examined, no instance has been recorded of a tank that had been hit by RP and escaped major damage.)

We have not yet found a case of a direct hit on a gun of larger calibre than 20 mm, but there is little doubt that it would be wrecked.

12. Pilots' reports and our own observations show that damage to heavy concrete structures such as gun casemates or to thick masonry such as church towers is only superficial.

13. Except at Calais, where a Canadian MO dealt with 70 German casualties, 12 of whom were said to have been caused by rockets, the evidence all points to the lethal effect on personnel having been small.

This is only to be expected as the 60 lb SAP head with delay fuze can only be seriously lethal if it happens to catch men inside a building which it penetrates; against troops in the open it penetrates too far into the ground to be dangerous. Judging from results of trials, the fragmentation head with instantaneous fuze which is now in use should prove far more dangerous to men in the open, but against troops in small slit trenches it is not likely to have any appreciable advantage. The fragmentation head should however prove superior to the SAP against soft-skinned vehicles and guns.

## Morale Effects on the Enemy

14. About a hundred prisoners of war have been questioned about rocket attacks; approximately half of them had been in positions which were so attacked and all had at some time witnessed such attacks from distances of 1000 metres or more. They varied in morale and physique, from the lowest "Total Mobilisation" types to ex-aircrew personnel serving in a Parachute regiment.

15. Except for a few AA gunners, all who had been attacked by rockets expressed their dread of the weapon. The reasons generally given were as follows:

- (a) RP is an unknown quantity, except to the AA gunners. (Exaggerated tales of its terrors have circulated among German troops and Typhoons seem to rank with artillery in their disturbing effects).
- (b) The noise of the plane as it dives is a danger signal and is, in itself, terrifying.
- (c) The noise of the approaching rockets is frightening. In addition, one PW captured at Wimile near Boulogne insisted that the most terrifying moment was when the rockets left the plane; he considered it was extremely shattering to watch.

16. With the exception of the GAF AA gunners, PWs stated that they always took cover immediately when the Typhoons started to attack and remained there for times varying from one to ten minutes afterwards; they expected the planes to circle round and strafe their positions with cannon fire. It seems that a succession of attacks suitably timed have a very great effect on morale; if, for instance, three flights of 4 attack a position at intervals of 15 minutes, there is probably a period of 10 to 20 minutes afterwards during which enemy are in no condition to offer stiff resistance to attack by the ground forces. It has even been found that the very presence of our aircraft over the battlefield is sufficient to cause the enemy to remain under cover.

17. Some tank crew prisoners have also been interrogated on the subject of air attack; although none of them had been subjected to rocket attacks, their statements are of interest. The experienced crews stated that when attacked from the air they remained in their tanks which had suffered no more than superficial damage (cannon strikes or near misses from bombs). They had great difficulty in preventing the inexperienced men from baling out when our aircraft attacked. Large numbers of undamaged tanks have often been found abandoned in places where air attacks had taken place.

18. It appears quite definite that it is the nature of the attack that upsets the Germans and not the physical damage which it causes. None of the prisoners had seen any damage or casualties caused by the attacks which had so scared them. The incident described in Appendix D is an interesting illustration of the morale effects of rocket attacks.

## Morale Effect on our Own Troops

19. When asked what they think of rocket-firing Typhoons, infantry officers have without exception been very enthusiastic. They say that the effect on our own troops of a flight of Typhoons diving at the German FDLs is most marked; it seems to raise their morale even more than it lowers the enemy's. Our troops are impressed by the accuracy with which rockets are fired at targets only a short distance in front

of them. So much reliance is placed on the effectiveness of these attacks that when, for reasons not always obvious to the front line troops, a request for close support Typhoons has to be turned down, a feeling of dissatisfaction is apt to arise.

20. The following incident, which occurred near Overloon (E 7632) on 13th October, illustrates the morale effects of rockets.

A battalion in 3 Br Inf Div was lying along the south side of a wood approximately 300 yards from the enemy who were holding the northern edge of the next wood. During the morning the battalion tried to advance but were driven back across the intervening open ground. Air Support was requested and a squadron of Typhoons was ordered to attack the wood at 1400 hrs with RP. This attack took place as planned and the battalion advanced across the open ground immediately afterwards without opposition. The CO of the battalion said that not only had the RP successfully unnerved the enemy but they had also put new vigour into his own men who were somewhat disconsolate after the casualties and reverses of the morning.

## Conclusions

21. The greatest effect of attacks by rocket firing Typhoons in close support is morale, both on the enemy and our own troops. The effect on the enemy is of short duration only and therefore needs to be closely coordinated with military operations.

22. Except against concrete or heavy masonry the destructive effect is satisfactory, but owing to limitations of accuracy a considerable effort is required to obtain hits on small targets.

23. Where destruction is required some guide can be given as to the effort required (Table II).

24. As enemy troops almost invariably take cover when attacked by Typhoons, casualties to personnel in field positions are rare.

# Target 1

Scale 23 yards = 1 inch

⊕ Rocket Crater

M.N.

Map Ref  
D. 018132

Wooden  
Army  
Huts

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H  
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Shed

★ M.P.I.

Barn  
*hit*

Church  
*hit*

House  
*hit*

House  
*hit*

House  
*hit*

H  
o  
u  
s  
e

House

House

Pond

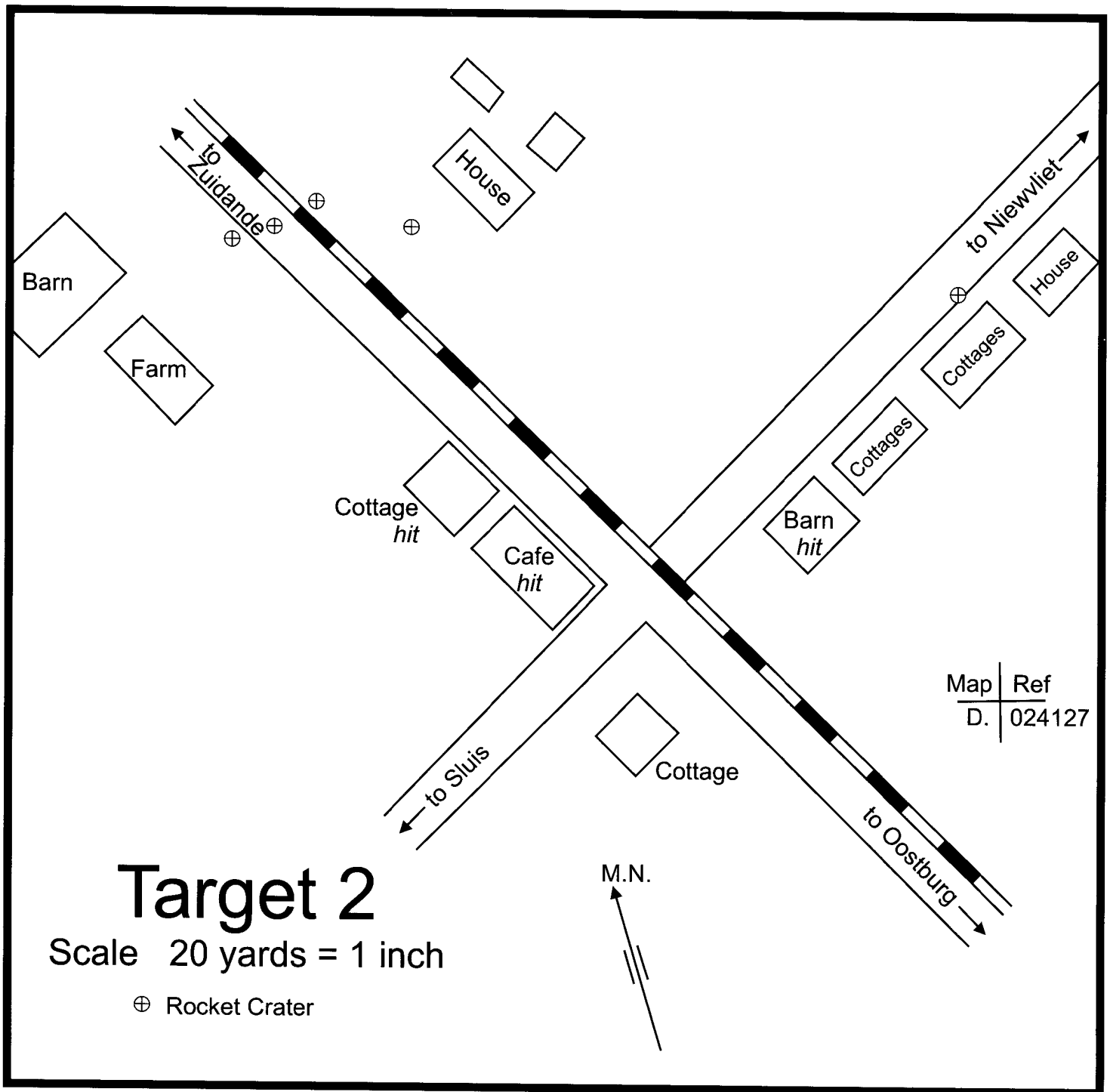
to  
Cadzand

to  
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s

to Oostburg →

Village of Zuidzande

Appendix A



Map/Ref  
D. 002174

# Target 3

Scale 25 yards = 1 inch

⊕ Rocket Crater

⊙ Unexploded Rocket

← to Cadzand

Brick

Shelters

Built

Into

Embankment



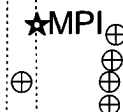
Barn  
*Burnt out*

German lorry  
*burnt*



Barn  
*Burnt out*

German Car  
*burnt*



★MPI



Stable

Farm House

Shed

M.N.



# Target 4

Scale 32 yards = 1 inch

⊕ Rocket Crater

M.N.

