

## THE TANK MUSEUM PRIZE 2015\*

# Tanks in the ‘Hundred Days’ 1918 - A Diminishing Resource

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### ABSTRACT

*The opening day of the Battle of Amiens on 8 August 1918 saw the largest number of tanks engaged since Cambrai, the previous November. Thereafter the ability of the Tank Corps to mount large-scale tank attacks across an extended front was restricted by the numbers of tanks available. Tanks were inherently unreliable, and were vulnerable to artillery and adverse ground conditions. This article examines the factors which contributed to the reduction in numbers engaged and surmises that more tanks could have been made available were it not for the Tank Corps holding them back to build up a reserve in men and machines for 1919.*

### Introduction

With the debut of the tank in September 1916, a new dynamic was introduced to the stalemate of trench warfare. Winston Churchill maintained that tanks were used prematurely and their impact squandered before greater numbers were available.<sup>1</sup> They were a “work in progress”, though, being too unreliable and vulnerable to enemy artillery to be considered a means of breakthrough by themselves. However, as part of a combined arms offensive, as demonstrated at the Battle of Cambrai in November 1917, mass tank attacks contributed to the restoration of surprise on the Western Front. Their ability to crush wire defences avoided the need for a prolonged artillery bombardment in advance of an offensive and their sudden appearance alongside a crushing pre-registered barrage contributed to a shock and awe effect on enemy morale.

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\* Earlier this year, the BJMH in cooperation with the Department of War Studies at Wolverhampton University and the Tank Museum in Bovington, UK ran a competition for the best undergraduate or postgraduate essay on the First World War and Tanks. Roger Blaber won the Museum’s prize and was awarded his £1000 cheque at a special luncheon during the Museum’s ‘Tank Fest’ weekend in June 2015.

<sup>1</sup> W.S. Churchill, *The World Crisis 1911-1918* (London: Penguin Classics, 2007 [1931]), p. 315.

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The Battle of Amiens (8-12 August 1918) marked the commencement of the ‘Hundred Days’ offensive which culminated in the Armistice. The opening day saw 430 tanks engaged but by 11 August only 38 were in action.<sup>2</sup> Thereafter, tanks were not available in sufficient numbers to mount comparable mass attacks and, with the one exception of the Battle of St Quentin on 29 September when 173 tanks were engaged, tanks were mostly used only in smaller-scale operations. This period has not been extensively covered in the historiography of the war, particularly by comparison to earlier years, and whilst there are several works which focus on tanks throughout the war, tanks during the ‘Hundred Days’ are generally assumed to have been too few in numbers to have made a substantial contribution to the outcome. It is the apparent shortage of tanks at a time when record numbers were being produced which this article seeks to examine, how this determined the offensive capacity of the Tank Corps after Amiens and whether more tanks could have been available than were committed.

### **The Construction Conflict**

Producing tanks and their spare parts in the quantities and specifications required by the Tank Corps had been a source of conflict between the designers, manufacturers, politicians and War Office since the first tank came off the production line. The output of tanks in 1918, according to the *Official History of the Ministry of Munitions*, comprised 1,137 Heavy tanks and 145 Medium A (Whippet) Light tanks<sup>3</sup> Whilst production levels had improved, it was too late to make a significant difference to tank availability in the ‘Hundred Days’.

Balancing the operational needs of the Tank Corps in a period of rapid technological development against the manufacturers’ requirements for fixed orders and large production runs had been an ongoing problem. The Tank Corps wanted tanks urgently to meet their establishment, but they also wanted machines which incorporated the latest design changes. The continued production of the obsolete Mk IV well into 1918 was the most extreme example of this dichotomy, where development and production were out of step with Tank Corps requirements.

Output consistently failed to meet the optimistic production forecasts and had become of such concern that a special meeting of the Ministry of Munitions Council Committee was held on 1 August 1918, chaired by the Minister, Winston Churchill, who drew attention to a recent serious decline in output. Deliveries in July were

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<sup>2</sup> Bovington Tank Museum [BTM], E2006.515, ‘Elles Summary of Operations to GHQ, 29 October 1918’.

<sup>3</sup> *The Official History of the Ministry of Munitions*, vol. 12, *The Supply of Munitions*, Part III, ‘Tanks’ (Uckfield: The Naval and Military Press and The Imperial War Museum, [1921]) Appendix VI.

only 33% of the March estimates and, even after these forecasts had been revised, they still underachieved by 50%.<sup>4</sup> The reasons for these shortfalls included delays in finalising technical drawings, insufficient supplies of components, skilled labour shortages as a result of men being conscripted into the Army plus the onset of the influenza epidemic.<sup>5</sup> In recognition of the increasing importance of tanks, responsibility for tank design and production was concentrated in a new committee, the Tank Board, which held its inaugural meeting on 15 August 1918.<sup>6</sup> Its main function was to speed up production and improve existing machines whilst developing new models.<sup>7</sup> Although the immediate concern was to increase production in order to meet the operational needs in France, it was too late to influence the numbers of new tanks available during the 'Hundred Days' to any great extent, and the main emphasis was therefore to prepare for 1919.

