

The Development and Use of Armoured Vehicles in the First World War,
with Special Reference to the Role of Winston Churchill.

Submitted by Richard Adrian Hill to the University of Exeter
As a thesis for the Degree of
Doctor of Philosophy in History
In August 2020

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Abstract

Although their contribution in the Great War was limited, the use of armoured vehicles marked the commencement of significant changes in the nature of military operations. Late in the war, a report that was critical of Ministry management of tank production escaped the cloak of secrecy normally maintained by government departments. The report suggested Ministerial managerial standards fell well short of claims later made by Churchill.

This raised the question of other possible failings and whether more might have been accomplished by Britain's "secret weapon". It therefore appeared appropriate to consider the development of armoured vehicles with a view to establishing whether there was any justification for the proposition that the nation might have allowed a greater war-time contribution by armoured vehicles to have escaped its grasp.

Examination of military and Treasury files at the National Archives formed the core of the study. Transcripts of the hearings of the Royal Commission on Awards to Inventors, 1919/1920, were particularly relevant, these having received little attention in existing scholarship.

Findings revealed poor management by Churchill's Landships Committee in 1915 and later by the Ministry. The most significant finding was that inadequate briefing of the designers led to inappropriate specification for the first tanks. Many of the breakdowns associated with tanks in training and action at the Somme were predictable, the result of "old age", exceeding of design life. Poor management by the Landships Committee appointed by Churchill had firstly slowed the design effort then provided a specification inappropriate to army requirements. The consequences of delays and faults for operations in the war, notably for the Battles of the Somme, are a matter of speculation, but could have been significant.

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Acknowledgements

I would like to acknowledge the invaluable support and guidance of my supervisors, Professor Richard Toye, for his patience, speed of response and unerringly identification of elements of my thesis and research in need of further attention or redrafting and Doctor Gajendra Singh, whose contributions broadened the examination of my work at the key stages of progression and finalisation of the thesis.

I would also like to thank staff at the National Archives and Tank Museum and librarians, particularly at Exeter and Bath but also at many other libraries across the country, invariably obtaining the files or books requested and often making helpful suggestions about other useful sources of information.

Thanks are also due to my partner Celia for her support over the last four years, particularly in caring for my spaniel, Tank, on the occasions of my numerous lengthy visits to London, Exeter and other libraries and archives.

Abbreviations

2ic	- Second in Command
AA	- Anti-Aircraft
ADMT	- Assistant Director of Military Transport
AP	- Armour Piercing
AS	- Artillerie Speciale
BEF	- British Expeditionary Force
BofT	- Board of Trade
CGS	- Chief of the General Staff (HQ France)
CGV	- Charron, Girardot and Voigt
CIGS	- Chief of the Imperial General Staff
CID	- Committee of Imperial Defence
CMMG	- Canadian Motor Machine-Gun
CMWS	- Controller Mechanical Warfare Supply
CO	- Commanding Officer
Col.	- Colonel
CS	- Chief of Staff
DA	- Director of Artillery
DCMWD	- Deputy Controller Mechanical Warfare Department
DFW	- Director of Fortifications and Works
DG	- Director-General
DGMWD	- Director-General Mechanical Warfare Department
DSD	- Director of Staff Development
EEF	- Egyptian Expeditionary Force
FF	- Friendly Fire
GHQ	- General Headquarters
HB	- Heavy Branch Machine Gun Corps
IWC	- Imperial War Cabinet

KC	- King's Council
KOYLI	- King's Own Yorkshire Light Infantry
LAMB	- Light Armoured Motor Battery
MEF	- Mediterranean Expeditionary Force
MGC	- Machine-Gun Corps
MGO	- Master General of Ordnance
MM	- Ministry of Munitions
MOD	- Ministry of Defence
MT	- Mechanical Transport
MWD	- Mechanical Warfare Department
MWOAD	- Mechanical Warfare (Overseas and Allied) Department
MWSD	- Mechanical Warfare Supply Department
NA	- National Archives
NWFP	- North -West Frontier Province
OH	- Official History of the War
OHL	- Oberste Heeresleitung (Supreme Army Command)
OP	- Observation Post
RAP	- Regimental Aid Post
RFA	- Royal Field Artillery
RGA	- Royal Garrison Artillery
RNAS	- Royal Naval Air Service
SA	- Small Arms
SP	- Self Propelled
<i>The History</i>	- The History of the Ministry of Munitions
WO	- War Office
VPK	- Verheerstechnische Prüfungskommission (Traffic Engineering Examination Board)
WW1	- World War One

Photographs

Photo.	Subject
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2	S. W. Africa – Terrain/Port Problems, Landing via Raft.
3	Early RNAS Open Rolls Royce Armoured Car
4	Early Open-topped Belgian Armoured Car,
5	RNAS Seabrook Armoured
6	Simms War Car, April 1902
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8	Armoured Fowler, c. 1900
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11	Renault Model 1915
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13	AEC Experimental B-type, WO 1915.
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Introduction.

The Meteorological Office recorded the weather in Britain during September 1916 as generally dry and dull, the only notable adverse event being the mid-month passage of a depression across the country.¹ However, the papers contained news of the war reflecting a contrasting, bluer colour in the emotional spectrum. The news was imprecise but sufficiently detailed to constitute a genuine basis for optimism: optimism that would build as the war progressed.² Upon later reflection, many might have described the news as a shaft of light through a dark period of history in which the war had consistently failed to conform either to the initial spirit of optimism that, for some, had characterised Britain's entry into the conflict, or to restrained acceptance that was perhaps the response of many others.³

The newspapers of 16 September contained the first reports of a new British weapon.⁴ Censorship restricted descriptive details, thereby fuelling speculation:

Nobody talked of anything else yesterday but the 'tanks'....Every man has cherished dreams of wonderful mechanical contrivances that would be evolved in this war. The clangerous striding machines of Mr Wells' Martians and their terrible heat-ray have teased many a citizen's midnight imagination.⁵

Journalists played on the embarrassment of the enemy, whetted the public appetite and sought to occupy the moral high ground:

When the secrecy which rightly surrounds the construction and use of this most recent addition to our fighting machines can be lifted, we may perhaps be enabled to imagine the feelings of the German infantry in their shell-battered trenches when, in the uncertain light of dawn, they saw advancing upon them an army of unearthly monsters, cased in steel, spitting fire, and crawling laboriously but ceaselessly over trench, barbed wire, and shell crater.⁶

¹ Meteorological Office, *Monthly Weather Reports 1916*, https://digital.nmla.metoffice.gov.uk/collection_75a68cd2-cabe-43a8-98bb-3919f51e59a9/, accessed 5 June 2019.

² Basil Liddell Hart, *History of the First World War* (Trowbridge, Cassel, 1973), p. 332.

³ 'Great Ovation to the King and Queen: Crowds at Palace: Intense Enthusiasm', *Daily Telegraph*, 5 August 1914; Hew Strachan, *The First World War, vol. I: To Arms* (Oxford, Oxford University Press, 2001), p. 162; Catriona Pennell, *A Kingdom United: Popular Responses to the Outbreak of the First World War in Britain and Ireland*, (Oxford, Oxford University Press, 2012), *passim*.

⁴ 'The New British Attack', *The Times*, 16 September 1916.

⁵ "'Tank Talk", Exciting Day for Theorists', *Daily Mail*, 19 September 1916.

⁶ 'The Mysterious "Tanks" - Our Latest Military Weapon', *The Times*, 16 September 1916.

Such reports touched upon what would become an important element in the tank's armoury, namely psychological effects. According to Field-Marshal Sir Douglas Haig, Commander-in-Chief of the BEF:

So great has been the effect produced upon the German infantry by the appearance of British tanks that in more than one instance, when for various reasons real tanks were not available in sufficient numbers, valuable results have been obtained by the use of dummy tanks painted on frames of wood and canvas.⁷

The British press rejected German accusations that tanks breached international rules of warfare, holding British inventiveness to be outsmarting the enemy.⁸ Such accusations were unlikely to be taken seriously bearing in mind Germany had itself torn up the rulebook by the treatment of civilian populations in occupied territory and introduced chemical substances to the battlefield.⁹

Yet journalists made more of events than was justified. They falsely described British tactics in terms envisaged by those responsible for the development of the new machines, namely concentrated attacks.¹⁰ GHQ had not adopted such tactics but had dispersed the machines into small groups. As will be shown, both in terms of tactics and degree of success, the reality differed considerably from journalistic hype. Most tanks ditched or broke down before reaching enemy trenches.¹¹ It would be some time before equipment and tactics harmonised with early journalistic claims.

Much more might have been achieved, and well before 1916.¹² Opportunities for the development of mechanical warfare had surfaced many years earlier but had lain dormant owing to lack of vision and initiative. In December 1915, at the end of a two-

⁷ John Herbert Boraston (ed.) *Sir Douglas Haig's Despatches December 1915-April 1919* (London, J. M. Dent and Sons, 1919), Seventh Despatch, 21 December 1918, 'Advance to Victory'.

⁸ 'Sir D. Haig wins at small cost: Dash of the Tanks', *Daily Mail*, 18 September 1916.

⁹ See for example, Jean Michel Veranneman, *Belgium in the Great War* (Barnsley, Pen and Sword, 2018), pp. 33-43; John Keegan, *The First World War* (London, Hutchinson, 1998), pp. 91-93; John Horne and Alan Kramer, *German Atrocities, 1914: A History of Denial* (New Haven, Yale University Press, 2001), passim; Barbara W Tuchman, *The Guns of August* (London, Penguin, 2014), pp. 340-356. The initial release of gas from cylinders was, technically, not a breach of international law, which specifically forbade asphyxiating gas projectiles, but such distinctions were unlikely to impress adversaries and soon proved to be the start of the general introduction of such methods of warfare, see Paul Strong and Sanders Marble, *Artillery in the Great War* (Barnsley, Pen and Sword, 2011), p. 48; Ludwig Fritz Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford, Oxford University Press, 2002), passim.

¹⁰ National Archives, WO158/843, Robertson (on behalf of Lloyd George) to Haig, 25 July 1916.

¹¹ Chris McCarthy, *The Somme: The Day-by-Day Account* (London, Arms and Armour, 1993), pp. 100-109.

¹² 'Naval and Military Intelligence: The Simms Motor War Car', *The Times*, 5 April 1902.

hour speech on achievements by the Ministry of Munitions, Lloyd George had criticised progress since August 1914:

Ah! Two fatal words of this War! Too late in moving here. Too late in arriving there. Too late in coming to this decision. Too late in starting with enterprises. Too late in preparing. In this War the footsteps of the Allied forces have been dogged by the mocking spectre of "Too Late" and unless we quicken our movements damnation will fall on the sacred cause for which so much gallant blood has flowed. I beg employers and workmen not to have "Too Late" inscribed upon the portals of their workshops: that is my appeal.¹³

His accusations were, in reality, aimed at the War Office and politicians.¹⁴ Additionally, it will be shown that Lloyd George's remarks applied more widely than he may have appreciated. Firstly, he himself, along with other tank aficionados of 1915, was deserving of elements of the criticism he eloquently directed at others. Secondly, the period over which the criticism applied extended back for more than a decade, during the greater part of which his party had been in power and he had occupied senior Ministerial office.

The historiography contains considerable justification for Lloyd George's criticism. Later actions showed that the army and nation in general would raise its game to secure victory. However, the existing literature neglects several significant issues. By inadequately recognising the prospective impact of advances in technology on the nature of warfare, the government and Army Council failed to make appropriate preparations.¹⁵ Consequently, before the war, no provision was made in terms of motor traction for movement of artillery or supplies over difficult terrain and there was no experimentation with armoured fighting vehicles.¹⁶ On the eve of war, Crompton's pleas for SP guns were rejected by the Army Council, "the matter has been carefully considered and it has been decided not to take up at the present time the question of designing a gun of this nature".¹⁷ Indeed, minimal armoured protection was provided

¹³ Hansard, HoC debates, statement by Mr. Lloyd George, 20 December 1915, 96-165.

¹⁴ Richard Toye, 'Lloyd George's War Rhetoric, 1914-1918', *Journal of Liberal History*, 77, Winter 2012-13, pp. 24-29 (p. 27).

¹⁵ Peter Simkins, *Kitchener's Army: The Raising of the New Armies 1914-1916* (Barnsley, Pen and Sword, 2007), pp. 5-9.

¹⁶ Tank Museum, 0.69.01(41) Crompton, Crompton to Secretary War Office, 17 June 1914, Crompton, experienced in the problems of haulage over rough ground, had for some time been seeking the provision of military supply vehicles with 8ft. diameter wheels and the construction of mechanically propelled field guns.

¹⁷ Tank Museum, 0.69.01(41) Crompton, Guthrie Smith to Crompton, 29 July 1914, the content of the letter extended to just seventy-seven words. Colonel Rookes Crompton had served with the Royal Engineers in the Boer War and was appointed Honorary Colonel of the London Engineers in 1911(London Gazette 23 June 1911); National Archives, T173/34B, Royal Commission on Awards to

for any units on the 1914/1915 battlefield, leaving personnel vulnerable, with little alternative but to go to ground, or, in the case of artillery, to provide indirect fire support.¹⁸

The government compounded errors associated with inadequate pre-war preparations by inefficient supply procedures and by adoption of inappropriate specifications. Scholarship fails to draw adequate attention to management weaknesses or to the degree to which Churchill, who was in part responsible for elements of the shortcomings in tank production during the war, later fought to inflate and burnish his personal role in developing tanks. The engineers and industrial managers, upon whose efforts the quality of new machinery/vehicles depended, appear neither to have been rewarded appropriately nor to have enjoyed the status warranted by their abilities and knowledge. Marder draws attention to Fisher's reform programme which, to a degree, reduced efficiency penalties suffered by the navy through stigmatisation of engineering and engineer officers.¹⁹ There appears to have been no equivalent pre-war reform in the Edwardian army. Evidence of this is apparent from the lack of involvement of appropriate engineers in conferences to determine future tank design and development. This weakness was particularly significant when the BEF first came to use tanks, ignorant of engineering considerations adversely impacting reliability, a consideration which should have influenced tactics.

Delay in taking advantage of the attributes of armoured vehicles seems likely to have increased the scale of casualties early in the war.²⁰ Subsequent design and construction difficulties further restricted the contribution armoured vehicles were able to make towards the successful conclusion of the conflict. The firepower of tanks may have been marginal compared to that of artillery but tanks had the ability to target direct fire onto enemy strongpoints from forward positions with infantry. Edmonds

Inventors, Crompton claimed that, in South Africa, Lord Roberts moved him from electrical engineering to "organise the mechanical transport": he subsequently formed the Mechanical Transport Committee in London, later becoming consulting engineer to the Road Board.

¹⁸ James E. Edmonds, *History of the Great War, Military Operations, France and Belgium, 1914, vol. I* (London, Macmillan, 1933), pp. 106-111 and 256-257; Strong and Marble, *Artillery in the Great War*, pp xviii-xxiii.

¹⁹ Arthur Marder, *From the Dreadnought to Scapa Flow: The Royal Navy in the Fisher Era, vol. I, The Road to War 1904-1914* (Barnsley, Seaforth Publishing, 2013), pp. 29-33.

²⁰ National Archives, WO32/11357, Director of Staff Duties to President, Reorganisation Committee, 28 June 1919.

draws attention to many instances of tanks being called upon to keep the advance flowing during the Hundred Days:

As soon as it became light many (tanks) fell victims to the enemy's forward guns. Their effect was largely moral. They were only used in small packets to assist the infantry, and did good service in crushing machine-gun posts and in village fighting. The infantry liked to see them".²¹

In earlier wars, and at Le Cateau, infantry had valued having artillery fighting alongside them. However, in such positions tanks were excessively vulnerable to direct or observed and adjusted fire. Ministry suppliers and military commanders were slow to address this vulnerability.²²

Although press reports in September 1916 stirred public imagination, the events they described might easily have been misinterpreted as a minor change in battlefield tactics. However, the appearance of the first primitive and unreliable tanks represented a significant, tangible marker of forthcoming major changes in the conduct of warfare. Many in the army failed to recognise the importance of events that were unfolding, though, in an imprecise and emotive way, the significance of the first use of tanks seems to have been recognised by the enthusiastic response of the public. Army doubters did not include Haig, BEF Commander-in-Chief from December 1915. Under a Commander with less vision, the extent of unreliability might have resulted in withdrawal from the experimental project. It was however fortunate that Haig immediately saw the significance of the moment and the potential to reduce casualties.²³ Within hours of their first use, he had asked for five times the original number of tanks.²⁴ At a conference four days later Haig's staff made an order for 1,000 tanks.²⁵

²¹ James E. Edmonds, *Military Operations France and Belgium, 1918, vol. V* (London, Naval and Military Press, 1993), p. 577.

²² National Archives, MUN4/5206, 15 October 1918, Armament Construction Officer to Controller MM, reporting unsatisfactory trials of 6-pdr smoke shell; Deputy DSD to Controller MM, 8 November 1918, specifying improved arrangements for production of smoke by chemical means from tank exhausts; WO158/832, 1 September 1918, Lawrence to First, Second, Third, Fourth and Fifth Armies, advice on the "proper use" and protection of tanks, including copy of captured German document dated 23 July on "Organization of Anti-Tank Defence".

²³ Livesay, *Canada's Hundred Days: With the Canadian Corps from Amiens to Mons, Aug. 8-Nov. 11, 1918* (Toronto, T. Allen, 1919), Livesay supports Haig's assessment of the beneficial effect on casualty numbers, pp. 43-45, 54-55.

²⁴ Ernest D. Swinton, *Eyewitness: Being Personal Reminiscences of Certain Phases of the Great War including the Genesis of the Tank* (London, Hodder and Stoughton, 1932), p. 286.

²⁵ National Archives, WO158/836, Recommendations for the expansion of the Heavy Section (Tanks), Machine Gun Corps, put forward by Major-General Butler, Deputy Chief of the General Staff, GHQ, France, at a conference held on 19 and 20 September 1916, pp. 1-2.

Praise is due to the Commander-in-Chief for recognising the potential value of armoured vehicles but earlier lack of foresight by senior military personnel should not be overlooked. Along with other senior officers and politicians, Haig was many years “Too Late” in recognising the contribution that could be made to the efficiency of warfare through the combination of the new technologies of motor vehicles, machine-guns and light artillery. Over the preceding two decades there had been many indicators of the likely human and financial costs of warfare in nineteenth century mode on a battlefield bristling with twentieth century weapons.²⁶ Such indicators were to leave no mark in terms of mechanical and associated tactical progression. The potential for beneficial change provided by developing technologies was not generally appreciated.²⁷ Yet there was much debate over the value and tactical use of machine-guns in the pre-war period. Notably, on the eve of the First World War, Major-General Altham, drawing substantially from experiences in the Russo-Japanese War, provided a clear summary of advantages, disadvantages and tactics. However, his assessment was based on a more mobile form of warfare than would materialise on “The Western Front”. His book did not address response to entrenched stalemate along lines forecast by Jean De Bloch.²⁸ Similarly, he did not consider whether there might be a role for armoured cars such as sent by the Italian Army to Libya in 1912.²⁹

Shimshoni has drawn attention to this failure by national leaders to utilise the opportunities provided by new technologies, “Of the historical lessons, the ones most missed by the leaders of 1914 were those regarding the impact of evolving technologies”. He postulated that the “knowledge and basic technology to produce

²⁶ Michael Howard, ‘Men against Fire: Expectations of War in 1914’, *International Security*, 9, 1, 1984, pp. 41-57, (pp.42-43); T. H. E. Travers, “The Offensive and the Problem of Innovation in British Military Thought 1870-1915.” *Journal of Contemporary History*, 13, 3, 1978, pp. 531–553, (pp. 537-538).

²⁷ Studies of the Russo-Japanese War suggested large-scale casualties would be sustained in crossing the *fire-swept zone* in front of entrenched enemy positions. See, for example, Tim Travers, *The Killing Ground: the British Army, the Western Front, & the Emergence of Modern Warfare 1900-1918* (Barnsley, Pen and Sword, 2009), pp. 43-46, 62-65 and 250-251 and ‘The Offensive and the Problem of Innovation in British Military Thought 1870-1915’, *Journal of Contemporary History*, 13, 3, 1978, pp. 531–553, (pp. 534-537).

²⁸ E.A. Altham, *The Principles of War, vol. I* (London, Macmillan, 1914), pp. 309-331. It would appear Altham had intended to produce a second volume, but it seems likely the matter was allowed to rest after the experiences of the war had rendered volume I of value only as a historical snapshot of past procedures rather than a textbook to guide future operations; Tim Travers, “Technology, Tactics, and Morale: Jean De Bloch, The Boer War, and British Military Theory, 1900-1914”, *Journal of Modern History*, 51, 2, (1979), pp. 264–286, (pp. 264-267).

²⁹ W. H. Beehler, USN, *The History of the Italian-Turkish War September 29, 1911 to October 18, 1912* (Annapolis, The Advertiser Republican, 1913) pp. 94 and 105.

tanks and armored cars was surely available to all by 1912”.³⁰ Although his comments are substantially correct, the claim that the technology to develop tanks was available to “all” did overstate the pre-war spread of such technology. On the other hand, he understated the length of the period in which the technology to produce armoured cars had been available and in which the technology to produce tracked vehicles had been available to a more limited group of nations.³¹

Reasoning behind the failure of the military profession to take greater advantage of developing technologies has exercised many minds. Grissom has pulled together earlier thoughts from the scholarship and categorised four ‘models’ against which military response to innovation has been examined.³² He awards special acknowledgement to the work of Posen who had earlier concluded that “Military oppose innovation”, whereas civilian intervention “is often responsible for the level of innovation and integration achieved in a given military doctrine”.³³ Posen’s conclusions are supported by others, including Beard and Zisk.³⁴ These analysts share Posen’s views of the importance of civilian involvement in innovative military progression. Being large bureaucracies, Posen concluded that military organisations are intrinsically inflexible therefore hard to change or that they are inflexible as between services.³⁵ He judged, according to the major models, that “senior officers and/or civilians are the agents of innovation. They recognize the need for change, formulate a new way of warfare” and “manipulate the organization into compliance.”³⁶ Recent research is related primarily to Interwar or Cold War periods and the initial inclination is to devalue their relevance to earlier periods. However, elements correlate well with initial British experience with armoured vehicles, firstly the cold-shoulder to

³⁰ Jonathan Shimshoni, ‘Technology, Military Advantage, and World War I: A Case for Military Entrepreneurship’, *International Security*, 15, 3, (1990), pp. 187-215, (passim).

³¹ E. Bartholomew, *Early Armoured Cars* (Princes Risborough, Shire, 1988), pp. 3-11; Tank Museum, 623.437.425(41), Derrick Warren, *The Hornsby Tractors: A Brief History of the chain-track “Caterpillars” from Grantham*; Richard M Ogorkiewicz, *Design and Development of Fighting Vehicles* (London, MacDonald, 1968), pp. 25-26.

³² Adam Grissom, The Future of Military Innovation Studies, *Journal of Strategic Studies*, vol. 29, No. 5, (2006), pp. 905-934 (p. 908).

³³ Barry R. Posen, *The Sources of Military Doctrine: France, Britain, and Germany between the World Wars* (Ithaca N.Y., Cornell University Press, 1984), p. 227.

³⁴ Edmund Beard, *Developing the ICBM: A Study in Bureaucratic Politics* (New York, Columbia UP, 1976), pp. 145-194 and Kimberly M. Zisk, *Engaging the Enemy: Organization Theory and Soviet Military Innovation 1955–1991* (Princeton, Princeton UP, 1993), pp. 178-183.

³⁵ Adam Grissom, The Future of Military Innovation Studies, *Journal of Strategic Studies*, vol. 29, No. 5, (2006), pp. 905-934, (p. 919).

³⁶ *Ibid*, p. 920.

the armoured car, then the shelving of the tank concept in February 1915. However, the army could not restrict civilian thought. Churchill, Stern, d'Eyncourt, Crompton and Tritton were all civilians and Wilson was essentially a civilian, simply joining up in 1914, over-age, "to do his bit". Additionally, Posen's observation, that "innovation should occur mainly when the organization registers a large failure, or when civilians with legitimate authority intervene to promote innovation", duly came to pass in 1915/16.³⁷

Grissom acknowledges the need for more work to assimilate bottom-up innovation into models that are essentially top-down.³⁸ Past relevance of bottom-up developments with armoured vehicles is exhibited by Wilson and Tank Corps workshops in France and by the many units operating armoured cars in Asia and Africa, where climatic conditions gave additional impetus to localized modifications/innovations.³⁹

Some point to the achievements of the cavalry in modifying and enhancing its role during the early years of the century.⁴⁰ This raises the question of whether armoured cars were necessary. However, cavalry and armoured cars had distinctive attributes, which in many circumstances could prove complementary.⁴¹ This was frequently demonstrated in the Palestine campaign, for example at the Musmus Pass where "it was undoubtedly largely due to their (armoured cars) effective support that our casualties were so negligible".⁴² Whereas cavalry possessed the major advantage of speed over many forms of unmetalled countryside, armoured vehicles offered a degree of protection from shrapnel and small-arms fire, though could utilise speed only on roads or relatively hard-surfaced dry terrain.⁴³ Fletcher's work is particularly

³⁷ Posen, *Sources of Military Doctrine*, pp. 224-225.

³⁸ Adam Grissom, *The Future of Military Innovation Studies*, *Journal of Strategic Studies*, vol. 29, No. 5, pp. 905-934, (p. 930).

³⁹ David Fletcher, *War Cars: British Armoured Cars in the First World War* (London, HMSO, 1987), *passim*.

⁴⁰ Spencer Jones, *From Boer War to World War: Tactical Reform of the British Army, 1902-1914* (Norman, University of Oklahoma Press, 2012), pp. 185-190.

⁴¹ David Kenyon, *Horsemen in No Man's Land: British Cavalry and Trench Warfare 1914-1918* (Barnsley, Pen and Sword, 2011, pp.210-214; report by Kavanagh, 27 May 1915, reproduced in Murray Sueter, *The Evolution of the Tank: A Record of Royal Naval Air Service Caterpillar Experiments* (London, Hutchinson, 1937), pp. 35-37.

⁴² George Alexander Weir, 'With the Fourth Cavalry Division in Palestine', *The Cavalry Journal*, July 1920, pp. 189-206, (p. 202), Weir records the LAMB "afforded very great assistance both during the advance through the Musmus Pass....and during the action itself their presence was found to add considerably to the confidence of the vanguard".

⁴³ Sam Cottingham Rolls, *Steel Chariots in the Desert: The Story of an Armoured-Car Driver with the Duke of Westminster in Libya and in Arabia with T. E. Lawrence* (London, Jonathan Cape, 1937), pp. 45-57; 'Rescue of Tara Prisoners: Motor-Car Race across the Desert', *The Times*, 22 April 1916 - the

instructive in revealing the variety and extent of interest in and use of armoured cars by all ranks in a number of army operational units once the lid was taken off military use of these innovative machines by Army Council acceptance in 1915 of elements of "Winston's Circus".⁴⁴ It is regrettable that this receptive reservoir of talent and operational capability was not tapped before 1915.⁴⁵

Bloch's prediction of military stalemate had not been accepted in Britain or internationally.⁴⁶ In these circumstances it is perhaps unsurprising that no item relating to armed or armoured vehicles appeared on the agenda of General Staff conferences held at the Staff College each January between 1906 and 1914.⁴⁷ It is significant also that there were no items on armoured motorised firepower on the papers of the Army Council and its Committees over the period 1904-1913.⁴⁸ The Army Council had been established to provide brains for the army.⁴⁹ Esher had believed the army's body could

distance covered by the armoured cars/ambulances etc. was some 115-150 miles in conditions lacking the infrastructure of Western Europe. Armoured cars were also used, effectively, on the North-West Frontier (see photograph 1 and, with difficulty, in Persia, German S.W. Africa (photograph 2) and East Africa - for details of Persia and S.W. Africa, see Bryan Perrett, *British Armoured Car Operations in World War One*, pp.103-117 and 75-88; Bartholomew, *Early Armoured Cars*, p. 29, describes the types of armoured cars used in India during the war for internal security and on the North-West Frontier, see <https://www.tanks-encyclopedia.com/static/archives.php> - an Indian-pattern armoured car was produced in 1921 ("Rolls Royces sent to India were modified prior to the manufacture of the 1921 Indian Pattern, featuring roomier, extended hull armor, and a redesigned domed turret with four machine-gun ball mount emplacements."), <https://tanks-encyclopedia.com/#>, WW1, More, United Kingdom, accessed 21 January 2021. David Fletcher, *War Cars: British Armoured Cars in the First World War* (London, HMSO, 1987), pp. 91-95 provides a "comprehensive" illustrative rather than definitive schedule of armoured car units: it is included as Appendix A to illustrate the extent of interest and adoption of armoured cars by the army as soon as the value of armoured vehicles was accepted.

⁴⁴ Fletcher, *War Cars*, Although the BEF, EEF and MEF appear to have relied initially and primarily on vehicles from Winston's Circus, there were insufficient to supply the Indian Government which was therefore required to arrange its own supply; T. A. Heathcote, *The Afghan Wars 1839-1919* (London, Osprey, 1980), p. 177. Armoured cars were not used to a great extent on the Western Front. However, their value was appreciated by the Cavalry Corps and a limited number were attached to cavalry units, see for example National Archives, WO95/1104. The wide distribution of military engineering capability or access to civilian facilities enabled units to adapt vehicles to suit their own requirements and in consequence it is not always possible to make specific statements on the characteristics of vehicles operated by individual units. Fletcher, *War Cars*, pp. 91-95, contains an extensive summary of individual units, the models they used and changes made, though even Fletcher has been unable to categorise the complete extent of adjustments carried out on the Western Front, in Mesopotamia, India, Palestine and Africa. See Appendix A.

⁴⁵ Stephen Badsey, *Doctrine and Reform in the British Cavalry: 1880-1919* (Abingdon, Routledge, 2016), pp. 236-237.

⁴⁶ Grant Dawson, 'Preventing "A Great Moral Evil": Jean De Bloch's 'The Future of War' as Anti-Revolutionary Pacifism', *Journal of Contemporary History*, 37, 1, (2002), pp. 5-19, (pp. 15-17).

⁴⁷ Defence Academy of the UK, Joint Services Command and Staff College, Hobson Library, SC10-18A, reports and verbatim records of proceedings at Annual January Conferences held under the Orders and Direction of the CIGS, 1906-1914.

⁴⁸ National Archives, WO163/8, Index of topics, Army Council, 1905-1913.

⁴⁹ Edmonds *Military Operations, 1914, vol. I*, p. 4.

not be fixed unless its brain was put right, but there was a dearth of suitable candidates for positions on the Council.⁵⁰ The lack of interest in AFVs raises a basic question over the reorganisation of the army following the Boer War and over the calibre of senior personnel.⁵¹

It is the contention of this thesis that, significant as the exploits of September 1916 were, they did not represent the birthplace of armoured warfare either on the ground or in the mind. Progress towards armoured warfare should have been made much earlier by the British Army. The first chapter will therefore examine the period during which there was no significant interest in early AFVs and flawed trials were undertaken of a civilian tracked system. It will also examine Churchill's false claim to have foreseen the need for tanks in 1914. This period is important since the lack of innovative plans and action resulted in lost opportunities during the early mobile phase of the war in the west and on more distant fronts.

By contrast, the navy displayed innovation lacking in the army.⁵² The value of mobile firepower was recognised as soon as the navy assumed responsibility for limited military operations in August 1914.⁵³ The desirability of comprehensive armoured protection for the operatives of its vehicles was then recognised after initial experiences using armed cars accessorised by limited protective armour.⁵⁴ The need for effective protection was felt more keenly upon the death of a member of one of Belgium's most eminent families, Prince Louis de Baudouin, whose unit, equipped with open topped armoured cars, was ambushed in October 1914.⁵⁵ Sueter, Head of Churchill's RNAS, had recognised the need for overhead protection prior to the

⁵⁰ Ian F. W. Beckett, 'Selection by Disparagement': Lord Esher, the General Staff and the Politics of Command, 1904-1914, in *The British General Staff: Reform and Innovation c.1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], pp. 42-46.

⁵¹ John Gooch, *The Plans of War: The General Staff and British Military Strategy c.1900-1916* (London, Routledge, 1974), pp. 46-59 and 111-112; Beckett Ian F W, 'Selection by Disparagement: Lord Esher, the General Staff and the Politics of Command, 1904-1914' in *The British General Staff: Reform and Innovation c.1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014 [2002]), pp. 41-56, (pp. 50-56).

⁵² Murray Sueter, *The Evolution of the Tank: A Record of Royal Naval Air Service Caterpillar Experiments* (London, Hutchinson, 1937), pp. 27-29; National Archives, MUN 210/1940/13, Scott-Moncrieff to Bingham, 4 November 1918.

⁵³ Sueter, *Evolution of the Tank*, pp. 29-30.

⁵⁴ *Ibid*, pp. 30-33, See Photograph 3.

⁵⁵ 'The Devil's Car', *Daily Telegraph*, 31 October 1914; Sueter, *Evolution of the Tank*, p. 32. See photograph 4: Belgian manufacturing facilities soon fell into German hands, but it is possible the cars shown on the 1917 photograph may have incorporated greater armoured protection than existed in 1914.

ambush. By October, the Navy had devised and commissioned the production of an effective armoured car. Subject only to upgrading of its suspension, this would be used by British forces for more than two decades without major alteration.⁵⁶ The navy's cars were armed with machine-guns though they also had vehicles armed with 3-pounder guns.⁵⁷

The second chapter will examine the unsuccessful efforts of the navy to develop a tracked fighting vehicle between February and July 1915. It will contrast this with the successful work of Sir William Tritton and Walter Wilson, subsequently handed the development task by Eustace Tennyson d'Eyncourt, the Admiralty's Director of Naval Construction, appointed by Churchill as president of his Landships Committee. Their work was undertaken in a limited period as demanded by circumstances on the Western Front: they were not "Too Late". Having accepted a role for "landships", the army passed the responsibility for preparations to receive the machines to Ernest Swinton, unwisely electing not to play any direct or pressurising role to secure development of tanks at the earliest date possible.

Without naval contributions, the nation's progress in designing, manufacturing and using armoured vehicles would have been further delayed. Thanks to the navy, an effective armoured car was available from approximately the start of 1915. So far as tanks are concerned, despite expeditious development work by Tritton and Wilson, it was not until mid-1918 that the army was equipped with a tank possessing a reasonable degree of reliability and capable of being driven by a single person. Hotblack considered it was not until the Mark V was produced that the tank was "beginning to be a real weapon".⁵⁸ Events during the early periods of the war are significant owing to their influence on progress throughout 1916-18.

After the Armistice, no system was introduced to identify or reward appropriate individuals for advocating development of tracked or wheeled AFVs.⁵⁹ However, a

⁵⁶ Rolls Royce Ltd., *Rolls Royce and the Great Victory* (Haworth, Brönte Hill, 1972), p. 19; Boyd Cable, *Rolls Royce Cars in War* (London, Rolls Royce, 1919), p. 12.

⁵⁷ See photograph 5, these vehicles also incorporated only limited armour protection.

⁵⁸ Captain "Boots" Hotblack, observations at a speech by Lt.-Colonel W. D. Croft, on *The Influence of Tanks upon Tactics*, 7 December 1921, reproduced in the *Journal of the Royal United Services Institution*, vol. 67, 1922, issue 465, pp. 39-52 (pp. 48-49). Hotblack joined the Heavy Section in 1916, rising to the rank of Major-General as Deputy DSD in 1937 and GOC 2nd Armoured Division in 1939.

⁵⁹ For the purposes of this thesis, a tank is defined as an armoured, armed and tracked vehicle. This definition therefore includes those Mark IV machines redesigned as supply rather than fighting "tanks" since they did retain a single machine-gun.

Royal Commission was established to consider claims for “inventions”, physical forms of new or improved ideas, and to recommend appropriate awards.⁶⁰ From 1919, the Commission considered many claims, operating to compensate for losses caused by the government utilising inventions without incurring payments that would have been secured through patents in peacetime.⁶¹ The largest award relating to the first tanks was made to the engineers responsible for their design and construction, Tritton, managing director at Fosters of Lincoln and Wilson.⁶² However, at £15,000, approximately £10/heavy tank, some 0.2% of the construction costs, the award perhaps reflected the nation’s dire financial situation in 1919 rather than the value of the machines to the Allies, particularly during the final months of the war.⁶³

Studies of tank development tend to concentrate on the origins of the concept and early design work. These factors are important but should not be allowed to dominate to the disadvantage of issues connected with manufacture and assembly. Manufacturing was located firmly on the critical path of armoured vehicle supply as the tank moved from prototype, late in 1915, to production in bulk. Industrial efficiency was not afforded the level of importance warranted and it was perhaps no coincidence that the Ministry of Munitions failed in 1916 and 1917 to meet its manufacturing forecasts. The Ministry also failed to modify tank design in accordance with military aspirations. The situation deteriorated further during 1918 as output lagged well behind forecasts and behind the aspirations not only of the British Army but also of allies and associates, who had been assured machines would be available for their use.⁶⁴ The early stages of this situation will be considered in chapter three and the

⁶⁰ National Archives, ADM1/22825, Treasury to Admiralty, 27 March 1919, enclosing Royal Warrant for establishment of Commission “to enquire into and determine the Awards which may properly be made to inventors in respect of the user [sic] by Government Departments of their inventions during the present war”.

⁶¹ See National Archives, MUN7/112, Ministry of Munitions Patents Advice Note – General Office Note No.111. Circulation dated 26 March 1917.

⁶² National Archives, T173/34B, recommendations of Royal Commission on Awards to Inventors to the Treasury, 17 November 1919. A substantial percentage of the award would have been expended on legal charges: Tritton elected to share the remaining part of his award with the staff of Fosters.

⁶³ National Archives, T173/531, recommendation of the Royal Commission on Awards to Inventors to the Treasury, 2 December 1920, which rewarded Wilson with a further £2000 for a claim under the Commission’s examination of “Improvements to Tanks”, for “certain Gear and Mechanism used in Tanks” (essentially Wilson’s epicyclic gears first used in the Mark V).

⁶⁴ National Archives, MUN4/6400, minutes of conference at GHQ, 10 June 1918, MUN5/211, meeting between Churchill and Loucheur, 6 June 1918 and MUN4/2807, MM to War Office, 30 May 1918.

continuation and development of problems, together with the first use of tanks by France and Germany, in chapter four.

Despite Churchill's efforts during spring/early summer 1918, problems with tank production increased, a situation that will be considered in chapter five. Cumulatively, these manufacturing problems were significant since they restricted the availability of armoured vehicles and advancement in design. The mechanical efficiency of machines and operational efficiency of units were thereby adversely affected.⁶⁵

Chapter six assesses revelations consequent upon the appointment of Jack Seely as Deputy Minister and James Maclean as CMWS in July/August 1918. This marked the commencement of efforts to place tank production on a sound industrial footing and rectify problems that Ministers and Heads of Mechanical Warfare had failed to resolve.⁶⁶ Their efforts took place too late to influence remaining military operations but would have been vital to tank output had the war extended into 1919. This period is important in illuminating earlier Ministry inefficiency and the mismatch between Churchill's advocated strategy and his ability to produce the volume of armoured hardware required to sustain the offensive effort he advocated. Churchill's hostile reaction in September 1918 to expert criticism of tank production by his Ministry is evidence of the potential personal consequences had the Armistice not been signed in 1918. Lloyd George's Tank meeting on 8 August 1918 figured prominently in the redirection of Ministry efforts. The chapter will also contrast explanations for poor performance made at this meeting with a report prepared by the new CMWS.⁶⁷ These events during the final months of the war are significant since they demonstrate the scope that had existed for more efficient management of production and enhancement of fighting capabilities. Events are also significant in determining the balance sheet of advantages/disadvantages of Churchill's role in the development of armoured vehicles and thereby defining his contribution to major changes in the conduct of military operations in the early decades of the century.

⁶⁵ Further observations by Hotblack following the speech by Croft on *The Influence of Tanks upon Tactics*. Interestingly, Hotblack recorded that he knew "personally of a great many cases in battle where the tank with its increased speed (it was only 5 mph then)-"did down" the gun; Goya, *Flesh and Steel*, p. 225, French experiences also show that their faster Renault tanks adjusted the combat balance between tanks and field artillery.

⁶⁶ Churchill Archives Cambridge, CHAR15/87, 'Report on Condition of Mechanical Warfare Supply Department at 1918'.

⁶⁷ National Archives, CAB24/5/20, notes of Lloyd George meeting on Tanks, 8 August 1918.

Early historiography consists primarily of memoirs of politicians and senior officers together with some volumes of the Official Histories. Lloyd George, Churchill and others tended to advance criticisms alleging military myopia in respect of the potential of tanks to break the deadlock on the Western Front. They considered it represent tactical misuse to subdivide limited numbers into operational “penny packets”, rather than concentrations for massed attacks. They believed deployment of the small number of tanks used at Flers should have been held back until more were available.⁶⁸ The Official Histories and army personnel tended to defend the wider distribution of tanks across the battlefield to support infantry offensives, justifying such tactics by emphasising unreliability, difficulties of communication and navigation and limited numbers. These factors, GHQ believed, mitigated against the suitability of tanks to perform a largely independent role.⁶⁹

Later work, particularly by Glanfield, has enlarged the scope of the examination of tank production and usage and is particularly relevant, though certain sections provide limited information on his sources of information and he fails to deal adequately with the justification for claiming that Churchill was the father of the tank and “without his efforts, it would have remained on the back-burner until unveiled by the French during their 1917 Spring Offensive on the Chemin-des-Dames”.⁷⁰ Less convinced than Glanfield, David French considers Churchill to have been just one of the godfathers of the tank, a claim somewhat easier to justify.⁷¹

Revisionists of the general approach to the history of the war demonstrate convincingly that the criticisms of tank tactics by Churchill, Lloyd George and others were unsound. However, they do not emphasise the failure of military and political leaders to respond to the first generation of armoured vehicles, models designed by Vickers, Charron and Fiat commencing in 1902. Investment in this early stage was limited, though there were efforts by Italy, France and Russia to investigate the military

⁶⁸ David Lloyd George, *War Memoirs*, pp. 381-388; Winston S. Churchill, *The World Crisis 1911-1918* (New York, Free Press, 2005), p. 315; National Archives, WO95/91/6, Elles to Edmonds, 4 September 1934.

⁶⁹ Clough Williams-Ellis and Amabel Williams-Ellis, *The Tank Corps* (New York, George H Doran, 1919), introduction by Hugh Elles, pp. viii-ix, and p. 30 (tank navigation difficulties).

⁷⁰ John Glanfield, *The Devil's Chariots: The Birth and Secret Battles of the First Tanks* (Stroud, Sutton Publishing, 2006), p. 268.

⁷¹ David French, ‘The Mechanisation of the British Cavalry between the World Wars’, *War in History*, July 2003, 10, 3, pp. 296-320 (p. 296).

value of early models.⁷² Armoured cars were used in Libya, Morocco and Russia in actions that represented revolution, colonial unrest or a less intensive war than would later be waged against German forces. Yet in Britain there was no meaningful response to the early small waves of an unrecognised incoming tide of armoured warfare that would develop into mountainous breakers as the new century unfolded. It is claimed that in 1914 the Army's Mechanical Transport Committee asked the General Staff whether they saw a role for armoured cars.⁷³ Neither such an approach nor the response have been identified, though the reply cannot have been favourable bearing in mind the lack of any subsequent action. The scale of tank warfare at Kursk in 1943 demonstrates the accelerating pace of twentieth century military change. Though perhaps of doubtful reliability, estimates of tank numbers involved during the Battle of Kursk range from 5,000 to 10,000+ depending largely on the definition of the period of the battle under consideration.⁷⁴

Similarly, there is little mention in the scholarship of the lack of response by the British Army to initial pre-war developments. The design of Simms War Car in 1902 may have been flawed, but there is no evidence the army explored whether it constituted technological advancement or military irrelevancy.⁷⁵ As Edgerton's work has shown, for the period through to the Second World War and beyond, capability was not a problem.⁷⁶ Industrially and technologically, the country was capable of turning its hand to the development of sophisticated weaponry. The difficulty in preparing for the First World War appears rather to have been one of lack of importance attached to mental ability as compared to fighting abilities. In consequence the stalemate of entrenched warfare and the disadvantages of lack of protection on

⁷² Brian Christopher Foss, *Encyclopedia of Tanks and Armoured Fighting Vehicles* (Staplehurst, Spellmount, 2002), p. 182; Bartholomew, *Early Armoured Cars*, pp. 5-6 and 11; Tank Encyclopedia, WW1 - Tanks – France, Russian Empire, Kingdom of Italy, www.tanks-encyclopedia.com, accessed 16 January 2019.

⁷³ David Fletcher, *War Cars: British Armoured Cars in the First World War* (London, HMSO, 1987), p 12.

⁷⁴ David M Glanz and Jonathan M House, *When Titans Clashed: How the Red Army Stopped Hitler The Battle of Kursk* (Kansas, University Press, 2015), p. 217; Mark Healy, *Kursk 1943: Battle Story* (Stroud, Spellmount, 2012), pp. 43-55. Healy assesses the numbers of German and Russian tanks at the start of the battle as some 4730, though significant numbers may have reinforced units during the month-long course of the battle, particularly the Russian force, since Healy records Russian production figures to have reached some 2000/month by the spring of 1943.

⁷⁵ See photograph 6.

⁷⁶ David Edgerton, *Science, Technology and the British Industrial 'Decline' 1870-1970* (Cambridge, Cambridge University Press, 1996), pp. 29-32 and *Britain's War Machine: Weapons, Resources and Experts in the Second World War* (London, Allen Lane, 2011), pp. 1-10.

an increasingly hazardous battlefield were either unrecognised or simply accepted. Arguably, it is appropriate that Bidwell and Graham should consider this issue under the heading of “the Still and Mental Parts”.⁷⁷

The navy did recognise these values and developed armoured cars shortly after the declaration of war.⁷⁸ Since wheeled vehicles were of limited use in the entrenched conditions that developed in France and Belgium from late 1914, such vehicles became available for the army on more distant, less entrenched fronts.⁷⁹ Those slow or unable to grasp the potential of armoured vehicles had included both Kitchener and the initial Commander-in-Chief of the BEF, Sir John French.⁸⁰ In these circumstances, valuable tactical opportunities had been lost. Furthermore, in 1915 some smooth-talking was necessary to secure redirected use of naval vehicles to areas in which they could offer enhanced tactical opportunities compared to, or in conjunction with, cavalry.⁸¹

Even recent additions to the scholarship do not acknowledge army failure to recognise the potential of armoured vehicles. In considering the influence of the Boer War on the tactical development of the army, Spencer Jones makes no reference to the “missing” assets of armoured vehicles notwithstanding the fact that armoured rail and road trains had been used in the Boer War.⁸² In terms of technology and tactical development it could be held that the army had taken a step backwards by 1914.

Owing to its own unimaginative record, and the contrasting innovative work of the navy, senior officers were perhaps understandably reluctant to acknowledge the role armoured cars might have played in Belgium and France during 1914. Yet Holmes and Mallinson describe examples of gallant but costly cavalry screening in August

⁷⁷ Shelford Bidwell and Dominick Graham, *Firepower: British Army Weapons and Theories of War 1904-1945* (Barnsley, Pen and Sword, 2004), pp. 38-65.

⁷⁸ Martin Gilbert, *Winston S. Churchill, vol. III, The Challenge of War, 1914-1916* (Boston, Mass., Houghton Mifflin, 1971), pp. 65-69.

⁷⁹ *Ibid*, pp.162-163; Bryan Perrett, *Iron Fist: Classic Armoured Warfare Case Studies* (London, Arms and Armour, 1995) pp. 20-33.

⁸⁰ Gilbert, *Churchill, vol. III*, Asquith to Churchill, 17 February 1915, p. 289 and Asquith to Venetia Stanley, 18 February 1915, p. 290.

⁸¹ Churchill Archives Cambridge, CHAR13/27B, Churchill to Kitchener, 21 December 1914; National Archives, ADM1/8492/158, Locker-Lampson to Masterman Smith, 22 June 1915 including attached memorandum; Bryan Perrett and Anthony Lord, *The Czar's British Squadron* (London, Kimber, 1981), pp. 27-28.

⁸² Spencer Jones, *The Influence of the Boer War (1899-1902) on the tactical development of the regular British Army 1902-1914* (Norman, University of Oklahoma Press, 2009); Fletcher, *War Cars*, p. 6 See photographs 7 and 8.

1914 to protect withdrawing infantry and to slow the southern advance of German forces.⁸³ In close country and with only basic communications, against an enemy generously equipped with artillery and machine-guns, the screening of infantry withdrawal was a demanding operation.⁸⁴ There is general praise for the achievements of British cavalry in protecting the BEF during the retreat from Mons, but on the occasion that Allenby was unable to guarantee such protection, losses were heavy and it was perhaps fortunate that more serious losses were avoided.⁸⁵ The cost of the one occasion, at Le Cateau, on which cavalry cover could not be guaranteed was significant.⁸⁶

As demonstrated by the respect shown by Uhlans for RNAS armoured cars, mechanised firepower might have stemmed British losses.⁸⁷ Yet, in 1919, when faced by criticism of his draft report, including comment by the DSD that armoured cars would have been invaluable in the retreat from Mons and at the Marne, the Chairman of the Reorganisation Committee dismissed armoured cars as of little benefit in operations against well-equipped forces.⁸⁸

Aimée Fox's recent work similarly contains no acknowledgement of the army's failure to keep abreast of developments in armoured warfare. She states:

the army promoted a culture of innovation across its operational theatres where individuals were given the opportunity to influence institutional behaviour. Fundamental to the army's learning effectiveness was the influence of its two-stranded pre-war ethos, comprising the social and the

⁸³ Stephen Badsey, Cavalry and the Breakthrough Doctrine, in *British Fighting Methods in the Great War*, ed. by Paddy Griffith (London, Frank Cass, 1996), pp. 147-148; Allan Mallinson, *1914: Fight the good Fight: Britain, the Army and the Coming of the First World War* (London, Bantam Press, 2013), pp. 329 and 340.

⁸⁴ Kenyon, *Horsemen*, pp. 24-28; Edmonds, *Military Operations France and Belgium, 1914, vol. I*, pp. 99-102; Richard Holmes, *Riding the Retreat: Mons to the Marne 1914 revisited* (London, J. Cape, 1995), pp. 135-142 and 137-142.

⁸⁵ David Stevenson, *1914-1918: The History of the First World War* (London, Penguin, 2004), p. 56.

⁸⁶ Edmonds, *Military Operations France and Belgium, 1914, vol. I*, p. 238; Antony Bird, *Gentlemen, We will Stand and Fight: Le Cateau, 1914* ((Marlborough, Crowood, 2008), pp. 45-60 and 184; Stevenson, *1914-1918*, p. 56.

⁸⁷ Edmonds, *Military Operations France and Belgium, 1914, vol. I*, pp. 134-137 and 182, BEF casualties at the Battle of Le Cateau were 7,812 and a loss of 36 guns, the standard of cavalry protection of the retreating II Corps was high, but Smith-Dorrien was forced to fight on 26 August when Allenby's cavalry could not guarantee protection; National Archives, WO32/11357, DSD to President, Reorganisation Committee, 28 June 1919 – it seems likely this was one of the instances in which the DSD envisaged that armoured cars would have been of value in slowing the enemy advance.

⁸⁸ National Archives, WO32/11357, DSD to President, Reorganisation Committee, 28 June 1919 and reply dated 1 July 1919.

intellectual. This proved an important and enduring framework throughout and beyond the First World War.”⁸⁹

Fox dismisses the idea that the army’s ethos and tradition acted as a brake on innovation believing that its ethos “provided the army with the ability to adequately examine new ideas and situations” and that it “enabled the army to respond fully to the need for adaptation and innovation.”⁹⁰ In many aspects of the army’s learning experiences, before and during the war, Fox’s observations are well made and material, but she does not consider the learning process relating to armoured vehicles.⁹¹ Her views, as she recognises, are fundamentally at variance with the judgments of Williamson Murray and Paul Kennedy who respectively concluded that “the bureaucratic framework and the culture of the pre-war period ensured that learning took an inordinate amount of time” and that the army “did not encourage open discussion and reassessment”.⁹²

Though it would appear that elements of Fox’s criticism of conclusions by Murray and Kennedy are justified, in so far as the limited subject matter of this thesis is concerned, Murray’s comment is vindicated by experiences in the introduction of tanks and Kennedy’s argument rings true for armoured cars. Furthermore, it is difficult to envisage Swinton agreeing with Fox’s conclusions, since nine months elapsed and over 250,000 casualties were incurred before his observations on Western Front requirements were accepted by the War Office/GHQ.⁹³ Even then, acceptance was limited and fragile.

⁸⁹ Aimée Fox, *Learning to Fight: Military Innovation and Change in the British Army, 1914-1918* (Cambridge, Cambridge University Press, 2018), p. 241.

⁹⁰ *Ibid.*, p. 21.

⁹¹ *Ibid.* The only reference to “tanks” is in relation to acceptance by France, “As commander of the French First Army, General Auguste Dubail actively observed and encouraged tactical innovations, supporting individuals such as Colonel Fetter in his development of a prototype flamethrower in October 1914. Likewise, senior generals, such as Phillipe Pétain and Joseph Joffre lent their support to Colonel Estienne’s idea for the tank in 1915”.

⁹² It does not form part of the objective of this thesis to consider or judge the merits of learning within the army generally, rather simply to consider learning and progression related to armoured warfare. It is concluded that the army was late in accepting the need for innovation by use of armoured vehicles. In consequence it is reasonable to conclude that the timing of the introduction of armoured vehicles and degree of their sophistication fell short of what might have been secured in a more welcoming environment.

⁹³ War Office, *Statistics of the Military Effort of the British Empire in the Great War* (London, HMSO, 1922), pp. 253-255, August 1914-June 1915 inclusive – includes nearly 55,000 fatalities.

Nevertheless, “innovation” is not a precise term.⁹⁴ Innovation is perhaps best considered on a sliding scale. At the lower end of the scale, those implementing a more beneficial use of an existing object, a way of improving the operation of a weapon or piece of equipment or more beneficial tactics, are certainly entitled to seek recognition for innovation. However, this is a luke-warm form of innovation. At the other end of the scale, perhaps in isolation, sit Oppenheimer/Groves et al, perhaps separated by some distance from other important figures such as unknown Chinese from the late Tang dynasty, who developed the first explosives, Wernher von Braun and other contributors to more momentous innovative advances in warfare.

The scholarship appears to confirm that no senior member of the British military establishment recognised the military potential of armoured vehicles following Karl Benz production of the first motor vehicle towards the end of the 19th century. Within the context of the number and nature of enhancements taking place at this time to battlefield weaponry, particularly automatic small-arms and QF artillery, Badsey’s condemnation appears beyond dispute.⁹⁵ It is a matter of judgment where armoured cars and tanks should be positioned on the sliding scale of innovative importance, but they are deserving of inclusion. Foley supports Lloyd George, believing the tank “was probably the most important technological innovation to emerge from the First World War”.⁹⁶ Foley also touches upon the issue of categories of innovation, but his work concentrates upon the contrast between top-down and horizontal spread of innovation.⁹⁷ Much of the scholarship deals with recent conflicts and future predictions and is not necessarily a good guide to explanations for pre-WWI failure to recognise the major innovation of AFVs.⁹⁸

⁹⁴ Dictionary definition of innovation—1. a new idea, method or device: novelty, 2. introduction of something new, see <https://www.merriam-webster.com/dictionary/innovation>, viewed 6 April 2021. Wikipedia stresses innovation is related to, but not the same as, invention: innovation is more likely to involve the practical implementation of an invention (i.e. new or improved ability) to make a meaningful impact in a market or society, not all innovations require a new invention. Technical Innovation is often manifested via the engineering process when problem solving is of a technical or scientific nature, <https://en.wikipedia.org/wiki/Innovation>, viewed 6 April 2021.

⁹⁵ Stephen Badsey, *Doctrine and Reform in the British Cavalry 1880–1918* (London, Routledge, 2008), p.236.

⁹⁶ Robert T. Foley, Dumb Donkeys or Cunning Foxes: Learning in the British and German Armies during the Great War, *International Affairs*, 90/2 (March 2014), pp. 279-298, (p. 291).

⁹⁷ Robert T. Foley, ‘A Case Study in Horizontal Military Innovation: The German Army, 1916–1918’, *Journal of Strategic Studies*, 35:6, pp. 799-827, (p. 803) - Foley’s categories include ‘adaptation’, a term advanced by Farrell for changes short of innovation, not involving ‘institutional change’.

⁹⁸ See for example, Adam Grissom, ‘The Future of Military Innovation Studies,’ *Journal of Strategic Studies* 29/5 (October 2006): 919-930, Theo Farrell, ‘Improving in War: Military Adaptation and the British in Helmand Province, 2006-2009,’ *Journal of Strategic Studies* 33/4 (2010): 567-594, Theo

Cambrai and the Spring Offensives may have alerted the War Office and GHQ to pending restoration of mobile warfare. Future requirement for tanks was reassessed.⁹⁹ Also, separately, an order was made for additional armoured cars, though there was no comment about priority.¹⁰⁰ It was not until October 1918 that a degree of urgency was expressed.¹⁰¹ Only well after the Armistice did a senior War Office figure challenge the earlier lack of demand for armoured cars:

There was an urgent demand for Motor Machine Gun units and Armoured Cars in all the most critical stages of the war, notably during the retreat from Mons and the battle of the Marne, the German offensive in the Spring of last year, and in the final stages of the campaign in France, while all our experience of other theatres such as India and Mesopotamia, Egypt and the Caucasus, proves there is a very great demand for Armoured Cars.¹⁰²

Dell, Director of Staff Duties, tactfully refrained from treading too heavily on War Office toes by omitting to mention that it was primarily thanks to Canadian and Russian initiatives that the army possessed a small number of poor-quality armoured cars for use on the Western Front from mid-1918.¹⁰³ Similarly, much of the armoured support for forces operating in other parts of the world was the result of innovation and development by or on behalf of the navy. This exchange of views does not support the general contention of effective army learning on innovation by armour. Furthermore, dissemination of advice on the use of tanks was not undertaken efficiently. Elles gave evidence in 1919 that he did not see Swinton's 1916 note on the use of the new machines until the war had ended.¹⁰⁴ It would also appear that Army and Corps Commanders had not received copies, or had not read them, since Lieutenant-General Sir William Pulteney, GOC III Corps, endeavoured to send tanks through the remains of High Wood in contravention of Swinton's advice: Rawlinson, the Army

Farrell, Frans Osinga and James Russell, eds. *Military Adaptation in Afghanistan* (Stanford: Stanford Security Studies, 2013) Robert T. Foley, 'Institutionalized Innovation: The German Army and the Changing Nature of War, 1871-1914,' *Journal of the Royal United Services Institute*, 147/2 (2002): pp. 84-90.

⁹⁹ National Archives, MUN4/2791, WO to MM, 18 December 1917, MUN4/2790, Minutes of Conference, 10 June 1918, WO158/859, Tank Committee Agendas and Minutes, January to June 1918.

¹⁰⁰ National Archives, MUN4/3454, WO order dated 2 January 1918, requisition 216 (Q.M.G.3.d).

¹⁰¹ National Archives, MUN4/3454, WO to MM, 12 October 1918.

¹⁰² National Archives, WO32/11357, Director of Staff Duties to the President of the Reorganisation Committee, 28 June 1919.

¹⁰³ National Archives, WO95/1163, Appendix A, reports on Operations of 17 Armoured Car – Tank Battalion - 11 June, 8 August and 24 August 1918.

¹⁰⁴ National Archives, CAB45/200, Elles to Edmonds, 4 September 1934.

Commander, failed to correct Pulteney's defective proposals.¹⁰⁵ None of the four tanks allocated to penetrate High Wood reached their first objectives.¹⁰⁶

Particular attention is paid in this thesis to the role of Churchill in the development of armoured vehicles. This is not simply because he played a significant role, both for wheeled and tracked vehicles. He also appeared in different roles in many stages of the introduction of AFVs, namely in 1914-15 at the Admiralty, 1917-18 at the Ministry of Munitions and 1919 at the War Office. Churchill was also not averse to offering his advice in 1915-17 whilst serving in the army or as a backbench MP.¹⁰⁷ From 1924-29, as Chancellor, he continued his association with armoured vehicles, though not always in a beneficial way. David French sums up the inconsistent nature of Churchill's actions or objectives during the post-war period, "Churchill's role was paradoxical. He was both a major stimulus towards mechanisation, and a major obstacle on the path to that goal."¹⁰⁸ French considers Churchill's control of the purse strings to have been a significant factor in the loss of Britain's lead in tank design/development and the failure to produce a competitive "medium tank" prior to, or during, the Second World War.¹⁰⁹ It will be shown that these paradoxical characteristics were not dissimilar to those exhibited by Churchill in the First World War, notably beneficial advocacy of the principle of armoured warfare yet concurrent handicaps in respect of his views on detailed design and use. In these circumstances, it would be ill-advised to consider the early history of British armoured vehicles or the level of performance in their production without examining the form and significance of Churchill's role.

Bearing in mind his post-war efforts and the advances made under his leadership at the Admiralty, it may seem ungenerous to criticise Churchill's advocacy of armoured vehicles. His support for armed then armoured vehicles at the Admiralty and his advocacy in the post-war period would prove of considerable, though under-recognised, benefit to the army over many years.¹¹⁰ However, his ideas were indebted

¹⁰⁵ Trevor Pidgeon, *The Tanks at Flers: An Account of the First Use of Tanks in War at the Battle of Flers-Courcelette, The Somme, 15th September 1916* (Cobham, Fairmile, 1995), pp. 54-55.

¹⁰⁶ *Ibid.*, pp. 103-109.

¹⁰⁷ National Archives, CAB37/159/20, 'Mechanical Power in the Offensive', Winston Churchill, 9 November 1916.

¹⁰⁸ David French, 'The Mechanisation of the British Cavalry between the World Wars', *War in History*, July 2003, 10, 3, pp. 296-320 (p. 320).

¹⁰⁹ *Ibid.*, pp. 318-319.

¹¹⁰ David Fletcher, *Rolls-Royce Armoured Car* (Oxford, Osprey, 2012), pp. 4-46; Sueter, *Evolution of the Tank*, pp. 27-29.

to and triggered by observations and representations by others rather than his own vision. He would later deploy his literary ability and a generous level of misrepresentation to inflate or disguise his own role in the development of armoured vehicles.¹¹¹

As a result of wartime experiences, largely through bottom-up innovation, the army's attitude would change and armoured vehicles would be welcomed.¹¹² This may in part have been due to the fact that in 1919 Churchill transferred from Munitions to the War Office and those advocating the military value of the armoured car, in war or policing duties, had a powerful ally. Churchill soon found himself in conflict with the Treasury over armoured cars.¹¹³ By July 1919 the new Minister of War was ensuring his Cabinet colleagues were aware that the "need for armoured cars at the present time is urgent".¹¹⁴ He reinforced his arguments with the War Diary of the 17th Tank (Armoured Car) Battalion and a minute of the General Staff. His concluding comment to his Cabinet colleagues "that the British Army was not equipped with many more of these units will be a problem which will doubtlessly perplex the minds of future military historians" has retained its ring of truth over the succeeding century.¹¹⁵ However, whilst Churchill's comment is supported, he conveniently ignored self-criticism by omitting to record that it was not just the army but also politicians who, both before and during the war, failed to recognise the potential value of armoured cars as a means of exploitation, of undertaking or cooperating with cavalry tasks and the potential ability to move firepower to plug defensive weaknesses or support offensives.¹¹⁶

Contrary to Churchill's evidence to the Royal Commission, this thesis will show that he came forward with few practical novel ideas for armoured warfare. His contribution was restricted to advancing the ideas of others, though even in these circumstances

¹¹¹ Ibid, pp. 27-33.

¹¹² National Archives, WO32/11357, DSD to President, Reorganisation Committee, After War Field Army, 28 June 1919.

¹¹³ National Archives, T12357, Churchill to Austen Chamberlain, 22 June 1919.

¹¹⁴ National Archives, CAB/24/89/6, Churchill to War Cabinet, Proposed Provision of Armoured Cars, 25 July 1919.

¹¹⁵ National Archives, CAB24/89/6, Churchill to War Cabinet, 23 September 1919.

¹¹⁶ Juliette Champagne and John Matthews, Raymond Brutinel and the Genesis of Modern Mechanized Warfare in Adriana A. Davies and Jeff Keshen (ed.), *The Frontier of Patriotism: Alberta and the First World War* (Calgary, University of Calgary Press, 2016), p. 21; James E. Edmonds, *History of the Great War, Military Operations, France and Belgium, 1918, vol. I* (London, Macmillan, 1933), pp. 414 and 268 and *vol. II* (London, Macmillan, 1937), pp. 244 and 440.

his interpretation of new ideas was not always in tune with originators' intentions. Nevertheless, when claiming the laurels, Churchill positioned himself at the head of the queue of witnesses before the Royal Commission on Awards to Inventors, where, to the disadvantage of those to whom credit should have been awarded more liberally, he sought to inflate his own foresight, role and achievements. Prior recognises such tactics by Churchill.¹¹⁷ However, Prior's work covers a range of issues with which Churchill was involved at different stages of the war. In consequence he does not investigate in depth Churchill's actions in resisting appropriate recognition for Tritton and Wilson in developing the first tank. It will be shown that such resistance was sustained despite the recommendations of three separate Committees at Munitions.

Earlier in this introduction, there is a quotation of the concluding remarks from Lloyd George's speech in December 1915. It is the contention of this thesis that, in respect of the development of armoured vehicles, Lloyd George's brief criticism, veiled in respect of those who represented his targets, was fully justified. Evidence to support that view will be produced in the following chapters. Had the various leading politicians and military figures responded more wisely and objectively to the dawn of armoured warfare, the nation might have avoided elements of the human and financial losses that were incurred over the course of the war. As Lloyd George appreciated, the employers and industrial workers, to whom, ostensibly, his plea was directed, had no control over development and adoption of military hardware, though there were undoubtedly examples of both groups profiting "excessively" from industrial opportunities provided by the wartime boom in military expenditure.¹¹⁸ In defence of the industrial community, it should be emphasised that some British firms had endeavoured to guide the pre-war army along the route of armoured, wheeled, fighting vehicles and tracked haulage vehicles: they were not among the parties who were "Too Late".

Lateness was not the only problem confronting the march of the tank in wartime Britain. There were two further notable though avoidable hurdles. Firstly, different views were held on issues of tank design. It is questionable whether all decisions on design were correct in the context of securing the most appropriate operational

¹¹⁷ Robin Prior, *Churchill's World Crisis as History* (London, Biddles, 1983), pp. 235-238.

¹¹⁸ J. S. Boswell and B. R. Johns, Patriots or Profiteers: British Businessmen and the First World War, *Journal of European Economic History*, Rome, 11, 2, (Fall 1982), 21-27 (pp. 22 and 27).

performance of tanks. Secondly, it is also the case that some of the individuals involved in the management of design and production processes did not contribute the degree of skill and/or effort demanded by the nation's critical position. This was most notably the case during the early stages of design and development in 1915 when management failed to inform the design engineers of amended tasks for the machines. The unfortunate consequence was an inappropriate specification, leading to numerous track failures in 1916, when the machines were first used in the battles of the Somme.¹¹⁹ Management was also a major difficulty throughout the production phase from 1916 to August 1918 until, belatedly, a capable, experienced industrialist was appointed as Controller MWS.

It is an objective of this thesis to examine the development path of armoured vehicles to determine whether their production might have been accelerated and enhanced by more capable management. The consequences of different development paths are a matter of conjecture. Each branch of the army had its particular development path against which the advantages of innovation may be judged. The Royal Artillery, which became the dominant arm, had its own development path. The artillery of 1914-1916 did not have the widespread capability and expertise of the artillery of 1918 and could at no time be described as fleet of foot. Owing to distance and/or poor communications, this often resulted in forward units being deprived of support when most needed.¹²⁰

The tank was initially viewed by enthusiasts as a breakthrough machine, capable of restoring battlefield mobility. However, there was little possibility of it fulfilling such a role. The time required for design and manufacture was likely to greatly exceed the rate at which German defensive systems would expand and the defence was always likely to be able to reinforce a threatened sector of the Front more easily than an offensive force could progress over an active or recent battlefield. Nonetheless, whilst packing a minor punch compared to artillery, tanks did possess the advantage of presence at the sharp end. Even primitive communication between infantry and tanks was therefore on occasions able to indicate particular enemy strongpoints requiring

¹¹⁹ Trevor Pidgeon, *The Tanks at Flers: An Account of the First Use of Tanks in War at the Battle of Flers-Courcelette, The Somme, 15th September 1916* (Cobham, Fairmile, 1995), passim; Trevor Pidgeon, *Tanks on The Somme: From Morval to Beaumont Hamel* (Barnsley, Pen and Sword, 2010), passim.

¹²⁰ Nick Lloyd, *Hundred Days: The End of the Great War* (London, Viking, 2013), p. 83.

attention when artillery support was not available, with a potential bonus of accuracy of fire.¹²¹ Perhaps through rose-tinted binoculars, Sergeant Walter Downing recalled, that when in trouble, “we signalled to the tanks, and they turned towards the obstacle....As their little toy guns spoke and their little, pointed shells flew, another German post was blown to pieces”.¹²² Simkins recognises the importance of tanks during the Hundred Days in combating enemy strongpoints and machine-guns.¹²³ However, it entailed exposure to considerable danger. Vulnerable forward locations had been avoided by field artillery since South Africa or Le Cateau, as “high risk”.¹²⁴ The summary in appendix D suggests that the assistance of tanks in overcoming obstacles in mobile warfare was valuable, though the cost in machines was high, sufficiently high for GHQ to attempt to limit their involvement in minor confrontations since costs were “not compensated for by the results attained”.¹²⁵

¹²¹ Brian Hall, The Development of Tank Communications in the BEF, 1916-1918, in *Genesis, Employment, Aftermath: First World War Tanks and the New Warfare, 1900-19*, ed. by Aleric Searle (Solihull, Helion and Co. Ltd., 2015), pp. 136-162 (p. 156). Coloured flags, waved shovels and pull-cords proved of limited value, the most satisfactory solution being the installation of a liaison infantryman in the rear of the tank.

¹²² Lloyd, *Hundred Days*, p. 74.

¹²³ Peter Simkins, Somme Reprise: Reflections on the Fighting for Albert and Bapaume, August 1918, in *Look to your Front: Studies in the First World War by the British Commission for Military History*, ed. by Brian Bond (Staplehurst, Spellmount, 1999), pp. 147-159, (pp. 156-157).

¹²⁴ National Archives, WO158/832, Lawrence to all armies re German anti-tank defence and limitation of tank activities, 1 September 1918; Strong and Marble, *Artillery in the Great War* pp. xviii-xxiii and “proper soldiering” pp.16-19; Antony Bird, *Gentlemen we will Stand and Fight: Le Cateau 1914* (Marlborough, Crowood Press, 2008), pp. 71-72, 123 and 154.

¹²⁵ National Archives, WO158/832, Lawrence to all armies (OA109), 1 September 1918.

Chapter One – Britain’s Late Start: Wasted Time, 1902 to March 1915

In the years before the war, the Army Council had not recognised the potential tactical benefits from using armoured cars. Experiences early in the war did not change this position. Neither did the construction of continuous entrenchments result in fresh tactical vision at a senior level. What were the consequences and significance of delayed recognition of the value of developing technologies in surmounting the problems of static conditions and providing mobility of firepower?

Similarly, should greater benefits have been extracted from the nation’s “invention” of tanks? Lloyd George certainly thought so:

British in conception, design and manufacture, the Tank was the one outstanding and dramatic invention brought forth by the War in the sphere of mechanical aids to warfare. It was the ultimate British reply to the machine-guns and heavily fortified trench systems of the German Army, and there is no doubt whatever that it played a very important part in helping the Allies to victory. It might have played a still greater part if it had been developed more promptly through a livelier display of sympathy and encouragement on the part of the War Office.¹

In December 1915 Lloyd George had not intended his “Too Late” allegations to apply to the pre-war period, a time when he and the Liberal Party had enjoyed a long unbroken period in office. Nevertheless, his remarks were applicable to all who held positions of responsibility for military policy in the years after the Boer War when petrol-driven “war cars” were first designed in Britain and France and steam-driven armoured trains were run both on tracks and roads.²

Some seek to justify the failure of the British Army to experiment with armoured cars by claims that they were ill-suited to the full range of worldwide locations in which battalions might be called upon to fight. It is certainly correct that they were of little or no value in jungle, mountains, mud or soft sand, but experiences during the war show that they were well suited to operations in much of Asia and Africa and proved to be invaluable in the NWFP, a significant location for the Edwardian army:

¹ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), p. 381.

² J. E. Nowers, “A History of Steam Road Traction in The Royal Engineers”, *The Royal Engineers Journal*, vol. 95, Nos. 3 and 4, Tank Museum, Steam Traction, E2009.5985; Herbert C. Fyfe, The Automobile in Warfare, Experiences in the South African Campaign, *Scientific American*, vol. 88, 11 April 1903, pp. 268-272; David Fletcher, Tank Museum, Steam Traction, E2009.5987, British Army Steam Sappers: Steam Engines in The Boer War. See photographs nos. 7 and 8.

Armoured cars had demonstrated their versatility in India during the First World War, when their mobility, firepower and relative invulnerability to rifle fire had made them ideal in the NWFP for reconnaissance, patrolling, the pursuit of raiding gangs, escort duties and the support of beleaguered outposts in areas where roads or open ground existed.³

Lack of foresight thus applied both to the “traditional” Empire role and to the “new”, mobile continental role anticipated in the event of war with Germany.⁴

Deficiencies in vision and military preparation came home to roost in August 1914. Kitchener despaired at aspects of lack of preparation, “did they remember when they went headlong into a war like that, they were without an army, and without any preparation to equip one.”⁵ He remarked as early as September 1914 that “our chief difficulty is one of material rather than of personnel”.⁶ The provision of equipment, munitions and training for a greatly enlarged army was a difficult, longer-term exercise that had to be undertaken as hostilities took place.⁷ The extent of supply problems for munitions and other military requirements was criticised both by Christopher Addison shortly after commencing his two-year spell at the newly-created Ministry of Munitions and by the Official History.⁸ Addison’s preliminary reports on munitions were made over ten months after war had been declared and were so disquieting that Lloyd George determined “they had better not be circulated”.⁹ Moreover, problems were accentuated by what was perceived as a “new” form of “static”, trench warfare, since this possessed a voracious appetite for a range of munitions, with which, in many cases, the army was poorly equipped or even totally unequipped.

This chapter will examine events to March 1915, a period that could have generated military advantages from the combination of technological advances in automotive

³ T R Moreman, *The Army in India and the Development of Frontier Warfare 1849-1947* (London, Macmillan, 1998), p. 128, quoting from Brigadier-General Montagu, Report on Mechanical Transport and Armoured Cars in India (Simla 1917), p. 12 and Notes on Armoured Cars (Simla, 1915), p. 4.

⁴ Hew Strachan, *The British Army, its General Staff and the Continental Commitment 1904-1914*, in *The British General Staff: Reform and Innovation c.1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], pp. 75-94 (p. 94).

⁵ George Arthur, *The Life of Lord Kitchener, vol. III* (London, Macmillan, 1920), p. 265.

⁶ James E. Edmonds, *Military Operations, France and Belgium, 1915, vol. I* (London, Macmillan, 1927), pp. 15-16.

⁷ Franklyn A Johnson, *Defence by Committee: The British Committee of Imperial Defence, 1885-1959* (London, Oxford University Press, 1960), pp. 14-15; Edmonds, *Military Operations, France and Belgium, 1915, vol. I*, pp. vii, 28 and 37-38; George Cassar, *Asquith as War Leader* (London, Hambledon Press, 1994) pp. 54-55.

⁸ Christopher Addison, *Politics from Within 1911-1918: Including Some Records of a Great National Effort* (London, H. Jenkins, 1924), pp. 63-78; James E. Edmonds, *Military Operations, France and Belgium, 1915, vol. II* (London, Macmillan, 1927), pp. 11-17.

⁹ Addison, *Politics from Within*, p. 68.

engineering and armament. It will also consider the likely reasons and possible consequences of delays in grasping those opportunities and will examine the claims made by Churchill concerning his role in the development of armoured vehicles during this period.

Inventors on both sides of the Atlantic had advanced the concept of AFVs little more than a decade after Karl Benz's patent for the first petrol-driven vehicle in 1885.¹⁰ The first European armoured car, exhibited in Paris in April 1902, was a French CVG.¹¹ The extent of armoured protection on the vehicle was so limited that it might be more accurately described as armed rather than armoured.¹² Despite admitting he did not know how they would be used or the form additional armour should take, the French Minister of War, General Louis André, supported the concept, venturing that it "would be absolutely imprudent to declare today that the automobile is not destined to become one of the instruments of the battlefield".¹³ By 1904, CGV had amended its design and built a vehicle that was fully enclosed and turreted. Early CGVs were used to combat civil unrest in Russia and indigenous forces in Morocco.¹⁴ Other French companies became involved in the design and production of armoured cars and some French units had been issued with Peugeots by August 1914.¹⁵ Other units later received Renaults.¹⁶ Despite somewhat limited progress, France had demonstrated a degree of belief in the technology and formed armoured military units immediately after the commencement of war.¹⁷ Production was then accelerated rapidly, Renault completing fifty 1914-model armoured cars by early 1915, though they suffered considerable design faults necessitating modification. The opening spell of mobile warfare, in which such vehicles might have thrived, terminated well before they were

¹⁰ Jack Challoner, *Genius: Great Inventors and their Creations* (London, Carlton Books, 2010), pp. 32-33 - Patent DRP37435, 29 January 1886.