Farm House

Barn  
*set on fire by cannon attack*

Stable

Dutch Barn

Duck Pond  
★  
MPI

Bomb

Bomb

Ditch

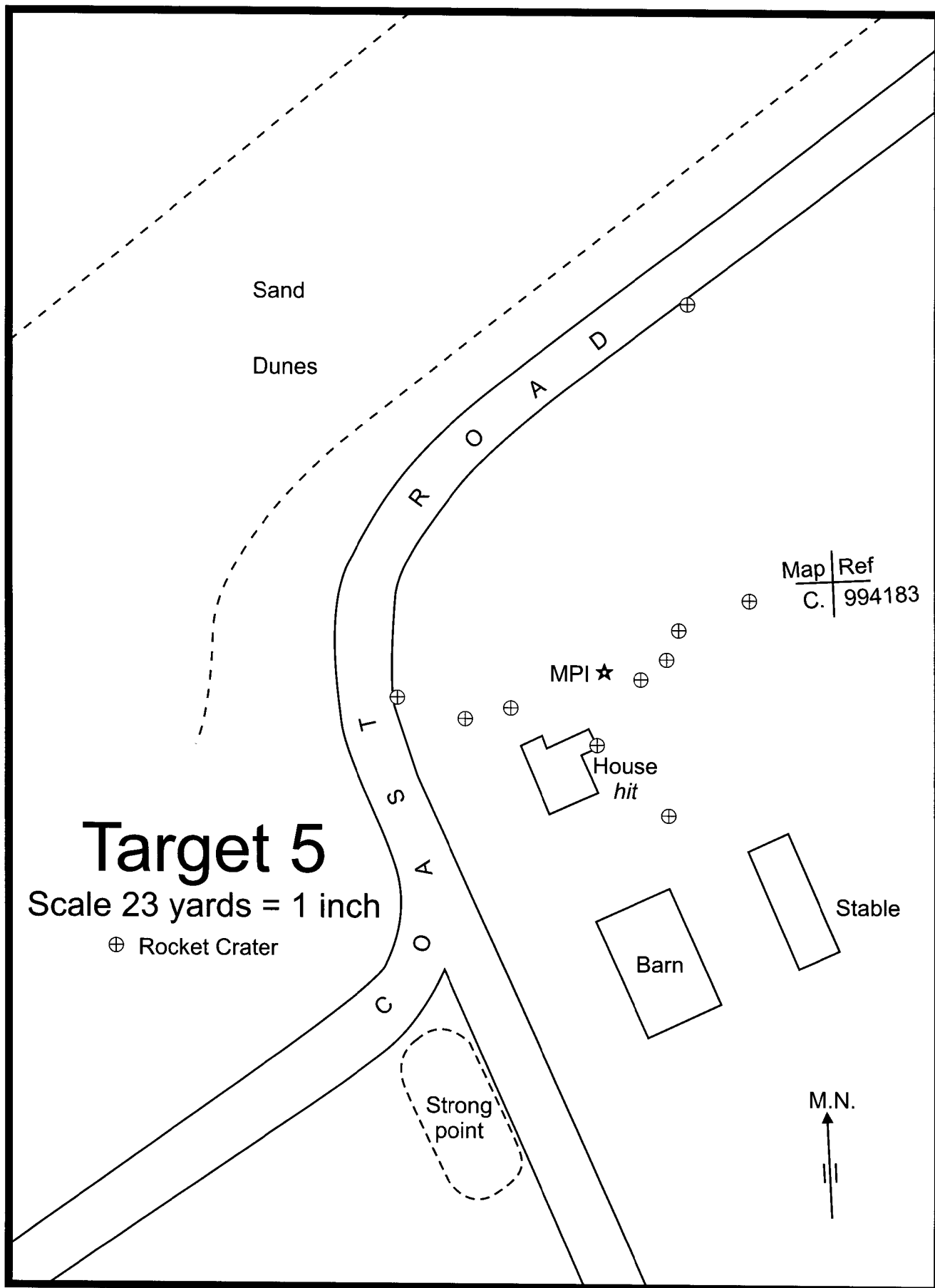
Cottage

Map/Ref  
C. 997177

↑  
to  
C  
a  
d  
z  
a  
n  
d

Ditch

Ditch

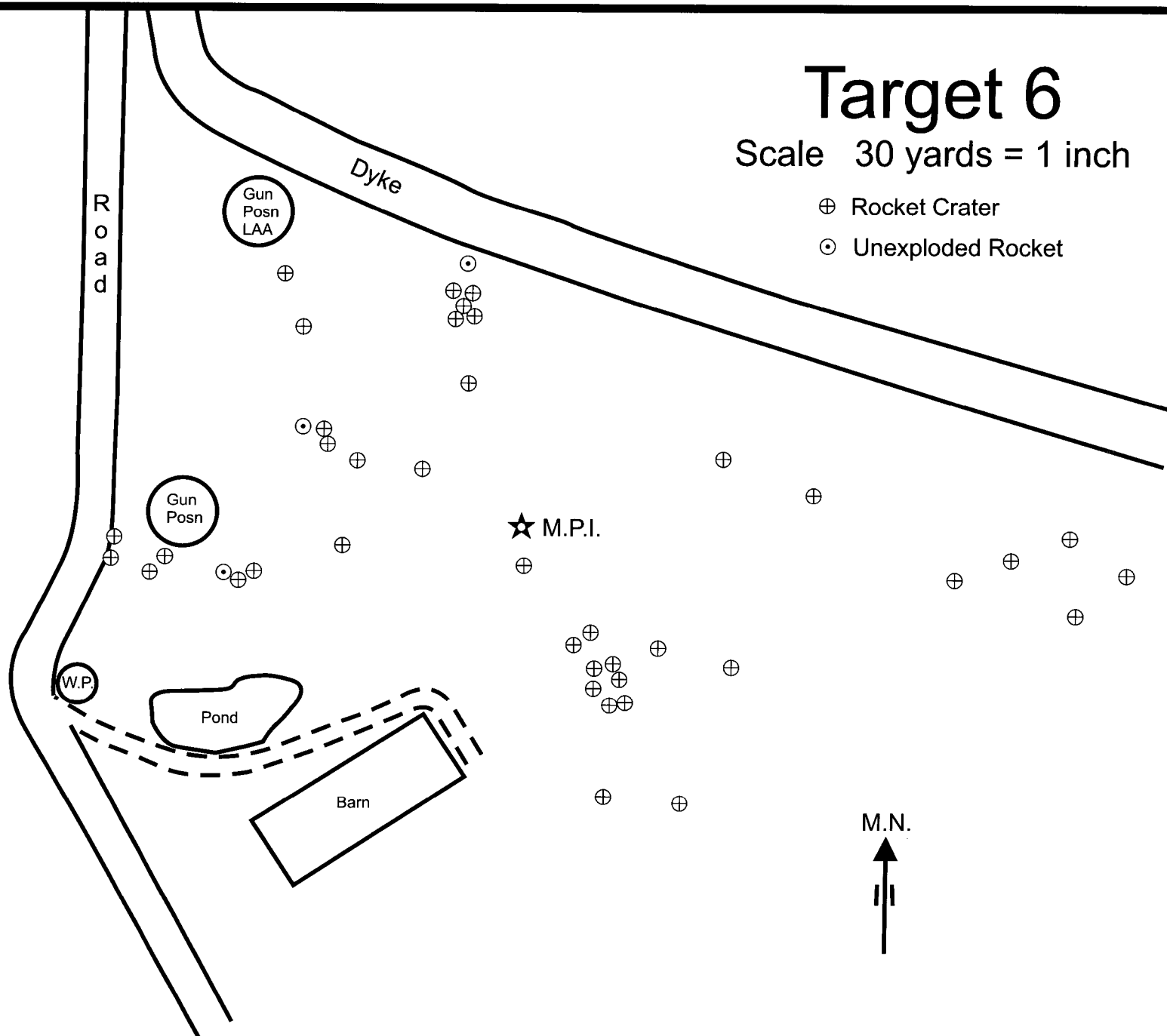


# Target 6

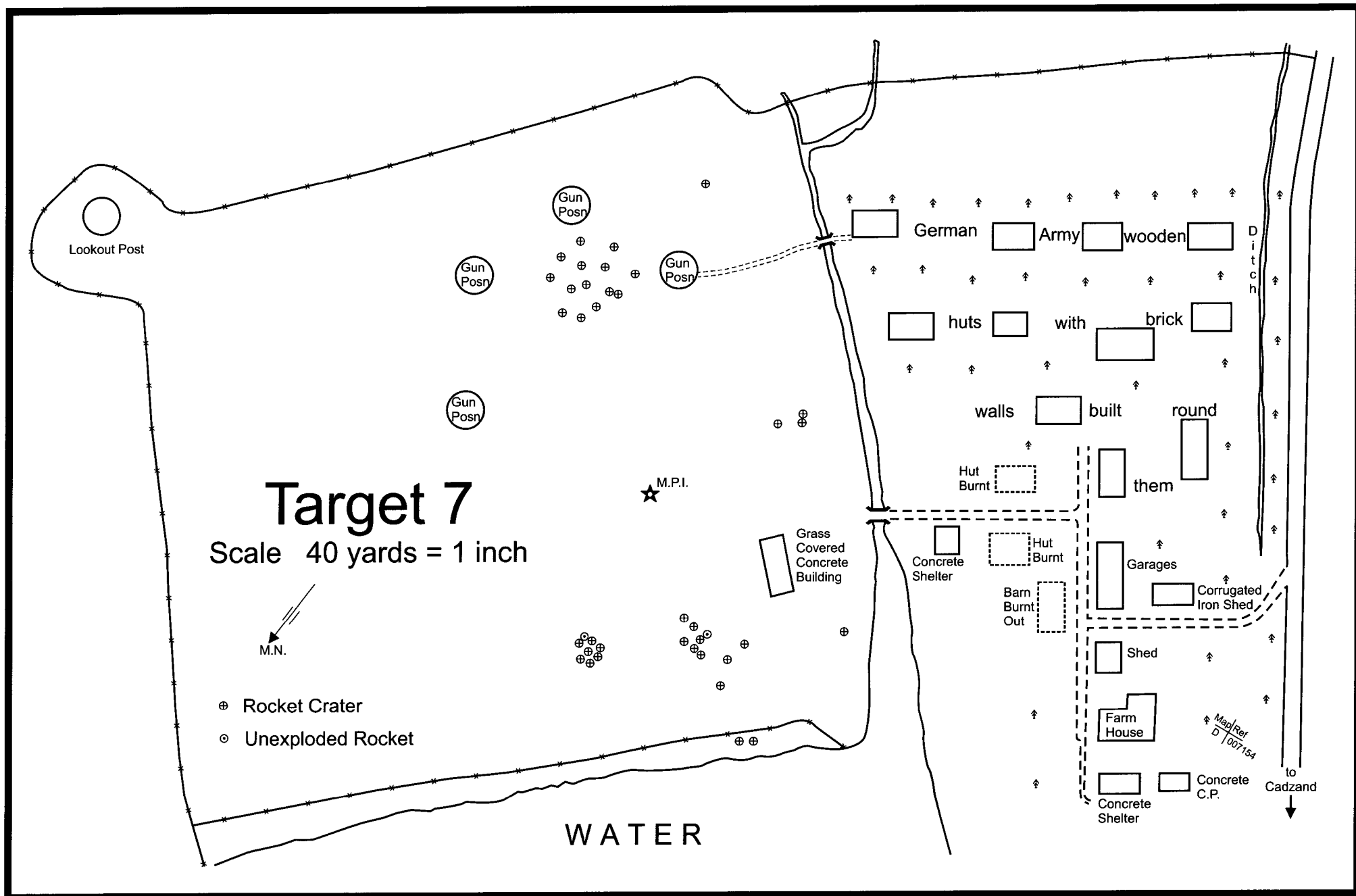
Scale 30 yards = 1 inch

⊕ Rocket Crater

⊙ Unexploded Rocket



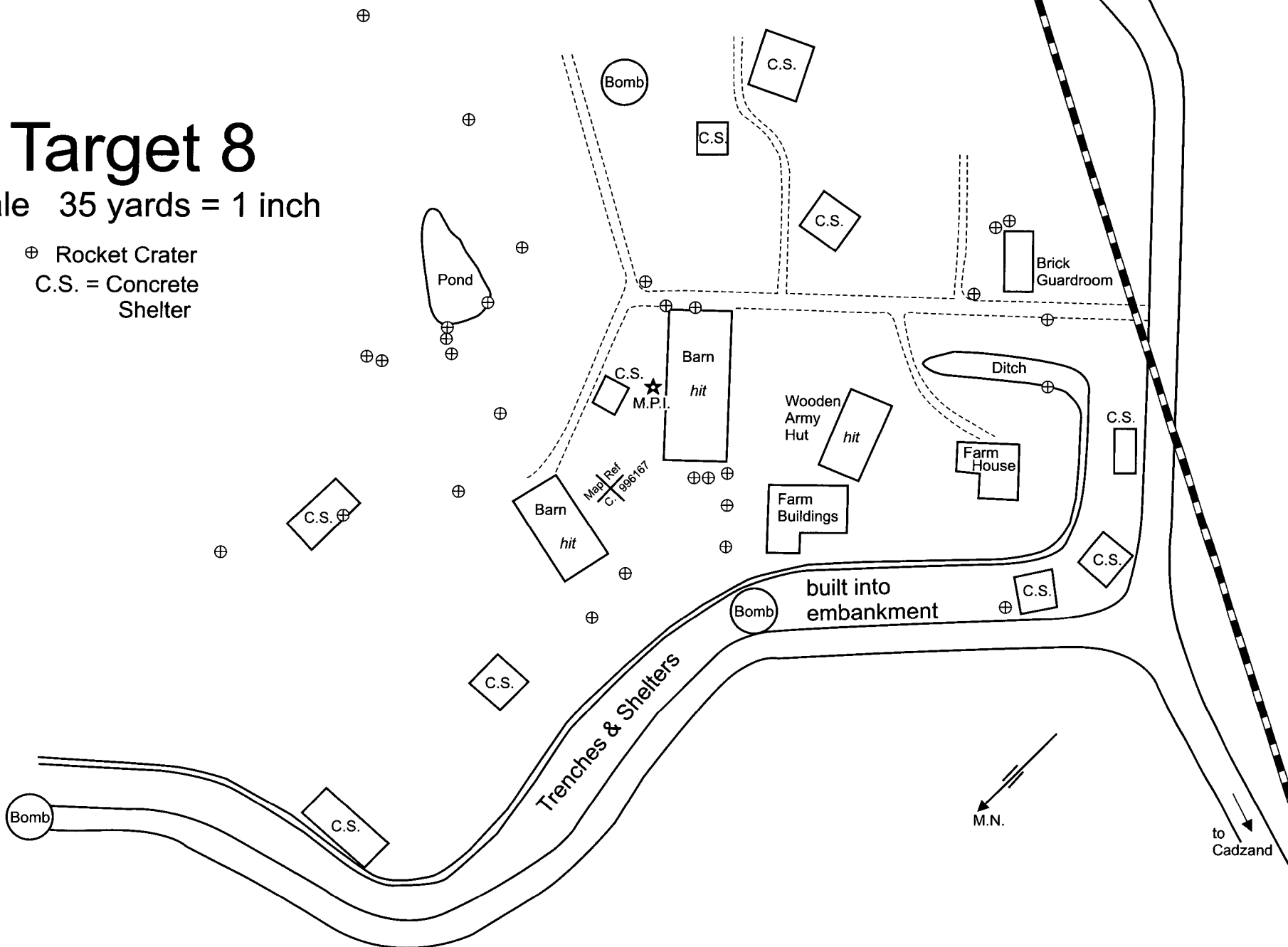
Map	Ref
D	006180



# Target 8

Scale 35 yards = 1 inch

⊕ Rocket Crater  
C.S. = Concrete Shelter

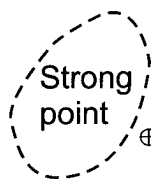
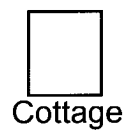


SEA DYKE

Many strong points

Coast Road

Timber Store



★ M.P.I.