Losses from enemy action aside, the durability of tanks in 1918 was extremely limited, and the number of tanks that could be maintained in fighting condition was prejudiced by a dearth of spare parts. In 'Notes on Fourth Army Operations', dated 11 August 1918 and subsequently presented to the Tank Board, it was noted that: 'The endurance of Heavy Tanks may at present be pit [sic] down to three days, after which Light Tanks must carry on.' A handwritten annotation in an unknown hand has added to the typescript version: 'or else a fresh force of Heavy Tanks'.<sup>8</sup> Elles had simultaneously written to the Tank Board that, from records of engine hours run and based on the average of a number of machines, a Mk V might be expected to run for just 200 miles, the limiting factors being the track driving wheels and bushes. In the case of a Medium A, life expectancy was 400 miles, the limiting factor here being the Coventry Chains (heavy-duty chains carrying the drive from the primary shaft to the gear shafts). He also made the point that, whilst high-mileage machines were still fit for training purposes, they were not fit for fighting.<sup>9</sup> In battle conditions and over unsuitable ground, parts could be expected to need replacing more frequently. Training and long approaches from railheads to the front line placed further strain on the limited life of key components. Design faults also contributed to early failure rates. The failures experienced and relatively short life of some parts reflect a technology which was at the cutting edge of its time. Remarkably short timescales from the drawing board to production and delivery gave little time to perfect the design before the focus had moved on to a newer model. Whilst always looking for

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<sup>4</sup> The National Archives [TNA]: MUN 4/6400, Ministry of Munitions Council Committee, 'Production of Tanks', 1 August 1918.

<sup>5</sup> *The Official History of the Ministry of Munitions*, pp. 65-66.

<sup>6</sup> *ibid.*, p. 67.

<sup>7</sup> TNA WO 158/867, Tank Board Minutes, 15 August 1918.

<sup>8</sup> TNA WO 158/867, "Notes on Fourth Army Operations", 11 August 1918.

<sup>9</sup> TNA WO 158/867, Letter Elles to Tank Board, 11 October 1918.

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faster, reliable and better armoured machines, the Tank Corps had to fight with what was available.

Mechanical failures and battle damage placed immense strain on the workshops in France. Their ability to maintain tanks in fighting condition was severely compromised by a grossly insufficient stock of spare parts. The allocation of sufficient spares to accompany newly delivered tanks had been an ongoing issue throughout 1917 and, with the demands being placed on the Tank Corps, had become critical in 1918. Elles wrote to Major-General Capper, Director General of the Tank Corps, in April complaining that tanks were being delivered without a stock of spare parts.<sup>10</sup> In reply, Capper blamed the Minister of Munitions, Winston Churchill, for pushing for the completion of tanks at the expense of maintenance parts.<sup>11</sup> Adhering to optimistic production forecasts was certainly a sensitive issue and it is quite possible that pressure was applied to maintain tank production at all costs.

In a letter dated 15 September 1918 the Army Council emphasised that:

A demand for Tanks should be interpreted to mean tanks and an adequate supply of upkeep spares and that no delivery is complete unless accompanied by these spares.<sup>12</sup>

The necessity for spares was again pointed out to the Tank Board on 3 October, and it was recorded that:

The General Staff had stated that they would rather have a less [sic] number of machines completed with spares rather than a large number inadequately equipped with spares.<sup>13</sup>

Whatever action was to be taken, it would be too late to alleviate the shortages in France. Tanks required constant maintenance and their propensity to breakdown was immense. Crews were expected to be able to carry out daily maintenance and servicing and to carry out further checks before going into action. Men with engineering experience were preferred as the ability to detect faults could avoid unnecessary breakdowns.<sup>14</sup> Nevertheless, the requisite level of expertise was often lacking. 8th Tank Battalion observed:

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<sup>10</sup> TNA WO 158/816, Letter Elles to Capper, 29 April 1918.

<sup>11</sup> TNA WO 158/816, Letter Capper to Elles, 30 April 1918.

<sup>12</sup> TNA WO 158/867, Letter Army Council to Tank Board, 15 September 1918.

<sup>13</sup> TNA WO 158/867, Tank Board Minutes, 3 October 1918.

<sup>14</sup> BTM E2006.2655.3 - 2nd Battalion Training Manual.

That a maintenance book was not sufficient to guarantee efficient repair work from men who have never had any previous mechanical training, or who do not possess mechanical instinct. - Many men are entirely ignorant of the fundamental principles of the engine and transmission and are quite incapable of detecting and remedying the simplest faults.<sup>15</sup>

The need was stressed that a workshop lorry, fully equipped with small parts, should follow each company into action. It was further noted that this had not been the case in recent actions.

Apart from running repairs carried out by the battalions themselves, workshops situated close to the front line carried out more complex repairs. During September, the No 2 Advanced Workshop War Diary recorded that 32 machines were made fit for action and despatched to battalions. This work included overhauling and replacing engines and epicyclic gears and fitting tracks and sprockets, armoured plates, magnetos, starters, dynamos and accumulators.<sup>16</sup>

Tanks undoubtedly often broke down unnecessarily for want of proper maintenance and spares shortages had a marked impact on the number of machines which could be put back into fighting condition. No indication has been found to quantify how many tanks were laid up for want of spare parts, but it seems likely that parts were cannibalised from salvaged tanks which could otherwise have been put back into service.<sup>17</sup>

### **Fit to Fight**

In the absence of sufficient numbers coming off the production line to replace the losses incurred during and after Amiens and an inadequate supply of spare parts to maintain the fleet and replace damaged components, the effective salvaging of tanks from the battlefield was of the utmost importance.

'Weekly Tank Notes' published by the Tank Corps and circulated to the General Staff at the instigation of Lieutenant-Colonel J. F. C. Fuller, provide a useful source of information on operations and tank numbers.<sup>18</sup> Number 21, issued on 4 January

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<sup>15</sup> BTM E2007.872 - 8th Tank Battalion War Experiences, Chapter I. Mechanical.

<sup>16</sup> BTM E1949.177.7, No.2 Advanced Workshop War Diary.

<sup>17</sup> Bryn Hammond, 'After Amiens: Technology and Tactics in the British Expeditionary Force during the Advance to Victory, August–November 1918' in Gary Sheffield and Peter Grey (eds.), *Changing War: The British Army, the Hundred Days Campaign and the Birth of the Royal Air Force, 1918* (London: Bloomsbury, 2013), pp. 55-72.