¹¹ Charron, Girardot and Voigt, three former French cycling champions whose firm was usually known simply as Charron.

¹² E. Bartholomew, *Early Armoured Cars* (Princes Risborough, Shire, 1988), p. 5. See photograph 9.

¹³ Alain Gougau, *L'Aube de la gloire: les autos mitrailleuses et les chars français pendant la grande guerre* (Issy-les-Moulineaux, Soc. OCEBUR, 1987), p. 11.

¹⁴ David Bosanquet, *The Tank Encyclopedia, France, Armored Cars*, <http://www.tanks-encyclopedia.com/>, accessed 20 January 2019; Bartholomew, *Early Armoured Cars*, pp. 3-6.

¹⁵ Bosanquet, *Tank Encyclopedia, WW1 Tanks, France, WW1 French Armored Cars, Automitrailleuses Peugeot 1914*, <http://www.tanks-encyclopedia.com/>, accessed 9 July 2019. See photograph 10.

¹⁶ Bosanquet, *Tank Encyclopedia, WW1 Tanks, France, Renault modèle 1914*, <http://www.tanks-encyclopedia.com/>, accessed 9 July 2019. See photograph 11.

¹⁷ *Ibid*, WW1 Tanks, France, *Armored Cars*.

available in substantial numbers.¹⁸ By July 1918 few remained in service with the result that, along with heavy tanks, British armoured cars were transferred to assist the French counter-attack at Soissons.¹⁹

The first British ideas were by Frederick Simms.²⁰ His vehicle was manufactured by Daimler, armoured by Vickers and unveiled at the Crystal Palace in April 1902, just days after the CGV was first exhibited in France.²¹ In addition to the Simms War Car, one further British-built armoured car was produced in the pre-war years.²² This was designed by Walter Wilson, who in 1906 worked for the Armstrong Company. Wilson later re-joined the forces and played a major role in the design and development of tanks.

War Office experiments do not appear to have occurred until early in the war: they were not successful.²³ Although Kitchener did not admit it, the navy spared the army further development work by providing armoured cars and other vehicles commencing late 1914 when entrenched conditions prevented continued use of naval armoured cars in support of RNAS operations.²⁴ After Churchill left the Admiralty in May 1915, most military assets, known as “Winston’s Circus”, were formally transferred to the army.²⁵ The army was not keen to reveal experimental work it had undertaken, as demonstrated by its approach to the RNAS in February 1915 when it simply sought

¹⁸ Ibid, WW1 Tanks, France, Peugeot 1914 Armored Car and Renault Modèle 1914.

¹⁹ Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918. The unit also took part in the battles at Ravenel and the River Ourcq in June and July respectively; National Archives, WO95/116, War Experiences and Tactical Notes of 17 (Armoured Car) Tank Battalion, undated, but received from 3 Tank Group by HQ Tank Corps 2 February 1919.

²⁰ David Fletcher, *War Cars: British Armoured Cars in the First World War* (London, HMSO, 1987), pp. 8-9. See photograph 6.

²¹ Lord Montagu and David Burgess-White, *Daimler Century* (Sparkford, Patrick Stephens, 1995), pp. 59-61.

²² Christopher Foss, *Encyclopaedia of Tanks and Armoured Fighting Vehicles* (Staplehurst, Spellmount, 2002), p. 137. Neither Simms nor Wilson’s cars incorporated overhead protection.

²³ Murray Sueter, *The Evolution of the Tank: A Record of Royal Naval Air Service Caterpillar Experiments* (London, Hutchinson, 1937), pp. 33-35; Bartholomew, *Early Armoured Cars*, p. 19.

²⁴ Fletcher, *War Cars*, pp. 33-38; Charles Rumney Samson, *Fights and Flights* (London, E Benn, 1930), pp. 150-151.

²⁵ National Archives, ADM1/8437/316, Greene to War Office, 19 August 1915. Churchill’s actions involving military operations in Belgium in 1914 became a source of criticism and jealousy by/on the part of Kitchener and other military and political figures. A balanced account of the value and achievements of his Royal Marines, armoured cars, armoured trains and bus fleet is given by Glanfield, *Devil’s Chariots*, pp. 47-51 and Barry Gough, *Winston’s Circus, Finest Hour*, 177, Summer 2017, <https://winstonchurchill.org/publications/finest-hour/finest-hour-177/winstons-dunkirk-circus/>, accessed 28 July 2019.

assistance on the use of armour plate.²⁶ It was only after interview by Kitchener that Thomas Hetherington, a junior officer in the Navy's Armoured Car Squadron, became aware that the armoured omnibus chassis he had been asked to inspect was an experimental armoured car.²⁷ The army's reticence was understandable bearing in mind the two machines they developed or commissioned were underpowered, lacked resistance to short-range small arms fire and failed to impress in terms of likely durability.²⁸ By the time Hetherington undertook his inspection, the navy's more sophisticated Rolls Royce had already entered service.²⁹

In terms of technical awareness, the key point is that the Army Council declined to associate itself with early work on armoured cars undertaken in Britain or abroad. It showed no sign of having recognised the value of armoured cars either before the war or during the early weeks of mobile conflict in Belgium and France. It needs nevertheless to be borne in mind that an apparent lack of written evidence does not necessarily mean that some had not appreciated the error in neglecting armoured vehicles. Kitchener's experimental vehicles betray an underlying awareness of earlier failure to tread a worthwhile path. In contrast to unpromising army experimental work, observations made by users of the navy's favoured Rolls Royce model were invariably complimentary, as shown by the accolade awarded by T. E. Lawrence, "a Rolls in the Desert is above rubies".³⁰

Kitchener's attitude towards such innovation is illustrated by his reply to George V, who, impressed by Raymond Brutinel's Canadian armoured motors, each incorporating two mounted machine-guns, commented that they "should be very useful". Kitchener's reply was "I don't think so, Sir, it would unbalance the fire power of a Division."³¹ His tactless and inapposite remark, made during a Royal inspection, illustrates a defect in character and was a source of dismay rather than encouragement to those who had foreseen the benefits of mobile firepower and

²⁶ Sueter, *Evolution of the Tank*, pp. 34-35.

²⁷ Ibid, p. 35. It is not clear whether Hetherington inspected the Autocarrier or the larger AEC model or both.

²⁸ Bartholomew, *Early Armoured Cars*, p. 19, Autocarrier, photograph 12. See also Experimental AEC B-type, photograph 13.

²⁹ Sueter, *Evolution of the Tank*, p. 33, plate VI. See photograph 14.

³⁰ T. E. Lawrence, *Seven Pillars of Wisdom: A Triumph* (London, Jonathan Cape, 1935), p. 591; Peter Pugh, *Rolls Royce, The Magic of a Name: The First Forty Years of Britain's most Prestigious Company* (London, Icon Books, 2015), p. 91.

³¹ Dominique and Jacques Baylaucq, *The Extraordinary Story of a French Citizen Brigadier-General in the Canadian Army* (St. Albert, Arts and Heritage, 2014), p. 46.

armoured protection.³² Some in Britain, France, Russia, Italy, Belgium and Canada showed initiative in advocating a traditional military technique, modified, in terms of cladding, source of power and armament, by developing technology. However, the British Army, as a major potential beneficiary, failed to reap any benefit from any form of armoured vehicle in 1914.³³ Experiences in South Africa, that might have served as a foundation for progress, were not developed after the Boer War.

Although it was relatively undeveloped industrially, Russia possessed more armoured cars in 1914 than any other nation.³⁴ In other respects the plaudits belonged to Italy which had been first to deploy armoured cars for warfare, in Libya, in 1912.³⁵ By this time, the Belgian Army was pioneering patrol cars armed with machine guns and sharpshooters but did not begin installing armour plate until invaded.³⁶

Germany constructed no general-purpose armoured cars before late 1915. According to Bosanquet this was not because Germany had failed to experiment with armoured cars, but because it had failed to recognise their tactical value.³⁷ Bosanquet's view is supported by the fact that Germany had developed specialised armoured cars for use in combatting observation balloons.³⁸ It is surprising that this one tactical use was acknowledged but other potential uses rejected. However, use of partly-armoured vehicles by the Belgian Army quickly led to German use of captured Belgian vehicles against their former owners and a reappraisal of German policy,

³² Juliette Champagne and John Matthews, *Raymond Brutinel and the Genesis of Modern Mechanized Warfare in The Frontier of Patriotism: Alberta and the First World War*, ed. by Adriana A. Davies, Jeff Keshen and Rob Huebert (Calgary, University of Calgary Press, 2016), pp.17-18. It should be recalled that Tritton claimed Kitchener made similar disparaging remarks at the trial of the first tank at Hatfield Park on 2 February 1916. William Robertson, *From Private to Field-Marshal* (London, Constable, 1921), p. 268, Robertson later claimed "Kitchener agreed to my proposal that a hundred should be ordered at once", which suggests that Kitchener's remarks and early departure from Hatfield were designed to preserve security concerning the value of the machine.

³³ Bartholomew, *Early Armoured Cars*, pp. 24-25.

³⁴ *Ibid*, p. 23.

³⁵ W. H. Beehler, USN, *The History of the Italian-Turkish War September 29, 1911 to October 18, 1912* (Annapolis, The Advertiser Republican, 1913) pp. 94 and 105; Bartholomew, *Early Armoured Cars*, p. 11.

³⁶ Bosanquet, Tank Encyclopedia, First World War Tanks, Belgium, Minerva Armored Car, The Belgian Army – Pioneering the use of armored cars, tanks-encyclopedia, <http://www.tanks-encyclopedia.com/>, accessed 3 July 2019.

³⁷ *Ibid*, German Empire, Ehrhardt E-V/4, accessed 4 April 2019.

³⁸ The Times, *History of the War, vol. I*, (London, The Times, 1921), The German Army in the Field, pp. 224-240 (see photograph 15). Frederick Maurice, *Forty Days in 1914* (London, Constable, 1919), pp. 41, 72, 88, 104, and 148 records five references to the use of armoured cars by the German Army in Belgium between 4 August and 2 September 1914: it is likely these were balloon busters, armed with AA guns, or captured vehicles.

German armoured cars being constructed in relatively small numbers from late 1915.³⁹ Possibly owing to a shortage of manufacturing capacity, armoured vehicles did not become a major feature of German wartime armament.⁴⁰

Much is said in secondary literature about BEF shortages of arms/ammunition/equipment, such as quantity and type of artillery ammunition, lack of heavy artillery and hand grenades and number of machine-guns.⁴¹ Additionally, there is considerable criticism of Britain's failure to identify the need for armoured vehicles early in the war. However, there is relatively little criticism of this same failure before the war.⁴² It is understandable that those in senior military or political posts would not wish to draw attention to their failure to advocate or experiment with such technology, but is difficult to explain the shortage of critical comment in the scholarship. There was a period of twelve years between construction of the Simms War Car and outbreak of the First World War, ample time in which to evaluate, and, if considered appropriate, to modify and develop armoured vehicles for deployment in a war that over this period loomed increasingly large on the horizon.⁴³ Failure might be explained in part by the structure of the army and the division of responsibilities. Strachan highlights the limited role of the General Staff viz-a-viz commanders of

³⁹ Bartholomew, *Early Armoured Cars*, pp. 29-30. See photograph 16; Bosanquet, *Tank Encyclopedia*, First World War Tanks, German Empire, Ehrhardt E-V/4, tanks-encyclopedia.com, accessed 4 April 2019.

⁴⁰ Ibid, pp. 29-30; Bosanquet, *Tank Encyclopedia*, German Empire, WW1 German Armored Cars, <http://www.tanks-encyclopedia.com/>, accessed 3 July 2019, just 46 built during the war, mostly Ehrhardt E-V/4; First World War Tanks, tanks-encyclopedia.com/, accessed 3 July 2019.

⁴¹ Gary Sheffield and Dan Todman, Command and Control in The British Army on the Western Front, in *Command and Control on the Western Front: The British Army's Experience 1914-18*, ed. by Gary Sheffield and Dan Todman (Staplehurst, Spellmount, 2007), pp. 7-8; Lloyd George, *War Memoirs*, pp. 76-78, 83-87 and 356-366; R. J. Q. Adams, *Arms and the Wizard: Lloyd George and the Ministry of Munitions 1915-1916* (London, Cassell, 1978), pp. 175-179; Edmonds, *Military Operations France and Belgium, 1915, vol. II*, (London, Macmillan, 1936), pp. 76, 95 and 161.

⁴² Such criticism is completely absent in most cases – see for example Ernest D. Swinton, *Eyewitness: Being Personal Reminiscences of Certain Phases of the Great War including the Genesis of the Tank* (London, Hodder and Stoughton, 1932), passim; Winston S. Churchill, *The World Crisis, vol. II, 1915* (London, 1923), pp. 71-91 and Lloyd George, *Memoirs*, passim. For an exception, see Jonathan Shimshoni, Technology, Military Advantage, and World War I: A Case for Military Entrepreneurship, *International Security*, vol. 15, No. 3 (Winter, 1990-1991), pp. 211-212.

⁴³ Hew Strachan, *The British Army, Its General Staff, and the Continental Commitment, 1904–1914*, in *The Schlieffen Plan: International Perspectives on the German Strategy for World War I*, ed. by Hans Ehlert et al., by David T. Zabecki, (Lexington, University Press of Kentucky, 2014), pp. 293–318; John Gooch, A Particularly Anglo-Saxon Institution: The British General Staff in the Era of Two World Wars in *The British General Staff: Reform and Innovation c. 1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], p. 167; Keith Jeffrey, *Field-Marshal Sir Henry Wilson: A Political Soldier* (London, Oxford University Press, 2008), pp. 92-95.

fighting units/formations.⁴⁴ He notes the unsatisfactory division of staff responsibilities and the failure of the General Staff to secure acceptance of its continental approach:

The continentalism of the General Staff not only failed to move laterally, to the adjutant general's and quartermaster general's departments, it also failed to percolate downward to the parts of the army that were responsible for the actual business of fighting.⁴⁵

It is tempting to explain the position by observing that the need for particular forms of equipment and armament would have been recognised more easily by closer working or integration of those responsible for the fighting, for the policy that would determine the location of the fighting and for the supply and development of weaponry. However, this is to an extent belied by the response of a number of individuals in Territorial forces who commissioned the construction of their own armoured cars.⁴⁶ Free from what appears to have been an unappreciative response by the regular army, an obvious advantage was seen more clearly by some on the military periphery. This aligns with examination of the Edwardian Army by Connelly and Bowman, who record argument by some junior or middle-ranking officers about the lack of priority for a potential war against the world's strongest military power and, notably from within artillery circles, about the need to concentrate on heavier guns and copious supplies of ammunition.⁴⁷

It cannot be determined why senior army personnel failed to embrace the attributes of the armoured car. It may have been due to lack of vision or bending the knee to controlling politicians intent on utilising available resources for social rather than military benefit. However, it is difficult to see how shortage of money can explain the situation since there appears to have been no debate on the matter either in military or financial circles.⁴⁸ In general terms, preparations for the forthcoming war were not

⁴⁴ Hew Strachan, *The British Army, Its General Staff, and the Continental Commitment, 1904–1914*, in *The British General Staff: Reform and Innovation, 1890–1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], pp. 75–76.

⁴⁵ *Ibid.*, p. 310.

⁴⁶ B. T. White, *British Armoured Cars, 1914–1945* (London, Ian Allen, 1965), pp. 8 and 27–28; Bartholomew, *Early Armoured Cars*, pp. 20–21. See photograph 17.

⁴⁷ Timothy Bowman and Mark Connelly, *The Edwardian Army: Manning, Training, and Deploying the British Army, 1902–1914* (Oxford, Oxford University Press, 2012), chapter 3, Training and Doctrine, *passim*, particular importance of issues on pp. 76–84.

⁴⁸ Stephen Badsey, *Doctrine and Reform in the British Cavalry 1880–1918* (London, Routledge, 2008), p. 236.

assisted by post-Boer War reductions in expenditure.⁴⁹ This may have had a bearing on the failure to adopt tracked vehicles for haulage and supply purposes and quantities and type of artillery ammunition but there is no evidence that it affected experimentation with armoured cars.⁵⁰ Since armoured cars did not manage to jump the first hurdle (need or military value), they did not face the second hurdle (securing finance). Reorganisation does not appear to have succeeded in the objective of supplying the necessary quality of brains to the Army Council.⁵¹

Despite failings in South Africa to generate enthusiasm for armoured vehicles, experiences did encourage interest in the development of motorised transport. In the early years of the century, standards were set for motorised military transport and experiments were pursued with a range of steam, paraffin and petrol-driven machines capable of hauling artillery and other heavy equipment. The army established a Mechanical Transport Committee but did not staff or finance the Committee sufficiently to enable it to appoint its own staff to undertake necessary research, experimentation and development. Innovative progress was reliant upon cooperation with civilian firms prepared to undertake research and development in anticipation of securing military contracts.⁵² For over a decade the Committee encouraged the development of vehicles for haulage. This included tracked vehicles, but orders for such vehicles were not forthcoming. In consequence, Hornsby's, the only firm experimenting with the use of tracked vehicles for military purposes, sold their patents to the American Holt company.⁵³ Following the outbreak of war Britain then found it necessary to acquire or build under license over 2,000 Holt tractors for towing guns.⁵⁴ Military interest during

⁴⁹ Richard Burdon Haldane, *Richard Burdon Haldane: An Autobiography* (London, Hodder and Stoughton, 1929), pp. 137-138; Edmonds, *Military Operations, France and Belgium, 1915, vol. II*, p. 12.

⁵⁰ Defence Academy of the UK, Joint Services Command and Staff College, Hobson Library, SC10-18A, reports and verbatim records of proceedings at Annual January Conferences held under the Orders and Direction of the CIGS, 1906-1914, include no items on armoured cars; similarly, no items appear in RUSI journals between the Boer War and First World War.

⁵¹ James E. Edmonds, *Military Operations France and Belgium, 1914, vol. I* (London, Macmillan, 1933), p. 4; Ian F. W. Beckett, 'Selection by Disparagement': Lord Esher, the General Staff and the Politics of Command, 1904-14, in David French and Brian Holden Reid, *The British General Staff: Reform and Innovation c. 1890-1939* (London, Routledge, 2014) [2002], pp. 35-47; Shelford Bidwell and Dominick Graham, *Firepower: British Army Weapons and Theories of War 1904-1945* (Barnsley, Pen and Sword, 2004), pp. 46-48 and 94-115.

⁵² John Glanfield, *The Devil's Chariots: The Birth and Secret Battles of the First Tanks* (Stroud, Sutton Publishing, 2006), pp. 13-14.

⁵³ National Archives, Annual Report of Mechanical Transport Committee 1913/14, p. 22; Glanfield, *Devil's Chariots*, pp. 12-16.

⁵⁴ *Ibid*, pp. 15-16 and 31.

this period was centred on towing and haulage, though it would not have required an inconceivable advance in thought to have graduated to a combat role for variants of such vehicles. Press cartoons and authors had pointed the way during the Boer War.⁵⁵ This was followed by *The Ironclads*, a short story by H. G. Wells.⁵⁶

By 1908, experimentation had reached the stage that enabled a tracked vehicle to appear at the Royal Review at Aldershot.⁵⁷ Potential assistance was not limited to the press and continental motor industry. An engineer from Australia, Lancelot de Mole, forwarded plans of a caterpillar system to the War Office in 1912. His offer was declined since the War Office was “not further experimenting with chain rails”.⁵⁸

Events prior to the declaration of war do not paint the War Office as aware of the need to adapt to prospective changes in the nature of warfare or to changes in Britain’s role resulting from potential consequences of new alliances. The only consolation that can be drawn from failure to foresee future value in armoured vehicles is that the same blind-spot was exhibited to varying degrees by all participants in the forthcoming tragedy. Notably, the German Army, reliant upon a quick victory, must have reflected on the benefits that might have accrued from an advanced or flank screen of armoured cars and the provision of more mechanical transport generally. Armoured cars might have enabled the German Army to challenge the effectiveness of British cavalry in protecting the retreating BEF after Mons. Additionally, after several weeks of marching and fighting, many German units were in poor shape to take part in the key Battle of the Marne.⁵⁹

Having failed the first test of foreseeing armoured opportunities in a forthcoming war, the next question would be how rapidly the nation would respond as aspects of tactical reality were revealed through experience of conflict. Three stages of a process

⁵⁵ Tank Museum, Hornsby Chain Tractor 623.437 425 (41), *Chase of de Wet* by Rudyard Kipling, 1913 press cuttings of private and official experiments in motorised transport and its linking to combat roles and cartoon drawn by W Raleton “*Warfare of the Future: The Traction Mounted Infantry in Action*”. See photograph 18.

⁵⁶ H. G. Wells, *The Land Ironclads* (London, Todd Publishing, 1943).

⁵⁷ ‘King Edward watches Two Big Armies in a Sham Fight and Inspects the Caterpillar which drags Heavy Guns’, *Daily Mirror*, 19 May 1908. See photograph 19.

⁵⁸ National Archives, T173/34B, Evidence of Lancelot de Mole to the Royal Commission on Awards to Inventors, 20 October 1919, p. 128.

⁵⁹ Robert Foley, *Baptism of Fire: The German Army’s Lost Victory in 1914*, a presentation as part of the Western Front Association President’s Conference series “A World at War 1914-18”, 1914: The BEF and the German Imperial Armies, <https://www.youtube.com/watch?v=-mudhjZe8X8>, accessed 10 June 2019.

needed to be surmounted before armoured vehicles could influence the scale of casualties and course of continental warfare, namely, recognition of need and benefits, design and construction of prototypes and manufacture in numbers. Whereas the potential value of armoured cars might have been detected and appreciated before the war, the need for tanks was not readily identifiable until a continuous front had been created, thereby preventing favoured flanking manoeuvres. Thereafter, the speed and skill with which tanks could be developed was capable of exerting a considerable influence on the remaining period of war and therefore on the final balance sheet. Recognition of need, resolution of mechanical difficulties and efficiency of construction were important to national wellbeing. Yet, as the country enjoyed the fine summer of 1914, it was unaware that failure to achieve even the first stage in developing weapons capable of combatting its enemies' strengths had already sealed the fate of many thousands of its citizens. Edmonds, somewhat conservatively, described losses at Loos as "the price paid in flesh and blood for unpreparedness for war".⁶⁰ Failure to develop armoured cars was an element of that unpreparedness: this is inadequately recognised by the scholarship.

Six overlapping wartime periods relating to off-road armoured vehicles will be examined in broad chronological sequence: three fall within this chapter. Firstly, claims by Churchill to have envisaged, between September 1914 and January 1915, the need for armoured vehicles and to have authorised initial work on a machine he described as a forerunner of the tank.⁶¹ Secondly, the vision and initial efforts of others, notably Ernest Swinton, between October 1914 and January 1915, to persuade the army to develop AFVs to assist in the attack on machine-gun and wire-protected entrenched positions. Thirdly, brief trials of caterpillar traction by the army in February 1915.

Churchill did not dissent from the Liberal Party's distaste for military expenditure, forcibly expressed, though perhaps exaggerated for political effect, by Campbell-Bannerman.⁶² Campbell-Bannerman outlined priorities for the incoming Liberal government in his first public speech as Prime Minister. His words did not suggest the

⁶⁰ Edmonds, *Military Operations, France and Belgium, 1915, vol. II*, pp. 391-393, casualties for the Battle of Loos (25 September 1915-16 October 1915), were 50,380, of whom some 15,800 were "killed, or missing and never heard of again".

⁶¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answers to questions 6-11.

⁶² 'Sir H Campbell-Bannerman at the Albert Hall: Declaration of Policy', *The Times*, 22 December 1905.

future army would be awash with money, “Militarism, extravagance, protection are weeds which grow in the same field, and if you want to clear the field for honest cultivation you must root them all out”. His government’s intentions so far as military expenditure and armaments were concerned were introduced by his view that “the growth of armaments is a great danger to the peace of the world”. Interspersed by the cheers of the capacity audience, he asked “What nobler role could this great country assume than at the fitting moment to place itself at the head of a league of peace....?” Although in the 1900’s Churchill campaigned energetically across the nation in support of increased taxation, his objective, primarily, was to advance living standards for the working man. His speeches, notably before the 1909 budget, emphasised the need for “social reconstruction and reorganisation”, since “the social conditions of the British people at the dawn of the twentieth century cannot be contemplated without deep anxiety”.⁶³

Randolph Churchill records “in 1911 faith in Germany’s good intentions was rudely shaken, and Churchill was among the first to see the need to change his views, and to seek policies consistent with the danger”.⁶⁴ Randolph’s opinion, that Agadir figured prominently in Churchill’s change of tack, may well have been correct, but he was wrong to state that his father sought policies consistent with the danger. Certainly, naval planning belonged in that fold, but military policies do not appear to have figured in the changes he advocated. Churchill’s concerns over domestic social issues were well founded, but he misjudged “the German threat” and failed to recognise or admit the scale of the burden the nation might be called upon to bear. Initially Churchill’s view was based on the false premise that others would behave logically. Since there was no logical reason for Britain and Germany to go to war, therefore there would be no conflict. He stated that in terms of prosperity, regardless of the outcome, the cost and consequences of war would inevitably mean that both nations would be losers:

I think it is greatly to be deprecated that persons should try to spread the belief that war between Great Britain and Germany is inevitable. It is all nonsense.....while there is no danger of collision of material interests, there is no result which could be expected from any struggle between the two countries except a disaster of a most appalling and idiotic character....One

⁶³ Robert Rhodes James (ed.), *Winston S. Churchill: His Complete Speeches 1897-1963, vol. II* (New York, Chelsea House Publishers, 1974), speech at Leicester, 4 September, 1909, *The Budget*, p. 1317.

⁶⁴ Randolph S. Churchill, *Winston S. Churchill 1874-1965, vol. II, Young Statesman, 1901-1914* (London, Heinemann, 1967), p. 521.

month of fighting would destroy more wealth than five years of trading could produce.⁶⁵

Some in Germany held similar views.⁶⁶

Churchill's appreciation of the German naval threat preceded his transfer to the Admiralty in 1911. In 1908 he had made general statements in support of naval strength. At the Admiralty he fought hard for naval expenditure, making many speeches on naval developments, seeking, largely successfully, to increase British naval forces to maintain numerical superiority over the growing German and Austro-Hungarian programmes.⁶⁷ His aspirations were secured despite opposition from within his Party, notably from the Chancellor, Lloyd George.⁶⁸ Nevertheless, at no stage did he take a sound, comprehensive view of the nation's military preparedness in relation to its likely commitments in the event of war with Germany. In August 1911 Churchill had written a memorandum on the *Military Aspect of the Continental Problem*, a prophetic document in terms of features of the German invasion of France some three years later, but open to criticism through greatly understating British involvement in the event of war. He estimated maximum involvement of British forces on the continent at 296,000, with the possibility of elements of a levy of 500,000 for home defence being sent abroad at a later date.⁶⁹ Over 5,700,000 served in the British Army between 1914 and 1918.⁷⁰

Churchill's association with the development of armoured vehicles commenced shortly after war was declared. In his evidence to the Royal Commission, Churchill recounted the success of his armoured cars prior to the establishment of a continuous trench line from Switzerland to the Channel.⁷¹ Unfortunately, naval armoured cars and

⁶⁵ Rhodes James, *Complete Speeches*, vol. II, speech at Swansea, 14 August 1908, *Government Policy and the Foreign Situation*, p. 1085.

⁶⁶ Richard Burdon Haldane, *Before the War* (London, Cassell, 1920), pp. 27-28.

⁶⁷ Rhodes James, *Complete Speeches 1897-1963*, vol. II, speech at The Guildhall, 9 November 1911, *Naval Defence*, pp. 1891-1893.

⁶⁸ John H Maurer, *Churchill and Strategic Dilemmas Before the World Wars: Essays in Honor of Michael I Handel* (London, Routledge, 2003), p. 6; Rhodes James (ed.), *His Complete Speeches vol. II*, pp. 1919-1941, 1970-2008, 2033-34, 2067-2109 and 2168-2184, but most significantly his speech on Navy Estimates of 17 March 1914 which proposed an increase of £4 million, received with some hostility by his colleagues, and upon which he judged it necessary to seek compromise, pp. 2233-2262.

⁶⁹ Churchill Archives Cambridge, CHAR 24/3, memorandum by Mr. Churchill, 13 August 1911.

⁷⁰ War Office, *Statistics of the Military Effort of the British Empire during the Great War* (London, HMSO, 1922), p. 364.

⁷¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answer to question 6.

other military activities with which Churchill became involved represented a source of friction between himself and Kitchener.⁷² This friction may have impacted adversely on the development of the tank through the secrecy imposed by Churchill on the commencement of his “Landship” project at the Admiralty early in 1915.

Churchill also informed the Royal Commission that by October 1914, as armoured cars could no longer move round the trenches, it was obvious that “some method should be devised which would enable them to traverse and pass over the trenches themselves”.⁷³ He claimed he sent for Admiral Bacon who was engaged in the production of 15-inch howitzers and asked him to design an armoured machine which would carry guns and fighting men and would be capable of crossing the trench lines.⁷⁴ According to Churchill’s evidence, Bacon designed a bridge-carrying machine for which an order was placed. This order was however subsequently cancelled since “a better design had been arrived at through an altogether different agency”. Churchill claimed that “no earlier effort to make a tank or trench crossing vehicle had been made”.⁷⁵ He repeated this version of events in *The World Crisis* in which he attempted to render more plausible his question to Bacon about making versions of tractors that “could cross trenches and carry guns and fighting men”, by adding that the eight enormous caterpillar tractors towing Bacon’s 15-inch howitzers “were extremely suggestive”.⁷⁶

However, Churchill’s statement is not consistent with the evidence of others. He was correct to attribute work on the provision of heavy guns to Bacon who, following the successful action of German heavy artillery at Liege, foresaw the need for a heavy howitzer for the British Army.⁷⁷ As rail transport would have been too inflexible for the transport of such a weapon, Bacon faced a double challenge in the movement of his new artillery pieces by road, firstly, the excessive weight of the gun in relation to the capabilities of towing vehicles and, secondly, the difficulty of movement in areas in which roads had been damaged. Having solved the problem of weight by designing

⁷² National Archives, Kitchener Papers, PRO30/57, Kitchener to Churchill, 19 and 23 December 1914.

⁷³ National Archives, MUN5/394, statement by Churchill to the Royal Commission, dated 1 September 1919, paragraphs 8-10.

⁷⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answer to question 8.

⁷⁵ *Ibid*, answers to questions 9-11.

⁷⁶ Winston Churchill, *The World Crisis 1911-1918* (London, Free Press, 2005), p. 305.

⁷⁷ Reginald Bacon, *From 1900 Onwards* (London, Hutchinson, 1940), pp. 196-197. See photograph 20.

the howitzer as a two-piece armament, he approached the War Office but received a rebuff on the grounds that it was not the policy of the Army Council to employ heavy guns in the field.⁷⁸ Regrettably, Bacon does not give dates, but, at this stage, he claims to have approached Churchill at the Admiralty where he “met with a very different reception”. An order for his proposed howitzers was secured.⁷⁹

During that period, Bacon referred neither to a suggestion or possible order from Churchill for the means of transporting the parts of the howitzer nor to the development of a bridge-laying vehicle. However, having designed the wagons on which the howitzer would be loaded, Bacon turned his attention to the means of traction, contacting Tritton at Messrs. Fosters of Lincoln “whom he was aware had been making 120-H.P. tractors for ploughing in the Argentine”.⁸⁰ Bacon’s recollection of the sequence or timing of some events may be suspect, but Tritton supports his general outline: “it was to assist in the solution of a transport problem that the services of William Foster and Co. were first requisitioned by the government”.⁸¹ Furthermore it appears Tritton accompanied Bacon on his visit to the Admiralty late in September when an order for 105-H.P. tractors was secured.⁸² This order was completed, seventy-seven vehicles being delivered to the Admiralty.⁸³ Foster’s *History* includes photographs of the wheeled vehicles on test on 3 December 1914 and in convoy towing howitzer parts for embarkation.⁸⁴

However, whereas Churchill described these tractors as “enormous caterpillar tractors”, photographs and Tritton’s evidence to the Royal Commission prove they were wheeled.⁸⁵ Eloquently, Churchill attempted to weave his role in the forward defence against Zeppelin attack into the chain of causation of the tank, “Thus the Air

⁷⁸ Ibid. p. 198; Bowman and Connelly, *The Edwardian Army*, pp. 78-83, which illustrates the realistic, contrasting doctrine recommended by middle and junior rank officers in the Royal Artillery.

⁷⁹ Bacon, *From 1900 Onwards*, pp. 196-197.

⁸⁰ Ibid, pp. 196-200. Bacon was mistaken about the engine used by Fosters, it was 105HP.

⁸¹ William Foster and Co., *The Tank: Its Birth and Development* (Hinkley, William Foster and Co., 1920), p. 11.

⁸² Bacon, *From 1900 Onwards*, pp. 198-199; National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answer to question 2491. It would appear that the order was for seventy-seven tractors or that it was trimmed to this figure later in 1914/1915.

⁸³ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Tritton by Grey, answer to question 2483. (See photograph 21).

⁸⁴ William Foster and Co., *The Tank: Its Birth and Development* (Hinkley, William Foster and Co., 1920) pp. 12-16. See photographs 21 and 22.

⁸⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Tritton by Grey, answer to question 2484. See photographs 21 and 22.

was the first cause that took us to Dunkirk. The armoured car was the child of the air; and the tank its grandchild.”⁸⁶ The development path of the bridge-layer and efforts to adapt it for use in combat conditions is far from clear, but the picture drawn by Churchill is entirely fictional. Additionally, Bacon does not support Churchill’s claim that, upon being shown pictures of these caterpillar tractors by Bacon, “I at once asked whether they would be able to cross trenches and carry guns and fighting men, or whether he could make any that would”. There is no evidence of a Foster’s caterpillar tractor either in October 1914 or any subsequent date during the war.⁸⁷

The *Official History* states that the bridge-laying vehicle was first brought to the attention of Churchill by Bacon in November 1914 and was officially submitted to Kitchener at Churchill’s suggestion.⁸⁸ Furthermore it states that Churchill provisionally ordered a number of vehicles of this design at a date intimated to be early in January 1915. Whilst the details in the *Official History* do not appear to be fully supported by surviving documents, there is no reason to doubt that the general picture is correct since Bacon and Stanley Von Donop, Master General of the Ordnance, refer to Kitchener’s knowledge of the matter.⁸⁹ Churchill’s cancellation of the order on or shortly after 20 February 1915 appears not to have been a full cancellation since Fosters and Bacon continued to work on a prototype, trialled in June 1915.⁹⁰ Mansell of the Coventry Ordnance Works confirmed that the prototype would shortly be ready for trial, but was unable to find any paperwork. He claimed to have been summoned by Churchill “one day” (most probably shortly after the Landships Committee was formed on 20 February 1915), stating that Churchill cancelled the order but “told me to go on with the one”.⁹¹ Mansell wished to know whether the machine was on order

⁸⁶ Churchill, *World Crisis 1911-1918*, p. 304.

⁸⁷ William Foster and Co., *The Tank*, passim.

⁸⁸ Ministry of Munitions, *History of the Ministry of Munitions, vol. XII, The Supply of Munitions, part III, Tanks* (London, HMSO, 1922), p. 6.

⁸⁹ National Archives, MUN5/394, Von Donop to Scott-Moncrieff and Guthrie-Smith, 12 January 1915, giving effect to Kitchener’s orders.

⁹⁰ Bacon, *From 1900 Onwards*, p. 200; National Archives, MUN5/394, Von Donop entry arranging trials for the machine in file 121/Stores/1332 dated 12 January 1915 and T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answer to question 2493 and examination of Churchill by the Attorney-General, 7 October 1919, answer to question 8. See photograph 23.

⁹¹ National Archives, T173/34B, Mansell to Von Donop, 20 May 1915.

from the War Office or Admiralty since the sub-contractor “is worried about his money”.⁹²

Tritton acknowledged a remark made by Bacon at the trial of the howitzer tractor that “it would be a good thing if a machine could be constructed capable of laying its own bridge, and which, being equipped with means of offence and defence, would be of assistance in trench warfare”.⁹³ This, according to Fosters, set Tritton thinking and “at the urgent solicitation of the Admiral” built an experimental machine which succeeded in crossing an eight-foot wide trench by means of its wheels and portable bridge.⁹⁴ Therefore, according to Bacon and Tritton, the decision to build a bridge-layer did not originate with Churchill at all. Although Churchill claimed the order for the bridge-layers was cancelled owing to a better machine having been devised, comment made by Tritton’s Counsel to the Royal Commission was that Churchill’s verbal cancellation was on 20 February 1915, “Tritton saw him in bed somewhere about 9 or 10 o’clock at night, and at that interview Mr. Churchill cancelled the order he had given for the 70 petrol driven tractors for hauling these guns [sic]”.⁹⁵

At this time there was no other “better solution” and the underlying reason must have been optimism that some alternative machine would quickly be built by the Committee he had established earlier that day. In any event it is clear that the bridge-layer was not Churchill’s idea and was not a forerunner of the tank, being unarmoured, unarmed and wheeled.⁹⁶ Additionally, Tritton and Bacon show that Churchill did not authorise or require the initial experimental work on the machine. Although Bacon claims to have toyed with the idea of an armoured bridge-laying tractor, Tritton

⁹² Ibid.

⁹³ William Foster & Co., *The Tank*, pp. 12-15.

⁹⁴ Ibid, p. 15; National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answers to questions 2485-2489. (The answer and question recorded at 2485 do not appear to correspond. It may be that the answer to question 2485 and the question to which the answer is given were omitted from the transcript in error. This does not however affect the key point of Tritton’s evidence that he was, under his own initiative, working on the bridge-carrying vehicle around the period of Christmas 1914. Tritton’s answer to Commissioner Mackinder’s question 2508 confirms that the experimental bridge-layer was his “own machine”).

⁹⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 20 October 1919, statement by Frank Russell, Tritton’s KC, to the Commission, p. 137. Russell mistakenly refers to the cancellation being for the vehicles for hauling the 15-inch howitzers, he should have referred to the order for the conversion of such vehicles to bridge-layers. The order for the haulage vehicles was not cancelled, but was completed “in full”, see evidence of Tritton on 21 October in answer to question 2483 and photographs of some of the vehicles in William Foster and Co., *The Tank: Its Birth and Development* (Hinkley, William Foster and Co., 1920), p. 16.

⁹⁶ See photographs 22 and 23.

dismissed the idea that the tractor could have been armoured. He believed the weight of the machine, its bridge and armour were “fatal to its being able to travel over the quagmire the ground of Flanders and Belgium was fast becoming”.⁹⁷

The remarks and course of events outlined by Bacon and Tritton are considered sufficient for Churchill’s claims in respect of 1914 to be rejected. Rather, it seems likely Churchill was deliberately merging the separate issues of entrenched warfare and the practice of German Uhlans, during the brief spell of mobile warfare in August and September 1914, to dig ditches across roads to restrict or slow down movements of armoured cars. This practice was recognised in *The World Crisis*, in which Churchill claimed that the “enemy, harassed by the armoured cars, cut gaps in the roads, and I called immediately for means of bridging these gaps.”⁹⁸ The bridge-layer did not become available for trials until June 1915, trials which it failed, amongst other reasons, owing to its inability to cross closely-spaced trenches.⁹⁹ Owing to restricted speed and mobility, it would have been ill-suited for patrols distant from British bases.

On a connected note, Churchill’s evidence to the Royal Commission, that it was obvious “some method should be devised which would enable them [armoured cars] to traverse and pass over the trenches themselves”, is illogical. His statement begs the question of how the bridge-layers would reach the first line of trenches and whether they would be able to advance further once they had crossed them. Critically, the enemy would need to be defeated in the locality of the crossing place before the bridge-layer could be deployed. The question which Churchill and the BEF should have addressed was that of inevitable problems associated with reaching and moving past enemy trenches, coping with adverse ground conditions and enemy weapons, rather than one limited element of the problem. There seems no doubt therefore that a significant part of Churchill’s evidence to the Royal Commission was manufactured in order to present himself in a favourable light. It is interesting to note that Bacon’s remarks, mentioned by Tritton, show how close his ideas were to that of the tank. Bacon envisaged an armed and armoured bridge-layer but made no effort to promote the design of such a vehicle. Tritton accepted the trench-crossing capabilities of

⁹⁷ William Foster & Co., *The Tank*, p. 16.

⁹⁸ Churchill, *World Crisis, 1911-1918*, p. 304.

⁹⁹ National Archives, T173/34B, report dated 11 June 1915, by Colonel Holden and Major Wheeler on bridge-laying machine developed by Fosters.

Bacon's concept but considered the additional weight of armour would render the machine inoperable.

The evidence therefore shows that Churchill, in common with most participants and observers of the Western Front, failed during 1914 to identify the key elements to be resolved if entrenched defences were to be overcome. Ernest Swinton, appointed on 7 September as BEF war correspondent, did identify those key elements. He saw the need for armed and armoured vehicles, capable of moving across no-man's-land, wire and trenches on tracked systems, tasked with destroying machine-guns, the main German defensive weapons.¹⁰⁰ Well placed to observe events and assess potential improvements in equipment or tactics, Swinton connected the values of the armoured car with tracked movement across shelled ground and destruction of enemy defensive systems. He painted a vivid picture of the consequences of 8th Division's attack on 9 May 1915 when, following the cessation of the opening bombardment, mainly with shrapnel, the enemy emerged from their shelters relatively unharmed to inflict severe damage:

in most cases our assault was stopped dead on the top of our own parapets or a few yards in front, where the ground was strewn with bodies. A feature of the defence was again the slaughter dealt out by machine guns.¹⁰¹

The reality therefore is that the evolution of the tank cannot be traced through Churchill and Bacon to September 1914, but its complicated development path of some fifteen months, can be followed back to the officer appointed by Kitchener as "*Eyewitness*". Swinton foresaw at an early stage the type of machine needed to break entrenched deadlock by destroying machine guns and protective wire. Belatedly, it was his specification that would determine the characteristics of the tank that would emerge from a slow, intermittent and uncoordinated development process, armoured, armed and tracked.¹⁰²

In formulating his proposals for assisting offensive operations on the Western Front, Swinton was deeply indebted to the vision of his friend Hugh Marriott in July 1914. A fellow engineer, working in mining in South Africa, Marriott saw in the Holt Caterpillar Tractor potential military usefulness. Marriott's vision was, however, restricted to

¹⁰⁰ Swinton, *Eyewitness*, p. 39.

¹⁰¹ *Ibid*, p. 113.

¹⁰² *Ibid*, pp. 131-138.

haulage, for which purpose Holt Tractors were gradually adopted by the army.¹⁰³ Whilst others may have had similar ideas to those of Swinton, and at an earlier date, Swinton alone can claim to be the originator of the sequence of events leading to the development of the Mark I, which fulfilled his basic task specification. His judgment and ideas represent the commencement of tank development.¹⁰⁴

Swinton explained that he first associated the potential of chain traction as a means of overcoming entrenched defences as he was returning to London on 19 October 1914.¹⁰⁵ He sought to promote the concept of the “machine gun destroyer” by the planting of a series of “seeds”. Regrettably, these seeds were sown at a somewhat leisurely pace, since, despite the first two being sowed that same month, the fifth and final seed did not leave his hand until June the following year. Bearing in mind the scale of British casualties during this period, and in the following period required for design and manufacture, an earlier sowing might have been attempted. Some would claim that open warfare would shortly be resumed and that there was no need for an armoured machine. But how was a breach in the enemy defences to be created and did the means exist to support an advance at such a point? Heavy artillery was in short supply, appropriate ammunition scarce and supply vehicles capable of operating over difficult ground did not exist.¹⁰⁶

An earlier development of the tank could conceivably have resulted in a better coordination of fighting seasons and manufacturing runs than eventually resulted and might have saved a proportion of the casualties that continued to be incurred for little or no tangible benefit.¹⁰⁷ In the event, in October 1914 Swinton was deprived by Kitchener’s busy diary of the opportunity to put his views direct to the Secretary of State.¹⁰⁸ He nevertheless expounded those views to Hankey, Secretary to the War Cabinet, and to “Tri-Nitro Tom” Tulloch, an explosives expert and fellow advocate of mechanical warfare who had utilised his pre-war position as an employee of a

¹⁰³ Glanfield, *Devil’s Chariots*, pp.15-16.

¹⁰⁴ Swinton, *Eyewitness*, pp. 31-32; Stephen Roskill, *Hankey, Man of Secrets, vol. I, 1877-1918* (London, Collins, 1970), pp. 146-147.

¹⁰⁵ Swinton, *Eyewitness*, pp. 78-79.

¹⁰⁶ Paul Strong and Sanders Marble, *Artillery in the Great War* (Barnsley, Pen and Sword, 2013), pp. 35-40; Bidwell and Graham, *Firepower*, pp. 96-99.

¹⁰⁷ Edmonds, *Military Operations France and Belgium, vol. II, 1915*, pp. ix and 389-400.

¹⁰⁸ Swinton, *Eyewitness*, pp. 80-83.

German-owned company to dabble in espionage and obtain information on German armaments.¹⁰⁹

Swinton described his discussions with Hankey on 20 October, 1914, as “the sowing of the first seed, the first constructive step in the conception and evolution of what came to be known as the Tank”.¹¹⁰ Swinton reprimanded himself for failing to press more strongly against the cancellation of his arranged meeting with Kitchener on 22 October. He missed the opportunity to lobby a fellow engineer who possessed the authority to initiate experimentation in the development of armoured, tracked vehicles.¹¹¹

The division of tasks agreed on 21 October 1914 by Swinton, Hankey and Tulloch, obliged Swinton to sell the concept to GHQ. Tulloch would “follow up the technical side with a view to finding the right people for design and development” whilst Hankey would “try his hand with the War Office and Ministers”.¹¹² In the event, Hankey had no success with Kitchener who made it plain he would not support such a scheme. On his return to St. Omer, Swinton sowed a second seed with Brigadier-General George Fowke, Engineer-in-Chief. Though personally unsympathetic, Swinton claims Fowke informed him that he had contacted the War Office on the subject. Just over two months later, Swinton sowed a third seed direct with the senior officer of the Royal Engineers, General Scott-Moncrieff, but found the concept was new to Scott-Moncrieff, who, frustratingly, pointed out that it was War Office policy only to investigate matters specifically requested by GHQ.¹¹³

Nevertheless, Scott-Moncrieff was interested and invited Swinton to visit him with Tulloch for further discussion. However, in talks with Tulloch at his club on the following morning, Swinton met Colonel Louis Jackson, responsible under Scott-Moncrieff for trench warfare. Swinton explained that Jackson suggested the matter should be left to him to discuss with Scott-Moncrieff:

¹⁰⁹ National Archives, MUN5/394, notes of interview of Tulloch by Lloyd and Redstone of the Historical Records Branch, 18/12/18 and letter Tulloch to Lloyd of same date.

¹¹⁰ Swinton, *Eyewitness*, p. 83.

¹¹¹ *Ibid.*

¹¹² Roskill, *Man of Secrets*, Hankey to Liddell Hart, 3 April 1948, p. 147.

¹¹³ Swinton, *Eyewitness*, p. 100.

This I did gladly for I was extremely busy; and I asked him to take Tulloch to the Director of Fortifications and Works, in the hope that the latter, with the collaboration of these two officers, would be able to effect something.¹¹⁴

Swinton conceded that his failure to press for a meeting with Kitchener whilst in London in October 1914 had been an error, but made no apology for failing, personally, to press his efforts to interest the War Office in the concept of the tank, either as a follow-up to his approach made through Fowke, or that made direct to Scott-Moncrieff. On the contrary, he sought to defend his limited actions “I had done my utmost to get the idea taken up and translated into action; but strictly speaking, these activities were outside the scope of my official duties.”¹¹⁵

Swinton’s claim to have done his “utmost” is at variance with his comments and the facts. His failure to press the matter with Kitchener followed by his willingness to allow Tulloch and Jackson to advance the cause at the arranged meeting with Scott-Moncrieff suggest his confidence may have been less than he sought to portray. In the event, though unbeknown to Swinton for many months, the proposed meeting of Tulloch with Scott-Moncrieff did not take place.¹¹⁶ It is difficult to judge whether such a meeting would have had any effect on future decisions, but it is not beyond the realms of possibility that it could have stiffened the resolve of a sympathetic Scott-Moncrieff to overcome the obstruction which would be posed by his ADMT, Colonel Holden, following trials of the Holt Tractor.

So far as Tulloch was concerned, in January 1915 he submitted a report on the subject, but this failed to outweigh objections made before and following army trials of the Holt the following month.¹¹⁷ It is in any event unlikely Tulloch would have been as persuasive as Swinton since his concept of mechanical assistance was somewhat different. Whereas his concept incorporated tracks and armour, and he was prepared to consider a range of designs, his favoured machine would have been steam driven, weighing 500 tons.¹¹⁸

¹¹⁴ Ibid.

¹¹⁵ Ibid, p. 84.

¹¹⁶ Ibid, pp. 162-163.

¹¹⁷ National Archives, MUN5/394, Tulloch to Jackson, 19 January 1915, enclosing memorandum dated 15 January providing proposal for “Land Cruisers” and T173/34B, Register 121/Stores/2531, undated and unsigned note headed ‘Dear General’ on Tulloch proposals - from content, clearly Holden to Scott-Moncrieff concerning trials of the Holt Tractor in February, 1915.

¹¹⁸ National Archives, MUN5/394, Tulloch to Swinton, 20 August 1915 and Tulloch to Jackson, 19 January 1915.

The conclusion cannot be avoided that Swinton lacked confidence, resulting in him falling short in advocating army adoption of the concept. Alternatively, or additionally, he may have been concerned his career would suffer had he pressed too hard for measures out of line with War Office thoughts or practice. In the light of his later treatment by higher command, and the similar fate of his assistant, Brough, the limited determination with which he pressed the matter is understandable.¹¹⁹

In the meantime, Hankey was having no success in generating interest in tanks either in political or military circles. Asquith was appreciative and promised full support provided Hankey could “get W.O. to play”.¹²⁰ However, Hankey found von Donop, “too overwhelmed with his own job to take it on” and Wolfe Murray, also a member of the Army Council, to be “not much use”.¹²¹ Although Kitchener heard Hankey out, he responded to the effect that “the armoured caterpillars would be shot up by guns.” Bearing in mind Hankey had become an administrator and had no direct experience of conditions facing the BEF, it is possible Kitchener may simply have given little credence to Hankey’s views. Although Kitchener might have taken a similar line had Swinton spoken to him personally, it is nevertheless possible that the views of a fellow engineer familiar with conditions at the front could have resulted in the commencement of a more thorough consideration of a “machine gun destroyer” during 1914.

On Christmas Day, 1914, having failed to make progress in convincing others of the value of a mechanical solution to the stalemate at the Front, Hankey had “an uncontrollable urge to put on paper an appreciation of the war situation as a whole”.¹²² Following a review of how similar deadlocks to the Western Front had been broken in previous wars by special apparatus or attack from a different direction, Hankey inserted into his writings a paragraph on an armed caterpillar roller. The *Boxing Day Memorandum*, as it became known, proved to be effective, not in military circles, but with Churchill, who, throughout his career showed an intense interest in the

¹¹⁹ In respect of Swinton, see *Eyewitness*, pp. 300-309 and Roskill, *Man of Secrets*, pp. 304-305, for Brough see *Eyewitness* p. 280 and Glanfield, *Devil’s Chariots*, pp. 150-151: Sueter was treated similarly, though by the Navy - see *Evolution of the Tank*, pp. 243-245.

¹²⁰ Roskill, *Man of Secrets*. p. 147.

¹²¹ *Ibid*, p. 219.

¹²² Maurice Pascal Alers Hankey, *The Supreme Command, vol. I*, (London, Allen and Unwin, 1961), pp. 244-250.

introduction of new weapons.¹²³ Churchill sent an appreciative minute to Asquith.¹²⁴ Additionally, either fearful that his political and military colleagues would lack the vision and resolve to see the matter to a conclusion, or scenting the potential for future personal recognition, or both, Churchill instructed Murray Sueter, his Director of Air Development, then, shortly afterwards, Eustace Tennyson d'Eyncourt, Director of Naval Construction, to design and build an armoured vehicle.¹²⁵ It was the *Boxing Day Memorandum* that ignited Churchill's advocacy of a non-wheeled solution to overcome German defensive tactics. His participation in the development of the tank stemmed from Swinton's thoughts via Hankey's pen rather than from his own ideas or instructions given to Bacon in 1914.

By producing his *Boxing Day Memorandum*, Hankey had taken a significant step towards furthering the cause that was being advocated, albeit ineffectively, by Swinton. Unfortunately, comments made by Hankey in relation to special "apparatus" formed but a small section of his Memorandum.¹²⁶ Furthermore, they did not represent an accurate picture of the role or design Swinton had in mind. Paragraphs 8-11 of the Memorandum dealt with the issue of special apparatus, but only paragraph 9(a) covered a device associated with the landship concept. Hankey strayed significantly from Swinton's advocated path, describing numbers of large, heavy rollers themselves bullet proof, propelled from behind by motor engines, geared very low, the driving wheels fitted with 'caterpillar' driving gear to grip the ground.....The object of the device would be to roll down the barbed wire by sheer weight, give some cover to men creeping up behind, and support the advance with machine-guns.¹²⁷

Hankey's observations would appear to have established a particular vision in Churchill's mind, that would be amended and included in his instructions to Sueter and seemingly also in his discussions and guidance to d'Eyncourt. In this way, Swinton's machine gun destroyer became for Sueter, d'Eyncourt and the Landships Committee, primarily, a trench-taking armoured personnel carrier rather than a means of

¹²³ Stuart Macrae, *Winston Churchill's Toyshop: The Inside Story of Military Intelligence (Research)* (Stroud, Amberley Publishing, 2011), pp. 78-80, 94-99, 143-145 and 164; David Jablonsky, Churchill and Technology, in *Churchill and the Strategic Dilemmas before the World Wars*, ed. by John Maurer (London, Routledge, 2003), pp. 121-146 (passim).

¹²⁴ National Archives, MUN5/394, Churchill to Asquith 5 January 1915, Appendix A to Churchill's statement to the Royal Commission, 1 September 1919.

¹²⁵ Ibid, paragraphs 17-20.

¹²⁶ Hankey, *Supreme Command*, pp. 244-250.

¹²⁷ Ibid, p. 246.

destroying or dominating the enemy's main defensive weapon. Moreover, Churchill's instructions to Sueter contained impractical and/or ineffective proposals and no reference to caterpillar tracks.¹²⁸ Following Churchill's letter to Asquith of 5 January 1915, the development path of the tank became somewhat complicated. Two separate and, for six months, unconnected channels of trials and experimentation were conducted or commenced with a view to developing an armoured vehicle, i.e. by the army and navy respectively. However, Churchill's failure to appreciate elements key to successful offensive operations in the conditions existing on the Western Front would effectively constitute a handicap for his Landships Committee.

Although no request had been received from GHQ, Swinton's third seed to Scott-Moncrieff did result in an agreement to examine the possibility of converting a Holt tractor or other machine to form an off-road armoured vehicle. Additionally, Hankey's ideas, via Churchill and Asquith, had been commended to Kitchener.¹²⁹ This potential line of progress therefore also found its way to Scott-Moncrieff's desk. It was thus doubly unfortunate that the test devised by Scott-Moncrieff's "experts" and held at Shoeburyness on 17 February 1915, suffered both from inappropriate and unrealistically difficult test conditions, caused by a combination of the unreasonable design of obstacles and strongly adverse seasonal weather, together with poor preparation of the Holt machine.¹³⁰

The outcome of the trial was that the Holt Tractor failed to overcome the prepared obstacles. Hugh Marriott had witnessed a severe test of the tractor's capabilities near Antwerp in June 1914.¹³¹ Having by 1915 joined GHQ in France, he also witnessed the trials at Shoeburyness. He recorded that at Shoeburyness he had seen the tractor driven through estuary marshland, consisting of sand under water and a top layer of slimy mud and rank grass, dragging a five-furrow plough frame set at maximum depth (c.2 ft). In places, having gathered up a tangled mass of grass and mud at the front, it

¹²⁸ National Archives, T173/463, Churchill to Sueter, Tudor and Admiralty Director of Contracts, 18 January 1915, appended to his evidence to the Royal Commission dated 1 September 1919.

¹²⁹ Churchill, *World Crisis 1911-1918*, p. 307.

¹³⁰ National Archives, T173/34B, Marriott to Swinton, 3 June 1915, (response to questions posed by Swinton on conditions at the test of the Holt Tractor on 17 February 1915), Royal Commission on Awards to Inventors, 7 October 1919, evidence of Swinton, p. 17 and return of questionnaire to Swinton by Hugh Marriott at GHQ, dated 3 June 1915.

¹³¹ National Archives, MUN5/210, Marriott to Schnerb, 11/12/18.

was nearly submerged, but “only stopped when the caterpillar got onto a ground where there was no rank grass. All the above was without mudlugs”.¹³²

Unsurprisingly, military requirements differed from and exceeded those of commercial industries for which the Holt had been designed and it was inappropriate for an existing off-the-peg commercial machine to be judged by military criteria on a pass or fail basis. Even Colonel Holden, who had strong reservations about developing caterpillar traction, was prepared to concede this fact in advance of the trials.¹³³ However Holden made no allowance for this factor in post-trials comments. Holden’s professional judgment on the disadvantages of the Holt Tractor, expressed to Scott-Moncrieff, were the likelihood of excessive weight, vulnerability to enemy artillery and the length of time required to resolve problems. He considered the war would be over before a machine would be ready, unless “the war is going to last for many years”. He expressed support for experimentation with existing appliances, but was “afraid the designing and building of new engines specially for this work is quite out of the question in view of the time involved”. He felt the only possible useful action would be “to experiment with such engines as are available viz: the caterpillar type, and the Traction engine type, fitted with some means of bridging ditches, bridging trenches and other obstacles.”¹³⁴

Events would prove Holden’s judgment to be flawed. Notwithstanding that no significant progress was made by mid-1915, the first tank successfully completed trials at Hatfield eleven months after the Holt trials at Shoeburyness. Anyone can be excused poor judgment, but the comparison of Holden’s seemingly reasonable acceptance of the possibility of providing a suitable solution by means of modifications to an existing commercial machine with his post-trials comments raises the question of whether he misrepresented events and/or designed the tests to support professional concerns he had raised before the trials.

¹³² National Archives, T173/34B, questionnaire completed for Swinton by Hugh F. Marriott, 3 June 1915. Mudlugs are track attachments which project downward into the ground to secure greater leverage or traction in soft ground – known by a variety of names, including “spuds” and “grouzers”.

¹³³ National Archives, T173/34B, Holden to Scott-Moncrieff dated 25 January 1915.

¹³⁴ Ibid, note 13 on file 121/Stores/2531 by Holden, 18 February 1915. Some theoretical work was undertaken whereby deployable extensions would have been incorporated to provide support fore and aft to prevent the front wheels/rear tracks slipping into trenches: such additional skis/wheels were not incorporated onto working models.

Holden described how both sides of a trench obstacle gave way, resulting in the front wheel of the Holt falling too far into the trench for it to be able to extricate itself. Yet, although he recorded that the slippery ground prevented “the Caterpillar tracks getting a proper hold”, he made no allowance for this failure to the non-attachment of mudlugs. Most significantly, no comparison was made of the basic consideration of length and position of the caterpillar tracks on the machine compared to width of the trench. The relevance of these considerations must have been obvious to a qualified engineer, yet Holden makes no reference to them in judging the performance of the Holt. The benefit of spuds (mudlugs) is acknowledged, but only to the extent that “If the ground had been dry and the tracks fitted with spuds this trial [crossing of two lines of trenches] might have been successful but even if it had been the other obstacles were quite impossible ones owing to their width and depth.” This observation is misleading on two counts. Firstly, the value of mudlugs is made in relation to dry rather than wet conditions. Secondly, the issue of failing these obstacles is raised as if they are different forms of test. Yet the note records that the Holt passed the first two of the four tests, wire crushing and the trous-de-loup. There is no record of it attempting the fourth obstacle, sunken wire, but the prospects of successful completion of this test would appear to be similar to those for plain trenches since it would have been dependent on the same factors.

The lack of detail on the key issue of the length of tracks compared to width of the trench is most significant as Holden’s description of the tests as “quite impossible” suggests the rearward positioning of the tracks relative to the centre of gravity would inevitably result in the Holt’s front wheel dipping into the trenches thereby rendering forward movement impossible.¹³⁵ From the observations of Marriott and Tritton, it would seem the lesson from the trial should have been that the tracked system had potential to be successful subject to appropriate modification.¹³⁶ The performance would appear to have been sufficiently promising to justify such a conclusion and the

¹³⁵ David Fletcher, *The British Tanks 1915-19* (Marlborough, Crowood, 2001), p. 25. Photograph 24 shows clearly that if the front wheel of such a machine dipped into a trench, further forward movement would be restricted as the machine would simply be driving the front of the vehicle into the rear wall of the trench. It does not require great imagination to appreciate that an extended position for a front wheel or the addition of a skid tray might prevent such an obstructive occurrence and that the length of the caterpillar tracks would need to be increased to provide the means of crossing all but the narrowest of trenches.

¹³⁶ National Archives, ADM116/1339, Register 121/Stores/2531, Marriot to Swinton, 9 June 1915.

comments of some senior officers envisaged a programme involving modification or redesign into a machine capable of meeting military requirements.

Register 121/Stores/2531, a circulating document for recording and distributing views of senior officers in different sections of the War Office, contains observations made between 20 January and 1 March 1915 on the Shoeburyness trials. Most observations showed considerable sympathy for the tracked concept prior to the trial. Afterwards, there was a general recognition that the Holt was not sufficiently powerful or designed appropriately for the tasks required of an armoured vehicle in the conditions on the Western Front. Nevertheless, there were a number of comments indicating support for a larger/more powerful machine capable of handling the required tonnage of armour and equipment. Von Donop is often criticised for lack of foresight.¹³⁷ Nevertheless, even he put forward a constructive proposal in addition to a range of criticisms of the tractor and its limitations, when he admitted "I may be wrong and perhaps I should be convinced otherwise were I to see the design which any competent person were prepared to submit." He asked that Scott-Moncrieff should, in consultation with Holden, identify a competent designer to whom "the conditions could be submitted".¹³⁸ However, neither Scott-Moncrieff nor Holden considered it appropriate to forward any ideas or proposals for the improvement of the machine or advancement of the project.¹³⁹

In November 1918, Scott-Moncrieff expressed the hope that, notwithstanding the likelihood most of the credit for the development of the tank would go to the navy, it "will not I hope be forgotten that some soldiers at least had a vision of possibilities."¹⁴⁰ He fails to acknowledge either that he himself did not belong to such a band of visionaries or that he commanded the Department that failed to support the development of a tracked machine possessing development potential, against the opposition of Holden. This weakness was magnified by leadership deficiencies at the very top of the political pyramid, since neither the new, although lukewarm and hands-

¹³⁷ Winston S. Churchill, *The World Crisis, vol. II, 1915*, (London, Thornton Butterworth, 1923), p. 72; Addison, *Politics from Within*, pp. 114 and 234; David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), pp. 97-102; Roskill, *Man of Secrets*, p. 147.

¹³⁸ National Archives, ADM116/1339, 121/Stores/2531, Scott-Moncrieff to Holden, entry no. 19, 1 March 1915.

¹³⁹ National Archives, ADM116/1339, 121/Stores/2531, Holden to Scott-Moncrieff, entry no. 20, 1 March 1915.

¹⁴⁰ National Archives, MUN 210/1940/13, Scott-Moncrieff to Bingham, 4 November 1918.

off convert, Asquith, nor the sceptical and equally hands-off Kitchener, took any steps to ensure that the concept received a fair trial by Scott-Moncrieff's Department.¹⁴¹ Had they possessed the managerial attributes demanded by the posts they occupied, they would have been aware of Scott-Moncrieff's strengths and weaknesses. Bearing in mind the losses and failings of offensive actions by the BEF before artillery and tank support were developed and applied in a sound tactical manner, Churchill's verdict, that "it was not those who learned the slowest who were made to suffer most", is exceedingly apt.¹⁴²

On 1 March 1915, Scott-Moncrieff, in accordance with Von Donop's suggestion, asked Holden, a former President of the Institute of Civil Engineers, whether he could suggest someone "competent to design a land cruiser not too heavy that will cross any ordinary country and negotiate the usual fences".¹⁴³ Holden's two-line reply said that he could not, and concluded, incorrectly and somewhat contradictorily, that the "only firm in this country who have had any experience in this line are Hornsby's of Grantham."¹⁴⁴ Such a curt, dismissive reply appears to confirm suspicions of prejudice by Holden, since it is inconceivable an engineer of his experience would have been unaware of other firms capable of attempting such a task. Indeed, observers at the trials included Tritton from Fosters, experienced in caterpillar traction and the eventual builders/joint designers of the first tank.

However, any lingering doubt as to the presence of prejudice is effectively removed by comparison of Holden's notes on register 121/Stores/2531 with entries on register 121/Stores/1322 by Captain Haynes, who was responsible for organising and supervising the Shoeburyness trials.¹⁴⁵ Many of Holden's comments represent a reasonable match to those of Haynes, but exclude mention of any of the qualifying remarks in the final section of the report by Haynes and include one key factual difference. Holden misrepresented weather and ground conditions, stating that "the weather had been very wet and it was raining slightly during the trial, the ground was soft". Haynes stated "the ground was saturated with water, the trenches were half full and heavy rain was falling most of the time." Holden also omitted to mention that the

¹⁴¹ Churchill, *The World Crisis, vol. II, 1915*, pp. 75-76.

¹⁴² *Ibid.* p. 22.

¹⁴³ National Archives, T173/34B, Scott-Moncrieff to Holden, 1 March 1915.

¹⁴⁴ *Ibid.*, Holden to Scott-Moncrieff, 1 March 1915.

¹⁴⁵ National Archives, T173/34B, report on trial of Holt tractor, 19 February 1915.

tractor engine was not running well during the trial, though before and after the trial it had been quite satisfactory, or that the missing mudlugs would have improved performance in wet conditions. The relative measurements of the width of the trench and positioning and length of the tracks were not specified. The care and diligence shown by Haynes and Holden in preparing and accepting the components of the circuit and preparation of the machine is perhaps best illustrated by the comment that “in their present form” the missing spuds “take a very long time to fit”.¹⁴⁶

Register/121Stores/2531 also includes a series of comments on whether Captain Tulloch, an advocate of tracked vehicles and former working colleague of Holden, should be invited to attend the trial. Tulloch had written a note early in 1915 in support of developing landships.¹⁴⁷ The DA asked Scott-Moncrieff whether he wished Tulloch to attend. Scott-Moncrieff’s reply was favourable, but this was rapidly countered by a two-line intervention, unsigned but clearly from Holden, which ensured no invitation was sent to Tulloch.¹⁴⁸ The result was that no further work on tractors was authorised and the Army’s cursory examination of chain traction was shelved.

Had the following months been used effectively in the design and manufacture of a tank, it would not have been possible to spare the army the losses incurred during the depressing year of 1915. However, it is conceivable that, instead of making their debut at Flers during the middle stages of the Battles of the Somme, tanks could have appeared some eleven weeks earlier on 1 July. Additionally, there might have been sufficient time to construct a greater number of tanks than available for Flers and/or undertake more rigorous tests. Furthermore, greater training might have been possible and the Mark I might have been used when ground conditions were more favourable than more cratered conditions later in the year.¹⁴⁹ An advancement of initial experiences might also have enabled improved models to take part in the offensives at Arras in April 1917.¹⁵⁰

¹⁴⁶ National Archives, T173/34B, report on trial of 17 February 1915 of Holt Caterpillar by Major Haynes and War Office Notes, January to July 1915, containing comments by Colonel Holden dated 18 February 1915.

¹⁴⁷ National Archives, ADM116/1339, Tulloch to Jackson, 19 January 1915, attaching notes on Land Cruisers and Destroyers dated 15 January 1915.

¹⁴⁸ National Archives, T173/34B, internal War Office memoranda 25 January to 1 March 1915.

¹⁴⁹ National Archives, WO256/11-13, Haig Diary July-October 1916. See photographs 25 and 26.

¹⁵⁰ National Archives, T173/776, Royal Commission on Awards to Inventors, cross-examination of Johnson by Russell, answers to questions 3281-3283, concerning the effect of the condition of the terrain on the performance of the tanks at the Somme, Third Ypres and Cambrai. The unseasonable

The consequences of the mismanaged tractor trial might be debated at length but there can be no doubt that the episode cost the tank development process some five to six months. Scott-Moncrieff blamed Holden for missing the opportunity to kick-start army cooperation in the design and development process in February.¹⁵¹ Scott-Moncrieff's criticism appears to be targeted at Holden's professional judgment rather than his integrity, but the registers show Holden should have been taken to task over a broader range of issues.

It is also relevant to draw attention to the failure to take advantage of the knowledge and abilities of "junior" officers. The problems of Swinton and Brough will be examined later. At the Shoeburyness trials military representatives included Marriott who had witnessed a test of the Holt Tractor some eight months earlier. Marriott was familiar with the technique for extricating the tractor from a stationary semi-submerged position, it having been demonstrated to him by Jules Schnerb of Vienna whilst he was seeking suitable machines to assist in extracting soda deposits from the Magadi Lake. Following its emergence from a water hole several feet deep with sloping slimy sides, Marriott described the Holt in glowing terms:

the success of this test in demonstrating the immense capabilities of this machine in a position which would undoubtedly have been fatal to any other type of traction engine was so marvellous that in reporting the result subsequently in England I expressed the opinion that unbelief was pardonable in the case of anyone who had not observed the operation for themselves.¹⁵²

There is no evidence of Marriott or any other officer present at the trials being invited to contribute to the proceedings or the resultant judgment. Rather, the writings of Sueter and Swinton suggest that anyone putting forward views finding disfavour with senior officers risked being branded "difficult" with adverse career consequences.¹⁵³

Although it is clear that the army's inappropriately designed trials were responsible for a significant delay, there can be no certainty about the consequences for the development of the tank. Savings in time might not have been used profitably and the

weather affecting ground conditions at Arras is outlined in *Military Operations, 1917, part II*, p. 540 and described more vividly in Jonathan Nicholls, *Cheerful Sacrifice: The Battle of Arras 1917* (Barnsley, Pen and Sword, 2010), pp. 69, 131-132, 135, 139-140 and 167.

¹⁵¹ National Archives, MUN5/394, Scott-Moncrieff to Bingham, 4 November 1918.

¹⁵² National Archives, MUN5/210, Marriott to Schnerb, 11 December 1918. The test observed by Marriot was the pushing of the tractor up a slope with no risk of the front wheel running into a vertical obstacle.

¹⁵³ Sueter, *Evolution of the Tank*, pp. 257-264; Swinton, *Eyewitness*, pp. 300-304.

talents of Wilson might not have been utilised.¹⁵⁴ A delay of up to six months could, however, have been most significant and it is therefore appropriate to examine reasons and responsibilities for an avoidable and possibly costly delay inflicted by higher management. A combination of factors needs to be considered.

Working downwards in terms of seniority of personnel, Asquith as Prime Minister lacked vision and drive.¹⁵⁵ This is demonstrated by his comment to Hankey that he would support the development of tanks if the War Office were in agreement. This betrays a shortage of qualities required in a war-time leader. Moreover, arguably, it was neglectful of him to take no further interest in the matter following his discussion with Kitchener in support of the ideas of Churchill and Hankey.¹⁵⁶ It is interesting to note that although Asquith mentions both Churchill's note and Hankey's *Boxing Day Memorandum* in diary form in *Memories and Reflections*, no reference is made to any discussion with Kitchener on the matter.¹⁵⁷ Some years later Asquith wrote to Churchill reassuring him that he had indeed "sent for K. and made him read your letter, at the same time expressing my strong personal concurrence. He promised to set the experiments in train without delay, and I know that he did so".¹⁵⁸

Even if Asquith passed on the message, there is no mention of any enquiry about the result of the "experiments". For an indication of where Asquith's particular interests

¹⁵⁴ In such circumstances the initial British design might simply have been the superimposition of an armoured body on a Holt type track – as happened both in Germany and France.

¹⁵⁵ National Archives, MUN4/5210, Notes of interview of Lord Lee on 19 December 1922, likely to have been undertaken in connection with the writing of the History of the Ministry of Munitions – "Lord Lee with Mr. Lloyd George during preparations for change of Government. Mr. Lloyd George's motive together with that of other Ministers concerned was the genuine feeling that with Asquith and those in power we should lose the war, as Government lacked constructive purpose, energy and a realisation of the situation." (Lee's comments carry additional weight bearing in mind that he was a political opponent of Lloyd George.)

¹⁵⁶ Asquith's approach to Kitchener is mentioned by Churchill in *The World Crisis*, p. 73, and by Hankey to Liddell Hart, 3 April 1948, reproduced in Roskill, *Man of Secrets*, pp. 147-148. It is confirmed by National Archives, MUN5/394, 12 January 1915, Von Donop to Scott-Moncrieff and Guthrie-Smith.

¹⁵⁷ The Earl of Oxford and Asquith, *Memories and Reflections 1852-1927, vol. II* (London, Cassell, 1928), pp. 51-64 (29 December 1914 - 27 February 1915).

¹⁵⁸ National Archives, MUN5/210, Asquith to Churchill, 6 November 1918. Examination of the Asquith Papers at the Bodleian Library provides no evidence of any written follow-up to Asquith's initial approach to Kitchener. Asquith's letter to Churchill in November 1918 bears the hallmark of a belated, false effort to limit political damage resulting from inadequate importance attached to his handling of the initial views of Swinton and Hankey. By that date it is likely Asquith would have recognised and been concerned by the difference between his response to the concept of the tank in 1915 and their achievements on the Western Front in 1918 and particularly by the extent to which the electorate had taken the tank to its heart. See Photographs 27-30 and 54.

lay, contrast frequent, social references to the personalities of those with whom he was in contact.¹⁵⁹

Kitchener may have done much to secure the expansion of the army, but his personality, over-sensitivity to the suggestions of others and approach to technology and the changing nature of warfare appear to have demonstrated that Asquith was unwise to have encumbered him with such extensive responsibilities.¹⁶⁰ The Secretary of State for War should have been interested in new developments, keen to keep a fatherly eye on events such as the trial of the Holt Tractor, and ready to intervene personally if he judged the performance of his staff to be insufficiently dynamic, imprudent, inappropriate or suspect in any significant way. Post-war interviews of senior appointees at the Ministry of Munitions, politicians and those serving other Ministries or branches of the armed forces, show a significant number critical of Kitchener's abilities and of his receptivity to new technology. His qualities in these respects are compared unfavourably to those of Lloyd George.¹⁶¹ The observations of Melville Lee fit well with Kitchener's failure to identify potential roles for armoured vehicles, "Agreed K. had personality, determination, industry and singleness of view, but lacked adaptability and imagination."¹⁶²

Observations by others support Lee's judgment. Firstly, Milman considered the War Office worked hard on munitions but "there were no big ideas", "L.G's spirit and temperament inspired and gingered up all those working under him", and "if big views like Mr. L.G's had not been introduced by someone....war would not have been won".¹⁶³ Secondly, Booth explained that Kitchener appreciated munitions tasks were beyond the capability of the War Office and sought a Supply Department in conjunction

¹⁵⁹ Asquith, *Memories and Reflections*, for example 5 January to 27 February 1915, pp. 54-64. It needs to be borne in mind that owing to Kitchener's loss off Orkney with *The Hampshire*, Asquith's claim could not be confirmed or contradicted.

¹⁶⁰ Addison, *Politics from Within*, p. 229; Glanfield, *Devil's Chariots*, pp. 81-82; Swinton, *Eyewitness*, p. 196 and Churchill Archives Cambridge, CHAR/2/143-145, Brendon to Minister for War, 19 September 1914; National Archives, MUN9/26, notes of interview of Bingham and Milman.

¹⁶¹ National Archives, MUN9/26(Lloyd George Papers), notes of interviews of Major Melville Lee, 25 May 1923.

¹⁶² Ibid, Notes show that Major Melville Lee, was interviewed on 30 November 1922 when he recorded Lloyd George's dissatisfaction with soldiers' forecasts of the outcome of operations compared to results actually achieved. Lee believed Lloyd George considered the professionals, from lack of activity of mind, "were inclined to go on barking up the same tree under which they had started barking, and could not foresee where things might branch out in different directions – conservatism."