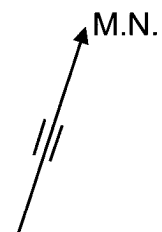
Map/Ref  
C. 976176

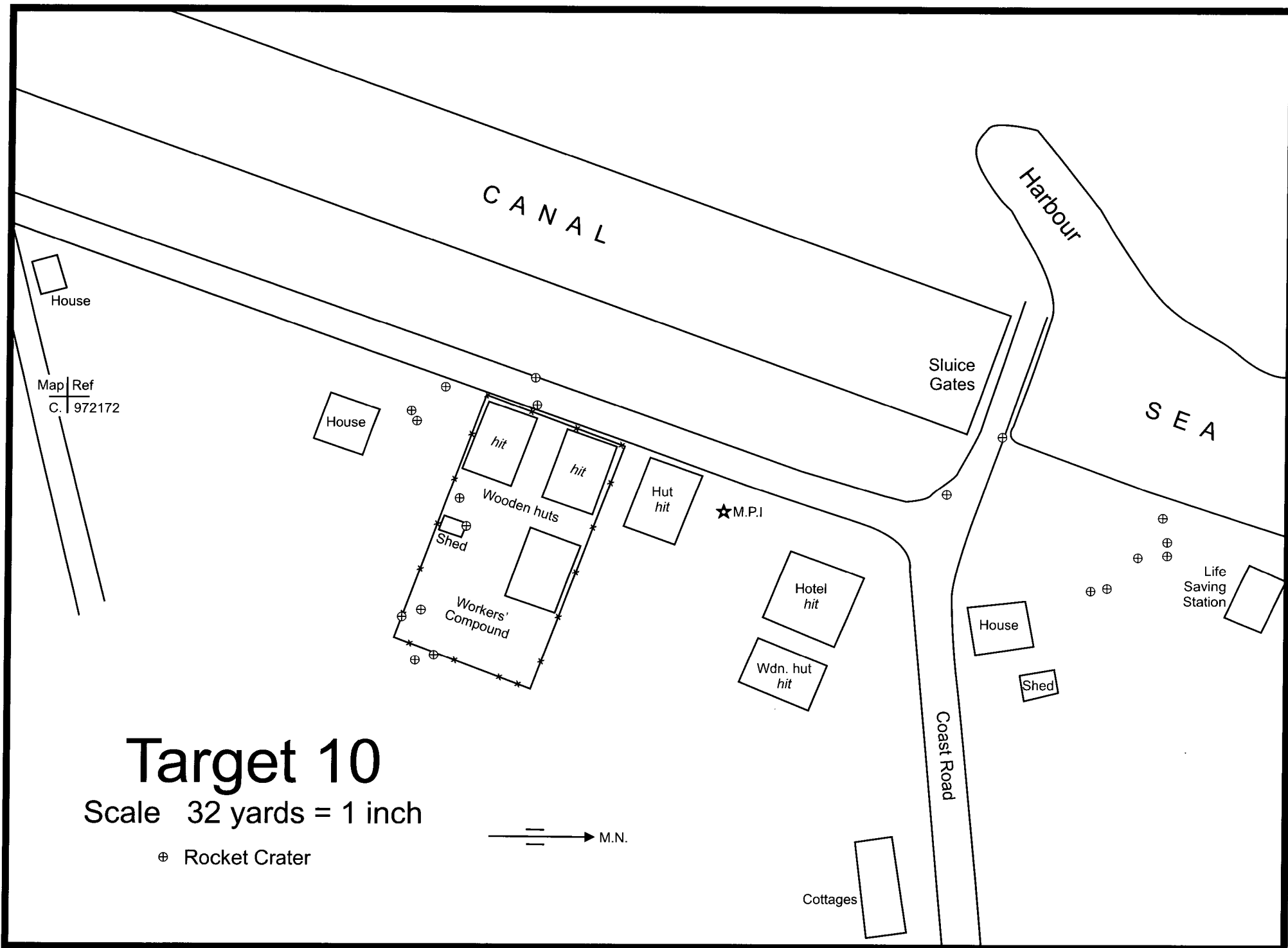
# Target 9

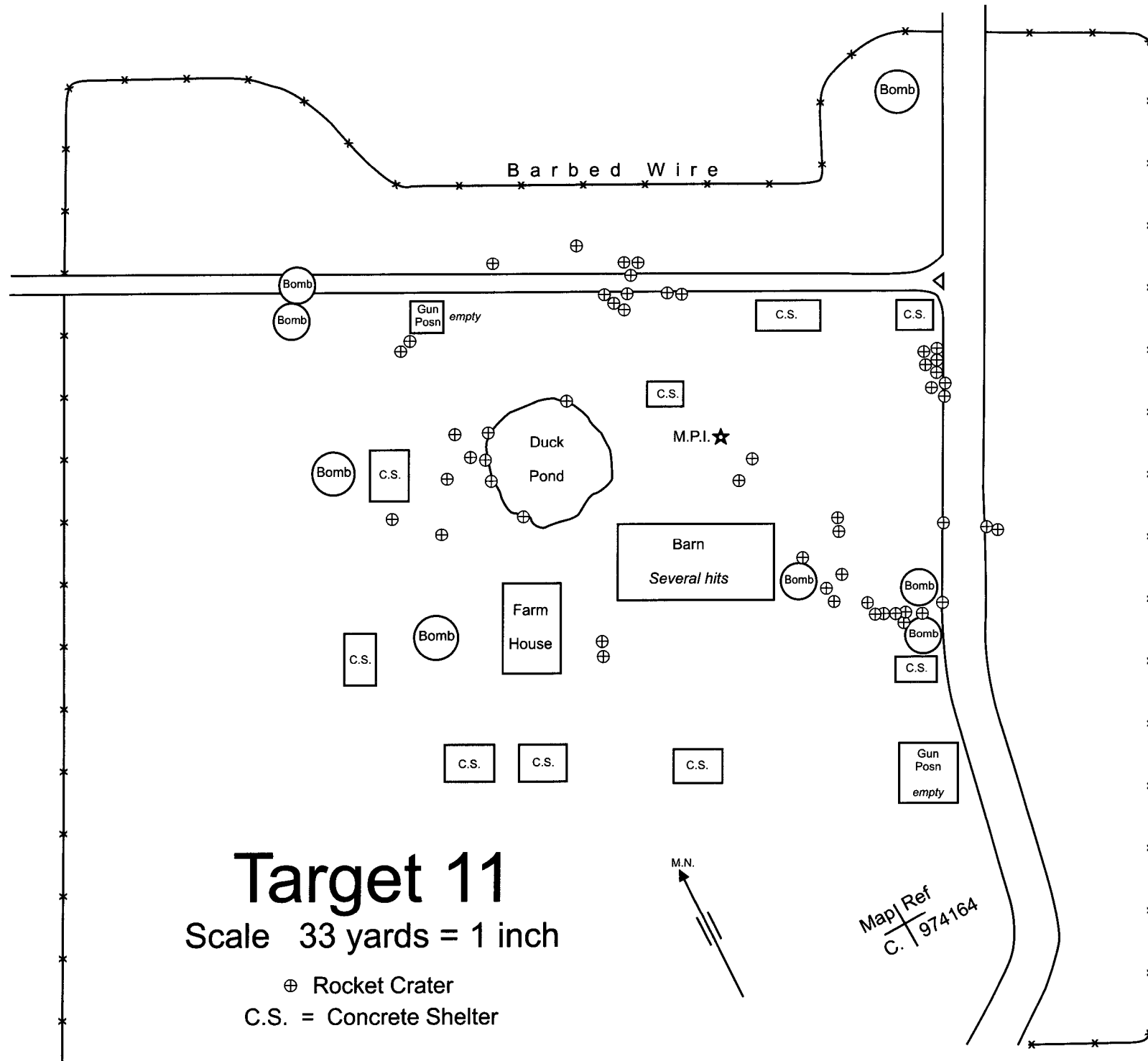
Scale 27 yards = 1 inch

⊕ Rocket Crater

⊙ Unexploded Rocket

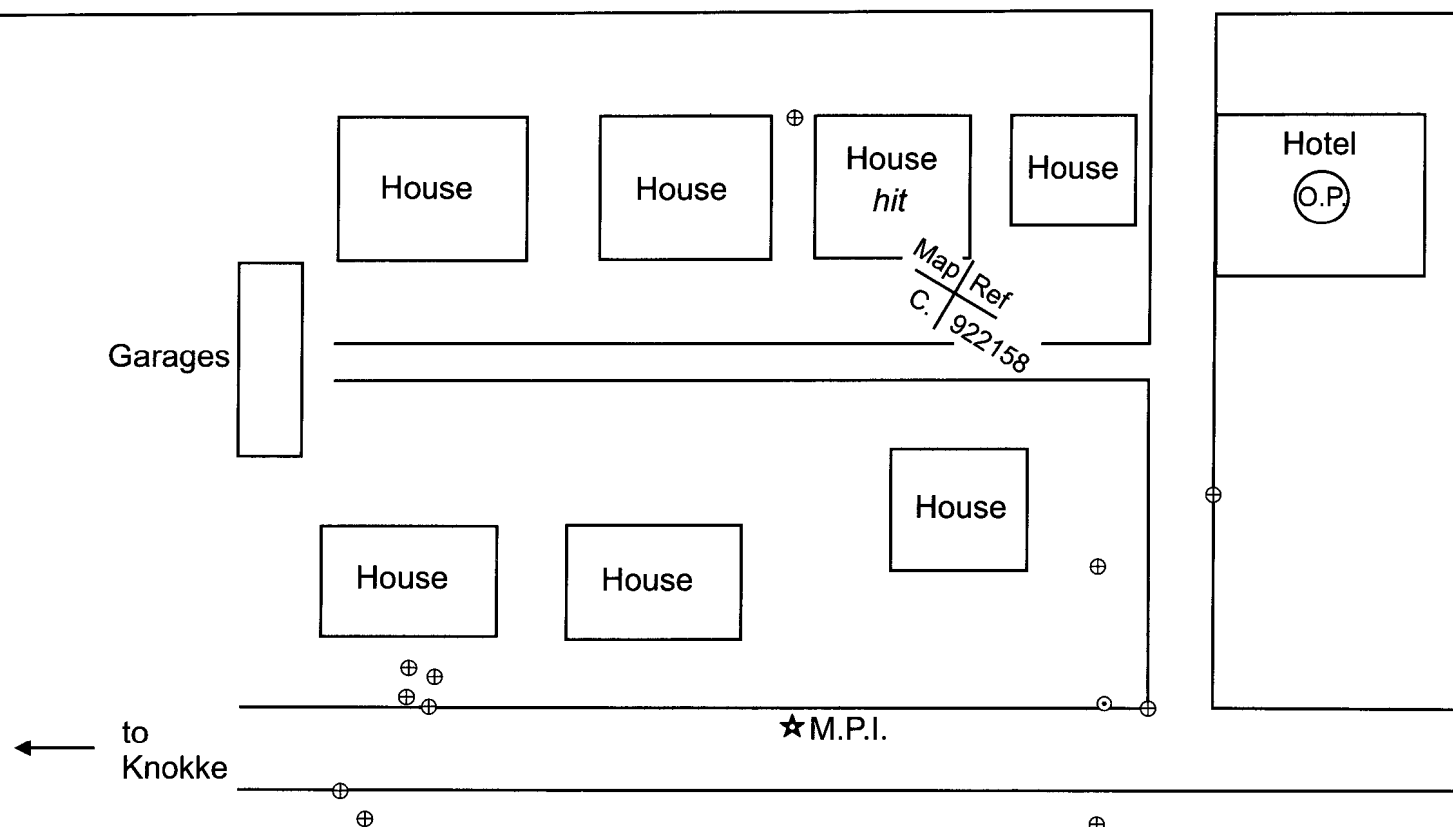






S E A

P r o m e n a d e



# Target 12

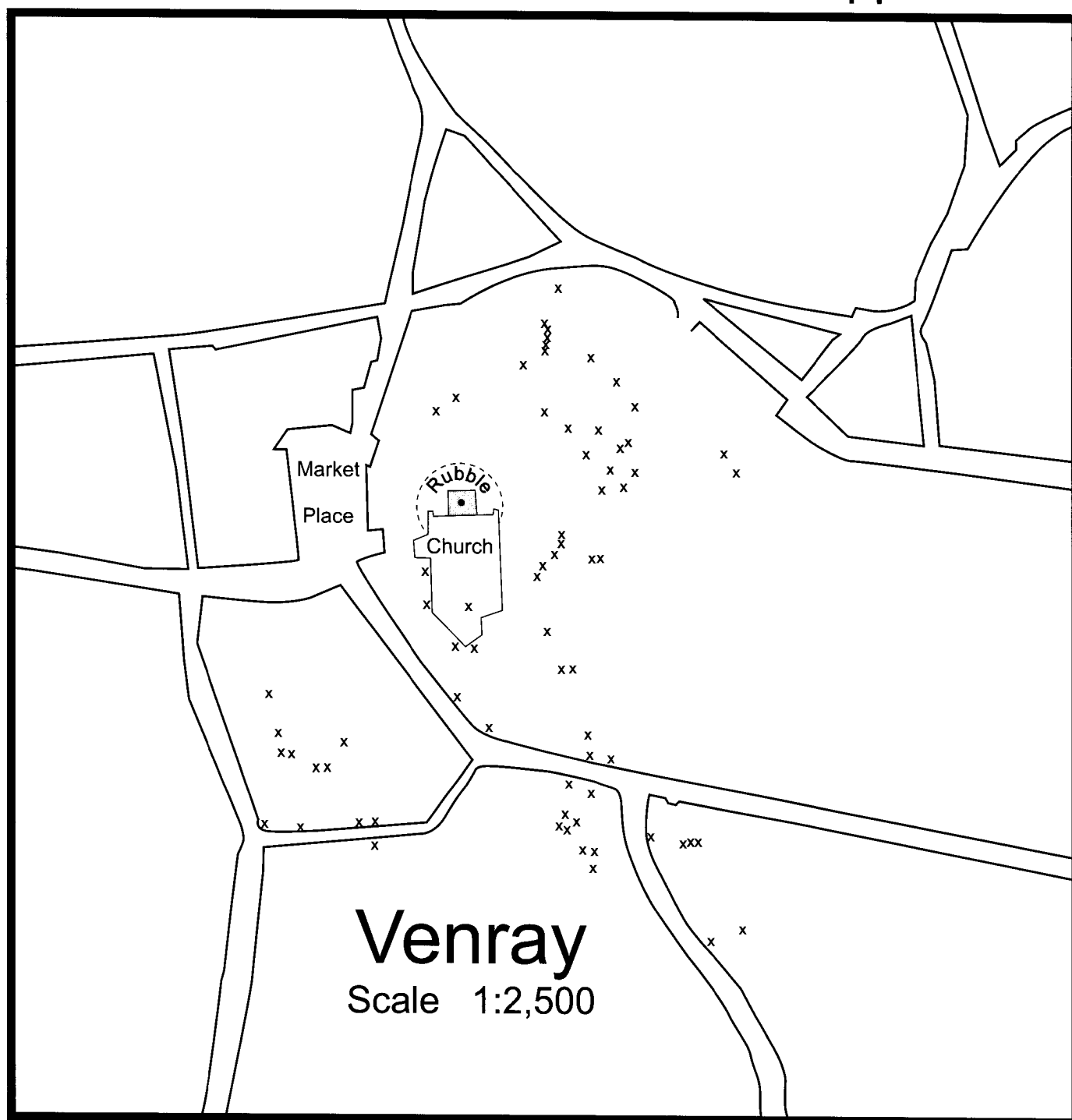
Scale 23 yards = 1 inch

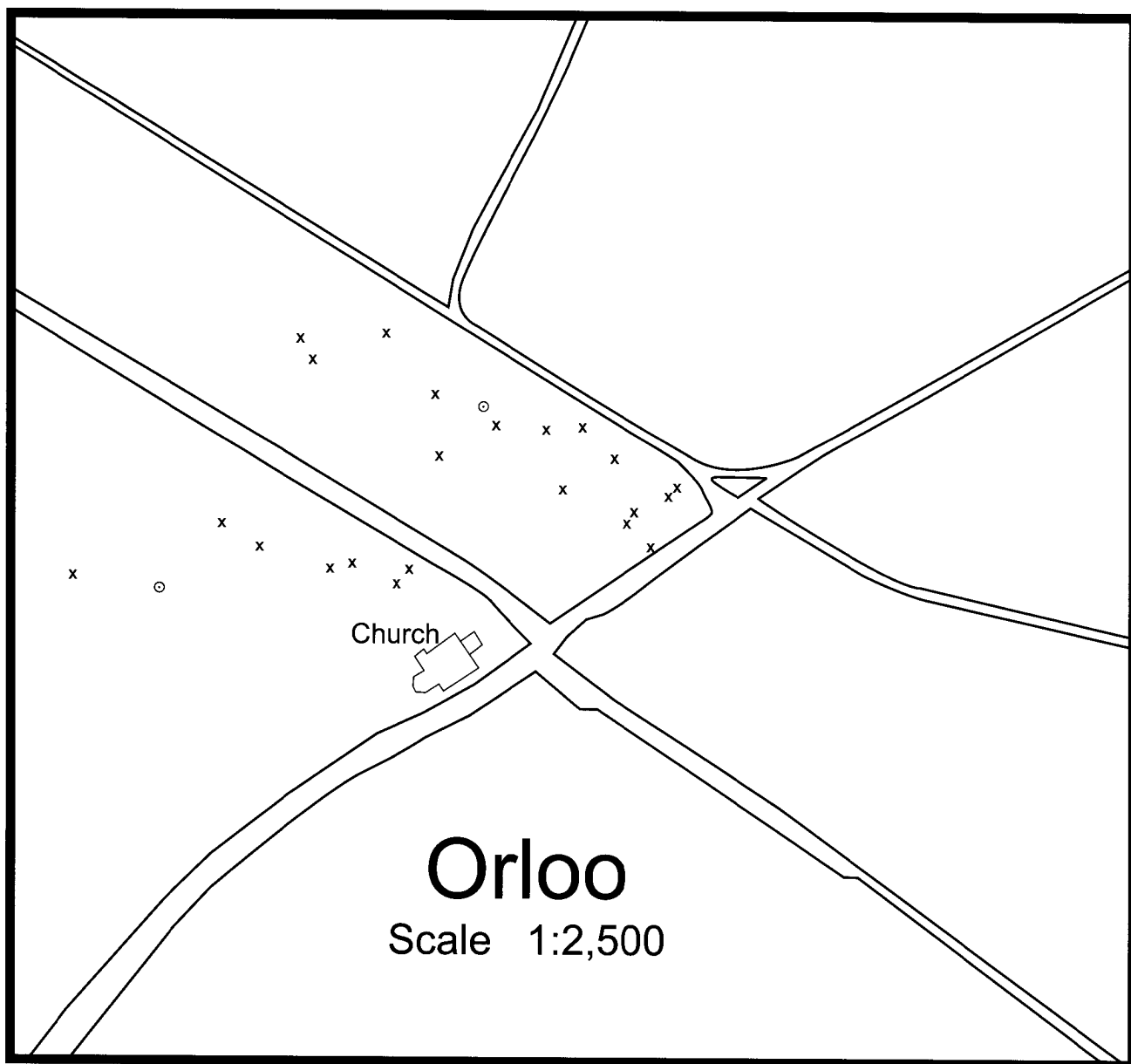
- ⊕ Rocket Crater
- ⊙ Unexploded Rocket

M.N.



## Appendix B





## Appendix C

1. The large volume of data on dispersion of RP has been obtained from the examination of target areas in the Breskens Pocket. However, the use to which these data can be put is limited on account of the following:

- (a) The actual aiming points are not known;
- (b) It is not known whether successive pilots in any one attack used the same aiming point.

Analysis of the fall of shot in these attacks yields a figure of 46 yards for the average displacement of the shots from the mean point of impact (MPI) for each individual attack. It also shows that the distribution of all shots taken together with their MPI superimposed is approximately normal.

If the MPIs were close to the aiming points and these were the same for each pilot in any one target area, then the figure of 46 yds would be a good measure of the operational accuracy in these attacks. Introduction of the displacement of the MPI from the aiming point were it known would increase the figure; allowance for the use of several aiming points in any one attack would reduce it. It is only possible to make an educated guess as to which of these unknowns would have had the greater weight, but the likelihood is that the operational accuracy was certainly no better than a mean error of 46 yards.

2. For the attacks on the church towers at Venray and Orloo the following data can be extracted:

	<b>Displacement of MPI from centre of tower</b>	<b>Mean displacement of shots from centre of tower</b>	<b>Mean displacement of shots from MPI</b>
<b>Venray</b>	64 yards	111 yards	97.5 yards
<b>Orloo</b>	62.5 yards	99 yards	72.6 yards

Part of the dispersion can be accounted for by variations in the direction of attack, heights of aiming point and angles of dive. The displacements of the MPIs on the ground can also be partly accounted for if the attacks were made predominantly from one direction at an elevated aiming point. However, no amount of juggling with the figures can produce a mean displacement of shots from aiming marks as low as the 46 yards which was the best that could be adduced in the case of the attacks in the Breskens Pocket.

3. In the target area studied by the BAU were 4 gun positions approximately in line and 60 yds apart and some magazines. It is possible that some shots which fell at a considerable distance from the guns were aimed at one or other of the magazines. Ignoring these shots and assuming each of the remaining 70 to have been aimed at the gun position nearest to which they fell the mean displacement of strikes from the aiming point comes to 65 yards. This is the most flattering assessment of the accuracy of this attack that can be given.