<sup>18</sup> Lieutenant-Colonel John F.C. Fuller, *Memoirs of an Unconventional Officer* (London: Ivor Nicholson, 1936), p. 343.

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1919, stated that 687 tanks were engaged during the Battle of Amiens of which 193 were ‘knocked out’.<sup>19</sup> These were either tanks which had been damaged beyond repair or, more likely, disabled by enemy action, although not necessarily permanently. Tank Corps HQ reported that, of the tanks engaged, 480 were handed over for salvage.<sup>20</sup> The higher number salvaged than ‘knocked out’ is probably down to tanks being salvaged which had broken down or ditched, as well as those which had suffered damage as a result of enemy action. In the 10th edition of ‘Weekly Tank Notes’ dated 12 October 1918, it was reported that since 8 August more than 250 tanks which had been knocked out by direct hits or other causes had been repaired at the Tank Corps workshops and sent back to the brigades. It was also noted that practically all of the equipment from immobile tanks which could not be recovered had been salvaged and overhauled for re-issue.<sup>21</sup> Great emphasis was placed on battalions recovering equipment from tanks which could not be made ‘fit’.<sup>22</sup> The ‘Central Workshops History’ noted that 544 tanks were received in August of which 269 were salvaged. One tank went through a cycle of being shot out of action, salvaged, repaired and handed back to the battalion no less than three times over a five-week period between 8 August and 8 September.<sup>23</sup>

Elles, now promoted to Major-General, reported to the Tank Board Meeting on 31 August ‘that he was repairing between 20 and 30 tanks a week and expected to lose up to date as unfit for repair a total of between 30 and 40’.<sup>24</sup>

More tanks were thus being put back into action than were being written off as irreparable. Salvaging tanks and equipment from the battlefield in the absence of sufficient deliveries of new tanks and spares was crucial to the Tank Corps maintaining some offensive capacity.

On 29 October 1918, Elles forwarded to GHQ a summary of Tank Corps operations between 8 August and 20 October. During this period, tanks had been engaged in 1,890 separate actions over 32 separate days.

8 August - 31 August	(14 days fighting)	1,184
1 September - 30 September	(9 days fighting)	397
1 October - 20 October	(9 days fighting)	309

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<sup>19</sup> BTM E1949.127, Weekly Tank Notes No. 21, Appendix A.

<sup>20</sup> Tim Travers, *How the War Was Won* (Barnsley: Pen & Sword, 2005 [1992]), p. 127.

<sup>21</sup> BTM E.1949.127.

<sup>22</sup> BTM E2006.2655.3 - 2nd Battalion Training Manual.

<sup>23</sup> BTM E.2006.1703, Central Workshops History.

<sup>24</sup> TNA WO 158/867.

630 fighting tanks were with the battalions on 8 August. All battalions started at a strength of 36 tanks; a total of 540 for the fifteen battalions then in place, excluding the armoured cars, plus a reserve of six tanks.<sup>25</sup> Although the official establishment of a fully-equipped tank battalion was 48 fighting tanks, the actual numbers of fighting tanks in a battalion never reached this level.

On 31 August 1918 the Tank Board was presented with a Return of Tanks for the week ending 19 August 1918, according to which 738 tanks in France were fit to fight just a week after the close of the Battle of Amiens.<sup>26</sup> However, this number included 250 of the obsolete Mk IVs, previously withdrawn from service. Four battalions were of necessity re-equipped with Mk IVs in the aftermath of Amiens, but by 14 September just 67 remained on battalion strength (of which 47 were fit to fight) with 106 in Central Stores.<sup>27</sup>

Tanks were in action almost continuously, apart from two weeks in September, when, having been fought to their limits, all tanks were withdrawn and placed in GHQ Reserve to refit and re-organise.<sup>28</sup> The numbers of fighting tanks with brigades peaked on 21 September at 410, preceding the Battles of the Hindenburg Line. It would seem that every effort had been made to gather as many tanks as possible for the forthcoming offensive, although not all the tanks with the brigades were adjudged to be 'fit to fight'.<sup>29</sup> On 27 September, 65 tanks were engaged, and for the main assault on 29 September the Tank Corps was able to muster 181 tanks.<sup>30</sup> Not all those with the brigades were necessarily fought, either because they were not called upon, were not deemed fit, were not sufficiently close to the front line, or were being held in reserve.

Battlefield conditions and the manner in which tanks were fought resulted in high loss rates. Two battalions of 4th Brigade fielded 34 tanks each on 29 September. Of these, only 14 reached their objectives and just 15 were fit for action the following day.<sup>31</sup> 5th Tank Brigade deployed 56 fighting tanks on 29 September of which 32 received direct hits.<sup>32</sup> In both these instances, not all the Brigade's battalions were engaged on 29 September, presumably being held back for actions on subsequent days.

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<sup>25</sup> BTM E2006.515 Elles Summary of Operations.

<sup>26</sup> TNA WO 158/867 - Return of Tanks, week ending 19 August 1918.

<sup>27</sup> TNA WO 158/867, Weekly Tank State Report, 14 September.

<sup>28</sup> BTM E2007.2254 Weekly Tank Notes No. 36, 19 April 1919.

<sup>29</sup> TNA WO 158/867, Weekly Tank State Report, 21 September.

<sup>30</sup> BTM E2006.515 Elles Summary of Operations.

<sup>31</sup> LHCMA 1/7 - 4th Tank Brigade Report on Operations.

<sup>32</sup> LHCMA 1/7 - 5th Tank Brigade Report on Operations.