¹⁶³ Ibid, interview, 7 June 1923, of Brigadier-General L. Milman (DDG Gun Ammunition Filling, September 1916 then Controller, November 1916-March 1919).

with BofT, but this scheme fell through owing to inertia of Asquith. Booth had great admiration for Kitchener but he was snowed under and badly served by MGO's Department and felt, through loyalty, that he could not refuse to act by MGO's advice. Booth considered "LG had "marvellous quickness at spotting where the shoe pinched" and when he became Minister of Munitions the whole thing, though hastily organised, was arranged on a big scale and "drive" put into it, he thought "the war might have collapsed if L.G. had not taken on munitions business".¹⁶⁴ Thirdly, Bingham considered the War Office worked night and day and did its best but the size of the job was not then appreciated, "it was thought that the placing of orders was sufficient to insure production", whereas "it was essential...to have control of raw material, machinery, labour, shipping etc. as L.G. did."¹⁶⁵ Finally, "Having viewed the 'futile slaughter' on the front, Arthur Lee became increasingly frustrated with the conduct of the war by the Asquith government...Lee sought out his former political opponent David Lloyd George as the one member of the government who, he considered, had 'sufficient courage and dynamic energy ... to insist upon things being done'.¹⁶⁶

Kitchener's failure to plan comprehensively for the large-scale munitions increase required and his intolerant attitude towards Churchill's involvement in military matters raise questions over his suitability to operate at a senior level within a political environment.¹⁶⁷ There is a general acceptance either that Kitchener misjudged the munition requirements or was unprepared to reorganise the War Office to deal with the matter. Suttie appears to accept Duncan Crow's assessment:

"Perhaps inefficiency (of the War Office) is entirely the wrong word: it implied the ill-working of a machine. In this case the machine was working fairly well - but it was the wrong machine. It was one which had been constructed for another scale of purpose. What had to be done was to create a new machine".¹⁶⁸

¹⁶⁴ Ibid, Interview of George Booth (Joint Head War Office Special Organisation to increase Munitions Production, April 1915, DDG(B) Ministry of Munitions Supply Department June 1915-December 1918 and Chair, Russian Supplies Committee 1915-18).

¹⁶⁵ Ibid, undated interview of Major-General Bingham, Military Advisor at Munitions 1916-1917, Member of Munitions Council 1917-1918 and Member of Army Council 1917.

¹⁶⁶ Alan Clark, *A Good Innings: The Private Papers of Viscount Lee of Fareham* (London, J. Murray, 1974), p. 140.

¹⁶⁷ National Archives, MUN9/26, interview with Bingham; National Archives, Kitchener Papers, PRO/30/57, Kitchener to Churchill, 23 December 1914.

¹⁶⁸ Andrew Suttie, *Rewriting the First World War: Lloyd George, Politics and Strategy 1914-1918* (London: Palgrave Macmillan, 2005), p. 64.

This accords generally with the assessments of interviewees summarised above. Only one interviewee, Captain Percy Creed, supported Kitchener and was critical of Lloyd George. Creed's comments took the form of a rant against Lloyd George's decisions and personality generally rather than an analytical summary of munitions policies.¹⁶⁹

A mature and statesmanlike response to trespassing by Churchill on army territory would have been to consider the value of each instance on its merits and to remain calm and unruffled. Yet Kitchener acted in the opposite way, writing irately to Asquith, drawing him into what he regarded as a dispute.¹⁷⁰ Kitchener's inappropriate and unseemly approach is but marginally offset by the fact that not all the letters he drafted appear to have been sent. In response to Churchill's offer of various elements of Winston's Circus, Kitchener stated that armoured cars "are, or can be, provided by the War Office when required". The assistance sought from Hetherington shortly afterwards shows this statement to have been false.¹⁷¹ Events appear to demonstrate, albeit perhaps thoughtlessly, a willingness to place pride ahead of the wellbeing of his command, a trait reinforced by his failure to agree with the King's comment on the value of Brutinel's armoured motors.¹⁷² Their value would later be demonstrated, particularly during the 1918 Spring Offensives and Hundred Days.¹⁷³

Scott-Moncrieff appears not to have been antagonistic to the development of the tank.¹⁷⁴ In 1918 he would become a member of Churchill's Tank Awards Committee. However, his lack of a forceful response to a dismissive reply by Holden to Von Donop's suggestion for further action on caterpillar traction, demonstrates unsuitability for occupation of a senior military position. It would be difficult to argue with Swinton's

¹⁶⁹ National Archives, MUN9/26(Lloyd George Papers), interview of Captain Percy Creed, Creed felt Lloyd George's attack on drink ill-advised, worst effect on "large majority of sober working men" – believed Lloyd George "got at by pussyfooting cranks", found Asquith's Newcastle speech "very useful, good effect". Considered there were "10,000 surplus officials in the Ministry of Munitions....great admirer of K." and that "K. was very badly served. Took on rotten machine at War Office....K. had knack of choosing a man, giving him a job and letting him do it. Lloyd George was a great dis-organiser."

¹⁷⁰ Martin Gilbert, *Winston S. Churchill, vol. III*, (Boston, Mass., Houghton Mifflin, 1971) pp. 164-167.

¹⁷¹ National Archives, Kitchener Papers, PRO/30/57, Kitchener's reply to Churchill's letter of 24 December does not appear to be in a form that would have been sent. It is nevertheless significant as an indication of the unreasonable nature of Kitchener's thoughts.

¹⁷² Baylaucq, *Extraordinary Story*, p. 46.

¹⁷³ James E. Edmonds, *Military Operations France and Belgium, 1918, vol. I* (London, Macmillan, 1935), p. 414, *vol. II* (London, Macmillan, 1937), pp. 23, 36, 49, 127 and 416, and *vol. IV* (London, HMSO, 1947), pp. 47, 53, 93 and 366. See photographs 31-33.

¹⁷⁴ National Archives, T173/34B, File 121/Stores/2531, entry no. 19, 1 March 1915.

assessment of him as “sympathetic, but ineffectual”.¹⁷⁵ His relative inactivity, which would be modified some months later, seemingly by external pressures and fear of criticism, was tantamount to subservience to the views of subordinate staff and disregard of the lack of foresight and performance of an important section of his command. Tulloch supports Swinton’s assessment of Scott-Moncrieff’s limitations as a senior manager.¹⁷⁶

Holden and his staff were given an important task in organising the trials of the Holt tractor. As “the technical expert”, Holden had the opportunity to compensate for the lack of knowledge and understanding of mechanical matters by more senior officers.¹⁷⁷ However, his actions and conclusions were such as to draw criticism from two fellow engineers present at the trials. Firstly, Marriott found the Holt not properly prepared for the conditions: he also criticised the selection of the tractor driver, remarking “You must have mudlugs and a clever driver on the clutch.”¹⁷⁸ Secondly, Tritton, who restricted himself to the sarcastic yet damning comment that the machine had not been designed to plough its way through the English Channel.¹⁷⁹ Furthermore, it is relevant to note that the performance of the Holt Tractor did nothing to shake the faith of the young members of Churchill’s armoured car unit, observers at the trials, since their interest and involvement in the development of a landship continued unabated. Later trials of a Holt tractor by the French Army resulted in an order for 400 adaptations of that machine, Tracteurs Estiennes, early in 1916.¹⁸⁰

Tulloch commented to the Ministry of Munitions in 1918 that he advised Swinton not to consult a “certain official” as he would “certainly ‘crab’ the whole idea and throw difficulties in the way”.¹⁸¹ It is difficult to see how Swinton could have prevented the involvement of the ADMT. Accordingly, Holden was consulted. His unjustified

¹⁷⁵ Swinton, *Eyewitness*, pp. 134-135.

¹⁷⁶ National Archives, MUN5/210, Tulloch to MM, 2 December 1918.

¹⁷⁷ Brig.-Gen. Sir Capel Holden, *The Times*, 31 March 1937 and Oxford Dictionary of National Biography, <https://go.gale.com/ps/start.do?p=TTDA&u=exeter>, accessed 21 January 2018. Holden occupied many senior engineering positions in military and civilian life. Vice president at the time, he was elected President of the Society of Automobile Engineers in 1914, a position which he was unable to take up owing to pressure of work.

¹⁷⁸ National Archives, T173/34B, Marriott reply of 9 June 1915 to questionnaire from Swinton dated 3 June 1915.

¹⁷⁹ Bacon, *From 1900 Onward*, p. 201.

¹⁸⁰ Albert Stern, *Tanks, 1914-1918: The Log-Book of a Pioneer* (London, 1919), Appendix V; Glanfield, *Devil’s Chariots*, pp. 128-129.

¹⁸¹ National Archives, MUN5/210, Tulloch to MM, 2 December 1918.

criticisms, unfair representation of the trials, design of the circuit and failure to consider potential, rather than simply the results of an existing commercial machine, were undoubtedly the cause of the obstacle Tulloch had predicted. Tulloch's assessment of the consequence of Holden's involvement was "Six months at least have been wasted because one man said it would be a year before a special design could be got out and a machine built".¹⁸²

Scott-Moncrieff later criticised Holden by stating that he had missed a great opportunity in declining the idea.¹⁸³ Yet Holden was in Scott-Moncrieff's command and was responsible for giving advice rather than orders. Tulloch, who had previously worked with Holden, considered the ADMT possessed a formidable reputation in the world of military transport and this view proved to be sound since Holden's opposition, regardless of its merits, appears to have been decisive in closing the army's file on the development of tanks.¹⁸⁴

By way of contrast, support was forthcoming for the ideas of Swinton and Tulloch from Colonel Louis Jackson.¹⁸⁵ Jackson recorded that "it is only a question of time before some such war machine appears and the nation which produces it will have a great advantage."¹⁸⁶ Notwithstanding the fact that Ludendorff and other enemy generals might have had a vested interest in allocating an excessive share of the responsibility for their defeat upon a factor not directly under their control, their later comments on tanks, together with those of their Allied counterparts, support Jackson's prediction.¹⁸⁷ At the key time, however, his vision was unable to counter the critical

¹⁸² National Archives, MUN5/210, Tulloch to Swinton, 20/08/15; 'A Claim for the Invention of Tanks: Bentley v. The King', *The Times*, 25 and 27 November 1925 - in evidence to the High Court, Holden claimed to be an advocate of tracked drive and that the WO had two tracked vehicles in 1914 - although it is possible that Holden was sympathetic to the introduction of tracked vehicles and simply objected because he felt they could not be developed quickly, it seems likely that the existence of any tracked/half-tracked AFVs would have surfaced in 1915 had they existed. - no evidence has been found to justify this claim which appears to have been generated to suit the dual purpose of defence against Bentley's false claim relating to the development of the tank and self-protection against claims of lack of professional vision and/or ability by obfuscation through reference to haulage vehicles.

¹⁸³ National Archives, MUN5/394, Scott-Moncrieff comment at Tank Awards Committee, 10 October 1918.

¹⁸⁴ National Archives, T173/34B, Holden to Scott-Moncrieff, 25 January 1915 and 18 February 1915; National Portrait Gallery, on-line index of portraits, <https://www.npg.org.uk/collections/search/sitA-Z/sith>, accessed 6 August 2017, Holden was later Knighted and promoted to the rank of Brigadier-General: his portrait hangs in the National Portrait Gallery.

¹⁸⁵ Swinton, *Eyewitness*, p. 100; National Archives, T173/34B, Register No. 121/Stores/2531.

¹⁸⁶ National Archives, T173/34B, entry no. 2 on Register 121/Stores/2531, 20 January 1915.

¹⁸⁷ Erich von Ludendorff, *My War Memories* (London, Hutchinson, 1919), pp. 679-680. Jackson's prediction is not necessarily fully valid, since it is open to criticism on the grounds that Germany would

and prejudiced observations of Holden since he was unqualified to contribute any specialised input and had to admit that he could give no opinion on “how long it would take to design and build it”.¹⁸⁸

Between August/October 1914, the navy demonstrated that it was possible to construct an effective and reliable armoured car within a relatively short period.¹⁸⁹ Yet as Lloyd George later confessed:

the outbreak of war found this country totally unprepared for land hostilities on a Continental scale.....our Army, mainly used for policing our widely scattered Empire, was a small highly trained force of professional soldiers.....lacking both the numbers and the equipment for large-scale fighting against European armies.¹⁹⁰

In view of the unbroken length of Liberal government before the war, it is reasonable to conclude that Lloyd George’s summary represented his genuine belief. The Second Boer War had administered a severe jolt to the Victorian army.¹⁹¹ However, the re-organisation of military forces failed to march in step with the strategic choice of alignment with France following the Entente Cordiale.¹⁹² This failure of alignment of policy and military means could be judged to have had significant consequences in 1914. It is most unlikely that more extensive preparations for continental warfare in terms of numbers and equipment would have resulted in the adoption of any armoured vehicles, particularly if Glanfield is correct in his judgment that “In the higher reaches of the British and most other armies in 1914 the prevailing mindset was deeply suspicious of innovation, technical or otherwise”¹⁹³. Glanfield’s remarks have some validity though are excessive. Indeed, Spencer Jones commends the response of the army to elements of equipment and tactical reassessment following the Boer War.¹⁹⁴

not have possessed the means to take advantage of the invention had it first emerged from German sources.

¹⁸⁸ National Archives, T173/34B, entry no. 17 on Register 121/Stores/2531, 23 February 1915.

¹⁸⁹ Sueter, *Evolution of the Tank*, pp. 29-34.

¹⁹⁰ Lloyd George, *Memoirs*, p. 75.

¹⁹¹ Edmonds, *Military Operations 1914*, vol. I, p. 2; Spencer Jones, *From Boer War to World War: Tactical Reform of the British Army, 1902-1914* (Norman, University of Oklahoma Press, 2012), p. 11.

¹⁹² The *Entente Cordiale* was a series of documents signed by Britain and France in 1904. The Entente documents related primarily to colonial issues in various parts of the world. They did not provide for assistance to France in the event of conflict with Germany. However, the documents together with the later understanding of the *Anglo-Russian Entente* and *Triple Entente* and international events such as the Tangier Crisis foreshadowed growing cooperation with France and Russia. These documents and events provided sufficient material to enable appropriate decisions to be taken regarding armaments and resupply.

¹⁹³ Glanfield, *Devil’s Chariots*, p. 17.

¹⁹⁴ Jones, *Boer War to World War*, pp. 207-215.

However the army emerges as less successful when judged against the recognition of the more profound form of innovation stemming from motorised armoured vehicles and necessary adjustment of tactics. British pre-war and “early-war” response to armoured cars failed to match even the somewhat limited pre-war acceptance by Italy, France, Russia, Turkey and America or the early wartime response of Belgium and Canada and of the Royal Navy.¹⁹⁵ The key fact is that the army possessed no operational armoured cars until presented with a range of Churchill’s squadrons in 1915. By this time, owing to entrenchment, such vehicles were of limited value in France.

The preceding sections of this chapter have demonstrated that Lloyd George’s assessments were substantially correct. Britain did not heed pre-war developments of armoured vehicles by others. Development work on motorised transport did not penetrate the mental Chinese wall which separated haulage from fighting vehicles and the originality and insight of one of its relatively junior officers had not overcome traditionalism, lack of vision and insufficient innovation at the key senior level. Furthermore, it has been shown that Churchill’s claims in respect of his vision in 1914 were fabricated.

Politically and militarily, advisors and policymakers do not emerge creditably from the examination of events prior to March 1915. Furthermore, as the spring of 1915 arrived there was an absence of any official recognition of the value of motorised armoured warfare to offer the prospect of a more competitive future national response to a depressing military picture. Fortunately, however, there was one spark of light. Protected from prying political, military and Treasury eyes, in the confines of the Admiralty, Churchill, had recognised the value of armoured vehicles. Although his military, management and engineering talents would prove inadequate for the task of securing the design and production of the first tank, he was nevertheless deploying a section of his formidable range of attributes, self-confidence, determination and obstinacy, by clandestinely setting up a group within the navy to undertake the army’s work.¹⁹⁶ Churchill’s claim to “greatness” rests largely on his achievements in the Second World War, but what better confirmation could there be from an earlier period

¹⁹⁵ B. T. White, *British Tanks and Fighting Vehicles 1914-1945* (London, 1970), pp. 115-117; E Bartholomew, *Early Armoured Cars* (Princes Risborough, Shire, 1988), pp. 5-25.

¹⁹⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answers to questions 44-52.

of his life for Best's conclusion to his biography of Churchill, "I am persuaded that...we are diminished if, admitting Churchill's failings and failures, we can no longer appreciate his virtues and victories".¹⁹⁷

The flame had not expired but Britain could ill afford the time that had been wasted. A large new army was being formed and logic suggests the key objective should have been to provide maximum possible assistance for this army when first committed to the offensive. However, by March 1915, ideas for a "machine-gun destroyer" had been rejected and progress in providing adequate and effective artillery support was insufficiently advanced.¹⁹⁸ Time was of the essence in limiting future losses. The next chapter will examine how the introduction of two gifted and experienced engineers would succeed in removing the obstructions of complicated design and inadequate efforts that were blocking progress. In the light of the critical national situation, the chapter will pay particular regard to the urgency with which this innovative work was undertaken.

¹⁹⁷ Geoffrey Best, *Churchill: A Study in Greatness* (London, Hambledon, 2001), p. 336.

¹⁹⁸ Strong and Marble, *Artillery*, pp. 41-42 and 71-75; Lloyd George, *Memoirs*, pp. 327-337.

Chapter Two - Progress in 1915 - Slow and Quick

This chapter reviews the main issues associated with development of tracked fighting vehicles in 1915 prior to formal acceptance by the Army Council early in 1916. As in most walks of life, much depends upon having the right people in the right places at key moments in time. Particular regard will therefore be paid to the contributions of those associated with the development of armoured vehicles, either in facilitating, or delaying, the introduction of a technologically advanced form of warfare. At this time of national crisis, obstacles were capable of rendering the Landship project “Too Late” to aid British participation in the war. Furthermore, difficulties were increasing for all parties involved, since the elements and conduct of warfare were changing rapidly. Operational characteristics in 1914/15, when Swinton first advanced the theory of armoured operations and Churchill set up the Landship Committee, differed greatly from the warfare within which armoured vehicles would operate in 1918.

Marble points out:

In previous wars, when tactical movement had been stymied by firepower, generals had been able to maneuver strategically.....But by 1914, demographics and the willingness of politicians to put very large percentages of their nations' young men in uniform produced armies so large that battle-lines reached across continents.¹

It might have been anticipated that these unexpected conditions would have stimulated new ideas. Yet, in March 1915, Churchill became the only active player in the quest for armoured vehicles capable of untying the knot of the Western Front. Britain's small professional army had in large measure been destroyed during four months of fighting in a traditional manner.² A new, mechanised approach was needed to enable an emerging, inexperienced, larger army to avoid similar experiences. His enthusiasm ignited by Hankey's *Boxing Day Memorandum*, Churchill had recognised the potential value of armoured vehicles but his understanding of their optimum military

¹ Sanders Marble, *The Infantry cannot do with a Gun less": The Place of the Artillery in the British Expeditionary Force, 1914-1918* (London, University of London Press, 1998), p. 3.

² James E. Edmonds, *History of the Great War based on Official Documents, Military Operations France and Belgium, 1914, vol. II* (London, Macmillan, 1929), pp. 465-469; Anthony Farrar-Hockley, *Death of an Army: The First Battle of Ypres, 1914, in which the British Regular Army was destroyed* (London, Barker, 1970), p. 180.

role and therefore the design that was needed would be shown to be at variance with army requirements when these were adopted mid-1915.³ Churchill told Asquith:

the power of the rifle is so great that 100 yards is held sufficient to stop any rush, and in order to avoid the severity of the artillery fire, trenches are often dug on the reverse slope of positions, or a short distance in the rear of villages, woods or other obstacles. The consequence is that the war has become a short range instead of a long range as was expected [sic] and opposing trenches get ever closer for mutual safety from each other's artillery fire. The question to be solved is not therefore the long attack over a carefully prepared glaxis of former times, but the actual getting across of 100 or 200 yards of open space and wire entanglements.⁴

Churchill's note contained a number of impractical suggestions. He recognised the problem of wire, which accentuated the risk of losses from artillery and small-arms fire but did not identify the machine-gun as one of the greatest threats.⁵

Terraine's articles on war myths portray artillery as the greatest threat to troops during the war. Taking the war as a single entity, it is beyond doubt that artillery was "the grimest reaper", but Terraine pays insufficient regard to circumstances in different tactical phases. The threat from the machine-gun increased dramatically as soldiers emerged from their "bullet-secure" trenches in order to close with the enemy. On such occasions the threat of artillery also increased, but artillery was able to keep its score ticking over in all phases throughout every day: even deep trenches were no guarantee against high-explosive shells. For BEF offensives in the earlier stages of the war, the machine-gun is recognised by many as the greatest threat.⁶ It may also be able to claim first place in later offensives when the BEF had to a large degree mastered the techniques for effective counter-battery fire. Circumstances varied along the front, but many who witnessed 1915 offensives judged the machine-gun as the backbone of enemy defence. At Aubers Ridge, Swinton refers to the assault, "in most cases" being "stopped dead on the top of our own parapets or a few yards in front,

³ Maurice Pascal Alers Hankey, *The Supreme Command 1914-1918, vol. I* (London, Allen and Unwin, 1961), pp. 244-255; Ernest D. Swinton, *Eyewitness: Being Personal Reminiscences of Certain Phases of the Great War, including the Genesis of the Tank* (London, Hodder and Stoughton, 1932), pp. 146-148; National Archives, T173/34B, d'Eyncourt to Crompton enclosing War Office requirements for design of landship, 1 July 1915.

⁴ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915.

⁵ *Ibid*, Churchill statement to the Royal Commission, 1 September 1919, Annexure A, Churchill to Asquith, 5 January 1915: Churchill refers to the proposed machines as "mechanical devices for the taking of trenches", the problem to be solved was "getting across of 100 to 200 yards of open spaces and wire entanglements".

⁶ Paul Cornish, *Machine Guns and the Great War* (Barnsley, Pen and Sword, 2009), pp. 43-45.

where the ground was strewn with bodies. A feature of the defence was the slaughter dealt out by the machine-guns firing directly and obliquely across No Man's Land."⁷ Lee was so convinced of the need for change that he returned to England during the Battle of Loos, "Went down to Walton Heath, had long talk with Mr. Lloyd George, showed him photos of dead in rows opposite machine-gun emplacements." Lee understood that the situation had not been appreciated by Lloyd George before his visit.⁸

The consequences of emerging from the relative safety of trenches into the field of machine-gun fire is well recounted in the scholarship.⁹ Holmes points out "Unusually in a war in which artillery was the major killer, about 60 percent of these casualties (1 July 1916) were caused by machine-gun fire."¹⁰ From German records, Duffy concludes that machine-gun fire:

was beyond doubt the main strength of the German defence, against which the attackers stood 'no chance'....the destructive power of the machine-gun is the cause of the enormous losses they sustained, and the first impetus of the attack was on many occasions broken just by the fire of the machine guns in the first German line. The machine gunners were magnificent, and so was the way their weapons were sited. All the prisoners, including the officers, are unanimous on that point.¹¹

Coppard further endorses the threat of machine-guns during British offensives and highlights difficulties in determining cause of death.¹² Terraine acknowledges the nuanced nature of the machine-gun/artillery "myth" by his comment, "Soldiers in trench

⁷ Swinton, *Eyewitness*, p. 113.

⁸ Cornish, *Machine Guns*, pp. 44-45; National Archives, MUN9/26, notes of interview of Lord Lee, 19 December 1922, Cornish confirms Lee's visit to Lloyd George.

⁹ William James Philpott, *Bloody Victory: The Sacrifice on the Somme* (London, Abacus, 2010), pp. 176-200; Gary Sheffield, *The Somme* (London, Cassell Military, 2004), pp. 49-52, 59 and 62; Martin Middlebrook, *The First Day on the Somme: 1 July 1916* (Harmondsworth, Penguin, 1984), pp. 123-210.

¹⁰ Richard Holmes, *The Western Front* (London, BBC, 1999), p. 127, Descriptions of early offensive actions in the Official History, first-hand evidence by Swinton and Lord Lee and descriptions of the disposition of bodies and naïve offensive tactics described or outlined by various historians, e.g. Middlebrook, Philpott and Sheffield, lend support to the argument that for offensives during the early part of the war, the machine-gun was the most effective element of German defence on the Western Front: notably, Middlebrook, in *The First Day of the Somme*, (pp. 87, 125 and 249), describes how and why Captain Martin, 9th Devons, modelled the exact spot at which his company "would be doomed" - "burial parties found the bodies of Capt. Martin and those of his men who had fallen in front of Mansel Copse, exactly where he had predicted they would be caught by a German machine-gun."

¹¹ Christopher Duffy, *Through German Eyes: The British and the Somme 1916* (London, Wiedenfeld and Nicolson, 2007), p. 168.

¹² George Coppard, *With A Machine Gun to Cambrai* (London, HMSO, 1969), pp. 120-121, on 29 September 1915, Coppard saw "masses of British dead, struck down by machine gun and rifle fire. Shells from enemy field batteries had been pitching into the bodies, flinging some into dreadful postures".

warfare were only exposed to machine-gun fire from time to time-when carrying out attacks or daylight raids, or working in the open: they were exposed to artillery fire the whole time they were in the front zone".¹³ Terraine chose to elaborate neither on the relative killing record of different weapons during different phases of the war nor upon statistical methodology, a stance apparently not varied by subsequent scholarship.¹⁴

Churchill had recognised the potential of armoured vehicles to contribute to the unlocking of trench stalemate. Early in 1915, the Battle of Neuve Chapelle would reveal to the BEF the extent and inter-relationship of difficulties in undertaking offensive operations. The experience would also reveal to the German Army the need for greater sophistication of defensive entrenchments since British operational tactics increased German respect for the capabilities of the BEF.¹⁵ Future offensives would not become any easier. Similarly, the role of the tank would become more complex than envisaged by Churchill in January 1915. The consequences of this change for the design of the tank would not be recognised fully and would lead to a less satisfactory debut on the battlefield than should have been the case.

Churchill's view of the BEF's difficulties did not represent a sound basis for specifying appropriate forms of mechanical assistance for offensive operations. He envisaged:

forty or fifty of these engines prepared secretly and brought into position at nightfall could advance quite certainly into the enemy's trenches smashing away all the obstructions and sweeping the trenches with their machine-gun fire and with grenades thrown out of the top.¹⁶

He also advocated the use of both wheeled or "portable" personnel shields and smoke. Churchill had not foreseen the difficulties that would be faced by tank

¹³ John Terraine: *The Smoke and the Fire, Myths and Anti-Myths of War 1861-1945* (Chichester, R. J. Acford, 1980), p. 132.

¹⁴ Ibid; Gary Sheffield, *The Smoke and the Fire: Myths and Anti-Myths of War 1861-1945*, A Reappraisal by Gary Sheffield, in *The Western Front Association Stand To*, no. 122, April 2021, pp. 51-52. Bearing in mind the complexity of the subject it is easy to understand why Terraine should not have wished to examine the matter more closely, for example, would rows of bodies described as machine-gun victims, but later blown into "dreadful postures" by artillery fire, have been categorised as MG or artillery victims? Similarly, how should those falling victim to Spanish Flu, following gunshot or shrapnel wounds, be categorised, or victims of gas, grenades, or non-automatic personal small arms, etc? Furthermore, how should unretrieved bodies be categorised. In all such cases it is safe to say that death would not have been determined by rigorous autopsy.

¹⁵ National Archives, WO158/17, Du Cann to CGS on tactical lessons of the Battle of Neuve Chapelle, 15 March 1915; Gary Sheffield, *The Chief: Douglas Haig and the British Army* (London, Aurum Press, 2011), pp. 107-111.

¹⁶ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915.

drivers/commanders in navigating from an enclosed vehicle, the difficulties of avoiding multiple ditching hazards or the potential unreliability of complex new machinery. Similarly, he did not appreciate the impracticality of infantry carrying or pushing wheeled metal shields.¹⁷ Furthermore, many of the limited supply of grenades available in January 1915 were of a primitive design.¹⁸

It may appear harsh to criticise the one member of the senior political and military establishment to have recognised the value of armoured vehicles, but Churchill's comments and subsequent actions did not provide the best start for designing the first tank. Churchill later stated that he took steps to design landships at the Admiralty because he was not convinced the army would be persuaded of their value.¹⁹ He referred to the landship as "a tank or armoured trench-crossing vehicle." These vehicles were intended for military tasks, yet, initially, the army had no involvement in his clandestine project.²⁰ He did not mention that, before instructing two groups at the Admiralty to construct a "landship", he had made no effort to check the response of Kitchener to the *Boxing Day Memorandum* and had not added his support to Asquith's endorsement of Hankey's memorandum to Kitchener.²¹ Admiralty efforts were underway before trials of the Holt tractor at Shoeburyness.²² Politics or personality clashes might well have rendered impossible even the partial integration of the army into Churchill's project. Nevertheless, it should perhaps have been attempted. At a later stage, the army would pay a price for problems that earlier involvement might have forestalled.

Churchill's letter to Asquith describes his thoughts on over-riding strategy, tactical problems and ways in which offensives on the Western Front might be assisted by technology.²³ He considered a committee of experts ought to be sitting continually at the War Office to formulate schemes and examine suggestions. Churchill judged the matter so urgent that it would not be possible in most cases to have lengthy

¹⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by Attorney-General, content of question 99.

¹⁸ Shelford Bidwell and Dominick Graham, *Fire-Power: The British Army Weapons & Theories of War 1904-1945* (Barnsley, Pen and Sword, 2004), pp. 124-125; 'Mills Bomb Inventors: "Claims for Awards"', *The Times*, 18 January 1921.

¹⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by Attorney-General, answer to question 28.

²⁰ *Ibid*, answer to question 13.

²¹ *Ibid*, answers to questions 25-29 and 51.

²² *Ibid*, answer to question 29.

²³ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915.

experiments beforehand and therefore made the astute point that “If the devices are to be ready by the time they are required it is indispensable that manufacture should proceed simultaneously with experiment”. It is notable that Churchill did not mention this in his evidence to the Royal Commission.²⁴ Clearly, the reason for this omission was that Churchill did not wish to draw attention to the shortcomings of the Committee he had appointed, which had experimented for nearly six months without producing a working machine, or to his and d'Eyncourt's failure, as managers, to press for construction concurrent or overlapping with design. The relative simplicity of producing a purely experimental machine would be demonstrated in August 1915 by Tritton who, following about a week on design work and preparations, commenced construction of Little Willie on 11 August, completing it by 8 September.²⁵

Churchill's first instructions were issued to Murray Sueter, Head of his RNAS.²⁶ In evidence to the Royal Commission, Churchill was at pains to emphasise his lack of mechanical qualifications. This represented a get-out-of-jail card, frequently used to avoid awkward cross-examination that might reveal the negligible contribution his Committee had made to the design of the first tank.²⁷ Some four years earlier he had harboured no reservations about sending Sueter a detailed though flawed instruction on how to conduct experimentation.²⁸

In his note to Asquith, Churchill had included a frustrating mix of sound comment and advice on strategy and administration but unsound detail and tactics. Unfortunately, Churchill was not in a position to put into practice the sound parts of his advice, since Kitchener had responsibility for such matters. By contrast, he was able to instruct Sueter on the way unsound details should be engineered and tested. His instructions to Sueter required trials in which two steamrollers were fastened together side-by-side so they were to all intents and purposes one roller at least 12-14 feet wide. This was to be run along trenches to ascertain the weight necessary to smash

²⁴ Ibid, Churchill statement to the Royal Commission, 1 September 1919, Churchill's letter of 5 January 1915 was appended to his statement.

²⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answers to questions 2561 and 2614.

²⁶ National Archives, MUN5/394, minute from Churchill to Sueter, 18 January 1915, included as Annexure D to Churchill statement to the Royal Commission, 1 September 1919.

²⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, for example, 7 October 1919, examination of Churchill by Attorney-General and cross-examination by various legal representatives, answers to question 84, 109 and 150 and comment to Chairman, p. 17.

²⁸ National Archives, MUN5/394, Annexure D of Churchill statement to the Royal Commission, 1 September 1919.

in the trenches. Elementary considerations such as the varying nature of the soil/substrata in different areas, the traction of a steamroller under different conditions and the form of trench construction do not appear to have occurred to him. It seems unlikely Churchill's concluding remark to Sueter was written in jest, "the only difficulty you have got to surmount is to prevent the steamrollers from breaking apart".²⁹ Churchill gave Sueter two weeks to carry out his instructions, a task which would determine the nature of Sueter's future participation in the project.³⁰

Sueter was experienced in dealing with technical issues.³¹ Presented with a problem on a clean sheet and given a longer innings he might have produced a workable solution.³² He endeavoured to divert the project onto more practical lines by commencing investigations into the provision of a tracked vehicle.³³ However, the specific requirements of the First Lord could not be ignored, with the result that his obligation to provide what Churchill later described as a "trench-roller" inevitably resulted in failure.³⁴ Churchill's use in *The World Crisis* of the term "trench-roller" itself represented a shift of his position, a veiled admission that the machine described to Sueter in January 1915 in no way resembled the eventual "tank". However, whereas in 1923 such a term could safely be used, in 1919 Churchill felt it necessary and advantageous to his reputation to avoid any mention of ways in which he might have acted more beneficially. Consequently, Churchill falsely assured the Royal Commission that his efforts from September 1914 represented early attempts to secure the provision of a tank or trench-crossing vehicle.³⁵ Churchill later appreciated

²⁹ National Archives, MUN5/394, Churchill to Sueter, 18 January 1915.

³⁰ National Archives, T173/776, Royal Commission on Awards to Inventors, for example, 7 October 1919, examination of Churchill by Attorney-General, answer to question 37 and MUN5/394, Churchill to Sueter, 18 January 1915.

³¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, cross-examination of Churchill by Whitehead on Sueter's achievements in the navy with aircraft, submarines, torpedoes and armoured cars, questions 66-79; Oxford Dictionary of National Biography, Rear-Admiral Murray Sueter, <https://www-oxforddnb-com.uoelibrary.idm.oclc.org/view/10.1093/ref:odnb/9780198614128.001.0001/odnb-9780198614128-e-36368?rskey=bYkNDx&result=1>, accessed 18 December 2017; A. Gordon Wilson, *Walter Wilson: Portrait of an Inventor* (London, Duckworth, 1986), pp. 33-34.

³² National Archives, T173/776, Royal Commission on Awards to Inventors, for example, 8 October 1919, examination of Sueter by Whitehead, answers to questions 423-425 and Royal Commission on Awards to Inventors (Improvements in Tanks), 15 November 1920, examination of Sueter by Daphny, answer to question 1496.

³³ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Sueter by Whitehead, pp. 41-44.

³⁴ Swinton, *Eyewitness*, pp. 56-57.

³⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answers to questions 7-12 and 22-26.

the shortcomings of his 1915 instructions to Sueter and endeavoured to protect himself against cross-examination by down-grading his instructions to Sueter to “ideas of a suggestive character”, by off-loading the responsibility for the “trench-roller” onto Hankey, yet nevertheless by claiming some benefit from the idea since:

I had, of course, no expert knowledge of mechanics....This particular variant [the steamroller] broken down [sic] through its mechanical defects but there is no doubt that it played its part in forming opinions among the armoured-car officers and experts connected with the armoured-car squadrons and in setting imagination to work for other and more helpful solutions.³⁶

Churchill's statements concerning events in 1915 were proving as unreliable as those of 1914, since the armoured car squadrons did not design or build the first tank and Fosters was not connected to them in any direct way.

Sueter dutifully carried out Churchill's instructions with the result that in each of four tests the steamrollers broke apart as soon as the engines were started. Tests were then attempted with a single roller, but this would not climb the slightest incline.³⁷ Consequently, on 20 February 1915, dissatisfied with the progress being made by Sueter, Churchill set up the Landships Committee, under the chairmanship of d'Eyncourt. The Committee was answerable direct to himself as First Lord.³⁸

Showing no repentance for having specified inappropriate tests, Churchill later blamed Sueter for failing to resolve the problems of the landship in a fortnight: “I was not altogether satisfied that the subject was being handled by strong enough elements, and by strong enough personalities in the Armoured Car Division.”³⁹ The irony of this statement will become clear when d'Eyncourt's management of the Landships Committee is examined together with the efforts of Sueter to stiffen d'Eyncourt's resolve and shepherd him towards greener pastures.

Churchill's observations to the Royal Commission do not fully explain why he should have passed the reins from Sueter to d'Eyncourt, but the decision may have been triggered by discussions at a dinner party given by the Duke of Westminster, commander of one of Churchill's Armoured Car Squadrons. The dinner party was held

³⁶ National Archives, MUN5/394, Churchill Statement to Royal Commission, 1 September 1919, para. 17.

³⁷ Murray Sueter, *The Evolution of the Tank: A Record of Royal Naval Air Service Caterpillar Experiments*, (London, Hutchinson, 1937), pp. 56-57.

³⁸ Winston S. Churchill, *The World Crisis 1911-1918*, (London, Free Press, 2005), p. 308.

³⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answer to question 35.

to afford members of the squadrons the opportunity to put their ideas to Churchill on the future of armoured vehicles following the establishment of continuous entrenched defences from Switzerland to the English Channel. The ploy was successful in that their discussions, particularly about a wheeled land battleship, inspired Churchill and resulted in his establishment of the Landships Committee the following week:

He [Hetherington] advocated the creation of land battleships on a scale far larger than had ever been practicable, and rather on the lines of those suggested by Mr. H. G. Wells. As a result,....I went home determined that I would give imperative orders without delay to secure the carrying forward in one form or another of this project in which I had for so long believed.⁴⁰

Churchill reacted badly to Sueter's failure "altogether to solve the mechanical difficulties" or to "find anyone who could solve them", since, apparently spitefully, he gave evidence to the Royal Commission that Sueter was "not even summoned to the meeting in my sick-room on the 20th February at which the [Landships] Committee was appointed".⁴¹ Similarly, it would appear Sueter was not invited to Westminster's dinner party. The Attorney-General, acting on behalf of Churchill, chose not to mention these matters during his introductory examination of his witness, presumably because Sueter's approach was more practical than that of Churchill and because he was more committed to the project than d'Eyncourt and less tolerant of delays. As early as April, Sueter was complaining about the slowness of d'Eyncourt's Committee.⁴²

Churchill's claim, to have "long" believed in armoured vehicles, represented part of his deception: such a belief had been held for about a fortnight. The main point was that Churchill had not simply failed to recognise the attack on machine-guns as an important role for armoured vehicles, but had failed to keep abreast of thoughts within his Armoured Car unit in the period between the solidification of the Western Front in October 1914 and the *Boxing Day Memorandum*.⁴³ Furthermore, although Churchill's

⁴⁰ Ibid, answer to question 32; National Archives, MUN4/4979, undated and unattributed proposal to Build a New Type of Gun Carrying War Machine; Sueter, *Evolution of the Tank*, p. 50 confirms that there was such a proposal which may have been drafted by Hetherington or may have been prepared by Sueter based on proposals by Hetherington, Sueter gives no date other than "towards the end of 1914; National Archives, T173/776, Royal Commission on Awards to Inventors, 9 October 1919, cross-examination of Hetherington by Bousfield, answers to questions 1256-1262 - these suggest the date was slightly later than indicated by Sueter.

⁴¹ National Archives, MUN5/394, Statement by Churchill to the Royal Commission on Awards to Inventors, 1 September 1919, para. 25.

⁴² National Archives, T173/776, Royal Commission on Awards to Inventors, 9 October 1919, examination of Sueter by Bousfield, answer to question 1178.

⁴³ National Archives, T173/776, Royal Commission on Awards to Inventors, 8 October 1919, questioning of Boothby by Chairman, answer to question 295.

interest in armoured vehicles had been stirred by Hankey, it still required initiative by members of his Armoured Car unit to boost that interest. Unfortunately, neither of these stimuli set Churchill on course for the holy grail of the tank. His false testimony to the Royal Commission continued as he explained issues in 1915. When asked whether the idea in March 1915 “was to have a machine which would carry a number of men into the enemy’s trenches?”, Churchill replied:

That was not my original idea. I essentially dwelt upon it as an engine of war which was to fight, to roll down the wire, and to sweep the trenches with Machine-gun fire, and which the troops were to use as a *point d'appui* to manoeuvre with rather than using it as a carrier to carry a definite body of troops into the enemy lines.”⁴⁴

This evidence ran counter to his answer to an earlier question.⁴⁵ It would also be contradicted by later witnesses.⁴⁶ Most significantly however it is contradicted by documentary evidence:

Two months ago the First Lord sent for me and then put me on a Committee of Engineers to report on the possibility of building large armoured self-propelled platforms on which a strong storming party of from 50 to 70 men could safely be transported across the fire-swept zone....⁴⁷

Progress was reported regularly to the Landships Committee.⁴⁸ However, perhaps the most telling contribution in refuting Churchill’s claim to have sought a fighting tank came from Crompton who confirmed showing plans of proposed “men-carrying machines” to Churchill in March 1915.⁴⁹ Crompton’s version of events is confirmed by Stern:

These Landships were at first designed to transport a trench-taking storming party of fifty men with machine-guns and ammunition: the men standing in two ranks at each side, and protected by side armour of 8mm. thickness and roof armour of 6mm.⁵⁰

⁴⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by Attorney-General, answer to question 199.

⁴⁵ Ibid, answer to question 8.

⁴⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 20 October 1919, examination of Crompton by Simon, answers to questions 2115-2116 and 8 October 1919, examination of Sueter by Whitehead, answers to questions 555-556.

⁴⁷ Tank Museum, 069.01(41) Crompton, Crompton to Smith-Dorrien, 30 April 1915.

⁴⁸ Ibid, Landships Committee Progress Report on Armoured Self-Moving Platforms, 4 March 1915.

⁴⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 20 October 1919, examination of Crompton by Simon, answers to questions 2115-2121.

⁵⁰ Albert Stern, *Tanks, 1914-1918: The Log-Book of a Pioneer* (London, Forgotten Books, 2012), p. 20.

Though Churchill did not foresee the value of AFVs before receiving Hankey's *Boxing Day Memorandum*, evidence to the Royal Commission shows that members of his Armoured Car unit did consider the use of tracked vehicles and armour protection at an earlier date, though they do not appear to have linked tracks, armour and armament into a single vehicle. Prominent among such officers were Lieutenant Robert MacFie and Major Thomas Hetherington. MacFie joined the armoured car unit with experience of tracked vehicles in agriculture in America. There is no evidence that MacFie's advocacy of tracked vehicles extended beyond their use for haulage purposes until well after the establishment of the Landships Committee.⁵¹ Hetherington on the other hand did associate the combination of armament and armour, though, as outlined to Churchill at Westminster's party, he envisaged this on large diameter wheeled vehicles.⁵²

The most significant point to emerge from the evidence of Hetherington, MacFie, Sueter and other RNAS personnel is that Churchill was not sufficiently in touch with thoughts within the lower echelons of the RNAS in 1914. Although he later claimed it was obvious, nothing from 1914 suggests Churchill had addressed the issue of restoring mobility to military operations. Nevertheless, evidence given by his Engineering Officers in the Armoured Car unit shows they had been considering, albeit in an uncoordinated way, the use of more powerful armoured vehicles to overcome the barrier of trenches and wire. It must be recognised that some witnesses before the Royal Commission were seeking financial awards and their evidence may have been skewed to suit their claims, but no such accusations can be made against non-claimants such as Briggs, the Unit's Chief Engineering Officer:

It is rather difficult to assign a definite date of first knowing about it [Hetherington's scheme] but I am able to assign a definite date to the time when we had thoroughly considered it, and very considerably modified it. That date I am definitely able to assign as the last week in January, and I am certain we must have heard of it at least three weeks before that, and probably a little longer, to investigate certain issues....we were all thinking of some vehicle that would go across country and do over the land what the

⁵¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 9 October 1919, examination of Hetherington by Watson, answer to question 1221 and cross-examination by Bousfield, answers to questions 1265-1266.

⁵² National Archives, T173/776, Royal Commission on Awards to Inventors, 8 October 1919, examination of Sueter by Whitehead, answers to questions 426-428.

armoured motor cars would do on the roads. The Hetherington proposal gave us the opportunity of crystallising our thoughts on that vehicle.⁵³

In response to the further question “The first definite proposal that was brought to your mind by anybody was the Hetherington scheme which consisted, among other things, of using large wheels?”. The simple reply of “Yes” confirms that these early RNAS ideas were not directly related to the development path of the tank.⁵⁴ Tantalisingly, MacFie and Hetherington, both within the Armoured Car Unit, were advocating caterpillar traction and self-propelled armament, though the two were not being linked together. Early in 1915 the water was further muddied by the instructions of the First Lord who envisaged trench-taking and safe transportation of troops across no-man’s-land as the main roles of the landship.⁵⁵ The armament of Churchill’s landship was the machine-gun to clear trenches rather than an artillery piece to destroy machine-gun emplacements.

The importance of management issues stands out prominently at many stages of the development of the tank. The value of innovative ideas and technical expertise could too easily be diminished by poor management decisions. Churchill might have established a Landships Committee in 1914 had he enjoyed a closer managerial relationship with his Armoured Car unit. As it was, members of the unit would appear to have found it necessary to arrange a party in order to communicate with him on a matter of operational significance.

Nevertheless, as would be revealed by events later in the war, and later in the century, Churchill’s action in establishing the Landships Committee was appropriate and far-sighted. The problem was that the Committee needed to secure a rapid solution of mechanical and manufacturing problems in order to maximise the beneficial effect of technological advance during the remainder of the war. For several reasons, Churchill’s actions did not secure the speed of development so badly required.

The misspecification of Churchill’s landship by the inclusion of a troop-carrying requirement and inadequate aggressive capability should not have delayed the production of the first tracked, armoured vehicle. Other factors were also at play, particularly the calibre of senior staff, a factor that may have been particularly

⁵³ Ibid, examination of Briggs by Whitehead, answers to questions 629-631 and cross-examination by Hunter Gray, answer to question 665.

⁵⁴ Ibid., answer to question 668.

⁵⁵ Ibid., answer to question 667.

significant bearing in mind Churchill's pressurised involvement with other responsibilities. The time he could devote to thought, liaison and management of the landship project would have been limited severely by the Dardanelles venture.

However, the Dardenelles cannot entirely absolve Churchill from responsibility for the largely wasted period of the first six months of 1915. Churchill's own management skills were found wanting. In appointing d'Eyncourt, Churchill had selected a man who did not possess the leadership qualities required. Neither d'Eyncourt nor Crompton was capable of the drive and pragmatism necessary to secure the timely construction of an experimental prototype let alone a practical working model. Even allowing for the heavy workload of his main job, d'Eyncourt did not contribute the effort required. Having appointed an experienced consultant, Colonel Rooks Crompton, and automotive engineer, Lucien Le Gros, d'Eyncourt appeared to delegate progress to them without himself contributing a sufficient degree of supervision. In consequence the project was allowed to drift.⁵⁶ Several months passed by with no tangible progress and no cracking of the managerial whip. Other members of the attached RNAS support team could see the problems, largely self-inflicted, that were faced by Crompton.⁵⁷ The principal obstacle was Crompton's belief that an articulated solution was required to achieve certain climbing manoeuvres, to navigate narrow, twisting, French roads and to cross weight-restricted bridges.⁵⁸ In the event, as Le Gros would later be forced to admit, it was by rail that tanks would complete their journey to positions close to the Front.⁵⁹

The role of Sueter in supporting and guiding d'Eyncourt as delay increased and as Swinton succeeded in reviving army interest in AFVs deserves special mention and throws light on a key period in the passing of responsibility for progress to Fosters. It is reasonable to assume that Gordon Wilson's recognition of the value of Sueter, "a

⁵⁶ Sueter, *Evolution of the Tank*, p. 79; National Archives, T173/776, Royal Commission on Awards to Inventors, 8 October 1919, cross-examination of Boothby by Solicitor-General, answer to question 369.

⁵⁷ Sueter, *Evolution of the Tank*, pp. 77-78.

⁵⁸ Stern, *Tanks*, p. 20; National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Frank Russell, answer to question 3057 and 20 October 1919, cross-examination of Le Gros by Hunter Gray, answers to questions 2345 and 2406-2408.

⁵⁹ *Ibid*, re-examination of Le Gros by Simon, answer to question 2470.

colourful and enterprising figure”, stems from comments made by his father.⁶⁰ In evidence to the Royal Commission, Sueter recounted that in July:

d'Eyncourt came to see me and said he wanted to resign from the Presidency of the Land Ship Committee....then said he did not think there was much future for land ships, and he wanted to give it up....I asked....if he could not get out a machine and he said he thought the Land Ship Committee should do something, and he thought he would turn down the less promising designs....I persuaded him to go on as President...He said: “I will only do it if you remove Commander Boothby from the Committee”.⁶¹

Sueter’s comments confirm the later portrayal of d'Eyncourt as irresolute and an unreliable witness.⁶² It is not possible to provide evidence to corroborate Sueter’s comments since they were made during a one-to-one conversation. However, while acknowledging that Sueter was seeking to persuade the Commission of his own importance in securing an armoured vehicle, his remarks ring true. D'Eyncourt had not sought involvement with landships but had been consulted by Sueter and Churchill and then “invited” by Churchill to lead the project.⁶³ By the time of his discussions with Sueter in July he had nothing to show for the efforts of his Committee which had suddenly become the focus of attention following the army’s revived interest in armoured vehicles. Furthermore, Crompton and Le Gros were experiencing criticism for their unsuccessful efforts to design a complex articulated machine.⁶⁴ This had resulted in Sueter inserting Boothby onto the Committee in order to turn up the heat on d'Eyncourt and encourage the diversion of efforts along more practical lines.⁶⁵ D'Eyncourt was finally under pressure. However, he would have been aware that his resignation, though a convenient way to relieve one form of pressure, could have attracted criticism and generated other pressures.

⁶⁰ Wilson, *Portrait*, pp. 34-37.

⁶¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 8 October 1919, examination of Sueter by Whitehead, answer to question 475.

⁶² National Archives, T173/776, Royal Commission on Awards to Inventors, 10 October 1919, cross-examination of d'Eyncourt by Solicitor-General, answers to questions 1962-1971, 2057 and the immediately ensuing discussion with the Chairman of the Commission.

⁶³ National Archives, MUN5/394, Sueter report to Admiralty on History of Armoured Cars, Juggernauts, Land Battleships, Tanks, 20 September 1916.

⁶⁴ See photograph 34.

⁶⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answers to questions 3057-3064.

A key stage in the development of the tank had arrived. Probing by the army could only be put off for a limited period.⁶⁶ It was important for d'Eyncourt's prestige that he should produce some form of hardware.⁶⁷ There was a general recognition that a machine, any machine, was needed. Tritton met Stern and d'Eyncourt towards the end of July when he was told "The complaint was, nothing was happening, and would I take on the job and build something. They wanted something to show for propaganda in order to keep the Tank scheme alive."⁶⁸ The credit for teasing out positive progress from a hive of inactivity belongs to Albert Stern, a banker who, following the outbreak of war, had volunteered his services to Churchill together with finance for an armoured car.⁶⁹ By mid-1915 he was Secretary to the Landships Committee.⁷⁰ Stern freely admitted to being "very much against Colonel Crompton".⁷¹ In June, Stern appears to have assumed the role of progress enforcer.⁷² The failure of Crompton to produce results, together with a general realisation that his proposed articulated machine was impractical, had undoubtedly led to a lowering of respect for his ability and would have made him a primary target for Stern.⁷³ It was likely however that the determining issue so far as Crompton's future with the Committee was concerned was d'Eyncourt's desperation for something to be built in order to conceal his lack of progress.⁷⁴ This brought to light the fact that Crompton had prepared no detailed plans from which a manufacturer could undertake the construction of part of his proposed articulated machine. This was revealed when, in view of their commitment to other munitions contracts, Metropolitan were released from their contract to build Crompton's machine.

⁶⁶ National Archives, ADM116/1339, d'Eyncourt to Scott-Moncrieff, 30 July 1915, claiming situation between War Office and MM 'doubtful', therefore putting off meeting of Joint Committee till "the whole matter is on a proper basis", i.e., playing for time.

⁶⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, evidence and cross-examination before the Commission had effectively established that avenues explored by the Landships Committee had been discontinued by July 1915 - see in particular 7 October 1919, cross-examination of Churchill by Greene, answers to questions 229-230.

⁶⁸ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Tritton by Gray, answers to questions 2810-2811.

⁶⁹ Stern, *Tanks*, pp. 3-6.

⁷⁰ *Ibid*, p. 18.

⁷¹ National Archives, MUN5/394, Tank Awards Committee, 10 October 1918, evidence of Stern, p. 6.

⁷² Tank Museum, 069.01(41) Crompton, Stern memorandum, 16/06/15, changing procedures and Crompton's role.

⁷³ National Archives, T173/218, See views of Field in note dated 13/08/15 and T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, opinions expressed in answers to questions 3057 and 3064; Sueter, *Evolution of the Tank*, views of Sueter and Boothby, p. 80.

⁷⁴ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answer to question 2543.

D'Eyncourt and Stern had then turned to Fosters to undertake the construction of "half" the articulated landship.

Tritton recounted that on 15 July, only three days after Fosters had agreed to undertake the job, d'Eyncourt enquired whether Tritton had made a good start. On being told that no start had been made as no plans had been received from Crompton, an answer which appeared to contradict Crompton's assurances some weeks earlier, d'Eyncourt, Stern and Tritton took a taxi to Crompton's office.⁷⁵ On 5 June Crompton had stated that Metropolitan who had at that time only recently taken over as the main contractors from Fodens:

have the work of the main frames, the details of armouring and all the principal features of the design well in hand; they sent a leading draughtsman, Mr. Cartwright to Colonel Crompton's office, he returned....taking with him the general designs in a sufficiently complete form to enable all the detail work to be carried to completion in their own offices. The final drawings as settled by Colonel Crompton on behalf of the Admiralty have been sent up and will be checked forthwith."⁷⁶

Tritton explained to the Tank Awards Committee and Royal Commission that the only "plans" available were sketches, nothing from which the machining of parts could be undertaken. There "was not a single drawing of any kind".⁷⁷ Tritton explained that d'Eyncourt "had an interview with Colonel Crompton at the other end of the room. "He did not know what passed".⁷⁸ The immediate outcome was that Tritton sent Rigby, his senior draughtsman, to Crompton for a week to work under his requirements. Rigby was under strict written instructions to do anything Crompton wanted but to take no "responsibility in initiating". These instructions were reinforced by a further telegram "We must take no responsibility for design".⁷⁹ Tritton had no intention of providing Crompton with an opportunity to involve Fosters in disputes over responsibility for delay or error.

Rigby's work yielded a single blueprint but was not adequate for the construction of the machine and in consequence of almost daily calls from Stern, Tritton wired him on

⁷⁵ Ibid, answer to question 2521.

⁷⁶ National Archives, T173/34B, Crompton Progress Report, 5 June 1915.

⁷⁷ National Archives, MUN5/394, Tank Awards Committee, 1 November 1918, evidence of Tritton, p. 14.

⁷⁸ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answer to question 2521.

⁷⁹ Ibid., answers to questions 2525-2530.

27 July to explain why matters were at a standstill.⁸⁰ The outcome was a meeting between d'Eyncourt and Tritton at which the whole job was handed to Fosters with Wilson nominated as overseer. Crompton was to be retired.⁸¹

Stern's role in the events in June/July was significant and led eventually to a landship being designed and constructed by Fosters. In undated draft evidence, prepared by Wilson for the Royal Commission, reference is made to a probing discussion in which Stern asked Wilson whether he would prefer to work with Tritton or Crompton. Wilson informed Stern that if Tritton and he were put on the job "we would soon produce a machine that would do something."⁸² Stern did not appear before the Royal Commission as he was not a claimant. He did, however, give evidence to Churchill's Tank Awards Committee in 1918 and this confirmed his lack of respect for Crompton.⁸³ After the war Stern wrote of his experiences as a "tank pioneer" but his style of writing does not lend itself to the determination of reliable detail and his discussion with Wilson, which presumably took place early in July 1915, is not mentioned.⁸⁴ Therefore while Tritton's evidence is not verified by Stern, it would appear Stern was seeking ammunition from Wilson to use against Crompton. His probing was successful and assisted the case for excluding Crompton from the development process and appointing Tritton and Wilson to produce an experimental machine.

Stern therefore played a vital role in the fortunate combination of factors leading to the development of the tank. By contrast, events also emphasise the poor management of the process by d'Eyncourt who failed lamentably to check the illusory progress claimed by Crompton. As late as 12 June d'Eyncourt had written to Crompton thanking him for his Progress Report which "is very clear and gives an excellent account of the present position".⁸⁵ With misplaced confidence, d'Eyncourt sent a copy

⁸⁰ Liddell Hart Centre for Military Archives, Stern Papers, Stern1/6/33, Tritton to d'Eyncourt, 27 July 1915.

⁸¹ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answer to question 2550.

⁸² National Archives, T173/776 Royal Commission on Awards to Inventors, 21 October 1919, comments by Russell, Wilson's Counsel, to Chairman of Commission, p. 138; Tank Museum, Walter Wilson Papers, draft proof of evidence for Royal Commission (not included in introductory examination by his barrister on 21 October 1919).

⁸³ National Archives, MUN5/394 Tank Awards Committee, 10 October 1918, evidence of Stern, p. 6.

⁸⁴ Stern, *Tanks*, passim.

⁸⁵ Tank Museum, 069.01(41) Crompton, d'Eyncourt to Crompton, 12 June 1915.

of the Progress Report to Churchill. The previous week d'Eyncourt had written to the Admiralty Secretary stating:

construction of these "Landships" has been in the development stage, but the design has now practically been settled. Considerable progress has been made and the matter was recently explained by D.N.C. to the present First Lord who approved verbally of the work being continued on the lines already approved.⁸⁶

D'Eyncourt was not in control of events. Pressure from Sueter, Stern and later from Tritton, eventually convinced him that fundamental change was required if exposure of his lack of progress was to be avoided. His ambition for an in-house solution had failed: external assistance was required.

Probing and directing by Sueter and Stern thus led to the appointment of an experienced engineering company to design and construct a tracked armoured vehicle. Fortunately, an experienced and talented engineer was given the responsibility of overseeing their work, though Stern would undoubtedly have been aware that Wilson's role would be more extensive than supervision. There is little doubt that Stern played a major contribution in pulling d'Eyncourt's project out of the fire. However, the first seven months of 1915 had yielded no significant progress in securing the machine-gun destroyer so badly needed. Up to that time, 9 May, at Aubers Ridge, was the costliest day in terms of casualties for the British Army.⁸⁷ The ill-planned or under-equipped spring offensives emphasised the need for innovation or limited activity. French allies sought unreserved aggression.⁸⁸

The first task facing Tritton as he returned to Lincoln early in August was not to produce a war-winning machine, rather a face-saving machine. The face to be saved was not his own but that of d'Eyncourt, a man who had allowed the sands of time to slip through his fingers and would, a bare thirteen months later, unscrupulously deprive Wilson and himself of the tributes they so richly deserved for producing not just an experimental machine for show, but, in addition, a model capable of undertaking the tasks notified to them by the Landships Committee. As such, they made a major contribution to the strengthening of offensive operations and to demoralising elements

⁸⁶ National Archives, ADM116/1339, d'Eyncourt to Admiralty Secretary, 7 June 1915.

⁸⁷ War Office, *Statistics of the Military Effort of the British Empire in the Great War*, (London, HMSO, 1922), pp. 237-271.

⁸⁸ James. E. Edmonds, *Military Operations, France and Belgium, 1915, vol. I* (London, Macmillan, 1936), p. 128.

of the German army.⁸⁹ The questions were, however, how long would design take and when would it be possible to put the machine into production and train prospective crews. Furthermore, how successfully would it undertake the envisaged roles? Clearly no machines could be produced in time to help scale down casualties in any remaining autumn offensives in 1915, but was it possible to provide an effective antidote to machine-guns for the start of the 1916 fighting season? It should be borne in mind that the greater the delay, the greater the sophistication of German defensive arrangements. Realistically, there was no possibility of a machine being designed and developed within the lifespan of the elementary defences existing at the time the landship was envisaged. In these circumstances, the alternative approach of blasting a way through with artillery was understandable and appropriate. However, artillery was on its own development path and by July 1916 had not reached the necessary level of quantity, type and reliability of ammunition and degree of sophistication of operational techniques required to destroy or neutralise defences in order to render success possible.⁹⁰

As Tritton prepared Foster's staff to undertake the new job and Wilson endeavoured to clear up outstanding work in order to join Tritton, Swinton was making preparations for resolving staff and organisational issues necessary to accompany a successful outcome to the design work at Lincoln and subsequent manufacture. He must have reflected on the pace exhibited by the project since his letter to GHQ some three months earlier. In May he had become aware that the handling of press reporting was to be changed and assumed, correctly, that his role as *Eyewitness* was coming to an end.⁹¹ Since the confirmation of his assumption and his approach to GHQ occurred on the same day it seems likely that the two issues were connected.⁹² His final seed took the form of a memorandum to Sir John French, on "The Necessity for Machine-

⁸⁹ John Herbert Boraston (ed.), *Sir Douglas Haig's Despatches December 1915-April 1919* (London J. M. Dent and Sons, 1919), Seventh Despatch, 21 December 1918, Advance to Victory; Martin Gilbert, *Winston S. Churchill, Companion vol. IV, part I, January 1917-June 1919* (London, Heinemann, 1937), Churchill to Clementine, 10 August 1918, pp. 368-373; William James Philpott, *Anglo-French Relations and Strategy on the Western Front 1914-1918* (London, Palgrave Macmillan, 1996), pp. 51-52 and 74-76.

⁹⁰ Paul Strong and Sanders Marble, *Artillery in the Great War* (Barnsley, Pen and Sword, 2011), pp. 90-91; Jonathan B. A. Bailey, 'British Artillery in the Great War' in *British Fighting Methods in the Great War*, ed. by Paddy Griffith (London, Frank Cass, 1996), pp. 23-49 (pp. 35-43).

⁹¹ Swinton, *Eyewitness*, pp. 123-124.

⁹² *Ibid*, pp.125 and 158.

gun Destroyers”.⁹³ The BEF had set up an Inventions Committee and when this body supported Swinton’s proposal, French addressed an appropriate memorandum to the War Office.⁹⁴

Most probably as a result of the loosening of tongues following Churchill’s departure from the Admiralty, or confusion between the trial of the bridge-layer and the work of the Landships Committee, the involvement of the Admiralty in armoured vehicle experimentation had become known at the War Office before receipt of French’s memorandum late in June. The origin of the “leak” is not known, though “Winston’s Circus” was not popular at the Admiralty and there is therefore no shortage of suspects. Major-General Charles Callwell, Director of Military Operations, heard of “the caterpillars” through a member of his staff whom he discreetly calls Z. Apparently in May 1915, Z told Callwell “I’ve been hearing about the caterpillars, sir”.⁹⁵ Callwell later claimed that the General Staff had been unaware of Swinton’s proposals in late 1914/early 1915 and that his projects had been turned down by “a technical branch to which he had unfortunately, referred them”. Callwell described the value of the caterpillars as “incontestable ever since trench warfare became the order of the day”.⁹⁶ There is no reason to doubt Callwell’s claim of ignorance concerning the test of the Holt Tractor and associated matters, but knowledge had not been limited to some small technical branch. Kitchener and Von Donop were involved. Callwell’s excuse simply painted the Army Council in an even less satisfactory light, since it said little for organisation or management that a proposal, later described as of great importance, was unknown by all at a senior level.

By the time Swinton returned to London, wheels were already beginning to turn. The issue was no longer one simply of the merits of a scheme put forward by relatively junior officers. It had acquired the additional spice of inter-service rivalry. The Third Sea Lord, Tudor-Tudor, replied to a probing approach from Scott-Moncrieff on 30 May, informing the General that they had eighteen landships on order, the first likely to “be ready in about a month”. D’Eyncourt would have been delighted had this timing been realistic, but it is likely Tudor’s exaggeration served to increase concern that the army

⁹³ Ibid, pp. 129-134.

⁹⁴ National Archives, T173/463, French to War Office, 22 June 1915, this included copies of Swinton’s memorandum and technical specification; Swinton, *Eyewitness*, pp. 148-149.

⁹⁵ Charles Edward Callwell, *Experiences of a Dug-out, 1914-1918* (London, Constable, 1920), pp. 116-119.

⁹⁶ Ibid, p. 118.

hierarchy might be seen in an even poorer light compared to their sea-faring colleagues. Tudor sprinkled further salt on the General's tail by pointing out, somewhat more truthfully, that "this is essentially a war of machines and machines and armour protection hardly appear to have been utilised to any great extent on shore as yet."⁹⁷

The Sea Lords and new First Lord, Arthur Balfour, were undoubtedly pleased by the army's involvement since it would further the ambitions of most of the Sea Lords to off-load the range of non-naval projects developed under Churchill.⁹⁸ For their part, the War Office was prepared to accept various elements of "Winston's Circus". It was also anxious to retain the services of Admiralty personnel engaged on the Landships Committee. With the agreement of the Admiralty, a new Joint Committee was formed chaired by Scott-Moncrieff. The former Landships Committee was retained as a Working Party for the Joint Committee and for practical purposes therefore continued much as when under Admiralty "control".

The early advantage of army participation was the provision of elements of the military specification for the machine. It could be argued that only at this stage was the misdirection of Hankey's *Boxing Day Memorandum* and Churchill's notes to Asquith and Sueter largely eliminated. With the pending expiry of Crompton's contract and the coupling of Stern to d'Eyncourt as an enforcer, the project was provided with the drive previously in short supply. By July the pieces were beginning to fall into place in a way that promised more rapid and genuine progress in the development of fighting vehicles.

Matters were assisted considerably by the success of Hankey in securing the temporary appointment of Swinton as cover at the CID during his visit to Gallipoli.⁹⁹ Swinton's occupation of the influential position of Secretary to the Dardanelles Committee provided a key to most doors and he lost no time in visiting d'Eyncourt to ascertain the exact position at the Admiralty. Leaving d'Eyncourt to resolve the engineering difficulties, Swinton addressed "the vexed subject of Departmental responsibilities", obtaining the agreement of Asquith to call an Inter-Departmental Conference.¹⁰⁰

⁹⁷ National Archives, T173/34B, Tudor-Tudor to Scott-Moncrieff, 30 May 1915.

⁹⁸ Sueter, *Evolution of the Tank*, pp. 244-245; National Archives, ADM1/8530/230, passim.

⁹⁹ Stephen Roskill, *Hankey: Man of Secrets* (London, Collins, 1970) p. 205.

¹⁰⁰ Swinton, *Eyewitness*, pp. 169-170.

The role of the ad-hoc Conference was significant, since it established the relative roles of the Admiralty, War Office and Ministry of Munitions in the development of armoured vehicles. The War Office was to convey its requirements for armament, type of machine and protection required to the Landships Committee which would continue its experimental work of design and construction, “as far as is desirable”, following which it would hand over the work to the Ministry of Munitions. A naval unit, 20 Squadron, would be retained and expanded under the Landships Committee and Trench Warfare Department of the Ministry to provide necessary labour and logistical support.¹⁰¹

Swinton is to be commended for the work he undertook during the period following his return to the CID, though, as will later be shown, he failed to attempt the cutting of corners that might have made the new machines available for the commencement of the 1916 Somme offensives. It was not appreciated at the time, but the compartmentalisation of work between the army, navy and Ministry failed to address one particular set of engineering and design issues that would impact significantly on early operations by tanks.

The first half of 1915 passed with no tangible progress in the development of an off-road fighting vehicle. Militarily, the position on the Western Front remained unsatisfactory. Throughout 1915, chinks of success from operations were outweighed by failures, particularly at Aubers Ridge and Loos.¹⁰² The position was no more satisfactory at Gallipoli, where initial naval and military assaults had failed. On the home front, security was threatened from the air, Zeppelins targeting London from May 1915.¹⁰³ Conscription was on the political agenda, a preparatory National Registration Bill being laid before Parliament on 5 July.¹⁰⁴

¹⁰¹ National Archives, MUN5/394, Committee of Imperial Defence, Report and Recommendations of an Interdepartmental Conference held on 24 December 1915 on the Question of the Provision of Caterpillar Machine-Gun Destroyers or “Land Cruisers,” their Equipment, Manning and Cognate Subjects, paras. 7-8.

¹⁰² Spencer Jones, Introduction: The Forgotten Year, in *Courage without Glory: The British Army on the Western Front 1915*, ed. by Spencer Jones (Warwick, Helion, 2015), pp. xxiv-xxx (xxv-xxvii); Western Front Association World War One Article on Aubers Ridge 9 May 1915, <http://www.westernfrontassociation.com/world-war-i-articles/aubers-ridge-9-may-1915/>, accessed 8 December 2020; James E. Edmonds, *Military Operations, France and Belgium, 1915, vol. II* (London, Macmillan, 1936), pp. 77-79; ‘British Check before Aubers’, *Daily Mail*, 15 May 1915.

¹⁰³ Edwin Campbell, *Zeppelins: The Past and Future* (St. Albans, Campfield Press, 1918), p. 17.

¹⁰⁴ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), vol. I, p. 430.

The Landships Committee's slumbers were about to be disturbed. The army's interest in armoured vehicles would result in an expectation that the Committee would play a meaningful role in the war. The disturbance was magnified by the activities of Swinton, Sueter and Stern. Swinton's contribution was passive, his arrival in d'Eyncourt's office simply underlined the military and political interest in what hitherto had been a secret, exclusively naval project.¹⁰⁵ Upon the departure of Churchill, d'Eyncourt might have expected the project to be wound up. Yet, within a few weeks, the situation had changed from a part-time project, involving little effort or concern on d'Eyncourt's part, to a significant source of activity and point of military and political interest. Bearing in mind his Committee's lack of progress, this was deeply concerning to d'Eyncourt. Stern was directly under d'Eyncourt's control, his determination and insight were valuable compensation for the lack of such qualities in d'Eyncourt and he posed no threat of criticism that could reveal the ineffective management of the Committee. Sueter on the other hand occupied a senior position and was not answerable to d'Eyncourt: he and his staff, particularly Boothby, did pose a threat to the spread of information on under-achievement beyond the confines of the Committee. As established by cross-examination of Churchill in 1919, by June 1915 all avenues that the Landships Committee had been exploring had been abandoned.¹⁰⁶

On 1 July Sueter had reached an agreement with d'Eyncourt that work on the articulated landship would be discontinued in favour of a single unit. However, shortly thereafter it was established that Crompton's work comprised little more than sketches. Conditions were therefore favourable for the receipt by d'Eyncourt of advice from Stern that the design and development of the landship should be passed to Fosters.

Stern's important influence on events had commenced with the circulation of the agenda for the Landships Committee on 8 June. This included a paper under d'Eyncourt's name, though almost certainly written by Stern, aimed at putting the Committee on "a sound business footing".¹⁰⁷ The paper listed Crompton's duties as preparation of reports, keeping of minutes, expenditure of money and taking of

¹⁰⁵ Swinton, *Eyewitness*, p. 161.

¹⁰⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, cross-examination of Churchill by Russell, answers to questions 229-230.

¹⁰⁷ National Archives, MUN 4/4979, minutes of Landships Committee, 8 June 1915.

decisions on new ideas/inventions “before they are put before the Committee”. These responsibilities were reduced to the single task of working on the prototype, with Stern appointed as Secretary and given the responsibility of presenting any suggested ideas by other parties direct to the Committee, by-passing Crompton. Crompton was far from happy with such changes, disputed some of Stern’s statements and sought clarification of the roles of different parties.¹⁰⁸ Events were shortly to show that he was unable to take any steps to change the unsatisfactory state of the project and the termination of his involvement in it. He and Le Gros would later spend much time seeking to persuade the Royal Commission of the value of their work, but the Commission would tactfully conclude that they were employed for six months as consulting engineers:

In discharge of their duties they worked loyally and very hard, and no doubt supplied the Committee with useful data and sound advice. But they did not, in the result, invent or discover the special features subsequently incorporated in the Tanks”.¹⁰⁹

In consequence, no award was made to Crompton or Le Gros, but they might nevertheless have felt satisfied with the verdict as a less diplomatic body might have concluded that they were far from the dynamic duo urgently required to produce a machine capable of raising national morale and that, not only did they fail to discover any special features, but spent valuable time exploring the false trail of articulation for a machine which, if constructed, would have been more akin to an armoured personnel carrier than a tank.

Stern’s meeting with Wilson represented an important step in the outsourcing of design work to Fosters. It is recorded that Wilson had commented to Stern along the lines of “If you leave the matter to Tritton and myself we can produce a machine pretty quickly”.¹¹⁰ Such a comment would have been manna from heaven for a secretary keen to draw a line under Crompton and his articulated machine. Nevertheless, the

¹⁰⁸ Tank Museum, 069.01(41) Crompton, Stern to Crompton, 18 June 1915.

¹⁰⁹ National Archives, T173/463, Recommendations to the Treasury by the Royal Commission on Awards to Inventors, 17 November 1919, pp. 2-3.

¹¹⁰ National Archives, T173/776, Royal Commission on Awards to Inventors, 20 October 1919, representations to the Commissioners by Russell, Counsel for Tritton and Wilson, p. 138 - with only minor inaccuracies this outlines the key sequence of events in the appointment of Wilson and Tritton, though does not make clear the particular letter to which the date of the meeting between Stern and Wilson is related; Tank Museum, Wilson Papers, undated draft proof of evidence for Royal Commission. The wording used by Russell differs from that used in Wilson’s draft proof but the meaning of the two phrases is the same.

decision rested with d'Eyncourt. Initially, d'Eyncourt attempted to contain Foster's involvement to that of contractor. It took another fortnight and conclusive proof, in the form of Crompton's failure to prepare drawings for even one section of his articulated units, for d'Eyncourt to appreciate that he had no option but to pass both design and construction to Fosters.¹¹¹ It seems likely that the threat of failure outweighed any aspirations by d'Eyncourt to maintain operations in-house, a tactic, had it been successful, that would have enabled him to construct a defensible case for claiming substantial credit.

The passing of design and construction responsibilities to Tritton and Wilson marked a transformation in the Landship project. Little Willie was constructed over the next two months and the more difficult task was completed of progressing from a flawed machine, having unreliable tracks, poor climbing ability and high centre of gravity, to a machine capable of undertaking the tasks specified. Limited military operational requirements were notified to Fosters on 26 August.¹¹² It would have been during the processes leading up to the test of Little Willie that Tritton and Wilson demonstrated their practical inventiveness.¹¹³ Most significantly, an improved track was designed by 22 September. The commencement of the second task had not awaited the completion of the first but started on 24 August when d'Eyncourt had given the clearance for Tritton and Wilson to proceed with their design concept. Churchill's requirement that design and construction should take place concurrently was at last being observed. On 21 September the general outline of a different model was presented to d'Eyncourt for authority to commence construction. On 29 September, a wooden mock-up was displayed at the Inter-Departmental Conference, which granted authority for construction.¹¹⁴ Problems in securing materials caused a month's delay, construction commencing on 28 October.¹¹⁵ The machine was ready to run under its own power on 6 January 1916. Trials were conducted, firstly, close to Lincoln, then,

¹¹¹ National Archives, T173/475, Tritton to William Foster and Co., 1 August 1915.

¹¹² National Archives, T173/776, Royal Commission on Awards to Inventors, 20 October 1919, examination of Tritton by Russell, answers to questions 2604-2610.

¹¹³ Ibid, answers to questions 2611-2637.

¹¹⁴ National Maritime Museum, d'Eyncourt Papers, DEY41, Committee of Imperial Defence, Admiralty Landships, Proceedings and Report of Conference, 29 September 1915; National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answers to questions 2695-2696.

¹¹⁵ William Foster and Co., *The Tank: its Birth and Development* (Hinkley, William Foster and Co., 1920), pp. 27-28.

on 29 January and 2 February, “national” trials at Hatfield. These were held to be successful.

To summarise, the most significant events in the quest by Churchill to develop a landship occurred at the beginning and end of the period. In January 1915, Churchill became an advocate of armoured warfare, but failed to recognise the main military requirement, to stem infantry casualties and assist in overcoming defence by machine-guns and wire. In June 1915, the army’s interest in armoured machines was revived by Swinton’s advocacy and the “leak” of information concerning naval activity in such matters.

Despite the fact that Churchill did not make a claim for financial reward, nor was he entitled to do so, the Royal Commission felt it proper to record him a tribute:

In the first place the Committee desire to record their view that it was primarily due to the receptivity, courage and driving force of the Rt. Honourable Winston Spencer Churchill that the general idea of the user of such an instrument of warfare as the ‘Tank’ was converted into a practical shape.¹¹⁶

Yet was Churchill deserving of such a generous tribute? His efforts were praiseworthy, but to what degree were those efforts directly responsible for the emergence of the tank? Several authors have expressed reservations on the matter, notably Prior in *Churchill’s World Crisis as History*. A less generous, though more accurate, assessment of events would surely credit Churchill for recognition of the value of armoured vehicles and for setting up an organisation to secure their development. However, Churchill’s “team” did not succeed. Success was secured by an external company, “overseen” by a member of his team, whose talents had neither been recognised nor properly utilised under d’Eyncourt’s management.¹¹⁷

Throughout the time the tank was being designed and constructed Churchill was no longer involved in the project, having firstly moved to the Duchy of Lancaster then to the BEF.¹¹⁸ This course of events was to prove problematic for Churchill when he eventually gained readmittance to government in 1917 and would lead him into a somewhat reprehensible series of actions designed to distort events and to inflate and

¹¹⁶ National Archives, T173/34B, Recommendations of Royal Commission on Awards to Inventors dated 17 November 1919, p. 1.