4. If we take a radial mean error of 40% and a normal distribution the chance of obtaining at least one hit on targets of different sizes can be calculated. For example, the chance of hitting a horizontal area 10' x 10' is 1.06%. The results of such calculations as applied to some typical targets are set out in the table below:

<b>Table II</b>					
<b>Target</b>	<b>Size</b>	<b>Horizontal projected area (45° dive)</b>	<b>% Shots Hitting Target</b>	<b>For 50% Chance of Hit</b>	
				<b>RP Needed</b>	<b>Sorties</b>
Small gun position	5 yds diameter	19 sq yds	.2	350	44
Panther tank	22'6" x 10'9" x 9'10"	50 sq yds	.5	140	18
Large gun position	10 yds diameter	80 sq yds	.8	88	11
Army hut	60' x 30' x 20'	270 sq yds	2.8	24	3
Large building	120' x 54' x 50'	1000 sq yds	10.0	7	1

In the case of the two largest targets in the above table the figures may be optimistic on account of abnormality of distribution. Several cases have been noted of close groups of strikes on the ground which have clearly originated from one aircraft. In the circumstances in which these groups occur, the chance of getting at least one hit is reduced, though the chances of multiple hits are increased.

5. Detailed analysis of the strikes on gun emplacements at Boulogne and on Walcheren Island is not possible. The percentages given in para.6 of the main text of this report are not inconsistent with those given in the above table.

## Appendix D

A loud speaker caravan was taken up to the forward lines of a battalion of 15 Scottish Division at about 1000 hrs on 28th September 1944. The Divisional Intelligence Officer (IO) crawled forward, and at 1045 hrs started talking to the Germans holding a wood 300 yards ahead. The subject matter of this talk was the overwhelming superiority of the allies in aircraft and artillery. At 1055 hrs, exactly at the minute arranged, a squadron of Typhoons appeared and circled the area for five minutes, during which time the IO spoke about the deadly accuracy of these aircraft. At 1100 hours the rocket attack began and the IO gave a running commentary, after which he called upon the enemy to surrender. Two Germans from an outpost on the flank come forward; then a fighting patrol went into the wood and found a number of men waving white handkerchiefs. When told to come out they attempted but machine gun fire from further inside the wood prevented them, and the patrol retired. A second Typhoon attack took place at 1300 hours, and more men deserted by crawling forward on their bellies. One of these PW stated that a house which was being used as an OP was hit, and that the occupants pulled out immediately. Another PW stated that after the first attack the company was temporarily withdrawn into the middle of the wood to prevent further desertion. Although the battalion never took the wood (they moved 2 days later), they had a large number of German prisoners and deserters who testified to the shattering effect of the Typhoon attack.