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By 9 November the number of tanks with the battalions were down to nearly a third (240) of those held at the outset of Amiens. Not all fit fighting tanks reached the brigades, though. Some were with Central Stores or Central Workshops awaiting release to the brigades, whilst others were at the training schools. The numbers with the schools, particularly the new Mk V\*, continued to rise throughout the period when the brigades were desperately short of tanks. From 116, on 14 September, the numbers had risen to 205 by 9 November. This was nearly as many as the 240 tanks with the brigades on the same date.<sup>33</sup>

Whenever tanks were engaged, losses through enemy action or mechanical breakdown were heavy. Throughout September and through to November, tanks classified as unfit remained in excess of 700, more than double those still deemed ‘fit to fight’.<sup>34</sup> However, the numbers fought were also influenced by the availability of manpower to repair and man the tanks, the logistical issues in getting tanks to the front line and the tactical environment which determined how they were fought.

### **Manpower**

By mid-1918, the manpower shortage had become critical, with the BEF severely depleted after its losses in the spring German offensives. Industry was struggling to maintain output with insufficient skilled labour and amidst constant competition for priority between the military and the manufacturers. Despite this, the Tank Corps underwent a significant expansion in 1918. From a strength of 8,083 on 1 January 1918, the Corps had expanded by 57% to 12,698 by 30 September, having reached a high point of 13,336 in July, before the commencement of the ‘Hundred Days’. Although the Corps strength never reached the official establishment levels, it was mostly only down by 10%, and was never less than 80% of establishment, even after the losses of August and September.<sup>35</sup>

Skilled men to maintain and repair tanks were in constant demand and the workshops struggled to keep pace with the increasing numbers of tanks being delivered. According to Weekly Tank Notes No 50:

The Tank Corps was handicapped by the difficulty of securing an adequate number of really skilled technical men to carry out the repair and mechanical maintenance of machines. Serious as this difficulty was in the

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<sup>33</sup> TNA WO 158/867, Weekly Tank State Reports, 9 November.

<sup>34</sup> TNA WO 158/867, Weekly Tank State Reports, 14, 21 September, 12 October, 2 November.

<sup>35</sup> BTM E1949.127 Weekly Tank Notes No 26 - Appendix A, Strength and Establishment of Tank Corps, January–October 1918.

early days of the Corps, later on it became acute, when with the several expansions of the Corps, the supply of tradesmen available was utterly disproportionate to the numbers of combatant men enrolled.

This necessitated tank crews being trained in maintenance, leaving Central Workshops to undertake the more skilled technical repairs.<sup>36</sup> To what extent technical skills shortages in Central Workshops may have affected the number of tanks which could be returned to the brigades is unknown. It was certainly an issue, but the apparent success in repairing salvaged tanks suggests it was not a predominant factor in tank availability.

In his report of 29 October to GHQ on operations between 8 August and 20 October, Elles advised that the fighting strength of the Tank Corps at the outset was approximately 7,200 of all ranks, with 500 semi-trained reinforcements. Battle casualties for the period were high at 41% of the crews, totalling 3,188. Elles also stated that battalions started considerably under strength and that, as a result of casualties, the average fighting strength was 24 crews per battalion. Junior ranks, he reported, comprised mainly very inexperienced officers who required much training in mechanics, the use of ground and quick tactical action.<sup>37</sup> The continuous fighting in August and towards the end of September would have placed considerable strain on the ability of the Tank Corps to mount major offensives, regardless of whether sufficient tanks were available. Some months earlier, on 4 May, Fuller had noted in his diary that the supply of tanks was greater than the personnel available.<sup>38</sup> Some further insight is perhaps provided by a reference in the 2nd Battalion History, which records that at the end of August all battalions in France were called upon to send personnel home to form new battalions. The History goes on to observe that in October battalions had difficulty in putting just one company in action and that no trained reinforcements were in sight.<sup>39</sup>

There is no doubt that the casualties incurred were of such a magnitude that they would have placed a serious strain on the Tank Corps. Weekly Tank Notes No 4, published contemporaneously with the period in question on 31 August, reported that; 'the Tank Corps was deficient by 250 officers and 2,000 other ranks, representing about 30% of the fighting strength, although only 75% of these were casualties'.<sup>40</sup> What constituted a casualty is open to interpretation, but in Weekly

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<sup>36</sup> BTM E1949.127, Weekly Tank Notes No 50, 26 July 1919.

<sup>37</sup> BTM E2006.515, Elles Summary of Operations.

<sup>38</sup> BTM E1980.18, Fuller Diary.

<sup>39</sup> BTM E2006.2655, 2nd Battalion History, Chapter XII.

<sup>40</sup> BTM E1949.127, Weekly Tank Notes No 4, p.12.

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Tank Notes No 20 a distinction is made between battle casualties and wastage from sickness and other causes.<sup>41</sup>

Crew sickness and exhaustion was an ongoing problem that affected the resilience of crews and thereby the Tank Corps’ ability to maintain the tempo of operations. Ventilation on the new Mk V was particularly bad, with exhaust fumes being drawn into the tank itself. The temperature in a Mk V\* was recorded at 86.5 degrees Fahrenheit.<sup>42</sup> The combination of heat, carbon monoxide and petrol fumes had an extremely debilitating effect on crews in action and it could take several days before they were fit enough to resume. The limits of a crew’s endurance was generally 8 hours, after which they needed 48 hours’ rest.<sup>43</sup> A report on 1st Tank Brigade operations between 27 September and 30 September noted that:

The crews of Mk V tanks suffered very [sic] much from exhaustion. On 3 September the Mk IV crews were in a very dazed and exhausted condition, thought to be attributable to the long approach march.<sup>44</sup>

The Battle History Sheets for the 8th Battalion tell a similar story of exhaustion from heat and fumes. Second Lieutenant R. Dunlop reported that his crew were exhausted after the action on 29 September after covering two miles and being in action for just one hour.<sup>45</sup> Sergeant Vickery on 30 September reported that his crew were suffering from petrol fumes and badly shaken.<sup>46</sup> These comments are typical of the majority, although some crews were perhaps more resilient and were reported as fit, or else their commanders were more sanguine in their Battle Reports.