¹¹⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answers to questions 3050-3058.

¹¹⁸ Andrew Roberts, *Churchill: Walking with Destiny* (London, Allen Lane, 2018), pp. 218-244.

misrepresent his role and that of d'Eyncourt and his Committee. This had the inevitable consequence of denying or minimising the part played by Tritton and Wilson. There appears to be no recognition in the scholarship of Churchill's prolonged and censurable campaign, which represented an extension of earlier efforts by d'Eyncourt, commenced in September 1916, with the same objectives. The benefit to Churchill and d'Eyncourt is plain, the enhancement of their reputations by basking directly in the glory of a new iconic weapon that was believed to have made a significant contribution to winning the war and had become a national talisman during dark, mid-war days.¹¹⁹ Churchill's behaviour is perhaps more understandable, though still inexcusable. He would have been sensitive to the possibility of accusations of mismanagement following hard on the heels of the Dardanelles episode, in which he may at times have been judged too harshly.¹²⁰ On the other hand d'Eyncourt's misrepresentations possess no mitigating considerations, indeed, his record is tainted by financial objectives.¹²¹

Prior hints at Churchill's deception in claiming a degree of vision in 1914 and early 1915 that he had not possessed. Examination of the evidence presented to the Royal Commission, the correspondence of Tritton and Bacon and Churchill's preparation for the Inquiry in 1919 show conclusively that Prior's suspicions were justified. Furthermore, examination shows that the duration and intensity of Churchill's perjurious "campaign" was greater than Prior or others appear to have realised. Churchill's determination to direct an unjustified proportion of the credit for the concept and development of the tank onto himself and the Committee he established, seemingly knew no bounds.

Tritton and Wilson posed a threat to Churchill's aspirations in the sense that the greater the recognition of their inventiveness, the more likely it was that questions might be asked along the lines of "exactly what did d'Eyncourt and the Landships Committee achieve?" Churchill's awareness of this threat is shown by his visit to the Commission about a fortnight before the start of its proceedings. Churchill pointed out:

¹¹⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, cross-examination of Churchill by Greene, answers to questions 169-171.

¹²⁰ Tim Coates (ed.), *Defeat at Gallipoli: The Dardanelles, part II, 1915-1916* (London, Stationery Office, 2000), pp. 291-299.

¹²¹ National Archives, T173/776, Royal Commission on Awards to Inventors, 10 October 1919, cross-examination of d'Eyncourt by Solicitor-General, answers to questions 1965-1969.

in the case of Sir Eustace Tennyson d'Eyncourt, he was an official, who as Chief Naval Designer, was called upon to supervise the design and construction of the Tanks when it had been determined that some instrument of war of this kind should be used, and that if the Commission, without any explanation of their action, were merely to make some very small award to him, or to refuse to make him an award at all on the ground there was no user of any invention of his, and at the same time were to award, say, ten or twenty thousand pounds to Tritton and Wilson, the public would undoubtedly be ready to believe that Sir Eustace D'Eyncourt, when called upon to design a tank had failed to do so, and had been forced to have recourse to an outsider and his previous reputation would undoubtedly suffer very severely. I said I would put this point before the Chairman.¹²²

Ostensibly, the reason for Churchill's visit to the Commission was to determine whether the Commission wished him to attend to present evidence he had earlier submitted as a statement.¹²³ The nature of his discussion shows, however, that he had an underlying reason for speaking as he did, namely a political message for the Commission to the effect that the situation he outlined, a reasonable representation of the truth, could be embarrassing for the government. In the event, in spite of the lack of any inventive contribution by d'Eyncourt and his blatant, unsuccessful efforts to purloin the inventive achievements of others, the Commission did award him £1,000.¹²⁴ In framing their recommendations the Commissioners stated:

This is a claim with regard to which we have found much difficulty. This claimant undoubtedly rendered exceptional services as Chairman of...the DNC Committee in the selection and elimination of the various forms of design proposed...particularly with armament; and he was acting outside his duties as Director of Naval Construction. On the other hand he was acting within his duties as Chairman of the Committee in question, and further it was mobility rather than armament which formed the principal inventive feature of the Tanks. On the whole we recommend the award of a sum of £1,000.¹²⁵

The Commission was less inclined to repeat its generosity in 1920 when d'Eyncourt attempted a second bite of the cherry in conjunction with Skeens.¹²⁶ Skeens received an award, but d'Eyncourt did not "The Commission are not prepared to recommend

¹²² National Archives, T173/34B, unsigned internal Treasury memorandum, 18 September 1919.

¹²³ Ibid.

¹²⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, representations by Russell to the Commissioners, pp. 142-144.

¹²⁵ National Archives, T173/34B, Recommendations to the Treasury by the Royal Commission on Awards to Inventors, 17 November 1919.

¹²⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 10 October 1919, the evidence of Skeens, a Senior Draughtsman at the Admiralty, was particularly damaging to d'Eyncourt by revealing the false nature of d'Eyncourt's evidence.

that any remuneration should be allowed to Sir Eustace Tennyson d'Eyncourt".¹²⁷ Throughout both Inquiries, the Chairman exhibited a sound understanding of the issues and motivation of claimants. The only criticisms that might be made of Commission recommendations are that the sum awarded to Tritton and Wilson was inadequate, that no sum should have been awarded to d'Eyncourt and that the question mark raised over the possibility of Wilson benefitting from observation of work by Nesfield and MacFie should have been exposed as failing to fit a comparison between their respective designs.¹²⁸ It seems likely that underlying political considerations explain the first two aberrations.

The Royal Commission invited criticism of its objectivity by placing Churchill, a non-claimant, in the vanguard of its report. The wording of the Commission's recommendations suggests members of the Commission were split over whether or how much to award d'Eyncourt. Perhaps the excessive praise for Churchill represented a form of sop, compensation for not being able to comply to a greater degree with his wishes. To some extent Churchill may have shot himself in the foot by the nature of his evidence, since at times it was clear he was not telling the truth. Notably, for matters that were inconvenient, Churchill was inclined to have no memory of people or events or to have no technical or mechanical knowledge. The outstanding example of this was his denial of having met Tritton early in the war, when he had in fact met him twice, one in memorable circumstances, late on 20 February 1915 whilst Churchill was in his sickbed.¹²⁹ It was difficult to maintain a false stance in the face of sustained cross-examination by a range of KCs representing a variety of different interests and Churchill made one slip that would not have gone unnoticed by the Commissioners. In response to cross-examination about Little Willie and the design of the all-round track Churchill was asked and replied:

¹²⁷ National Archives, T173/191, Royal Commission on Awards to Inventors (Improvements to Tanks), Commission recommendation to Treasury on claims 924 and 1426 relating to Hinged and Folding Sponsons, Spherical Mountings for Machine-guns and Mountings for 6-pounder Guns, signed by Charles Sargant, Chairman, n.d. No reason was given by the Chairman, but the recommendation would have been based on the WO Counterstatement to the excessive claim, for £9900, i.e., small inventive merit, applicants were in the service of the government, the work fell within the claimants' job descriptions and was excessive, Director of Artillery to Royal Commission, 11 November 1920.

¹²⁸ Compare photographs 35 and 36.

¹²⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Churchill by Russell, answers to questions 267-272, 20 February 1915 was the day Churchill established the Landships Committee.

Did Sir Tennyson d'Eyncourt tell you that the difficulty had been overcome by the device of Sir William Tritton and Major Wilson of the All Round Track? - No, he did not tell me that, and I do not believe it is true anyhow.¹³⁰

Delighted by Churchill's faux-pas, Russell dismantled the flimsy defence Churchill had maintained over the bulk of the day's hearing by the simple comment "You are now posing as an expert".¹³¹

Yet, notwithstanding the lack of any evidence of inventiveness on the part of d'Eyncourt, the Commission made an award to him that complied to a degree with Churchill's representations in advance of the Inquiry. More significantly, the Commission did partially rectify the injustice to Tritton and Wilson of the downgrading of their design role caused by misleading notices in the press shortly after 15 September 1916:

It is to these two claimants that we attribute the credit of designing and producing in a concrete practical shape the novel and efficient engine of warfare known as the "Tank"; and it is to them that in our judgment by far the largest award should be made, though allowance has to be made for the special opportunities afforded to Major Wilson by his official position.¹³²

In their tributes to Wilson the Commissioners appear to have been restrained either by representations of the Attorney-General for economy or those of other claimants, Nesfield and MacFie, whose ideas incorporated a projecting track which they alleged Wilson might have observed on a model they had prepared and found useful in his design.¹³³ It is not possible to tell to what degree these factors may have devalued the award to Wilson.¹³⁴ It is significant that the Commission gives no indication of what "the special opportunities" were. Initially, much of Wilson's time was spent attaching 3-pounder guns to RNAS vehicles. Later he worked at Burton-on-Trent where, under his supervision, singly or coupled together, "Bullock tractors were being tested in a borrowed field".¹³⁵ It is difficult to see how this work could have provided any

¹³⁰ Ibid, answer to question 240.

¹³¹ Ibid, preamble to question 241.

¹³² No evidence was submitted to the Commission by any party that Wilson had been present at a demonstration of a model. Wilson stated that his duties had taken him to other parts of the site. Correspondence, evidence and the biography by his son suggest that Wilson would not have relished congregating in communal areas indulging in small talk.

¹³³ National Archives, T173/776, Royal Commission on Awards to Inventors, 9 October 1919, comments by Caradoc Rees in discussion with Chairman of the Royal Commission prior to introducing his witness, Nesfield, pp. 79-80.

¹³⁴ National Archives, T173/34B, Recommendations of Royal Commission on Awards to Inventors to the Treasury, 17 November 1919.

¹³⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 7-21 October 1919, *passim*. See photograph 34.

assistance to Wilson in designing the Mark I tank. The experiments being undertaken on behalf of Crompton represented an experimental 'cul-de-sac', work which did not impress Wilson.¹³⁶ Similarly, from their observations on Crompton's claim, the work at Burton did not impress the Commissioners and it is difficult to accept that this was a genuine reason for scaling down Wilson's award.

Bearing in mind Wilson's talent had not been recognised by d'Eyncourt and that he had been attached to Fosters merely as overseer rather than designer, there would appear to have been a stronger case for rewarding his initiative and cooperation for work beyond the terms of his "job description" rather than penalising him for a spurious advantage. There is no doubt that in relation to the cost of the tanks and value of contracts, the sum awarded to the inventors was small. It formed only some 30% of that recommended by the Tank Awards Committee some eleven months earlier.¹³⁷

The Commissioners concluded that Nesfield and MacFie's ideas "were of considerable value" but there was "no conclusive proof that they were brought to the notice of or communicated either directly or indirectly to the actual designers of the tank".¹³⁸ They were awarded £500 each. This seems to resolve the matter rather unsatisfactorily. Wilson's solution was fundamentally different to Nesfield's model, on which the track did not wrap round the body to provide support and prevent track sag, relying instead on specially constructed supports to either side.¹³⁹ Nesfield's form of construction would have increased the width of the machine considerably, a fact disguised by narrow tracks on the model. In order to achieve an overall 9ft. rail transportation width, the internal space of Nesfield's tank would have been little more than half that of the Mark I.¹⁴⁰ Furthermore, though Wilson was a member of the armed

¹³⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3057.

¹³⁷ National Archives, ADM1/22825, Tank Awards Committee Recommendations, undated but submitted to Churchill at a date between 18 December 1918, the date of the last witnesses to be interviewed by the Committee and 3 March 1919, the date a copy was sent by the MM to the Treasury.

¹³⁸ National Archives, T173/34B, Recommendations of Royal Commission to the Treasury, November 1919.

¹³⁹ National Archives, MUN7/112, photograph of Nesfield's model. See photograph 35.

¹⁴⁰ National Archives, MUN7/112, the width of tracks for the Mark I was 20.5 in., width for conveyance by rail c. 9ft., approximately the maximum permitted loading gauge. The tracks represented 41% of the transportation width (sponsons removed) of the Mark I, compared to a visual estimate of about 15% for Nesfield's model. Although the likely weight of Nesfield's model was not estimated, this would undoubtedly have given his design a quite impractical ground loading. The unit ground loading for the Mark I was deemed excessive, leading to tracks of increased width for later Mark Vs of 26.5in. – some 50% of the overall transportation width. Tracks on the Mark VIII were widened by a further 6 in.

forces and was paid for his services, he was not a career soldier. He signed up in response to encouragement by his brother, Percy, for patriotic reasons and/or the search for adventure.¹⁴¹ He had been in private industry for the preceding sixteen years.

Without doubt, Tritton and Wilson had transformed the quest for an armoured vehicle, fully accomplishing their set task in five months. They not only succeeded where d'Eyncourt's efforts had failed, they did so in a shorter period and achieved a more efficient machine than would later be designed by Germany or France, whose unimaginatively designed heavy/medium tanks were similar to Little Willie, armoured boxes on tracks. Subject to efficiency of administrative, manufacturing and personnel issues, the project that had started so slowly was, by late 1915, in a position to provide an additional dimension to offensive military tactics. Participation by Wilson and Tritton was by no means over, they would retain major roles in the design and manufacture of armoured vehicles for the remainder of the war. However, for the next few months the baton would pass to others to prepare the machines and personnel for introducing tanks to the battlefield.

each, c. 60% of the width of the machine, though this would have been required by the increase in weight to some 37 tons. Track pressure (soft ground, 6 in. sinkage) for the Mark I was 13lb/sq. in., reducing to 10lb/sq. in. for the Mark V (26.5 in. track). Track pressure for the Mark VIII is not recorded, though a statement is made to the effect it would be approx. half that of previous models – a statement that should be viewed as suspect.

¹⁴¹ Gordon Wilson, *Portrait*, p. 31.

Chapter Three – 1916: Limited Awareness of the March of Time

In 1916, the issues of greatest national significance as the tank moved from experimental model to accepted weapons system were the speed with which it could be made available to assist offensives and the effectiveness of design work and preparations in providing machines capable of operating reliably and effectively. Time would be no less important in 1916 than in 1915. Indeed, time would be more important, since the anticipated “grand offensive” by the nation’s greatly enlarged army was much closer. The German attack at Verdun increased pressure on Britain for early action.¹

Neither the army nor Landships Committee would prove capable of inserting the burst of pace required for tanks to participate at the outset of 1916 offensives. This was not for want of opportunities. Delays reflected the nature of society, excessive respect for seniority and an absence of a targeted programme. Thus, there was no pressure on or delegation of responsibilities to Scott-Moncrieff, Swinton or the Joint Committee, no identification of critical dates for progress: key decisions would follow “correct” procedures. No measures were taken to cut corners. It was left to Haig to associate the progress of the tank with the start of the summer offensives.² By then it was “Too Late” for such a connection to be effective.

Swinton was aware of the importance of time but, as with the sowing of his five seeds, once again failed to secure a rate of progress fully reflecting the gravity of the BEF’s situation. In writing to Scott-Moncrieff to arrange the final Inter-Departmental Conference of 1915, Swinton had foreshadowed the dire need for tanks to counter German defences, “The time factor is even of more importance than I thought, and I think it might not be long before the caterpillars may be required badly.”³ Later, perhaps emboldened by the success of the Hatfield trials, he reminded the War Office of the importance of a “quick” decision:

¹ Gary Sheffield and John Bourne (eds.), *Douglas Haig: War Diaries and Letters 1914-1918* (London, Weidenfeld and Nicholson, 2005), p. 177; James E. Edmonds, *History of the Great War, Military Operations France and Belgium, 1916, vol. I* (London, Macmillan, 1932), pp. 41-51; J. P. Harris, *Douglas Haig and the First World War* (Cambridge, Cambridge University Press, 2008), pp. 208-210.

² Sheffield and Bourne (eds.), *Douglas Haig: War Diaries*, 14 April 1916, p. 184.

³ National Archives, CAB17/120B, Swinton to Scott-Moncrieff, 18 December 1915.

the essence of the matter now appears to lie in speed of production....it is eight days since members of the Army Council and representative officers from France witnessed the trial of the machine, and that this period, translated into out-put of machines....would correspond to an outturn of something like 20 machines.⁴

Swinton's warning was to the point, advancement of the order might have enabled additional tanks to have been fielded on 15 September.⁵ However, his selection of this period was inappropriate, since it was thirty-six days from the date that *Mother* had first run under her own steam, forty-nine days since the December Inter-Departmental Conference and seventy days since Tritton's modified track had been tested on 'Little Willie'. This largely successful test marked the point at which the landship project moved from a position of confidence in design to possession of significant evidence of success.⁶ This was a transitional point at which the cutting of corners became justified. Indeed, given the contextual circumstances, it was the point at which the nation might reasonably have expected enterprising moves to advance the project. As Churchill had said to Asquith in January 1915, "the worst that can happen is the loss of a small amount of money".⁷

Documents show d'Eyncourt also became aware of potential consequences of the ticking clock, though not as early as he later sought to portray. In letters to Churchill and Kitchener and in a report to the Admiralty Board he claimed to have advocated the placing of an order for machines for training purposes to prevent delay, "I begged them to order ten for training purposes two months ago".⁸ D'Eyncourt's observations cannot be relied upon. There is no evidence of a written appeal and the only opportunity for a verbal appeal would have been at the Inter-Departmental Conference on 24 December 1915. Neither the minutes of that conference nor Swinton's extensive notes refer to such a plea.⁹ D'Eyncourt did later write to Kitchener offering beguiling benefits of early supply and, thereafter, modifications to provide improved machines:

⁴ National Archives, MUN5/394, Swinton to War Office, 11 February 1916.

⁵ National Archives, MUN4/2790, WO to MM, 12 February 1916, the letter ordering 100 machines was received some 15 days after the Hatfield trial.

⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answers to questions 2640-2649.

⁷ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915.

⁸ National Archives, ADM116/1339, d'Eyncourt to Churchill, 14 February 1916.

⁹ National Archives, MUN4/4979, Swinton notes of Inter-Departmental Conference on 24 December 1915 and MUN5/394, agenda and minutes of Inter-Departmental Conference, 24 December 1915, *passim*.

it will take 3 or 4 months to produce them in sufficient numbers.... While these are being manufactured we could proceed with the design and production of more formidable machines of improved type with such modifications as your Lordship might approve.¹⁰

Since mid-1915 the army had accepted landships as potentially useful. It was moreover particularly helpful that French had requested such technology be examined.¹¹ Nevertheless, the caution of those on or directly answerable to the Army Council negated the value of the speed with which Tritton and Wilson undertook their work. The respect for rank and “correct” procedure is illustrated by the minutes of the Inter-Departmental Conference:

That if and when the Army Council, after inspection of the final experimental Land Cruiser decide that such machines are required for the army....the provision of these machines shall be entrusted to a small Executive Supply Committee....and shall come into existence as soon as the decision of the Army Council is made.¹²

Wedded to justifying or protecting its own position, the hierarchy was failing to apply the principle underlying its formation a decade earlier. The Army Council was not providing brains, rather it was placing progress on a leash. To use a tactical analogy, the decision to advance should have been delegated to the man on the spot. Although the calibre of the two principal forward “commanders”, Scott-Moncrieff and d’Eyncourt, does not inspire confidence, if forced to make a decision, they would in all probability have been guided by the engineers. Tritton and Wilson were best placed to judge both the readiness of their “invention” and steps necessary to secure rapid production. Scott-Moncrieff should have had the engineers in his pocket, enabling him to launch production as soon as they advised it was opportune to do so.

Between August 1914 and December 1915, the BEF incurred some 375,000 battle casualties. So far as experimentation with armoured vehicles was concerned, the army was “on-side” by the second half of 1915. It says little for senior management that, following this development of policy, no steps were

¹⁰ National Maritime Museum, d’Eyncourt Papers, DEY42, d’Eyncourt to Kitchener, 30 January 1916, from Haig’s remark of availability by May, it would appear the erroneous production date given by d’Eyncourt was soon passed to GHQ – see National Archives, WO158/831, draft of Haig to WO, 9 February 1916.

¹¹ National Archives, T173/463, French to War Office, 22 June 1915.

¹² National Archives, MUN5/394, Inter-Departmental Conference, 24 December 1915, commencement of wording of Recommendations for Supply of Machines.

taken to expedite the production of a machine that might have stemmed prospective casualties in 1916.¹³

D'Eyncourt's sycophantic intervention with Kitchener did not assist the Ministry, Swinton or BEF. Firstly, delivery of tanks took twice as long as d'Eyncourt had forecast to Kitchener and, secondly, the Ministry would prove sensitive to losing its exclusive right to modify design.¹⁴ Following an April meeting with Haig, Swinton set out Ministry and tank erectors' stalls. He anticipated the output of some "practically finished machines" by 1 July. These would enable a meaningful level of driver training to be commenced. All 150 machines would become available by 1 August by which time some would already have been shipped to France and seventy-five crews would have been fully trained.¹⁵ He concluded, unwisely, "I am afraid this letter does not contain what you would have liked to hear, but it is the cold truth and shows the real situation."¹⁶ His letter did not contain the cold truth but an optimistic timetable from Stern. Two months later he was forced to adjust his position and explain to GHQ that only one new tank had been delivered to Elvedon since his earlier letter. Without explanation, he still forecast that the full 150 tanks in the extended first order would be delivered, approximately, by the "beginning of September".¹⁷ Predictably, on 1 July he found it necessary to explain the reasons for a further delay of about a fortnight.¹⁸ On 16 August yet a further delay was reported, this time owing to problems with shipping.¹⁹

The underlying difficulty was that manufacturing forecasts were not realistic. A general problem existed nationally as firms vied for contracts. In this instance, no specific reasons are given but an explanation would almost certainly have included delays in delivery of components to the two tank-erecting companies. All problems would not necessarily have come to light, but Swinton's reference to "substantially completed machines" was undoubtedly a veiled reference to delays in the arrival of sponsons.²⁰ This delay led to the use of incomplete

¹³ James E. Edmonds, *Military Operations France and Belgium, 1915, vol. II* (London, Macmillan, 1936), pp. 391-393.

¹⁴ National Archives, MUN4/2796, Montagu to Phipps, 25 October 1917.

¹⁵ National Archives, MUN4/2806, Swinton to Butler, 26 April 1916.

¹⁶ *Ibid.*

¹⁷ National Archives, MUN4/2806, Swinton to Butler, 14 June 1916.

¹⁸ National Archives, WO158/833, Swinton to Burnett-Stuart, 1 July 1916.

¹⁹ National Archives, WO158/843, Swinton to Burnett-Stuart, 16 August 1916.

²⁰ National Archives, MUN4/2806, 6 June 1916, schedule of forecast delivery dates without sponsons. Deliveries from Fosters are forecast to commence five weeks after the first deliveries

machines for driver and other training, a practice which caused unforeseen problems since stresses incurred during training led to slight contortions and therefore misalignment of the bolt holes on the frames of the tanks with those pre-positioned on the sponsons.²¹

The third occasion on which d'Eyncourt claimed to have forewarned of the need for early manufacture for training purposes was in a report requested by the Admiralty following press coverage immediately after commencement of the Battle of Flers/Courcelette:

as the design developed I had two or three months before strongly recommended at a meeting held at the Imperial Defence Committee's rooms under the presidency of Sir G. Scott-Moncrieff, that 10 or 20 machines should be ordered. It was, however, decided to wait results of complete trials of the first machine.²²

Press coverage of the tanks heralded a scramble for prestige, honours and cash rewards that was pursued most energetically between September 1916 and November 1920. It should be noted that in the seven months between his letters to Churchill and Kitchener and his report to the Board of Admiralty, d'Eyncourt doubled the number of training tanks he professed to have sought in advance of the army's formal acceptance of the machine. His claimed prescience was also advanced by one/two months. The Inter-Departmental Committee met only twice under the chairmanship of Scott-Moncrieff, in August and December 1915. The design of *Mother* had not been completed by August so it could only have been on Christmas Eve that d'Eyncourt could have made such a plea. His claim was made in his letter to Kitchener, 30 January 1916. It is therefore clear that he was inflating a period of one month six days to "two or three months". The likelihood is that d'Eyncourt's claim was fabricated, that he had not foreseen the problem of training and construction in relation to 1916 offensives and that he had failed to comply with Churchill's advice to act "with all despatch".²³ He also failed to follow the spirit of Churchill's advice to Asquith following receipt of the *Boxing Day*

from Metropolitan, no doubt owing to the building works necessary at Lincoln. A marginal note states "Sponson delivery dates cannot as yet be estimated".

²¹ W.H.L. Watson, *With the Tanks 1916-1918: Memoirs of a British Tank Commander in the Great War* (Barnsley, Pen and Sword, 2014), pp. 38-39; John Glanfield, *The Devil's Chariots: The Birth and Secret Battles of the First Tanks* (Stroud, Sutton Publishing, 2006), p. 144.

²² National Archives, ADM116/1339, d'Eyncourt report to Admiralty Board, 18 September 1916, p. 4.

²³ National Archives, ADM116/1339, Churchill to Secretary Landships Committee, 24 February 1915.

Memorandum, to conduct experimentation and manufacture “concurrently”.²⁴ Though impractical, it was the principle of the advice rather than the detail that should have been observed, by overlapping of activities. The time for d’Eyncourt to have sought early construction was after the successful testing of Tritton’s new track on 3 December or at the Inter-Departmental Conference on Christmas Eve 1915.

So far as Lloyd George was concerned, he ensured, following a demonstration of wire cutting by a Killen-Strait tractor in June 1915, that tank construction would come under his wing at Munitions rather than that of Kitchener.²⁵ The transfer of the Landships Committee from the Admiralty to the Ministry was to take place upon the success of the Landships Committee in producing a satisfactory armoured vehicle. Lloyd George played his ownership card on 12 February 1916.²⁶ Arguably, this was too late for tanks and crews to be ready for summer’s “Big Push”. It seems inconceivable that in December 1915 Lloyd George remained unaware of the pending successful conclusion of the Landship Committee’s work: this was the time when his energies should have been deployed to force the pace of production and preparations for renewed offensives in 1916.²⁷ In addition to political connections, Lloyd George and Frances Stevenson were associated with Stern socially. Although the first reference to Stern comes in Stevenson’s diary entry for 26 July 1916, it is likely their association started earlier, perhaps resulting from their shared involvement in the early moves towards construction of landships, notably the demonstration of the Killen-Strait tractor and Stokes mortar arranged by Stern for 30 June 1915.²⁸ Unwittingly, come 1 July 1916, Lloyd George’s inactivity ensured his place with those he branded “Too Late”.

In considering the Mark I, it needs to be borne in mind that the initial specification stemmed from Churchill’s early 1915 ideas of requirements and tactics. From June 1915, when the army joined the project, military requirements were outlined tentatively by Scott-Moncrieff to d’Eyncourt. Churchill’s early vision

²⁴ National Archives, MUN5/394, Annexure A to Churchill’s Statement to Royal Commission on Awards to Inventors, 1 September 1919.

²⁵ National Archives, MUN5/394, Recommendations of First Meeting of Inter-Departmental Conference on Landships, 28 August 1915; Swinton, *Eyewitness*, pp. 169-170.

²⁶ National Archives, MUN4/2791, MM to War Office, 12 February 1916.

²⁷ A J P Taylor (ed.), *Lloyd George: A Diary by Frances Stevenson* (London, Hutchinson, 1971), pp. 110, 118 and 124.

²⁸ Albert Stern, *Tanks, 1914-1918: The Log-Book of a Pioneer* (London, 1919), pp. 26-27.

was largely replaced.²⁹ The recommendations of the Inter-Departmental Conferences called by Swinton between August and December 1915 further amended and enlarged the changes.³⁰ Nevertheless, Churchill's influence was not entirely purged.³¹ In compliance with Churchill's original intentions, aspects of the tank's specification continued to be based on a limited role as a trench-taking machine. Churchill had envisaged the landship simply breaching enemy defences, which were generally shallow and unsophisticated late in 1914. By taking and crossing enemy trenches, the landships would pave the way for traditional methods of army manoeuvre to be restored.

This single-use purpose was displaced by the army's vision of a continuing role for tanks as machine-gun destroyers, active amid enemy defences strengthened and deepened in the six months following Churchill's note to Asquith.³² However, although the internal space and armament of the proposed machines were changed, management did not address the possibility of there being consequences for track specification. The explanation for this appears to lie in the allocation of a restricted role for the designers in the on-going tank project. In the light of later events, it was unfortunate that Tritton and Wilson were not present at the first Inter-Departmental Conference.³³

Wilson's biography and other papers show that Stern had an unfortunate habit of taking decisions unsupported by those having the technical knowledge and understanding on which decisions should have been based.³⁴ This aspect of his management of tank production would impact significantly on the form of armoured support provided to the BEF. Stern's approach was that "any tank is better than no tank."³⁵ Stern would have considered Haig's comments after Flers

²⁹ Tank Museum, 069.01(41) Crompton, d'Eyncourt to Crompton, 1 July 1915.

³⁰ National Archives, MUN5/394, CID Papers 224B, 'The Future Procedures as to the Design and Construction of Land Cruisers or Armoured Motor-Cars propelled on the Caterpillar Principle for the Use of the Army', report and recommendations, 28 August 1915, 225B, 'Admiralty Landships, Proceedings and Report of a Conference', minutes dated 4 October 1915 and 227B, 'The Present and Future Situation regarding the Provision of Caterpillar Machine-Gun Destroyers or "Land Cruisers"', minutes dated 13 January 1916.

³¹ National Archives, MUN5/394, minutes of meetings of Inter-Departmental Conferences, 28 August 1915 and 24 December 1915 and WO158/831, reports to meeting of Inter-Departmental Conference, 29 September 1915.

³² Robert T. Foley, *Dumb Donkeys or Cunning Foxes? Learning in the British and German Armies during the Great War*, *International Affairs* 90/2 (March 2014), pp. 279-298 (pp. 7-8).

³³ National Archives, MUN5/394, Minutes of Inter-Departmental Conference, 28 August 1915.

³⁴ A. Gordon Wilson, *Walter Wilson: Portrait of an Inventor* (London, 1986), pp. 52-53.

³⁵ *Ibid*, p. 52.

to support the priority of numbers over quality.³⁶ Wilson was less doctrinaire, allocating greater importance to improvements. Wilson's son identified this as "the point at contention between Stern and my Father."³⁷ The absence of the design engineers from the Inter-Departmental Conference in August 1915 may have been an early example of Stern's inexpert, authoritarian management.

The performance of the tanks on 15 September 1916 would show that the consequences of professional or inter-organisational rivalries could be serious, since client and designers were pursuing different paths.³⁸ The initial requirement for the machine to travel just fifty miles would result in the specification of tracks insufficiently durable to undertake the more demanding usage associated with more extensive operations required by the army. It would appear that this issue was not sufficiently obvious to d'Eyncourt, a naval architect, for it to have been the subject of instruction to Fosters or for it to be covered by any of the subject headings at Inter-Departmental Conferences.³⁹

No justification can be seen for Stern's lack of respect for Wilson. The problem lay in a form of power struggle and perhaps also of social class. The struggle had its roots in the hallowed ground of benefit to the nation rather than the customary medium of personal advantage. Unfortunately for the army as beneficiary of the end product, Stern had the advantage of rank, in the face of which Wilson's outstanding engineering abilities faced an insurmountable obstacle. Wilson was responsible for the design of most British tanks during the war, seven of the eight models that saw service, estimated at 2545 of the 2745 tanks that were built.⁴⁰ He also undertook additional tasks as resident consultant to Metropolitan who manufactured over 70% of British wartime tanks.⁴¹ Clashes over professional issues tend to frequent the pages of memoirs on military or political issues, but clashes may surface in other fields and can adversely affect national wellbeing in equal measure.

³⁶ Stern, *Tanks*, p. 119.

³⁷ Tank Museum, A. Gordon Wilson, *Draft Biography of Walter Gordon Wilson*, p. 116.

³⁸ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

³⁹ National Archives, MUN5/394, minutes of Inter-Departmental Conference, 28 August 1915 and T173/475, Tritton to William Foster and Co., 1 August 1915.

⁴⁰ Tank Museum, Wilson, *Draft Biography*, p. 130. Walter Wilson also designed five of the other eight Marks that were constructed or planned and provided his epicyclic gearing for each of these excluding only the Medium A.

⁴¹ Glanfield, *Devil's Chariots*, Appendix 3.

As Chairman of the Landships Committee, and coming from a technical background, d'Eyncourt bore the greatest responsibility for failing to provide a comprehensive, up-to-date briefing for the design engineers. This would have significant implications for the army on 15 September, resulting in numerous breakdowns before and during the battle, thereby contributing to the lack, or limited success, of elements of XIV and III Corps.⁴² Breakdowns are recorded in unit combat reports but they also occurred during training in England and France and during movement from ports to forward areas. Swinton does not provide details of the problems in England, recording simply that progress “was hampered in every direction by the frequent failure of the machines, owing to minor defects”.⁴³ In the light of evidence given to the Royal Commission and examination of experiences on the Somme, it is reasonable to assume that a proportion of these breakdowns were caused by track failure resulting from the use of the machines beyond their 50-mile design life.⁴⁴

Though not recorded formally in print, the designers' evidence on the adopted 50-mile life is consistent with the observations and actions of Stern, who in February 1916 was elevated from Secretary of the Landships Committee to Head of the Tank Supply Department at the Ministry. Stern's view was that a tank was a one-shot weapon, not to be maintained as permanent equipment but once used to be replaced by another tank.⁴⁵ This point is covered in secondary literature but is not examined in sufficient depth, with the result that responsibility for the unreliability of the Mark I is neither apportioned appropriately nor explained thoroughly. Problems occurred or proliferated because the machines had been designed for a “limited operational mileage”.⁴⁶ These problems were aggravated by the fact that no thought was given to the effect on longevity of training mileage, before and after shipment to France.⁴⁷ To make matters worse, odometers were not fitted to British tanks until late in the war and therefore no-one could tell

⁴² National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson by Watson, answers to questions 3238-3248.

⁴³ Swinton, *Eyewitness*, p. 261.

⁴⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Gray, answers to questions 2971-2979.

⁴⁵ Glanfield, *Devil's Chariots*, pp. 149-150.

⁴⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

⁴⁷ *Ibid.*

exactly what mileage had been undertaken by any particular tank.⁴⁸ Wilson later clarified events by confirming that when the tanks were released for action in August/September 1916:

it was regarded that if the machine once went into action that was all that was required of it. There was no attempt in the first machine at longevity, but what none of us had our minds on was training....when they went overseaseverything looked all right and I think we were all very pleased that we were getting a great deal longer life than what we had anticipated. But what in fact happened was, that the rollers had cold rolled out....I think the biggest measurement was 5/8ths of an inch longer than when they were originally passed."⁴⁹

Moreover, the mechanical robustness of the initial batch of tanks was not threatened simply by the effects of training. In June 1916 Swinton sought to convince GHQ that they should place additional orders to prevent the dispersal of key workers from Metropolitan and Fosters once the initial tanks had been completed.⁵⁰ GHQ was not convinced: it sought evidence of suitability for participation in mobile exercises before taking such a decision.⁵¹ In consequence, Swinton was obliged to arrange an exercise to judge suitability of machines through a mock offensive.⁵² Swinton was less than pleased with this requirement which came at a time when he was under pressure to send machines to France. The exercise also posed a threat to mechanical condition, though this was not fully appreciated by those requiring, organising, participating in or observing the manoeuvres. The exercise at Elvedon was eventually held on 21 July and involved twenty-five tanks.⁵³ Thanks to a special effort by Stern and workers from Metropolitan, Swinton would have believed that any damage caused by this exercise had been rectified.⁵⁴ However, evidence given by Wilson

⁴⁸ National Archives, WO194/55, Descriptions of Tanks by model, see Mark V sheet 3 for description of the type of "Distance Indicator" (in yards) used on the Mark V, firstly from the Port Driven Chain Wheel, later, owing to problems caused by mud, to the Cross Drive shafts.

⁴⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102. Wilson is referring to the industrial process of shaping metal at normal everyday temperatures. Cold-formed steel (CFS) is the common term for steel products shaped by cold-working processes carried out at near room temperature, such as rolling, pressing, stamping, bending, etc. Stock bars and sheets of cold-rolled steel (CRS) are commonly used in all areas of manufacture. The terms are opposed to hot-formed steel and hot-rolled steel. In the case of the tanks the wearing process was inadvertent though predictable, resulting from pressure imposed by a c.30-ton tank. The solution lay in increasing the width of metal. As a temporary expedient, it is understood that cast-iron was inserted into the rollers by workshops in France.

⁵⁰ Swinton, *Eyewitness*, pp. 260-261.

⁵¹ National Archives, WO158/833, Burnett-Stuart to Bird, 7 June 1916.

⁵² Swinton, *Eyewitness*, pp. 261-266.

⁵³ *Ibid*, pp. 264-267.

⁵⁴ *Ibid*, p. 269.

and Johnson to the Royal Commission showed this was not the case since consequences for the rollers could not have been reversed other than by replacement of worn components.⁵⁵ It seems inevitable therefore that maintenance, conscientiously and enterprisingly arranged by Stern, was, in at least one vital respect, superficial. The exercise had robbed the machines of a proportion of their limited mileage, a further consequence of senior officers “protecting” their positions in the hierarchy and failing to secure appropriate engineering advice.

The shipment of tanks to France commenced less than four weeks after the Elvedon exercise. Pressure on the first machines continued on the far side of the Channel. In addition to further training, it is widely recorded that they were treated akin to a circus act for the benefit of army spectators.⁵⁶ The first twenty-five machines used in the exercise on 21 July would also have been used intensively for training at Elvedon/Thetford during late June/August. Furthermore, they would have constituted the bulk, probably the entire contingent, shipped to France between 20/26 August for C Company.

Two machines were damaged during unloading at Havre on 26 August and two broke down on route to their camp, likely to have been due to track failure, though no reasons were recorded. The remainder of C Company’s machines were at that time on-board at Avonmouth.⁵⁷ The machines would have been available for increased wear and misuse for about a fortnight. Brough, in charge of the tanks in France, sought, unsuccessfully, to protect them from misuse and also, unwisely, spoke in favour of delaying their participation in offensives until available in substantial numbers. The reward for his efforts was to be declared unacceptable to GHQ and to be returned to England as “difficult”.⁵⁸ Whereas some of the first shipment of D Company’s machines were also used for training exercise, in the shorter time available they almost certainly operated within their design limitations. The second shipment of D Company’s machines had little

⁵⁵ Philip Johnson, 2nd Lieutenant Heavy Section MGC in September 1916, Lieutenant-Colonel, Superintendent of Tank Design and Experiment at the WO by 1919.

⁵⁶ Christy Campbell, *Band of Brigands: The Extraordinary Story of the First Men in Tanks* (London, Harper Perennial, 2008), pp. 165-167; Swinton, *Eyewitness*, pp. 277-280; Patrick Wright, *Tank: The Progress of a Monstrous War Machine* (London, Faber and Faber, 2000), pp. 36-37; Trevor Pidgeon, *The Tanks at Flers: An Account of the First Use of Tanks in War at the Battle of Flers-Courcelette, The Somme, 15th September 1916* (Cobham, Fairmile, 1995). p. 45.

⁵⁷ National Archives, WO158/843, Butler to Whigham, 26 August 1916.

⁵⁸ Swinton, *Eyewitness*, p. 280.

opportunity for training and were almost immediately sent forward to The Loop, a rail hub close to start locations for the battle: usage would not have eaten into their planned life cycle to any significant extent.⁵⁹ Swinton was critical of the shortage of time for training, but this may well have protected D Company machines from risk of track failure. Pidgeon records that on 1 September the Prince of Wales watched C Company tanks training with 56 Division.⁶⁰ The Prince and others were unimpressed that “two of the tanks broke down”. On 8 September Asquith observed the final D Company exercises before departure to The Loop: no breakdowns are mentioned. It is surprising that neither at the time nor since has the preponderance of breakdowns been linked with the unit or age of the machines. By 14 September all new reserve tanks at GHQ had been exchanged for broken-down machines.⁶¹

In view of the scale of failings, the generally critical response to their first action on 15 September is understandable and justified. However, a fair allocation of responsibility for the failings is absent both from official publications and scholarship. *The History* records:

Initially, forty-nine were employed, but only thirty-two reached their starting point. Five of these were ditched and nine broke down from mechanical trouble, while of the remaining eighteen, nine did not catch up with the infantry.⁶²

Campbell provides a similar comment.⁶³ Sheffield believes a lesser number took to the field, “Of forty-eight tanks that were ‘runners’ on 15 September, only about twenty-one actually got into action”.⁶⁴ Johnson explained to the Royal Commission that he regarded the 1916 Mark I as a failure and that the future of tanks was in the balance as a result of its limited achievements in 1916 and early 1917.⁶⁵ Johnson claimed it was generally accepted that operations at Cambrai in November 1917 saved the tanks.⁶⁶

⁵⁹ Pidgeon, *Tanks at Flers*, pp. 43-47.

⁶⁰ *Ibid*, p. 45.

⁶¹ *Ibid*.

⁶² Ministry of Munitions, *History of the Ministry of Munitions, vol. XII, The Supply of Munitions, part III Tanks* (London, HMSO, 1922), p. 36.

⁶³ Campbell, *Band of Brigands*, pp. 153 and 175.

⁶⁴ Gary Sheffield, *The Somme* (London, Cassell Military, 2004), p. 113.

⁶⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson, Superintendent of Tank Design and Experimentation at the War Office, by Watson, answer to question 3254.

⁶⁶ *Ibid*, answer to question 3255.

Numbers and the nature of problems may vary slightly but the verdict, a serious problem of reliability, was clear. This issue was to exercise minds both in France and England in September and October and solutions to the problems would be addressed both by the modification of components and changes to the design of later tanks. It should be borne in mind that Johnson was appearing before the Royal Commission not as a claimant but as expert witness for the Treasury, his task was to devalue the Mark I tank in the eyes of the Commission and thereby encourage Commissioners to recommend a low financial award for inventors. Johnson's evidence, though not incorrect in basic content, was slanted towards negativity. Like Wilson, Johnson was not in France on 15 September and therefore may not have appreciated the influence of drier conditions on the fortunes of tanks on the first day of the Battle of Flers: "I went out five days after the First Battle of the Somme on 20th September [sic]".⁶⁷

It should also be borne in mind that Johnson was a 2nd Lieutenant at the time and that, regardless of views at lower levels, the tank enjoyed support at the level that counted most, namely Commander-in-Chief. Haig received Swinton "very cordially" on 16 September:

He thanked me for what I had done, and said that though the tanks had not achieved all that had been hoped, they had saved many lives and had fully justified themselves; that he wanted five times as many; that he wished the existing arrangements to go on; and that I should go home and continue to command, raise and train the force".⁶⁸

Stern confirms the thanks expressed by Haig to Swinton and himself "Go back and make as many more Tanks as you can. We thank you."⁶⁹

Bearing in mind the serious consequences of weak rollers on the performance of tanks at the Somme, it is surprising that the reasons for this problem, have not been addressed in detail. This lack of examination also unjustly influences any apportionment of responsibility for a situation that might so easily have been avoided. D'Eyncourt, his Committee, the War Office and Ministry escape their just share of criticism, whereas the designers' work is devalued inappropriately.

⁶⁷ Ibid, answer to question 3225. Johnson's comment was clearly intended to be "five days after the first use of the tanks in the Battles of the Somme".

⁶⁸ Swinton, *Eyewitness*, p. 286.

⁶⁹ Stern, *Tanks*, p. 96.

In order to examine this issue thoroughly it is considered advantageous to examine tank by tank the problems experienced on 15 September.⁷⁰ In the light of the 50-mile life factor, it is particularly instructive to compare experiences of C Company, the first to be shipped to France and therefore, in general, equipped with the oldest tanks, with D Company, whose arrival in their forward areas was completed only two days before the battle commenced.⁷¹ Complications can arise in defining the cause of certain tanks being eliminated from the battle and by the use of the reserve pool of tanks that was brought into play owing to losses occurred during training. Fuller confirms Pidgeon's understanding on the use of the reserve tanks, noting there were ten tanks in GHQ reserve "all mechanically unfit".⁷² The reserve, a special delivery arranged by Swinton, did not arrive until about the second week in September.⁷³

There had been ambitions to form an additional part-company to assist III Corps operations, but this idea was abandoned. Fuller's note suggests the reason was that all the reserve tanks had been used to replace faulty machines. D Company's War Diary shows only one broken-down machine. Therefore, even with nine reserve tanks being issued to C Company, some sixteen C Company tanks were old, over-used output.⁷⁴ No comprehensive record has been found to show the age of each tank used on 15 September but the delivery number provides a rough guide and it appears possible to determine which tanks are replacements as opposed to originals by the magnitude of their army numbers.⁷⁵ Thus it is likely that Vincent and Henriques in C21/22 commanded replacements for machines languishing as break-downs in GHQ reserve since their numbers

⁷⁰ Pidgeon, *Tanks at Flers*, pp. 59-179.

⁷¹ Swinton, *Eyewitness*, p. 280.

⁷² J. F. C. Fuller, *Tanks in the Great War 1914-1918* (New York, E. P. Dutton and Company, 1920), p. 54.

⁷³ Pidgeon, *Tanks at Flers*, p. 43; National Archives, MUN4/2806, Swinton to Bird, 4 September 1916. Initially, Swinton specified eight tanks, "8 spare Tanks with a consignment of accessories for "C" and "D" Companies Heavy Section entrained on the night of the 3rd aaa these Tanks will reach Havre without drivers as they are spare machines aaa a party under an officer will therefore have to be detailed from the Heavy Section to entrain these 8 Tanks and the accessories which are part of the equipment of "C" and "D" Companies aaa Q M.G." The reserve was later increased to ten (MUN4/2806, Swinton to DSD, 6 September 1916).

⁷⁴ National Archives, WO95/110, War Diary for D Company, records against only 1 "D" Company tank that it was a "new" tank ("New D4"): ergo the remaining nine reserve tanks were almost certainly drawn by "C" Company, whose diarist made no comment on whether individual tanks were originals or replacements.

⁷⁵ See Appendix B.

were 740 and 533. Tull(741), Clarke(746), Elliot(760) and Ambrose(554) supporting The Guards also have numbers suggesting they were replacements.⁷⁶

The key point is that no replacement machine suffered track failure whereas the older machines of Dashwood(716), Murphy(513) and Bates(714) failed for this reason. Although not mentioned in his published book, Fuller's draft script describes the faults of machines in GHQ reserve, "Of the 10 with Headquarters none were fit for action on the 15th. September the majority owing to mechanical trouble due principally to defects in the rollers."⁷⁷

Statistics can be further complicated through individual tanks suffering multiple experiences. Track faults or damage to the steering mechanism might for example have been responsible for ditching: other faults affecting mobility, particularly ditching and track failure, might have increased loss from gunfire.⁷⁸

Before examining experiences on the day, it is necessary to refute part of Johnson's evidence to the Commission on the distribution of tanks arriving in France. When asked whether he knew if the tanks that went into action on the Somme had been previously used in training, he replied:

Some had not been used at all; others had been used to a certain extent; some had been used to a further extent. They were all mixed up together. The Tanks were continually being delivered the whole time we were at Thetford. Those that were delivered first had the most running and those that were delivered just prior to being sent to France had none at all.⁷⁹

⁷⁶ Army numbering of male tanks started at 700, female at 500. The Guards system was letter based, but it is known their support was from C Company. Highlighted comments in the right-hand column of Appendix A to this thesis show the six machines which suffered track failure were early models within the numerical range 3-23. The highlighted numbers in the Company No. column are likely replacement machines. The recorded information does not enable three of these machines to be identified, probably because of errors in numbering (four Army numbers are duplicated).

⁷⁷ National Archives, CAB45/200-Undated and Unattributed Observations on Tank Actions. However, it can be seen that certain sections are an identical match to text in Fuller's *Tanks in the Great War*.

⁷⁸ Pidgeon, *Tanks at Flers*, p. 107. Problems in determining the reason for the loss of some of the tanks is well illustrated by C23 attached to 47 Division. It is recorded that the tank attempted to cross a trench at an excessively acute angle resulting in it falling into the trench and thereby breaking a track. Yet it seems unlikely that the crew or observers would know whether a defective, loose track played a part in the ditching of the tank, i.e., whether the damage resulted entirely from the force or angle of the ditching or whether the damage was in part or whole the consequence of the worn state of the rollers and track. C24 was destroyed by shellfire a few days later.

⁷⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson by Watson, answer to question 3229.

Although most of Johnson's answer is unexceptional, the comment that they were "all mixed up together" is incorrect. Individuality of units is apparent from rivalry within Heavy Section between the first tank companies, evidenced by Captain Harold Mortimore, the first man to command a tank in battle:

There had always been a bit of rivalry at Thetford between A, B, C and D Companies as to which would be the first in action, Naturally I was delighted when it turned out to be D, but I didn't think my tank would be first in the company - and I suppose in the world - to fire a shot in anger.⁸⁰

In so far as it could be accommodated by their tactical plans, GHQ and Army Commanders did not mix tanks from the two Companies within Divisions. It was incorrect of Johnson to say that tanks were "all mixed up". The splitting of two companies of tanks between three Army Corps resulted in a proportion of tanks in III Corps being a mixture of C and D Company machines, but, with only one exception, a mix of the machines of the two Companies below Corps level was avoided.⁸¹

The most notable element in this analysis is that none of the newer tanks from D Company or, so far as can be determined, replacement machines with C Company, suffered track failure. This category of fault was considered by Hugh Elles, appointed to command the tank arm in France in September 1916, as the most significant weakness of the Mark I.⁸² The fact that six machines suffered track failure in moving to battle positions or during action on 15 September and that the reserve pool was comprised mainly of older machines that had broken down prior to the battle is significant and accords with the explanation about limited-life rollers given by Wilson to the Royal Commission:

They [rollers] had become hollow and had commenced to get loose on their spindles and that sort of thing. The result was that really they were on their last legs before they went to France..... It was put down to soft material but I do not think that was it. I have here a report showing that No.708 had run from 4th July to about 20th of August, and must have done 300 hours run. She was then rather worn out, but I considered that running good.⁸³

⁸⁰ Pidgeon, *Tanks at Flers*, p. 148, Mortimore's comment is wrongly attributed to John Foley. Foley's comment in *The Boilerplate War* (London, Frederick Muller, 1963), p.17, is that "A place in history has surely been reserved for Captain Mortimore and his seven men for they were the first tank crew ever to go into action".

⁸¹ See Appendix B.

⁸² National Archives, WO158/836, Elles to GHQ, 30 September 1916.

⁸³ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

The evidence presented to the Royal Commission and the examination of the fortunes of C and D Company tanks on 15 September are considered to be compatible and sufficiently reliable to absolve the designers from responsibility for track problems. Wilson commented that it was not just mileage but also loading that mattered since the combination of these two factors determined the life of the rollers.⁸⁴ Wear would be most severe and breakdown most likely when tanks were fully loaded for battle.

The track problem had its roots in the management of the project. Tank tasks should have been specified during d'Eyncourt's briefing of Tritton in July 1915.⁸⁵ The briefing was verbal and incomplete. Even at the eleventh hour it might still have been possible to identify the weakness of the rollers, but the shortcomings of management again triumphed and the tanks were shipped to France without a thorough examination. Excessive secrecy over their move left Wilson uninformed about their departure.⁸⁶ Had the tanks been subjected to a thorough examination before shipment, it might have been possible, stocks permitting, for new rollers to be fitted. If not, knowledge of the weakness might have encouraged IV/Reserve Armies to reconsider whether lanes should have been left free of artillery support.⁸⁷

Before examining other Mark I faults, it is perhaps an opportune point at which to comment upon how the situation could have arisen that defective machines were despatched to take part in an important battle and upon the impact of unreliability on the level of satisfaction with tanks. It seems most unlikely today that a similar situation would arise since consultation and liaison between different groups appears to take place to a thorough, even excessive, degree. Yet this was clearly not the case in Edwardian society. The stratification of society in general and of the army in particular appears to have been responsible for the tank project having been conducted in compartments which, though not water-tight, were nevertheless self-contained to a significant degree. When the army became involved in the project in July 1915 it did so at a distance. Scott-Moncrieff

⁸⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answers to questions 3118-3119.

⁸⁵ National Archives, CAB17/120B, Tritton to William Foster and Co., 1 August 1915.

⁸⁶ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

⁸⁷ Edmonds, *Military Operations France and Belgium, 1916, vol. II* (London, Macmillan, 1938), pp. 363-365.

was appointed chairman both of the Joint Committee and the Inter-Departmental Committee of the CID, but there is no evidence that he did more than notify d'Eyncourt's Committee by letter of broad army requirements. He would have been involved with Swinton, d'Eyncourt and other representatives at the Inter-Departmental Committee meetings, attending two of the three meetings held between August and December 1915, but there is no evidence of a "working relationship" and a memorandum of 25 August shows he was not at that time well informed about the Landships Committee:

I then went to see the Chief Constructor of the Navy [d'Eyncourt] and he tells me that the trials on a machine made on Colonel Crompton's principle have proved unsuccessful, but that there is another machine (on a different principle, as far as I could gather – I asked him to let me have a diagrammatic sketch) which is arriving in component parts from America and will be put together by Messrs Foster of Lincoln in about ten days time.⁸⁸

It should be noted that d'Eyncourt gave Scott-Moncrieff the false impression that Crompton's machine had been built and subjected to tests which it had failed. In reality Crompton had not built a machine. D'Eyncourt succeeded, however, in hiding the fact that he had achieved nothing significant over the previous six months. Since Scott-Moncrieff found it convenient for the trial of the machine to be held about 10-11 September, to enable him to "inspect the Coast Works of Defence" in Scotland, d'Eyncourt secured an additional period for Tritton and Wilson to produce some face-saving hardware.⁸⁹ Scott-Moncrieff's behaviour is entirely consistent with Swinton's judgment of him as ineffectual.⁹⁰ Notwithstanding the army's failures in a series of offensives earlier in the year, his allocation of time between a low priority defence project in Scotland and one potentially of great benefit on the Western Front demonstrated that his mishandling of the Holt trial six months earlier was not a one-off, idiosyncratic occurrence. The prospect of Scott-Moncrieff dropping in on Swinton or the designers for an informal chat about the project, the use of the new machines and ways in which they might be improved can only be described as fanciful.

Swinton visited d'Eyncourt and Stern to ascertain the facts about naval involvement in designing an armoured vehicle but appears, after those visits, to

⁸⁸ National Archives, ADM116/1339, Scott-Moncrieff to Holden, Wheeler and Bird, 25 August 1915.

⁸⁹ Ibid.

⁹⁰ Swinton, *Eyewitness*, pp. 134-135.

have left the matter entirely to the naval committee while he endeavoured to formulate proposals for the incorporation of tanks into the army.⁹¹ Swinton recorded, somewhat complacently and trustingly, that, about 31 July/1 August, Stern “turned up again with some drawings. I was too busy to examine them, and was content to leave matters of mechanical design in the hands of experts who were working on what I regarded as the right lines.”⁹² As a banker undertaking a senior management role, Stern was not the most appropriate person for discussion with Swinton either on the role or design of landships. Yet d’Eyncourt had referred Swinton to Stern a day or two earlier:

He gave me a brief outline of the position, and informed me that a fresh design for a landship was being prepared in accordance with a specification recently received from the War Office, but that apart from design the question of departmental responsibility was in the air. For further details he referred me to the Secretary of the Committee - Lieutenant Stern.⁹³

Swinton’s visit occurred just after d’Eyncourt had learned of Crompton’s failure to produce the drawings necessary to enable one section of an articulated machine to be constructed and had awarded the landship contract to Fosters.⁹⁴ It seems likely d’Eyncourt would have been keen to screen prying eyes from the unproductive work of his Committee, particularly eyes belonging to an officer from the influential CID. Referral of Swinton to Stern rather than to Fosters had the advantage for d’Eyncourt of rendering it unlikely that Swinton would ascertain the true position of the project within the immediate future, thereby safeguarding the period for Tritton to produce some form of hardware to mask lack of progress over the preceding six months. Albeit unintentionally, the redirection of Swinton to Stern rather than to Tritton and Wilson also ensured that no discussion on the role or design of the landship took place between the three key figures involved in the development and role of the landship. Swinton’s ability to unearth shortcomings in the specification of the tank was effectively muzzled. Thanks to Scott-Moncrieff’s accommodating diary and the work and innovation of Tritton and Wilson, the curtain d’Eyncourt drew around the project did its job and by the time the curtain was drawn it was to reveal not only the token *Little Willie* but also

⁹¹ Ibid, p. 161.

⁹² Ibid.

⁹³ Ibid; National Archives, ADM116/1339, Scott-Moncrieff to Holden, Wheeler and Bird, 25 August 1915, confirms Moir’s decision to play no role in the development of the landship until an acceptable prototype had been produced by d’Eyncourt’s naval Committee.

⁹⁴ National Archives, ADM116/1339, Tritton to William Foster and Co., 1 August 1915.

a glimpse, albeit in wood, of an effective machine. At some point late in 1915 Lloyd George instructed Sir Ernest Moir to “find out and get busy with the pushing on of the landship project”, but “Moir found the Admiralty Committee working and decided to leave them alone”.⁹⁵ Unfortunately, neither the Minister nor Moir pursued the matter.⁹⁶

There are varying assessments of tank, artillery and infantry actions on 15 September. The essential, valid point is that the reliability of the tanks allocated to The Guards and to XIV Corps as a whole did not reflect well on tank construction. Many were unfit for duty, a fact unknown to Heavy Section or the army generally. In ignorance, Rawlinson adopted intricate tactical plans for the use of the tanks, including lanes free from artillery bombardment to avoid tanks being struck by friendly fire.⁹⁷ The result was that instances occurred when no tanks, or a token number, arrived to support infantry units that had been allocated limited supporting artillery fire prior to assaulting strong defences.⁹⁸ The reality was that a lottery existed whereby the prospects of success by particular units depended in part on whether tanks from C or D Company were allocated for their support. Furthermore, it is clear that Rawlinson and his staff had no idea of the difficulties of navigation from inside a closed-down Mark I and it is thought that two of the tanks on 15 September were put out of action by friendly fire when straying from the 100yd. corridors.⁹⁹

Some comment is appropriate on the relationship of events on 15 September to tactical theories. Fourth Army sought to achieve an advance based on penetration by small groups of tanks. Swinton’s concept had been a concurrent advance of tanks regularly spaced, at intervals not exceeding 150 yards.¹⁰⁰

⁹⁵ National Archives, MUN9/26, notes of second interview of Sir Ernest Moir, 11 June 1923, this provides a further example of a missed opportunity to provide assistance in the task of design and/or construction of the first tank through an inclination to leave the conduct of work to the group undertaking the job without an examination of whether assistance was required.

⁹⁶ Sir Ernest Moir was Controller of Munitions Inventions at the Ministry from August to December 1915, following which he became Ministry Representative in the US. In August 1917 he was appointed to Churchill’s Munitions Council as “M”, though, prosaically, this reflected his responsibilities for “materials” rather than matters associated with espionage.

⁹⁷ Miles, *Military Operations, France and Belgium, 1916*, vol. II, pp. 294-295 and *Military Operations, France and Belgium, 2nd July 1916 to the End of the Battles of The Somme*, *Appendices*, pp. 79-84, Appendix 25, Battle of Flers-Courcelette, XV Corps Artillery Operation Order No. 47, 13 September 1916; Pidgeon, *Tanks at Flers*, p. 53.

⁹⁸ *Ibid*, pp. 94-95, The Guards Division; Trevor Pidgeon, *Tanks on The Somme: From Morval to Beaumont Hamel* (Barnsley, Pen and Sword, 2010), p. 10.

⁹⁹ See Appendix B.

¹⁰⁰ Swinton, *Eyewitness*, p. 204.

Churchill's ideas were similar to those of Swinton.¹⁰¹ GHQ had initially favoured this form of assault.¹⁰² When considering the percentage of losses due to breakdowns, ditching and artillery fire, it can readily be seen that, on the basis of experience at Flers, Swinton's tactical dispositions would not have worked. The gaps due to losses would have greatly exceeded coverage by surviving machines - by a ratio of 4 to 1. Even allowing for the success of some machines before being lost later in the battle, it appears likely that half the active front would have lacked an operational machine only a short distance in front of the start line.

On 15 September, over much of the front, advances were severely limited, but Pidgeon correctly observed that 41 Division's advance in penetrating groups enjoyed most success.¹⁰³ Having recognised this fact, Pidgeon did not proceed to the next question by enquiring whether there might be an explanation for this. Had he done so, the significance of the fact that 41 Division was equipped wholly with relatively new machines might have emerged. The Division suffered its share of losses to artillery fire, ditching and tail damage, but this left sufficient machines to complete much of their task. Little wonder Haig was pleased with the result: his losses were greater than he appeared to realise or to be prepared to admit, but progress had improved compared to earlier phases of the Somme. He would have been pleased by the recognition of this in the press.¹⁰⁴ Haig did not appreciate the fact at the time, but results might have been considerably better had the tank project been managed more effectively thereby enabling breakdowns to be reduced and additional tanks to be deployed. The nature of the problem with the track was identified late in October but not resolved until January 1917 by fitting heavier rollers.¹⁰⁵

In addition to track weaknesses, ditching, was a major problem. On 15 September, fifteen were lost for this reason alone and a number of others were

¹⁰¹ Churchill Archives Cambridge, CHAR68/52-59, Churchill memorandum on 'Variants of the Offensive', December 1915.

¹⁰² Edmonds, *Military Operations, France and Belgium, 1916, 2nd July 1916 to the End of the Battles of The Somme, Appendices* (London, Macmillan, 1938), pp. 39-45, Appendix 15, GHQ Instruction to Fourth and Reserve Armies Regarding the Employment of Tanks (OAD 111), 16 August 1916, item 4c.

¹⁰³ Pidgeon, *Tanks at Flers*, p. 163; Edmonds, *Military Operations, France and Belgium, 1916, 2nd July 1916 to the End of the Battles of the Somme, Appendices*, pp. 92-95, Appendix 27, The Somme 1916 - Battle of Flers-Courcelette - Orders regarding Tanks issued by 41st Division.

¹⁰⁴ Stern, *Tanks 1914-1918*, p. 96; 'Sir Douglas Haig's Great Victory', *Daily Mail*, 18 September 1916.

¹⁰⁵ National Archives, WO158/836, Burnett-Stuart to War Office, 2 November 1916 and WO158/844, Elles to General Staff, 20 October 1916.

stranded temporarily.¹⁰⁶ Ditching could result from deep mud or from slipping into entrenchments or steep shell craters in wet or dry conditions. Wilson visited the Somme on 24 September and appears to have assumed that conditions on 15 September had been the muddy ones he witnessed. This was not so, there had been heavy rain in the days after tanks were first used.¹⁰⁷ Ross of Bladensburg, historian to the Coldstream Guards, recorded:

Few of the men had had an opportunity of seeing beforehand the *terrain* on which they were about to operate. There was, however, perhaps less to be learnt from it than usual even if they had seen it; for the whole country looked like a wide expanse of storm swept water agitated into waves of great depth, that had become suddenly solidified....¹⁰⁸

No doubt conditions varied in different parts of the area according to gradients, drainage and the effect of previous military usage, but on 15 September it was clearly not the uniform sea of mud that Wilson might have imagined. Oblivious to the significance of his comments to delays in the supply of tanks to the BEF, Ross of Bladensburg further recorded:

As long as summer lasted the ground was fairly hard and firm: but when the autumn was ushered in with a deluge of rain the soil was converted into a sea of mud, and movement, unless by pack animals, became almost impossible.¹⁰⁹

Combat reports suggest the problem, extent and location of heavily cratered surfaces was the main battlefield hazard for tanks on 15 September and, at that stage, mud was not a major issue.¹¹⁰ The greatest risk was that drivers would slip into trenches or shell craters owing to lack of driving experience, damaged tracks or tail units or the sheer proliferation of hazards. The tail steering/climbing unit, capable of causing problems even on relative billiard-table conditions around Lincoln and East Anglia, was particularly vulnerable to mechanical breakdown in conditions which imposed greater pressures on the structure. The tail units also slowed manoeuvring, represented deadweight for an under-powered engine to

¹⁰⁶ Pidgeon, *Tanks at Flers*, pp. 59-179.

¹⁰⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answer to question 3143.

¹⁰⁸ Ross of Bladensburg, *The Coldstream Guards 1914-1918, vol. I* (London, Oxford University Press, Henry Milford, 1928), pp. 483-484, describes conditions on 15 September; McCarthy, *Somme Day by Day*, pp. 109-115 describes the daily rainfall on the following days, with over half an inch falling on Monday 18 September.

¹⁰⁹ *Ibid*, p. 502; Foley, *Boilerplate War*, p. 12.

¹¹⁰ Pidgeon, *Tanks at Flers*, pp. 127-128, descriptions of ditching appear to be consistent with problems of depth of mud in only one case, C1, supporting 2 Canadian Division, though even in this case the description is not conclusive.

drag around the battlefield, increased the size of the machine and thereby its vulnerability to shell damage and represented, through damage and resultant friction, a potential anchor slowing further the already snail-like pace of the machines.¹¹¹ Glanfield records that Wilson was aware of the weakness of the tail units and decided “to replace the lot with a sturdier version to be built by Metropolitan”.¹¹² When Stern discovered this, he cancelled the order. It is not possible to assess the effect of this on performance on 15 September but it is likely to have been significant.

In his memoirs, Lloyd George praised British invention of the tank as “the one and outstanding dramatic innovation brought forth by the War in the sphere of mechanical aids to warfare”¹¹³ It is regrettable that civilian and military management accompanying this inventiveness was not of an equivalent standard. For the reasons explained earlier, managers were unable to bring tanks into service for the start of summer offensives on 1 July. Upon featuring in battle, tanks were then found to suffer several significant faults, ones that should have been resolved by competent management, debate or consultation before deployment.

Ill-considered, pointless and uncooperative behaviour by its personnel ensured the army contributed to its own problems on 15 September and in the following weeks. Wilson gave evidence to the fact that his requests to examine conditions at the front had been denied.¹¹⁴ He did not visit the area until 24 September, twelve months too late to influence design measures to combat mud or to highlight the risk to fragile tail steering units.¹¹⁵ It is not possible to say for certain that visits to the front in 1915 would have resulted in the adoption of more effective measures for operating in the conditions to be found on the Western Front, but it is difficult to see what the army had to lose by facilitating such a visit.

¹¹¹ Ibid, pp. 59-175, for example Colle in D25 supporting 50 Div. and Enoch in D7 supporting 41 Div.; National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson by Gray, answers to questions 3232-3234, Johnson confirmed that the additional climbing ability provided by the tail was unnecessary in the area in which the tanks were operating, that it rendered the tanks relatively immobile, was vulnerable and badly designed.

¹¹² Glanfield, *Devil's Chariots*, p. 148.

¹¹³ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), p. 381.

¹¹⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answer to question 3143.

¹¹⁵ Ibid.

In a similar vein, no attempt appears to have been made to prepare sufficiently challenging conditions in Britain for the testing and practice of tanks and crews. The army's relatively undemanding circuit at Hatfield Park failed to provide a realistic test of *Mother's* ability to operate effectively in conditions tanks would encounter in France. The Hatfield circuit was as benign as the trials for the Holt Tractor at Shoeburyness had been hostile.¹¹⁶ The main difference was that ground conditions at Hatfield, Elvedon and Lincoln were devoid of shell craters or deep mud.¹¹⁷ Nevertheless, *Mother* still found it difficult to negotiate one muddy patch that had been provided at Hatfield. This incident does not appear to have set alarm bells ringing. There would for most of the time be no shortage of mud and difficult terrain in the later battles on the Somme, at Arras or Ypres.¹¹⁸ The result was that machines, supposedly capable of nearly 4mph in flat, dry conditions were, in combat conditions, normally restricted to 0.2-1 mph – a bonus for German artillery.¹¹⁹ This also affected the radius of operation of the tanks, reducing it to as little as five miles when restricted to first gear and to steering methods reliant on brakes.¹²⁰ Of the limited number of tanks that fought successfully on 15 September, three found it necessary to retire for refuelling, a hazardous trip that wasted time and was not always uneventful.¹²¹ Tritton endorsed criticisms by Archie Holford-Walker, commander of C Company, of the tame training conditions in England when, in rebutting criticisms of the ditching of tanks in muddy ground, he replied that the tanks "got through the ground which the government considered was suitable as a test at Hatfield Park".¹²² Pidgeon supports Tritton's comment:

The routes they were forced to follow lay over ground which had already been churned up during the violent bombardments of previous weeks;

¹¹⁶ National Archives, T173/776, this shortcoming was recognized though not examined in detail at the meeting of the Royal Commission, 21 October 1919, see cross-examination of Tritton by Gray, answers to questions 2998-3004 and Chairman's comments following question 3003.

¹¹⁷ See for example, photograph 36, understood to be the only photograph of "*Mother*" at Hatfield Park for the January/February 1916 trials and photograph 37 of "*Mother*" during trials at Lincoln in January 1916.

¹¹⁸ Pidgeon, *Tanks at Flers*, photographs at pages 129 (Crème de Menthe) and 128 (Chartreuse) show the state of some of the ground over which tanks had to advance on 15 September 1916. See photographs 25 and 26.

¹¹⁹ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answers to questions 3134-3145 and MUN4/4979, notes by Swinton for the forthcoming Tank Trial at Hatfield, p 3, 17 December 1915.

¹²⁰ W M Rossiter, *Driving a Mark I Tank*, in Pidgeon, *Tanks at Flers*, Appendix 4.

¹²¹ Pidgeon, *Tanks at Flers*, pp. 94 (Clarke), 98 (Elliot) and 115 (Colle), Elliot is thought to have run out of fuel before he could return to safety.

¹²² National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Tritton by Gray, answer to question 2998.

now it was churned up yet again and resembled a storm-tossed sea, a fearful place for men who had trained on the gentler fields of Elvedon.¹²³

The results of inadequate consultation or joint preparation were drivers and machines unprepared either for the relatively dry cratered conditions of parts of the area on 15 September or the sea of mud into which it was mostly transformed following the advent of wet conditions a few days later.¹²⁴ Tank crews were not unaware of the lack of realistic training conditions, but representations for a first-hand view of conditions at the front met the same fate as those of Wilson. Unsuccessfully, Allen Holford-Walker sought assistance through familiarisation:

One of the greatest trials we were up against was the fact that none of us had seen badly shelled ground of the type we were asked to meet in these battles. This had always worried me, even when in training at Thetford, and I remember asking that the officers at least should be sent for even three weeks in the part of the line where typical terrain could be found, but this apparently could not be arranged. Our training at home was of the parade ground type which was of little value when we met the real article. It was a very creditable effort on the part of my lads that they were able to function at all.¹²⁵

In consequence, drivers were ill-prepared and weaknesses in their machines were not identified. Crews had neither been provided with training facilities that remotely resembled conditions on the Somme nor had they been briefed adequately since they did not appreciate that their tanks might operate successfully provided damaged tail units were simply disconnected.¹²⁶

It is considered the above paragraphs demonstrate that the limited achievement of tanks on 15 September was due to a combination of circumstances, many of which were avoidable. Firstly, the Landships Committee had failed to brief the designers on the army's requirements for the machines. Secondly, tail units of known weakness had been incorporated despite the efforts of the leading designer to replace them with stronger units. Thirdly, the limited height of trench breastworks in the battle area rendered tail units unnecessary. Fourthly, army preparation and briefing for the nature of the terrain on which

¹²³ Pidgeon, *Tanks at Flers*, p. 127.

¹²⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answers to questions 3134-3145.

¹²⁵ Holford-Walker Papers, letter of 22 April 1935, quoted in Pidgeon, *Tanks at Flers*, p. 100. Major Allen Holford-Walker commanded C Company, his brother, Capt. Archie Holford-Walker was commander of tank C19.

¹²⁶ Pidgeon, *Tanks at Flers*, pp. 80-81. Archie Holford-Walker's tail unit on C19 was damaged on route to his start location. He sought repair and took no part in the battle rather than continuing after simply disconnecting the tail unit.

fighting would take place was inadequate. The army also failed, in the summer of 1915, to embed itself within the design process or to apply pressure for advancement of the project in keeping with pending operational requirements in 1916.

Owing to limited achievements on 15 September, the designers received considerable criticism during the hearings of the Royal Commission.¹²⁷ However, examination of the individual experiences of tanks provides support for the explanation given by Wilson that many of the tanks were worn out before the battle.¹²⁸ Following their first action, Elles ranked overcoming track trouble as the most important alteration required for future tanks.¹²⁹ Despite this, it does not appear to have been noted that the newer machines of D Company or those used as replacements in C Company did not suffer track failure.¹³⁰

In addition to tank design and battlefield tactics, the achievements of tank units also relied on the Ministry and industry to deliver soundly constructed tanks in a timely fashion. In December 1915, Bird, DSD at the War Office, had notified Swinton that he had been chosen to raise and command the new tank unit on home soil.¹³¹ Swinton did not receive this news without reservation since he would be leaving a position of some influence for one exposed to opposition that he was aware existed within the army. Nevertheless, he considered it his duty to accept the post, to which he was appointed in March 1916.¹³² The new arm changed name several times over the following eighteen months. During most of the period the subject of this chapter, it was, for security reasons known as Heavy Section, MGC.

Following the Hatfield trials, Swinton and members of the Landships Committee awaited the response of the Army Council. A conditional order for 30-40 tanks was received, scarcely appropriate to a moment that heralded a fundamental change in the conduct of warfare.¹³³ The order provided insufficient

¹²⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson by Watson, answers to questions 3235-3244.

¹²⁸ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answers to questions 3133-3134.

¹²⁹ National Archives, WO158/836, Elles to GHQ, 30 September 1916.

¹³⁰ Pidgeon, *Tanks at Flers*, pp. 61, 94, 96, 98 and 130.

¹³¹ Swinton, *Eyewitness*, pp. 217-218.

¹³² National Archives, MUN4/2806, Whigham to GHQ Home Forces, 17 March 1916; Swinton, *Eyewitness*, p. 219.

¹³³ National Archives, WO158/833, War Office to MM, 9 February 1916.

machines for tactical use in operations or to offset expenses of a novel form of manufacture. The order was described by Swinton as “quite inadequate” and he suggested it should be raised to at least 100, the number then decided upon.¹³⁴ The first French tank order made after trials the following week was for 400 machines.¹³⁵

Both Stern and Swinton refer to preparations having already been made for bulk production prior to the initial order.¹³⁶ Stern stated that on Saturday 12 February “all preparations having already been made, orders were telephoned and telegraphed” to Fosters and Metropolitan to “start production of 100 machines”.¹³⁷ The order set in motion the manufacture of the first batch of tanks. Though the precise date for the commencement of the BEF’s 1916 offensive was not known at that stage, the loss of eleven to fifteen days for the placing of the order after the Hatfield trials may have been significant. Kitchener, Robertson (CIGS) and Butler (Haig’s representative), were all present at the trials and it does not seem unreasonable to suggest that, within an army organised for efficiency, arrangements should have been made for such senior officers to take a decision on the spot.¹³⁸

Of the hundred tanks in this order, twenty-five were to be constructed by Fosters and seventy-five by the larger Metropolitan Company in Birmingham.¹³⁹ Both firms expressed their eagerness to start, though Metropolitan were in need of engineering drawings from Fosters and personal supervision and advice from Wilson, a role that provided him with a strong base from which to influence design issues as time passed.¹⁴⁰ Stern’s claim to have prepared for construction in anticipation of the order is not consistent with Tritton’s letter of 13 February which simply refers to “news from London that a considerable order will be placed...and I can assure you that no effort will be lacking on the part of myself and my Staff to carry out the desires of your Committee”.¹⁴¹ The letter, addressed to

¹³⁴ National Archives, MUN4/2806, War Office to MM, 12 February 1916.

¹³⁵ Tim Gale, *The French Army’s Tank Force and Armoured Warfare in the Great War* (London, Routledge, 2016), pp. 24-25.

¹³⁶ Stern, *Tanks*, p. 68; Swinton, *Eyewitness*, p. 197.

¹³⁷ Fuller, *Tanks*, p. 68.

¹³⁸ William Robertson, *From Private to Field-Marshal* (London, Constable, 1921), p. 268, Robertson claims that he and Kitchener agreed at the Hatfield trials on 2 February 1916 that 100 tanks should be ordered “at once”.

¹³⁹ National Archives, CAB1/16, Tank Supply Department Report, 28 February 1916.

¹⁴⁰ Tank Museum, Gordon Wilson, *Draft Biography*, pp. 100-101.

¹⁴¹ National Maritime Museum, d’Eyncourt Papers, DEY50, Tritton to d’Eyncourt, 13 February 1916.

d'Eyncourt, contained no suggestion that news from London had initiated any activity. Taken in isolation, this might not justify suspicion that preparations in advance of and following the army's order were conducted less expeditiously than Stern claimed. However, the speed with which Fosters could respond would inevitably have been constrained, since shortly after the war the company recorded that to:

comply with the Government's requirements, it was necessary to expand the works by building a new Erecting Shop and extending the Boiler Shop, while other Departments had to be dismantled and re-equipped with the tools requisite for the new class of work.¹⁴²

A period for re-equipment was unavoidable but the delay in undertaking building works was likely to have been more significant and provides an explanation for a progress report in May showing production forecasts for Lincoln lagging over a month behind Birmingham.¹⁴³

Metropolitan may also have been slow out of the blocks. It was not until 28 February that they confirmed financial and other arrangements agreed at a conference on 15 February.¹⁴⁴ It follows that neither firm was in a position to commence construction until well after the army's first order was received, though it is not known when they commenced preparations for undertaking the new work.