# **German Flak and Allied Counter-Flak Measures in Operation “Varsity”**

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## **Part I - Introduction**

1. An attempt has been made to assess the effectiveness of the counter-flak measures in reducing the enemy activity during the landing of 6 Br and 17 US Airborne Divisions on the east side of the Rhine on 24th March, 1945.

2. The information set out in this report has been obtained from the following sources:

- (a) Direct observation of the operation from high ground on the west bank of the Rhine.
- (b) Examination of flak positions.
- (c) Interrogation of local civilians.
- (d) Examination of gliders on the landing zones.
- (e) Interrogation of prisoners from flak batteries.
- (f) De-briefing reports of British and American glider pilots.
- (g) Visits to Headquarters of 6 Br A/B Div, 17 US A/B Div, IX US Troop Carrier Command, 38 Group (RAF) and 1 Wing Glider Pilot Regiment.
- (h) 2 TAF “Daily Log” and Ops Flashes
- (j) IX USTCC Ops Flashes and Ops Reps.

3. There were four ways of reducing the activity of the German flak batteries, namely:

- (a) Attacks by medium bombers of IX US Bombardment Division and 2 Group (2 TAF). These took place between 0745 and 0930 hrs on D-Day, P-Hour being 1000 hrs.
- (b) Counter-battery fire during the night of D-1/D and an artillery bombardment between P-30 mins and P hour.
- (c) Attacks during the operation (P-30 to P+210 mins) by Typhoons of 83 and 84 Groups (2 TAF) with rockets and fragmentation bombs.
- (d) Assaults on the flak positions by the airborne troops themselves.

4. The number of enemy AA guns of all calibres deployed throughout the “Varsity” area was considerable. The Second Army Hostile Battery List, amended up to 2359 hrs 23rd March, 1945, contained 357 positions in two lists. List A, consisting of targets in the Artillery Zone (roughly between the Autobahn and the Rhine, see map at Appendix A), gave 106 positions which were shown as having 231 LAA and 108 HAA guns in all. List B, batteries beyond the Artillery Zone, had 251 flak positions containing possibly

668 LAA and 78 HAA guns. Subsequent examination of the ground and interrogation of civilians showed that about half of these positions were unoccupied on the day of the operation.

5. Over 150 prisoners from these flak positions were interrogated and documents found on the sites were scrutinised; as a result it has been possible to form a clear picture of the Order of Battle of Flak formations in the "Varsity" area (See Appendix B). This shows that, had all units been at full strength, there would have been 562 AA guns in the area, 78 heavy and 484 light. As many of the LAA guns were trillinge or vierlinge and as it is known that a number of mobile 2 cm vierlinge were also operating in the area at the time, it appears that the number of barrels that could be fired at the airborne armada was not far short of a thousand. (Trillinge are triple and Vierlinge are quadruple LAA guns.)

6. Some of the flak units had been brought into the area as late as D-1 and prisoners stated that the airborne landing was expected at the time and place at which it did occur. The discovery of a marked German map suggests that some leakage of information had taken place. In spite of the reinforcements which were probably brought in as a result of such leakage, the number of guns in the area was still very much less than that shown on the Hostile Battery Lists. There were very few real gun positions which did not figure in these lists, although the counter-battery intelligence work was very difficult owing to bad weather and the fact that the Germans refused to disclose their positions by firing before D-Day.

## **Part II - Counter-Flak Activity**

### **Medium Bombers**

7. Twelve positions were attacked by mediums on the morning of D-Day, eight by IX Bombardment Division with 260 lb fragmentation bombs and four by 2 Group with clusters of 20 lb fragmentation bombs and a small number of 500 lb MC bombs (fused nose instantaneous). Details of these attacks will be found at Appendix C.

8. The aiming of the 260 lb F bombs was very good and their fragmentation pattern most impressive but, although some damage was caused to buildings and equipment associated with one flak battery, no hits were scored on any guns. When the small area of a gun pit is considered in relation to the pattern of bombs dropped by a formation of some 30 mediums, the chances of a direct hit are seen to be very slight. This was demonstrated in these attacks where an average of over 500 bombs was dropped on each battery but only one landed in a gun pit and that an unoccupied one.

9. The 20 lb fragmentation bombs released from the No.17 Clusters were also well aimed and high concentrations were achieved in the target areas, but not sufficiently dense to give many hits in gun pits. Where men were caught in the open, casualties were inflicted, but not on a sufficient scale to reduce the effective fire power. Details of these attacks are fully described in a paper entitled "Field Investigation on Fragmentation Cluster Bombs. Wesel-Bocholt area, Germany, April 1945" (Ref: 2 TAF/S.31100/19/Arm).

10. The attacks by the medium bombers had little effect by direct destruction, but it is probable that such accurate and concentrated attacks had some temporary morale effect. This may account for the fact that, although the German gunners had orders not to open fire before the airborne operation began for fear of disclosing their positions, they disregarded these instructions to the extent of damaging 58 of the 336 medium bombers involved. It is unlikely that this morale effect continued after P hour because the medium bombing programme had to be concluded by P-30 mins to allow the dust to settle down before the arrival of the paratroops.

## Artillery

11. The counter-battery fire of the night D-1/D was not specifically directed against flak positions as such, but several of them were engaged and where damage was done this has been included in the part played by the artillery in reducing the fire power available to the enemy during the airborne operation. Full details will be found at Appendix D.

12. Between 0930 and 0952 hrs on 24th March, 1945, some 24,000 rounds (440 tons) were fired at flak positions in the "Varsity" Area. 12 Corps fireplan "Carpet" was the engagement of 79 points, each by a single battery for 25 minutes, and the 30 Corps programme "Rapier" was the engagement, scale 2 or 3, time on target, of 22 points. Where the points were very close together or coincident they have been grouped together and the total number of targets thus arrived at is 95. The amount of fire with which the targets were to be engaged varied from 16 to 1000 rounds with an average of 242 rounds per target. (Corresponding average figures in other operations were "Switchback" 427 and "Veritable" 1117 rounds per target).

13. All but three of the 95 positions engaged by 12 and 30 Corps were visited a few days after the operation and those cases where signs of damage were discovered are fully described in Appendix D. 39 of the positions were probably unoccupied on the day in question and 24 of these had been engaged in the fire plan. A further 23 with no evidence whatsoever of any occupation were also engaged.

14. As was the case with the medium bombing (see para.10 above), the physical damage inflicted by the artillery was very small but it is considered that there was some temporary lowering of morale. Prisoners from flak positions in the Artillery Zone stated that several 2 cm guns were jammed by the dust which the shelling raised. The diagram at Appendix E shows that the effectiveness of the opposition met by the first squadrons of troop-carrying planes was very much less than that encountered by later arrivals; this would seem to suggest that gunners, who had gone to ground during the artillery programme and the medium bombing, did not return to their guns immediately when the airborne armada was sighted.

## Fighter-Bombers

15. In addition to the provision of fighter protection for the numerous formations of troop-carrying and glider-towing aircraft and the maintenance of standing patrols over German airfields, the Second Tactical Air Force had four wings of Typhoons permanently employed on anti-flak patrols over the "Varsity" area. Between them these four wings kept an average of 37 aircraft over the area throughout the vital 4 hours, P-30 to P+210 mins. At times the number of Typhoons rose to over sixty. Details of the attacks by aircraft of 83 and 84 Groups during the operation are given at Appendix F together with the findings of the ground investigators.

16. The Typhoons were armed with either rockets or cluster bombs in addition to their normal complement of 20 mm cannon shells. Each flight was given an area of operation with instructions to dive down and attack any flak position seen to be firing and, if, during the course of the patrol, no such fire was observed, there was always a prearranged target known to be a flak position which was to be attacked before returning to base. The briefing also provided for a large scale ground-strafting attack to precede the arrival of the first paratroops but unfortunately it was never carried out because the Dakotas arrived 8 minutes early.

17. The British glider-towing aircraft were flying at 2500 ft at the time of release and climbing to much greater heights for the return journey so the Typhoons on anti-flak patrol had to remain about 4000 ft for the purpose of observation. There was a thick ground haze and a very considerable amount of

the normal smoke and dust associated with a battlefield; it is not surprising therefore that 70% of the pilots reported having seen no guns firing. The poor visibility also accounts for the rather vague map references given for the points that they did attack as map reading under such conditions cannot have been easy. A special note about the visibility will be found at Appendix H.

18. Most of the positions claimed to have been attacked by the fighter-bombers were visited shortly after the operation. One rocket was found to have scored a direct hit on a 3.7 cm LAA gun, causing complete destruction; two multiple LAA guns showed signs of damage to individual barrels which were not incompatible with the results of ground-strafting by Typhoons. Fires had broken out at a 10.5 cm AA battery after a rocket attack but the guns themselves were not damaged until the Germans destroyed them before surrendering. One of the 20 lb fragmentation bombs from a No.17 Cluster bomb had landed inside an 88 mm pit and had killed the crew but the gun itself was destroyed by the enemy at a later date. It is just possible that some of the attacks for which inaccurate map references were given might have yielded results had the investigators been able to locate the targets on the ground.

19. When unoccupied sites were found local inhabitants were consulted and in this way it was frequently established that guns had been in position on the Saturday morning and that they had fired. On one occasion when no gun site was to be seen the local farmer volunteered the information that he and his family had filled in the pits soon after the Germans had taken the guns away.

20. Except in the case of the mobile 2 cm vierlinge which were known to have been operating in the area it is considered highly improbable that any guns damaged by the Air Force or the Artillery would have been removed from their sites as the Germans were very short of transport relying almost entirely on horses.

21. The authors have already shown in their Joint Report No.3, entitled "Rocket-firing Typhoons in Close Support of Military Operations" that the chances of landing rockets inside gun pits are very small (not better than 1 in 700 for an emplacement 5 yds in diameter). It was only to be expected therefore that, even where they were very accurately aimed, rockets rarely hit the target; they did however land sufficiently close to achieve considerable if temporary morale effect. The same is true, to a different degree, for cluster bombs. For such effect to leave lasting value the attacks require to be repeated at intervals of not more than 15 minutes throughout the operation. If, for the sake of numerical example, it is assumed that an effective attack would be one aircraft per position and that each aircraft could attack twice during a sortie, the 251 positions in the Hostile Battery List B would have required four times the effort actually employed. In fact very few batteries were attacked more than once and a large number were never attacked at all owing to the limitations imposed: no batteries west of the Autobahn were scheduled for RAF attack because they were in the area of the DZs and LZs, many more to the east of that line were too close to our own troops and the bad visibility prevented pilots from seeing some of those which they might otherwise have attacked.

22. In many previous battles the very presence of a flight of Typhoons in the neighbourhood has had a considerable effect on the enemy but there are several reasons for thinking that on this occasion it was not very great. Firstly, owing to the poor visibility and the height at which they were flying, they were not readily seen. Secondly, the vast number of Dakotas and bombers at low altitudes would tend to drown the noise of the fighters' engines. Thirdly, the sight of descending gliders loaded with airborne troops would probably exercise the minds of gunners far more than the threat of a rocket attack, great though their fear of such attacks is known to be. The diagram at Appendix G shows the number of Typhoons over the area at any time throughout the operation. The lack of correlation between this and the diagram showing aircraft hit by flak (Appendix E) confirms the theory that the mere presence of the Typhoons had little effect on the flak.

## Assault by Airborne Troops

23. The diagram at Appendix E shows that, after the first half hour, there was a progressive decline in the number of aircraft hit by flak and a similar trend is seen in the figures for seriously damaged gliders (see Appendix J); this suggests that some reduction of fire power was being brought about. The possibility of ammunition shortage has been investigated but only on one site was any evidence of such a shortage discovered. It has already been shown that the effect of the Typhoon anti-flak patrols was not great and so it would appear that some other influence was at work.

24. In a number of cases gliders were found to have landed within 50 yds and less of anti-aircraft batteries and, although some of the gliders were only burnt-out wrecks, others were undamaged. This evidence confirms the stories contained in the de-briefing reports where glider pilots described how they and their passengers eliminated flak batteries before unloading and proceeding to their RV. Owing to the lack of definite map references it is not possible to state exactly how many batteries were overrun by airborne troops during the period of the glider landing but it was probably between ten and fifteen, which is an appreciable proportion of the batteries in the immediate vicinity of the dropping and landing zones.

25. As was to be expected the destruction of flak positions by the Airborne troops exceeded that caused by the artillery and air forces combined.

## Prisoners

26. The flak prisoners interrogated averaged between 20 and 30 years of age and appeared fairly intelligent and reasonably fit. Only 36 of them had been captured within 24 hrs of the anti-flak programme and these were the only ones who could be interrogated before subsequent events had muddled their impressions. Of these 36 men, 18 had excellent morale; they were very secure and seemed pleased to have done us some harm. Only 6 appeared to be really shaken and were insecure, the remaining 12 giving no particular indications. Compared with infantry and other PW captured during the same operation the 50% of good morale is a very high figure.