The availability of trained manpower was undoubtedly a serious issue and the constant attacks in August and towards the end of September had exacerbated the already stretched resources to such an extent that this may well have limited Tank Corps offensive capability. There is no evidence that crew availability prevented tanks being deployed, but the combination of casualties and exhaustion certainly had an effect on the tempo of offensives, which often could not be sustained beyond the first day without fresh crew and tanks. From the Tank Corps strength reported in

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<sup>41</sup> BTM E1949.127, Weekly Tank Notes No 20, 21 December 1918.

<sup>42</sup> TNA WO 158/867 - Paper on medical implications of ventilation and heat dated 18 September 1918, attached to 8th Meeting of Tank Board, 3 October 1918.

<sup>43</sup> Christopher B. Hammond, ‘The Theory and Practice of Tank Co-operation with Other Arms on the Western Front during the First World War’ (Unpublished PhD thesis, University of Birmingham, 2005), p. 381.

<sup>44</sup> BTM E2006.1771, 1st Tank Brigade War Diary.

<sup>45</sup> BTM E1975.176.3.2, Battle History Sheet, Tank No. 9385.

<sup>46</sup> BTM E2007.748, Battle History Sheet, Tank No. 9034.

Weekly Tank Notes, it seems there were reserves available which were not included in the 7,700 reported by Elles to GHQ. Given the expansion that the Tank Corps had undergone, it is quite likely that these men were not yet sufficiently trained to be utilised effectively, even had there been sufficient tanks available for them to crew.

### **The High Command**

J.F.C. Fuller, a highly intellectual senior staff officer with the Tank Corps, was scathing in his contempt for the military hierarchy of the BEF, whom he perceived to be hidebound traditionalists, incapable of understanding the new science of mechanical warfare.<sup>47</sup> Despite such criticism, there is no evidence to suggest that Haig and GHQ were in any respect 'anti-tank' in principle, or that there was any reluctance to commit to action as many tanks as were available. Tanks were indeed so important to GHQ that the Chief of General Staff (CGS), Lieutenant-General Sir Herbert Lawrence, was writing personally to the War Office in July 1918 to resolve a mechanical problem.<sup>48</sup> If anything, tanks were over-committed, but in too few numbers to be effective.

Buoyed by the success of Amiens, Haig sensed that victory was possible in 1918, although Churchill and the War Office were of the view that the decisive period of the war would be mid-1919 and were gearing up munitions, including tanks, accordingly. Haig was at pains to disabuse Churchill and to convince him that every effort should be made 'at getting a decision as soon as possible'.<sup>49</sup> That tanks featured prominently in his plans is made clear by a diary entry on 10 September, when he received a visit from General Seely, President of the Tank Board. Haig told him 'we ought to aim at finishing the war now and not to delay the provision of tanks until experiments showed we had a perfect design'.<sup>50</sup> Haig evidently wanted as many tanks as possible to help secure victory.

### **Logistics**

Elles reported to GHQ on 29 October 1918 that tanks were operating 30 miles from the railhead and that rail concentrations and assemblies for surprise attacks had gone practically without a hitch.<sup>51</sup> The Tank Corps had become practiced in transporting their 30-ton behemoths, but the practical implications of doing so were considerable. Railway bridges often had to be rebuilt to accommodate the wider and heavier loads, and specialised wagons were required, capable of carrying up to 40

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<sup>47</sup> BTM E1980.18, Fuller Diary.

<sup>48</sup> TNA MUN 4/280L, Letter Lawrence to War Office 11 July 1918.

<sup>49</sup> Gary Sheffield and John Bourne (eds), *Douglas Haig: War Diaries and Letters* (London: Weidenfeld and Nicolson, 2005) pp. 448-457.

<sup>50</sup> *ibid.*, p. 459.

<sup>51</sup> BTM E2006.515, Elles, "Summary of Tank Operations".

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tons.<sup>52</sup> Despite specially-adapted ramp wagons, enabling tanks to be detrained in an hour and twenty minutes, moves did not always go smoothly; 8th Tank Battalion complained that tank moves by rail were badly organised, definite information in respect of any move being seldom given.<sup>53</sup>

The capacity of railway lines was restricted, with tanks competing for passage with munitions and other essential supplies. Keeping up with the pace of advance, once the railheads had been reached, placed further strain on the mechanical durability of the tanks and their crews. The daily movement of tanks tested the endurance of the crews to their limits and mechanical problems had to be dealt with on the spot.<sup>54</sup> Long approach marches during offensives placed further strain on crews, who in some cases were so exhausted by the time that they reached the starting point that they were incapable of going into action.<sup>55</sup>

It was not only the tanks and their crews that had to be brought to the front line in readiness for offensives. Mass tank attacks required prodigious quantities of supplies to be assembled. In preparation for the Battle of Amiens, 4th and 5th Tank Brigades each required 80,000 gallons of petrol, 22,000 gallons of oil and 20,000 pounds of grease. Half as much again was scheduled to arrive on commencement of the battle, and ammunition was stockpiled to the extent of 50,000 rounds of high explosive shells, 10,000 rounds of 6 pounder case shot and 5,000,000 rounds of small arms ammunition.<sup>56</sup> The logistical challenge of planning a mass tank attack was consequently a massive undertaking which could not be initiated without massive disruption to the whole transport system and the vital infantry and artillery supply chains.<sup>57</sup> Organising a limited mass attack on an established position such as the Hindenburg Line made some disruption worthwhile, but to have planned any larger-scale offensives would have made any gains disproportionate to the effort required and could have actually jeopardised the offensive momentum. The pace of advance throughout much of the ‘Hundred Days’ militated against the logistical demands of tanks and required that they were constantly moving to keep up with the infantry to be used as and when required. Consequently, the time available to plan tank attacks on any scale was extremely limited, as corps and divisional plans could not be

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<sup>52</sup> Colonel A. M. Henniker, comp., *Official History of the War: Transportation on the Western Front, 1914-1918* (London: Naval & Military Press and Imperial War Museum, [1937]), pp. 307-313.