Stern's dynamism and ability to cut through red tape is widely acknowledged, as for example by Fosters and Swinton.¹⁴⁵ However, his comment that all preparations were made in advance of the order from the War Office is clearly incorrect. It is difficult to envisage a valid reason why the contractual matters at Metropolitan should not have been resolved in advance of the army's order. Similarly, delays in Lincoln might have been avoided by undertaking construction works in advance of the certainty of requirement. A form of guarantee should not have presented an insuperable problem bearing in mind the importance of the project. Notwithstanding delays in the commencement of construction and assembly, the timescale actually achieved for the delivery of the first machine

¹⁴² William Foster and Co., *The Tank: Its Birth and Development* (Hinkley, William Foster and Co., 1920), p. 38.

¹⁴³ National Archives, MUN4/2806, Progress Note on Deliveries, 9 June 1916, seemingly accompanying letter from Swinton to Butler dated 14 June 1916, though the copy on file appears to be that of Bird. The information and forecasts in the report would undoubtedly have come from the erecting companies via Stern.

¹⁴⁴ National Archives, CAB1/16, Tank Supply Department Report, 28 February 1916.

¹⁴⁵ William Foster and Co., *The Tank*, p. 39; Swinton, *Eyewitness*, p. 161.

was close to that forecast by Metropolitan, mid-June.¹⁴⁶ However, thereafter, deliveries do not appear to have been at the rate of ten per week that the company had forecast. It is not possible to tell whether this was the fault of the company, the result of optimistic forecasting, or attributable to delays experienced in the provision by others of necessary armament and components or, perhaps, a combination of these reasons.

Prior to Stern's appointment as Head of the Supply Department at the Ministry, Kitchener had asked him to go to the War Office as Head of the Department recommended by the Inter-Departmental Conference. However, Lloyd George also sent for Stern informing him that, in accordance with his agreement with Balfour, Churchill's replacement as First Lord at the Admiralty, production was the responsibility of his Ministry. No doubt emboldened by the demand for his services, Stern was not slow to take advantage, telling Lloyd George that he was "willing to undertake the production of tanks in quantity within six months, but could only do so if given special powers".¹⁴⁷ Stern drafted a "Charter" which Lloyd George signed on 12 February.¹⁴⁸ It will later be seen that this charter was most significant for the design and production of tanks since it gave Stern's Committee "the final decision in all matters connected with the manufacture and inspection of these machines". These events also underline the lack of requirement in the society of the time for professional qualifications and relevant experience. Stern had been of great service in recognising in Wilson and Tritton the abilities needed to design and construct "*Mother*", but he possessed no relevant qualifications or experience in industrial production or management and no knowledge or understanding of the engineering principles involved in the new machine or possible future upgrades. It was unwise of Lloyd George to grant such powers to Stern's Committee.

Stern's claim in the report of the Tank Supply Committee on 28 February that "the construction of 100 tanks has begun" was misleading. Stern does not explain or even acknowledge problems mentioned in Swinton's letters to the War Office or GHQ. The only problem mentioned within his first report was one that fell beyond his responsibilities, namely the supply of armament. The Admiralty was

¹⁴⁶ Ibid, p. 259 and CAB1/16/8, Metropolitan to Stern, 28 February 1916, appended to report to Cabinet, 6 March 1916, on the Tank Supply Department.

¹⁴⁷ Stern, *Tanks*, p. 63.

¹⁴⁸ Ibid, pp. 64-66.

apparently able to supply only 100 six-pounder guns, with the result that a further hundred needed to be ordered. However, despite an early increase of the army's order to 150 tanks, there is no evidence that shortage of main armament would have caused any delay in production.¹⁴⁹ Indeed, in the interests of defence against possible massed infantry attack against tanks, the decision was also taken early in April, to omit guns from half the tanks and substitute additional machine guns. The supply of main armament should therefore have been less challenging than originally envisaged.¹⁵⁰ It is notable that Stern makes no mention of the first meeting of the Tank Supply Committee on 12 February. This, presumably, was because he did not wish to broadcast the content of the minutes, which envisaged contract terms with Metropolitan being "discussed and settled" on 15 February and that, after ten weeks, the rate of tank supply would be, "Messrs. Foster & Co., 5 machines per week. Metropolitan Co., 15 machines per week".¹⁵¹ Supply commenced well after this late April forecast and proceeded at a slower rate.¹⁵²

After the war, *The History* failed to provide an accurate representation of events in the commencement and completion of the contract for the first tank order. It dealt at length with business methods, coordination with the production of other munitions and qualities required, but lacked conviction, leaving the reader suspecting that the authors, in common with the Head of the Supply Committee, had no background in industrial production and no interest in objectivity. *The History* did, however, unintentionally identify a significant shortcoming in the structure of the Department. With the exception of armament arrangements and inspection of armour plate and engines, it recorded "there was no clear-cut division of duties nor allocation of responsibilities". Thus the "removal of any difficulties experienced was the joint responsibility of all members of the Department".¹⁵³ *The History* sought to portray this flexible arrangement as advantageous. However, an issue not allocated to a particular individual or group is no-one's responsibility. *The History's* verdict that this "elastic system served its purpose well while production was proceeding on a small scale with comparatively few firms involved" does not sit comfortably with the succession of

¹⁴⁹ Stern, *Tanks*, pp. 63-90.

¹⁵⁰ Swinton, *Eyewitness*, pp. 226-227.

¹⁵¹ National Archives, MUN4/4979, Minutes of Tank Committee, 12 February 1916.

¹⁵² Swinton, *Eyewitness*, pp. 257-262.

¹⁵³ Ministry of Munitions, *History*, vol. XII, part III, p. 33.

letters Swinton was required to write to the War Office and GHQ pushing back the delivery date of the first batch of tanks.¹⁵⁴

Ministry staff needed to maintain close contact with the tank-erecting companies and their suppliers to ensure components on which the erectors relied would arrive in good time. Glanfield lists a substantial range of monitoring tasks undertaken by Stern's Department, but provides no citation and no identification of monitoring methods or explanation of whether efforts were made to take action in respect of components likely to be delayed.¹⁵⁵ It is clear from Swinton's letters to the War Office and from *Eyewitness* that late delivery of sponsons was a significant problem but the two sources that might be expected to provide an insight into the matter, *Tanks 1914-1918* and *The History*, make no reference to this issue. According to Swinton, those matters causing delay in output were the delivery of sponsons, telescopic gun sight brackets, Hotchkiss guns and spare parts, defects in the tails (discovered during practice) and distortion of the structure of machines owing to use for training without sponsons.¹⁵⁶ Only two of these points, spare parts and Hotchkiss guns, are mentioned by Stern.¹⁵⁷ *The History* records that the MWSD "confidently expected an early output of the 100 tanks which had been ordered" and that, following the increase in the order, Stern "undertook that the 150 craft would be ready for transportation to France by the end of July".¹⁵⁸ Tank supply at this time was ranked as one of the army's three most urgent tasks and *The History* stated that this was "given corresponding priority".¹⁵⁹ It claims the difficulties that arose were "unforeseen", particularly those relating to personnel, spare parts and equipment.

The picture painted by *The History* is misleading since it claims the problem of supplying spare parts was intensified by a difference of view between the Supply Department and military authorities. The differences are described as, firstly, the length of life of tanks and therefore for the need for spare parts, secondly, that

¹⁵⁴ National Archives, MUN4/2806, Swinton to Burnett-Stuart, 1 July 1916 and WO158/833, Swinton to Butler, 14 and 20 June 1916.

¹⁵⁵ Glanfield, *Devil's Chariots*, p. 147.

¹⁵⁶ National Archives, MUN4/2806, Swinton to DSD, 31 July 1916.

¹⁵⁷ Stern, *Tanks*, chapter IV, bearing in mind that he had cancelled Wilson's order for more robust tail units, Stern inevitably would not mention delay or weakness caused by tail units.

¹⁵⁸ Ministry of Munitions, *History*, vol. XII, part III, p. 34; National Archives, MUN4/2806, GHQ to War Office, 2 April 1916 and WO32/5754, War Office to GHQ, 5 April 1916.

¹⁵⁹ Ibid. National Archives, MUN4/2806 Haig to War Office, 9 February 1916 and telegram GHQ to War Office, 16 August 1916, MUN5/210, War Office to MM 12/02/16 and WO158/844, Kiggell to QMG with copies to all armies, 8 November 1916.

liaison between the MWSD and army, conducted through Swinton, was insufficient to give the Department a knowledge of army requirements in detail and, thirdly, that provision of spares and associated repair units caused considerable delays that were aggravated by the slowness with which Hotchkiss guns became available as they were withdrawn from anti-aircraft service.¹⁶⁰

The History is open to criticism on a number of these points. The key issue in assessing the performance of management is not whether problems were unforeseen, but whether they were unforeseeable. The question of spare parts was entirely foreseeable but appears to have received no attention until Stern wrote to the new Minister, Edwin Montagu, early in August, well after the date he had forecast the order for the first 150 machines would have been completed.¹⁶¹ He admitted the original order included spares but claimed to have been under the impression that tanks would not be used before delivery of the full 150. He stated that, from more recent discussions, he believed it was “intended to send small numbers of these machines out at the earliest possible date”. He did not believe the machines could “be equipped to my satisfaction before the 1st September”, adding that he had “made arrangements that 100 machines shall be completed in every detail, together with the necessary spares, by the 1st September”. Stern shared the view held by d’Eyncourt, Hankey, Churchill and others that the tank should be kept secret until a substantial number had been gathered for a mass assault.¹⁶² The possibility cannot be ruled out that he used the spares issue to discourage early use of a small number of tanks.¹⁶³ Moreover, spares were a sensitive subject, since the withholding of scarce components from the production line would further reduce output, already well below forecasts.

Delays in undertaking training would have a significant effect on performance on 15 September. *The History* states that a limited number of training machines similar to *Mother Tank*, but with boilerplate instead of hardened steel armour, arrived at Thetford early in June and it was anticipated that crews for seventy-five tanks would in any case be fully trained by the end of July.¹⁶⁴ This is contradicted

¹⁶⁰ National Archives, MUN4/2806, WO to GHQ, 5 April 1916, confirms potential problem supplying 800 Hotchkiss machine-guns, offers 500 Hotchkiss and 300 Vickers – alternative to increase number armed with Hotchkiss 6-pdr. guns.

¹⁶¹ Montagu succeeded Lloyd George as Minister of Munitions on 9 July 1916.

¹⁶² Stern, *Tanks*, p. 87.

¹⁶³ *Ibid*, pp. 87-90.

¹⁶⁴ Ministry of Munitions, *History*, vol. XII, part III, p. 35.

by Swinton who recounts that he was forced to start driver training in June with just the original *Mother Tank* stripped of her guns as these were required for gunnery training.¹⁶⁵ He does not give dates for the arrival of additional machines, but simply confirms there were sufficient for training on a larger scale by the end of June.¹⁶⁶ References to machines made of boilerplate occur elsewhere. This is not confirmed by Swinton, though is used as the title of Foley's book.¹⁶⁷ At this stage it is relevant simply to flag up the fact that documents do not support the claim in *The History* that delivery of additional machines took place "early in June", rather that it did not commence until mid-June and that perhaps only eight machines were released by manufacturers before July.¹⁶⁸

Sufficient records do not appear to exist to explain the reasons for delays in manufacture. It seems likely that by 1916, national industrial resources were fully engaged, that the ability of engineering firms to switch rapidly to new products was constrained by existing commitments and that firms may have been taking on more orders than they could process efficiently. Problems had been apparent in 1915 when both Fodens and Metropolitan asked to be relieved of the obligations in their contracts with the Admiralty on prototypes for a landship.¹⁶⁹ Undoubtedly companies preferred to manufacture armaments that were more traditional and for which they had previous experience, but it seems likely the delay by Metropolitan in February 1916 in formally agreeing terms for construction of tanks may be explained in part by the completion of other ongoing military contracts. Further evidence of difficulties are provided by Vickers, whose records show that, "By the time that tanks went into production the company's capacity could be stretched no further".¹⁷⁰ This situation represented a severe test of the resolve of those tasked with the supply of tanks. It would not

¹⁶⁵ Swinton, *Eyewitness*, pp. 232 and 259.

¹⁶⁶ *Ibid*, pp. 241 and 257-258. Swinton refers to a "nebulous date" for the arrival of tanks at the Elvedon training ground, i.e., "about halfway through June" then states that "At the beginning of June the first Tanks were near enough to completion for one company of the Heavy Section, after having undergone all the training obtainable at Bull House, to move to Elvedon". However, he then stated, "delivery of machines did not keep pace with the estimated programme."

¹⁶⁷ Foley, *The Boilerplate War*, passim, (Evidence relevant to the production of these training tanks will be examined in relation to their alleged use during the Battle of Arras some ten months later, see Chapter Four).

¹⁶⁸ Glanfield, *Devil's Chariots*, Appendix 3.

¹⁶⁹ National Archives, MUN5/210, MM to d'Eyncourt, 3 July 1915, Metropolitan to MM, 3 July 1915 and Metropolitan to Director of Navy Contracts, 19, 22 and 26 July 1915, T173/34B, Metropolitan to Director of Navy Contracts, 11 June 1915 and ADM116/1339, internal Admiralty memorandum by Director of Contracts, 19 April 1915.

¹⁷⁰ J. D. Scott, *Vickers: A History* (London, Weidenfeld and Nicolson, 1962), p. 107.

have been possible for a firm such as Metropolitan to prepare for large-scale production until they were assured of such work being allocated to them.

Stern was in charge of the Supply Department at the Ministry from early 1916 until October 1917. His management of the Department was significant since it was within this period that the first tanks were prepared for use, their design was amended and further tanks and other armoured vehicles were devised for later use. Shortcomings in design have already been outlined, but it is appropriate to consider the issue further in relation to the problems inherent in appointing non-professionals to important management posts. A relationship exists between the quality of a new machine and the time taken to bring that machine into service. Stern was not an engineer and for that reason was not well placed to adjudicate on engineering issues or to judge the merits of different engineering concepts. His enthusiasm may have been beyond question, but his professional background bore no direct relationship to his tasks as head of MWSD.

There are no records of Stern being responsible for delays during the spring and summer of 1916 but his only reference to a personal role in assisting tank supply is in the run-up to the departure of tanks for France in July/August 1916. At that time he enlisted the assistance of workers from Metropolitan to undertake the repair or maintenance of tanks involved in the Elvedon demonstration on 21 July to enable them to be embarked for France the following month.¹⁷¹ In recruiting volunteers to work on worn or damaged tanks at Elvedon, Stern showed initiative and energy, but he was responsible for supply and it speaks volumes for his role that he could find no other worthwhile observation to include within his book to explain his contribution to the supply process during this period. Bearing in mind his ambitious forecasts for output of 150 tanks by the end of July, a more robust defence might have been expected of the fact that the first machines were not embarked for France until mid-August and that the order was not completed until late October.¹⁷² Stern appeared to possess attributes that would have made him a good “number two” but his lack of technical knowledge, harmonious personal qualities and sound management abilities, essential for the Head of the Supply Department, represented a severe handicap: he would

¹⁷¹ Stern, *Tanks* pp. 86-87.

¹⁷² Ministry of Munitions, *History*, vol. XII, part III, p. 34; Glanfield, *Devil's Chariots*, Appendices 2 and 4.

nevertheless survive a further year before being moved on when Churchill became Minister of Munitions.¹⁷³

Neither *The History* nor *Tanks 1914-1918* provide explanations for the delays in production over the period from February to September, but it is clear there was a significant delay in the commencement of work and an unexplained delay in the manufacture of sponsons and other components. However, it seems unlikely that the elimination of these delays could have provided a saving of eleven weeks, the period that might have enabled the supply to Haig for use on 1 July of the numbers available on 15 September. So far as the full completion of the extended first order of 150 tanks is concerned, this would have necessitated a saving of at least eighteen weeks, surely quite unachievable without looking further back to the early months of 1915 and an earlier start on design by Tritton and Wilson. It would seem realistic, however, given an earlier start both to preparations and construction by Fosters and Metropolitan, coupled to more thorough monitoring of the construction programme, for a significant number of tanks to have taken part in the initial phases of the Battles of the Somme, a period when ground conditions may have been considerably less challenging for tanks than in the period from mid-September to November.

It is easy, and normally correct, to blame those at the top for deficiencies in the performance of their organisations since they enjoy the greatest powers or most advantageous positions to secure or advocate change. Comments by Hankey suggest the army was no exception to the general rule. The summary of discussions between Hankey and Seely indicates a widespread appreciation in the army that the methods of higher command would prove unsuccessful in the forthcoming summer offensive.¹⁷⁴ Seely's observation on the caterpillars was to the point but he would have been unaware of the stage reached in their manufacture and had not held high office since his resignation over the Curragh incident in March 1914. On 29 April it would in any case have been too late for the manufacture of tanks to be accelerated to meet a 1 July deadline.

In May 1916, reorganisation provided Churchill with an opportunity to resign his commission and return to England with minimum scope for criticism by his

¹⁷³ Churchill Archives Cambridge, CHAR15/46, Churchill to Lloyd George, 9 September 1917 explains the position as seen by Churchill immediately before decision on Stern's future.

¹⁷⁴ Stephen Roskill, *Hankey: Man of Secrets* (London, 1970), p. 268.

political adversaries. Churchill's aspirations for the fall of Asquith's coalition and his own return to a position of responsibility in government was clear from his letters both before and after that date.¹⁷⁵ However, by the time of the first operational use of tanks at Flers neither aspiration had been achieved. Rather, the national situation had developed largely along the lines he feared, the sacrifice of thousands of lives in a manner widely expected to result in failure. Commentators would later identify the Battles of the Somme as an important period in the wearing down of the German Army.¹⁷⁶ However, it is not clear whether they secured the minimum standard sought by Churchill, namely a life for a life, and might perhaps be seen more appropriately in terms of his pre-war prediction that there would be no winner in a war with Germany.¹⁷⁷

As the last few days prior to the first use of tanks passed in a flurry of activity, those who had been instrumental in guiding the project through invention and manufacture in quantity must have felt disappointment that more had not been achieved. Significant progress had been made since Churchill had adopted and developed the idea he mistakenly thought had emanated from Hankey. However, for most of that period progress had been uninspiring or painfully slow, the exception being mid-August to December 1915 when Tritton and Wilson had designed and developed *Mother*. Even during this period there is no evidence that the Joint Committee had taken all measures an influential military body might reasonably have invoked to minimise delay in assembling material required to progress from design to development of the prototype.¹⁷⁸

1916 was not an eventful year for Churchill's involvement with tanks. While he was out of office, the development of the tank progressed steadily rather than spectacularly. Whether judged against the efficiency of production or its efficiency in action, the tank was not an outstanding success. However, its limited

¹⁷⁵ Martin Gilbert, *The Churchill Documents, Volume 7 "The Escaped Scapegoat" May 1915-December 1916* (New York, Bloomsbury Academic, 1918), for example in his letters to Clementine, 2 and 4 January 1916.

¹⁷⁶ William James Philpott, *Bloody Victory: The Sacrifice on the Somme* (London, Abacus, 2010), pp. 624-625; Robert T Foley, 'What's in a Name?: The Development of Strategies of Attrition on the Western Front, 1914-1918', *The Historian*, 68:4, pp. 722-746, (pp. 745-746); Gary Sheffield, *The Chief: Douglas Haig and the British Army* (London, Aurum Press Ltd., 2011), pp. 197-198.

¹⁷⁷ John H. Maurer, "'The Ever-Present Danger': Winston Churchill's Assessment of the German Naval Challenge before the First World War", in *Churchill and Strategic Dilemmas before the World Wars: Essays in Honor of Michael I. Handel*, by John H. Maurer (London, Routledge, 2003), pp. 7-50 (pp. 44-45).

¹⁷⁸ William Foster and Co., *The Tank*, pp. 27-28.

achievements were sufficient to convince the Commander-in-Chief that tanks had the potential to play a significant role on the battlefield.¹⁷⁹ Unfortunately for the management of tank production, issues were becoming increasingly complex. This was due to ambitions, both in the army and on the part of the Ministry and enthusiasts, for greatly expanded production and a wider range of tank types and to the acquisition of skills and experience within the BEF that would lead to Ministry views on design being challenged. These issues would generate friction and disputes that would be fought within a national context of increasing competition for limited available means of production.

In 1916, Lloyd George's plea against being "Too Late" failed in a manner he had neither specified nor expected. There is no evidence of avoidable delay on the part of Metropolitan, Fosters or their workforce in assembling the first tanks, though events did not occur in the timely fashion required. Rather, delay appears to have occurred in placing orders and in ensuring priority for works or components required to enable tanks to be assembled in time for use during the 1916 offensives. Bureaucracy in the military and public services and lack of knowledge of industrial production by senior staff appear to explain delays rather than lack of urgency by industry. The result of the shortcomings of all parties was that tanks were not involved in the first two and a half months of fighting at the Somme. The army must accept a significant share of the responsibility for this, since it failed to provide any assistance to or pressure on the Landships Committee between June 1915 and April 1916. In the Army Council's defence, d'Eyncourt's unnecessary and erroneous letter to Kitchener in January 1916 may have given the impression that acceleration of effort was not necessary.¹⁸⁰ Swinton is critical of GHQ for the "naïve question of whether any tanks could be ready, with crews trained, by the middle of June". Clearly, he was unaware d'Eyncourt had said that they could be ready by April/May!¹⁸¹

However, it was not just speed, but also quality that mattered. Problems were perhaps inevitable in producing complex new machines. Nevertheless, serious errors occurred that could easily have been avoided by sound management, utilising basic measures of consultation and cooperation. It is difficult to understand how the Landships Committee could have instructed Fosters to build

¹⁷⁹ Sheffield and Bourne (eds.), *Haig: War Diaries*, 15-17 September 1916, pp. 230 and 232.

¹⁸⁰ National Archives, MUN5/394, d'Eyncourt to Kitchener, 30 January 1916.

¹⁸¹ Swinton, *Eyewitness*, p. 257.

a machine based on tactical usage that was out-of-date, how Stern could have cancelled Wilson's order for stronger tail units and how the army could have judged the adequacy of the first machine by tests in conditions that bore no relationship to those awaiting tanks in France.

Answers appear to lie in the absence of meaningful debate within military and government bodies. Swinton records how it was necessary for him to address the Inter-Departmental Conference on 29 September on the proposed machine displayed to full-scale in wood. D'Eyncourt, the Chairman for this meeting, is let off lightly by Swinton:

Among so large a gathering of professional soldiers Mr. d'Eyncourt was reluctant to take the lead in the deliberations. Since it was urgently necessary to ascertain official opinion on certain vital matters at that meeting, I mounted a convenient packing case, and with the chairman's permission put the points for consideration to those present. The principal questions were the main and secondary armaments.¹⁸²

It is easy to understand that a military assembly would concur with Swinton's identification of the "principal questions". It was unfortunate, however, that there was no introduction to the proceedings, a measure that would inevitably have referred to the purpose of the machines and a summary of tactical use and design. A significant opportunity for the "light roller" issue to be revealed and debated was therefore missed. The conference had been called to afford the Landships Committee the opportunity to bring all interested parties up-to-date and obtain authority to advance to the construction of *Mother*. It is considered reasonable to expect in a period of rapid development of a new weapon that a Chairman of a developing body should prepare a brief introduction, running through the thoughts underlying the development and concluding with decisions sought from the conference. It seems likely d'Eyncourt's reluctance to play such a role stemmed not simply from a shyness to talk about military matters to a military audience, but also to a lack of knowledge of the engineering underlying the design. It is understandable that on this occasion, with Tritton and Wilson present, d'Eyncourt would have been reluctant to take the lead in a discussion on the design as a whole. He must have been relieved that the meeting debated armament, on which his knowledge would have been no less than that of Tritton and Wilson, rather than traction and design generally.

¹⁸² Ibid, pp. 174-175.

Tritton later claimed that d'Eyncourt "did not give five hours consideration to the whole job".¹⁸³ D'Eyncourt's failure to prepare a short introductory speech to the conference on 29 September lends support to Tritton's over-simplified comment. It would be exaggerating to claim that this shortcoming in d'Eyncourt's approach and personality was decisive in restricting the scope of debate at the conference, but it does represent an example of ways in which his personal objectives and management weaknesses contributed to flaws in the design of *Mother*. He deserves severe criticism for the breakdown of so many of the first sixty tanks that were produced. It is not possible to provide an exact figure, but by failing to brief the designers on the army's requirements for the landships he was responsible for the failure of some seven machines in the period of and immediately before the first day of Flers, for the majority of those lying in GHQ Reserve awaiting repair, and, probably, for most of those that suffered tail failure.

"C" and "D" Companies went to France late in August 1916 but, by no stretch of the imagination, were they fit for action. Personnel were only partly trained and many vehicles had been or would become worn out by training and demonstrations at Thetford and in France.¹⁸⁴ So far as Lloyd George's "Too Late" plea was concerned, despite the capable efforts of designers and valiant efforts of somewhat scratch crews, the tank did not explode onto the battlefield as early or in the manner that Churchill and other tank enthusiasts had envisaged. The reasons for this are complex, involving the state of equipment, individual characteristics of the crews and their training and the standard of management of the project. It should also be mentioned that the management of the new machines by senior army personnel left much to be desired, since Swinton's advice note did not percolate down to those who should have received it, including Elles. However, even those receiving it either failed to read it or did not heed its advice, which, according to Cuthbert Headlam, was not unusual.¹⁸⁵ Therefore, when called upon to arbitrate between Pulteney's intention to send tanks through High Wood and reservations by Elles, Rawlinson simply

¹⁸³ Tank Museum, Tritton marginal note on *Tanks in the Great War*.

¹⁸⁴ Foley, *Boilerplate War*, p. 12 – Despite containing a number of inaccurate comments, notably on higher level issues, Foley's book has the advantage of his interviews with survivors of the tanks that saw action in the war, it thereby provides a valuable ingredient in forming a view on some of the accepted "truths" of these actions.

¹⁸⁵ Jim Beach (ed.), *The Military Papers of Lieutenant-Colonel Cuthbert Headlam, 1910-1942* (Stroud, History Press, 2010), p. 200. Headlam was appointed in charge of publication of doctrine in 1918.

commented “This is a matter for consideration. You had better settle whether it is worth going through the wood or whether it is better to ignore it and go round it.”¹⁸⁶

An end of term report on the first, relatively small-scale British introduction of armoured vehicles, might comment “exhibits sound technical ability but lacks organisational qualities needed to ensure a more decisive impact”. The most fundamental issues were linked problems of management and personnel. The abilities and qualities of personnel were of fundamental importance. Churchill had contributed the requisite initial vision, confidence and determination but lacked judgment and detailed understanding of military requirements and production for progressing design and development. It was particularly significant that Churchill’s judgment of others led him to appoint an inappropriate manager to carry the project forward. D’Eyncourt was not from the required mould. Consequently, for design, he relied excessively on Crompton who lacked the ability to produce a practical design in a reasonable period. It was somewhat fortunate that the judgment and determination of Stern resulted in two most capable engineers producing a working model from the limited resources available.

Yet Stern could not pull all d’Eyncourt’s chestnuts from the fire and the first tanks therefore went into action built to a specification not matching the role the army required and with known tail weaknesses. In consequence, full advantage was not taken of the rapid innovation of Tritton and Wilson and the sound preparations by Swinton. Furthermore, the speed with which Tritton and Wilson undertook their work did not result in a supply of tanks for the opening of the 1916 offensive. Time wasted by a combination of drift, allowed by d’Eyncourt and Crompton, lack of meaningful involvement by Scott-Moncrieff and the Army Council and an apparent failure by Stern’s MWSD to arrange the timely supply of components, resulted in the undertaking of operations on the Somme without the support of tanks for two and a half months. Failings could have resulted in the abandonment of the tank project.¹⁸⁷ In the event, isolated actions along the lines that Churchill, Swinton and others had visualised as the norm, notably by Hastie

¹⁸⁶ Pidgeon, *Tanks at Flers*, p. 55.

¹⁸⁷ Douglas Gordon Browne, *The Tank in Action* (Edinburgh, W. Blackwood and Sons, 1920), pp. 4-5.

at Flers and Storey at Gird Trench, coupled to the vision of Haig, ensured that it survived.¹⁸⁸

In 1917 the “countryside” around Arras and the Chemin-des-Dames would reveal the extent to which Britain had benefitted from its experiences with tanks on the Somme and whether France would be successful in preparing for and conducting an armoured offensive in terms of design, reliability and tactical use of armoured vehicles. The next chapter will study the ways in which the army and Ministry sought to resolve flaws revealed on the Somme, the degree of success they achieved, the extent to which their efforts assisted the BEF’s spring operations in 1917 and the entry of French tanks onto the stage.

A competition between tank design and all-arms tactics and German defensive measures was about to begin. On the opening day of the Somme offensive BEF casualties numbered almost 60,000. Swinton would not have been surprised that some 60% of these casualties were caused by machine-guns.¹⁸⁹ Despite French representations, the BEF had (prematurely?) let the armoured cat out of the bag. The intelligence spotlight was therefore alerted to identify defensive measures that might be used by the German Army to counter the Allies’ new weapon and whether Germany might itself construct tanks. Moreover, fighting would no longer be restricted to competition with the enemy. Skirmishes on policy would also break out within British lines as first-hand military experience of tanks gave rise to challenges to Ministry supply

¹⁸⁸ Fuller, *Tanks*, p. 57, 2nd Lt. Storey, in a female tank, was instrumental in the capture of some 1500 yards of the well-defended Gird Trench. For a total of only five casualties, the tank and 64 Bde, 21 Division, killed many enemy defenders and took 370 prisoners. As the attack developed, they were assisted by strafing from a low flying aircraft; Trevor Pidgeon, *Flers and Gueudecourt: 15-26 September 1916* (Barnsley, Leo Cooper, 2017), p. 131.

¹⁸⁹ Richard Holmes, *The Western Front* (London, BBC, 1999), p. 127.

Chapter Four – From Flers to Churchill’s Recall to Government: The Importance of Starting in the Right Direction.

The preceding chapters reveal a belated, stuttering national effort to design and develop armoured vehicles suitable for operating in conditions inherently disadvantageous to traditional infantry or cavalry operations. In September 1916, the BEF had witnessed the first use of its tanks and was therefore able to judge from practice, rather than theory, ways in which they might evolve to contribute most effectively to future military operations. As in most fields of human endeavour there were different views on how to proceed and strongly held views on the “best” course of action.

It was important that the army should set off in the right direction. The design and development of heavy military equipment was not a nimble process readily responsive to adjustment. It was not known at the time, but Flers represented the mid-point of the war: there would be limited opportunities to compensate for or correct further false steps or delays. The important issues in this chapter, which covers the period from September 1916 to Churchill’s appointment as Minister of Munitions in July 1917, are, firstly, improvements to the heavy tank, the original specification for which had been severely constrained by initial need to use available industrial components and, secondly, the approach to new technological and tactical problems, determined in part by the response of German defensive doctrine.¹ Consideration of these issues would include the identification of additional roles for different types of armoured, tracked machines.

Official and secondary literature tend to concentrate on numbers, but quality was also important. After Flers, Rawlinson noted “A great battle. We nearly did a big thing.”² It was not a time for generals to harvest congratulations, rather to ensure that subsequent decisions best fitted the prospective future situation, thereby yielding a bountiful harvest at a later date. Elementary management errors had constrained achievements at Flers. Speed, agility, effectiveness of

¹ Robert T. Foley, *The Other Side of the Wire: The German Army in 1917*, in *1917: Tactics, Training and Technology*, ed. by Peter Dennis and Jeffrey Grey (Loftus N.S.W., Australian Military History Publications, 2007), pp. 155-178 (pp. 170-175).

² Allan Mallinson, *Fight to the Finish: The First World War – Month by Month* (London, Bantam Press, 2018), p. 198.

armour plate and, most importantly, mechanical reliability needed to be improved if tanks were to contribute to the achievement of “big things”.

In the light of the shortage of time before the first 1917 offensives and the limited availability of assets required for manufacture of munitions; it was important that decisions should be taken quickly. It was likely that trade-offs would be required between enhanced quality and numbers of vehicles produced. Common sense suggests the army should have had a substantial say in such aspects of the development of the tank. Unfortunately, like the bridge player who sacrifices any chance of making his contract by the play of the “obvious” card to the first trick, the army would forfeit early achievement of the changes it most needed by a false move at the outset. By its comments and 1,000-tank order, the army over-prioritised continuity of supply and under-prioritised technical advancement. In a benign, cooperative atmosphere such an error might have been of little consequence. However, earlier struggles over control of the supply of munitions, the mishandling and army rejection of the concept of armoured vehicles in 1914/1915 and the personalities of principal Ministry and military players had resulted in a competitive rather than cooperative atmosphere.

It was no coincidence that Stern should entitle chapters in his book “*Fighting the War Office*” and “*The War Office gets its Way*”.³ This theme is evident in *The Devil’s Chariots*, one chapter of which is entitled “*The Production Battlefield*”.⁴ Inter-departmental disagreement and criticism are evident in many memoirs, secondary literature and other sources.⁵ There were also clashes within the same camps, notably, Wilson and Swinton suffering at the hands of Stern and GHQ respectively.⁶ In terms of progress, this unsatisfactory state of affairs did not exist without penalty. This chapter will examine, in greater depth than attempted by the existing scholarship, the consequences, after Flers, of the army’s hastily

³ Albert Stern, *Tanks 1914-1918: The Log-Book of a Pioneer* (London, Forgotten Books, 1919), pp. 143-181.

⁴ John Glanfield, *The Devil’s Chariots: The Birth and Secret Battles of the First Tanks* (Stroud, Sutton Publishing, 2006), pp. 215-238.

⁵ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), see headings under War Office, p. 2106; A. J. P. Taylor, *Lloyd George: A Diary by Frances Stevenson* (London, Hutchinson, 1971), pp. 80-81; Patrick Wright, *Tank: The Progress of a Monstrous War Machine* (London, Faber and Faber, 2000), p. 27; National Archives, MUN5/394, Statement by Churchill to Royal Commission on Awards to Inventors, 1 September 1919, paras. 16-17; Stephen Roskill, *Hankey: Man of Secrets* (London, Collins, 1970), p. 147.

⁶ A. Gordon Wilson, *Walter Wilson: Portrait of an Inventor* (London, Duckworth, 1986), p. 54; National Archives, MUN4/2806, Burnett-Stuart to Whigham, 24 August 1916 and Whigham to Kiggell, 25 August 1916.

determined priority for tank numbers without satisfactorily resolving policy for model enhancement.

Conference minutes of 19/20 September 1916 show the course of tank production was, in certain respects, determined at this early stage. Attendees skated over an issue that would bedevil army/Ministry relations over the following two years, namely striking a balance between competing objectives of improving the new machine and avoiding disruption to the continuity of production. To the wider army, the jury was out, but for GHQ, driven by Haig's visionary welcome for tanks, there was no scope for indecision or delay. Flanders represented the bell announcing the first round of a fresh bout. The new machines had revealed untrodden avenues of design, development and tactical considerations for the army to explore in the planning of future offensives.⁷ Despite their unreliability, the original machines had shown sufficient capability to suggest they would become increasingly influential as the contest progressed: control of their development path was important. Spurred by Haig's aspirations, GHQ sprang into action. Only four days after the tank's debut, Haig's representative, Major-General Butler, led the GHQ contingent at a conference with representatives of the War Office and Ministry.⁸ Having appreciated in a number of instances that the tank had been responsible for improved performance in the offensive, Haig sought a greatly increased number: "they had saved many lives and had fully justified themselves".⁹ At the conference Butler placed the seemingly impressive order for 1,000 tanks. Minutes show that certain improvements in design were to be introduced, but, at that time, the GHQ contingent required that these should take place only "as and when possible so as not to delay the present rate of output."¹⁰

⁷ National Archives, WO158/325, 5 October 1916, Kiggell Note on the Use of Tanks; Ernest D. Swinton, *Eyewitness: Being Personal Reminiscences of Certain Phases of the Great War including the Genesis of the Tank* (London, Hodder and Stoughton, 1932), pp. 198-214, Notes on the Employment of Tanks; National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Elles by Solicitor-General, answers to questions 3303-3311.

⁸ National Archives, WO158/836, notes of conference at GHQ, 19 and 20 September 1916; Mallinson, *Fight to the Finish*, p 130, Mallinson records that Butler saw the potential of the tank "straight away", this may explain his hasty move in ordering 1,000 tanks "of the same variety" rather than negotiating a firm link between numbers and specification.

⁹ Swinton, *Eyewitness*, p. 286.

¹⁰ National Archives, WO158/836, notes of conference at GHQ, 19 and 20 September 1916 and Haig to Secretary War Office, 2 October 1916.

A few days after the conference, Elles was appointed in charge of the Heavy Section in France, though his command did not include operational responsibilities. Shortly after his appointment, Elles notified GHQ of improvements that should be sought to the Mark I.¹¹ Elles favoured a different tank design, but understood the decision for improvement to Mark I had been taken by Haig.¹² It cannot be ascertained whether the decision was that of Haig alone or whether Butler and others around him shared that view, but it was apparently undertaken without consultation with the officer who was to command tanks in France.¹³ In these circumstances and based on limited battle experience, Elles sought changes to provide a more reliable track, reduced vulnerability to bellying/sponson jamming, greater engine power and more effective armour. Various other issues were also recognised as requiring attention.¹⁴

It would have been better had Elles been appointed before the conference with the Ministry and the placing of such a large order. Additionally, in the interests of reducing the risk of later misunderstanding or misrepresentation, army representatives should have made a written order rather than relying on note-takers' minutes at conference. Butler later claimed the minutes did not represent an accurate record of decisions.¹⁵ He informed Elles that the first paragraph of the minutes was "not quite correct", claiming the actual position was that the remainder of the first orders for 150 machines would be completed and a "hundred more are on order", these would:

be the same design as the present tank with certain modifications to the armour, to the roof and to mechanisms, which have been arrived at by the experience of the recent fighting. A 'continuation order' is to be given for these, not necessarily 1,000 and they will go on being turned out until the new designed tank can be turned out to take their place, i.e. in 4 to 5 months' time. An order for a thousand of the new design

¹¹ National Archives, WO158/836, Elles to General Staff, 30 September 1916 and Knothe to Elles, 28 September 1916.

¹² National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Elles by Solicitor-General, answers to questions 3308-3315.

¹³ National Archives, WO158/804, Appointment of Elles announced in Burnett-Stuart to First, Second, Third, Fourth and Reserve Armies, 29 September 1916. Heavy Branch became The Tank Corps in July 1917.

¹⁴ National Archives, WO158/836, Elles to General Staff, 30 September 1916; Basil Liddell Hart, *The Tanks: The History of the Royal Tank Regiment and its Predecessors* (London, Cassell, 1959), pp. 95-96.

¹⁵ National Archives, WO158/836, marginal note on minutes of conference and Butler to Elles, 22 September 1916.

tank, which is the object of the present conference in Paris, is to be given when designed.¹⁶

Butler's objective appears to have been that, after 250 machines had been constructed, the Mark I family would be replaced by a redesigned machine, eliminating significant shortcomings: this would be available in time for operations by the following spring. The Ministry did not cast doubt on the practicality of such a programme.¹⁷

Over the following weeks, the slowness, vulnerability and tactical limitations of the Mark I would become better appreciated. Elles soon concluded that the "any-tank-is-better than-no-tank" policy had failed.¹⁸ Unbeknown to Elles, Wilson agreed with his assessment and in the winter of 1916/1917 completed much of the design work for the Mark V.¹⁹ However, Stern was a major obstacle to the rapid introduction of enhancements. As Wilson pointed out, Stern could not bring himself to mention "design" without a generous preamble of expletives. In part the problem was an extension of that experienced in 1915, the designers lacked a seat in the tent in which key decisions were taken. Haig's comments about the need for the maximum possible number of tanks for the 1917 Spring Offensives was made without an adequate industrial briefing. Further information might not have changed his requirements for the immediate future but might have enabled him to provide wider comments that could have assisted in defining a timetable to secure the qualitative aspirations of Elles and Wilson.

A continuation order (100 Marks II/III), constructed early in 1917, incorporated a number of relatively minor modifications. The purpose of such an order was seen by Stern as the protection of the industrial workforce from conscription or dispersal and assistance in training tank crews, "On October 16th a further 100 tanks were ordered to keep the factories going until the design for the 1,000 had been settled."²⁰

Further modifications would be incorporated later (Mark IV), though it would remain in its essential characteristics an unmistakable descendant of Mark I, possessing the major disadvantage of cumbersome procedures involving stopping and combined actions by at least the driver and two gears men to

¹⁶ Ibid.

¹⁷ Stern, *Tanks*, p. 98.

¹⁸ National Archives, WO158/845, Elles to GHQ, 30 March 1917.

¹⁹ Gordon Wilson, *Portrait*, pp. 52-55.

²⁰ Ibid, p. 113; David Fletcher, *The British Mark I Tank* (Oxford, Osprey, 2004), pp. 37-43.

change gear or change direction significantly.²¹ Elles claimed some 90% of tank losses occurred when the machines were stationary through ditching or changing direction.²² In these circumstances, improvements to provide a more straightforward driving system should have been near the top of the army's wish list rather than below some 600-1,000 machines "of same type" as the rudimentary first design.

The army's precipitate action resulted in delay obtaining modifications necessary to meet tactical requirements. For reasons which no-one made clear, though which may in part be explained by the consequences of production changes to accommodate three new models, they would also find that Stern and manufacturers were again unable to adhere to forecast delivery schedules. The defence by the Ministry to claims of delay were based on the effect of changes to tank specification.²³ Stern claimed that the length of time taken by the army in reaching decisions on modifications to the Mark I and shortage of labour were responsible for delays in producing Marks II-IV.²⁴ The required specification was confirmed by the army in November 1916 at which time Stern adjusted his forecast for commencement of Mark IV deliveries from 1 January to 7 February 1917.²⁵ When production failed to meet this forecast, Stern blamed problems of labour supply. This was not supported by Addison when under pressure at the War Cabinet and was the subject of a complaint by Taylor of the Ministry's Labour Department that Stern was manufacturing or exaggerating labour difficulties.²⁶

The army had taken two months to finalise its requirements for changes to the Mark I. This may have been a contributory factor in causing delay, but no explanation was offered for the construction of fifty Mark III, an experimental model. The transition from Mark I to IV involved three sets of changes requiring variations in the manufacture of a number of components and in construction procedures. It seems likely that the Ministry bit off more than the manufacturers

²¹ Douglas Gordon Browne, *The Tank in Action* (Edinburgh, W Blackwood and Sons, 1920), p. 348; Clough and Amabel Williams-Ellis, *The Tank Corps* (New York, George H. Doran, 1919), p. 194.

²² National Archives, WO158/814, Elles to Anley, 23 April 1917.

²³ Ministry of Munitions, *History of the Ministry of Munitions, vol. XII, The Supply of Munitions, part III Tanks* (London, HMSO, 1922), p. 37.

²⁴ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/3, memorandum by Stern, 20 February 1917.

²⁵ National Archives, WO158/836, notes of meeting at MWSD 23 November 1916.

²⁶ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/3, 5 March 1917, War Office memorandum on the Output of "TANKS" considered at meeting of War Cabinet 102, 22 March 1917, item 7, Tanks; National Archives, MUN4/2791, Taylor to Kellaway, 27 February 1917.

could chew in the relatively short period available before Allied 1917 Spring Offensives. Stern's initial forecast had been in line with Butler's aspirations and his note to Elles.²⁷ Delivery of the first Mark IV was forecast for 1 January 1917 "working up to 40 a week."²⁸ This forecast was varied significantly on 23 November, when Stern stated that "From February 7th to 31st May, Mark IV machines would be produced starting at the rate of 20 per week, production to be continued until design is altered. 300 will be ready by end of May."²⁹ The revised forecast may have remained acceptable to the army but, as the launch of the spring offensive approached, it became clear that the revised production forecast was also unreliable: measures were required to assemble a force for the offensives utilising Mark II training machines from France and England and surviving Mark I machines.³⁰

The view at GHQ, that fighting should be left to soldiers, may well have been astute and correct.³¹ Equally there was a case for negotiations to be undertaken and requirements to be expressed by those more skilled in visualising progress and in expressing themselves in ways appropriate to securing those requirements. In the light of GHQ's reservations about the design of the Mark I, Butler's way-marking at the conference on 19/20 September was entirely inappropriate.³² Orders should have been conditional upon, or more closely related to, specific changes in design. It is not clear who wrote the conference minutes. There is nothing to suggest Swinton was responsible or that any other person deemed them to be inaccurate and it may be significant that Butler himself did not seek to have them "rectified". Butler's explanatory but poorly drafted letter to Elles may itself indicate that the case he endeavoured to portray was based upon subsequent more careful thoughts rather than any fundamental error in the remarks attributed to him by the minutes.

²⁷ National Archives, WO158/836, Butler to Elles, 22 September 1916 and WO32/5754, Stern to DMRS, 10 October 1916.

²⁸ *Ibid.*

²⁹ National Archives, MUN4/2791, minutes of meeting held at MWSD, 23 November 1916.

³⁰ Fuller, *Tanks*, pp. 81-83.

³¹ National Archives, WO158/837, Kiggell to Whigham, in response to proposal that use of tanks should be delayed pending opportunity for use *en masse*, Haig considers "the idea is somewhat peculiar & it would appear likely to be more useful if the manufacturers concentrated on production and left tactics to soldiers."

³² National Archives, WO158/836, recommendations for the expansion of the Heavy Section (Tanks), Machine Gun Corps, put forward by Major-General Butler, Deputy Chief of the General Staff, GHQ, France, at a conference held on 19 and 20 September 1916, pp. 1-2.

In any event, shortly afterwards GHQ attempted to wriggle out of the situation by cancelling the 1,000-tank order.³³ The charter granted to Stern by Lloyd George vested the key control of tank design with the Ministry.³⁴ Nevertheless, the army's ability to influence design through placement of orders was an important card at the negotiating table. Following Flers, the Army Council was singing from the same hymn sheet as key politicians. In those circumstances it should have played its high-ranking card more astutely, maximising its value by placing limited orders for machines incorporating only minor changes and indicating its intention to place further orders when additional specified enhancements had been made. Too late did the Army Council and GHQ realise the implications of their actions and attempt to undo the damage by cancelling the 1,000 machines referred to in conference minutes as "of same type".³⁵ When informed of the cancellation Stern played his trump card, an appeal to Lloyd George. It may have appeared to Lloyd George that the army had reverted to its former stance of hostility towards tanks since, by rescinding the order, they were casting aside the protection of conformity. Furthermore, the letter was poorly drafted, bluntly seeking cancellation of the order rather than stressing amendment or clarification, with the objective of improving design, and aspirations to seek even greater numbers of an improved product. In the political circumstances of the time, the letter could so easily be seen as a red rag and would have ensured that Stern's appeal to Lloyd George, at that time conveniently positioned as Minister of War, achieved reinstatement of the original order.³⁶

It would be difficult to overstate the significance of this decision. Production of Mark IV would continue as a fighting or supply tank for the remainder of the war.³⁷ The decision represented a victory for Stern by ensuring continuity of production, but represented a setback for Heavy Branch, which sought a more mobile heavy

³³ National Archives, MUN4/2790, War Office to MM, 30 September 1916.

³⁴ National Archives, T173/34B, minute by Lloyd George, 12 February 1916.

³⁵ National Archives, WO158/836, notes of conference at GHQ, 19 and 20 September 1916.

³⁶ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), p. 385.

³⁷ National Archives, MUN4/837, Statistics, Tanks, Allies - Position in the Field, November 1918; Glanfield, *Devil's Chariots*, Appendix 4. The manner in which statistics were kept makes it difficult to give a precise date for the output of tanks. The date will vary according to whether it is taken as the date of acceptance by/delivery to the Ministry by the tank erecting companies, delivery by the Ministry to workshops in France or release from the workshops to Tank units. In general terms, the bulk of the order for the Mark IV, as fighting or supply tank, was completed by the spring of 1918, though a small number continued to be supplied in the second, third and fourth quarters of 1918.

tank, and for Walter Wilson who was keen to make improvements.³⁸ Although it is not possible to judge with certainty the extent to which the decision delayed the production of an enhanced model (Mark V), it clearly facilitated Stern's drive to provide numbers at the expense of the changes that Elles and Wilson wished to achieve.³⁹ The existence of such a large order, controversially exceeded by Stern, would condemn the army to fight until summer 1918 with a machine needing the services of up to four crew members to drive it.⁴⁰ Continuity of production of an existing model may have helped retain elements of the industrial workforce, but a price would be paid by the BEF operationally.

Glanfield recounts the incident of the 1,000-tank order in some detail but does not challenge the wisdom of Lloyd George's decision.⁴¹ Harris and Liddell Hart do not mention the matter and *The History* erroneously introduces matters that did not influence decisions.⁴² The general view appears to be that reinstatement of the order was advantageous so far as the development of armoured vehicles was concerned. Lloyd George anticipated praise for reinstatement, since he expressed regret at not having "organised at the outset for a larger supply than the War Office demanded".⁴³ Yet he dealt with the matter without consideration of quality and in disregard of the developing technology of the period. When acquiring *objets d'art* it may be advantageous to enter the market as early as possible. However, except in special circumstances, for vehicles or weapons the advantage is more likely to be found in the purchaser biding time, investing only in short-term requirements. The risk otherwise is to become encumbered by yesterday's model.

So far as British heavy tanks were concerned, the period from late-1916 to mid-1918 witnessed two unfulfilled promises/delays that impacted adversely on army operations. Firstly, there was a delay in securing a range of enhancements

³⁸ Gordon Wilson, *Portrait*, p. 52. The Heavy Section MGC became Heavy Branch MGC in November 1916.

³⁹ *Ibid.*, p. 54; National Archives, WO158/845, Elles to GHQ, 30 March 1917.

⁴⁰ Williams-Ellis, *The Tank Corps*, p. 49.

⁴¹ Glanfield, *Devil's Chariots*, pp. 160-162.

⁴² Ministry of Munitions, *History, vol. XII, part 3*, p. 37. It is stated that the 1,000-tank order was cancelled since the Army Council's request for supply by 1 March 1917 could not be met. This factor is not mentioned in the letter of cancellation of 30 September 1916, which considers issues of design and offers the prospect of a continuation order to keep production moving. The size and timing of that order are not specified and do not appear to have been explored by Stern or Lloyd George with Robertson or the Army Council.

⁴³ Lloyd George, *War Memoirs*, pp. 387-388.

to form the Mark IV. Certain enhancements were necessary, particularly increasing the effectiveness of armour.⁴⁴ No Mark IVs emerged from workshops until April 1917.⁴⁵ Improvements represented useful advances but they did not transform the machines into the next generation of tanks. It must have been frustrating for Heavy Branch to fight the Battles of Arras using machines with serious defects, yet aware that improvements to be incorporated in replacement machines would still not address fundamental changes required to meet tactical requirements. Although it may not have been the finished article, a more significant advance in quality awaited via the introduction of the Mark V.⁴⁶ Mark V possessed advantages not just in terms of versatility and mechanical reliability, but also in ease of maintenance. Williams-Ellis quotes the views of mechanics in tank workshops to illustrate the scale of the differences, "Drivers and mechanics who have handled both machines seem to regard the running of a Mark V. as child's-play after struggling with the caprices of 'Mother'."⁴⁷ With the 1917 Spring Offensives approaching, Haig may have been right that almost any tank was better than no tank, but, since the early tanks were decidedly rudimentary, the line advocated by Elles to introduce enhanced models as quickly as possible, was surely in the best interests of fighting capabilities.⁴⁸

In Wilson, Britain had a gifted and energetic engineer who, under astute management, would have advanced the supply of improved tanks earlier than achieved under Stern's imperative for numbers over quality.⁴⁹ It is difficult to find a description that does justice to advantages the Mark V eventually bestowed on the army, though the Official Historian to the 13th Tank Battalion stated:

The old Mark IV had serious disadvantages. Its engine power on bad ground was insufficient, and the clumsy secondary gears made turning slow and difficult.... This, in battle, became a heavy handicap on the fighting powers of the Tank. The officer was hampered by the need to attend to brakes, and a gunner called upon suddenly to attend to gears

⁴⁴ Stern, *Tanks*, pp.113-114.

⁴⁵ National Archives, MUN4/774, Weekly Review of Statistics of Output. It should be borne in mind that the date of "output" of a tank did not represent the time it became available for use by the army. The inspection of the machine, its transport to Avonmouth, Havre and The Loop could take several weeks.

⁴⁶ National Archives, WO32/5754, Stern to Layton, 10 October 1916.

⁴⁷ Williams-Ellis, *The Tank Corps*, pp. 49-50.

⁴⁸ National Archives, WO158/845, Elles to GHQ, 30 March 1917: cf. conclusions at conference attended by Haig at War Office, 23 November 1916, "It is very important to consider and adopt improvements in design from time to time, but almost any design now is likely to be better than no tank."

⁴⁹ National Archives, WO32/5754, Stern to Layton, 10 October 1916.

would lose the fleeting chance of firing at favourable targets. In the new Mark V. Tank these troubles largely disappeared. An engine of new design gave both greater speed and greater turning power, while a system of epicyclic gears made turning easy and under the sole control of the driver.... an immense advance in type had been secured.⁵⁰

Moreover, the justification by Lloyd George for his decision to reinstate the 1,000-tank order and Stern's description of events do not appear to be entirely accurate. Both Lloyd George and Stern rely in part on the fact that orders had been made before the War Office cancellation and could not therefore reasonably be stopped.⁵¹ Yet the attempt by the War Office to cancel the order was dated 30 September, some 10 days before Stern claims to have become aware of its existence, "on October 10th, I received an official instruction from the Army Council cancelling the order".⁵² Stern's memorandum to Layton is significant in underlining his tunnel vision:

the essential point to consider is the continual flow of tanks. I have given instructions for the construction of 600 tanks, incorporating the improvements suggested by the G.H.Q. both verbally and by letter. Delivery of these, will, I hope start on January 1st, working up to 40 a week. I hope that a Tank incorporating all the improvements required may be ready for manufacture to follow these 600 The design has been left to my Department. The requirements and suggestions made by G.H.Q. the War Office and Heavy Section, M.G.C. will be incorporated at the earliest opportunity.⁵³

Stern was uncompromising in seeking continuity of construction and in emphasising his authority to determine design. Based upon the rate of production he envisaged, 600 tanks should have been constructed by April, yet drawings for the new machine had not been completed. Gordon Wilson believes his father started designing Marks V and VI in "the winter of 1916-17" and observed, mid-1917, that Stern "was losing sight of the essential task which, in my father's view was the introduction of the Mark V tank at the earliest possible moment".⁵⁴

Furthermore, what happened to the War Office letter between 30 September and 10 October? There was no delay in receipt by the Ministry, as witnessed by Layton's memorandum to Stern's Department, attaching a copy, summarising the letter and enquiring "what output you anticipate being able to work to of the

⁵⁰ Williams-Ellis, *The Tank Corps*, pp. 193-194.

⁵¹ Stern, *Tanks*, p. 108; Lloyd George, *War Memoirs*, p. 385.

⁵² Stern, *Tanks*, pp. 107-108.

⁵³ National Archives, WO32/5754, Stern to Layton, 10 October 1916.

⁵⁴ David Fletcher, *The British Tanks 1915-19* (Marlborough, Crowood, 2001), p. 31; Tank Museum, A. Gordon Wilson, *Draft Biography of Walter Wilson*, p. 120.

present design and whether a continuation order is likely to be necessary”.⁵⁵ The memorandum also asked, “when the new design is likely to be ready”? It thus seems most unlikely Stern was unaware of the cancellation until 10 October. Yet there appears to be no record of Stern responding to Layton’s memorandum earlier than that date, indeed no record apparent on Ministry files of any correspondence emanating from Stern between 30 September and 10 October. However, in Stern’s papers there is a copy of a note to Montagu dated 6 October giving production estimates for tanks and stating “we are producing 1,000 tanks with the least possible delay. This design will be the same as the present ‘Tank’ with slight improvements, until we have evolved the new design. The supply will be continuous”.⁵⁶

Stern had returned from France on 28 September.⁵⁷ He spent some part of the following week escorting H. G. Wells around Metropolitan’s works. He appears to have been active at the Ministry during part of the first week of October so must have known of the cancellation before 10 October. The wording of his note to Montagu suggests that, notwithstanding reassurances about introducing the Mark V after 600 Mark IV had been constructed, his intention was that the full 1,000 should be built. His note to the sympathetic Montagu was less guarded than his note to the communicative Layton since he would have been aware that the latter was likely to distribute content externally. It appears he may have chosen to ignore the letter for some four to ten days. *The History* provides no information material to the timing of Stern’s knowledge of the cancellation, simply stating that an order was placed for 600 machines “to enable the full output to be maintained until machines of the new types were ready to take their place.”⁵⁸ In the event, production figures show no output of Mark IV until April and no release of mechanically acceptable Mark IV to units in France until May.⁵⁹ This was four/five months later than the date initially quoted by Stern.⁶⁰ The appearance of

⁵⁵ National Archives, WO158/836, DMRS to TSD, 2 October 1916.

⁵⁶ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/2, Stern to Montagu, 6 October 1916.

⁵⁷ Stern, *Tanks*, p.105.

⁵⁸ Ministry of Munitions, *History*, vol. XII, part III, p. 37.

⁵⁹ National Archives, WO158/814, Elles to Anley, 6 May 1917; WO95-91-1, War Diary of HQ Heavy Branch records Mark IV tanks arriving from 20 April, but none being issued till 9 May.

⁶⁰ Ministry of Munitions, *History*, vol. XII, part III, p. 50. It is recorded that some nineteen Mark IV machines were “shipped to France by the middle of April”, but a Board reported they were “unfit for fighting and the whole position pointed to lack of adequate inspection at home”. The timeframe and numbers are roughly in line with the War Diary of Heavy Branch HQ. A list of complaints dated 7 May 1917 was received by the Ministry from the Army Council following

a replacement model incorporating modifications the Tank Corps was so anxious to receive (Mark V) failed to materialise until 1918, some seven months later than Stern had forecast.⁶¹

It is quite clear someone was being less than straightforward about events early in October 1916. The finger of suspicion points towards Stern, who would appear to have ignored the cancellation of the 1,000-tank order, probably enabling him to render it more difficult or embarrassing for cancellation to be achieved. Stern had form in displacing facts less than supportive of his approach by ones more agreeable. This was made clear by Taylor of the Ministry's Labour Department, since, following Stern's comments at the Minister's meeting on 27 February 1917, Taylor informed Kellaway, the Ministry's Parliamentary Secretary, of the facts concerning the labour position at Metropolitan and Daimler. He thought it desirable that "such misleading statements as those made by Colonel Stern, ought not to pass unchallenged."⁶² Taylor was concerned that Stern's comments would reflect badly on the Labour Department, but the reason for Stern's exaggeration or invention of difficulties of labour supply is likely to have been to establish this in the minds of those present as the reason for delays in the output of tanks. Stern was a forceful character, deeply committed to his role in spearheading the production of tanks, proud to disregard the views of others and the limitations of his own authority and convinced of the rectitude of his case. There seems little doubt that to Stern the ends would justify the means. This is well illustrated by his comments at a conference on engine supply.⁶³ Stern recorded:

General Henderson asked that I should be prevented from employing five special firms in making 700 Ricardo engines, in anticipation of tanks that had not yet been ordered. I said that I had ordered these engines with foresight to prevent the shortage of engines for tanks such as they were now experiencing with aircraft. In spite of this the Committee approved his resolution. However, I took no notice of it. We continued

inspection in France, see National Archives, MUN4/2791, Stern to Layton, undated but responding to each of the complaints. The complaints were generally of a minor nature, many relating to the introduction of the Lewis Gun into the Mark IV contrary to the advice of the Ministry, which claimed it was not suited to the space and openings within the tank and was more prone to external damage than the Hotchkiss or Vickers. HB's infatuation with the Lewis gun lasted a mere five months, following which they sought the reintroduction of the Hotchkiss, see, MUN4/2791, 6 May 1917, 'Report on Machine Gun for Tanks' by Special Committee chaired by Lt.-Colonel Lannowe.

⁶¹ National Archives, WO32/5754, Stern to Layton, 10 October 1916.

⁶² National Archives, MUN4/2791, Taylor to Kellaway, 27 February 1917.

⁶³ Ibid, Minutes of 'Conference on Supply of Petrol Engines', 5 February 1917.

the building of the 700 engines, and in order not to stop the continuity of manufacture, I gave an order for another 700.”⁶⁴

Stern fails to mention that following discussions at the conference on 5 February, Haig wrote to the War Office supporting views expressed on his behalf by Butler, namely that in respect of engine production the “essential requirements for the air service in France must have priority.” A copy of this letter was sent to Colonel Stern.⁶⁵ It may be significant that Stern does not confirm whether his moves were successful in enabling tanks to bypass national priorities since other documents suggest the priority for aircraft was enforced. The nation’s industrial resources were stretched and Stern was not exhibiting the responsible approach warranted, particularly as the “first of the initial 700 [engines] had not yet been tested, but we believed in them.”⁶⁶ In this instance Stern had taken expert advice and the development of the Ricardo engine he organised was successful.⁶⁷ However, his faith in his judgment did not always reap dividends, a fact which he acknowledged in respect of the petrol-electric transmission he had admired on a visit to France. The system performed so poorly in tests in January 1917 that “all orders were cancelled”.⁶⁸

The electric drive wasted too much of the already inadequate horsepower. This ‘improvement’ thus turned out to be a failure. By then, however, Stern, in his impetuous way, had ordered 600 sets of these electric drives without consulting Wilson who, reasonably enough felt Stern had trespassed on his preserves.⁶⁹

Aware of the army’s requirement for an easier system for driving the machines, Stern rejected the option of implementing Wilson’s solution, he preferred instead to organise an event at Oldbury at which a range of companies demonstrated the capabilities of alternative future machines. Stern would have been embarrassed by the fact that Wilson’s epicyclic system was the clear winner of the Oldbury event. It would appear that at no stage was Stern able to recognise, admit or take full advantage of Wilson’s ability.⁷⁰

In terms of numbers produced, the value of the Mark IV cannot be disputed since it accounted for approximately 50% of British heavy tanks constructed

⁶⁴ Stern, *Tanks*, pp. 124-125.

⁶⁵ National Archives, WO158/804, Haig to War Office, 11 February 1917.

⁶⁶ Stern, *Tanks 1914-1918*, p. 125.

⁶⁷ Ministry of Munitions, *History*, vol. XII, pp. 42-43; Stern, *Tanks*, pp. 123-125.

⁶⁸ Stern, *Tanks*, pp. 120-121.

⁶⁹ Gordon Wilson, *Portrait*, p. 53.

⁷⁰ *Ibid.*

before the Armistice.⁷¹ On the other hand, it is difficult to challenge the assertion that much of the nation's resource for the manufacture of armoured vehicles was tied up for a significant period in the production of a model that did not meet operational needs effectively. Elles led the call for progress as early as September 1916.⁷² Mark IV incorporated a number of the improvements sought by Elles and GHQ but most significantly did not provide one-man control or increased engine power. By March 1917 Elles was describing the Mark IV, which at that time still existed only on the drawing board or production lines, as "rudimentary and possesses defects which make it very expensive as regards personnel and material and very difficult to use tactically".⁷³ By April 1917 Elles had concluded the "Mark IV machine will not do what we want".⁷⁴

Stern would claim on a number of occasions that completion of the 1,000-tank order would not delay commencement of an improved model. These claims were not confirmed by events. The output of Mark IV exceeded 1,100 before any Mark V was assembled.⁷⁵ Stern also claimed the 1,000-tank order would be completed by 30 June 1917, yet this output was not achieved until December 1917.⁷⁶ It would appear Stern did not forego any opportunity to stress the problems of the tank erectors in switching production from an existing manufacturing run to a new product.⁷⁷ No reason is seen to dispute the comments of Stern or Metropolitan on manufacturers' preferred timescales for completion of orders. However, the question that should have been addressed was whether economy in the use of stockpiles of materials and subservience to manufacturers' timescales paid sufficient regard to military circumstances. How should the balance sheet weigh the advantage to the BEF of delayed delivery of machines capable of greater speed and manoeuvrability under the control of one driver against earlier delivery of a greater number of less efficient machines? It seems unlikely that, given sufficiently attractive financial terms, tank erectors and their labour force would

⁷¹ Glanfield, *Devil's Chariots*, Appendices 3 and 4.

⁷² National Archives, WO158/836, Elles to GHQ, 30 September 1916.

⁷³ National Archives, WO158/805, Elles to GHQ, 30 March 1917.

⁷⁴ National Archives, MUN4/700, Elles to Anley, 23 April 1917. For a description of the difficulty in steering Marks I to IV see Williams-Ellis, *The Tank Corps*, p. 194.

⁷⁵ National Archives, MUN4/774 and MUN4/775, Weekly Review of Output Statistics.

⁷⁶ Liddell Hart Centre for Military Archives, Stern Papers, Stern to Montagu, 6 October 1916; National Archives, MUN4/5168, MUN4/774 and MUN4/775, Weekly Review of Output Statistics.

⁷⁷ National Archives. See for example, MUN5/210, minutes of meeting at MM, 8 October 1917, note of comment by Stern to the effect that manufacturers sought a 20-week run; Liddell Hart Centre for Military Archives, Stern Papers, Stern1/2/3, minutes of meeting at MWD, 3 October 1917, at which Stern made a similar comment.

have declined to vary what Stern regarded as inevitable or desirable industrial practices.

There appears to have been no meaningful debate on this subject at any of the many conferences held between the army and Ministry or at internal Ministry meetings. Yet construction could be varied, albeit subject to inconvenience and, possibly, financial consequences, since this was achieved by the curtailment of production on the Mark V in the summer of 1918 in favour of the longer Mark V*, held to be needed to cross wider German trenches.⁷⁸

Stern may not have grasped the full intention of Haig's approach. In November 1916 Haig was recorded as stating "It is very important to consider and adopt improvements in design from time to time, but almost any design now is likely to be better than no tank."⁷⁹ Haig's immediate intention, undoubtedly governed by anticipated requirements for 1917 spring offensives, which could have been little more than three months ahead, was therefore clear. Yet, it was inappropriate for Stern to interpret short-term requirements as advocacy of long-term abstinence from change. Rather, approaching circumstances always needed to be borne in mind to judge the right time to make improvements. In all cases plans were needed in order that changes could be implemented at the least inopportune moment. Stern failed to do this, preferring in 1917 to redirect work from the preparations for the Mark V by switching efforts to other tracked models sought by the army but which might be seen as lower priorities than the main battle tank. In the fullness of time those other models were produced too late to impact on the war.⁸⁰

The army also does not appear to have approached supply in the correct manner, showing excessive irritation at the lack of change. This reaction was based on failure to appreciate the reasons why the achievement of the changes they desired, and production in general, took so long. It was not until August 1918 that a body was established that promised to approach supply from a more comprehensive understanding of problems. The key issue to be determined was that of the least disadvantageous time at which to incur penalties of supply from

⁷⁸ National Archives, MUN5/211, Duckham to Churchill, 4 October 1917.

⁷⁹ National Archives, WO158/845, minutes of conference attended by Haig at War Office, 23 November 1916,

⁸⁰ Gordon Wilson, *Portrait*, p. 54; National Archives, MUN4/851, Tanks (Position in the Field) records that there were no Medium B and just 3 Mark IX in France by w/e 17 November 1918.

interruption of output necessary to introduce improvements. Such decisions needed to be taken in the light of the tactical situation, seasonal conditions, manufacturing capabilities, lost production that might be anticipated from the implementation of change and the value of improvements that could be introduced. However, not all shortcomings can be laid at the door of Stern and the Ministry, since the army had little understanding of the time taken to translate the means of securing benefits from design changes onto production lines. The MWSD were either in a similar position or chose not to reveal the true position to the army or wider Ministry.⁸¹

During preparations for the Battle of Flers, the failure of the Ministry and industry to meet predicted output levels did not assist the establishment of harmonious relations.⁸² Stern's allocation of priority to the production of tanks in quantity coupled to unrealistic production forecasts and unprofessional standards of inspection, fuelled friction and discontent.⁸³ Tank supply involved difficulties in reconciling problems of industrial production and military tactics in an atmosphere of personal sensitivities and rivalries. Late in 1916 the situation was about to become more complex owing to the extension of tactical objectives beyond the initial aims of neutralising enemy defences by destroying machine-guns, flattening wire and crossing and enfilading trenches. The additional dimensions centred on a growing appreciation of the benefits of armoured caterpillar vehicles to fulfil a variety of other roles on the battlefield. Such roles included assistance in the consolidation of territorial gains through the supply of ammunition, food and equipment to forward units. They also included exploitation by lighter, faster tanks of any initial breakthrough secured through assistance to infantry by artillery and heavy tanks. Enhanced mobility was also required for forward movement of artillery and personnel to consolidate gains against counter-attack and support further advances.⁸⁴ In terms of experience, qualifications and inclination Stern, was ill-equipped to fulfil this complex managerial role.

⁸¹ National Archives, MUN5191, Wilson to Maclean, 31 October 1918, Wilson's internal memorandum to Maclean illustrates the complexity and sensitivity of changes to specification after production details had been agreed or the manufacturing process commenced.

⁸² National Archives, WO158/816, Elles to Capper, 1 March 1918.

⁸³ National Archives, WO158/814, Elles to Anley, 23 April 1917.

⁸⁴ National Archives, WO158/817, unattributed and undated fourteen page note on 'Tank Supply', likely to be from Elles to Capper, (judging from the last date for which statistics are quoted likely to have been compiled in the week following 6 October 1917) and MUN4/2795, Butler to MM, 15 October 1916, details and trials for Gun-carrying tank; Stern, *Tanks*, pp. 76 and 81.

Furthermore, difficulties in developing tactics for offensives were accentuated by an enemy efficient in honing countermeasures. The relatively primitive, shallow defences facing the BEF at Neuve Chapelle in the spring of 1915 had, by 1917, increased vertically, horizontally and in quality.⁸⁵ This had been discovered and appreciated by some assault troops before the fateful 1 July 1916, though was not acknowledged appropriately in terms of tactical planning:

General Snow [VII Corps commander] and his staff...[tell] us that we shall have practically no casualties, because all the Germans will have been killed by our artillery barrage...We know however that the Germans have dugouts 40 feet deep....⁸⁶

The defensive system had also spread horizontally comprising several lines and tactical deployment stretching back in places for many miles. By 1917 German tactics envisaged the first 1-1.5 miles being lightly manned, with counter-attack forces held further back thereby less vulnerable to the growing power of Allied artillery.⁸⁷

There was no fundamental disagreement between BEF and Ministry over an expanded role for armoured vehicles. Despite claims by Stern, it is fair to say there is greater evidence of forward thinking in France, notably through Elles and the Tank Corps, than at the Ministry.⁸⁸ This more advanced thought is most notable in relation to the Supply Tank. Speed of movement of supplies was an important factor either as a basis for further forward movement, before the enemy could deploy reserves to reform its lines to contain a potential breakthrough, or to resist counter-attack. This problem was appreciated not only at GHQ, but also by units that found much of their effort and manpower being expended on forward movement of supplies and ammunition. Rackham records in a report for the Ministry in August 1917 “It is everywhere agreed that it is of the utmost importance that Supply Tanks are sent out as soon as possible, and I believe every effort should be made to have the first experimental machine completed by

⁸⁵ National Archives, ADM116/1339, GHQ to War Office, 2 August 1915; Stephen Bull, *Trench Warfare*, in *War on the Western Front: 1914-1918*, ed. by Gary Sheffield (Oxford, Osprey, 2013), pp. 190-192.

⁸⁶ Hugh Sebag-Montefiore, *Somme: Into the Breach* (London, Penguin Books, 2017), p. 56, observations of Private Percy Jones of the 1st/16th Battalion of the London Regiment (Queen’s Westminster).

⁸⁷ Cyril Falls, *History of the Great War, Military Operations France and Belgium, 1917, vol. I* (London, Macmillan, 1940), pp. 401-402. John Terraine, *To Win A War: 1918 The Year of Victory* (London, Sidgwick and Jackson, 1978), pp. 187-188.

⁸⁸ Freed from the need for secrecy after the use of tanks in 1916-1917, Heavy Branch was renamed the Tank Corps in July 1917.

Christmas”.⁸⁹ Rackham’s report is significant in two respects. Firstly, it shows Ministry experimental facilities in a particularly unfavourable light, well behind forward thinking in France, since an experimental model less than eleven months before the end of the war was scarcely setting the bar at an ambitious level and, secondly, owing to remarks about the Drawing Office “it is essential that we get as many draughtsmen on the job as possible”. Some twelve months later, with an experienced industrialist in charge of the Supply Department, the confused state of the Drawing Office would be identified as a key defect.

So far as the logistical importance of Supply Tanks is concerned, Fuller illustrated this by recalling how, at Hamel in 1918, Supply Tanks delivered some 20-25 tons of engineering stores to a point only a few hundred yards to the rear of the captured objective within half an hour of it being taken. He calculated 1200 men would have been needed to deliver this quantity of stores.⁹⁰ Unfortunately for the army, in the hands of poor management, the Ministry’s role authorised by Lloyd George prior to the development of tanks represented a potential obstacle to military design aspirations.⁹¹ It could be used by those not directly involved in the use of the machines to the frustration of a BEF anxious to redirect design and manufacturing effort into line with its own developing ideas on the form of armoured assistance it required. In reality it is likely the BEF/War Office had insufficient understanding of the time taken to design and put into production machines incorporating the amendments sought. Their objectives were unachievable within the aspired timescale. Nevertheless, the situation called for compromise. Despite the value of his enthusiasm and drive, Stern failed to resolve conflicting priorities satisfactorily. In part this appears to have been the result both of excessive consideration for the aspirations of industrialists concerning methods of production and of his inability to assess the appropriate weight to give to military comment and aspirations. Standing at the junction of technological, military and industrial expertise, Stern lacked the qualities essential for successful management and the understanding of the elements required to operate most efficiently.

⁸⁹ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/10/9, report by Rackham dated 22 August 1917 following his visit to France from 7 to 21 August.

⁹⁰ Fuller, *Tanks*, p. 168.

⁹¹ National Archives, ADM116/1339, minute by Lloyd George, approved by Director of Finance at the Ministry of Munitions, 12 February 1916.

Decisions and achievements by the Ministry during the first eighteen months of its responsibility for tank production suggest that by mid-1917 the army was deserving of a more influential position at the munitions “High Table”. In terms of procedures and responsibilities it was paying the penalty both for its earlier inability to predict and embrace change and technology in advance of emerging or developing military circumstances and for lack of political priority for army funding. The response of politicians to a laggard army had been to strip it of the ability to control its own supply of weaponry.⁹² The moves to gather into civilian control the responsibilities for the supply of munitions may have been justified in 1914-1915, but politicians should have responded earlier, or in a more thoughtful way, to changes within the army, and to its unique position as end-user. In the interests of national efficiency, the army should have been assigned a more effective representation on tank design. However, benefitting perhaps from his military credentials, it was not until Seely took charge of tank production at the Ministry that the heat was apparently taken out of the “power struggle” over design and supply of armoured vehicles. By that time just three/four months remained of a fifty-one-month war, too little time for changes to have an effect. The army would not regain greater control over the design of weaponry until 1919.

There were four Ministers of Munitions during the Ministry’s wartime existence. They played an important role in the ways in which they supervised and became involved in the supply of armoured vehicles. Lloyd George as the first Minister had added tanks to the Ministry’s responsibilities but became Secretary of State for War before any tanks were delivered to the BEF. Montagu was in office from July to December 1916 during which time the Mark I was supplied to the BEF and used in later Battles of the Somme. However, for the greater part of the period covered by this chapter Addison occupied the position. Both Montagu and Addison experienced pressure from the army for greater involvement in decisions about tank supply.

Montagu’s attitude towards army representations is well illustrated by a handwritten note in November 1916 as GHQ began to appreciate from

⁹² R. J. Q. Adams, *Arms and the Wizard: Lloyd George and the Ministry of Munitions 1915-1916*, pp. 19-27 and 42-43; John Alfred Spender and Cyril Asquith, *Life of Herbert Henry Asquith, Lord Oxford and Asquith* (London, Hutchinson, 1932), pp. 136-140.

experience at Flers that the tank would progressively become more significant in future operations:

I do not want a row with the WO if one can be avoided but I am inclined to observe (1) that surely the arrangements made here as to who is to have charge of tank construction and who is to inspect them are matters for me to decide.⁹³

The kernel of Montagu's response was polite but uncompromising resistance, since the War Office was informed that the Minister "has already made arrangements for the design, supply, and inspection of the Tanks asked for by the War Office".⁹⁴ The slow rate of enhancement to the tank, low rate of manufacture and failure to meet forecast delivery dates fuelled army frustrations, which had their roots both in the unfulfilled supply forecasts prior to Flers and in dissatisfaction with the quality of the Mark I.⁹⁵ Montagu's reply to further War Office advances for greater influence or control over design was polite rejection, offering simply that "any suggestion as to alteration in pattern and design.....will receive the fullest consideration."⁹⁶ No agreement was reached but the War Office would appear to have allowed sleeping dogs to lie over the winter. During his relatively brief spell as Minister, Montagu was supportive of Stern's efforts to build tanks.⁹⁷ However, his tenure of the office should have been marked by a willingness to concede a greater role for the army in determining tank design. Neither he nor Stern appears to have possessed appropriate qualities to achieve a harmonious and beneficial relationship with the War Office.