27. The outstanding impression of all PW was amazement and fear at the sight of the airborne landings. None of them had experienced the medium bombing which preceded the landing. Whilst many expressed dislike and fear of our fighter-bombers they did not seem especially impressed by them on the day in question (24th March). None had been shaken by the artillery to the same extent as were PW taken after the heavy barrages which opened some of our earlier set-piece attacks.

28. Prisoners from 15 positions outside the Artillery Zone were interrogated. In 10 cases the men said that they had been attacked by fighter-bombers and five of these attacks were considered to be the direct result of firing their guns. In these 10 cases of Typhoon attacks the prisoners maintain that they fired back at the fighters; this is consistent with claims made by flak prisoners from previous operations (See the authors' Joint Report No.3). In 4 out of the 5 positions which reported no Typhoon attack the guns had not fired during the operation because the gliders and accompanying aircraft were out of range. Although 15 is only a small proportion of the batteries in the "RAF area" these facts show that the Typhoons were not without effect. There is no PW evidence from other batteries in this area but it seems probable that there were several more positions which did not fire during the operation owing to the fact that they were too far away. There can be little doubt that it was the flak batteries inside the Artillery Zone which inflicted most damage.

## Part III - Effects of the Flak

### Gliders

29. The principal effect of the flak in the operation was the destruction of gliders. In many cases the same guns which fired at them whilst in flight were able to continue the action when the gliders had landed, because they were well sited for the dual role. The casualties to glider pilots and their passengers, though by no means light, were not sufficient to affect the course of the battle but the loss of equipment was serious. Figures for damage and loss quoted in this report must be considered as being much too low because only some 1200 out of 1400 glider reports are available and it is feared that most of the remaining 200 were damaged or destroyed.

30. The number of seriously damaged gliders reported was 153 and those not unloaded or the unloading of which was delayed for considerable periods of time amounted to 173. The causes of were:-

- (a) Crash landing due to flak damage.
- (b) Fires due to flak or mortar.
- (c) Crews being pinned down by artillery, mortar or sniper fire on the landing zone.

The German flak batteries were therefore in a large measure responsible for the loss of the equipment so badly needed for the operation.

31. A secondary effect of the flak was the disorganisation caused by damage to towing planes. Two instances occurred when glider formations, still on tow, were prematurely broken by a plane diving through them hopelessly out of control; also at least 20 gliders had to cut off when their tow-planes were hit. The result of such happenings was that gliders landed well away from their appointed LZs and were separated from others of their formations so that guns arrived with no jeeps to tow them, (this latter applies only to American gliders).

32. It was planned that British gliders would be released at 2500 ft and American gliders at 700 ft. According to debriefing reports American gliders were released at very varied heights. The figures in Table 1 below show the percentage of the gliders, released at various levels, which suffered flak damage:

Table 1	
Height of release	Percentage hit
<b>A. American gliders</b>	
Below 1000 ft	41.6
1000 ft - 1500 ft	44.1
1500 ft - 2000 ft	50.5
over 2000 ft	69.4
<b>B. British gliders</b>	
2500 ft	59.5

Many of the American glider pilots complained of the great height at which they had to cast off, and they attribute their losses to that fact.

33. To discover any differences that may have existed between various LZs from the point of view of flak, an analysis of flak damage by LZs was made as is shown in Table 2 below:

<b>Table 2 Flak Damage to Gliders</b>					
<b>Landing Zone</b>	<b>Minor Damage</b>	<b>Serious Damage(*)</b>	<b>Total Damage</b>	<b>No Flak Damage</b>	<b>Total</b>
<b>A. American</b>					
<b>LZ "S"</b>	197 (35.4%)	56 (10%)	253 (45.4%)	304 (54.6%)	557
<b>LZ "N"</b>	102 (34.5%)	26 (8.8%)	128 (43.3%)	168 (56.7%)	296
<b>Total</b>	299 35%	82 9.6%	381 44.6%	472 55.4%	853
<b>B. British</b>					
<b>LZ "O"</b>	16 (35%)	20 (43.5%)	36 (78.5%)	10 (21.5%)	46
<b>LZ "P"</b>	27 (31.8%)	8 (9.4%)	35 (41.2%)	50 (58.8%)	85
<b>LZ "R"</b>	28 (37.2%)	17 (22.8%)	45 (60%)	30 (40%)	75
<b>LZ "U"</b>	29 (44%)	15 (22.6%)	44 (66.6%)	22 (33.4%)	66
<b>Total</b>	100 36.8%	60 22%	160 58.8%	112 41.2%	272
(*) Serious damage is interpreted as meaning damage involving some loss of control.					

The figures in this table and in the diagram at Appendix J, where the time factor is also considered, show that American glider damage due to flak was remarkably consistent round about the 45% mark. British gliders with approximately the same proportion of "minor damage" suffered more serious damage, the amount of which varied greatly from one LZ to another. LZ "P" where damage was the least was the furthest westward and to reach LZ "O" where most damage was suffered gliders had to fly within range of many more guns as will be seen from the map at Appendix A. (The difference between times of landing at these two LZs was not significant.)

## Fires in Gliders

34. Of the 860 American glider pilot reports only 23 mentioned destruction by fire, three while in free flight, five while still rolling on the LZ and the rest during the first hour or so after landing. In only one case was it possible to remove the load before the fire. The cause of fire in the 23 cases recorded is equally divided between mortar and AA fire. Other gliders were burnt out after their pilots had left them and were not therefore reported; even so the proportion is very much lower than in the case of British gliders where at least 40 out of 327 examined by the salvage party were found to have been burnt. The load had been removed from 8 of these gliders before the fire destroyed them.

35. There were many cases of SAA and even LAA shells passing through the covering of the Waco and causing no more damage than a tear in the fabric; in such circumstances an incendiary bullet would have little effect. The more solid wooden construction of the Horsa and Hamilcar is such that resistance would generally be offered and incendiary bullets could be expected to start fires irrespective of the nature of the load. The four burnt out Waco gliders, the loads of which are recorded, all carried Jeeps

but would not be safe to assume from this that all the other 19 fires were due to the presence of Jeeps although apart from the load there is very little inflammable material in a Waco glider. There were however 23 instances in which Jeeps carried in American gliders had been hit by flak, including petrol tanks and oil pipes perforated, and one of these caused an outbreak of fire.

## Damage to Aircraft

36. No aircraft were hit before dropping their paratroops and not many before releasing their gliders, thus damage to aircraft can have had little direct effect on the course of the battle. Table 3 below gives the salient facts.

<b>Table 3 Aircraft Damaged and Lost</b>				
	<b>Height Over Target</b>	<b>A/C Sorties</b>	<b>No. Damaged</b>	<b>No. Lost</b>
1. Br planes towing gliders	2500'	440	32 (7.2%)	7 (1.6%)
2. US planes towing gliders	varied between 700' and 2500'	609	169 (27.5%)	14 (2.3%)
3. US planes with Br paratroops	700'	240	77 (31.6%)	14 (5.8%)
4. US planes with US paratroops	700'	298	79 (26.5%)	18 (6.0%)
<b>Total</b>		1587	357 (23.0%)	53 (3.3%)

37. Table 1 shows that gliders released at "over 2000 ft" suffered damage rate of 69% whilst for those released "below 1000 ft" the rate was 42%. Table 3 shows that the corresponding figures for loss of aircraft were 1.6% and 6.0%. Considering aircraft damaged the percentage at the lower height is certainly greater but these aircraft all managed to fly home whereas most of the damage to gliders involved serious loss of equipment. It thus appears that the low release is the more efficient.

38. Altogether 316 anti-flak sorties, involving 92 attacks on gun positions, were flown by Typhoons of 83 and 84 Groups during the operation. The total damage suffered was 2 aircraft lost, 7 aircraft damaged and 2 pilots lost. In addition, one Tempest and four Typhoons (with their pilots) were lost over the area; these were not attacking gun positions but their loss was due to flak.

## Casualties

39. It was unfortunately impossible to obtain casualty figures for either 6 Br or 17 US A/B Divisions for the period of dropping and landing; however the first 24 hours of the operation produced the following figures for 6 Br A/B Division:

<b>Table 4 Casualties in 6 Br AB Div (first 24 hours)</b>					
	<b>No. Involved</b>	<b>Killed</b>	<b>Wounded</b>	<b>Missing</b>	<b>Total</b>
<b>1. Paratroops</b>	4400	125 (2.9%)	264 (6%)	49 (1.1%)	438 (10%)
<b>2. Glidertroops</b>	3800	216 (5.7%)	477 (12.5%)	51 (1.3%)	744 (19.5%)
<b>Total</b>	8200	341 (4.2%)	741 (9.0%)	100 (1.2%)	1182 (14.4%)

<b>Table 5 Glider Pilot Casualties</b>					
	<b>Despatched</b>	<b>Killed</b>	<b>Wounded</b>	<b>Missing</b>	<b>Total</b>
<b>1. British</b>	880	38 (4.3%)	77 (8.8%)	135 (15.4%)	250 (28.5%)
<b>2. American</b>	1816	33 (1.8%)	106 (5.9%)	55 (3.0%)	194 (10.7%)
<b>Total</b>	2696	71 (2.6%)	183 (6.8%)	190 (7.1%)	444 (16.5%)

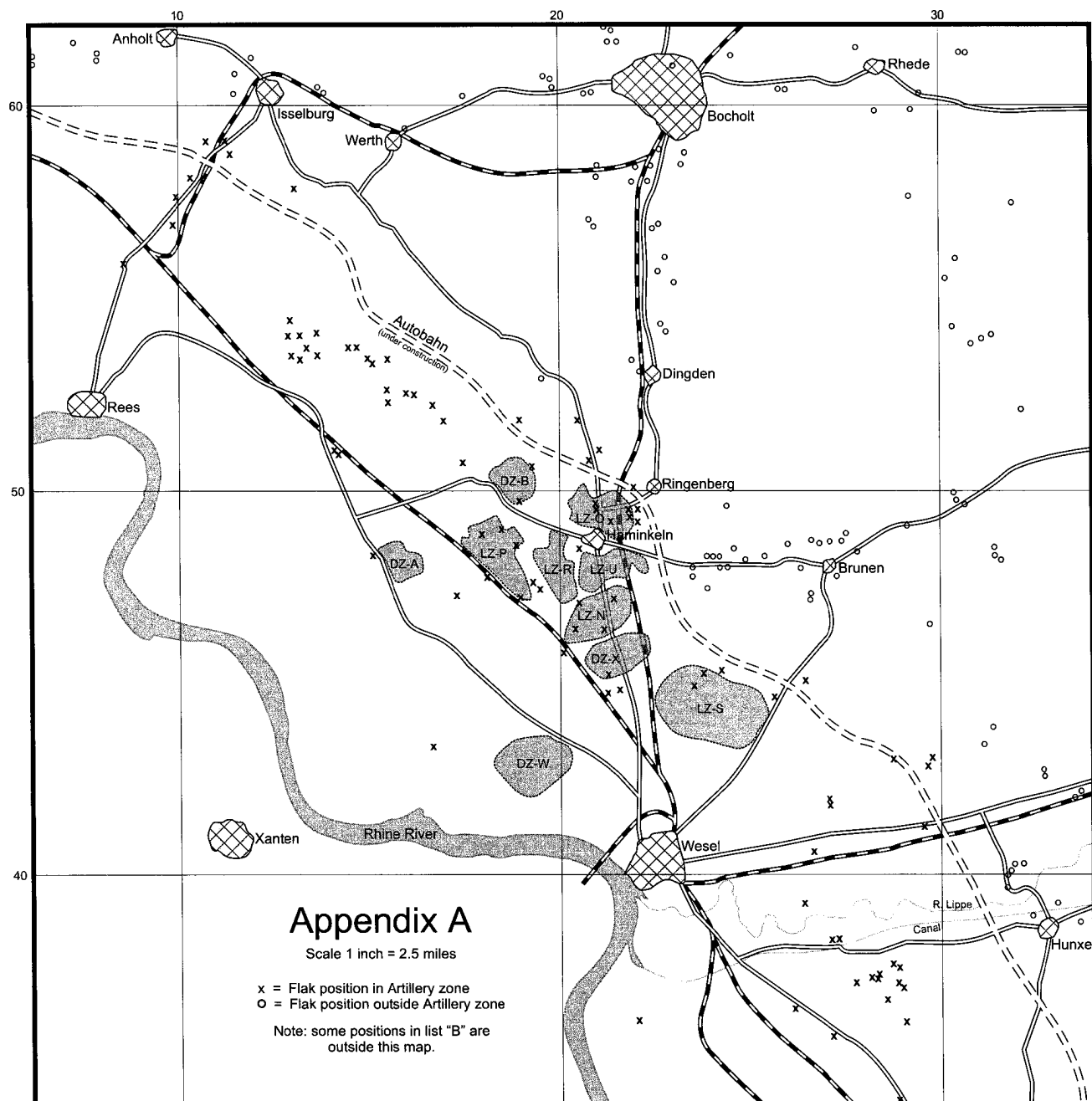
40. Figures extracted from glider pilots' reports, which are of necessity incomplete in that where both pilot and co-pilot became casualties no record is available, yield the following information concerning killed and wounded in the air and immediately after landing. They refer to pilots and their passengers.