<sup>53</sup> BTM E2007.872, 8th Tank Battalion War Experiences, Chapter 6.

<sup>54</sup> LHCMA, I/7, Report on Operations - 4th Tank Brigade, 27 September to 17 October, 1918.

<sup>55</sup> LHCMA, I/7 Report on Operations - 5th Tank Brigade, 29 September to 5 October, 1918.

<sup>56</sup> Sir James E. Edmonds, *Official History of the War: Military Operations France and Belgium 1918*, vol. 4 (London: HMSO, 1947), Appendix VII, pp. 563-564.

<sup>57</sup> David J. Childs, *A Peripheral Weapon?: the Production and Employment of British Tanks in the First World War* (Westport, Connecticut: Greenwood Press, 1999), p. 182.

finalised until the evening preceding the following day's operations. As it was generally impossible for the tanks to be in position in time for a dawn attack, they invariably caught up with the infantry later in the day to assist in mopping up.<sup>58</sup>

Despite the logistical problems, it was still possible to mount some relatively large attacks in August and September. On 21 August, 183 tanks were engaged, and two days later 103 tanks were in action. Then, on 29 September, 181 tanks were assembled for the assault on the Hindenburg Line.<sup>59</sup> It is doubtful though that significantly more tanks could have been engaged without disruption to the offensive capacity of the other arms.

The logistical problems associated with the daily movement of tanks and their supplies to the advancing front also had a direct impact on the numbers immediately ready for action, and, although Haig and GHQ remained supportive of using tanks in offensives, the breadth of front and the pace of advance determined to a large extent how they were used. A combination of infantry with insufficient experience of working or training with tanks and the deployment of tanks in small numbers relative to the size of the front resulted in high loss rates, which in a vicious circle further reduced the numbers available.

### **Tanks in Action**

In a report written in the immediate aftermath of the Battle of Amiens, Fuller wrote:

Infantry Commanders do not yet appreciate the exhaustive nature of tank fighting. The taxi-cab system of using tanks, that is, of whistling them up whenever required, is still constantly used; and it is absolutely wrong.

He went on to reiterate that tanks should not be used to lead the infantry assault across open ground and specified the respective responsibilities of tanks and infantry:

The duty of the tanks is to silence the enemy's machine guns so that the infantry may continue their advance. Equally it is the duty of the infantry to silence the enemy's guns, so that the tanks may not be knocked out. This form of co-operation has not yet been cultivated...<sup>60</sup>

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<sup>58</sup> LHCMA, I/7, Report on Operations - 4th Tank Brigade, 27 September to 17 October, 1918.

<sup>59</sup> BTM E2006.515, Elles, 'Summary of Tank Operations'.

<sup>60</sup> Fuller, *Memoirs of an Unconventional Officer*, p. 313.

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Without a strong working relationship with the infantry to whom the tanks had been allocated, tanks were more vulnerable to enemy fire, as would often prove to be the case in the weeks that followed.

Tanks were in constant action for the remainder of August, such that, by 24 August, 1st, 3rd and 5th Brigades had only 53 tanks between them that were fit for action.<sup>61</sup> Apart from the two offensives involving more than 100 tanks on 21 and 23 August, tanks had been used piecemeal as required, but all too often without regard to their particular needs or weaknesses. On 1 September, the Chief of the General Staff, Lieutenant-General Sir Herbert Lawrence, reiterated the necessity for liaison between local commanders and Tank Corps officers in planning operations and in ensuring that precautions were taken to avoid unnecessary tank losses. These included ensuring covering smoke screens with artillery barrages and allowing sufficient time for tanks to reach the starting point.<sup>62</sup> However, in practice, the speed of advance gave little time for methodical planning or reconnaissance and tanks were increasingly used as and when available.

Elles’ report to GHQ towards the end of the ‘Hundred Days’, confirmed that the doctrine contained in S.S. 214 and Lawrence’s entreaties for close liaison, were not universally followed. Elles had concluded that the success of tank actions appeared to vary directly;

With the solidity of the hostile defence, the breadth of front of attack, the opportunities for previous training and liaison with the infantry with which tanks co-operate and effective cover from view by smoke and fog.<sup>63</sup>

His conclusions were borne out by the experiences of 2nd Battalion, who affirmed that effective liaison between tank and infantry commanders was essential. Their attack in conjunction with the Australians was considered to have been successful, to a large extent as a result of their previous combined training.<sup>64</sup> However, the pace of advance gave little scope for training, and this undoubtedly contributed to a higher loss rate when tanks found themselves without sufficient support, as a result of being attached to infantry with no previous experience of working with tanks.

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<sup>61</sup> Major Clough & A. Williams-Ellis, *The Tank Corps* (New York: George H. Doran Company, 1919), p. 346.

<sup>62</sup> Childs, *A Peripheral Weapon?*, p. 164.

<sup>63</sup> BTM E2006.515 Elles Summary of Operations.

<sup>64</sup> BTM E2006.2655.3 - 2nd Battalion Training Manual.

