Canadian Military History

Volume 7 | Issue 1 Article 8

1998

Analysis of 75 mm Sherman Tank Casualties Suffered Between 6th June and 10th July 1944: Report No. 12

Report No.12 - No. 2 Operational Research Section

Analysis of 75 mm Sherman Tank Casualties Suffered Between 6th June and 10th July 1944

Long before the war it was evident that science would have much to contribute to the development of military equipment, and it was no surprise that research found such wide applications to the technically difficult but fundamentally amenable problems of Radar, Anti-aircraft and Fragmentation, to name only a few. These problems offered great possibilities to the well-established methods of the physical sciences. By contrast, the complexities of military tactics proved for a long time intractable, since even the smallest battle is a bewildering compound of variables, and new methods had therefore to be worked out before there could be any hope of results. In spite of these difficulties, each of the six Operational Research Sections set up at one time or another with the Field Armies achieved a considerable measure of success. But where the future is concerned, it is not so much *the results they achieved, however valuable, as the methods they used, that will matter. For the superficial details of battle may be altered in a moment by the introduction of a new weapon, while the underlying principles of warfare scarcely change from one century to the next.*

Introduction to *Operational Research in 21 Army Group,* (Waterloo: LCMSDS, 1998).

No.2 Operational Research Section operated under the direction of the Scientific Adviser to the 21st Army Group, Brigadier Basil Schonland. Together with his Canadian deputy Omand Solandt, Schonland, a South African physicist, had built a team of brilliant young scientists who looked at operational problems without the blinkers imposed by service loyalties, traditions or untested assumptions.

The OR section examined most of the major weapons systems in use in Normandy. The following report, No.12 - "Analysis of 75 mm Sherman Tank Casualties Suffered Between 6th June and 10th July 1944" continued pre-invasion studies of the performance of Allied armour, confirming the most pessimistic views about the inferiority of the Sherman tank. This report documented what every crew member knew: the Sherman was dangerously vulnerable to all calibres of German anti-tank guns. The statistics were stunning. Sixty per cent of Allied tank losses were the result of a single shot from a 75 mm or 88 mm gun and two-thirds of all tanks "brewed up" when hit. German armour-piercing shells almost always penetrated and disabled a tank; the armour offered so little protection that the only way to survive was to avoid being targeted.

It is significant that this was not a purely technical problem; nor on the other hand was it an analysis of the whole or a large part of a battle. It was somewhere midway between the technical and the operational; it was possible to isolate the problem, although the conditions of the battle were all-important. This survey necessitated much collection of information. It was welcomed as one of the first papers ever to provide accurate data on how armour should be distributed on tanks fighting in close country and represents a significant phase in the development of No.2 ORS.

1. Introduction

The following survey of 75 mm Sherman tank casualties suffered in NORMANDY between 6th June and 10th July deals only with casualties and not with terrain, extent of enemy opposition, etc.

General information on tank casualties is collected by REME on such subjects as total number of tanks damaged, total brew-ups and the seriousness of the damage inflicted, but at the suggestion of S.D. 2nd Army, more data was collected; in particular the number of hits to knock out a tank, the number of hits which have failed to penetrate, the proportion on front, sides and rear and their angles of penetration.

In order to obtain this information a representative sample of tank casualties was taken from those fronts where 75 mm Sherman tanks fought between 6th June and 10th July, data being collected both from recovered and unrecovered vehicles. To test that the evidence was, as far as possible, representative, the proportion within the sample of brew-ups, mined tanks and AP casualties was also found and this proportion compared with that given by AFV (Tech) and REME, 2nd Army, who had access on these points to all 75 mm Sherman tank casualties. Agreement was good so that any further evidence given in this report on angles of penetration, etc., can justifiably be assumed typical till proved otherwise.

2. Data Collected

The data collected is given in the following table:

Analysis of Sherman Casualties		
(i) Total tank casualties analysed:	45	
	Proportion of total tanks	
(a) Number penetrated by German AP shot	40	89%
(b) Number mined	4	9%
(c) Number damaged, unidentified but "brewed up"	1	2%
(ii) Total "Brewed up"	37	82%
(a) Number penetrated by shot and "brewed up"	33	73%
(b) Number mined and "brewed up"	3	7%
(c) Number "brewed up" by unknown causes	1	2%

Note: In several cases it is difficult to distinguish between penetrations of 75 and 88 mm particularly after the tank had "brewed up". Too much reliance must not be placed on the proportion of such penetrations though the proportion given agrees well with the estimated occurrence of such guns given by G.S.I.(A) 2nd Army, Main H.Q.

Estimates by fighting soldiers were found to be unreliable since many reported they had been knocked out by 88 mm, when in fact it had been 75 mm shot, while the reverse mistake has not yet been discovered.