<b>Table 6</b>			
<b>Glider troops</b>	<b>Killed</b>	<b>Wounded</b>	<b>Total</b>
<b>1. British</b>	47	151	198
<b>2. American</b>	67	282	349
<b>Total</b>	114	433	547

Although some of these casualties were caused by SA and mortar fire, the majority are attributable to either light or heavy flak used in anti-aircraft and ground roles. Table 4 shows that in proportion to their total numbers British glider troops suffered twice as many casualties as the paratroops, and Table 6 shows that 30% of these occurred in the air or immediately after landing.

## Conclusions

1. Although the operation succeeded, the anti-flak programme contributed little to its success. Flak was not appreciably damaged by artillery nor by air attack, and there were substantial casualties to gliders, their crews, and their loads.
2. Material damage to gun positions, though slight, was as much as could have been expected, considering the weights of the air and artillery bombardments.
3. PW interrogation suggests that attacks on flak positions by Typhoons had a discouraging effect on the ground gunners.
4. The only marked reduction in flak intensity was brought about by capture of gun positions by airborne troops.
5. The extent to which aircraft and gliders were damaged depended on height: the higher the gliders were released the more damage they suffered but aircraft releasing gliders at 2500 ft lost only 1.6% whilst those flying over the area at 700 ft lost 6.0% and had a high damage rate.
6. Visibility was poor, principally owing to fires, but it is not proved that this contributed substantially to damage, because, although it made difficulties for the pilots, several thought that the smoke screened them from the ground gunners.



## Appendix B

Outline of Enemy AA Order of Battle and Dispositions in Area Wesel-Damme-Brunen-Bocholt-Haldern on 24 March 1945

### 1. General

The area was part of that controlled by VI AA Corps, and 4 AA Div (Hq Duisburg) appears to have controlled most of it. The principal local static formation was AA Gruppe Wesel, but parts may have been under command AA Gruppen Emmerich or Dorsten. Also present in the area were a number of units which had crossed the Rhine in the retreat, the AA Bns of two para divisions, and a good deal of Army LAA, possibly brought in to fulfil an anti-paratroop role and under command 100 AA Regt. It is probable that the static HQs directed and co-ordinated the disposing of all units and that Para AA Bns and other units under command of local army troops probably had to conform to the general AA plan.

### 2. Units Present

Unit	Organisation	Disposition
6 Para AA Bn, 6 Para Div	3 hy & 2 light tps	Gen area Rees
7 Para AA Bn, 7 Para Div	3 hy & 2 light tps (incomplete)	Gen area Oberdickshof
II Bn 21 AA Regt	3 hy & 2 light tps	Gen area Haminkeln Airfd
I Bn 157 AA Regt	4 hy & 2 light tps	Gen area Bocholt
366 Mixed AA Bn	4 hy, 2 10.5, 2 light	Over whole area, especially Haminkeln-Brunen Road
415 LAA Bn	4 light tps	Gen area Brunen
I Bn 505 Army AA Bde	4 light tps	Gen area Haminkeln-Dingden
716 LAA Bn	4 light tps	Gen area Haldern
3/748 LAA	3 light pls	South of Haminkeln
819 Army LAA Bn	4 light tps	Area Loikum Hussun
838 Inf Field Bn	3 light tps	Area north of Wesel
5/883 LAA	5 light pls	Area north of Wesel
Totals - At least elements of 11 battalions ; Possibly 17 Heavy troops and 34 Light troops (*)		

(*) i.e., the following:	
10.5 cm	12
8.8 cm	66
3.7 cm	75
vierlinge	44
trillinge	96
Sdr 2 cm	269
<b>Total, all types</b>	<b>562</b>
Extra barrels for multiple guns	360
<b>Total possible barrels</b>	<b>922</b>

## Appendix C

### Attacks by Medium Bombers 24th March 1945

#### A. IX US Bombardment Division

Target Location	Time over Target	Number of Aircraft	Bomb Load		Tons of Bombs	Ground Survey
			260 F	500 GP		
A 208604	0744	33	636	4	75	Believed 2 MGs and 3 wagons destroyed. Guns removed after having fired 24th March.
A161566	0744	36	553	4	63	Not visited: had been erased from Hostile Battery List.
A 258603	0747	39	733	4	87	Site unoccupied on 24th March 1945.
A 159570	0750	31	451	8	54	Not visited: had been erased from Hostile Battery List.
A 210583	0802	31	543	4	64	Accurate attack on unoccupied position 300 yards away from an active site.
A 208570	0853	31	534	4	63	4 x 88 mm guns removed by Germans before 24th March 1945
A 232583	0903	29	448	4	53	Bombs hit houses round site. 4 LAA guns fired 24th March and removed later.
A 198606	-	35	468	8	56	4 x 88 mm guns had been fired much 24th March. No damage. Removed by retreating Germans.
<b>Totals</b>		265	4366	40	517	

#### B. 2 Group (2nd Tactical Air Force)

Target Location	Number of Aircraft	Bomb Load		Tons of Bombs	Ground Survey
		20 F	500 MC		
A 326425	24	-	94	21	No sign of 500 MC bomb craters. 5 LAA positions, no damage.
A 324397	12	1872	-	17	Not visited.
A 245481	17	2652	-	23½	Good concentration over area containing several positions. Some casualties but no damage to guns.
A 267485	18	2184	32	26½	Good concentration round AP.
<b>Totals</b>	71	6708	126	88	

#### C. Combined Effort

336 planes dropped 11,242 bombs weighing 605 tons on 12 gun positions.

## Appendix D

### Artillery Targets

95 targets were engaged in the Counter-flak programme.

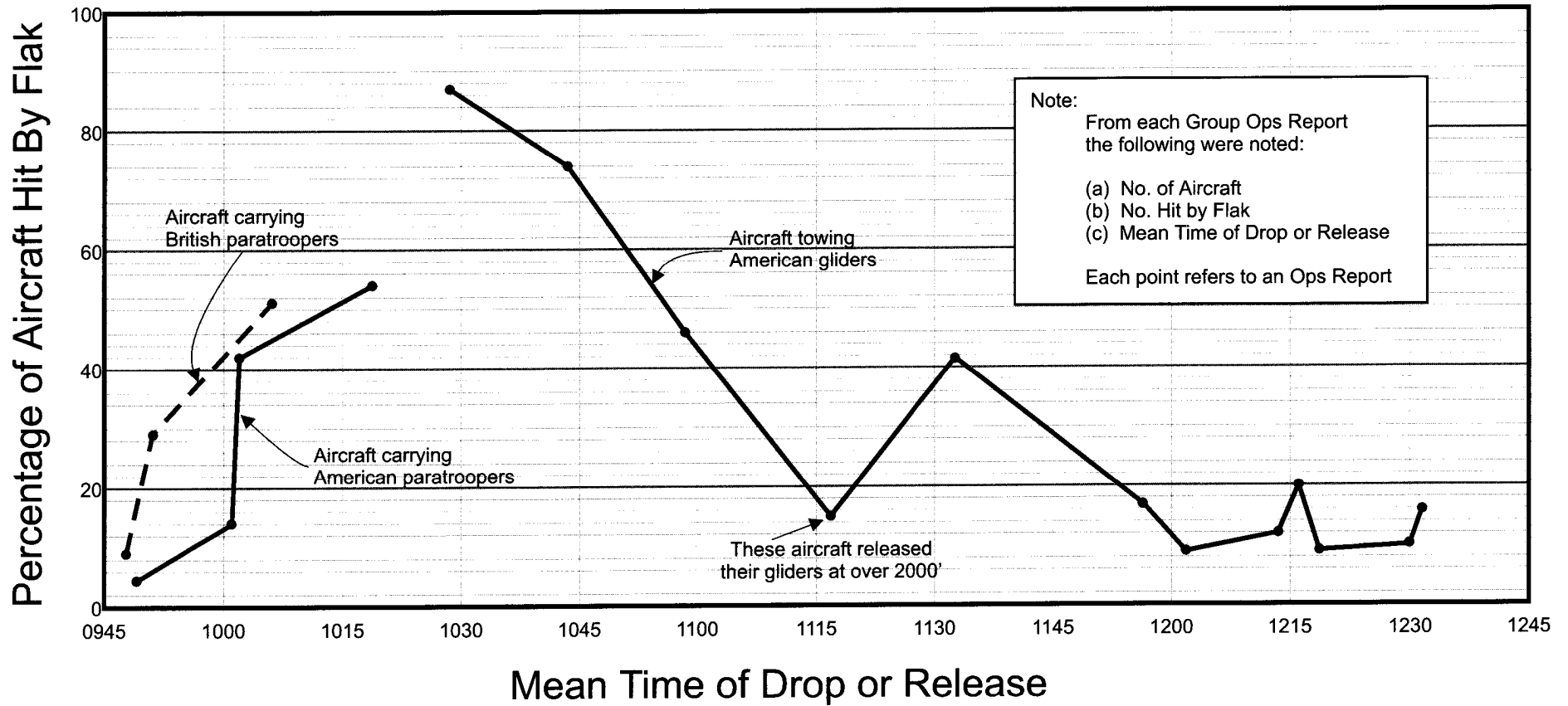
92 of them were visited by the ground investigators.

11 of these showed signs of damage or casualties that might be attributed to artillery, though not necessarily the Counter-flak programme.

CB Number	Map Ref	Weight of Bombardment	Findings of Investigators
191	16655217	133 rds Med (4.8 tons)	One of three 2 cm Vierlinge still in position but destroyed by Germans. Position heavily shelled, probably mostly by observed fire.
258	25654467	133 rds Med (4.8 tons)	Three 2 cm guns. No damage. 1 dead German. PW said that communications were out but this did not stop them from firing.
228	21184521	600 rds 25 lb Airburst and 400 rds 25 lb HE shells	Four pits with dummy guns but signs of recent occupation. One German grave dated 24th March. No craters found but airburst splinters in all 4 pits.
205	26374496	133 rds Med (4.5 tons)	Several craters near gun pits. Guns moved 500 yds on 24th March because of shelling, said PW. Burnt out 3/4-track ammn carrier found on site. Arty cut comms but did not stop firing.
230	242480	100 rds Med (4.3 tons)	8 German graves dated 24th March 1945. PW said both cluster bombs and arty killed men but guns continued to fire.
338	240483	100 rds Med (4.3 tons)	One German grave dated 24th March.
256	28704303	133 rds Med (4.8 tons)	Undated German graves. No signs of recent occupation.
1031	232474	400 rds 25 lb HE shells (4.5 tons)	One German grave dated 24th March, 1945. No signs of damage.
1016	25603911	1200 rds 25 lb airburst	Many craters found including craters in 2 gun pits.
221	21824955	200 rds Med (8.5 tons)	One gun pit probably hit by Arty. 4 dead Germans on site.
MM	21935007	100 rds Med and 40 rds in CB programme (5.8 tons)	Two gun pits received Arty hits. Guns destroyed by Germans. Two dead Germans found on site.