Elles had also noted in his report to GHQ that from 21 August, German anti-tank defences had 'stiffened considerably'.<sup>65</sup> The average rate at which tanks were knocked out in August had been around 25%, but the knock-out rate was often higher when fewer tanks were engaged. By September, the rate at which tanks were being hit had increased substantially to around 40%.<sup>66</sup> Elles's conclusion that the use of too few tanks increased the likelihood of them being hit was borne out by the observations of 2nd Tank Battalion that using insufficient tanks was invariably likely to result in failing to achieve the objective:

[U]sing tanks in small numbers is a vicious mistake. It saps the confidence of both the infantry and the Tank Corps...Where tanks are used, use them thickly, but do not use them everywhere and all along the front to be attacked.<sup>67</sup>

The experiences of individual tank commanders reinforce these conclusions. In his report of an action on 18 September, Lieutenant Smallwood of the 2nd Battalion suggested that tanks should be used in greater numbers when attacking strongpoints and that had four tanks been committed rather than two, not only could the position have been captured, but the capture of the other tank crew could have been prevented and his own tank could have been un-ditched.<sup>68</sup> The lessons of using too few tanks at short notice were again pressed home when on 21 September tanks of the 2nd Battalion were again engaged. Details of the attack were only learnt from the infantry at 4pm the previous evening and there was no time for any reconnaissance other than of the routes to the start line. Of 11 tanks, only eight reached the starting point and six of these were knocked out. The Battalion history concluded:

It is futile to use tanks in small numbers. Neither tanks or infantry were available in sufficient strength to take and hold their objectives. The opinion in the Battalion was to the effect that in the last two battles, tanks had been used and wasted in a manner contrary to all the experience that has been gained in tank tactics.<sup>69</sup>

The deployment of tanks in 'penny packets' undoubtedly increased losses and contributed to the decline in numbers available for action. It is of note, though, that Fuller, that most vociferous critic of Haig and GHQ, whilst deprecating the lack of

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<sup>65</sup> BTM E2006.515 Elles Summary of Operations.

<sup>66</sup> BTM E1949.127- Weekly Tank Notes No. 21, Appendix A, Summary of Casualties 8 August to 24 October 1918.

<sup>67</sup> BTM E2006.2655.3 - 2nd Battalion Training Manual.

<sup>68</sup> BTM, E2006.2676 - Battle History Sheet, Tank No.9118.

<sup>69</sup> BTM E2006.2655 - 2nd Battalion History.

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foresight in not having more tanks to fully exploit the advances, never complained that they should have been saved for mass attacks. Nor did he infer at any time that more tanks could have been deployed. In fact he applauded the Tank Corps's ability:

...to carry out a continuous battle of tank raids, thrust and retire operations, which through their paralysing effect on the enemy maintained for us an unbroken and general advance.<sup>70</sup>

Tanks were used whenever and wherever possible, and made a significant contribution to overcoming resistance, but they struggled to keep up with the increasingly fast-moving front, as a 4th Tank Brigade report on operations covering the period between 27 September and 17 October noted:

...it became an interesting problem and a new experience, moving tanks forward daily to keep in touch with the battle area in case they were wanted by the Corps to which they were allotted.<sup>71</sup>

In the six weeks leading up to the assault on the Hindenburg line, tanks were committed in such numbers as could be accumulated, often at short notice. They frequently suffered high losses as a result of not being used in greater numbers, being spread too thinly across a broad front, and without due regard to their vulnerabilities. Tanks were not central to the offensive but they were a ‘useful adjunct’. However, despite efforts being made to encourage closer co-operation with the other arms and infantry in particular, the pace of advance was such that attacks were often launched without sufficient pre-planning and resulted in a higher loss rate than might otherwise have been the case. Further mass attacks would have slowed the offensive, even if sufficient tanks could have been found.

### **Conclusion**

The dramatic decline in numbers after 8 August was not solely attributable to battle losses.<sup>72</sup> Many tanks may have suffered minor damage, mechanical breakdown, or simply ran out of petrol. However, even if the tanks were sound, their crews may have been unable to continue due to sickness from heat, exhaustion and asphyxiation.<sup>73</sup> Although battle losses were undoubtedly significant, an extensive and ongoing salvage operation ensured that many were eventually returned to action.

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<sup>70</sup> Fuller, *Memoirs of an Unconventional Officer*, (1936), p.316.

<sup>71</sup> LHCMA, I/7 Report on Operations 4th Tank Brigade, 27 September to 17 October.

<sup>72</sup> J.P. Harris, *Men, Ideas and Tanks* (Manchester: Manchester University Press, 1995), p. 179.

<sup>73</sup> Tim Travers, ‘Could the Tanks of 1918 Have Been War-Winners for the British Expeditionary Force?’, in *Journal of Contemporary History*, vol. 27, no. 3 (1992), p. 392.

According to the *Official History*, 582 tanks were handed over for salvage between 8 August and 27 September, of which only 14 were deemed irreparable.<sup>74</sup>

Tank production never achieved the ambitious targets which had been set and was consequently unable to fully meet the approved establishment for the Tank Corps. Furthermore, output from production was unable to replace the losses from the Battle of Amiens, and the Tank Corps was forced to fall back on its own resources. Despite considerable success in salvaging tanks from the battlefield, an ongoing failure to supply a sufficient volume of spare parts, jeopardised the Tank Corps's ability to maintain the tanks it had and resulted in some salvaged tanks being cannibalised for spares which could otherwise have been returned to the brigades.

Whilst Haig and GHQ were fully prepared to use tanks whenever and wherever possible, they were too few in number, too prone to mechanical breakdown and too unduly vulnerable to enemy artillery for them to be anything other than a useful auxiliary in offensives. Losses exceeded the rate at which tanks and crews could be replaced and 'the impression remained among infantrymen that tanks were decisive in set-piece battles but only a useful auxiliary in the extended fighting that followed'.<sup>75</sup> Nevertheless, tanks had become universally popular with the infantry in the aftermath of Amiens, resulting in them being in almost constant demand.<sup>76</sup>

Crucially, though, tanks were not of sufficient importance to determine the pace at which the advance progressed and to have incorporated their particular requirements into planned offensives would only have resulted in attacks taking longer to launch, thereby losing momentum and potentially reducing their impact.<sup>77</sup>

The difficulties of keeping up with the advancing front further affected the number of tanks available and the pace of advance often left insufficient time to plan attacks, or for effective liaison with the infantry. As a result, the deployment of tanks in small numbers, across a broad front, often with insufficient infantry support, led to higher loss rates and a further decline in the overall numbers.<sup>78</sup>

A shortage of skilled manpower to maintain and repair damaged machines and trained crew to fight them may have limited the number of tanks which could be

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<sup>74</sup> Edmonds, *Official History of the War*, vol. 4, p. 517.