In December 1916, when Lloyd George became Prime Minister, Montagu was replaced by Addison who had little time for Stern's single-minded approach to the problems of armoured vehicles. Addison had occupied high office at the Ministry since its formation and should have been well placed to judge how best to include the army in decisions on the supply and design of tanks and how to handle a difficult member of staff such as Stern. Since the tank was no longer an experimental machine, he removed the protection of Lloyd George's Charter from Stern's Department but did not resolve problems associated with tank supply.

⁹³ National Archives, MUN4/2796, Montagu handwritten note on circulating memorandum from Layton to Phipps following receipt from the War Office of a request for consultation on tank specification, 16 October 1916.

⁹⁴ National Archives, MUN5/210, Phipps to War Office, 17 November 1916.

⁹⁵ National Archives, WO158/814, Elles to Anley, 4 May 1917 and WO158/845, Elles to GHQ, 30 March 1917.

⁹⁶ National Archives, MUN5/210, Phipps to WO, 17 November 1916.

⁹⁷ Stern, *Tanks*, p. 113.

During Addison's period as Minister, the MWSD failed to ensure the supply of Mark IV tanks for use during the 1917 Spring Offensives and failed to complete the design and preparations for the introduction of the Mark V.⁹⁸ The inspection system also failed to prevent output of sub-standard work, resulting in an increased corrective burden for engineering workshops in France.⁹⁹

Those involved gave many reasons for delays in production. The problem in attempting to identify the limiting factors at any particular time lies in the range of manufacturing circumstances and the number of components required to achieve the finished article within a particular timescale. Shortage or delay in the availability of almost any single component was capable of delaying output, even the availability of appropriate screws.¹⁰⁰ Explanations for delays fell into three broad categories, managerial weaknesses, shortage of the sinews of production, i.e. materials, components, labour, facilities and finance and competing priorities for production necessities.¹⁰¹

Managerial efforts were not assisted by the fact that Stern was neither an engineer nor industrialist.¹⁰² He may therefore have sought shelter in the acceptance of practices advocated by others when the merits of their views should have been debated. Shortages, particularly of labour, are frequently advanced to explain delays in production, but there appear to be no cases of conclusive evidence justifying claims. This issue will be examined more closely in the chapter dealing with the final months of the war when an experienced industrialist prepared a report dealing with the organisation of the MWSD.

Upon the failure of Addison, the new and perhaps weaker Minister, to deliver the Mark IV in time for the Arras offensives, the War Office may well have scented they were pursuing a wounded animal. The attempt to increase army influence

⁹⁸ Wilson, *Portrait*, pp. 51-54.

⁹⁹ National Archives, MUN4/2790, Stern to Layton, in response to War Office letter to MM, 7 May 1917, listing response to complaints about condition of tanks delivered to France.

¹⁰⁰ This is well illustrated in National Archives, MUN4/2790, Stern to Layton, undated note as basis of reply to WO letter of complaint dated 7 May 1917: one aspect of the complaint was that "securing rings on the spherical ball mountings in a great many cases have only two sets of screws" (rather than six) "This is a particularly bad case of supervision." It transpired that the problem was a shortage of the required type of screw, "The remaining four sets of screws were despatched afterwards". The object was to save time, but it cannot be determined whether or not this tactic was successful.

¹⁰¹ For example, National Archives, WO158/804, Haig to War Office, 11 February 1917, at which time aircraft were first priority with tanks equal second.

¹⁰² Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/3, Duckham to Churchill, 4 October 1917.

was therefore renewed.¹⁰³ Lloyd George, as new PM, was made fully aware of poor performance by his former Ministry in tank production.¹⁰⁴ Addison endured an embarrassing time at the War Cabinet on 22 March 1917.¹⁰⁵ Nevertheless, the War Office failed to secure the controls they sought and settled in May for a Tank Committee that, in respect of design, was advisory. Stern and d'Eyncourt were the representatives of the Ministry on this Committee, which was assigned the role of formulating specifications, which the MWSD should put into effect, approving designs before manufacture and directing field trials.¹⁰⁶ The Committee did not work smoothly. It lacked representation from Heavy Branch, the most knowledgeable unit on the use of tanks in action. It also endeavoured to expand its role. Numerical representation on the Committee invariably led to Stern and d'Eyncourt being outvoted.¹⁰⁷ The consequence of this was that they refused to attend Committee meetings.¹⁰⁸

Although he stops short of direct criticism, it is clear Stern did not consider the fire of armoured warfare to burn within Addison. Later in the year, in response to Churchill's questions on experimentation, Stern claimed "I have had the greatest trouble to get anything, because we have been an experimental department. I have had practically no assistance to carry on my business at all. We can get neither officers nor engineers".¹⁰⁹ *The History* describes how "projects for further development of experimental facilities met with little support", resulting in Addison rejecting a scheme for the utilisation of Foster's workshops at Lincoln for experimental purposes on the grounds that "the future of tanks was still too uncertain".¹¹⁰ *The History* seeks to justify this decision on grounds of prematurity,

¹⁰³ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/2, notes of meeting at War Office, 1 May 1917 and Stern 1/2/3, 5 March 1917, War Office memorandum on Output of "TANKS".

¹⁰⁴ National Archives, WO32/5754, Hankey to MM, 7 March 1917 seeking observations on attached memorandum of 5 March from War Office on Output of Tanks, seemingly a War Office report produced for consideration by War Cabinet (102 – 22 March 1916). The memorandum recited the history of forecasts made to the War Office, outlined the importance attached to that supply by Haig, listed the limited deliveries made during January and February and stressed the importance of estimates being conservative rather than optimistic.

¹⁰⁵ National Archives, WO158/845, Whigham to Haig, 28 March 1917, attaching minutes of War Cabinet meeting of 22 March. Although the War Cabinet minutes simply reiterated the comments of those at the meeting, Haig and the War Office would have been content that the Ministry had not advanced a defence of any substance to their criticisms.

¹⁰⁶ Ministry of Munitions, *History*, vol. XII, part 3, pp. 50-51.

¹⁰⁷ *Ibid*, pp. 52-53.

¹⁰⁸ Stern *Tanks*, pp. 159-160.

¹⁰⁹ National Archives, MUN5/133, Ministry of Munitions Committee on Tanks, 5 September 1917, p. 11.

¹¹⁰ Ministry of Munitions, *History*, vol. XII, part 3, p. 46.

but it was later overturned by Churchill.¹¹¹ Since the Army Council had seen fit to order 1,000 additional heavy machines and was also considering other forms of tanks for additional specialised purposes, it appears quite incorrect to use this argument to reject proposals for expanding experimentation. Rather, the enlargement of experimental facilities might more appropriately have been viewed as a means whereby the Ministry might influence debate within the army. It could be argued that tangible evidence in the form of efficient prototypes serving a wider range of functions would have represented the most effective way to tempt the army along the path of armoured warfare.

Addison's decision on experimentation at Lincoln was not untypical of his approach to his Ministerial responsibilities. He failed during his period in office to resolve the wider organisational problems caused by rapid expansion of the Ministry and failed specifically to address poor performance on tank production.¹¹² In March 1917 Addison was called upon to explain to the War Cabinet why so few tanks were supplied to support actions designed to assist later large-scale French offensives. Hankey's minutes are brief but reveal a number of issues of interest by comparison with the memoirs of Stern and *The History*.¹¹³

The explanations/excuses advanced by Addison were numerous, vague and confused. He argued that the original estimate for tank output contained miscalculations. Though tanks had first been used in September 1916, final design had not been approved till 23 November: drawings were not ready until 7 January. The latest estimates envisaged a delay of a month or six weeks in arrear of the original estimate and "everything" was being done to speed supply "as much as possible". He was dissatisfied with tank organisation and was taking steps to improve it. Total deliveries at that time were 250 machines, though, if

¹¹¹ National Archives, MUN5/133, verbatim record of Ministry Munitions Council Committee on Tanks, 5 September 1917, Churchill argues passionately in support of Supply Tanks during the interview of Stern.

¹¹² Ministry of Munitions - *History of the Ministry of Munitions, vol. II, General Organisation for Munitions Supply* (London, HMSO, 1922), p. 76. *The History* records that the "first problem that confronted Mr. Churchill.....was the reform of headquarters organisation". Montagu and Addison had attempted to resolve problems caused by inter-departmental rivalry, including Addison's proposals for additional Parliamentary Secretaries and Staff Officers, but no satisfactory solution had been introduced and the subject was "still a matter of acute controversy when Dr. Addison left the Ministry", pp. 170-174.

¹¹³ National Archives, CAB23/2, minutes of War Cabinet meeting 102, 22 March 1917, item 7 Tanks.

requirements for spares for the 1,000-tank order were of the same magnitude as for tanks already supplied, it would be impossible to keep anything like 1,000 tanks available for service.

It is not clear which estimate was considered by Addison to represent “the original”.¹¹⁴ Since the report is concerned about delays in the production of the Mark IV, it would be anticipated that all comments should relate to the production process for that model. However, a number of comments clearly pre-date the commencement or specification and design of the Mark IV and could also or alternatively relate to Marks II and/or III. If Addison was referring to Mark IV, the relevant forecast appears to be that given by Stern, when, with a misplaced sense of precision, he adjusted his original forecast for production of Mark IV to 20/week from 7 February increasing to provide 300 by 31 May 1917: production would then continue till the design was altered. Arrival of the Mark V was anticipated about August/September 1917.¹¹⁵ This date was later put back to October: none were delivered until 1918.¹¹⁶

Contradicting Addison’s figures, the MGO informed the War Cabinet that there were only sixty tanks in France or in transit that were fit for service: Addison’s 250 included those destroyed during the battles of the Somme, those out of commission through want of spare parts and wastage during training. The War Cabinet “observed with concern that the number of Tanks available in the immediate future...is less than the number available last September.” However, there is no record of a more coordinated explanation being sought from the somewhat jumbled facts advanced by Addison. There is also no record of Addison being challenged on his comments about spares, yet he appears to have had no regard to the possibility of the demand being reduced by adjustment of design or upgrading of components.¹¹⁷ Bearing in mind the seriousness of the military position, Addison appears to have been insufficiently contrite and to have been let off lightly. In his diary, Addison’s comments on the issue are short and superficial. He criticises Stern’s Department for “a far too sanguine estimate of

¹¹⁴ National Archives, MUN5/210, notes of meeting with representatives of War Office and GHQ, 23 November 1916; Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/17, 16 April 1917, notes of Conference during visit to France to assess experiences of First Battle of The Scarpe.

¹¹⁵ National Archives, WO32/5754, Stern to Layton, 10 October 1916.

¹¹⁶ National Archives, MUN4/5168, Table VII, Weekly Review of Output Statistics.

¹¹⁷ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/18, notes of meeting at Central Workshops, 17 April 1917.

immediate deliveries and has let us down badly”.¹¹⁸ He acknowledges that Mark IV tanks “will certainly be a month late, although from the military point of view it may be a good thing, as it will mean the tanks will not be used in bad weather.”¹¹⁹ Bearing in mind the first Mark IVs were many months late, the daily level of British casualties for the battles were higher than for other major battles during the war, the Mark I-II tanks forced into use were not resistant to AP bullets and poor mechanical condition had required the return of the first Mark IV deliveries to England for remedial works, Addison’s injudicious comments were unlikely to have been well received in post-war military circles.

Only three months earlier Lloyd George had received considerable support from Addison when rising to the premiership.¹²⁰ Addison’s subsequent elevation to Minister and survival in the face of the War Cabinet’s concern may therefore not have been based entirely on merit. Following a brief period, that would have served to disassociate his departure from Munitions from criticisms of his performance, and with, perhaps, the face-saving feature of departing at his own request, Addison would leave the Ministry for a new position as Minister of Reconstruction. Had he departed shortly after the rebuke by the War Cabinet, Lloyd George might have been tainted by association. However, the most important consideration was the extraordinary weakness of his paper to Cabinet. Addison failed to explain the nature of and responsibility for alleged miscalculations, did not properly explain the design issue and appeared to muddle four different Marks of tank. He gave no detail of his reasons for dissatisfaction with the organisation or the steps being taken to improve it and did not elaborate on his depressing comment about the future of the proposed additional 1,000 tanks and why their reliability should not be improved in order to reduce wear and demand for spares.¹²¹ However, perhaps the most disconcerting element of his report was his comment that the delay might only be four to six weeks. This revealed the absence of appropriate recognition of the

¹¹⁸ Christopher Addison, *Four and a Half Years: A Personal Diary from June 1914 to January 1919, vol. II* (London, Hutchinson, 1934), p. 347.

¹¹⁹ *Ibid.*

¹²⁰ John Bourne, *Who’s Who in World War One* (London, Routledge, 2001), p. 1.

¹²¹ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/17, minutes of conference at Bermicourt, 16 April 1917. Stern explained improvements were sought to avoid wear on six parts and to increase the bearing surface. No detail was given, possibly because the minutes show Wilson as attending only when required to answer questions; Stern, *Tanks*, p. 139. Wilson and his staff were examining the design of the tank with a view to installing modifications that would reduce wear and the demand for spare parts.

importance of complying with the scheduling of the major spring offensive and insensitivity to the well-being of those whom he was serving.

For Heavy Branch recruits, tasked, in certain phases of the forthcoming battles, with leading the advance on enemy positions, and to the infantry being supported, safety within the tank and the number of tanks available to take part in the initial advance were of fundamental importance. Addison's dismissive reference to delays as "only four to six weeks", was ill-advised: this would prove to be the difference between availability for Arras and missing participation in the battles altogether. Tank supply for Arras was even less satisfactory than for Flers in 1916.¹²²

Addison's comment concerning spare parts touched upon an issue that generated much debate in the Ministry and BEF and could have had a bearing on the rate of production, though the extent and nature of records do not provide any conclusive data on the issue. At the commencement of production in bulk in 1916 it had been the practice of firms engaged in the assembly of tanks to place contracts for small components with other firms. *The History* states that, in consequence, overlapping resulted and the limited facilities for production were overtaxed. In 1917 the Department undertook to provide contractors with a range of components. The inspection staff also undertook duties associated with advising contractors how best to obtain parts, labour or higher priority for their war work. This reorganisation appears sound in principle but required the arrangement of inspection of components and supervision of progress at the premises of both contractors and sub-contractors during manufacture. Such a system should have been more efficient but may have resulted in the creation of a sizeable, complex role for a group insufficiently diligent or capable of undertaking it. This possibility is consistent with the non-specific conclusion in

¹²² Various predictions were made for the delivery of the Mark IV to the BEF, dates becoming progressively later as it became clear that earlier forecasts could not be met. For comparison between forecasts and actual delivery see National Archives, WO32/5754, Stern to DMRS (Layton), 21 December 1916, forecasting delivery of 120 machines in March 1917 and a further delivery of 120 in April, 140 in May then rising to 200 in June, 240 in July, 260 in August, and completion of the run by the delivery of 280 machines in September and compare to MUN4/2791, Holden to DMRS, 12 April 1917, confirming that the first batch of 19 machines had left for France and DMRS to Addison, 3 May 1917, giving the broader picture that 60 machines had arrived at Headquarters, France, 18 were on the railway between Havre and Headquarters and 22 were in transit to Havre.

The History that this “combination of the duties of inspection with responsibility for progress did not prove entirely satisfactory in its results”.¹²³

A further unsatisfactory element of Ministry operations centred on responsibility for tank supply and final inspection before release for military use. The objectives of production and inspection staff clashed since the producers wished to accelerate supply whereas inspection should have been concerned to ensure that all tanks leaving for France were fit for action.¹²⁴ *The History* muddies the water in relation to the nature of the problem since it did not result from the work of inspectors advising contractors on how best to secure parts, labour etc, but from the conflicting requirements of accelerating output to meet Ministry and military pressures whilst ensuring quality of the “finished” product. Consequences of allowing sub-standard work to pass through the inspection process were calculated by the receiving workshops in France to amount to some two/three weeks being added to rectify faults before clearance of machines for combat.¹²⁵ Difficulties were appreciated both in the Ministry and Heavy Branch in England, but there appears to have been a lack of willingness to resolve the problem. Brigadier-General Anley, Swinton’s successor, informed Elles in May 1917:

almost directly I took over this job [replacing Swinton] I represented as strongly as I could how unsatisfactory it was that the producer should also be the examiner.....It is not very much use tackling Stern: he always agrees, but the result is generally nothing.¹²⁶

Problems with inspection had been identified by Swinton as early as August 1916. He downplayed the seriousness but proposed a system of inspection for all tanks at a new testing ground at Oldbury to be supervised by Heavy Section.¹²⁷ No doubt it was for “diplomatic” reasons that Swinton chose not to ruffle feathers by criticism which he would have regarded as unproductive, but in the event his

¹²³ Ministry of Munitions, *History of the Ministry of Munitions, vol. XII, part 3, Tanks*, pp. 46-47.

¹²⁴ National Archives, the complaint about faults on newly delivered machines and the failure of the Ministry to separate functions is made on numerous occasions, e.g., WO158/814, Anley to Elles, 4 May 1917, MUN5/211, War Office to Ministry of Munitions, 3 July 1917 and DMRS to DGIM, 28 June 1917; WO2791, War Office to Ministry of Munitions, 26 June 1917 and Findings of Board of Enquiry, 26 April 1917.

¹²⁵ Ministry of Munitions, *History, vol. XII, part 3*, p. 63.

¹²⁶ National Archives, WO158/814, Anley to Elles, 4 May 1917. For a different view of the inspection issue see MUN4/2790, notes of Sixth Meeting of the Tank Committee, 22 June 1917, when the Committee, despite its concerns about inspection, accepted the representations of Stern and d'Eyncourt that “there would be great danger of delay in the delivery of tanks should any change be made” and put the matter off till the end of the year, though with a strong request that “a high official with great experience in the Inspection Department of the Ministry of Munitions should be lent to the Mechanical Warfare Supply Department”.

¹²⁷ National Archives, MUN4/2790, Swinton to Bird, 29 August 1916.

proposals were overtaken by unexpected termination of his command of tanks in England.¹²⁸

Stern's approach to inspection is difficult to excuse. Officers in France explained how delay in rectifying faults could lead to accelerated wear of parts, spares for which were "so difficult to obtain".¹²⁹ Heavy Branch made unsatisfactory tank quality even worse by requiring the replacement of the original Hotchkiss machine-guns in tanks by Lewis guns. This was a decision they would reverse only five months later following formation of a Special Committee to consider the make of machine-gun to be used. Reporting in May 1917, its main findings were that Mark IV tanks being delivered to France were not in an efficient fighting condition as regards Lewis Gun Mountings, that no date could be estimated for rendering them efficient and that the position pointed to a lack of adequate inspection in England. Though outside its terms of reference, the Board noted sixteen other problems resulting from faulty design, inadequate inspection or showing a lack of consideration and professionalism.¹³⁰ For example, inspection at Oldbury returned six of a batch of twenty-five machines owing to broken differential locks, thought to be due to insufficient clearance allowed for engagement of the gears.¹³¹ Comment by officers commanding the workshops include one noting "the condition of the Machines and the spare parts, which they brought with them, was lamentable".¹³² Elles went further, pointing out:

I wish you could talk to him [Stern] on the question of the Sprocket Pinions now being sent out to us. I don't know whose fault it is, the designer, the manufacturer or the Inspector, but I do consider it monstrous that the machines should be delivered to us in a condition which makes them fundamentally unfit to take the field without the expenditure of a great deal of labour and that after having been officially inspected and passed by the Ministry of Munitions".¹³³

Elles continued by explaining that the arming of 4th Battalion had been delayed by about a week entirely due to this cause, since:

¹²⁸ Swinton, *Eyewitness*, p. 300. It was only five weeks later that Swinton was first informed, confidentially, that he "was to be superseded."

¹²⁹ National Archives, MUN4/2791, Glasgow to HQ Heavy Branch, 28 April 1917.

¹³⁰ *Ibid*, report dated 6 May 1917 by Lieutenant-Colonel Lannowe.

¹³¹ National Archives, MUN5/211, Ministry Inspection Department at Oldbury (Metropolitan) to Lt. Robertson at MM, London, 18 January 1917.

¹³² National Archives, WO158/805. History and organization of central workshops and stores, Heavy Branch, Machine Gun Corps (Tank Corps). 4 December 1916 to 31 December 1916, compiled by Lt.-Colonel. J.G. Brockbank.

¹³³ National Archives, WO158/816, Elles to Capper, 15 June 1918.

every sprocket pinion spare that we are receiving has got to be laboriously trundled into the shop to be fitted with new bolts and to be properly bored out. I hope somebody will be hanged for this. Somebody certainly deserves to be".¹³⁴

Stern's detailed response to some twenty-seven headings of complaint suggests that not all were justified, even that some of the issues the subject of complaint had been requested by workshops in France or by GHQ.¹³⁵ This applied in particular to complaints associated with Lewis Guns.¹³⁶ Stern's memorandum summarised and answered sixteen varied complaints plus a further twelve related specifically to the Lewis Gun.

The Special Committee advised that the Lewis Gun "should be discarded at once" and considered the Hotchkiss best met requirements. It was easy to manipulate within the confined space of the tank turret, was fixed rigidly with minimum vulnerability outside the turret, was capable of accurate fire with one hand and was subject to few stoppages. Lewis Gun problems originated in France, but sound management by the Ministry could have saved the BEF from its own flawed proposal. Ministry management generally, and the inspection process specifically, lacked sound authoritative qualities. There is little doubt that the inspection process should have been separated from manufacture and that successive Ministers failed to grasp this particular nettle. Since the above comments by Elles were made only five months before the Armistice, it is difficult to reconcile this with *The History's* verdict that changes undertaken to the inspection process in 1917 could reasonably be described as falling within the ambit of the Ministry "putting its house in order".¹³⁷

The question of decentralisation was also relevant to efficiency of production. *The History* states that the branches of the Department dealing with design, supply and inspection all reported direct to the DG and were interdependent. The supply branch dealt with negotiation and administration of contracts but had no external staff and was entirely dependent on the Inspection Branch for information on progress and sources of supply. Standard parts were ordered in

¹³⁴ Ibid.

¹³⁵ National Archives, MUN4/2791, Stern to Layton, undated response to criticisms in Army Council letter of 7 May 1917.

¹³⁶ National Archives, MUN4/2791, Stern to Layton, undated memorandum providing basis of reply to Army Council letter of 7 May 1917 alleging "the tanks now being delivered are not in an efficient fighting condition as regards the Lewis Gun Mountings".

¹³⁷ National Archives, WO158/816, Elles to Capper, 15 June 1918.

large quantities and stored centrally at Leicester or at erectors' factories. Armour plate and optical stores were similarly acquired and stored at Birmingham or Glasgow and Leicester respectively. With the exception of armament, the responsibility for providing tank equipment and accessories, initially undertaken by four different Departments, was allocated solely to the MWSD. Although *The History* does not say so, and Stern makes no reference to the matter, it appears possible that the inflexibility displayed by Stern in switching work to upgraded models was partly due to the introduction of this system, since the Ministry would be reluctant to switch to later models at the cost of writing off the stock of parts accumulated for earlier contracts. This applied principally to the Mark IV, under production for nearly two years, a source of great frustration to Elles and the army generally, since for much of this period they regarded it as an obsolete model. Elles made his views plain in April 1917 at which time some 300 Mark IV tanks had been completed or were nearing completion:¹³⁸

Mark IV machine will not do what we want: this has become quite plain from the Arras Battle. Our casualties in Tanks have been....ninety percent due to the Tank being hit while stationary, either because it was bellied or in difficulties, or because it had to stop to swing or turn. I am very strongly of opinion that we must have something faster and handier which can be driven by one man instead of by four, and will not stop in heavily shelled ground. The wear and tear on men in digging out tanks has been very great, and there has been a large percentage of casualties caused to men outside Tanks."¹³⁹

Yet over five months later, at a conference called by Churchill to consider the tank programme, some 775 Mark IVs had been delivered to the Ministry's transport offices, weekly completions in the four weeks ending on the date of that conference being 134 machines. The notes of the conference show that Elles and his colleagues from the War Office and GHQ repeated the view that "GHQ did not want any more of that type", but records show deliveries of the main components of hulls, engines and sponsons, were adequate to sustain production at the recently achieved rates for well over a month.¹⁴⁰ A handful of deliveries were still being made in the last week of the war.¹⁴¹

¹³⁸ National Archives, MUN4/5168, Weekly Review of Output Statistics.

¹³⁹ National Archives, MUN4/700, Elles to Anley, 23 April 1917.

¹⁴⁰ National Archives, MUN4/5168, Weekly Review of Output Statistics.

¹⁴¹ National Archives, MUN4/837, Statistics, Tanks, Allies - Position in the Field, November 1918.

Mark II/III tanks were completed by the end of February 1917.¹⁴² The tail was omitted from both models, which had cast iron rollers and spuds on the track plates (Mark II) and thicker armour (Mark III).¹⁴³ Although it was envisaged that many of these tanks would be used for training purposes in England, the failure of the Ministry to provide any Mark IV tanks for the Battles of Arras in April 1917 resulted in Mark II training tanks being hastily collected in France to take part in the forthcoming battle.¹⁴⁴ Since the armour of these tanks was vulnerable to penetration by the German K bullet, this was the source of some disagreement between Stern and those advocating their deployment. Claims have been made that some of the tanks used at Arras were even less resistant to armour-piercing bullets than the Mark I at Flers in that they had been constructed of mild steel. Glanfield relies upon an entry in *Tanks 1914-1918* to conclude that some of the training tanks used at Arras were made of mild steel.¹⁴⁵ The evidence is not conclusive in respect of all relevant parts of all the tanks. It would appear Stern may have been mistaken or was exaggerating in order to emphasise what he regarded as an unwise decision to use tanks in combat before full modifications had been incorporated in accordance with combat experience. Nevertheless, his reservations and allegations were sufficient to stir Anley into action and he visited Wool to assure himself that tanks to be sent to France were constructed of armour plate. Anley explained:

information that only 15 Tanks at Wool had bullet-proof Front plates was based on a minute from the M.W.S. Dept. I proceeded to Wool to verify by testing plates with a chisel and the minute from the M.W.S.Dept. was found to be incorrect: this was confirmed by another minute from the M.W.S.Dept.¹⁴⁶

Stern's letter of objection to Addison did not mention mild steel, yet this, had it been true, would surely have formed a significant element in the case he was endeavouring to develop against the use of practice tanks at Arras.¹⁴⁷ Remarks by Watson, a tank commander, hint at a solution to the armour/mild steel issue,

¹⁴² National Archives, WO161/25, Internal memorandum to MGO, forming basis of complaint to War Cabinet re. delay in supply of Mark IV. Confirms Mark II/III delivered in January/February.

¹⁴³ Stern, *Tanks*, p. 113.

¹⁴⁴ Fletcher, *British Mark I Tank*, pp. 41-43 (The Mark III); Basil Liddell Hart, *The Tanks, The History of the Royal Tank Regiment and its predecessors Heavy Branch Machine-Gun Corps, Tank Corps and Royal Tank Corps, vol. I, 1914-1939* (London, Cassell, 1959), pp. 95-96.

¹⁴⁵ Stern, *Tanks*, pp. 148-149.

¹⁴⁶ National Archives, WO158/845, Anley to DA, 24 February 1917.

¹⁴⁷ Liddell Hart Centre for Military Archives, Swinton Papers, Stern to Addison, 12 March 1917.

since he records that on some Supply Tanks sponsons were constructed of mild steel.¹⁴⁸

Those involved in producing Mark IV tanks early in 1917 advanced a range of explanations for delay. Observations by Stern, Addison and the Ministry's Historians can readily be seen as unreliable. The reasons given by Stern included scarcity of raw material, shortage of labour, delays in transit and difficulty in obtaining tools.¹⁴⁹ These were, conveniently, matters for which he could not be held responsible: his claims relating to labour were disputed by Taylor.¹⁵⁰

Harris claims the tanks involved at Arras "were Marks I, II and III".¹⁵¹ *The History* states that Mark III, being experimental, was not supplied and that none left England.¹⁵² Falls, Fletcher and Fuller support the statement in *The History* that no Mark III was sent to France.¹⁵³ However, apart from the comment that the Mark III was experimental, no explanation is given for the retention of all Mark III tanks in England and the dispatch only of Mark II to France to join surviving Mark I machines. One of the enhancements incorporated in the Mark III was thicker armour, which would have been beneficial in combat but of no value for training at Wool. These factors suggest the Mark III was constructed of mild steel. Criticism of British tank actions during the war tend to emphasise the tactical use of the new machines and problems associated with their design. It is clear however that the manner in which the Ministry performed its role in organising and controlling tank supply also had a bearing on numbers and effectiveness of tanks in combat.

The principal role in the Spring Offensives was to be undertaken by the French Army. The British attack, commencing a week earlier, was intended to tie down enemy Divisions and attract reserves.¹⁵⁴ Haig would have been disappointed that

¹⁴⁸ W.H.L. Watson, *With the Tanks 1916-1918: Memoirs of a British Tank Commander in the Great War* (Barnsley, Pen and Sword, 2014), p. 211; John Foley, *The Boilerplate War* (London, Frederick Muller, 1963) adopts the allegation of the use of mild steel as the title of his book, but the comments of tank crew were not necessarily correct: they may have been misled by the penetration of tanks at Arras by German AP rounds.

¹⁴⁹ Stern, *Tanks*, p. 121; Ministry of Munitions, *History*, vol. XII, part 3, pp. 42-43.

¹⁵⁰ National Archives, MUN4/2791, Taylor to Kellaway, 27 February 1917.

¹⁵¹ J. P. Harris, *Men, Ideas and Tanks: British Military Thought and Armoured Forces, 1903-1939* (Manchester, Manchester University Press, 1995), p. 96.

¹⁵² Ministry of Munitions, *History*, vol. XII, part 3, p. 72, Ministry production figures show Mark III machines were constructed early enough to have participated in the Battles of Arras.

¹⁵³ Cyril Falls, *Military Operations, 1917*, vol. I, p. 13; Fletcher, *British Mark I Tank*, p. 43; Fuller, *Tanks*, p. 82.

¹⁵⁴ *Ibid*, pp. 81-82; Falls, *Military Operations, France and Belgium, 1917*, vol. I, p. vi.

more tanks were not available and that the sixty that were passed fit for duty comprised surviving Mark I tanks from The Somme and Mark II training tanks.¹⁵⁵ It was decided to divide these among the three Armies involved in the offensive rather than concentrating the force in an attempt to secure a break-through at a single point.¹⁵⁶ The concern of the War Cabinet was justified.¹⁵⁷ For a major series of offensives, the BEF's tank force fell short of acceptability, numerically and in quality.

It is not possible to attribute specific consequences to the shortage of machines but it is fair to draw attention to tactical and structural limitations, to possible consequences upon the level of casualties for the army generally and for Heavy Branch specifically.¹⁵⁸ The British average daily casualty rate for the Battles of Arras exceeded those for all other major offensives undertaken by Haig during the war.¹⁵⁹ Casualties for tank crew were increased by the inability of armour, particularly on the flanks, to resist AP rounds.¹⁶⁰ The problem was accentuated by the capture of tanks at Bullecourt and consequent enemy discovery of this weakness, resulting in the general issue of AP bullets to all German infantry units.¹⁶¹ Whereas the consequences of failure to produce more tanks for the offensives or to deploy them differently are open to debate, the consequences of loss of tanks or crew members to AP rounds can be identified as a direct consequence of the failure of the Ministry to provide tanks possessing the level of protection required following experiences on the Somme. Effective armour protection had been one of the major enhancements requested by Elles in September 1916.¹⁶² The importance of this factor at Arras was more significant than on the Somme, where AP ammunition had not been widely available to German units. Losses resulting from this factor were therefore more severe:

On 23 April eleven [tanks]....were employed in operations around Monchy, Gavrelle, and the Chemical Works at Rœux; excellent results were obtained, but no fewer than five out of the eleven machines

¹⁵⁵ Ibid, p. 82.

¹⁵⁶ Liddell Hart, *The Tanks*, p. 102.

¹⁵⁷ National Archives, CAB23/2, minutes of War Cabinet meeting 102, 22 March 1917, item 7 Tanks.

¹⁵⁸ Fuller, *Tanks*, pp. 82-83.

¹⁵⁹ War Office, *Statistics of the Military Effort of the British Empire in the Great War* (London, HMSO, 1922), pp. 253-271; Falls, *Military Operations, 1917, vol. I*, pp. 556-561; Jonathan Nicholls, *Cheerful Sacrifice: The Battle of Arras 1917* (Barnsley, Pen and Sword, 2010), p. 211.

¹⁶⁰ William Henry Lowe Watson, *A Company of Tanks* (Edinburgh, 1920), pp. 82 and 86.

¹⁶¹ Graham Keech, *Bullecourt: Arras* (Barnsley, Pen and Sword, 1999), p. 55; Liddell Hart, *The Tanks*, p. 96; Fuller, *Tanks*, pp. 87-88.

¹⁶² National Archives, WO158/836, Elles to General Staff, 30 September 1916.

sustained serious casualties from armour-piercing bullets, which had now become the backbone of the enemy's anti-tank defence.¹⁶³

Tank 716 would appear to have been one of the victims of AP rounds, all four crew casualties having been "hit whilst in the car".¹⁶⁴ The Commander's Action proforma also drew attention to problems caused by replacement of Hotchkiss machine-guns "The Lewis Gun mountings were bad, many targets were lost owing to the time it took to mount the gun, and finally we mounted the gun through the front flaps". Army tactics did not assist tank operations since the scale of bombardment of enemy positions and heavy precipitation combined to create ground conditions conducive to ditching.¹⁶⁵ As a result of a combination of factors, production delays, nature of construction and effectiveness of tactical measures, tanks did not achieve the degree of casualty limitation envisaged by Swinton and were only partially successful.¹⁶⁶ Fuller considered the main tactical lessons were to use tanks in mass, to keep a reserve and to avoid wet, heavily shelled ground. He also believed the moral effect of tanks to be very great and counter-battery work and use of supply and signal tanks to be essential.¹⁶⁷ Fuller recorded that:

The general result of the tank operations was favourable, though the number of casualties exceeded expectations. The value of the work they accomplished was recognised by all the units with which they worked. The casualties they inflicted on the enemy were undoubtedly heavy; in most cases where they advanced the infantry succeeded....¹⁶⁸

Seventy-two Mark IV tanks were available to support the attack on Messines Ridge.¹⁶⁹ Williams-Ellis recorded there were "as usual, a shortage of instructional machines" and that dummy tanks of wood and canvas were used for several practice attacks.¹⁷⁰ Although a number of improvements had been made, in many

¹⁶³ Fuller, *Tanks*, p. 88; Trevor Pidgeon, *The Tanks at Flers: An Account of the First Use of Tanks in War at the Battle of Flers-Courcelette, The Somme, 15th September 1916* (Cobham, Fairmile, 1995), p. 186.

¹⁶⁴ Fuller, *Tanks*, pp. 95-97, Battle History of Crew No. 9, Tank No. 716, 23 April 1917: "car" is army shorthand for "tank".

¹⁶⁵ Liddell Hart, *The Tanks*, p. 96; Fuller, *Tanks*, p. 85; National Archives, CAB27/8, Elles to Edmonds, 4 September 1934, explains the change heavy shelling had on ground conditions by the time tanks were used.

¹⁶⁶ Fuller, *Tanks*, pp. 85-89.

¹⁶⁷ *Ibid*, p. 89.

¹⁶⁸ Fuller, *Tanks*, p. 88, Australians at Bullecourt might have contested the universal application of this claim.

¹⁶⁹ National Archives, CAB45/200, (Original letters, comments, personal accounts, and extracts from War Diaries: Tank Corps), unattributed, but clearly by Fuller, Report on Tank Operations, (or draft of his book on *Tanks in The Great War*), Messines, Distribution.

¹⁷⁰ Williams-Ellis, *The Tank Corps*, p. 110.

respects the Mark IV “did not differ very materially from its predecessor [Mark I] in design”.¹⁷¹ So far as fighting capability was concerned, the essential differences were a heavier design of track roller, which improved reliability, a wider track, that reduced the range of conditions under which bellying would occur, and enhanced armour, resistant to AP bullets.¹⁷² In the event, the relatively small operation at Messines was so well planned and executed that tanks played a limited role. Williams-Ellis recorded that tanks proved useful in several phases of the battle, but the laurels belonged to the artillery, the infantry and the tunnelling companies, for whose work the battle is perhaps best remembered.¹⁷³ GHQ learned little new from the Battle of Messines. Tanks continued to perform well in patches and reliability was somewhat enhanced from the low standards exhibited in 1916. However, their slow speed and complex manoeuvring and gear changing remained severe disadvantages. They found difficulty keeping up with infantry, lacking the speed, reliability and manoeuvrability necessary to plant a more significant footprint on the battlefield. Supply tanks, converted Mark I models, were available for the first time: each battalion had six of these and two reserve tanks.¹⁷⁴ By and large special hardened steel had overcome the problem of the armour-piercing bullet and, importantly, the enemy appeared to be unaware of this fact.¹⁷⁵

Messines represented the first, though minor stage, of Haig’s ambitious and controversial 1917 Flanders offensive. As this reached a successful conclusion in the middle of June, the return of Churchill to the government drew nearer. Neither he nor Lloyd George favoured the wastage of British strength in “bloody and indecisive siege operations” preferring to await the build-up of American forces.¹⁷⁶

Within military circles, the impact of the first use of tanks was limited.¹⁷⁷ Results were patchy. Many tanks simply did not rendezvous with their infantry,

¹⁷¹ Ibid, p.111; Captain Wilfrid Miles, *Military Operations France and Belgium, 1917 vol. III*, (London, HMSO, 1948), pp. 13-14; Bryn Hammond, *Cambrai 1917: The Myth of the First Great Tank Battle*, (London, Weidenfeld and Nicolson, 2008), p. 43.

¹⁷² Williams-Ellis, *The Tank Corps*, p.111.

¹⁷³ James E. Edmonds, *History of the Great War: Military Operations France and Belgium, 1917 vol. II*, pp. 90-95.

¹⁷⁴ Fuller, *Tanks*, p. 125.

¹⁷⁵ Foley, *Boilerplate War*, pp. 49-50; Liddell Hart, *The Tank Corps*, pp. 110-118.

¹⁷⁶ Edmonds, *Military Operations France and Belgium, 1917, vol. II*, p. ix.

¹⁷⁷ Royal Commission on Awards to Inventors, 21 October 1919, examination of Johnson by Watson, answers to questions 3252-3255.

others had ditched or broken down before contributing significantly to the battle.¹⁷⁸ The under-specification of the tracks resulting from d'Eyncourt's inadequate brief to designers magnified their unreliability to the general military fraternity. This reputation may have contributed to missed opportunities in the only example of the use of tanks beyond the Western Front, since, following partial success at Flers, Robertson showed initiative in seeking to provide tank support for the EEF as they sought to advance towards Palestine. This request for tanks was not welcomed by Stern who expressed the view that, without a lengthy delay to change elements of their design, tanks were not suited to desert conditions.¹⁷⁹ However, Montagu was more receptive and Elles provided operational advice for Archibald Murray, Commander-in-Chief of the EEF.¹⁸⁰ Eight tanks and personnel arrived in Egypt in January 1917 and took part in familiarisation exercises near Gilban.¹⁸¹

The War Cabinet entertained ambitious objectives for the EEF, but Murray did not use his tanks in the First Battle of Gaza on 26 March. Fuller, whose source of information was the 2i/c of the Tank Corps detachment, states that in February "orders were suddenly received one day for the detachment to move with all possible speed to the fighting zone".¹⁸² The following day, the detachment arrived within fifteen miles of Gaza where it "remained for ten days". During this period the First Battle of Gaza came to an end.¹⁸³

There is considerable interest and speculation concerning actions at First Gaza, with many holding the view that the attack was called off at a point when it had virtually succeeded.¹⁸⁴ In these circumstances, it was possible the use of the tanks might have been decisive. It would appear Murray was influenced by others in his Command since Gullett revealed:

¹⁷⁸ Pidgeon, *Tanks at Flers*, pp. 59-179.

¹⁷⁹ National Archives, WO32/5754, Stern to War Office, 4 November 1916.

¹⁸⁰ National Archives, WO95/4366, Elles to Robertson, 20 November 1916.

¹⁸¹ Liddell Hart, *The Tanks*, p. 102; Fuller, *Tanks*, p. 98.

¹⁸² Tank Museum, C. P. Tothill and "Ranker", *The Tank Corps Journal*, vol. 1-3, "*Tanks in Palestine*", p. 104.

¹⁸³ Fuller, *Tanks*, pp. 98-99. Fuller noted that he was unable to provide dates for all events since the 2i/c, Major O. A. Forsyth-Major, "lost all his documents at sea in May 1918 when the ship on which he was returning to England was torpedoed and sunk".

¹⁸⁴ Lt.-Colonel C. Guy Powles, *New Zealand in the First World War 1914-1918: The New Zealanders in Sinai and Palestine: The First Battle of Gaza* (Auckland, Whitcombe and Tombs, 1922), p.96; Basil Liddell Hart, *The Tanks: The History of the Royal Tank Regiment* (London, Cassell, 1959), p. 126 and Henry Somer Gullett, *The Australian Imperial Force in Sinai and Palestine 1914-1918* (Sydney, Angus and Robertson, 1923), pp. 282-287.

British officers on the front who had seen the tanks at work in France were emphatic that they would be ineffective on the exposed, hard country immediately north of Wady Ghuzze, and that the ground, cut up as it was with branches of the wady, would be in places too rough for their progress.¹⁸⁵

Murray's Despatch is silent on this issue. He mentions tanks only twice in his twenty-four-page Despatch for the period covering First and Second Gaza.¹⁸⁶ In a letter written on his behalf shortly after the tanks were used at Second Gaza the view was expressed that "Tanks have been put to a severe test owing to the distance over very difficult terrain....to their objectives: nevertheless with a single exception all tanks succeeded in reaching the objectives allocated to them". The conclusion, notwithstanding limitations, was that "these machines have already proved themselves of the greatest value in this theatre, and it is probable that, as my operations develop, their value will proportionately increase".¹⁸⁷ Murray was replaced by Allenby shortly after Second Gaza, his Despatch did not accurately reflect the serious defeats he had suffered. Clearly, he would not have wished to draw attention to the fact that, in March, he had not tabled a potentially winning card. The only redeeming factor for Murray's decision not to use the tanks would appear to be that advice from Elles did not mention that the main weakness of the Mark I had been identified two months before the tanks sailed for Egypt. There is no record of tracks causing special problems when the tanks were used at Gaza in April.

Fuller is critical of the use of tanks at Second and Third Gaza largely due to the extent to which the small force was subdivided and used for an excessive number of tasks.¹⁸⁸ Allenby had replaced Murray as C-in-C by the time of the Third Battle and three Mark IV had been received to replace the losses of Mark I. Fuller's conclusion for Third Gaza was that on the whole "tank operations...were of assistance to the infantry. All tanks reached their first objective; four reached second, third, and fourth and one reached its fifth objective".¹⁸⁹

Notwithstanding the concerns of Stern and others, a pragmatic approach by those on the spot had shown that tanks could be employed in desert regions,

¹⁸⁵ Gullett, *Australian Imperial Force*, pp. 258-259.

¹⁸⁶ Murray Fourth Despatch, section 10, p. 11.

¹⁸⁷ National Archives, MUN4/2791, Murray to War Office, 27 April 1917.

¹⁸⁸ Fuller, *Tanks*, pp. 101-102.

¹⁸⁹ *Ibid*, pp. 132-133.

provided care was taken in greasing, design of sprockets and rollers and respect for the temperature: the EEF recorded mid-day temperatures “as high as 200°F” inside the machines, thereby restricting possible usage.¹⁹⁰

The key issue is that the opportunity to use the tanks to greatest effect had been lost by the apparent unwillingness of Murray to deploy his new, unfamiliar assets at First Gaza. Failure to capture Gaza on 26 March resulted in two further battles to take the settlement, the first, a heavy defeat, before success was secured in October. The episode appears to support criticisms by those holding the view that the army was slow or reluctant to adopt new technology. However, the general pattern of response to technological advancement cannot be judged by a single element in the broad gamut of issues faced by the army and it seems likely that the integration of tanks into the military repertoire posed specific problems. Furthermore, much depends on the human factor. Whereas the BEF enjoyed the presence of a C-in-C well-disposed to new technology, this does not appear to have applied to the same extent in the EEF early in 1917.¹⁹¹

The source of certain elements of Fuller’s information is unreliable. Events relating to First and Second Gaza may have become confused, since the War Diary shows the tanks did not move forward before the first battle but remained at Gilban from 27 January until 28 March when part of the detachment moved forward to Khan Yunis.¹⁹²

In the Australian History, it is claimed “Murray appears to have attached great importance to the recent arrival of six tanks” and that great pains were taken “to keep their presence secret as they were smuggled up the line”.¹⁹³ These statements are inconsistent with the Detachment’s War Diary and accounts of

¹⁹⁰ National Archives, MUN4/2791, Murray to War Office, 27 April 1917.

¹⁹¹ Gary Sheffield and John Bourne (eds.), *Douglas Haig: War Diaries and Letters 1914-1918* (London, Weidenfeld and Nicolson, 2005), pp. 18, 58, 165 and 171-172, Haig’s had low opinion of Murray’s character and abilities, “He (Kitchener) said ‘Would I like Murray?’ (as his CS when taking over from French) I said no”, “I raised no objection to giving Archie Murray (now CIGS) a Corps, because he is quite fit to command a corps on a defensive front, and is an educated soldier, though (rather) lacking in decision and judgement”. In 1917, Murray’s actions confirmed Haig’s assessment.

¹⁹² National Archives, WO95/4407, EEF Tank Detachment War Diary, April 1917. Similarly, the Tank Journal is mistaken in stating “Early in March, the Tank Detachment moved to Deir El Belah in preparation for the Second Battle of Gaza”: it moved to Deir El Belah on 1 April 1917; Archibald Percival Wavell, *The Campaigns in Palestine* (London, Constable, 1931), p. 70, the railway was approaching Rafa on 5 March, three weeks before the First Battle of Gaza.

¹⁹³ Gullett, *Australian Imperial Force*, p. 258.

those involved. They provide no information on Murray's reason for not using tanks in the attack.¹⁹⁴

Murray had not asked for tanks and it seems likely he was more comfortable fighting with resources with which he was familiar. Hadaway identifies "overconfidence" at the root of avoidable problems encountered during the battle.¹⁹⁵ It seems quite possible that this explanation applied to Murray's failure to deploy his tanks in March. The use of tanks during Second and Third Gaza was not outstandingly successful, but defences had been strengthened.¹⁹⁶

Although tanks did not impress all branches of the army, public perception of their achievements, magnified by the nature of press coverage and untainted by the spotlight of unreliability, was far greater. The advent of the tank afforded the British press the opportunity to cover a new element in the war. Being favourable to the nation, exploits of tanks, subject to an initial embargo on photographs or accurate descriptions, were unlikely to attract the censor's red pen. Notwithstanding the continuing inclination/requirement for the press to paint a rosier picture than was justified by military achievements, the performance at Flers did represent an improvement in combat effectiveness when compared to earlier BEF efforts or those of other British forces elsewhere. A relative freedom therefore existed for the press to indulge in an enhanced level of jingoistic reporting.¹⁹⁷ Despite the continued growth of the number of families in mourning, there was at last some positive news. Reports could be based on a tangible

¹⁹⁴ Murray Fourth Despatch, section 10, p. 11. The original version of Murray's Despatch, submitted to Derby in June 1917, was considered by the War Cabinet on 14 August 1917, following which it was passed to the WO for editing prior to release. The purpose of the editing was not simply to remove material that might have been of use to the enemy, but also for political reasons, a point admitted in the minutes of a conference at 10 Downing St. in 1920 when Murray sought permission to publish his original Despatch (CAB/23/37, 3 February 1920, pp. 3-4). However, to a large extent, Murray was the victim of misrepresenting his own achievements in earlier Despatches and communications with the WO: he comes across poorly in both versions of the Despatch, particularly in excuses that were removed from the original twenty-eight-page document.

¹⁹⁵ Marquess of Anglesey, *A History of the British Cavalry 1816-1919, vol. 5 1914-1919 Egypt, Palestine and Syria* (London, Leo Cooper, 1994), pp. 105-106; Stuart Hadaway, *From Gaza to Jerusalem: The Campaign for Southern Palestine 1917* (Stroud, History Press, 1917), p. 53.

¹⁹⁶ George MacMunn and Cyril Falls, *History of the Great War, Military Operations Egypt and Palestine, vol. 1* (London, HMSO, 1928), p. 326; Wavell, *Palestine Campaigns*, pp. 124-125.

¹⁹⁷ This reporting is well illustrated in words and cartoons, for example in the *Daily Mail*, 18 and 22 September 1916. The text and the messages in cartoons are exaggerated but based on fact.

element of success and cartoons could lampoon the discomfiture of the enemy in the face of British innovation.¹⁹⁸

There had been little to celebrate during the preceding two years. The press therefore took full advantage of the opportunity to herald a gratifying change in the course of the conflict.¹⁹⁹ Despite press censorship, the experiences and disappointments of the first two years, particularly the disastrous first day of the Somme, had progressively become more deeply etched into the national psyche.²⁰⁰ Loss of life was no longer contained to the ranks of volunteers or those limited numbers of civilians who might fall victim to actions at sea, coastal shelling or air attack. Conscription had been introduced in January 1916 for single men aged 18-41: married men were drawn into the net four months later.²⁰¹ In these circumstances it was not surprising that there were advocates for a negotiated conclusion to the struggle.²⁰² Some might say that by offering a ray of hope, the manner in which the tank was portrayed in the press administered a form of vaccine to combat war weariness and to safeguard the nation from the virus of gloom and despair. Others would see tanks as a medium for prolonging the conflict and increasing loss of life and national wealth.

On 16 September 1916 the first reports of the new weapon appeared in the press, "Splendid British gains", "Surprise Cars", "A New Fighting Machine".²⁰³ The fact that reports were somewhat vague would have heightened interest and expectations. Subsequent reports on achievements were exaggerated, but there was a kernel of truth and a basis for hope. The number and nature of the items and advertisements in newspapers and periodicals bore witness to the extent of national interest.²⁰⁴ By 15 January 1917, exactly four months following the first

¹⁹⁸ See for example, 'The Huns Terror of The Tanks as imagined by Louis Raemaekers', *The Times*, 22 September 1916, and 'Soldiers' Tales of the Tanks – Germans Astride a Monster', *The Times*, 20 September 1916.

¹⁹⁹ James Munson (ed.), *The Great War: The People's Story: The Diary of the Reverend Andrew Clark, 1914-19* (Oxford, Oxford University Press, 1985), entries for July and August 1916 and editorial comments, pp. 226-235.

²⁰⁰ Isobel Charman, *The Great War: The People's Story* (London, Arrow Books, 2015), entry for 2 July 1916, p. 229.

²⁰¹ Military Service Act 1916 received Royal Assent 27 January 1916.

²⁰² Lloyd George, *War Memoirs*, pp. 514-535 and Harold Kurtz, 'The Lansdowne Letter', *History Today*, 1 February 1968, 18, 2, pp. 84-92.

²⁰³ 'Splendid British Gains', *Daily Mail*, 16 September 1916 and 'Great British Advance', *The Times*, 16 September 1916.

²⁰⁴ The tank appeared not simply in reports from the Front, but in advertisements for entertainment and household products, for example, Wrights Coal Tar soap in the form of a tank, see *Illustrated London News*, 13 January 1917.

appearance of the tank in combat, the public quest for information would result in 111 picture houses in the London area showing a film based on the new weapon.²⁰⁵ The following week the film would be released in “the provinces” and later in the year tanks would form the basis of a major national fund-raising activity in which towns competed on a per capita basis to be top of the fund-raising league.²⁰⁶ According to the Director of Special Publicity for the National War Savings Committee, none of the many methods adopted to induce the public to invest in War Bonds was more successful than the “Tank Bank”, since “The Tanks captured the imagination of the man in the street like no other device of modern warfare”.²⁰⁷

This boost to national morale was sorely needed. Not only had the military conflict been unsuccessful, but other key areas were also a cause for concern. Owing to U-boat successes and demands on shipping resources posed by the requirement for munitions and raw materials, the level of national reserves of foodstuffs, albeit perhaps unjustifiably, were of concern.²⁰⁸ The government was seen as unable to come to grips with the situation and Asquith was increasingly coming into focus as an explanatory factor for ineffective national government.²⁰⁹ Churchill and Lloyd George might not have been unbiased commentators on the nation’s plight during 1916, but their observations, as two parliamentarians most energetically committed to a full-blooded form of national warfare, are worthy of special note.

Churchill did not mince his words during parliamentary debate though it was only in private correspondence that he made personal attacks on Asquith. Thus, Churchill confided to C. P. Scott, the “numbing hand of Asquith is over everything, and all initiative and energy seem paralysed”.²¹⁰ However, perhaps only to his wife did Churchill reveal the full extent of his feelings towards Asquith and

²⁰⁵ ‘Come and see the Tanks advance at the Front’, *Daily Mail*, 11 January 1917.

²⁰⁶ See, for example the table in ‘The Tanks’ Second Million’, *The Times*, 15 January 1918. See photograph 28.

²⁰⁷ The Tank Museum, ‘How Tanks Sold War Bonds’, *Tank Journal*, vol. 1, 1919, H Holford Bottomley.

²⁰⁸ Taylor, *Diary by Frances Stevenson*, p. 121; Lloyd George, *War Memoirs*, pp. 576-580.

²⁰⁹ Ibid, pp. 578-579, 581 and 586, Richard Toye, *Lloyd George and Churchill: Rivals for Greatness* (London, Macmillan, 2007), pp. 166-168; Basil Liddell Hart, *History of the First World War* (Trowbridge, Cassell, 1973), p. 384; Taylor, *Diary by Frances Stevenson*, pp. 122 and 127-131.

²¹⁰ Martin Gilbert, *The Churchill Documents*, vol. VII (London, C and T Publications, 2019), Churchill to C P Scott, 10 April 1916, pp. 1486-1487.

Kitchener since to her he expressed the venomous prediction that “the hour of Asquith’s punishment and K.’s exposure draws nearer. The wretched men have nearly wrecked our chances. It may fall to me to strike the blow. I shall do it without compunction.”²¹¹

Churchill lacked the power to deliver a blow of any substance, but Lloyd George occupied a sharply contrasting position. His views on the manner in which the nation should conduct the war closely resembled those of Churchill. He made no secret of his quest for a more comprehensive approach to the conflict and possessed the advantage, when appealing to the nation, of talented oratory by one from a lower social background than many politicians of the period.²¹² Widely seen as anxious to pursue the war more energetically and having demonstrated he was, at least temporarily, prepared to slide to a less elevated position on the political greasy pole in order to contribute more directly to the war effort, he commanded a degree of cross-party support and national respect that Churchill lacked. In the event it was he who was capable and prepared to wield the political knife to move the nation more rapidly towards a form of “total war”, which he saw as essential if victory were to be achieved.²¹³

French tanks progressed on a schedule several months behind that of Britain. Two Medium French Tanks were developed. The larger St. Chamond, which, owing to production and design delays or errors, accounted for only thirty-two of the 240 strong tank-force available for the first French offensive in April 1917, and the Schneider. Development of French tanks followed a different course to that adopted in Britain. Development of the Schneider, based on the Holt Tractor, followed the lines advocated by Colonel Jean Estienne, the acknowledged “father” of the French force, but the St. Chamond was designed by the Société des Forges et Acieries de la Marine after communication with the government.²¹⁴ The production of two “Medium” tanks, at a time when resources and

²¹¹ Ibid, Churchill to Clementine, 15 December 1915, pp. 1330-1331.

²¹² Iain Maclean, *Rational Choice and British Politics: An Analysis of Rhetoric and from Peel to Blair* (Oxford Scholarship Online, 2003), Chapter Six, Lloyd George: Supreme Tactician and Ambitious Strategist, p. 2, <https://oxford.universitypressscholarship.com/view/10.1093/0198295294.001.0001/acprof-9780198295297>, accessed 1 August 2019; Richard Toye, ‘Lloyd George’s War Rhetoric, 1914-1918’, *Journal of Liberal History*, 77, Winter 2012–13, pp. 24-29, (p. 24).

²¹³ Lloyd George, *War Memoirs*, pp. 583-594.

²¹⁴ T. E. Compton, The French Tanks, *The Journal of the Royal United Services Institution*, vol. LXV, November 1920, pp. 637-655 (p. 637).

manufacturing facilities were in short supply, appears inexcusable: it was a product of rivalries within French political circles.²¹⁵

The St. Chamond incorporated a 75mm gun, the most powerful tank gun used before the middle of the Second World War, but it lacked a robust drive. In the political and industrial circumstances surrounding its design and production the criticisms of the St. Chamond by Estienne and others might be judged as prejudiced, but its performance provided ample evidence that criticisms were valid. Nicknamed “the elephant on the legs of a gazelle” the St. Chamond’s limited track length and width resulted in ground loading approximately double the standard that should have been achieved.²¹⁶ The weaknesses of the St. Chamond suggest Estienne’s vision and experience would have been beneficial. They also appear to support the picture in post-war accounts of the *Artillerie Speciale* project as a struggle between a man of genius and narrow-minded bureaucrats, both military and civilian.²¹⁷ Elements of this picture may have some validity, but the performance of the original Schneider tanks suggests Estienne’s abilities in tank design may have been overrated. Following liaison at Chamlieu in January 1918, Fuller recorded in his Private Journal that their “big tanks are like kitchen ranges on tracks – quite useless”.²¹⁸ At a joint meeting of British and French representatives in Paris following the first attack by French tanks, Stern recorded that French representatives, including Estienne, “generally seemed highly dissatisfied with the French tank.”²¹⁹

In contrast, the later, light Renault was generally considered a success and formed part of an exchange due to have been completed with Britain had hostilities continued into 1919. In the event, both nations had difficulty producing sufficient tanks for their own purposes. Britain supplied a number of heavy tanks

²¹⁵ Tim Gale, *The French Army’s Tank Force and Armoured Warfare in The Great War* (Farnham, Ashgate Publishing, 2013), pp. 25-26; Leon Dutil, *Les Chars d’Assaut: Leur Creation et leur Rôle pendant la Guerre 1915-1918* (Nancy, Berger-Levrault, 1919), pp. 11-13; Michel Goya, *Flesh and Steel during the Great War: The Transformation of the French Army and the Invention of Modern Warfare* ((Barnsley, Pen and Sword, 2018), pp. 205-208.

²¹⁶ Gale, *French Army’s Tank Force*, pp. 13 and 27-28. See photograph 38.

²¹⁷ For example, see Compton, *The French Tanks*, *The Journal of the Royal United Services Institution*, vol. LXV, November 1920, pp. 637-655.

²¹⁸ Tank Museum, *The Private Journal of Lt. Colonel J. F. C. Fuller Relative to the Expansion and Employment of the Tank Corps December 1917 to July 26 1918*.

²¹⁹ Liddell Hart Centre for Military Archives, Stern Papers, Stern1/1/1, notes of meeting at Ministry of Inventions, 23 April 1917.

to French and American forces, but no Renaults were received by Britain in time for active use.²²⁰

From Estienne's report of the opening day of the battle on the Chemin-des-Dames and from subsequent reports, the principal weaknesses of the Schneider appear to have been its limited ability to cross obstacles, the location of fuel tanks and the lack of mechanical reliability.²²¹ The effect of inappropriate tactical use in exposing advancing machines to indirect artillery fire, was perhaps the greatest cause of initial failings.²²² The Schneider also had severe problems of command visibility, poor ventilation, ease with which it caught fire and difficulty of evacuation in an emergency.²²³

Only two of the three tank *groupements* took part in the offensive on 16 April, Estienne's reports showing that fifty-seven tanks were lost to German artillery, mostly indirect fire directed by ground and air OPs. The cause of this scale of losses came as a surprise. The AS had envisaged direct rather than indirect fire as the main threat. Gale assesses the loss of machines at just over 43%.²²⁴ However, this represents an under-acknowledgement of the disaster since many of the remaining 57% were out of action for the whole or part of the 16 April battle. Neither the AS nor supporting or supported infantry were greatly impressed by the quality of the French tanks.²²⁵ One infantry unit witnessed four tanks catch fire with, on each occasion, the crews becoming living torches as they exited the machines.²²⁶ This same fate befell the CO of the larger *Groupement*, Major Bossut early in the action. Although Gale's assessment is that some twenty-eight tanks were lost to artillery fire, in many cases the root cause of loss was

²²⁰ National Archives, MUN4/2800, Earl to Maclean, 2 October 1918 confirming the first twenty-five of an order of 175 Mark V* tanks were on their way to France, MUN4/2807, Seely to Layton, 24/July 1918, authorising five Mark V* tanks to be sent to America for training purposes, MUN4/2800, Finance and Statistical Sections to Earl, 20 November 1918 and 28 February 1919 and MUN4/851, Tanks, Position in the Field for week ending 17 November 1918 (By 20 November 1918, when the remaining part of the order was cancelled, some 100 tanks had been provided to France. Britain had received twelve Renault FT by 17 November).

²²¹ Tim Gale, *The French Army's Tank Force and Armoured Warfare in the Great War; The Artillerie Spéciale* (Farnham, Ashgate Publishing Ltd., 2013), pp.36 and 40 - the inability to cross even moderately wide trenches necessitated the allocation of a section of infantry to accompany each tank. See photograph 39.

²²² Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/19, notes at Ministry of Inventions, 23 April 1917; Tim Gale, *French Tanks of the Great War: Development, Tactics and Operations* (Barnsley, Pen and Sword, 2016), pp. 6-7.

²²³ Ibid; Gale, *French Army's Tank Force*, pp. 61-66.

²²⁴ Ibid, p. 50.

²²⁵ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/19, notes of meeting at French Ministry of Inventions, Paris, 23 April 1916.

²²⁶ Gale, *French Army's Tank Force*, p. 47.

mechanical breakdown, since artillery fire against stationary targets minimised complexities for OPs in accurately ranging onto targets. One German artillery unit claimed seventeen knocked-out tanks for the expenditure of only 277 rounds.²²⁷

Some criticisms of the Schneider were similar to criticisms of the Mark I. It would be inappropriate to assess the performance of the Schneider on the basis of percentage lost, since account should be taken of the way in which the force was used, the number of tanks that participated in the battle and their achievements. Many of the machines that were lost were victims of naïve planning which left the machines exposed to enemy observation for excessively long periods. Cooperation with supporting infantry frequently failed and, when a shell struck a Schneider, there was a high risk of most serious consequences owing to the location of petrol tanks. A significant difference between the Schneider and the Mark I was the limited ability of the Schneider to cross trenches and negotiate broken or pitted terrain. The Schneider resembled *Little Willie*, the prototype discarded by Tritton and Wilson in 1915. It was an armoured box on a set of tracks, lacking the climbing and trench-crossing ability of an all-round track.²²⁸ In consequence, the Schneider was dependent upon supporting infantry to help it cross all, except narrow, trenches. Such support was not forthcoming at certain stages of the advance on 16 April, therefore limiting progress.²²⁹

On 5 May, a second action illustrated the ability of the French Army to learn from mistakes and make the most of sub-standard machines. The lengthy approach of 16 April was avoided by placing *groupes* close to the French lines to advance at the same time as infantry. Each *groupe* was allocated specific tasks thereby facilitating better integration with infantry. The units were allocated close air support to eliminate accurate adjustment of fire by air OPs and to bring down fire onto German anti-tank batteries.²³⁰ A section of infantry was placed under the control of the *groupe* technical officer in an attempt to secure better support for the tanks and each tank was provided with signal pistols to bring down smoke shells to mask their movements. In consequence, despite being under continuous

²²⁷ Ibid, p. 55.

²²⁸ Steven J_Zaloga, *French Tanks of World War I* (Oxford, Osprey, 2010) p. 7. For comparison see photographs 39 and 40.

²²⁹ For example, AS3 at the first line of German trenches beyond Beaumaurais Woods, 16 April. Five Schneider were set on fire or immobilised by artillery in consequence of being unable to cross the trenches, Estienne Report, p. 10, in Gale, *French Army's Tank Force*, p. 48.

²³⁰ Gale, *French Tanks of the Great War*, p. 33.

artillery fire, the first units of AS1 arrived at the German lines without losing any tanks to artillery fire and were able to assist the restoration of infantry progress and consolidation by destroying numerous machine guns and repelling counterattacks. Two tanks progressed some two miles before the lack of infantry support necessitated retirement.²³¹ However, improvement in tactics was not matched by greater mechanical reliability. Four St. Chamonds failed to reach the assembly area. The loss of St. Chamonds was so great that their Commander sought a Schneider battery to act as reserve. Twelve St. Chamonds were operational at the start of the attack. A number contributed to the conduct of the battle, but they broke down successively. In total, the *groupement* sent thirty-one tanks into the attack, some twenty-five returned. Results were therefore much better than on 16 April, with only one tank falling victim to artillery fire.²³² Although the second action represented an improvement, French machines possessed basic weaknesses unamenable to straightforward remedy. Towards the end of the war, they were relegated to a supply function.²³³ This was not surprising in the light of heavy losses, some thirty-seven of forty St. Chamonds were lost attacking Courcelles on 11 June 1918.²³⁴

The reasoning underlying the lack of progress by Germany in the development of armoured vehicles, either before or in the early years of the war, has exercised many minds. Chamberlain and Ellis point out that, preceding the war, “German advocates of the use of armoured vehicles in the offensive role met the same sort of apathy as did the pioneers of the idea in Britain.”²³⁵ They have drawn attention to experiments with armoured cars by the German Army from 1905 onwards, including the use of such vehicles in military exercises, but consider a significant shortcoming to have been the fact that the potential roles of such vehicles were seen to be patrolling or haulage rather than combat.

Firstly Goebel, then subsequently Burstyn, an Austrian, produced drawings and/or prototypes of armoured, non-wheeled machines. However, with an accompanying comment that they might be interested if a commercial firm could

²³¹ Ibid, p. 34.

²³² Ibid, p. 35.

²³³ Goya, *Flesh and Steel*, p. 217; Dutil, *Les Chars d'Assault*, p. 207.

²³⁴ Anthony Clayton, *Paths of Glory: The French Army 1914-1918* (London, Cassell, 2005), p. 183.

²³⁵ Peter Chamberlain and Chris Ellis, *Tanks of World War I British and German* (London, Arms and Armour, 1969), p.53.

build it, the Austrian War Office returned Burstyn's drawings.²³⁶ Similarly, despite endorsement by a leading German military periodical, the German War Department was not enthusiastic, possibly, in part, for financial reasons.²³⁷ Having been rejected by Austria and Germany, the Daimler designers, led by Robert Wolf, were granted permission to sell his invention to France. The 4-wheel drive vehicle which had impressed in Austrian military manoeuvres was exhibited in Paris and subjected to trials by the French Ministry of War, (Photograph 42).²³⁸ It is suggested that the main interest by France was a comparison with the French Charron. Although it had a reasonable off-road capability, being able to surmount a 60-degree slope (photograph 43) and was capable of 45mph on roads, the Panzerautomobile was rejected in a May 1909 report by the Commission d'Étude des Armes Portatives et de Petit Calibre, which concluded armoured cars were not yet fit for military service due to their bad off-road capabilities and high production price. The unreliability of French armoured cars early in the war would suggest that the Ministry made a poor decision. Amongst those who inspected the Panzerautomobile was the Archduke Ferdinand.²³⁹

Early in the war the German Army made use of captured Belgian armoured cars, an expedient that may have stimulated the production of a number of their own.²⁴⁰ Their vehicles were deployed mainly to the Eastern Front since the establishment of a continuous trench line from Switzerland to the Channel limited participation in operations in the west. No action would appear to have been taken to support the design of a vehicle capable of penetrating entrenched positions until tanks were used by Britain. Various schemes were then put forward. The first vehicle to display tank characteristics was the Bremer Marien Wagen, essentially a Daimler truck with wheels replaced by tracks.²⁴¹ A sizeable number of other designs were brought forward, with orders being placed for several,

²³⁶ Christopher Foss, *Encyclopedia of Tanks and Armoured Fighting Vehicles: Comprehensive Guide to over 900 Armoured Fighting Vehicles from 1915 to Present Day*, (Staplehurst: Spellmount, 2003). See photograph 41.

²³⁷ Steven Zaloga, *German Panzers 1914-1918* (Oxford, Osprey, 2006), p. 4. Although it had a reasonable off-road capability, being able to surmount a 60-degree slope (Photograph 43), and was capable of 45mph on roads, it was rejected in a May 1909 report by. It is thought the main interest by France was the comparison between its Charron and the Panzerautomobile.

²³⁸ Leander Jobse, *The Tank Encyclopedia, WW1 Tanks, Austria-Hungary, Austro-German Panzerautomobil*, https://tanks-encyclopedia.com/ww1/austria-hungary/austro-daimler_panzerwagen.php, accessed 12 February 2021.

²³⁹ See Photograph 44.

²⁴⁰ Zaloga, *German Panzers*, pp. 4-5.

²⁴¹ Chamberlain and Ellis, *Tanks of World War I*, p. 67. See photograph 45.

including the LK2, resembling the Whippet in profile,²⁴² the K-Wagen and the Stürmpanzerwagen A7V/U, which, in order to overcome the shortcomings of the A7V, was based on the design of the British Mark IV.²⁴³ None of these orders had yielded a single tank by the time the Armistice was signed.²⁴⁴

In addition to fighting tanks, consideration was also being given to Personnel Carriers (Daimler Sturmwagen) and Supply Tanks (A7V Überlandwagen). By the date of the Armistice, a few Überlandwagen had been completed.²⁴⁵

German thoughts were therefore running along many of the same lines as British developments, but Germany suffered from a late start and from the effects of naval blockade on availability of materials. The model most used by Germany during the war was the British Mark IV, large numbers of which were renovated at Charleroi following capture, particularly after the counterattack at Cambrai and the Spring Offensives.²⁴⁶

Raths draws attention to problems caused by differences between relevant military and governmental agencies.²⁴⁷ In summarising work by Albrecht, Kaufhold-Roll, Petter and Schneider and Strassheim, he demonstrated that development of armoured vehicles did not take place with the stereotypical methodical, unified progress that might have been anticipated. Rather, he believed disagreements and changes of policy that occurred were similar to differences that characterised British experiences.²⁴⁸ The essential difference was that German efforts achieved no significant benefits.

Raths argues that “while the German military was certainly not technophobic nor resistant to change, the developments in ‘machine warfare’ were fundamentally inimical to the dominant cultural assumptions held by German officers.”²⁴⁹ There may be some validity in this statement but it seems more likely that events reflected the truth of the saying that necessity is the mother of invention. The necessity for the Allies to find a way of breaking the trench

²⁴² Ibid, p. 70. See photograph 46.

²⁴³ Tank Encyclopedia, German Empire, <http://www.tanks-encyclopedia.com/>, accessed 3 July 2019; Chamberlain and Ellis, *Tanks of World War I*, p. 67. See photograph 47.

²⁴⁴ Chamberlain and Ellis, *Tanks of World War I*, passim.

²⁴⁵ Ibid, pp. 64 and 71.

²⁴⁶ Ibid, p. 65.

²⁴⁷ Ralf Raths, German Tank Production and Armoured Warfare, 1916-18, *War and Society*, vol. 30, No. 1, March 2011, pp. 24-47, (pp. 26-30).

²⁴⁸ Glanfield, *Devil's Chariots*, Chapter 12, ‘The Production Battlefield’, passim.

²⁴⁹ Raths, German Tank Production, pp. 24-47.

stalemate was greater than German defensive requirements.²⁵⁰ The tank was an offensive “weapon”. It says little for the progressive characteristics or far-sighted qualities of all the national armies and governments involved that none saw fit to develop armoured vehicles on a significant scale either before the conflict or by way of early response to the nature of the war that developed. For those who had seen a prospective war as mobile in nature, it might have been expected that development of armoured cars would have been a logical accompaniment. That was not the case. Opportunities to secure advantages in unit dispositions prior to the Battle of the Marne and in the race to the sea were therefore missed.

The German decision was to use motor vehicles for road-based logistics. This decision was reasonable, based on a set of priorities akin to those of Haig who in 1916 placed tanks as only fourth priority for supply, ranked behind motor transport and railway locomotives.²⁵¹ The disadvantage for Germany was that the Allies’ resources were greater. However, the first use of British tanks acted as a catalyst for the development of German tanks, since, within little over a fortnight after the commencement of the Battle of Flers/Courcelette, HQ 1st Army had sent a report to OHL commenting that the new weapon was “potentially noteworthy”.²⁵² There appears at this stage to have been no disagreement in principle between the various departments in the Ministry of War and OHL that urgent action was required.²⁵³ Differences soon arose, but a group brought together by department A7V progressed rapidly, producing a prototype for demonstration on 30 April 1917. The track used was a modified Holt design. Disagreement over design and priorities continued. The most notable issue was the demand by Ludendorff for “a vehicle similar to the British tank design”.²⁵⁴ This led to unsuccessful experimental work on an all-round track.²⁵⁵

It can be seen therefore that administrative arrangements for decisions and production during 1917 did not run smoothly. Different groups were not working harmoniously and decisions on numbers and specification were in doubt.²⁵⁶ The

²⁵⁰ Maxwell Hundleby and Rainer Strasheim, *The German A7V Tank and the captured British Mark IV Tanks of World War I*, (Sparkford, Haynes, 1990), p. 120.

²⁵¹ Liddell Hart Centre for Military Archives, Stern Papers, Stern1/2/3, Conference Minutes, 29 September 1917.

²⁵² Rath, German Tank Production, p. 26.

²⁵³ Ibid, pp. 27-28.

²⁵⁴ Hundleby and Strasheim, *German A7V*, p. 23.

²⁵⁵ Chamberlain and Ellis, *Tanks of World War I*, p. 67, twenty were ordered in September 1918 but had not been built by the Armistice.

²⁵⁶ Zaloga, *German Panzers*, p. 6.

explanation for this situation is thought by Raths to lie in several factors - changes in the strategic direction of the war, success of anti-tank measures in the defence against British tanks, growing shortages of materials and manpower and the greater priority allocated by the army to the revision of tactical defence doctrine.²⁵⁷ Germany was under pressure both in terms of manpower and materials. Ludendorff and Hindenburg, concerned by the growing Allied superiority in weapons, armaments, and manpower were securing increased production of existing weapons to counter this disadvantage and to substitute machines for manpower.²⁵⁸ This new "Hindenburg programme" rendered 1917/1918 an unpropitious time for the design and manufacture of new weapons.²⁵⁹ Others have emphasised the significance of rivalries and failure of German projects, "factual incompetence and the petty jealousies of government agencies and individuals contribute to a lamentable confusion of projects and designs".²⁶⁰

The Battle of Cambrai stimulated efforts and tanks were placed on the first priority list for resources. The number of proposed A7V machines increased, but remained very low, at thirty-eight. Further complications were introduced by commencement of a parallel scheme for light tanks.

Three A7V units went into service between January and March 1918. Unfortunately, performance in training did not impress. The opinion of OHL was that the A7V met the demands of the specification, but battlefield conditions had changed. It was considered the A7V would not be able to master 1918 battlefield conditions since the nose was low and armour was mounted on the chassis, both issues being the product of its multi-role design. The machine was judged incapable of meeting the main fighting requirements of the army. Criticism of the design of the A7V was justified, though it may have been exaggerated by OHL in order to promote its own favoured projects, the K Wagen and LK Light Tank. The criticisms heralded the end of the A7V project, with production limited to three units of five tanks each plus a reserve of five.

²⁵⁷ Ibid, pp. 32-34.

²⁵⁸ Foley, *Other Side of the Wire*, p. 159.

²⁵⁹ Ibid, pp. 159-162.

²⁶⁰ Wolfgang Schneider and Rainer Strasheim, *German Tanks in World War I: The A7V and Early Tank Development* (Atglen, PA, Schiffer Publishing, 1990), pp. 2-3.