# Appendix "E"

## Incidence of Flak Damage to American Aircraft



## Appendix F

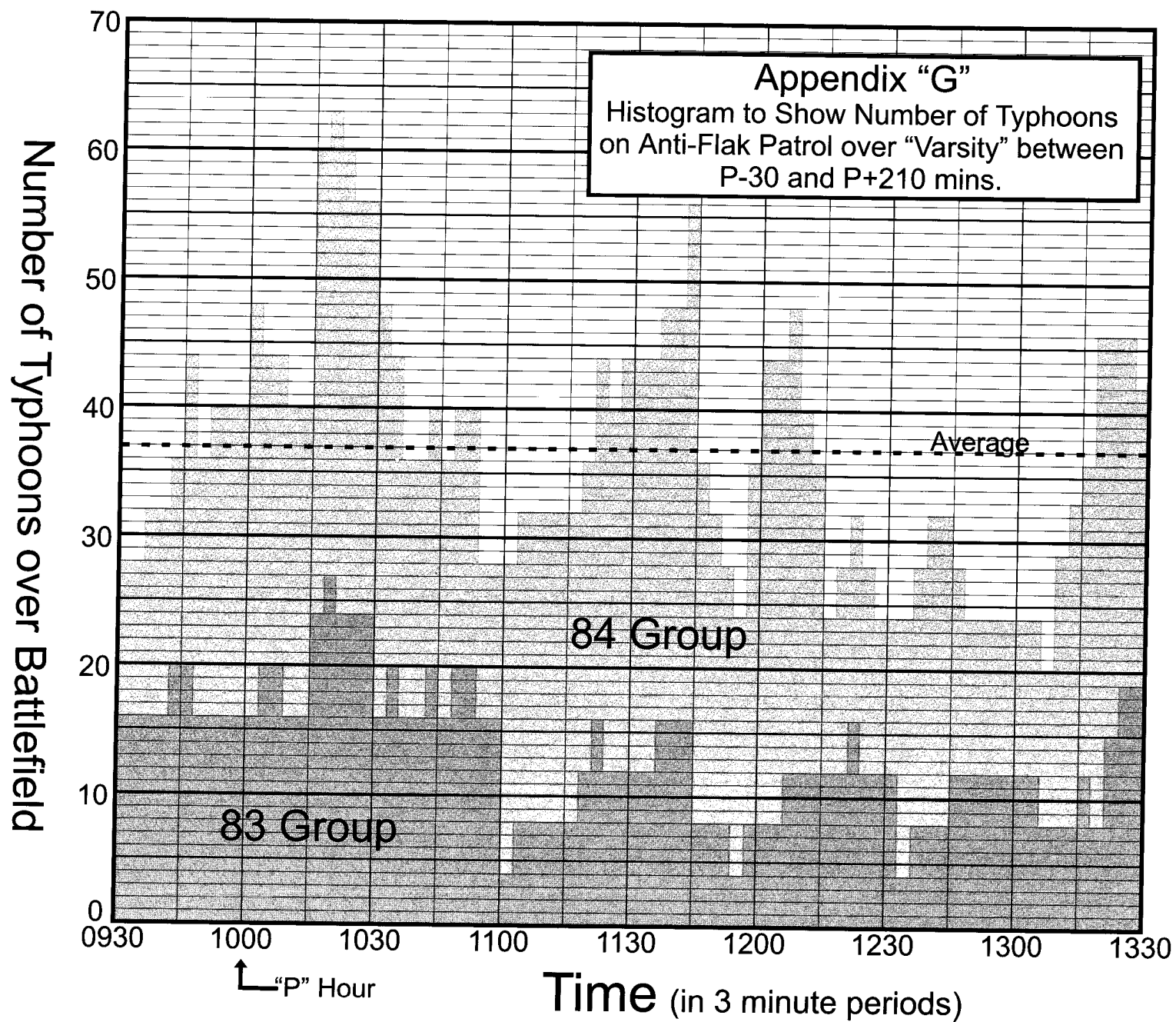
### Details of Fighter-Bomber Attacks

CB Number	Map Ref	No. of A/C	Attacked with	Claim	Finding
-	144606	4	28 RP	Att probable gun posn as "Limejuice" directed	No gun posn but RP hit farm 200 yds from pin point.
QA	20835700	10	78 RP	4 x 88 gun pits. Observed 2 salvos D/H. Appeared unoccupied.	Guns had been removed 21st March 1945. Accurate attack on unoccupied positions.
-	109589	3	6 x 500 lb Clusters	Att Intense LAA posn 109589 directly after rockets. Silenced flak posn A 1050	4 x 88 mm had fired from posn at 109589 on Saturday 24th March 1945. No sign of cluster bombs in the vicinity.
-	2847	4	16 RP	Att 6 LAA guns	No gun posns or rocket craters in the area.
-	2247 & 2148	4	22 RP	2 guns dest and 1 gun dest	6 triple 20 mm guns at 219494. Possible RP craters 500 yds away. 6 Triple 20 mm guns at 213492. Possible RP craters 400 yds away.
-	232515	8	55 RP	Flak posn dest	At 233517 was unoccupied posn with 4 RP craters very near. At 227516 2 RP craters near LAA gun pits, bullet embedded in one barrel (strafing?).
-	274485	4	8 x 500 lb Clusters	Bombed accurately. "Limejuice" reported "guns out"	At 275467 were 3 LAA posns that fired on 24th March 1945. No sign of cluster bomb attack.
	2945 & 264450	4	23 RP	4 guns 2945 ABTA NRO and 2645 LAA posn att NRO	No sign of guns or RP in this square (wooded). 3 LAA guns were at 264450 and later moved to 269450 because of arty shelling. No rockets.
MK	297451	4	24 RP	3 x 88 mm firing at 291434 att and silenced. Large fire left burning	4 x 105 HAA guns at 297431 had fired 24th March 45. Dest. by Germans. Several fires had broken out. No sign of rocket craters or debris.
	and 331435			LAA posn farmhouse att building partly demolished	6 triple 20 mm guns had fired from here, removed later. Rockets hit farm but not gun position.
-	172599	4	31 RP	Flak posn att ABTA. Guns not visible.	At 172602 were well constructed HAA posns (never occupied). 8 RP craters in NW corner of position.
-	2456	4	31 RP	LAA posn A2456 silenced.	At 232564 were 4 HAA sites (never occupied). Accurate attack but no guns.

CB Number	Map Ref	No. of A/C	Attacked with	Claim	Finding
-	309410	4	32 RP	Att LAA posns at 309410. NRO.	3 unfinished gun pits. No signs of occupation. RP hits in middle of posn.
	311409			311409 NRO	At 311407, LAA posn and telephone exchange. RP 200 yards away.
	314408			314408 NRO	3 LAA guns posns. No sign of RP.
154 177	2158	4	24 RP	Att probable flak posn 2158. ARTA.	At 210583 were 2 x 20 mm posns. RP hit building near LAA guns and killed Germans. Locals said also 4 HAA guns only 100 yards away had fired 24th March. No damage.
284	173600	4	24 RP	Att 6 LAA guns at A173600 and digging N side of target. ARTA.	At 175603 6 LAA posns apparently empty since Dec. 8. RP very near misses. No damage.
-	268463 & 269465	4	20 RP	Att flak posns A268463 & A269465	No sign of flak posn. Probable RP craters in vicinity. No flak posn. Attack on houses at 269468 with RP; badly damaged.
-	261512 & 269506	4	30 RP	Att flak posns 261512 (firing) & 269506 (firing)	No flak posn. 8 probable RP craters. No flak posn. 4 RP craters. Some signs of mobile guns having entered wood at 259517.
-	214578	4	31 RP	2 LAA gun pits 214578 seen and hit.	At 214577 3 x 20 mm guns fired on 24 March. Possible RP craters but no damage. At 215577 2 x 20 mm guns also fired 24 March. RP craters near guns but no damage.
-	2453	4	8 x 500 lb clusters	D/B 8 gun posn. A2453 bothering Spits. Guns silenced.	No guns posns in area except 2 single 20 mm guns at 251548. No sign of cluster bombs.
-	2748	3	20 mm cannon	Strafed gun posn N edge of Brunen. NRO.	Gun posn W edge of Brunen had been attacked by everybody. No signs of damage by strafing.
-	244543	4	32 RP	Att with RP and cannon A 244543 guns firing. Hits thought to have been scored; large flash seen.	2 single barrel 20 mm guns on edge of wood. Nearest RP crater 150 yards. No damage.
423	246485	4	24 RP	On open gun emplacements A246485. ARTA.	6 LAA positions. One 3.7 cm gun completely destroyed by rockets; others not hit.
314 315	325422	4	6 x 500 lb clusters	Gun posns A325422. ARTA.	Nearest posn 325426 had 6 cluster tails and many 20 lb F craters. No damage to guns which locals say did not fire due to lack of ammunition.
-	Area 2152 to 2449	4	32 RP and Cannon	Intense LAA area 2152 - 2449	At 223518 were 12 triple 20 mm guns. At 227516 were 6 more trillinge, one damaged by strafing. RP craters very near gun pits.

CB Number	Map Ref	No. of A/C	Attacked with	Claim	Finding
413	295467	4	29 RP and Cannon	Guns 295467 not firing.	3 x 20 mm vierlinge had fired from A 297465 24th March 45. One salvo very near gun pit. One German grave. No damage.
PZ	225567	2	16 RP	HAA posn 225567 firing at gliders. One salvo between 2 guns.	At 226569 one of 4 x 88 mm guns still on site damaged (probably arty, but possibly RP). RP craters very near.
-	261477	4	8 x 500 lb clusters	40 mm posn firing at Spits. ARTA.	No sign of cluster bombs at this point but 500 yards away was posn att by 2 Gp with many 500 lb clusters. Also HAA battery at 246473 had been attacked by clusters and 11 men KIA.
-	267476	4	32 RP and Cannon	No flashes. Att 4 gun posn 267476. ARTA.	No position at this pinpoint and no RP craters. Possibly same HAA site as referred to in previous entry, but no RP craters found.
-	223509	4	31 RP and Cannon	Gun posn active. ARTA.	No sign of any emplacement. Possible RP craters found, may have been aimed at an SP gun.
187	233585	3	6 x 500 lb clusters	Dropped slightly E of LAA posn	Found some distance from gun positions.
186	234582	1	2 x 500 lb clusters	Bombs right on HAA posn	No sign of canister remains found on site.
-	253479	4	6 x 500 lb clusters	One cluster right on non-active gun posn.	No sign of gun emplacement. Cluster bomb tails found.
-	323419	2	16 RP	Att active gun posn in wood.	No gun posn at this site but 1200 yds away 8 RP craters were found very near 3 guns pits where recent activity suspected.
-	322457	2	15 RP	Active gun posn. 4 RP direct hit on one gun.	Signs of 4 RP craters near one pit. Guns had been removed therefore probably undamaged.
QA 194	210569	4	8 x 500 lb clusters	LAA att but NRO.	Remains of clusters found on site but locals say guns removed 21 March, they then filled in gun pits and planted corn. Accurate attack on empty site.
-	202528	4	8 x 500 lb clusters	4 LAA guns in wood. ARTA.	No sign of position nor of cluster bombs.
392	279489	4	6 x 500 lb clusters and 2 x 500 lb HE	Gun posn direct hit with 500 HE	Nearest cluster bomb 25 yds from 3 LAA guns (281487). No damage. 500 HE were 100 yards away.
405	318484	4	8 x 500 lb clusters	7 lt flak guns and trenches. D/H but guns continued firing.	HAA posn at 314483 had been accurately attacked with cluster bombs but no sign of damage.

In addition 23 other attacks on gun positions were made by Typhoons of 83 and 84 Groups during the operation but it has not been possible to visit the sites, many of which were only 4 figure map references.



## **Appendix H**

### **Notes on Visibility in the Wesel-Bocholt Area 24 March 1945**

The meteorological conditions were such that any dust or smoke that rose was liable to be held in the lower atmosphere, thus some form of haze was only natural. What little wind there was came from the SE and brought with it smoke particles from the Ruhr industrial area, which was still functioning at the time. The smoke and dust from the medium bombing and the half hour's artillery bombardment no doubt added their smoke to the general haze.

This haze reduced the general visibility, but aerial photographs taken during the operation show that its effect was as nothing compared with the smoke which in places was so dense that many pilots declared it was a definite smoke screen put out by the Germans to confuse the landing. This suggestion has been investigated and seems to be unfounded. The aerial photographs showed many sources of smoke which were thought worth examining but in every case a perfectly genuine fire was found to be the origin; the inhabitants were questioned about the time and cause of such fires and nothing suggestive of intentional fire-raising for smoke generation emerged from the investigation. Although the ground survey party spent two weeks scouring the whole neighbourhood of the landing zones no trace of smoke generators was found, nor did interrogation of German prisoners yield any evidence.

Although the smoke and haze made the task of the Typhoon pilots very difficult (see Part II para 17) and although glider pilots were not able to locate their landing fields very well, quite a number of them stated that the smoke was more of a help than a hindrance because it tended to hide them from the German gunners; one American glider pilot went so far as to say that their losses would have been doubled if there had been no smoke.

# Flak Damage to American Gliders

Note: Glider pilots' reports were arranged in ¼ hour groups according to the time of release; then, for each ¼ hour group, the number in each damage category was expressed as a percentage of those operating.