<sup>75</sup> Shelford Bidwell & Dominick Graham, *Firepower, The British Army Weapons & Theories of War 1904–1945* (Barnsley: Pen & Sword, 2004 [1982]), p. 138.

<sup>76</sup> J.P. Harris with Niall Barr, *Amiens to the Armistice* (London: Brassey's, 1998), p. 150.

<sup>77</sup> J.P. Harris, 'The Rise of Armour', in P. Griffith (ed.), *British Fighting Methods in the Great War* (London: Frank Cass, 1996), p. 132.

<sup>78</sup> BTM E2006.515 Elles Summary of Operations.

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deployed but this does not seem to have been a major issue in determining the numbers of tanks which were fit to fight. Nor does it seem that skills shortages unduly affected the Central and Advanced Workshops, given their success in returning salvaged tanks to the brigades. Tank crews experienced high casualty rates and they were limited by their own endurance, but there is no evidence that the remaining crew numbers were insufficient to man the dwindling number of tanks with the brigades. Whilst the fighting strength of the brigades was in decline throughout the ‘Hundred Days’, in overall terms the Tank Corps seem to have had a larger theoretical fighting strength at the outset on 8 August than had been reported by Elles in his summary of operations for GHQ. Many of these men would not have been sufficiently trained to commit to battle, but it is improbable that a sizeable number could not have been found had the Tank Corps deemed it necessary.

A similar situation existed with the tanks themselves. A number of tanks which were reported as ‘fit to fight’ were not with the brigades, being held in Central Stores, Central Workshops, or the training schools. The latter in particular, were holding numbers of the latest Mk V\*s and by early November there were nearly as many tanks with the training schools as with the brigades. Furthermore, there were still plenty of the old Mk IVs in store, including those on Newbury racecourse. Although considered obsolete, those machines still with the Tank Corps were nevertheless fought with varying degrees of success.

The Tank Corps itself does not seem to have been unduly concerned with tank numbers. In the immediate aftermath of Amiens, some battalions could apparently muster no more than 16 fighting tanks, pending repairs and the issue of fresh machines.<sup>79</sup> Yet on 9 September, Winston Churchill, the Minister of Munitions, was outlining the state of the Tank Corps and its plans for future expansion to the Prime Minister, Lloyd George, reporting that, although the output of tanks was half of that expected; ‘Elles (Lieutenant-Colonel Hugh Elles, Commander in Chief Tank Corps) tells me that the tanks they have will see out the Tank men this year’.<sup>80</sup> Regardless of the apparent sanguine attitude to tank numbers, Tank Corps resources were so stretched that, after Amiens, the 7th and 12th battalions were re-equipped with the obsolete Mk IVs which they had only recently discarded.<sup>81</sup>

The inescapable conclusion is that more tanks and men, albeit of variable quality and standards of training, could in theory have been released to the front line in September and after. It is questionable though whether more tanks would have made

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<sup>79</sup> Clough & Williams-Ellis, *The Tank Corps*, p. 336.

<sup>80</sup> Childs, *A Peripheral Weapon?*, p. 127.

<sup>81</sup> Basil Liddell Hart, *The Tanks*, vol. 1 (London: Cassell, 1959), p. 177.

a significant difference at this stage of the campaign, although they may have reduced the level of infantry casualties. The Tank Corps may of course have committed more tanks had they known that the war would end in a few months, but it would have been reckless in the extreme to have utilised all their dwindling resources, leaving no reserve. Haig was of the opinion, on 21 September, that it would be possible to get a decision in 1918.<sup>82</sup> However the general expectation was that the war would continue, and the focus of the Tank Board and the Tank Corps in the autumn of 1918 was predominantly on preparing for 1919 and assembling a much larger force of tanks in the expectation that they would play a central role in the spring offensives. Fuller's implausible Plan 19 and Major General Harrington's more orthodox tactics envisaged offensives in 1919 which would employ tanks on a large scale across a broad front.<sup>83</sup>

At a meeting of the Tank Board on 10 October, Fuller, on behalf of Elles, responded to a discussion at the previous meeting concerning the desirability of holding at least 100% of tanks as a reserve. Elles' view was reported as being:

The whole of this year's fighting has accentuated the necessity for keeping a strong reserve of tanks in hand to make good losses. A reserve of machines is as essential as a reserve of men, and without it the fighting efficiency of tank units falls to pieces within 72 hours of their going into action.<sup>84</sup>

A month earlier, Elles had apparently told Churchill that the Tank Corps had sufficient tanks for the remainder of the year. Whilst more tanks and crews could conceivably have been released to the brigades, they would still have been too few to make a real difference and certainly not enough to make further mass tank offensives a practical proposition. Instead, it seems the Tank Corps were actively following Elles' credo in ensuring that sufficient machines and men were retained to form a core reserve on which to build for the 1919 offensive.

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<sup>82</sup> Sheffield and Bourne, *Douglas Haig: War Diaries*, p. 463.

<sup>83</sup> John Glanfield, *The Devil's Chariots* (Stroud: Sutton Publishing, 2001), p. 241.

<sup>84</sup> TNA WO 158/867, Minutes of Tank Board, 10 October 1918.