Opposite: *A German photograph of a Canadian Sherman knocked out in Normandy. Two penetrations are visible, one in the centre of the side hull, and the second at the bottom of the turret towards the back.*

(iii) Tanks penetrated by German A.P. shot		
	Number of hits	Proportion of total hits
A. (a) Total hits recorded	65	
(i) 75 mm	53	82%
(ii) 88 mm	12	18%
(b) Number of penetrations	62	95%
(i) 75 mm pentrations	50	77%
(ii) 88 mm pentrations	12	18%
(c) Number of failures to penetrate	3	5%
(i) 75 mm failures	3	5%
(ii) 88 mm failures	Nil	0%
(d) Average number of hits to knock out a Sherman tank	1.63	
(e) Proportion of hits which knock out a tank	62%	

B. Distribution of Hits				
	Front	Sides	Rear	Total
Hull	7	24	6	37
Turret	12	12	4	28
Total	19	36	10	65

C. Distribution of Failures				
	Front	Sides	Rear	Total
Hull	0	0	0	0
Turret	1	1	1	3
Total	1	1	1	3

D. Distribution of number of hits required to knock out each tank.								
Number of hits	1	2	3	4	5	6	7	8
Tanks knocked out	21	11	2	1	-	-	-	1

E. Distribution of angles of penetration				
	0-5°	5-30°	30-90°	Total
Hull	20	12	5	37
Turret	12	11	2	25
Total	32	23	7	62
% Distribution				
Hull	32	19	8	59
Turret	19	18	3	40
Total	51	37	11	99
F. A further study of tanks that had fought but had not been penetrated was also made				
Total tanks inspected	124			
Hits failing to penetrate	8			

3. Discussion

1. The proportion of brewed up tanks is high and it is therefore important to know whether or not this must always be the case. A more recent examination of later battles, which is not yet complete, has shown that the 1st Bn Coldstream Gds (5 Gds Armd Div) have suffered fewer brew ups than other units, e.g., during operation "BLUECOAT" only 1 in 20 casualties, of which casualties at least 12 were due to penetrations. The unit concerned attributes this to the fact that they carry no extra ammunition outside the armoured bins. It should be recognized that in no recorded case in our sample has the extra outside applique armour resisted any hit, and therefore the protection afforded by keeping all ammunition in the bins is almost certainly due solely to the internal flying fragments failing to penetrate the ammunition.

2. The small number of A.P. hits failing to penetrate is noticeable. This small number has been confirmed by the opinions of technical adjutants, etc., who agree that the proportion was probably not above 5%. This opinion is in keeping with the calculated expectations of failures based upon penetration figures for 75 mm and 88 mm guns at the ranges of engagement estimated by tank crews. There have also been complaints at the apparently low resisting power of the

present Sherman armour. REME, 5 Gds Armd Div state that an AP.300 and an AP.500 Browning both fired at 100 yds range, penetrated 1/2 and 1 1/2 inches respectively into the turret armour' Added to this, it is at present the practice to recondition for service partially brewed-up tanks whose quality of armour might often be low.

3. From the data collected, it will be seen that the proportion of hits on the sides and front of the 75 mm Sherman tank is more or less equal and therefore, for up-armouring to be effective a large area would need to be strengthened. For instance, up-armouring the front of the tank so that in the cases considered it would have given 50% protection on this face, would only have decreased penetrations by 15%. In consequence, if changes are required it would appear wiser to use the extra weight-carrying of the 75 mm Sherman to take a better gun; ie., to make German tanks more vulnerable rather than to attempt to decrease our own vulnerability. This suggestion would appear to be in keeping with present policy.

4. Requests have been made by DTD for any additional battlefield data to assist decide [sic] *on* the optimum thickness of individual armour plates and on their optimum distribution On the evidence of this report, where tanks are expected to attack in country as, or more, enclosed than Normandy, it is recommended that an almost homogenous defence be assumed (a homogenous defence being defined as a defence where the enemy are able to hold their fire so long, they are as likely to hit from the side or rear as from the front: for the use of this convenient term see DTD armour reports). Therefore, for optimum armour distribution, etc., a "p.d.v." (probability directional value) for an almost homogenous defence should also be used.

It is considered that present homogenous German defence is due to ease of concealment and that, until better methods of spotting tanks and A/T are found, such a form of defence will continue and can safely be assumed for similar terrain. It should be carefully noted however that the present sample of tanks has been taken from a series of battles where our forces were nearly always attacking, and it may well be that, in defence, more frontal hits will be recorded.

A soldier from the 12th SS Hitler Youth Division examines a Sherman knocked out by German AP shot.