A7V models saw action on a number of occasions, the first being on 21 March 1918 at St. Quentin, when two broke down, but the other two reached their designated objective trenches causing the trench personnel to flee – over 150 of their number were captured later.²⁶¹ The next attack was a failure owing to the tanks approaching the starting positions becoming stuck in a ravine, but on 24 April at Villers-Bretonneux a successful attack was launched and the first tank-versus-tank fight occurred, the machines of both sides leaving the battlefield severely damaged. According to Hundelby and Strasheim, there was, however, a clear victor at the next tank-versus-tank occurrence when they claim a single A7V destroyed one Whippet, immobilised two others and drove four more from the battlefield.²⁶² However, this assessment appears to be based on an incomplete picture since for this action Zaloga records that the Whippets and one Mark IV were also opposed on two sides by a battery of 77mm field guns.²⁶³ Of greater operational significance was the outcome of the German offensive on 24 April in the vicinity of Villers Bretonneux, recorded in the terms that “Wherever tanks appeared the British line was broken”, but, “Wherever the enemy infantry attacked without tanks it was repulsed”.²⁶⁴

A7Vs were also used in operations near Reims on 31 May and 9 and 15 July and near Cambrai on 31 August. Though capable of operating successfully in favourable conditions, Raths concluded that reliability was poor, particularly on rough terrain. However, he judged that the main problems were poor reconnaissance, dispersal of the force and the nature of their integration into operational plans, factors related to use rather than design.²⁶⁵ The disadvantages of the A7V are listed as limited trench crossing (2m.), poor battlefield crossing ability and a low nose, which aided supply carrying but represented a constraint on climbing ability. It is notable that in common with French tanks, the A7V needed the accompaniment of combat engineers if the ground was rough or trenches were wide.²⁶⁶ It is a tribute to British invention that both France, which sought to obtain British heavy tanks via an exchange, and Germany, which copied the Mark IV design for their A7V/U, were effectively recognising the

²⁶¹ Zaloga, *German Panzers*, p. 40.

²⁶² Hundelby and Strasheim, *German A7V*, p. 120.

²⁶³ Zaloga, *German Panzers*, p. 21.

²⁶⁴ Edmonds, *Military Operations, France and Belgium, 1918, vol. II*, p.389.

²⁶⁵ Raths, *German Tank Production*, p. 42.

²⁶⁶ *Ibid*, p. 40.

superiority of Wilson's design in operating over rough ground.²⁶⁷ A range of obstacles, insurmountable by French and German tanks posed no difficulty for Wilson's all-round track.²⁶⁸

Work continued on alternative models during 1918 though rivalries dictated that knowledge of all work would not be disseminated between different parties. Ambitions for 1919 were similar to those of Churchill on the Allied side, with plans for 800 LKII by the spring of 1919 and 4000 Light Tanks and 400 Heavy Tanks by the end of 1919. Aspirations were completely unrealistic. Hindenburg and Ludendorff had identified extensive requirements for expansion of the armaments programme to compete with Allied advances, but Germany did not have the manpower and material resources required for its Hindenburg Programme.²⁶⁹

Once again there is a form of parallel with British, or, more specifically, Churchillian aspirations. However, such ideas by Germany were even more unrealistic. By August, Germany was no longer on the offensive, was short of men and materials and was finding an increasing despondency within the ranks of its armed services. Plans that might have been invaluable in 1911 were too late and quite impractical in the military, industrial and political circumstances of 1917-1918.

The German venture into the field of armoured warfare had made no noticeable impact on the military struggle. Internal wrangling and machinations had not assisted a successful late entry into this type of warfare, but it is likely a larger more efficient force of armoured vehicles would similarly have had no appreciable effect on the bigger picture. In a sense, however, the venture may have been significant in providing directions for the future. The value of armour had been recognised: Germany would be neither a non-starter nor reluctant participant in mechanical preparations for the next major war.

For Churchill the period covered by this chapter was one of utter frustration: "I am profoundly unsettled: & cannot use my gift....I am faced with the problem of living through days of 24 hours each:& averting my mind from the intricate

²⁶⁷ Schneider and Strasheim, *German Tanks*, p. 38.

²⁶⁸ Zaloga, *French Tanks*, photograph of ditched Schneider at narrow trench, p. 7. For comparison see photographs 36, 37 and 39.

²⁶⁹ George Vascik, *Hindenburg Program Militarizes the German Economy* (Salem Press Encyclopedia, 2021), passim. The program sought increased production of weapons and munitions. Limited, strategically-insufficient increases were achieved at the expense of major disruptions in coal production and transportation, heightened social tensions and strikes.

business I had in hand - wh was my life [sic].”²⁷⁰ He had returned from France in the spring of 1916 gratified that tanks were under construction and anticipating a role in national war efforts.²⁷¹ To this end he worked without respite to influence the findings of the Dardanelles Commission.²⁷² The Commission’s conclusions may not have been exactly what he had sought but were not without benefit, their findings demonstrating that a significant share of responsibilities for the failure of the venture rightfully belonged to others.²⁷³ It was particularly convenient that Kitchener should have posed no obstacle to the drafting of fair, if timid, recommendations by boarding the doomed *Hampshire* in June 1916. Churchill would have welcomed the clear statement in a Supplementary Report by Commissioner Sir Thomas Mackenzie that the forcing of The Dardanelles was “a practicable proposition” given “recognition of the nature and extent of the difficulties”, the making of “adequate provision” and adoption of the “necessary strength of purpose”.²⁷⁴

Yet when Asquith fell from power, the call to ministerial office still did not arrive. Eight months were to pass before Lloyd George considered it politically prudent to offer Churchill a ministerial post. Munitions was perhaps not among the “chief posts” that Churchill would ideally have sought. It was not of cabinet rank. Churchill had indicated to Scott that the War Office “would do very well”, but he appeared nevertheless to be delighted, commenting, “not allowed to make the plans, I was set to make the weapons”.²⁷⁵

Churchill’s enthusiasm was therefore on course for recovery, but the nation approached the third anniversary of the conflict with a sense of resignation rather than enthusiasm, optimism or despair, wary lest Russia should exit the conflict and concerned about the escalating cost in human and material terms, but relieved America had become involved. So far as armoured vehicles were concerned, progress was being made but achievements were meeting neither the long-held aspirations of enthusiasts nor the aims of a limited element of the

²⁷⁰ Martin Gilbert, *Winston S. Churchill, Volume IV, World in Torment, 1916-1922* (London, Heinemann, 1973), Churchill to Sinclair pp. 1-2.

²⁷¹ *Ibid*, p. 2.

²⁷² *Ibid*, pp. 2-3. Jenny Macleod, *Reconsidering Gallipoli* (Manchester, Manchester University Press), pp. 29-32, 45-46 and 200.

²⁷³ *Ibid*, pp. 2-13; Tim Coates (ed.), *Defeat at Gallipoli: the Dardanelles Commission, 1915-1916* (London, HMSO, 2000), *passim*; Toye, *Rivals for Greatness*, p. 175.

²⁷⁴ Reproduced in, Coates (ed.), *Defeat at Gallipoli*, p. 308.

²⁷⁵ Winston S. Churchill, *The World Crisis 1911-1918* (London, Free Press, 2005), p. 720.

army. It would not be unfair to judge that the Ministry belonged in Lloyd George's "Too Late" camp both in the manufacture and design of armoured vehicles, since poor management seemed to be at the root of Ministerial problems. Notwithstanding these realities, the tank had rapidly become the darling of press and music halls and, at the Gaiety Theatre, the Palace Girls and Mlle. Regine Flory were joking as early as November 1916 that they "will teach the Kaiser & Co., we know how to win, when they see us dance the Tanko right into Berlin".²⁷⁶

Nevertheless, for many in the army, doubts persisted.²⁷⁷ Although improvements to the heavy tank had been made, the moderate pace of achievements in 1916 had been continued through much of 1917. Furthermore, the army would have seen no likelihood of this situation changing in the immediate future, with the result that they were saddled with fighting machines that lacked speed and manoeuvrability and with unreliable supply machines adapted from early models. Efforts to secure a faster, lighter tank capable of exploiting a breakthrough had not yielded satisfactory results.²⁷⁸ Relations between the army and Ministry had effectively broken down. This was the situation facing Churchill as his return to government approached.

Britain had not made full use of the period since the Battle of Flers. Somewhat by chance, the ball was thrown back to the man who had foreseen in 1915 the prospect of an important future role for armoured vehicles. Albeit that, thirty months earlier, he had shown the vision, though not the management finesse to guide it to success, he found himself again in charge of the development of armoured vehicles. This time his authority would be official. His rhetorical ability was not in question, but would his management skills enable him to identify and resolve Ministry problems hampering progress of the armoured cause and would he appreciate that the warfare to be fought in the coming year was not the same warfare as had fuelled his armoured vision in December 1914?

²⁷⁶ Wright, *Tank*, p. 50.

²⁷⁷ National Archives, Royal Commission for Awards to Inventors, examination of Johnson by Watson, answers to questions 3252-3254; Glanfield, *Devil's Chariots*, p. 200.

²⁷⁸ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/2/3, Duckham to Churchill, 4 October 1917.

Chapter Five - Churchill's Management of Tank Production, July 1917/July 1918.

The preceding chapter showed that Ministers and the DGMWD secured neither the quantity nor quality of tanks sought by the army for offensives in 1916/1917. Management expertise at the Ministry and in the army had been found wanting. The army had been denied an appropriate level of participation in tank design and the outstanding talents of Walter Wilson had not been utilised to secure the level of sophistication he was anxious and able to provide. Wilson would later state that the work he considered most important, the Mark V, had been stopped in July 1917 in favour of work on Medium and Universal tanks, though this only partially explained shortcomings.¹

The deficiencies had adversely affect military operations at Arras. One Commanding Officer stated that during this offensive, the behaviour of his officers and men might be summed up as “a triumph of moral over technical difficulties”.² By July 1917 future prospects were only marginally better. Provision of the Mark IV was in full flow, but its design remained rudimentary.³ Preparations for the introduction of a more sophisticated heavy tank and a purpose-designed supply tank had not been awarded the degree of priority they deserved in the light of experience and evolving military tactical thought.

It is likely Lloyd George's action in moving Addison to a less confrontational role in government was made with the objective of improving performance at Munitions, a Department critical to military success and a hive of military and industrial conflict. Addison's lack of grip on the supply of tanks had been exposed by his inept performance at Cabinet when taken to task by the War Office over the pending shortage of tanks for Arras.⁴ Additionally, his handling of union pressures and negotiations had attracted criticism.⁵ Depressed by the lack of optimism and talent of his Ministerial colleagues, Lloyd George felt it appropriate to offer Churchill a return to

¹ A. Gordon Wilson, *Walter Wilson, Portrait of an Inventor* (London, Duckworth, 1986), p. 54. A Universal Tank was one designed both for fighting and supply.

² J. F. C. Fuller, *Tanks in the Great War 1914-1918* (London, E. P. Dutton, 2012), p. 88.

³ National Archives, MUN4/774, Weekly Review of Statistics of Output.

⁴ National Archives, CAB/23/2/20, 22 March 1917, p. 3.

⁵ David Stevenson, 'Britain's Biggest Wartime Stoppage: The Origins of the Engineering Strike of May 1917', *History (London)*, vol. 105, issue 365 (2020), pp. 268-290, (pp. 269-280).

government, though not to cabinet.⁶ Owing to his unpopularity, Churchill's objective of a top seat, such as the War Office would have to wait.⁷ Munitions offered not only rescue from the quagmire in which he had been trapped since 1915, but a position on firm ground providing direct involvement in the planning of the conflict.⁸ Churchill would have recognised that, in wartime, Munitions offered opportunities to insert fingers into most government pies. However, he would also have been aware that his ability to secure the implementation of his advocated mechanical strategy would depend on several factors. His powers of persuasion were important, but events would also be influenced by the unfolding of experiences in the use of the new machines and by the appointment to key positions of those sympathetic to mechanical warfare. It is notable that Churchill's suggestions for membership of the last wartime Tank Committee included only one member, Elles, Commander of the Tank Corps in France, who might have been expected to challenge Churchill's views on armoured warfare in any fundamental way.⁹

The clash between two competing desiderata, uninterrupted production lines to secure maximum output, and interruption to improve mechanical efficiency, was a key issue following the army's first-hand experience of tanks. Assessment of the consequences of decisions on these matters is complicated by the subjective nature of the judgments involved, but, arguably, greater weight should have been placed on the views of military personnel at the sharp end rather than those at the Ministry occupying intermediate positions between manufacturers and end-users or in non-operational posts at the War Office. At the time of Churchill's arrival at the Ministry, Elles, keen to enhance the speed and manoeuvrability of fighting tanks, and Stern, anxious to produce the maximum possible number of tanks, represented the embodiment of the two disparate poles of quality versus maximum production. Yet even Elles, when detached in time and distance from the cauldron of the Western

⁶ Frances Lloyd George, *The Years that are Past* (London, Hutchinson, 1967), pp. 89-97, Lloyd George urged Asquith to appoint Churchill to Munitions when he became Secretary of State for War in 1916 and later, unsuccessfully, sought the agreement of his Conservative partners to Churchill's return to government in December 1916.

⁷ Norman Rose, *Churchill: An Unruly Life* (London, Simon and Schuster, 1994), p.135.

⁸ Winston S. Churchill, *The World Crisis 1916-1918, part II* (London, Thornton Butterworth, 1923), p. 294.

⁹ National Archives, MUN4/2801, Masterton-Smith to War Office, 6 August 1918.

Front, was prepared to acknowledge the difficulties faced by those who during the conflict had represented his “opposition” by placing quantity ahead of quality:

principles of production and design represented a direct conflict of opposing policies.....To stop or change this machinery [production process] results often in a loss of output which is in no way compensated by the improvements ultimately obtained”.¹⁰

This post-war comment by Elles was, perhaps, excessively generous to his former “opponents”. Much depended on the benefit of enhancements set against loss of output from implementation of potential upgrades. Judgment was all important. Knowledge of engineering, industrial management and military operations were key to sound decisions. None of the personnel involved were expert in all these core disciplines. Stern possessed the valuable ingredient of drive and determination but was proficient in none of the disciplines. Haig knew what he wanted to achieve but appears not to have met the Ministry’s principal engineers. There is no evidence that Haig or GHQ generally were aware of the detailed relationship of potential design amendments and rate of tank production. It is recorded that Haig was impressed by the capabilities of the Mark V just before Amiens, but it is a matter of conjecture whether he would have spoken differently to Stern in November 1916 or April 1917 had he then been aware of the nature of the changes that could have been introduced.¹¹ It would be a basic challenge for the management abilities of the incoming Minister to resolve these fundamental issues. Churchill needed to guide the army towards the most beneficial compromise that could reasonably be attained through a realistic assessment of engineering and industrial capabilities and operational consequences.

Procedural requirements for a new Minister caused some delay before Churchill could take up the reins of his new job. In forming a judgment on his achievements in the development of tanks it is necessary to have regard to the fact that supply of armoured vehicles formed but a small part of his overall responsibilities, though one in which he had a particular and long-standing interest and which he regarded as key to breaking the Western Front deadlock.¹² Churchill faced many problems at

¹⁰ Clough Williams-Ellis and Amabel Williams-Ellis, *The Tank Corps*, (New York, George H. Doran, 1919), introduction by Hugh Elles, pp. ix-x.

¹¹ Nick Lloyd, *Hundred Days: The End of the Great War* (London, Viking, 2013), pp. 53.

¹² National Archives, CAB24/44/35, ‘Munitions Possibilities of 1919’, Winston Churchill, 5 March 1918; Winston S. Churchill, *The World Crisis 1911-1918* (London, Free Press, 2005), p. 316.

Munitions. He commented that “in the first period of the war....the resources of Britain far exceeded any organization that could employ them....now all was changed.” He found himself instead “in a world of ‘limiting factors’ and ‘priorities’.”¹³ Scholarship concentrates upon the difficulties the Ministry faced in meeting fluctuating military demands at a time of shortages of the main components required for industrial production - labour, steel and other materials. This focus results in inadequate attention being allocated to the management of production and to Churchill’s undervaluation of this consideration.¹⁴ It would not be until Churchill appointed his friend Jack Seely to a new post of Deputy Minister in July 1918 that key management weaknesses would be identified and measures undertaken to narrow the gap between production capabilities and the level of requirements for armoured vehicles for the strategy Churchill advocated. That appointment would be too late to influence wartime supply and the BEF would enter the Hundred Days, as it had its offensives in 1916 and 1917, with “inadequate” numbers of tanks. Moreover, though of superior quality to the models of 1916 and 1917, the Mark V and Mark V* possessed significant weaknesses, particularly in the form of poor ventilation.¹⁵ Existing scholarship recognises the shortage of tanks throughout the Hundred Days but tends to attribute this to a shortage of labour and materials, perhaps unavoidable for a nation that had been at war for four years. This picture is neither complete nor accurate.

There are two key points to consider in this chapter, which covers the period from Churchill’s return to government to the Amiens offensive. Firstly, the degree of Churchill’s success in managing his Department to secure a larger and more advanced force of heavy tanks for the BEF, its allies and associates. Secondly, progress in manufacturing other armoured vehicles to serve various tactical purposes, essentially, exploitation and logistical support.

The scholarship concentrates upon the use of tanks in action, notably at Cambrai, rather than upon design or production issues. Studies generally see this as a successful period for Churchill in which he mastered the difficulties of munitions

¹³ Winston S. Churchill, *The World Crisis 1916-1918, part II*. (London, Thornton Butterworth, 1923), p. 294.

¹⁴ National Archives, MUN 5/211/1940/37, J. B. Maclean, ‘*Report on Condition of Mechanical Warfare Supply Dept. at August 1918*’.

¹⁵ National Archives, MUN4/5207, Wilson to Maclean, 22 October 1918: Williams-Ellis, *The Tank Corps*, p. 194.

production to provide materiel so advantageous to the recovery of the BEF and its capacity to undertake successful offensives in the summer and autumn of 1918. Haig praised Churchill for the supply of munitions early in 1918 following substantial losses during the Spring Offensives.¹⁶ With false modesty, Churchill emphasised his achievements in munitions supply, "If in these pages I dwell with pride on the extraordinary achievements of the Munitions Council in the field of supply, it is not to appropriate the credit. That belongs in the first instance to Mr. Lloyd George".¹⁷

So far as munitions in general are concerned, no reason is seen to dispute the views of Haig and Churchill. However, the picture in respect of armoured vehicles is quite different. Yet, for Churchill, armoured vehicles represented the key that would unlock German defences in the west, firstly by assisting breakthrough then by exploitation, resupply and reinforcement. However, production of these vehicles failed to attain levels even close to those aspired and forecast. It will be shown that low production was in part Churchill's fault, but that he avoided criticism by the way in which fighting on the Western Front developed and concluded. Haig saw the prospect of great strides in the progress of the war late in 1918, but this optimism was not shared by those in government or by society generally. If the prospect of a spring defeat had loomed uncomfortably large, it was surely not possible to achieve victory by autumn?¹⁸

The period around Churchill's reinstatement as a member of the government is regarded by some as the low point of the war for Britain and its Allies.¹⁹ The nation was perhaps less united than it had been during the early months of the war. Setting aside the sector of the population benefitting to a significant extent from economic activity generated by the conflict, such enthusiasm as there had been for the war had been diluted by the time Churchill was faced with the task of coming to grips with Munitions. The unprecedented loss of family members or friends affected a large

¹⁶ Gary Sheffield and John Bourne (eds.), *Douglas Haig: War Diaries and Letters 1914-1918* (London, Weidenfeld and Nicolson, 2005), 9 January 1918, p. 371

¹⁷ Churchill, *World Crisis 1911-1918*, p. 723.

¹⁸ Compare Haig's Special Order of the Day, 11 April 1918, see Charles Robert Mowbray Fraser Cruttwell, *A History of the Great War 1914-1918* (Oxford, Clarendon Press, 1934), pp. 518-519 with Haig diary notes of meeting with Churchill on 21 August 1918, see Sheffield and Bourne, *Haig War Diaries*, pp.447-448. Interestingly, Haig does not mention his Special Order in his diary, see editors' note, p.402.

¹⁹ David Lloyd George, *War Memoirs of David Lloyd George*, (London, Odhams, 1938), pp. 1467-1469, Anthony Farrar-Hockley, *Goughie: The Life of General Sir Hubert Gough* (London, Hart-Davis MacGibbon, 1975), pp. 194-195.

sector of the national population from the Prime Minister to typical civilian families in all social groups, though perhaps most significantly those in higher groups owing to the greater vulnerability of officers.

After three years of war the results of the efforts of an enlarged army appeared to be ones of limited territorial gain at a heavy, disproportionate and unsustainable cost of life and health. Large-scale French offensives were proving no more successful in 1917 than earlier in the conflict. Rumania had been defeated in May and events in Russia were the cause of grave concern. As a result of the resumption by Germany of unrestricted submarine warfare, losses of shipping, on which the ability of the nation to continue the war depended, were serious. The compensating consideration was that this had led to the entry of America into the conflict, a potentially decisive factor in the eventual outcome.²⁰ Many of these concerns developed further in 1917, notably in the form of a second revolution in Russia that heralded retirement from the war. This development would enable the Central Powers to transfer substantial forces from east to west in preparation for a large-scale offensive to bring the conflict to a conclusion before any substantial introduction of American forces. Worryingly, the American President appeared to be pursuing the introduction of his forces on the Western Front at a more leisurely pace than demanded by the seriousness of the situation.²¹ Italy suffered a major defeat at Caporetto in October/November leading to the already stretched British and French forces sending eleven divisions to Italy for fear their ally would leave the war.²² The British summer offensive, the Third Battle of Ypres, appeared to have the same characteristics as the Battles of the Somme, namely heavy casualties for insubstantial gains. Shipping losses did however decline following the introduction of convoy and additional anti-submarine measures.²³

Morale did not benefit from the underlying belief that there would be no end to the conflict in the short-term. It will be shown in later chapters that the view of senior members of British and Dominion governments did not envisage military action leading

²⁰ Lloyd George, *War Memoirs*, p. 709, monthly losses of shipping rose significantly in 1917, peaking at 526,447 gross tons (British) in April and remaining particularly high through the summer.

²¹ *Ibid*, pp. 1008-1009.

²² James E. Edmonds, *History of the Great War: Military Operations France and Belgium, 1918, vol. I*, (London, Macmillan, 1935), pp. 24-26.

²³ *Ibid*, p. 7; Henry Newbolt, *History of The Great War, Naval Operations, vol. V* (London, Longmans Green, 1931), chapters 1, 3, 4 and 5 passim; Richard Gough, *The War at Sea* (Edinburgh, Burlinn, 2000), pp. 306-310; David Stevenson, *1914-1918: The History of the First World War* (London, Penguin, 2004), pp. 322-324.

to a conclusion to hostilities before 1919-1920 and that some considered there could be no conclusion by force of arms.

As the incoming Churchill was introduced to staff at the Ministry, preparations for Haig's larger northern offensive were well under way.²⁴ The offensive would start on 31 July. Three Brigades of tanks were to be used, the full complement of tanks available at that time.²⁵ Significantly, no special concession was granted to the tanks in that the lengthy, "standard", preparatory bombardment was to be employed. Williams-Ellis lamented the misfortune of the offensive generally, and the consequences for the tanks specifically, in the deterioration of the weather on the first day of the offensive. Having on that day secured a good position for attack the following day, the army fought against counter-attacks ready for the blow it intended to land at daybreak. "That blow was destined never to be struck".²⁶ Haig's despatch states "The weather had been threatening throughout the [first] day.....During the afternoon, while fighting was still in progress, rain began and fell steadily all night. Thereafter, for four days, the rain continued without cessation".²⁷ Throughout August rainfall was unusually heavy and, though September was drier, rains returned in October.²⁸ The result, for most of the battle, was that conditions were ill-suited to tank operations.²⁹

Tanks were subjected to considerable criticism, notably in the report on his operations by Gough, Fifth Army Commander. They frequently failed to negotiate the muddy terrain or did so too late to participate fully in operations despite the assistance provided to the Mark IV by the attachment of unditching beams.³⁰ Examples continued

²⁴ Martin Gilbert, *Winston S. Churchill, vol. IV, 1916-1922* (London, Heinemann, 1973), p. 32; Sheffield and Bourne (eds.), *Douglas Haig: War Diaries*, 12 July 1917, pp. 303-305; Gary Sheffield, *The Chief, Douglas Haig and the British Army* (London, 2011), pp. 227-232; Jack Sheldon, *The German Army at Passchendaele* (Barnsley, Pen and Sword, 2014), pp. 41-42.

²⁵ Fuller, *Tanks*, p. 117.

²⁶ Williams-Ellis, *The Tank Corps*, pp. 143-144.

²⁷ John Herbert Boraston (ed.), *Sir Douglas Haig's Despatches, December 1915–April 1919* (London, J. M. Dent), p. 116.

²⁸ Basil Liddell Hart, *The Tanks, The History of the Royal Tank Regiment and its Predecessors Heavy Branch Machine-Gun Corps, Tank Corps and Royal Tank Corps, vol. I, 1914-1939* (London, Cassell, 1959), pp. 138-147; J. P. Harris, *Douglas Haig and the First World War* (Cambridge, Cambridge University Press, 2008), pp. 367-368, 372 and 376; Met Office, Daily Weather Report 1917, https://digital.nmla.metoffice.gov.uk/IO_aca3d94a-0c58-4fb4-9a73-f7e90d1c37af/ accessed 4 January 2021.

²⁹ Fuller, *Tanks*, pp. 120-123.

³⁰ Imperial War Museum, Film Archives, 1914-1918, *Tanks—The Wonder Weapon (unditching)*, <https://www.iwm.org.uk/collections/item/object/1060022815>, accessed 31/January 2020; William

to emerge of considerable assistance to the infantry, most noticeably on 16 August when, following a few days of “less wet weather”, twelve tanks were due to co-operate in a continuation of the offensive in the Langemarck-St. Julien area. None arrived in time and the offensive failed to take a position containing four concrete pillboxes, which were immune to field artillery and represented “almost impossible targets for heavy guns”.³¹ Maxse, Commander of 18th Corps and Lt.-Colonel Christopher Baker-Carr, Tank Brigade Commander, set what may have been a sensible precedent for Cambrai and later tank actions, agreeing that the pillboxes should be subjected to a tank attack without any preparatory bombardment other than smoke. Maxse had been advised that an infantry attack on the pill-box stronghold might cost 600-1,000 casualties. Infantry casualties following the successful tank attack numbered 15, with 14 casualties among tank crew.³²

Notwithstanding criticism from Gough and others, actions such as that at St. Julien ensured the continued support of Haig and his agreement, despite heavy commitments caused by Ypres and Caporetto, to an attack late in 1917 in the vicinity of Cambrai. The attack took place without preparatory bombardment and utilised the full resources of the Tank Corps. British artillery concentrated on counter-battery work, utilising improved means of locating enemy batteries and ensuring accuracy of fire by improved mapping, sound ranging, flash spotting and calibration of each individual gun. These technical improvements facilitated dispensation with ranging and an accurate surprise effect at Z-Hour.³³

The Battle of Cambrai is generally held to represent the point at which tanks secured a broad consensus of support and began to exert an increasing influence on the tactics of future warfare.³⁴ Utilising surprise, some 378 fighting tanks were launched against an enemy not fully prepared for the form of attack it was to experience.³⁵ This, combined with effective use of artillery helped Third Army to

Henry Lowe Watson, *A Company of Tanks* (Edinburgh, William Blackwood, 1920), p. 105. See photograph 48.

³¹ Williams-Ellis, *The Tank Corps*, p. 148.

³² Ibid, pp. 150-151; Liddell Hart, *The Tanks*, p.114; Fuller, *Tanks*, pp. 122-123.

³³ Shelford Bidwell and Dominick Graham, *Firepower: British Army Weapons and Theories of War 1904-1945*, (London, Pen and Sword, 1982), pp. 108-110 and 134.

³⁴ Wilfrid Miles, *History of the Great War: Military Operations France and Belgium, 1917, vol. III* (London, HMSO, 1948), p. 305; Liddell Hart, *The Tanks, vol. I*, p. 154.

³⁵ J. P. Harris, *Men, Ideas and Tanks: British Military Thought and Armoured Forces, 1903-1939*, (Manchester, Manchester University Press, 1995), pp. 123-124.

achieve a magnitude of advance well beyond that achieved by earlier offensives. Arguably the initial degree of success surprised GHQ since the force available for the battle was inadequate to exploit the opportunities created. Fuller despaired that no reserve of tanks was maintained for the second day: he disapproved of staking the entire tank force on the first day of battle, "To fight without a reserve is similar to playing cards without capital – it is sheer gambling."³⁶ It was the norm throughout the war that the limited availability of tanks resulted in constant "gambling" of this kind. Fuller's advice succeeded only in securing a somewhat lame and misleading response from Byng, the Army Commander: "I cannot go against the wishes of my Corps and Divisional commanders".³⁷ It has already been seen that Rawlinson failed to assert control of operations by the Fourth Army at High Wood. Byng similarly bowed to the wishes of his junior commanders at Cambrai. In Byng's defence, the infantry forces at his disposal were insufficient to have taken advantage of opportunities that might have presented themselves had he used his forces more astutely early in the battle. The scale and consequences of his errors in the deployment of his tanks and instructions to his Corps/Divisional Commanders were thereby limited in magnitude.³⁸

The "breakthrough" at Cambrai was contained. Water obstacles posed difficulties and tanks lacked the speed to capitalise on their advance before the enemy could reposition forces or prepare defences to frustrate further advance. Additionally, cooperation and coordination with other arms left much to be desired. This resulted in a major set-back at Flesquières Ridge where enemy artillery took a heavy toll on tanks. There were lessons both for tank design and army tactics. A faster machine was needed for progressive advance or exploitation and tanks required close cooperation with other arms, infantry, artillery and aircraft. Additionally, the integration of cavalry, the only units capable of rapid movement on the battlefield was problematic owing to management weaknesses and communications limitations.³⁹

Following containment of the German counter-attack at Cambrai, British offensive operations on the Western Front were brought to a close until the summer of 1918. In

³⁶ Liddell Hart Centre for Military Archives, Fuller Papers, BC1/24, Fuller to Elles, 30 October 1917.

³⁷ National Archives, CAB45/118. Cambrai 1917.

³⁸ Miles, *Military Operations France and Belgium, 1917, vol. III*, pp. 278-305.

³⁹ Miles, *Military Operations, France and Belgium, 1917, vol. III*, pp. 80-82 and 281-284; David Kenyon, *Horsemen in No Man's Land: British Cavalry and Trench Warfare 1914-1918* (Barnsley, Pen and Sword, 2011), chapter 4, passim; Stephen Badsey, *Doctrine and Reform in the British Cavalry 1880-1918* (London, Routledge, 2008), pp. 291-293.

the meantime, the BEF prepared for the assault it knew would take place upon the transfer of German forces from the Eastern Front. This was to be the final German assault of the war, their effort for victory or achievement of a stranglehold before the deployment of large-scale American forces deprived them of any meaningful chance of success. It was the last throw of the dice, which events would show represented a rash gamble.⁴⁰

As with offensive operations, there were differences of opinion on how tank units should be deployed in defensive mode. GHQ issued tactical guidance.⁴¹ There was no timely renewed written doctrine on defence and this may explain why, shortly before the German attack was launched, Haig called a conference to discuss defensive tactics.⁴² Army Commanders were required to state how they proposed “to employ Tanks on their respective fronts”.⁴³ The minutes show agreement with the “principle of the employment of tanks in the largest numbers possible for the purposes of counter-attack”.⁴⁴ However, the principle was observed on paper rather than in practice since concentration was insufficient to provide a realistic prospect of meaningful counter-attack. The suggestion was also made that in certain special cases it might “be advisable to employ a few tanks from concealed positions as mobile machine-gun units” (Savage Rabbits).⁴⁵ This further reduced forces available for counter-attack. Fuller produced additional guidance shortly after the commencement of the German assault on 21 March emphasising the potentially sacrificial role of tanks in delaying the enemy “to gain time for our infantry to withdraw”.⁴⁶

⁴⁰ Gary Sheffield, *Forgotten Victory: The First World War: Myths and Realities* (London, Headline, 2001), p. 223; Churchill, *World Crisis 1911-1918*, pp. 801-802.

⁴¹ National Archives, WO158/832, Kiggell to all Armies, 18 January 1918 and Lawrence to all Armies, 13 February 1918.

⁴² Jim Beach, Issued by the General Staff: Doctrine Writing at British GHQ, 1917–1918, in *War in History*, vol. 19, issue 4, pp. 464-491, (p. 486). Headlam describes inheriting a draft of SS.210, The Division in Defence, “which about fifteen people have been messing at”- this was not issued until May 1918 by which time nearly all German offensives had taken place.

⁴³ National Archives, WO158/864, agenda for meeting of Army Commanders.

⁴⁴ National Archives, WO158/864, record of conference of Army Commanders held at Doullens on Saturday, 2 March 1918, dated 3 March 1918, p. 1.

⁴⁵ *Ibid.*

⁴⁶ Alaric Searle (ed.), *The Military Papers and Correspondence of Major-General J F C Fuller, 1916-1933*, (Stroud, The History Press, 2017), pp. 75-76.

The initial days of the Spring Offensives left the BEF tank force sorely depleted.⁴⁷ IV Brigade lost all its tanks and by 28 March only twenty-seven of the establishment of ninety-eight tanks remained in II Brigade.⁴⁸ The seriousness of the losses of personnel and armaments led to demands for reinforcements and resupply. Churchill, who had been close to the front when the battle began, returned to England and called for a special effort by munition workers. He sought and received a good response, though, for many armaments, he had already accumulated substantial reserves. Significantly, Haig praised Churchill for the rapid response to shortages.⁴⁹ At the time of joining the Ministry Churchill had found himself embroiled in sensitive industrial disputes associated with the “skilled man’s grievance”. He had received criticism for acceding to wage demands which had spread more widely across industry than envisaged, though his decisions may have been part of government policy in relation to labour issues generally.⁵⁰ In the light of losses resulting from extensive enemy advances in the Spring Offensives, it may however have been fortunate that the Ministry had been generous with payments to industrial workers. This may have helped minimise industrial disputes in the period before the offensives.

During the German offensives, the Tank Corps was deployed and fought in accordance with a relaxed interpretation of the policy of concentration. Fuller was critical of the excessive number of concentration areas, nine in all, forming a 60-mile cordon with GHQ reserve to the rear of the First, Third and Fifth Armies.⁵¹ The total fighting strength at the time was only 320 Mark IV machines and fifty Whippets.⁵² The tanks suffered considerable losses during the German offensives but secured a number of successes against enemy concentrations.⁵³ “Savage Rabbits” also performed valuable checks on the German advance, twelve tanks of 4th Battalion

⁴⁷ Liddell Hart, *The Tanks*, pp. 162-163; Fuller, *Tanks*, pp. 172-176.

⁴⁸ Liddell Hart, *The Tanks*, p.164.

⁴⁹ Robert Blake (ed.), *The Private Papers of Douglas Haig 1914-1919: Being Selections from the Private Diary and Correspondence of Field-Marshal the Earl Haig of Bemersyde* (London, Eyre and Spottiswoode, 1952), p. 306; Sheffield and Bourne (eds.), *Haig: War Diaries*, p. 371.

⁵⁰ David Stevenson, ‘Britain’s Biggest Wartime Stoppage: The Origins of the Engineering Strike of May 1917’, *History (London)*, vol. 105, issue 365 (2020), pp. 268-290, (passim).

⁵¹ Fuller, *Tanks*, pp. 172-173; Liddell Hart, *The Tanks*, pp. 161-162.

⁵² Fuller, *Tanks*, pp. 172-173.

⁵³ *Ibid*, p.174. On 22 March the 2nd Tank Battalion counter-attacked in the neighbourhood of Vaux Vraucourt without infantry support but drove the enemy back and inflicted heavy casualties. Seventeen of the thirty tanks that took part were hit and crew suffered 70% casualties, but, most significantly, the enemy advance was delayed.

emerging from their forward concealed positions to restrain the local advance.⁵⁴ However, the scale of the breaches in the defence, notably of Fifth Army, rendered effective defence impossible, particularly since operational circumstances were ill-suited to tank maintenance requirements and the operational radius of an offensive machine such as the Mark IV was limited.⁵⁵ Consequently, on 13 April, when Fifth Army fell back across the Somme, many tanks had to be abandoned. Tank-less crews formed Lewis gun detachments and fought on foot.⁵⁶

Tank supply was not typical of that for munitions generally. There was no tank reserve. Resupply depended upon the availability of component parts and the rate at which tanks could be assembled. It was perhaps fortunate that the Spring Offensives occurred prior to re-equipment of units with Mark V, delivery of which was well behind forecasts.⁵⁷ Had it not been that any tank was better than no tank, the Tank Corps might have shed few tears over the loss of Mark IVs, since they regarded the model as obsolete.⁵⁸

The efficient performance of the Ministry in supplying other munitions would appear to have spared Churchill criticism for the “delayed” production of tanks. It is notable that even a century later the official military view is that the rate of tank production accelerated in 1918: “Throughout 1918 the Mechanical Warfare Supply Department, under Churchill’s supervision as Minister of Munitions, saw growth in production”.⁵⁹ This was not the case. In the first three quarters of 1918 some 1,136 tanks were produced, a reduction of 41 from the figure for the last three quarters of 1917.⁶⁰

The production of other arms did increase. Pre-war production of Vickers machine-guns was from a single factory at Erith, some fifty/annum. Upon the outbreak of war, efforts were made to increase this, but only 2,772 were produced between August 1914 and December 1915. Government funding facilitated further expansion at Erith

⁵⁴ Liddell Hart, *The Tanks*, p.162.

⁵⁵ Christie Campbell, *Band of Brigands: The Extraordinary Story of the First Men in Tanks* (London, Harper Perennial, 2008), p. 376; Fuller, *Tanks*, p. 177; Liddell Hart, *The Tanks*, pp. 162-163.

⁵⁶ Fuller, *Tanks*, pp. 175-176.

⁵⁷ National Archives, WO158/836, notes of meeting, 23 November 1916, Stern stating that “the first Mark V would “be ready for trial about end of January 1917, and that if it was decided to proceed with the manufacture of a number of this type, they would be available about August or September 1917”.

⁵⁸ National Archives, Elles to Anley, 23 April 1917.

⁵⁹ HQ Field Army, *The Cambrai 100 Year Souvenir Pocket Book: Commemorating the 100th Anniversary of the Battle of Cambrai* (Land Warfare Development Centre, 2017), p. 46.

⁶⁰ Glanfield, *Devil’s Chariots*, Appendix 4; National Archives, MUN4/902, Tanks: Position in the Field, January-October 1918.

and a new plant at Crayford and annual production increased to 7,488 in 1916. Other types of automatic guns were under development and British interest was revived in the Lewis gun: a small factory was already under construction for the production by BSA of some 10/week under license. In autumn 1914 BSE commenced construction of a new factory with a capacity for increasing production some fifteenfold, this was fully utilised after Lloyd George took control of procurement in May 1915. Amongst others, the British Cavalry and Tank Corps favoured use of the Hotchkiss, a factory for production being set up in Coventry, manufacturing some 40,000 between May 1915 and the Armistice. Manufacture of machine-guns increased from 79,746 in 1917 to 120,864 in 1918: it had been 287 in 1914.⁶¹ Home output of aircraft increased from 14,748 in 1917 to 32,018 in 1918: it had been 1,993 in 1915.⁶² Disparity between the steady increase of other munitions generally and the production of tanks was undoubtedly due in large part to the complexity of the tank. It may also have been that management was more efficient for other weapons. *The History* identified some 4000 contractors/sub-contractors for the 1918-19 tank programme. The total number of contracts was 6,000.⁶³ The scope for delays and manufacturing or design problems was thus of an altogether greater magnitude than for guns, small arms or aircraft. Complexity called for the highest standard of management, but the standard achieved was low.⁶⁴ Other factors such as labour supply and war priorities are frequently blamed for delay but there is little evidence that these were major factors.

Before examining production, it is necessary to look at the army's changing response to the need for tanks in consequence of experiences of offensive operations over the twelve months from the summer of 1917. Firstly, all elements in the army did not respond in the same way to the future role of tanks and did not hold identical views on the number and variety of machines required for future operations. The views of some parties are more easily determined than others. Notably Elles and Fuller in the Tank Corps in France frequently set out their views in the form of reports or letters, whereas many who were less convinced of the future role of tanks probably restricted

⁶¹ Ministry of Munitions, *The Official History of the Ministry of Munitions, vol. XI, The Supply of Munitions* (Uckfield, Naval and Military Press, 2009), pp. 25-27; Paul Cornish, *Machine Guns and the Great War* (Barnsley, Pen and Sword, 2009), pp.48-49; Lloyd George, *War Memoirs*, p. 364.

⁶² Ministry of Munitions, *The Supply of Munitions, Vol. XII, part I, Aircraft* (London, HMSO, 1922), p. 173.

⁶³ *Ibid*, part III, *Tanks*, p. 78.

⁶⁴ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Supply Department at 1918, passim.

themselves to adverse verbal comment to which indirect reference is made in certain memoirs.⁶⁵ Official advice was issued by the General Staff.⁶⁶ In September 1918, the fast moving conflict led to a review by the Chief of Staff, General Sir Herbert Lawrence, essentially responding to heavy losses of tanks as warfare became more mobile and German units became more proficient in anti-tank defence.⁶⁷

It has been shown that even before the Mark IV had been used in action, it was being written off by Elles, The gulf was widening between the army and the Ministry. Stern had played the Lloyd George card to have the 1,000-tank order reinstated, but in doing so had aggravated relations between the two Departments of State. The need for change and the criticism by army personnel of the MWSD were constant themes of correspondence or conferences during 1917 and represented issues that Churchill, as incoming Minister, could not ignore.⁶⁸

The army was inclined to associate its problems with Stern. Churchill was aware of this and subjected Stern to a severe grilling as part of a package of measures to assess and reorganise the Ministry in autumn 1917. Transcripts were kept of the interview of Stern and other senior figures at the Ministry and provide a valuable insight into Churchill's management style.⁶⁹ Churchill performed the main role at Stern's interview although it was conducted by the full, newly-formed, Coordinating Committee. Stern comes across badly. His performance contrasts sharply with that of William Weir who had been interviewed the previous day and had been associated with the Ministry since his recruitment by Lloyd George in 1915.⁷⁰ Weir provided instant, clear and unequivocal answers to Churchill's questions on aircraft.⁷¹ His biographer has described Weir's speech as "the fruits of long, logical and ordered

⁶⁵ See for example, Williams-Ellis, *The Tank Corps*, p.147.

⁶⁶ National Archives, WO158/832, SS204 (April 1917) expanded upon Kiggell's "Note on the Use of Tanks", 5 October 1916, before being superseded in March 1918 by SS214, Tanks and their Employment in Cooperation with Other Arms. Additionally, tactical advice was incorporated into instructions for the Training of Divisions, SS135 and SS210,

⁶⁷ National Archives, WO158/832, Lawrence to all armies (OA109), 1 September 1918, imposing limits on types of operations in which tanks should be used, stressing the importance of smoke and surprise and responding to German defensive tactics which were rendering tank losses "not compensated for by the results attained".

⁶⁸ House of Lords, Lloyd George Papers, LG/F/8/1/11, Churchill to Lloyd George, 9 September 1917.

⁶⁹ National Archives, MUN5/133, Transcript of Munitions Council Committee on Tanks, 5 September 1917.

⁷⁰ Gilbert, *Winston S. Churchill*, vol. IV, p. 138.

⁷¹ National Archives, MUN 5/212, Transcript of Meeting of Munitions Council Committee on Aeroplanes, 4 September 1917.

thought".⁷² Stern on the other hand was clearly nervous, hesitant and failed to demonstrate he was in command of events. To some extent Stern's poor performance was a reflection of an unreasonable stance by Churchill and may also have been a consequence of swimming in shark-infested waters since Stern was not a popular figure among senior managers at the Ministry and he enjoyed little support from members of the Committee.

Churchill's approach to Stern is understandable. If a mechanised strategy for operations on the Western Front was to be adopted, Churchill needed to persuade the army to maintain substantial orders for tanks. He also needed to improve relations with the War Office, reduce delays in delivery and enhance quality.⁷³ Churchill's appointment coincided with a particularly difficult period in relations with the War Office on the relative roles of the two Government Departments and responsibility for tank design/modification. Unwisely, earlier in the year, Stern and d'Eyncourt had discontinued participation in joint working arrangements with the War Office.⁷⁴

September's transcript portrays Churchill as argumentative and needlessly fussy.⁷⁵ Stern comes across as uncertain, defensive and not up to the job.⁷⁶ An adversarial relationship with the War Office was unacceptable. Three generals had asked for Stern to be removed from his post.⁷⁷ After providing Lloyd George a veto opportunity, the outcome was that Churchill appointed Admiral Moore to replace Stern as Controller MWD.⁷⁸ This was a move over which Churchill expressed regret since Stern was a keen advocate of the same strategy favoured by Churchill and Lloyd George. The principal reasons would appear to have been Stern's lack of interpersonal skills and

⁷² W. J. Reader, *Architect of Air Power: The Life of the First Viscount Weir*, (London, Collins, 1968), p.11.

⁷³ National Archives, MUN 5/211/1940/37, minutes of conference with War Office, 8 October 1917; Glanfield, *Devil's Chariots*, p. 203.

⁷⁴ Ministry of Munitions, *History, vol. XII, part III* (London, HMSO, 1922), pp. 50-53; Albert Stern, Tanks. Revelations of the Secret History of their Construction. Extracts from the Notebook of a Pioneer, *The Strand Magazine*, September 1919, p. 230.

⁷⁵ Churchill Archives Cambridge, CHAR 15/86A, Transcript of Meeting of Munitions Council Committee on Tanks, 5 September 1917; Glanfield, *Devil's Chariots*, pp. 208-209.

⁷⁶ *Ibid*, pp. 203-209; Churchill Archives Cambridge, CHAR 15/86A, Transcript of Meeting of Munitions Council Committee on Tanks, 5 September 1917.

⁷⁷ Albert Stern, Tanks. Revelations of the Secret History of their Construction. Extracts from the Notebook of a Pioneer, *The Strand Magazine*, September 1919, p. 231.

⁷⁸ Archibald Moore had entered the Navy in 1875 and was Director of Naval Ordnance and torpedoes from 1909 to 1912 when he was appointed Third Sea Lord. In 1914 he was appointed Commander of the Second Battle Cruiser Squadron, 1914, present in the actions in the Heligoland Bight, 28 August 1914, and Dogger Bank, 23 January 1915, after which he was relieved of his command at Jellicoe's insistence.

army dissatisfaction with the tanks being delivered.⁷⁹ Churchill accepted these factors in his criticism of Stern's efficiency.⁸⁰ However, in the light of subsequent events, two factors are relevant. Firstly, Stern was not dismissed from the Ministry, but, at the suggestion of Duckham, Head of Churchill's new Directorate containing the MWD, was offered the leadership of a new department dealing with relations with Allies on tanks.⁸¹ This was a sideways move.⁸² Secondly, remarks by Churchill to Lloyd George: "I am delighted with all these clever businessmen who are helping me to their utmost. It is very pleasant to work with competent people".⁸³ Churchill's view of the competence of some of the businessmen may have been sincere but the receipt of a report from Maclean, who replaced Moore in August 1918, gave him reason to reassess the capabilities of senior management so far as tank production was concerned. In October 1918, having learned that annual tank production would be some 2000 fewer than forecast little more than two months earlier, Seely would describe Churchill's staff at the Ministry in unflattering terms "Such an extraordinary miscalculation reflects gravely on those who were responsible early this year".⁸⁴

Believing he had resolved the clash of personalities and impasse between the Ministry and War Office, Churchill may not have been unduly perturbed that in August 1917 the War Office had clarified and, in the process, reduced its requirements for tanks.⁸⁵ His thoughts therefore turned, firstly, to 1918 and then to 1919, the year he considered it should prove possible, subject, most significantly, to the combat-

⁷⁹ Stern, *Tanks*. Revelations of the Secret History of their Construction, Extracts from the Notebook of a Pioneer, *The Strand Magazine*, September 1919, p. 230. The issue of quality dogged the relationship between the Ministry, War Office and Tank Corps throughout most of 1917/18, see for example Churchill Archives Cambridge, CHAR15/85, War Office to Ministry of Munitions, 7 May 1917, GHQ to War Office, 5 July 1917; National Archives, MUN 4/5170, minutes of meetings of Tank Board, 24 and 31 October, 1918.

⁸⁰ Harris, *Men, Ideas and Tanks*, pp. 161-163; Ministry of Munitions, *History, vol. XII, Tanks*, pp. 35-38; Martin Gilbert, *Winston S. Churchill, Companion, vol. IV, January 1917-June 1919*, (London, Heinemann, 1977), pp. 157-159.

⁸¹ Arthur Duckham was a Chemical Engineer and Inventor, Deputy Director of Munitions Supply 1916-17 and Member of Munitions Council, Supply and Engines, 1917-18. At the time of this reorganisation the MWSD was renamed the Mechanical Warfare Department, MWD.

⁸² Churchill Archives Cambridge, CHAR 86A, Duckham to Churchill, 22 February 1918.

⁸³ Martin Gilbert, *Winston S. Churchill, Companion Volume IV, part I, January 1917-June 1919*, (London, Heinemann, 1973), pp. 157-159, Churchill to Lloyd George, 9 September 1917.

⁸⁴ Churchill Archives Cambridge, CHAR15/87, Seely to Churchill, 9 October 1918.

⁸⁵ National Archives. MUN 5/211/1940/37, War Office to MM, 24 August 1917.

readiness of substantial American forces and further large-scale tank production, for a decisive campaign to be waged on the Western Front.⁸⁶

The problem for Churchill was that he had failed to identify the full range of problems at the MWD. He had addressed political issues but had failed to identify and resolve issues of professional ability. Dismissal of Stern should have been seen as necessary on both personal and professional grounds and should have been followed by appointment of a replacement possessing qualities previously absent. Arguably, professional ability was the essential ingredient for the cake, with charm or bonhomie the desirable, though perhaps inessential, icing. Stern's successor, Moore, was also wanting in his knowledge and experience of industry. In addition to this failure, Churchill neglected to conduct precautionary supervision. To a large degree, Churchill's actions and the consequences that flowed from those actions represented a re-run of the Landships Committee episode in 1915, namely the appointment of a manager lacking the range of abilities requisite for the success of the allotted task.

Moore's naval background provided experience in dealing with issues possessing limited similarities to aspects of tank construction or assembly. He had impressed Churchill during his time as First Lord by his backing of the fifteen-inch gun.⁸⁷ There was, however, no direct relevance between Moore's naval career and his role at the Ministry. Most significantly, his record, of which Churchill would have been fully aware, should have provided a warning of limitations of initiative and intelligence.⁸⁸ Jellicoe had been less than complimentary over Moore's judgment and decisions in the Battle of Dogger Bank in which Bennett considers Moore had chosen to "destroy one already crippled cruiser, instead of pursuing the main enemy force". Bennett interprets Jellicoe's remark to be directed at Moore when he wrote "He ought to have gone on,

⁸⁶ Churchill, *World Crisis 1911-1918*, pp. 728-729; National Archives, MUN4/5172, minutes of meeting on Tanks held at 10 Downing Street, 8 March 1918.

⁸⁷ James Goldrick, *The King's Ships were at Sea: The War in the North Sea, August 1914-February 1915* (Annapolis, Naval Institute Press, 1984) p. 299.

⁸⁸ Julian S. Corbett, *History of The Great War, Naval Operations, vol. II* (London, Longmans Green, 1921), pp. 82-102. As Commander of the Second Battle Cruiser Squadron, Archibald Gordon Henry Wilson Moore was 2ic to Beatty in the action at Dogger Bank, 23 January 1915, after which he was relieved of his command at Jellicoe's insistence. Moore's error was undoubtedly considered to be that of failure to engage with the enemy. He had misunderstood Beatty's flag signal and concentrated his force exclusively on the sinking of the already stricken Blücher, thereby allowing the remainder of the German First Scouting Group to escape - not considered a reasonable interpretation of Beatty's aggressive intent.

had he the slightest Nelsonic temperament in him, regardless of signals. In war the first principle is to disobey orders. Any fool can obey.”⁸⁹

The signal in question appears to be the flag signal made to Moore. Looking more widely at Jellicoe’s letter, his salvo might, in part, have been intended for Pelley, Captain of *The Tiger*.⁹⁰ Jellicoe’s further ungrammatical comments do nevertheless suggest Moore was his number one target by recording “it is simply ABSOLUTELY INCOMPREHENSIBLE to me why Moore discontinued the action at NOON! When the Sedlitz and Derfflinger, both heavily on fire and badly damaged and they had to scuttle into dock with great urgency....”⁹¹ Beatty’s criticism of Moore is perfectly grammatical but equally unsympathetic “Moore had a chance which most fellows would have given the eyes in their head for, and did nothing.”⁹²

In accordance with his later evidence before the Royal Commission, Churchill appears to have approached the appointment of a new Controller on the basis of personality rather than knowledge, qualifications, drive and practical experience. Moore’s naval CV could hardly be described as outstanding and, most significantly, there is no evidence that he had any experience in the nitty-gritty of industrial management and production. Effectively, Moore himself confirmed his unsuitability for high office, when, in departing his post as Controller, he informed Churchill that:

Subject to the existing policy control and priority of this Department remaining unchanged, it is believed that if nothing serious disturbs the labour and material supply, reliance may be placed upon the fact that the total number of Tanks as shown for production by March 31st 1919 may be relied upon. The monthly output, however, inevitably will fluctuate.⁹³

Within a month of Moore’s assurance, his replacement would produce a report providing a range of explanations for the Ministry’s poor tank construction record and an assessment that ran directly contrary to Moore’s claims. Maclean foresaw production continuing to decline and production facilities that were insufficient to meet the demands necessary to achieve Churchill’s targets.⁹⁴ It is possible Moore knew the true position and was misleading Churchill, but the likelihood is that he was simply

⁸⁹ Geoffrey Bennett, *Naval Battles of the First World War* (Barnsley, Pen and Sword, 2005), p. 163.

⁹⁰ Goldrick, *The King’s Ships*, pp. 298-299.

⁹¹ *Ibid*, p. 298.

⁹² Patterson (ed.), *The Jellicoe Papers, vol. I*, (London, Naval Records Society, 1966), Beatty to Jellicoe, 8 February 1915.

⁹³ Churchill Archives Cambridge, CHAR15/87, Moore to Churchill, 7 August 1918.

⁹⁴ *Ibid*, CHAR15/86, 2 March 1918, enclosing memorandum of same date from Fuller and Uzielli.

unable to evaluate assurances received from others. Whatever the case, Churchill had appointed to a key Ministry post an individual lacking the expertise even to determine the rate of production that was possible.

In later correspondence with Churchill, Fuller showed basic understanding that Churchill lacked, pointing out that this “problem is a twofold one, design and construction. Design requires a man who knows what we in France want. Production requires a man who is an expert in production.”⁹⁵ This was sound advice, though, arguably, the problem was threefold. Design required engineering ability, production required knowledge of industry and industrial processes and both these disciplines required an input of military understanding and judgment. This was a holy trinity, in no element of which could Stern or Moore claim competence. The appointment of Seely and Maclean in July and August would add significantly to management capabilities, though the talent of Wilson was never fully harnessed to the Ministry machine. Upon the departure of Stern to Overseas Development, Wilson remained associated to a significant extent with Metropolitan. In his position, Wilson lacked complete integration into the efforts of the Ministry in controlling design and production. Nevertheless, his standing was such that, if he dug in his professional heels, senior managers would be disinclined to exercise their managerial authority.⁹⁶ Wilson therefore exercised a limiting role on decisions from a position managerially peripheral, though invaluable and powerful industrially, in the eyrie of Metropolitan’s design office and shop floor.⁹⁷ As Wilson’s son pointed out, despite their larger drawing office staff, “the drawings of not one single successful tank used in France were produced in the Government Drawing Office”.⁹⁸ In contrast, Wilson designed “seven of the eight Marks which saw operational service, 2,545 of the 2,745 tanks built.”⁹⁹ Of those Marks that he did not design, all but the Medium A incorporated his epicyclic transmission.¹⁰⁰

⁹⁵ Searle, *Military Papers*, memorandum to Churchill, 2 March 1918, pp. 68-71.

⁹⁶ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Wilson by Gray, answers to questions 3129-3133 and MUN4/1591, Wilson to Controller (Maclean), 31 October 1918.

⁹⁷ Upon the movement of Stern in November 1917, Wilson would appear to have been elevated to a more senior position in charge of design. The first Mark V was produced some two months later. Wilson’s new position was not sufficiently senior to secure his inclusion among the 208 entries in the “List of some of the Principal Officers employed in the Ministry of Munitions during the War” (*Ministry of Munitions, History, vol. II, Appendix VIII*, pp. 260-275).

⁹⁸ Gordon Wilson, *Portrait*, p. 60.

⁹⁹ *Ibid.*

¹⁰⁰ *Ibid.*

Fuller advised Churchill of three main difficulties for mechanical warfare. He considered GHQ to be inert and would “lay down no policy”, “no efficient higher organisation” existed in the Tank Corps and “design and production are not assured”. He considered it “a waste of time to continue attempting to convince the Inconvincibles”. He advocated one Head for training, fighting and design and construction.¹⁰¹ Even this candid advice from Fuller, contained in a memorandum of career-ending dimensions, had it fallen into the wrong hands, failed to impart to Churchill a sufficient degree of alarm or caution. Apologetically, Churchill responded by acknowledging the spirit underlying Fuller’s critical remarks and outlining his own limitations in relation to those aspects of Fuller’s advice dealing with military matters. However, Churchill failed to recognise the significance of issues for which his Ministry was responsible. The possibility of shortcomings in his own backyard does not appear to have entered Churchill’s mind and his wildly optimistic prediction was “I think as the production develops – and during the next three months it will develop to a very large extent – it will carry all before it”.¹⁰²

The Mark V was coming on-stream as Churchill replied to Fuller and this did assist production figures over the following three months, but results were well short of Churchill’s predictions and of the aspirations of GHQ, America, France, and other allies seeking heavy tanks from Britain.¹⁰³ Following an increase to 227 Heavy, Medium and Supply tanks produced in April 1918, an increase likely to be explained by the Mark V coming fully on-stream and workers responding to the crisis of the German Spring Offensives, average production declined to just 137/month during May/July and 101 in August/September.¹⁰⁴ It will later be shown that the deteriorating state of production should not have surprised appropriately experienced personnel familiar with the working practices of the Ministry and its contractors and with the data held by the Ministry. These shortcomings, that would have been identified by “an expert in production”, remained unidentified or unannounced by Churchill’s staff or his “clever businessmen”.

¹⁰¹ Searle, *Military Papers*, Fuller to Churchill, 2 March 1918, pp. 68-69.

¹⁰² Tank Museum, Fuller Papers, A14, Churchill to Fuller, 8 March 1918.

¹⁰³ National Archives, MUN4/2807, Churchill received complaints from the War Office over his negotiations direct with foreign governments and in the light of low production figures the War Office sought to retain all Mark Vs for British use: Moore to Layton, 27 May 1918, shows the lack of clarity concerning policy.

¹⁰⁴ National Archives, MUN2/35, Ministry of Munitions: Statistics 1917-1918, Tanks, Monthly Figures.

Churchill's letter to Fuller is significant in that it betrays the extent to which he was out of touch with the running of a key Ministry Department.¹⁰⁵ His understanding and sympathetic response to the risks run by Fuller in his criticisms of the army foreshadowed his relations with military whistle-blowers during his wilderness years, but he failed to utilise the advice Fuller had provided and did not therefore set the Ministry on an efficient path by appointing an expert in production.¹⁰⁶ The two most pressing problems for Churchill should have been, firstly, to ensure that such contracts as were signed by the Ministry were fulfilled as quickly and efficiently as possible and, secondly, that an appropriate balance was struck between manufacturing efficiency and army operational objectives. By the time Churchill had settled into his new job and shuffled Stern into MWOAD, the issues surrounding the upgrading of the heavy tank had to some degree been resolved. However, the Mark V did not come on stream until February 1918: there is no evidence that Churchill took any steps to accelerate its introduction and it would appear to have been undertaken by Wilson when his authority to take design or experimentation decisions was enhanced by the replacement of Stern.¹⁰⁷

It is difficult to determine why Churchill should have been so confident of producing increasing numbers of tanks when expert opinion might have informed him otherwise. However, a clue is offered by Churchill's evidence to the Royal Commission when, in response to cross-examination on a technical matter, he stated "I am not an engineer: I know nothing about these things: I have to judge by weighing one man's opinion against another."¹⁰⁸ It suited Churchill's objective, of protecting himself from cross-examination before the Commission, to downplay his understanding of elementary scientific or mechanical issues, but his appointments and writings about tanks during the war show that his comments about lack of understanding of technical issues was not entirely without foundation. He had sufficient insight to appreciate that

¹⁰⁵ Searle, *Military Papers*, p. 73.

¹⁰⁶ *Ibid*, p. 69.

¹⁰⁷ Gordon Wilson, *Portrait*, pp. 59-60; National Archives, MUN4/774 and MUN4/775, Weekly Review of Statistics of Output, it is possible Stern would have released the shackles on Wilson a little earlier as the Mark IV programme neared completion, the date recorded for "commencement of design" in WO records is 5 October 1917 (WO194/55), though this is likely to represent the date of commencement of final drawings since Gordon Wilson was aware of his father working on the project during the previous winter and an experimental vehicle was run in March 1917.

¹⁰⁸ National Archives, T173/463, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by Russell, answer to question 236.

technological innovation was of value but did not have the understanding to ensure it was soundly handled by those under his control.

Some thirteen months of Churchill's spell at Munitions would elapse before James Maclean, an experienced industrialist, replaced Moore as Controller MWD. Then, notwithstanding the opprobrium of staff generally, Maclean rapidly produced a critical report placing public interests ahead of his own peer popularity by revealing the scale and breadth of problems at the Ministry. However, by that late stage of the war, the weaknesses Maclean identified could not be rectified in time to contribute to the number or quality of tanks used by the BEF. Had an appropriate Controller been appointed when Churchill became Minister there is every reason to believe that a greater number of tanks would have been available in 1918. Furthermore, had Lloyd George appointed an experienced industrialist early in 1916, the scope for improved production would have been even greater. It is ironic that two figures so closely associated with military success in the 20th century should both have failed to grasp the importance of relevant industrial experience and/or qualifications for a key post in the production of armoured vehicles.

So far as the army was concerned, its tactical ideas developed significantly during 1917 and 1918. Progressively, the machine-gun destroyer was seen as the lead member of a family of tracked vehicles. The other significant family members were the faster medium or light tank and the supply tank, the demand for which, in the interests of simplicity and economy, was fulfilled by the conversion of surplus Mark IV tanks.¹⁰⁹ The army's position was complicated by manpower shortages that were seen by some as rendering it difficult to expand the Tank Corps.¹¹⁰ At no stage did the army attempt to establish an effective control over design and production of armoured cars.

By the end of June 1917, the Tank Committee had inspected mock-ups of two alternative replacements for the Mark IV. Initially, subject to modifications, the Committee preferred the lighter Mark VI and the War Office duly placed an order for a total of 1600, though later changed to Mark V based on forecasts of earlier delivery. On 24 August, following observations from Haig, the Army Council cancelled previous requirements and substituted an order for up to 800 Supply Tanks (conversion of

¹⁰⁹ National Archives, MUN4/902, Tanks, Position in the Field, 1918 and MUN4/3547, Tanks, Deliveries ex Makers' Works; Glanfield, *Devil's Chariots*, Appendix 3.

¹¹⁰ National Archives, WO158/830, Haig to War Office, June 1918.

Marks I-III and towed sledges were acceptable within this category), 1600 Heavy Tanks, 1,200 Medium Tanks and 100 Gun-Carrying "Tanks".

Priorities and the limitations of the national economy were acknowledged by the proviso that the order was subject to reduction, if necessary, so that supply of aeroplanes, guns/ammunition, MT and locomotives "should not be jeopardised". The letter repeated Haig's view that "his needs in these four categories are of greater urgency than his need for Tanks".¹¹¹ Priority allocated to tanks was modified at various stages of the war, though there is no direct evidence that this hindered production, the impression being that it would have done so only had the rate of assembly been greater than the supply of component parts or the capacity of available labour. In his report in 1918 Maclean included two forecasts for tank production for 1918-1919, one related to existing levels of manpower, the other an enhanced level of production based on greater manpower.¹¹² Maclean envisaged that labour would become the limiting factor once he had built up productive capacity.

The month after Churchill's arrival at Munitions, Stern outlined the production position. He explained that 565 of the 1,400 Mark IV order had been delivered and that production would continue until completion of the order early in 1918. He claimed that efforts had been made to convert Mark IV tanks to Mark V but that this "has not been practical owing to the disorganisation which would be created at Contractors' Works, and consequent reduction in future output".¹¹³ This was not a decision Stern should have taken alone. Rather the facts should have been presented to the Army Council or War Cabinet for decision, along with the views of engineers and industrialists. At this time, Stern's position on Mark V production changed significantly. A month earlier he had confidently predicted the Mark V would be available by October, but his comment to Layton was no "production of this type can be anticipated before January next".¹¹⁴ Furthermore, he stated that, whilst plans were for an output of 160/month, "it will not be possible to reach this figure for some time after the commencement of production". Prospects for the Mark VI were similarly bleak with no production possible before July 1918. He forecast that the first ten Whippets would be

¹¹¹ National Archives, MUN5/394, War Office to MM, 24 August 1917.

¹¹² Churchill Archives Cambridge, CHAR15/87, report on 'Condition of Mechanical Warfare Supply Department at 1918', Appendix A.

¹¹³ National Archives, MUN4/2791, Stone(sic) to DMRS, 24/08/17.

¹¹⁴ National Archives, MUN5/211, Stern to Layton, 24/08/17

produced in May 1917, subsequently rising to 100/month. In the event the first Whippet emerged in fourteen months and production at no time exceeded thirty-six in a “5-week month”.¹¹⁵ It is not clear whether Stern’s revised position on the timing of the Mark V was caused by his recognition of production realities or to a policy decision on tank priorities. Gordon Wilson identified a specific decision that delayed work on the Mark V, namely in July 1917 when Stern and d’Eyncourt visited Metropolitan and inserted work into the design programme for two totally new tanks, the Medium B and Mark IX, at the expense of progress on the design of the Mark V. This vacillatory policy, Wilson claims, “not only delayed the introduction of a machine acceptable to the military authorities but also demoralised the design staff”.¹¹⁶

Errors in forecasting are understandable, but Stern’s predictions were so consistently short of the mark that an explanation must be sought in his motivation or personality. His note to Layton, and a friendly note to Elles, confirm that he did appreciate it was “impossible to forecast with any degree of certainty the productive capacity of the contractors”, but this did not prevent him attempting to forecast not only supply dates, but also monthly rates of production. So far as the Mark V is concerned it would appear that, during July 1917 he either discontinued his pretence that Mark V production would be much earlier than was possible or intended or became aware of revised circumstances, since he switched to forecasts that showed a more reasonable relationship to what was actually achieved: he also expressed production rates in defensive, imprecise terms.¹¹⁷ Stern sought to excuse the length of time he quoted for supply, but it is difficult to see how scarcity of raw materials, shortage of labour or difficulty in obtaining tools could explain an extension from less than five weeks to twenty-one weeks. Bearing in mind the time required to assemble a tank from available components, a forecast of under five weeks should have been based on all components being available or their supply being imminent and guaranteed. The figures issued in the *The History* show an output of only fifty-five Whippets during 1917.¹¹⁸ Although this shortfall is partially explained by the reduction in the army’s order from 400 to 200 machines, resulting in the Whippet being manufactured only in

¹¹⁵ National Archives, MUN4/3547, Tables VIII – TANKS. “Average Weekly Deliveries ex Makers’ Works”.

¹¹⁶ *Ibid*, p. 54.

¹¹⁷ National Archives, MUN5/211, Stern to Layton 24 August 1917.

¹¹⁸ Ministry of Munitions, *History, Vol. XII, Tanks*, Appendix VI, p. 93.

Lincoln, this factor would not necessarily have affected the production schedule for the remaining 200 machines.¹¹⁹

Meetings and correspondence continued between the army and Ministry.¹²⁰ The dissatisfaction of the army over both the heavy Mark IV, and the medium Whippet featured on these occasions:

There are sufficient Mark IV Tanks in France or nearing completion to provide all that were necessary of this type and that the further production of Mark IV Tank should be stopped at the earliest possible date” and “The improvements in engine-power and one-man-control now embodied in the experimental Mark V Tank should be introduced as soon as possible into the existing Mark IV Tank.¹²¹

The unhealthy relationship between Ministry and War Office is well illustrated by Stern placing contracts for 1400 Mark IV. The army insisted it had submitted orders for only 1,000. The army’s approach was modified by the adoption of Robertson’s pragmatic advice that it should accept Mark IV conversions for infantry supply purposes. The contract was also amended by the agreement of manufacturers to reduce the order to 1220, but this left the prospect of construction of eighty unwanted machines.¹²²

In an attempt to bring the warring factions together, Churchill arranged the establishment of a “New Tank Committee, which first met a few days after Stern became Controller Overseas Tank Production.¹²³ Notes by Elles following a conference at the Ministry in October 1917, when the nature of revised arrangements were under consideration, illustrate the extent of his dissatisfaction, “technical objections have out-weighed practical suggestion, and the arbiter has been the supplier. As a commercial proposition the M.W.S.D. would never have got rid of a single machine after the first hundred.”¹²⁴

¹¹⁹ National Archives, MUN5/211, minute on Tank Supply, Stern to Layton, 24 August 1917.

¹²⁰ National Archives, MUN4/2790, Capper to War Office, 25 August 1917 and War Office to MM, 30 August 1917.

¹²¹ National Archives, MUN4/6400, 28 September 1917, minutes of ‘Conference on Tank Policy’.

¹²² National Archives, MUN4/2790, MM to War Office, 12 July 1918. The history of the Mark IV order is explained by Boyd, Director of Statistics to Fleming 4 July 1918.

¹²³ National Archives, WO158/859, the first meeting of the New Tank Committee was held on 26 November 1917.

¹²⁴ National Archives, WO158/859, 7 October 1917, notes by Elles on the proceedings of conference held at MM.

Following Churchill's appointment as Minister, the army's further consideration of the type of tanks required and tactical use in 1918, such as could be assessed some six months in advance, was clarified at a conference attended by senior representatives of GHQ, War Office and Tank Corps. It was reported that Robertson's view was that the Ministry should concentrate on fighting tanks and improvise for other purposes, using converted machines where possible. The conference sought to terminate Mark IV construction, introduce more powerful engines and one-man control into existing Mark IV machines, cease construction of Whippets as soon as possible (with a construction limit of 200), provide Tank Supply Tanks in the proportion of one per five fighting tanks, construct 200 Infantry Supply Tanks, each being capable of carrying infantry or half a day's supplies for an Infantry Brigade and develop a new Medium Tank for exploitation. They expressed the view that production of any new tank should be on the basis of it being provided in "quantity" no later than 1 June 1918.¹²⁵

In 1918, efforts were made to pass unwanted Mark IV machines onto American forces and the French AS, whose larger tanks were regarded as failures.¹²⁶ However, understandably, neither nation was keen to accept machines judged to be second best and both sought a supply of Mark V.¹²⁷ Eventually, they secured a number of Mark V* machines, though not as early or in the quantity they and Churchill had hoped.¹²⁸ Additionally, some flexibility of limited armoured forces was achieved following the appointment of Foch as Supreme Commander, with British units, including both tanks and armoured cars, operating under French control.¹²⁹ Britain did receive a limited number of Renault tanks by November 1918, but there is no record of their use in action.¹³⁰

¹²⁵ National Archives, MUN4/6400, 28 September 1917, minutes of 'Conference on Tank Policy'.

¹²⁶ National Archives, MUN4/2799, Churchill to Loucheur, 18 July 1918 and Seely to Fleming, 6 July 1918.

¹²⁷ National Archives, MUN4/2807, June 1918, draft letter on tanks for French Army, MM to War Office, and DG Tank Corps to MM, 20 July 1918, informing "Mark IV Tanks are not acceptable to the Americans" and Drain to Stern, 22 July 1918, seeking twenty-two Mark V/V*.

¹²⁸ National Archives, MUN4/2807, Fleming to Moore, 26 July 1918 and MM to Harington 7 August 1918.

¹²⁹ Liddell Hart, *The Tanks*, p.174.

¹³⁰ National Archives, MUN4/851, Tanks, Position in the Field for week ending 17 November 1918. This shows 11 Renault tanks having been delivered to the Tank Corps in France and one "elsewhere" – presumably to the Ministry or War Office in England.

There were undoubtedly faults on both sides, but it is difficult to reach a conclusion that does not contain an element of criticism of the Ministry for failing to provide a responsive service to the army. Neither *The History* nor other documents deal adequately with this issue or the reasons for it. Shortly an effort will be made to point to references that may provide an explanation. In the meantime, it is necessary to examine the response of the army to the new problems of mechanised warfare.

The two dominant politicians of the war and/or subsequent period, namely Lloyd George and Churchill are critical of the army. It would be difficult to envisage two opponents possessing more effective oratorical or literary attributes. Lloyd George attacked the army on a wide range of issues.¹³¹ Specifically he emphasised that the concept of the tank was developed by the navy and that “the WO set up a Committee to investigate Colonel Swinton’s suggestion”, but “dropped the project after a few experiments and decided to take no further action”. He explained that he arranged to incorporate tank supply into his Ministry’s responsibilities as soon as the experiment was deemed a success.¹³² There is perhaps no reason up to that point to take issue with Lloyd George’s criticisms. However, he is on less firm ground when he continues by claiming:

the decision of the army chiefs to launch the first handful of these machines on a comparatively local operation in September, 1916, instead of waiting until a much larger number were available to carry out a great drive, has always appeared to me to have been a foolish blunder.¹³³

Churchill falsified his story of the development of the tank for reasons already explained. He fell, however, into the same trap as Lloyd George, expressing the view that the:

first twenty tanks, in spite of my protests and the far more potent objections of Mr. Asquith and Mr. Lloyd George, were improvidently exposed to the enemy at the Battle of the Somme. The immense advantage of novelty and surprise was thus squandered”.¹³⁴

Both politicians therefore express views at odds with those supporters of armoured warfare within the army. In doing so they extend their original sound criticisms of the army’s shortcomings before and during the first year of the war by unreasonable

¹³¹ Lloyd George, *War Memoirs*, notably chapters 5 and 6, ‘The Fight for Munitions’.

¹³² *Ibid*, p. 383.

¹³³ *Ibid*, p. 385.

¹³⁴ Churchill, *World Crisis 1911-1918*, p. 315.

criticism of army tactics and priorities from 1916 to 1918. GHQ considered combat experience to be of fundamental value. Moreover, tanks were insufficiently reliable and too slow to achieve the breakthrough to which the politicians unwisely aspired.¹³⁵ Additionally, adequate means of logistical support for such a “breakthrough” did not exist. Despite claims that the army approached the integration of armoured vehicles into its offensive repertoire imprudently or unenthusiastically, it is considered that its approach was appropriate and reasonable in the circumstances. The groups of tanks which formed the essence of army tactics at Flers may have been shown in practice to have been too small, but the army was not to know that the machines had been built to a faulty specification which adversely affected their survival before and during the battle.

Thoughts developed in 1917 from the 1915/16 wire/trench-crossing, machine-gun destroyer to machines capable of performing a range of other tasks, including exploitation, tank unit supply, gun-carrying, personnel carrying, and infantry/engineer supply. However, manufacturing capacity barely scratched the surface of requirements for effective implementation of cross-country armoured offensives. By the use of road and rail, defensive forces were always likely to be capable of assembling sufficient assets to thwart a limited-scale cross-country assault.

As a perfectionist, intolerant of those holding different views to his own, Wilson had a reputation of being a difficult individual.¹³⁶ However, the records show that he cooperated well with Tritton on the Mark I, with Tank Corps engineers in France following Flers and provided invaluable support to Metropolitan for over two and a half years. His harmonious working relationship with Metropolitan can be gauged by the fact that he worked jointly with Major John Greg, Technical Director at Metropolitan, to design a gun-carrying “tank”.¹³⁷ It would appear that this key engineer, who designed virtually all British wartime tank models, cooperated impeccably with those able to

¹³⁵ Goya, *Flesh and Steel*, chapter 10, “The Steel Fist”. The French Army faced similar problems to the BEF. It too had originally intended to use its tanks in a massed assault, but manufacturing delays and the British revelation of the “secret weapon” in September 1916 necessitated a rethink - it concluded that its larger, Medium tanks were too slow and vulnerable to form and exploit a breakthrough against a forewarned enemy. However, later when possessing the advantage of a faster light tank, the Renault FT, it restored the concept of massed offensives, which were therefore undertaken from July 1918 with a view to conquering a “deep zone”. Such offensives were generally expensive in terms of tank losses, though allowance needs to be made for the fact that the French Army was developing fresh tactics.

¹³⁶ Gordon Wilson, *Portrait*, pp. 54-55.

¹³⁷ Glanfield. *Devil's Chariots*, p. 172.

appreciate and utilise his outstanding engineering talent.¹³⁸ It was unfortunate that he was not integrated more fully into discussions between Stern and America in the Chateauroux/Mark VIII project. Wilson accompanied Stern to France after the Arras offensives, but appears to have been kept out of key meetings, for which he and other technical officers were on hand simply “to answer questions”.¹³⁹ Possibly, Stern wished to avoid the formation of an army/Wilson alliance to advocate technical advancement at the expense of production numbers. Wilson might have provided more realistic production forecasts. His exclusion from discussions with the Americans on the Mark VIII was particularly unfortunate: this denied the benefit of his work to the Anglo-American project which was therefore slower than it might have been and was not completed before the Armistice.¹⁴⁰

The degree of cooperation and understanding between engineers was not matched in the field of management. By the time Churchill interviewed Stern in September 1917, it was not just War Office generals who were seeking his removal from his post as Head of Mechanical Warfare. Elles, who, apart from his misguided advocacy for the use of Lewis Guns in tanks, showed fine judgment in the development of armoured warfare, also concluded Stern should be replaced. Early in 1917 Elles had been singing Stern’s praises, “expecting Stern back again to-morrow. I think his visit was of the greatest value”.¹⁴¹ By October he held the opposite view.¹⁴²

Delayed progress in improving early design by the introduction of one-man driving and increased engine power would have been of greatest significance in explaining Wilson’s changed opinion.¹⁴³ Although the Tank Corps did not determine or control the tactical use of tanks, Elles was responsible for the provision of the tank service to formation commanders and was aware that he was sending men into battle in

¹³⁸ National Archives, T173/776, Royal Commission on Awards to Inventors, examination of Tritton by Russell, answers to questions 2570-2575 and WO158/836, Knothe to Elles, 28 September 1916; Gordon Wilson, *Portrait*, pp. 51-73.

¹³⁹ Liddell Hart Centre for Military Archives, Stern Papers, Stern 1/9/17, minutes of conference at Bernicourt, 16 April 1917, attended by Butler, Elles and Stern - Wilson, Symes and Shaw “attending when requested to answer questions”.

¹⁴⁰ Gordon Wilson, *Portrait*, pp. 61-64.

¹⁴¹ National Archives, Elles to Anley, 23 April 1917.

¹⁴² National Archives, WO158/859, notes by Elles on proceedings of conference and Elles to War Office, 7 October 1917.

¹⁴³ National Archives, WO158/818, minutes of ‘Conference on Tank Policy’ at War Office, 28 September 1917.

machines possessing basic weaknesses.¹⁴⁴ The protective armoured mantle gave the impression of safety for the occupants of tanks compared to the exposed infantry they were assisting. The sense of safety was illusory, figures show their casualty rate to be similar to infantry and other arms.¹⁴⁵ Elles quest for one-man control and more speed was entirely reasonable in that it would provide the tank's main enemy, the German field gun, with a potentially more agile and elusive target.¹⁴⁶ Slow movement rendered Marks I to IV vulnerable to an excessive extent to direct and indirect fire from field guns owing to the need to stop to change gear or undertake significant steering manoeuvres.

Ludendorff's view was clear, for defence against tanks "the 06 field-gun, which penetrated them was sufficient; all we had to do was turn it out in sufficient quantities."¹⁴⁷ It is surprising Ludendorff did not recognise the potential handicap of mist or fog in defending against tanks. Owing perhaps to his naval association, Churchill had instantly appreciated the benefit of smoke as a form of protection for tanks.¹⁴⁸ Subsequently, the army and Ministry were slow to develop this line of thought. In muddy conditions the risk of bellying increased the vulnerability of the tank, a vulnerability which, in the sight of a field gun or enemy OP was not greatly assisted by the addition of unditching beams. This was due to the length of time the tank was stationary before the unditching beam might render it mobile again and to the vulnerability of the crew to small arms fire and shrapnel when working to deploy the unditching beam from positions outside the tank.

Although Stern and his successor, Admiral Moore, do not provide a detailed explanation of their reasons for continuing over a period of nearly two years with Mark IV contracts, it is difficult to see any explanation that does not include the issue of "performance criteria", output level and cost. Transfixed by the rate of production and

¹⁴⁴ National Archives, MUN4/700, Elles to Anley, 23 April 1917.

¹⁴⁵ J. P. Harris, *The Rise of Armour* in Paddy Griffith (ed.) *British Fighting Methods in the Great War*, (London, Frank Cass, 1996), pp.132-134. Harris summarises Tank Corps casualties at Amiens, 8 August-20 October 1918 as 561 Officers and 2627 Other Ranks, about 40% of fighting strength, proportionately higher than for Infantry over the same period; James E. Edmonds, *Military Operations France and Belgium, 1918, vol. IV*, (London, HMSO, 1947), p. 517, records casualties in the Tank Corps between 8 August and 27 September 1918 as 408 Officers and 1759 Other Ranks. The total size of the Tank Corps about this time was 7200 plus some 500 semi-trained reinforcements.

¹⁴⁶ Goya, *Flesh and Steel*, p. 225, records that French Renault FTs were more difficult to destroy than larger tanks, with one Renault destroyed for every eight engaged by their main enemy, German artillery, whereas one medium tank was destroyed per three engaged.

¹⁴⁷ Eric von Ludendorff, *My War Memories, 1914-1918* (London, Hutchinson, 1919), p. 337.

¹⁴⁸ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915.

concerns of manufacturers for production runs of length, there would appear to have been no attempt to employ shorter runs incorporating enhancements. In October 1917, soon after taking over from Stern, Moore emphasised to Duckham that in:

all cases [of new machines] it is desirable that a further fixed limit be given to whatever design is adopted, and for general convenience of manufacturers, rapidity and continuity of production, this limit ought not to be less than six months output.¹⁴⁹

A six-month run might have been acceptable for soundly designed machines, but the early tanks had many weaknesses.¹⁵⁰ Furthermore, in wartime, endurance tests were not necessarily conducted prior to issue.¹⁵¹ Moore was indicating, in a different, less abrasive way than Stern, that he was nevertheless inclined to act as the manufacturers' poodle rather than the army's terrier. He exhibited traits conforming to Jellicoe's judgment. Compared to the continuity of a large volume contract, regular or frequent switches in production would undoubtedly have incurred penalties, financial and numerical. Such changes would however have increased the efficiency of individual tanks in operations. The unpopularity of changes to production lines and Wilson's actual, as opposed to his theoretical, authority are well illustrated by the reaction of Metropolitan to a large order for Mark V late in the war.¹⁵² The army required "as quickly as possible" a repeat order of 2,000 Mark V "of precisely the same design" as those previously constructed.¹⁵³ Wilson had secured the agreement of Metropolitan "to lay themselves out for very rapid production....on the understanding that no alterations should be made." However, GHQ subsequently sought sixty-two amendments to upgrade the Mark V as Mark X. Wilson, drawing upon the mutual respect between himself, the Chairman of Metropolitan, Dudley Docker, and senior management at Metropolitan, claimed it was:

only due to my personally urging the necessity for certain of these changes and coming to a mutual agreement with them as to those which would really seriously affect production and those which could be put through without very serious delay that the majority of these changes have been adopted by them.¹⁵⁴

¹⁴⁹ National Archives, WO158/829, Moore to Duckham, 7 January 1918.

¹⁵⁰ Browne, *Tank in Action*, pp. 4-7.

¹⁵¹ National Archives, WO194/55, Mark V, sheet 1, shows, for example, no endurance tests were carried out for the Mark V.

¹⁵² National Archives, MUN4/1591, Mark V* Tank, Wilson to Controller (Maclean), 31 October 1918.

¹⁵³ Ibid.

¹⁵⁴ Ibid.

The BEF then sought further changes. Wilson was not convinced of the need for these changes and asked “to be relieved of any responsibility for Metropolitan Co’s production of the Mark X [sic] if this is insisted on”.¹⁵⁵ The Ministry and GHQ backed down.¹⁵⁶ The episode and that negotiated by Duckham for elongation of the Mark V to V* demonstrate that it was possible to compromise over the vexed question of amendments to design, contracts and agreements. Wilson had endeavoured to dissuade the army from lengthening the Mark V. On that occasion he limited the severity of his criticism, seemingly because he had dissuaded the Ministry/army from abandoning production of the Mark V altogether, allowing 400 to be built before switching production to V*:

While I quite appreciate that the wishes of those in France should have full consideration, I would here remind you that it was the express wish of France contrary to my technical advice that Mark V was converted to Mark V Star and that had I not strenuously opposed this alteration no Mark V would have been produced at all.¹⁵⁷

Effectively, endorsing Wilson’s judgment, Elles later stated that the lengthened Mark V* was not a success, being unpopular in the army owing to increased weight and length which left it underpowered and difficult to steer.¹⁵⁸ This was not simply the view of Elles but also of the War Office and Tank Corps as a whole since the War Office refused to part with any Mark V machines, requiring instead that V* should be supplied to French and US Armies:

I am commanded by the Army Council to inform you that owing to the transportation difficulties of the British Army being now overcome, the whole of the 400 Mark V Tanks will be required for the Equipment of the British Tank Corps. The British Army prefers the Mark V Tanks or (sic) the present style of fighting to the Mark Vx type.¹⁵⁹

In reality, the Army Council realised it had made a mistake in requiring elongation of the Mark V to Mark V*. Reversion to Mark V was evidence of this. They were fortunate that Wilson had persuaded them to undertake a limited run of Mark V.¹⁶⁰

¹⁵⁵ Ibid. It would appear Wilson should have referred to the Mark V: the two models were similar.

¹⁵⁶ National Archives, MUN4/1591, Wilson to Controller (Maclean), 31 October 1918.

¹⁵⁷ National Archives, MUN4/1591, Shaw to Controller, 7 November 1918, attaching extract from earlier report by Wilson contained in his memorandum, presumably to Shaw or Maclean, 5 October 1918, concerning proposed changes to petrol feed and other design elements of the Mark V**.

¹⁵⁸ National Archives, CAB45/118, Elles to Edmonds 23 March 1944. (Handwritten note by Elles on typed letter).

¹⁵⁹ National Archives, MUN4/2807, War Office to MM, 22 May 1918.

¹⁶⁰ National Archives, MUN4/3547, Statistics Output Tables, Tanks. Output of Mark V* commenced May 1918 during which month output averaged 3.5 Mark V*/week.

It is known from various comments and reports that there were problems with the Ministry's drawing office.¹⁶¹ However, it seems likely that the delay in developing the Mark V was largely the result of policy decisions by Stern. Wilson stated in October 1918 "that practically the whole of 1917 was lost owing to vacillation of requirements from France, the E.M.E. Machine having run on the 3rd March. The drawings for Mark V were not put in hand until 5th October."¹⁶² Wilson may have been correct that much time was lost in advancing design in 1917 but correspondence and notes of the various conferences do not support his statement that army vacillation was responsible for the delay. He may not have wished to blame Stern or may simply not have known the factors responsible. There is however no reason to doubt his comment about the running of the experimental machine. The March date fits with the winter period given by his son as the time he undertook his initial design work.¹⁶³

So far as the rate of construction is concerned, the lack of management ability at the Ministry appears to be at the root of the problem. Stern, Addison and Montagu appear not to have grasped the need to assess the capacity of plant and buildings for the manufacture of necessary components. Moore was aware of deficiencies but did not expand productive capacity. Churchill must have appreciated that problems existed but failed to take any action until June 1918 and then seemingly because he was under pressure from Seely, d'Eyncourt and Lloyd George. There is no evidence that Churchill had any understanding of the steps that were necessary. He appeared to have been genuinely surprised upon receiving Maclean's report on production and the underlying explanations for low output.¹⁶⁴

Haig may have been responsible for prolonging Stern's preoccupation with numbers rather than quality, since in April 1917 he repeated the advice given in September the previous year.¹⁶⁵ This extended the priority for quantity over quality until August. Stern claims he was told:

¹⁶¹ National Archives, MUN4/4979, notes of meeting, 22 March 1918 about the MWSD Drawing Office.

¹⁶² National Archives, MUN4/1591, Shaw to Controller, 7 November 1918 in response to questions from Elles on gravity feed petrol system for the Mark V**- includes extract from report by Wilson, 5 October 1918, in which he takes the opportunity to remind the recipients of aspects of his advice, that were rejected by GHQ, concerning the Mark V.

¹⁶³ A. Gordon Wilson, *Walter Wilson*, p. 52.

¹⁶⁴ National Archives, MUN4/3547, Statistics Output Tables, Tanks; Churchill Archives Cambridge, CHAR 15/92, Seely to Churchill, 9 October 1918.

¹⁶⁵ Albert Stern, *Tanks, 1914-1918: The Log-Book of a Pioneer* (London, 1919), pp. 119-120.

he [Haig] would do anything to help me; that a division of Tanks was worth ten divisions of infantry, and he probably underestimated it: told me to hurry up as many Tanks as I could, not to wait to perfect them, but to keep sending out imperfect ones as long as they came out in large quantities, especially up till August. He said that the Tanks, after aeroplanes, were the most important arm of the British Army, as they were such tremendous life-savers. He asked me who at the War Office did not believe in them. I replied that the A.G.'s department recruited my men. He agreed that it must be stopped.¹⁶⁶

These remarks, which may have greatly influenced Stern's actions, were made when Haig was under pressure for short-term results. Greater consideration was required on the relationship of short-term needs to longer-term supply and design policy. It is interesting to note that the date selected by Haig appears to take into account reduced urgency in supply over the winter period, a factor not raised by any other representative of the Ministry or army. However, though Haig may have been conscious of fluctuations in seasonal utility of tanks, he may have been less aware of the nature of enhancement that could be made to the main fighting tank. He was most impressed by the enhanced capability of the Mark V when it became available:

Remarkable progress has been made since Cambrai, not only in the pattern of Tank, but also in the methods of using them. Tanks now go first, covered by shrapnel barrage, and break down all opposition. Enemy in strongpoints and machine gun nests are then flattened out by the Tanks....During consolidation Tanks zig-zag in front to cover the operation.¹⁶⁷

It was helpful that the C-in-C should observe the improved capability of the Mark V, but his remarks suggest he overrated their ability to evade incoming fire and may have over-assessed their tactical ability in the offensive. This will be examined in the following chapter.

In the early part of the 20th century the army laboured under the handicap that it was poor form to advocate a different line to senior officers, yet Elles considered the matter of sufficient importance to depart from accepted practice when he pointed out that the underlying reason for the "any tank is better than no tank" policy was to obtain the maximum number for the Spring Offensive, i.e. "large production at an early date. This has failed." He advocated either "large quantities produced in a short period" or

¹⁶⁶ Ibid, pp. 133-134.

¹⁶⁷ Sheffield and Bourne (eds.), *Haig, War Diaries*, p. 436; Lloyd, *Hundred Days*, pp. 54-55 (Lloyd suggests that the male Mark V was armed with two 6-pounder guns and the female with six machine-guns. However, the male also had 4 machine-guns. Lloyd should have said that, on the female, the 6-pounders were replaced by two additional Hotchkiss machine-guns rather than "by six Hotchkiss machine-guns").

a “system whereby a lesser number is produced and maintained whilst continual modification and improvement in design is introduced”. He pointed out that the Mark IV design “is rudimentary and possesses defects which make it very expensive as regards personnel and material and very difficult to use tactically”. His handwritten alterations to the original draft letter toned down the suggestion that “design, output and maintenance” should be “extracted from the Ministry of Munitions”, but his campaign for change via a future joint conference was retained with the aspiration that “if necessary and expedient a new policy be laid down on a basis of facts”.¹⁶⁸

Aspirations by Elles were not to be achieved. His approach was possibly the opposite of that accepted by Stern. Whereas Stern does not appear to have challenged the industrial “necessities” advanced by Metropolitan, arguably, Elles attached insufficient weight to industrial requirements. In any event, the Mark IV was constructed in large numbers between May and October 1917 and smaller numbers continued to be manufactured for a further year.¹⁶⁹

Churchill should have had no difficulty in improving upon the performance of his predecessors. The organisational system Churchill introduced in August 1917, appears to have worked efficiently for the Ministry as a whole but the MWD did not operate along the same lines as other Departments.¹⁷⁰ The withdrawal of Lloyd George’s special Charter and replacement of Stern by Moore did not improve the running of the Department. Wilson stated that the replacement of Stern led to improvements, but he may have been influenced by the conclusion of large-scale Mark IV construction around that time and by his freedom to progress towards the introduction of the Mark V. There is no sign that the replacement of Stern by Moore provided any basic change of approach to the management of the MWD, indeed Moore seems to have been Stern’s equal both in kowtowing to the production runs favoured by industry and accepting unrealistic construction forecasts by industrialists. In February 1918, Moore suggested that, given the necessary steel, North British Locomotive Company and associated Manchester manufacturers might produce some 1,750 tanks between April and October 1918.¹⁷¹ In the event, North British

¹⁶⁸ National Archives, WO158/845, Elles to GHQ, 30 March 1917.

¹⁶⁹ National Archives, MUN4/3547, Average Weekly Deliveries of Tanks (ex-Works).

¹⁷⁰ Stern, *Tanks*, pp. 63-66.

¹⁷¹ *Ibid.*

produced nineteen Medium B tanks mostly in October/November 1918 and eleven Mark VIII after the Armistice.¹⁷²

Preparations for the production of the Mark V may not have been assisted by contract disputes. In the summer of 1917, Addison's cancellation of the autonomy Lloyd George had granted to the MWSD resulted in clashes between the Ministry's Finance and Mechanical Warfare Departments. The Finance Department claimed a dispute over contract price had no influence on the timing of production, but Stern and Duckham felt otherwise.¹⁷³ It may be telling that the matter was resolved as soon as the dispute was elevated to Director level. It would appear that "F", Hambling, then conceded it was inappropriate to continue to delay the supply of a more effective tank to the army for the potential benefit of £100/machine.¹⁷⁴ An inter-departmental dispute had developed under the jurisdiction of Addison, perhaps not an individual greatly feared by his subordinates. However, Hambling may not have relished the prospect of arguing the point with Duckham before the more imposing figure of Churchill, whose priorities and approach might have been altogether less understanding of "modest" financial savings compared to the value of the "bigger picture". Contracts were finally agreed and signed after several months of wrangling.¹⁷⁵

Production of the Mark IV was well advanced when Churchill arrived at Munitions.¹⁷⁶ Some 400 machines had been released to the Ministry's Transport Officer by 14 July and a further 238 by the end of August.¹⁷⁷ Churchill was immediately dragged into the debate on the number of Mark IV ordered by the War Office. By the time he had reorganised his Department, been accepted by the electorate of Dundee and advised on the situation of the Mark IV, it is understandable he should have concluded there was little to be gained by cancelling the remainder of the order at such a late stage. Duckham pointed out "to stop manufacturing Mark IV. at once would not assist the output of Mark V." As soon "as Mark V. was ready to come along the manufacture of Mark IV would cease".¹⁷⁸ Duckham's claim was not entirely accurate. Commencement

¹⁷² National Archives, MUN4/3547, Tanks – Average Weekly deliveries (ex-Works).

¹⁷³ National Archives, MUN4/4175, Duckham to Hambling, 30 August 1917.

¹⁷⁴ Head of each of Churchill's Divisions was known by a single letter "Identifier". Hambling, Head of Finance was "F", Duckham was "E", (Engines), Seely "W", (Warfare).

¹⁷⁵ Ibid, Metropolitan to Stern, 5 October 1917.

¹⁷⁶ National Archives, MUN4/774, Munitions General: Weekly Review of Statistics of Output.

¹⁷⁷ National Archives, MUN4/5172, Returns and Routine Reports: Weekly Reviews (DMRS).

¹⁷⁸ Liddell Hart Centre for Military Archives, Stern Papers, Stern1/2/3, minutes of Conference at MM, 29 September 1917.

of the Mark V was dependant not only on clearing industrial floorspace for a new range of components and manufacturing processes, but also on the availability of the components to be assembled to form a machine that differed in many respects from the Mark IV. There is no evidence that the necessary components were available to facilitate earlier construction of the Mark V. From comments in *Portrait of an Inventor* and on the weekly progress reports it appears that the true reason why construction of the Mark V could not start earlier was the lack of the necessary preparations which, bearing in mind the number of new components, would inevitably have taken several months.¹⁷⁹ Limited productive capacity for Mark IV remained after production of Mark V commenced in earnest in February 1918. The residue of Stern's over-ordering of Mark IVs, some seventy-seven tanks, were assembled between March/November 1918.¹⁸⁰

It has already been demonstrated that Churchill anticipated a surge in output in 1918. This, he would have believed, would result from the commencement of production of Mark V, increased output of Medium tanks and output of certain specialised machines for transporting artillery and supplies. Churchill appeared to have no reservations about improved rates of tank production in his advocacy of mechanised warfare. In October 1917, Churchill submitted a memorandum to the War Cabinet listing six principal forms of weaponry that could assist infantry in the 1918 fighting season, namely artillery, air, rail, gas, trench mortars and tanks. So far as tanks were concerned, he claimed the original conception of the use of tanks was by night, by surprise, as a novelty, as an independent arm under specially planned operations in favourable weather and on ground not torn up by artillery. His memorandum was critical of the way they had been used. He believed:

the resources of next year will for the first time make available numbers of Tanks with trained personnel sufficient not only to act as auxiliaries to the infantry in the main battle, but to provide the forces necessary for attacks of their own under the most favourable conditions and on a very large scale.¹⁸¹

He added:

the existing pattern of Tanks will be available in considerable numbers to support the main operations of the army during the spring and early summer, it should be possible by July to provide an ample force of a greatly improved

¹⁷⁹ Gordon Wilson, *Portrait*, pp. 54 and 59.

¹⁸⁰ National Archives, MUN4/3547, Statistics Output Tables.

¹⁸¹ National Archives, CAB24/30, 'Munitions Possibilities of 1918', 21 October 1917, p. 6.

pattern, lighter, faster and with a far greater radius of action".¹⁸²

Churchill deplored the priorities of the army, whereby only 18,000 men were allocated to the Tank Corps. It is not possible to compare the accuracy of Churchill's forecast with the eventual outcome. He used imprecise terms - "ample", "lighter, faster" and "far greater". It appears he was referring to the Mark V though this was heavier than the Mark IV and possessed an advantage of speed that was significant for movement in disadvantageous conditions rather than theoretical top speed.¹⁸³ It is possible Churchill intended the comparison to be between the Whippet and the Mark IV, in which case many of his points would have been justified. However, only 116 Whippets were produced by July. Marks V/V* were also available only in limited numbers, some 518 by July 1918.¹⁸⁴ It is clear he had no understanding of the limited productive capacity established by his Ministry. This undermined his ambitious future tactical plans. Furthermore, his objective to use tanks "for attacks of their own" shows that he had not shed his flawed appreciation of the tactical role and limitations of tanks and their mechanical reliability.

Beiriger expressed the view that under Churchill, the Ministry "began an ambitious and extensive mechanical warfare programme that featured trench mortars, tanks and airplanes". He recorded the qualification that "limited resources, competing government departments, entrenched military conditions and the exigencies of war all threatened the realisation of mechanical warfare".¹⁸⁵ The generality of Beiriger's comment is sound but it neglects to record that Churchill's estimates represented a gross exaggeration of what could be achieved. The "existing pattern of Tanks" were not available in adequate numbers for operations in the early summer of 1918 and those available for the main British effort at Amiens in the late summer were still

¹⁸² Ibid.

¹⁸³ National Archives, T173/776, Royal Commission on Awards to Inventors (Improvements to Tanks), examination of Johnson by Watson, answers to questions 1329-1330. The merits of utilising an epicyclic gearbox was considered at various stages of this Inquiry, it had not been discussed in 1919 as that Inquiry had been concerned solely with claims relating to the first tanks. Johnson explained that "the machines produced had such weight and such slow speed that when the engine was declutched it entirely lacked momentum and in practice it stopped dead instantaneously....and it had to be started away from rest....The use of epicyclic gear modified all that, because the change is so instantaneous from the application of one brake band to the application of another that you could obtain the advantage of the momentum of the machine."

¹⁸⁴ National Archives, MUN4/3547, Statistics Output Tables, Tanks.

¹⁸⁵ Eugene Edward Beiriger, *Churchill, Munitions and Mechanical Warfare: The Politics of Supply and Strategy*, (New York, Peter Lang, 1997), p. 99.

insufficient to meet the perceived needs of all three attacking Corps.¹⁸⁶ Furthermore, the “ample” force of lighter tanks of improved pattern did not materialise and exploitation at Amiens was entrusted to a relatively small number of the original, unimpressive Medium A, in conjunction with cavalry and a limited number of unreliable armoured cars.¹⁸⁷

The exploits of the Medium tank, *Musical Box* and 17 Armoured Car Battalion during the Battle of Amiens represented snapshots of the breakthrough and exploitation to which tank enthusiasts and Haig had aspired in mechanical or equine form.¹⁸⁸ A number of factors limited the achievements of Fourth and Third Armies at this time. Firstly, armoured cars were handicapped by their unreliable mechanical condition, small number, need for towed assistance over rough ground and lack of effective resupply arrangements, essential to maintaining a continuing impact.¹⁸⁹ Secondly, the use of Medium tanks was limited by their restricted number, deployment in association with cavalry units and limited firepower and speed.¹⁹⁰ Edmonds also considered cavalry action to have been somewhat unadventurous, though initial enemy disorganisation on 8 August heralded a most successful period for cavalry offensive action, justifying Haig’s earlier efforts to retain a Corps of a size capable of effective action as the network of German defence buckled somewhat under the pressure of artillery and heavy tank assault.¹⁹¹

For tanks, Fuller considered the outstanding lesson of Amiens to be the inadequate speed of Whippets for open warfare.¹⁹² It would be difficult to argue against the

¹⁸⁶ Edmonds, *Military Operations France and Belgium, 1918, vol. IV*, Appendix III, Fourth Army Operation Order of 31st July 1918, which shows a full Brigade of tanks attached to each of the Australian and Canadian Corps, but only a single Battalion to III Corps.

¹⁸⁷ Fuller, *Tanks*, pp. 219 and 228-229, ninety-six Whippets were deployed.

¹⁸⁸ Edmonds, *Military Operations, France and Belgium, 1918, vol. IV*, p. 514; Fuller, *Tanks*, pp. 230-235.

¹⁸⁹ Edmonds, *Military Operations, France and Belgium, 1918, vol. IV*, p. 64; Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918; Kenyon, *Horsemen*, pp. 212-213.

¹⁹⁰ Fuller, *Tanks*, pp. 228-229.

¹⁹¹ Edmonds, *Military Operations, France and Belgium, 1918, vol. IV*, p. 514; Kenyon, *Horsemen*, pp. 208-213; John Herbert Boraston, *Sir Douglas Haig’s Despatches December 1915-April 1919* (London, J. M. Dent and Sons, 1919), The Final Despatch, Part 2, Features of the War, para. 15, pp. 328-329 – Haig takes the opportunity to reply to critics of his advocacy of maintaining a strong cavalry force by outlining occasions and circumstances in which they demonstrated their value: Haig’s report is balanced both in terms of the range of circumstances in which cavalry was of value and relationships with other arms, insight which is maintained in his following paragraphs on “mechanical contrivances” and cooperation between arms.

¹⁹² Fuller, *Tanks*, p.229.

importance of this factor, though *Musical Box* demonstrated that, provided defence was dislocated, access to enemy rear areas was possible. The problem of engine power for heavy tanks had been appreciated for some time but GHQ and the Ministry had not prioritised the development of a light tank. Speed had been improved in the Mark V, but, for all British tanks, remained low and quite inadequate for exploitation and insufficiently elusive for German field artillery deployed in anti-tank locations. It was unfortunate that the tank exchange with France commenced too late to enable the BEF to launch a force of Renault FT at Amiens. The delay of the tank exchange would appear to have been a consequence of low levels of tank construction achieved by the Ministry in 1918. Furthermore, cavalry and tanks did not cooperate entirely amicably. Fuller had no wish to act as nursemaid to the cavalry, while Brigadier-General Archibald Home, B.G.G.S., Cavalry Corps, felt that the best way of using Whippets was to keep them as a reserve under the hand of a Cavalry Brigade Commander.¹⁹³

As Haig prepared his forces for the Battle of Amiens, d'Eyncourt, upset by low tank production, by the unseating of Stern from his former post some nine months earlier and, undoubtedly, by keenness to hobnob with the "top brass", was making representations to Lloyd George about tank production. Accordingly, it was announced that "The Prime Minister decided to hold a discussion on Friday afternoon next on the output of British Tanks, which was reported to be unsatisfactory. He invited any of his colleagues who were interested to attend" and informed members of the Imperial War Cabinet of his intention to call a meeting.¹⁹⁴ In the event the meeting took place just before the IWC on 8 August and members arriving for this later meeting joined in the discussion on tanks.

Outwardly, during the spring and early summer months, Churchill had remained optimistic about tank production.¹⁹⁵ However, he did adjust his position to the extent that he became sensitive to the issue of labour difficulties. Notably on 12 July he

¹⁹³ Fuller, *Tanks*, pp. 228-229; National Archives, WO95/575-3, Cavalry Corps Note by Home, B.G.G.S., 24 August 1918, Summary of Lessons learned from recent Operations No. 6, p. 4.

¹⁹⁴ National Archives, CAB23/44A/8 and CAB24/5/20.

¹⁹⁵ National Archives, CAB/23/5, minutes of War Cabinet meeting 360, 6 March 1918, p. 2.

issued a warning to the War Cabinet on the serious consequences of “the continual drafting of skilled men into the army from the munitions industries.”¹⁹⁶

Thanks in part to their armoured elements, actions in July at Hamel and Soissons demonstrated the ability of British, French and American units to dominate enemy forces and to this extent the Allies had successfully put behind them the worrying period of the German Spring Offensives. However, few beyond GHQ contemplated the end of the war in 1918. Haig recorded his meeting on 7 August with the King and his views on the opinions of allied governments, expressing “the belief that the British front would be much further forward before winter arrived”. He recorded that he “explained in detail on the map in my study our forthcoming operations”.¹⁹⁷ By the time of his meeting with Churchill, his optimism had increased:

Mr Winston Churchill....came to see me about noon...He is most anxious to help us in every way..... His schemes are all for ‘completion *next June!*’ I told him we ought to do our utmost to get a decision this autumn..... If we allow the enemy a period of quiet he will recover.....In reply I was told the General Staff in London calculate that the decisive period of the war cannot arrive until next July.¹⁹⁸

In fairness to Churchill and the General Staff, it should be recorded that Haig and GHQ had a history of optimistic forecasts.¹⁹⁹ Those present at the meeting on tanks on 8 August would not have been considering the development of tanks in the context of an early end to hostilities. Rather, the general feeling was that victory could not be delivered until the second half of 1919 at the earliest and might not be deliverable at all. The pessimism of Milner is particularly notable when expressing his view about the prospect of Allied success in 1919, “On this he personally felt the gravest doubt. In his view the Western Front was a candle that burned all the moths that entered it”.²⁰⁰ Smuts and Borden were equally pessimistic.

Events would unfold differently. On 7 August, as politicians and civil servants prepared to defend their performance on tank production before the Prime Minister the following day, so at the same time, entirely coincidentally, the product of their

¹⁹⁶ National Archives, CAB24/58, ‘Munitions and the Limits of Recruiting’, 12 July 1918, printed for War Cabinet meeting July 1918.

¹⁹⁷ Ibid, p. 321.

¹⁹⁸ Ibid, p. 324, entry for 21 August 1918; National Archives, CAB25/85, CIGS to War Cabinet, ‘British Military Policy 1918-1919’, 26 July 1918.

¹⁹⁹ Harris, *Men, Ideas and Tanks*, pp. 164-165.

²⁰⁰ National Archives, CAB23/44A/7, War Cabinet 27A, 31 July 1918 and CAB23/44A/8, War Cabinet 27B, 1 August 1918.

labours over the preceding months, Wilson's Mark Vs and Tritton's Whippets, together with a small number of armoured cars, took station to fulfil their role in the assault by Fourth Army at Amiens. Although the war had only a further three months to run, revelations and the outcome of events during that period were to present Churchill with a rollercoaster ride. Firstly, he would fear the exposure of shortcomings revealed by the appointment of a capable Controller to his MWSD. This would be followed by a sense of relief as the end to hostilities ensured that the weaknesses he had failed to identify and resolve would remain unknown to the general political world. The loyalty and discretion of his colleagues and staff at the Ministry, the euphoria of victory, the transfer of the spotlight from war issues to those of peace and the veil cast over past events by an embracing cloak of national security, sheltered his weaknesses from public gaze. The problems of judging who was "Too Late", who was motivated by personal vanity or benefit rather than the common good and the identification of the "weakest links" would generally be overshadowed by the problems of peace and the treatment of former enemies. Erstwhile key military issues would in general be pushed to one side, other than when occasionally surfacing as fuel in battles of the memoirs.

The proceedings of the Royal Commission would be a notable exception to this general picture and would provide ample incentive for Churchill to participate in proceedings in order to protect or burnish his wartime image. Regrettably, Churchill would not be entering the lists on the side of those most deserving praise but on behalf of those who had been "Too Late". He would brazenly deny any knowledge of Tritton during his time at the Admiralty, would downplay the role of Tritton and Wilson and would relegate Swinton's early vision into second place behind a fabricated picture of his own vision of the need for tracked vehicles.²⁰¹ D'Eyncourt would benefit from his status as Churchill's appointee, his contribution being transformed from the reality of slow, indeterminate action into an illusory model of astute leadership.²⁰² The special meeting at Downing Street on 8 August, the report submitted shortly thereafter by Maclean and evidence given the following year to the Royal Commission would reveal much of the nature of or lack of abilities of many of the key personnel involved in the

²⁰¹ National Archives, T173/776, Royal Commission on Awards to Inventors, cross-examination of Churchill by Russell, answers to questions 267-272 and examination by Attorney-General, answers to questions 7-10.

²⁰² Ibid, cross-examination of Churchill by Greene, answers to questions 157-171 and cross-examination by Russell, answers to questions 240, 246-276.

development of armoured vehicles. The findings of the Royal Commission, released immediately into the public domain, would go some way to rectifying the earlier inadequate recognition of the engineers responsible for “invention” of the tank. The issues reported by Maclean and the performance of individuals at the meeting on 8 August would not be revealed for many years. By the time of their release it would be the events of a further war between Germany and its European neighbours and their allies that would be uppermost in the public mind.

Chapter Six – Management Limitations are Revealed.

This chapter covers the final four months of the war, a crucial but neglected period in the history of the production of armoured vehicles. Though brief, events in this concluding period reveal much about the management of wartime tank production and the robustness of tank supply.

As the summer of 1918 arrived it was appreciated by those in senior military and political positions that the production of tanks was neither achieving forecast levels nor the standards set by other departments at Munitions. Churchill was not prepared to admit to the scale of failure:

General Harington said that the original intent had been for 8,400 Tanks [for 1919], but General Seely had lately informed him that we could not produce much more than half that number. Mr. Churchill's latest information on the subject, however, was that he hoped to produce within 1,500 of the original intent. At present we had 400 Mark IV. Tanks, which we would have to use as best we could....The Prime Minister expressed his intention of summoning a Meeting of all those concerned in the output of Tanks.¹

Extensive scholarship places the role of the tank in the context of all-arms operations in a successful period for the BEF, emphasising its contribution at Amiens but also immediately before and after that battle. However, it gives little attention to the rate of tank production. John Bourne hints at the significance of production over the preceding months of 1918 and the implications for fighting by the BEF by drawing attention to two associated key facts “we can never produce enough tanks to really convert to proper armoured warfare, but where we do use tanks in the Hundred Days we always prevail – always”.²

It is the intention in this chapter to examine events taking place in the shadows at the Ministry rather than those in the spotlight in France and Belgium where the BEF took the eye, moving to the centre of the ring in what was to be the final round with, as Bourne describes, the punching power of a heavyweight but the dexterity of a

¹ National Archives, CAB-23-44A-8, minutes of Imperial War Cabinet, 1 August 1918.

² John Bourne, *The BEF: The 'Final Verdict'*, Western Front Association Lecture, 6 December 2019, <https://www.youtube.com/watch?v=IU7f-TVyJFE>, accessed 18 April 2020. Bearing in mind the temptation, when lecturing, to simplify or exaggerate for effect, tank actions identified in the Official History have been checked to confirm claims of success for tanks in the Hundred Days, see Appendix 1. Bourne's comments align with Rawlinson's Special Order of 16 August 1918 relating to operations conducted on 8 August and succeeding days, quoted in J. F. C. Fuller, *Tanks in the Great War 1914-1918* (New York, E. P. Dutton, 1920), p. 227.

lightweight.³ Primarily, the punching power lay with the Royal Artillery, but it might have been greater and more flexible, and the casualties fewer, had it been supplemented by more tanks and had earlier advice on their use been heeded. Furthermore, there is a shortage of comment on absence of light tanks and the small number of armoured cars, so much cheaper to construct and easier to concentrate at “hot-spots” or opportunity locations in mobile warfare than heavy tanks, and less demanding on spares and servicing. These issues suggest a lack of appropriate and timely planning and innovative tactical thought both in London and at GHQ, though difficulties caused by shortages of resources and manpower need to be acknowledged.⁴

As soon as he heard of the offensive at Amiens, Churchill took a few days “holiday” to close up to the fighting. He sent back his impressions to Lloyd George and Clementine. His letters show no signs that he recognised the battle might have been more successful had he managed the MWD more skilfully, producing perhaps a greater number of heavy tanks for III Corps, a meaningful reserve for the Canadian/Australian Corps, light tanks or armoured cars to exploit breaches in enemy defences and, in accordance with his initial advice in January 1915, protective smoke-generating devices. Shortcomings in production had implications for operations throughout the Hundred Days. In this chapter the assessment by Ian Jacob of Churchill’s characteristics as PM during World War II should be borne in mind:

The Prime Minister was intensely loyal to his friends and supporters and to those who had served him. He always liked to fit them into jobs if possible near him, or else offering special opportunities for exercising what he thought were their talents or qualifications. At the same time he was a poor judge of character and had little understanding of organization, so that he sometimes insisted on unsuitable appointments.⁵

Churchill did not admit the fact, but he must have become increasingly concerned as the months of 1918 passed. Output of armoured vehicles was failing to scale the heights he believed necessary to spearhead a decisive assault on the Western Front

³ Ibid.

⁴ National Archives, MUN4/5191, Tank Corps in the Field to DSD(Tanks) War Office, 22 October 1918. Anticipated life of rollers on a Mark V* was 300 miles, Tracks and Track Driving Wheels 200 miles. Perhaps benefitting from hindsight, it is surprising GHQ/Tank Corps did not allocate priority to the construction of a light, truck-transportable tank such as the Renault FT, rather than seeking to rely on receiving Renault FTs from France. See photograph 49.

⁵ Sir John Wheeler-Bennett, *Action This Day* (London, Macmillan, 1968), pp. 172-173, Jacob was Military Assistant Secretary to the War Cabinet, 1939-45 and Chief Staff Officer to the MOD and Deputy Secretary (Military) to the Cabinet, 1952.

in 1919. This deficit was not marginal, but approximately half that required.⁶ Moreover, France also was failing to achieve the levels of production of light tanks, which he had hoped would form the basis of an exchange for British heavy tanks.⁷ Despite his practice of placing the best gloss on situations, the calling of a meeting of manufacturers in June and the appointment of Seely in July represent evidence of Churchill's concern.⁸

By mid 1918 armoured warfare enjoyed support not just politically but also at senior levels in the army, notably by Henry Wilson, the new CIGS, and Tim Harington his deputy. Wilson expressed his concern to Churchill two days before Amiens:

I am a little worried as to the prospects for next year both as regards the output of Tanks and Mechanical Traction. As regards the former you have our programme which I know is formidable....What I feel is that though our numerical superiority next year will not be very great, yet we can add materially to that by our lead in mechanical means.⁹

Haig did not call for the scale of growth of the Tank Corps that Churchill sought, nevertheless, over the preceding two years, he had appreciated and encouraged the value and potential of the new arm. The senior officers in the Tank Corps were enthusiastic and dedicated to their roles and, in Fuller, Churchill would have recognised a like spirit, whose aspirations, along the lines of Plan 1919, were largely in accord with his own.¹⁰

Plan 1919 was a "bold" concept incorporating a force of faster light/medium tanks to strike deep into enemy territory and attack enemy headquarters.¹¹ Such proposals

⁶ National Archives, CAB24/5/20, minutes of Prime Minister's meeting on Tanks, 8 August 1918, statement by Stern, pp. 4-5 and CAB24/45/69, report by CIGS, 17 March 1918, 'The possibility of obtaining a favourable decision to the war either in 1919 or at a later date', pp. 5-8.

⁷ National Archives, MUN4/851, minutes of conference at GHQ, 29 April 1918 and MUN4/2790, War Office to MM, 14 May 1918; Churchill Archives Cambridge, CHAR 15/92, Churchill to Seely, 14 September 1918.

⁸ National Archives, MUN5/211, minutes of meeting with Tank Manufacturers, 20 June 1918; Ministry of Munitions, *History of the Ministry of Munitions, vol. II, General Organisation for Munitions Supply, part I, Administrative Policy and Organisation* (London, HMSO, 1922), Seely commenced his duties at the Ministry on 13 July 1918, p. 273.

⁹ Martin Gilbert, *Winston S. Churchill, Companion, vol. IV, part I, January 1917- June 1919* (London, Heinemann, 1977), Henry Wilson to Churchill, 6 August 1918, pp. 366-367.

¹⁰ Churchill Archives Cambridge, CHAR 15/163, Churchill to Henry Wilson, 17 May 1918.

Unsuccessfully, Churchill endeavoured to replace Capper by Fuller as the British representative on the Tank Committee at Versailles.

¹¹ *The Military Papers and Correspondence of Major-General J F C Fuller, 1916-1933*, ed. by Alaric Searle, (Stroud, The History Press, 2017), pp. 93-138; Brian Holden Reid, *J. F. C. Fuller: Military Thinker*, (London, Macmillan, 1987), pp. 48-55; A J Trythall, *J F C Fuller: Staff Officer Extraordinary in The British General Staff: Reform and Innovation c.1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], p. 149.

were compatible with Churchill's aspirations to graft the means of exploitation onto the strike power of British artillery and heavy tanks. He envisaged French light tanks and 20,000 cross-country Newton Tractors to add to British exploitation potential.¹² Although often condemned as impractical, owing to the limitations of the tanks of the period and to unsophisticated or unreliable communications, it should be recalled that a Medium tank, *Musical Box*, and 17th Armoured Car Battalion did operate along such lines at Amiens.¹³ On 8 August, penetration was deep enough to surprise and scatter German Corps HQ troops at Foucaucourt.¹⁴ The exploits of *Musical Box* were eventually stopped only by a combination of artillery strikes and adverse consequences from additional petrol carried on the roof of the tank, in contravention of Tank Corps Standing Battle Orders.¹⁵

Stern and d'Eyncourt had disagreed with managerial changes at the Ministry following Churchill's 1917 reorganisation that had transferred Stern from the MWD's Home Production to Overseas Production. In July 1918 they judged it opportune to seek changes that incorporated a degree of reversion to former management arrangements: d'Eyncourt duly lobbied Lloyd George. Undoubtedly conscious of Addison's failure to solve the problems of tank production, Lloyd George had called a meeting in March, at which he had received an assurance from Churchill:

Mr Churchill circulated a tank programme for the period between 1st February 1918 and the 31st March 1919....it was a programme which indicated development towards the beginning of July next, but extending more rapidly in the later months of 1918 and the earlier months of 1919."¹⁶

¹² National Archives, MUN5/211, report by Percival Perry, Director of Traction, MWD, on charter and history for design and supply of 20,000 military tractors based upon a model designed and built by Col. Newton of the Trench Warfare Department. Treasury grants for supply from America had been authorized (\$35,000,000 in August 1918). The report is undated but appears to have been written shortly after the Armistice as part of the winding-up of the tractor programme. Specification for the tractor was – weight 5 tons tare, speed 5mph, minimum of 40hp. The rate of supply was envisaged as 10,000 by end January 1919, (8,000 from Buick and Studebaker); J. F. C. Fuller, *Tanks in the Great War 1914-1918* (New York, E. P. Dutton, 1920), pp. 291.

¹³ Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918.

¹⁴ National Archives, CAB24/89/6, memorandum by Churchill to War Cabinet, 23 September 1919; Fuller, *Tanks*, pp. 291-292; William Henry Lowe Watson, *With the Tanks 1916-1918: Memoirs of a British Tank Commander in the Great War* (Barnsley, 2014), p. 205.

¹⁵ Fuller, *Tanks*, p. 233; Clough and Amabel Williams-Ellis, *The Tank Corps* (New York, George H Doran, 1919), p. 306, despite Standing Orders, Lt. C. B. Arnold, commanding *Musical Box*, claimed that he had been ordered to carry the petrol cans on his Whippet.

¹⁶ National Archives, CAB24/4/51, minutes of meeting at 10 Downing Street to consider the Question of the Output of Tanks. In the interests of security, the programme was not reproduced in the minutes, but it would almost certainly have been that listed in National Archives, MUN5/211, minutes of

By July, production had fallen well below the level envisaged in Churchill's programme and Lloyd George wisely convened a further meeting. Since the Cabinet was not kept informed of the details of operations in France, that meeting was arranged, quite coincidentally, for 8 August, a significant day for tanks and for the prospects of the war as a whole. The meeting, attended by Ministers, Ministry staff and army personnel, commenced at 1030 hours, by which time the Battle of Amiens had been in progress for over six hours and many of the tanks produced by the Ministry had been put out of action.¹⁷ Due to attend an IWC meeting scheduled for 1130 hours, the Prime Ministers of Australia, Canada, New Zealand and Newfoundland and Lt.-General Jan Smuts representing South Africa, joined during the later stages of the meeting. It seems likely the tank meeting overran. Possibly as a result of the noon report on the Battle Situation, the IWC was informed by the CIGS of the offensive at Amiens.¹⁸ However, the meeting on tanks would appear to have been conducted in ignorance of such events.

In opening the meeting, Lloyd George invited d'Eyncourt to "state frankly and freely such criticisms as he had to offer".¹⁹ D'Eyncourt read a prepared text, which included:

A reorganisation took place about a year ago, but instead of making an improvement, things have grown steadily worse. Mr. Churchill spoke to me then, and I told him it was a mistake to upset the former organisation....I pointed out that Tanks were an entirely new development, and to discard the men who had successfully designed and produced them was a mistake. There was no field of choice of men who knew about Tanks. The intricacies of their manufacture are very great (there are over 2,000 standardised parts in each Tank, not counting the engines and guns), and all this requires a long training and most careful study.²⁰

D'Eyncourt continued by criticising the appointment of Admiral Moore as DGMWD, since, at the time, he knew nothing of tanks. He also criticised the Tank Committee "I confess to being rather tired of sitting on committees and listening to all sorts of proposals, none of which the committee has authority to carry out".²¹ He claimed:

Ministry of Munitions Committee 57, 7 March 1918. This envisaged the production of 4,438 tanks in the thirteen months March 1918/March 1919. It was forecast that production would rise from 106 in March 1918 to approximately 400/month from August onwards.

¹⁷ See for example, National Archives, CAB/23/44A/8, minutes of Imperial War Cabinet 27B, 1 August 1918, p. 18.

¹⁸ National Archives, CAB23/44A/10, minutes of Imperial War Cabinet 29A, 8 August 1918 and CAB24/60/47, Battle Situation-Noon-8th August 1918.

¹⁹ National Archives, CAB24/5/20, minutes of Prime Minister's meeting on Tanks, 8 August 1918,

²⁰ Ibid, Statement by d'Eyncourt included within the minutes.

²¹ Ibid.

About three months ago I told Lord Milner my views, and said it was necessary to have a Tank Board or Council with authority somewhat similar to the Air Board, and he generally agreed and asked me to co-operate....I also spoke to General Seely, and submitted, together with Colonel Stern and Admiral Moore, a scheme of reorganisation..... If such a Board is formed with the necessary authority, I am sure the output can be steadily and continuously increased.²²

D'Eyncourt had been associated with tanks since his appointment to preside over the Landships Committee three and a half years earlier. He had failed to launch that project in the manner Churchill had intended, had failed to direct the designers of *Mother* in line with army requirements (leading to a near fatal rate of track failures), had misdirected the army about the length of time it would take to supply the first tanks and, following the action on 15 September, had craftily and unjustifiably garnered unto himself much of the praise and acknowledgments that should have been awarded to Tritton and Wilson.²³ In 1919 he would appear before the Royal Commission seeking to deprive Wilson of awards for aspects of the design of *Mother*.²⁴ In these circumstances it would be easy to write off his lobbying of Lloyd George as further evidence of his cynical efforts to advance his reputation and position. It can be seen that elements of this were present:

I should propose to make use of practically all the Tank talent available, including Admiral Moore, who now knows a lot about it....I have been proposed as Vice-Chairman under General Seely, and shall be very glad to serve, if it is so desired, and, having this possibility in view, I have obtained the permission of the Third Sea Lord....to devote more time to tanks.²⁵

However, this intervention by d'Eyncourt was mixed in content. Some comments were false and misleading, but he also made valuable proposals. The powers he proposed for the Tank Board promised an end to the earlier disagreements over Ministry responsibilities and a medium through which, subject to details of membership, the army might have a greater say in tank design. Yet d'Eyncourt's proposals for

²² Ibid.

²³ National Archives, ADM116/1339, d'Eyncourt to Third Sea Lord, 18 September 1916.

²⁴ National Archives, T173/776, Royal Commission on Awards to Inventors, 10 October 1919. The clash of evidence can be seen in the following sections of the transcript:- examination of d'Eyncourt by Greene, answers to questions 1944-1954, cross-examination by the Solicitor-General, answers to questions 2017-2035, cross-examination of Frederick Skeens, Senior Draughtsman at the Admiralty, answers to questions 2080-2085, examination of Tritton by Russell, answers to questions 2592-2602, cross-examination by Gray, answers to questions 2930-2933 and examination of Wilson by Russell, answers to questions 3090-3093. The evidence of Skeens was particularly damaging to the false evidence given by d'Eyncourt.

²⁵ National Archives, CAB24/5/20, minutes of Prime Minister's meeting on Tanks, 8 August 1918.

membership did not match the wisdom of his terms of reference. He proposed that he himself, in addition to vice-chairmanship, should be Controller-General of Design and that Moore, Perry and Stern, who had all failed in different ways to distinguish themselves in earlier Ministry supply roles, should be included to take charge of experimentation, supply and production respectively. In directing his case to Lloyd George, d'Eyncourt was conscious of where the power resided and the likelihood of his representations bearing fruit. Nevertheless, his criticisms of Churchill generated the need for an apologetic letter to limit the offence to his benefactor. His letter to Churchill was respectful and honest though included a distasteful element of flattery:

You know well my admiration and respect for you & how I have always worked loyally under you both at the Admiralty and indirectly at Munitions....The Tanks have more than justified themselves in the last week's operations & it will always be remembered that you started the whole thing & that they only became a possibility owing to your original action.²⁶

Churchill accepted the grovelling apology but administered a deserved reprimand "I had a right to your advice before it was offered to anyone else".²⁷

D'Eyncourt's criticism of the Ministry's poor tank production record under Moore's leadership was justified, but, as Maclean's report would later show, his identification of the reasons for failure were fallacious. It was knowledge of industrial production, or management ability to assemble and lead a team possessing all relevant skills, that were lacking, rather than knowledge of tanks. In appointing Seely, Churchill had, belatedly, and perhaps inadvertently, initiated a process that would rectify the errors that handicapped earlier administrations. Within three weeks, a capable industrialist would be transferred within the Ministry to head the MWD and a knowledgeable and cooperative group of military and engineering members would be assembled to form a new Tank Board.

D'Eyncourt was also correct to identify the need for firm control over design modifications.²⁸ However, he failed to mention or appreciate the significance of the fact that production delays were not new phenomena and he failed to strike an appropriate balance in the quality/quantity argument, stating "to the production of any war machine in considerable numbers all improvements were an enemy, and that if

²⁶ Churchill Archives Cambridge, CHAR15/87, d'Eyncourt to Churchill, 12 August 1918.

²⁷ Ibid, Churchill to d'Eyncourt, 16 August 1918.

²⁸ National Archives, MUN 5/211/1940/37, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', pp. 8-9.

such improvements were not kept within reasonable bounds the production must be very seriously reduced".²⁹ D'Eyncourt possessed insufficient knowledge of the details of tank construction or of military requirements to advise on such matters. As Wilson illustrated when the army sought some sixty-two alterations to the Mark V some two months later, the true position was more complex: many alterations could be made without significant time consequences.³⁰ Delays had occurred under Stern. Stern's limited technical knowledge, impatience, lack of tact and establishment of a somewhat independent fiefdom within the Ministry, were at the root of many of the problems of inspection and production inherited firstly by Moore then by Maclean.³¹ The arm of the Ministry dealing with tanks had never conformed to Ministry standards, a legacy from Stern's agreement with Lloyd George in February 1916.³²

The most significant flaw in d'Eyncourt's argument was his assurance that tank output could be steadily and continuously increased under a Board with the necessary authority. His contention that designs were pulled about and standardisation was disturbed by Churchill's reorganisation appear to have lacked foundation in fact. At the time of Moore's appointment, large-scale production of Mark IV was drawing to a close. Designs and standardisation were changing but this was to enable the Mark V and other models to be constructed and was not related directly to the Head of Department. D'Eyncourt, who in January 1916 had assured Kitchener that the first tanks could be provided by May, did not have the knowledge and skills necessary to determine whether or not production could attain particular levels.

Stern supported d'Eyncourt by producing figures showing decline in production during 1918. He observed that on 8 March 1918, the MWD put forward a programme giving the number of tanks to be produced monthly from April to July, some 1,065. Yet output had been only 555. He pointed out that at a time when all other munitions of war showed continuous increases, the MWD had not reached the record 200 tanks/month attained in 1917 under his control. He understood a further re-organisation was contemplated and it was again suggested that men totally new to

²⁹ National Archives, CAB24/5/20, minutes of Prime Minister's meeting on Tanks, 8 August 1918.

³⁰ National Archives, MUN4/1591, Wilson to Maclean, 31 October 1918.

³¹ Ministry of Munitions, *History of the Ministry of Munitions, vol. XII, The Supply of Munitions, part III Tanks* (London, HMSO, 1922), pp. 38-40; John Glanfield, *The Devil's Chariots: The Birth and Secret Battles of the First Tanks*, (Stroud, Sutton Publishing, 2001), pp. 195-196.

³² Ministry of Munitions, *History vol. II*, pp. 32-33; Glanfield, *Devil's Chariots*, pp. 130-132; Albert Stern, *Tanks 1914-1918: The Log-Book of a Pioneer* (London, Forgotten Books, 2012), pp. 63-65.

mechanical warfare should be put in charge. In his opinion the Tank programme had failed because, firstly, at a critical period, the management was changed, secondly, production had been broken by continual changes of design and, thirdly, a deciding authority to determine production had been lacking.

The ability of Perry, the Deputy Controller, to determine future output was no greater than that of Moore. He considered it highly undesirable to attempt to "swap horses" in the middle of the tank programme and "believed" the Ministry programme would be realised by April 1919. From his experience of the time taken to get into the methods of a Government Department, he could not contemplate any change being made without results disadvantageous to output, and therefore, if the changes proposed on the Cabinet papers were made, he could not "guarantee" meeting the programme. These comments were devoid of any relevant substance. The facts raised by Stern were relevant but demonstrated no understanding of practical industrial realities. Perry was undoubtedly numbered among those identified by Seely as responsible for the "extraordinary miscalculation" earlier in the year.³³ Both Stern and Perry spoke as if output depended solely on personal qualities and integrity. When assessed against Maclean's later analysis, both can be seen to lack the knowledge and understanding required to explain the shortfall in production and the ability to implement appropriate remedial measures. Their observations confirmed their inappropriate occupation of senior managerial positions. Additionally, they were casting a shadow over Churchill's managerial abilities since he had appointed individuals lacking appropriate qualities to both posts of Controller, home and abroad.

The confidential note Churchill had received from Fuller in March 1918 had pinpointed the key problem, namely that "production requires a man who is an expert in production". This seemingly obvious point was not recognised by Churchill until Seely had supported Maclean's analysis of the problems and had maintained criticism of earlier management, notwithstanding Churchill's opposition. At no point did Churchill concede that the criticisms of Seely and Maclean were well founded. However, they were allowed to continue their modifications to the establishment, production capacity and procedures of the Supply Department without adverse comment, showing that Churchill had swallowed what must have been a bitter pill.

³³ Churchill Archives Cambridge, CHAR 15/92, Seely to Churchill, 9 October 1918.

Thereafter, he would have been concerned lest insufficient tanks should find their way to France to facilitate adventurous plans for 1919. Significantly, in terms of the development of the tank and availability for army operations, the consequence of Churchill's faulty management was that a further six to twelve months' production had passed at ceremonial pace when light infantry pace was required.³⁴

The fact that Moore had assisted d'Eyncourt with the production of his statement and appendix suggests he was content with proposals that might have enabled him to drop anchor in less turbulent waters.³⁵ He did not, however, accept all d'Eyncourt's arguments and, following the Cabinet's consideration of actual and forecast production for the five preceding months, 724 as against 1,466, he postulated different explanations for poor performance, namely cancellation of a particular model without a new design to take its place, the influenza epidemic and strikes which had affected production in July.³⁶ Moore had led the Ministry's efforts to produce tanks for nearly a year. During that time, he had made many estimates of future production levels, seemingly relying on manufacturers' schedules, all of which had proved optimistic.³⁷ Whilst some of the points he mentioned at Lloyd George's meeting might have been relevant, he showed no appreciation of the facts and practical industrial realities that his successor would shortly be putting into print. His performance and excuses at the Munitions Council Tank Committee the previous week, when he had denied responsibility for the figures, had been equally inept and misplaced:

The Minister considered that these estimates [March and July] showed a lack of touch with the realities of production on the part of the M.W.D. Admiral Moore was then called in. He disclaimed any responsibility for the estimates, which it was understood were manufacturers' anticipated deliveries, discounted by a fixed percentage.³⁸

³⁴ Churchill Archives Cambridge, CHAR 15/86A, Fuller to Churchill, 2 March 1918 and National Archives, CAB 24/5/20, minutes of meeting dated 8 August 1918, Appendix A.

³⁵ Ministry of Munitions, *History of the Ministry of Munitions, vol. II, General Organisation for Munitions Supply, part II Organisation for Munitions Supply* (London, HMSO, 1922).

³⁶ National Archives, MUN 4/5168, commentary on Weekly Output Statistics for July 1918.

³⁷ Churchill Archives Cambridge, CHAR 15/87, minutes of meeting of Council Committee on the Production of Tanks, 1 August 1918, memorandum from Moore to Churchill, 12 July, 1918, undated note of February, 1918, giving production figures for October 1917 to January, 1918, and forecasts to July, 1918; National Archives, MUN 4/2801, Moore to Duckham, 27 February 1918 and MUN 5/211/1940/37, Moore to Churchill, 4 May 1918 and agenda of meeting with Tank Contractors, 20 June 1918.

³⁸ Churchill Archives Cambridge, CHAR 15/87, minutes of Munitions Council Committee on Tanks, 1 August 1918.

To Moore's credit, he did not seek to shift responsibility for a key element underlying his failure onto his Minister. Yet Churchill had railroaded through the high targets early in the year.³⁹ Moore had expressed certain reservation at the time, particularly on the supply of gearboxes and want of broaches from Armstrong Whitworth for the Medium B.⁴⁰ He also stated that no check had been undertaken of the adequacy of national capacity, of steel plate, engines, steel casting and gearboxes, to meet the expansion in output demanded by Churchill.⁴¹ Moore described his note on output as merely "an arithmetical one".⁴² Moore's note to Leake (Ministry Administration), appended to the Minutes of Committee 57, suggests he would have been well suited to a political career:

These estimates, constituting a minimum production, were made before the meeting of tank contractors....on Thursday August 1st. The freedom of action given verbally....may have an effect upon the output that cannot now be estimated. C.M.W.D. cannot therefore accept responsibility for the accuracy of these figures, but can only say that it is thought they ought certainly to be met.⁴³

Under pressure, and about to resign or be dismissed, Moore clearly felt the need to respond to Seely's examination of the MWD and to questions at the meeting to be convened by Lloyd George. It would have been better had he remained silent. His note to Leake validated Jellicoe's analysis of his character and abilities. During much of 1918 he had taken no action to plug the gaps he recognised existed in productive capacity and was unable to mount a plausible defence of his position.⁴⁴

Moore's comments undermined his credibility together with that of Churchill who had appointed him to a post to which he was ill-suited. Churchill attempted to pass the responsibility for low tank output onto the War Office for taking men away from tank production. He then made the standard but meaningless comment that the

³⁹ National Archives, MUN 5/211/1940/37, instruction by Churchill, 20 February 1918 and minutes of 'Conference on Tank Programme', 11 February 1918.

⁴⁰ National Archives, MUN5/394, Perry to Layton (recipient not specified but statistical reports would be directed to 'R'), report for w/e 27th inst. (month not specified but can be identified as April 1918 by comparison with production total of 255 for the Mark V). A broach is a tapered, serrated tool used to shape or enlarge a hole.

⁴¹ National Archives, MUN4/2799, Moore to Duckham, 27 February 1918.

⁴² Ibid.

⁴³ Churchill Archives Cambridge, CHAR15/87, minutes of Council Committee on the Production of Tanks, Appendix A (memorandum from Moore to Leake), 1 August 1918. Committee 57 was the shorthand title of the Committee established with responsibility for overseeing tank production.

⁴⁴ For example, Churchill Archives Cambridge, CHAR15/86, Moore to Duckham, 21 February 1918, Allied Programme, includes comment that "production and machining facilities for armour plate in this country are distinctly limited."

reorganisation of August 1917 had been arrived at after “the most careful consideration”.⁴⁵ Churchill avoided any attempt to explain why he had considered the Admiral a suitable appointment as Controller in October 1917, but reassured the meeting that the full complement of tanks “as set out until the end of April 1919 would be obtained provided they had the support of the Government and received the proper quotas of men necessary for production”. It must have been clear to the assembled meeting that such a promise was valueless, indeed, the minutes show Lloyd George was not deceived by Churchill seeking to allocate responsibility for poor output to the loss of labour earlier in the year since he commented “the taking away of men from tank production did not explain the falling off in the numbers during May and June”.⁴⁶

Perhaps conscious of the fact that the comments he had made were unconvincing, Churchill concluded his contribution by seeking to play down the significance of low tank output, claiming the army had “as many tanks as it could handle at the moment”. It is assumed this statement was seeking to make capital of the fact that Haig had been reluctant to expand the Tank Corps.⁴⁷ However, the comment was particularly ill-timed. As he spoke, the army was well into the process, albeit largely temporarily, of losing most of its tanks during the Amiens offensive. Only 145 of the 415 tanks that had advanced early that morning remained fit for duty by the end of the day, a figure further reduced to just 38 by 11 August.⁴⁸ The low rate of production had deprived Rawlinson of a significant reserve.⁴⁹ Whilst most were capable of repair, spares were in short supply and it would require time to build up a large force.⁵⁰ Not only had reserves been lacking, but, to its detriment, III Corps had been only lightly equipped

⁴⁵ Ministry of Munitions, *History*, vol. II, p. 274, Stern remained as DGMWD until 26 October 1917.

⁴⁶ National Archives, CAB/24/5/20, War Cabinet, minutes of Conference to consider the Question of Tanks, 8 August 1918, p. 6.

⁴⁷ National Archives, MUN 5/210/1940/21, notes of conference at GHQ, 10 June 1918; Glanfield, *Devil's Chariots*, p. 234.

⁴⁸ Douglas Orgill, *The Tank: Studies in the Development and Use of a Weapon*, (London, Heinemann, 1970), pp. 68 and 80; Edmonds, *Military Operations, France and Belgium, 1918*, vol. IV, p. 517, records that of 582 tanks handed over to salvage between 8 August and 27 September, “only 14 were struck off the strength as irreparable (sic)”.

⁴⁹ Edmonds, *Military Operations, France and Belgium, 1918*, vol. IV, Appendix III, Fourth Army Operation Order, 31 July 1918, p. 525.

⁵⁰ Churchill Archives Cambridge, CHAR 15/91, minutes of Seventh, Ninth and Eleventh Meetings of Tank Board, 26 September, 10 October and 24 October 1918.

with tanks, priority allocation of the limited supply being given to the stronger Canadian and Australian Corps operating on the most suitable tank-terrain to the south.⁵¹

It may have been because he had personally been responsible for reorganising the Ministry and appointing senior staff in 1917 that Churchill was careful not to elaborate on his reasons for appointing Jack Seely as Deputy Minister. However, it is difficult to envisage a set of reasons that did not include the need for a fresh pair of eyes to assess Ministry shortcomings in tank production and improve relations with the army. It was significant that Seely's responsibilities included control of a new group, 'W' (Warfare), which included tank supply.⁵²

The meeting with tank producers on 20 June would have increased Churchill's awareness of difficulties for Ministry tank production. Firms had given a range of reasons for failing to meet their predicted outputs. Metropolitan claimed the withdrawal of the Tank Corps contingent, that had been assisting with assembly, and call-up of 1898 and 1899 men, accounted for under-performance and that "the quality of the men now being supplied was not good and consequently there were larger rejections for bad workmanship."⁵³ Churchill's intention had been to stimulate output, yet the tank producers placed the responsibility for delays on the Ministry. Fosters forecast the output of only fifty-seven Medium A by the end of June as opposed to their earlier forecast of seventy-seven: they claimed the only limiting factor was the supply of gearboxes: "they had tanks waiting for them".⁵⁴ Beardmore (Cardonald) "explained that they had not made a start with their order for Mk. VIII Machines owing to the absence of jigs" and Reid (North British) reported "they were losing labour through inability to start work on Mark VIII Tanks."⁵⁵

⁵¹ Orgill, *The Tank*, p.72; Edmonds, *Military Operations, France and Belgium, 1918*, vol. IV, p. 77 – only the 10th Tank Battalion was attached to III Corps - (36 Mark V and 12 Supply tanks).

⁵² Ministry of Munitions, *History*, vol. II, Appendices II to V show the Departmental Organisation of the Ministry at 1 July each year from 1915 to 1918. However, the chart for 1918 provides a misleading impression, since it represented a snapshot of a developing position. The following week Seely's position was changed or clarified. Although his appointment was announced in June, he did not, according to the list of Principal Officers in Appendix VIII, join the Ministry as Member of Munitions Council (W) until 13 July, and was appointed Parliamentary Under-Secretary and Deputy Minister on 22 July.

⁵³ National Archives, MUN5/211/1940/37, minutes of Meeting with Tank Contractors, 20 June 1918, observations of Dudley Docker, pp. 1-2. "1898-1899 men" refers to those born in those years, employed by Metropolitan but called to the colours in accordance with conscription policies.

⁵⁴ *Ibid*, observations of Tritton, p. 3.

⁵⁵ *Ibid*, p. 3. Jigs, devices used to maintain, mechanically, the correct positional relationship between a piece of work and a tool or between parts of work during assembly, were of particular

Churchill expressed surprise at Metropolitan's claim that "the withdrawal of 200 men should account for the loss of 200 tanks" but gave commitments that Beardmore should receive the first set of available jigs and North British should have a set without delay. Day (Engine Manufacturers) complained about delays in settling contracts and there was general criticism that American Liberty engines had not been received. Churchill found the gearbox situation "very unsatisfactory" and "expressed surprise that the problem with the Liberty engines had not been "brought to his notice as a matter of utmost urgency".⁵⁶ In this respect, Churchill's combative style may have worked against him in that staff may have been reluctant to give him news they knew he would not want to hear. Moore had expressed reservations about gearbox capacity in February, but Churchill's management structure had been insufficiently responsive to act: that task awaited the attention of "an expert in production", six months later.⁵⁷

Moore attempted to explain the contractors' comments in terms of priorities, but Churchill would have gained an unfavourable impression of the general state of tank supply. There is no direct evidence that this meeting represented the point at which Churchill lost faith in the ability of Moore and Duckham to run the Department efficiently, but his confidence in the future level of output must have been shaken and it may well have been the time at which he decided to appoint Seely. Seely's availability was fortuitous, attributable to disabling medical consequences from gas shortly after the cavalry charge at Moreuil Wood, three months earlier.⁵⁸ It may also be relevant to acknowledge that Churchill would have welcomed the appointment of a like-minded manager to supervise warfare issues and improve relations with the army, since this fitted well with the need for a senior colleague to tend shop while he redirected his attentions to wider strategy and government affairs that Lloyd George had begun to entrust to him.⁵⁹ Churchill's responsibilities and interests extended beyond armoured warfare from his desk at the Ministry. The magnetic pull for Churchill was France and the BEF, where he could assess the military situation, debate required

importance in the assembly of tanks. A firm would seek to recover the cost of jigs and other mechanical requirements over a prolonged run of the same work. Expenditure on these types of manufacturing preparations were probably a significant factor in the reluctance of firms to undertake short production runs.

⁵⁶ National Archives, MUN5/211/1940/37, minutes of meeting with Tank Contractors, 20 June 1918, observations of Mr C. Day representing the engine manufacturers, p. 3.

⁵⁷ National Archives, MUN4/2799, Moore to Duckham, 27 February 1918.

⁵⁸ J. E. B. Seely, *Adventure* (London, Heinemann, 1932), pp 310-312.

⁵⁹ Martin Gilbert, *Winston S. Churchill, vol. IV. 1917-1922*, (London, Heinemann, 1973), pp. 85-104.

munitions and strategy and work within sound of the guns.⁶⁰ Nevertheless, since he saw armoured strategy as a key or determining factor in the formula for military success, the welfare of the MWD was of special importance.

Seely was appointed about the time the issue of tank output was coming to a head. In July 1918 the BEF's stock of tanks in running order was just 925 with a further 176 in workshops in France.⁶¹ Of those in running order at this time, only 592 were Heavy Fighting tanks, Marks IV and V. An attack in 1919 as outlined to the War Cabinet by Henry Wilson called for some 8,000 tanks of all types. Wilson advised the War Cabinet that output for the 1919 programme would be 4,500 and that a further 1,500 would be provided by the "Americans" (by which it is assumed he meant Anglo-American assembly at Chateauroux). Estimating that 500 existing machines would survive any 1918 actions, this left a deficit of 1,500 that he proposed should be met by requesting the doubling of "American" provision.⁶²

Existing scholarship draws attention to Lloyd George's dissatisfaction with Haig's command of the BEF, mutual distrust and lack of respect.⁶³ The development of armoured vehicles emphasises the lack of coordination between events in France and London. Haig was grateful for the arms supplied by the Ministry. Aircraft, artillery, tanks, machine-guns and other equipment enabled him to fight a "rich man's war". However, there is no evidence of the integration of preparations in England with proposals in France. GHQ was keen to pursue the war in 1918, whereas Lloyd George and the War Cabinet generally were concerned about high casualties and pessimistic about the likely outcome of offensives. The PM "did not believe that we could obtain a decision on the Western front next year" and Smuts "was inclined to agree with Sir Robert Borden that a purely military decision was not possible in this war."⁶⁴ In the period before the Battle of Amiens, the War Cabinet had no firm information on

⁶⁰ Ibid, the contentment/exhilaration felt by Churchill in France is apparent from his numerous letters to Clementine, but is expressed overtly in that of 15 September 1918, pp. 395-397.

⁶¹ National Archives, MUN4/902, Tanks - Position in the Field, situation at week ending 28 July 1918.

⁶² National Archives, CAB24/45, report by CIGS dated 17 March 1918: 'The possibility of obtaining a favourable decision to the war either in 1919 or at a later date', pp. 5-8.

⁶³ Gary Sheffield and John Bourne (eds.), *Douglas Haig, War Diaries and Letters 1914-1918* (London, Weidenfeld and Nicolson, 2005) p. 266; Gary Sheffield, *The Chief: Douglas Haig and the British Army* (London, Aurum Press, 2011), pp. 200-257.

⁶⁴ National Archives, CAB23/44A/7 and CAB23/44A/8, 31 July and 1 August 1918, Military Policy.

pending events. On 1 August, Borden, Prime Minister of Canada, informed the War Cabinet that:

on the previous evening he had been told in confidence and great secrecy that the Canadian Army Corps...was now being moved forward into another region and he had some reason to believe that the intention was to employ them offensively. This looked as if the operations for improving our front might be about to commence.⁶⁵

Henry Wilson, CIGS, "knew nothing of any forthcoming operation".⁶⁶ The IWC assumed this to be a minor line-improving operation and there followed a long and inconclusive debate on Wilson's paper, tanks and war policy generally.⁶⁷ Members were aware that tank production might be only half the 8400 previously forecast but that Churchill remained of the opinion that any shortfall might be "within 1500 of the original intent."⁶⁸

Seely did not elaborate on his reasons for sensing that all was not well with tank production at the Ministry when he arrived in July.⁶⁹ However, he quickly reached decisions about tank supply and the management capabilities of those involved. By early August, Moore, Controller of Mechanical Warfare, had departed, to be replaced by James Maclean, an experienced industrialist, previously in charge of the Ministry's Gun Production then its Engineering Department.⁷⁰ Churchill's comment to Lloyd George on Moore was simply that the "Admiral has not been a success, and further very great efforts are required".⁷¹ On the face of it, Moore appears to have fallen on his sword on 4 August.⁷² However, Churchill's letter to Lloyd George and his imperative to keep criticism at arm's length suggest that Seely provided a helping hand.

The lack of understanding of the realities of tank production by Churchill and other key players can be determined from a comparison of a report prepared by Maclean with comments expressed at the special Tank Meeting on 8 August.⁷³ A plentiful

⁶⁵ National Archives, CAB23/44A/8, Minutes of Imperial War Cabinet 27B, p. 2, 1 August 1918.

⁶⁶ Ibid.

⁶⁷ National Archives, CAB25/85, British Military Policy 1918-1919 and CAB23/44A/8, Imperial War Cabinet 27B, General Military Policy.

⁶⁸ Ibid.

⁶⁹ Churchill Archives Cambridge, CHAR 15/87, Seely to Churchill, 9 October 1918.

⁷⁰ Ministry of Munitions, *History*, vol. XII, part 3, p. 67.

⁷¹ Gilbert, *Winston S. Churchill, Companion*, vol. IV, part I, Churchill to Lloyd George, 10 August 1918, pp. 370-371.

⁷² Churchill Archives Cambridge, CHAR 15/87 Churchill to Seely, 14 August 1918.

⁷³ National Archives, CAB24/5/20 minutes of Prime Minister's meeting on Tanks.

supply of tanks was fundamental to Churchill's strategy for success on the Western Front. It is therefore proposed to consider in detail the report prepared by Maclean on taking up his new appointment and to compare his findings, as an experienced industrialist, with the observations of those "on trial" at the Prime Minister's meeting.

Bearing in mind the complexities of production and sensitivity of the subject, Maclean's report was admirably brief and produced with commendable speed. There is no evidence that Maclean was tasked with preparing a report on the state of his new Department, but, from his introductory paragraph, it appears he had received criticism for his censorious assessment of the Ministry's ability to organise tank production. Maclean may have been seen as "disloyal" and may therefore have considered the facts and reasoning leading to his conclusions should be set down by way of rebuttal of criticism.⁷⁴ He was wise to do so, since, on receiving a copy of the report, Churchill responded aggressively to Maclean's findings and the implications for strategy in 1919. Notwithstanding the earlier alarm bells he should have heeded from his meeting with tank constructors, Churchill at first refused to believe Maclean's figures and questioned his sincerity:

Maclean's latest figures are utterly at variance with all the previous expectations and estimates with which I have been furnished. It is, of course, quite easy and very prudent on taking over a new Department, to write down the previous estimates to the lowest possible level. I am not, however, prepared to believe that the discrepancies are in fact so great as is representedI am not prepared to accept these figures now proposed as satisfactory, having regard to the existing resources and facilities placed at the disposal of the Controller....⁷⁵

Churchill sought a report showing in detail the causes why in each class of tank "there is this falling off from the previous estimates."⁷⁶ He also postulated linking spare engines and gearboxes in France to incomplete tanks in England. His justification for downgrading the importance of spares is in part based on the needs of the French and American Armies:

It appears to me utterly impossible for us to claim a reserve of 100 per cent of completed tanks by the 1st June, each tank made practically twice over in

⁷⁴ National Archives, MUN4/1374, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 1.

⁷⁵ Churchill Archives Cambridge, CHAR 15/87, Churchill to Seely, 4 October 1918.

⁷⁶ Ibid.

spares, while, at the same time, the French and American armies will be almost destitute of these weapons.⁷⁷

Churchill does not appear to have appreciated the rate at which tanks devoured spares. The Tank Corps maintained a list of the anticipated frequency of replacing parts most prone to wear. For example, the life of Mark V Driving Wheels was only 200 miles and Engine Replacement was estimated at 350 hours run-time (300 for a V*⁷⁸). The unreasonable nature of the points raised by Churchill reflects the serious nature of the blow to the strategy he envisaged for success and the acute embarrassment that would be experienced over the coming months if the validity of Maclean's report were to be confirmed by production figures. In reality there was no point in questioning certain aspects of Maclean's figures since the limited availability of components rendered earlier Ministry short-term forecasts unattainable. Furthermore, Churchill had not researched the suitability of salvaged parts for installation in new fighting tanks. Salvage operations by the Tank Corps were highly developed and enquiries could have shown that the condition of salvaged engines was not generally suitable for fighting machines:

Colonel Fuller asked that 24 engines might be sent to Woolwich for instructional purposes. Mr Maclean stated that he had already sent 12 of those engines, but it was difficult to provide the remainder. Colonel Searle stated that he thought France could assist in this matter with repaired engines, which though not capable of being used in Tanks were yet suitable for instructional purposes.⁷⁹

It seems unlikely that salvaged or spare parts in France could have provided any significant boost to tank numbers. Indeed, on occasions, dismemberment of a new tank was undertaken in order to provide parts to repair several damaged tanks.

Official statistics show there to have been 527 heavy tanks in France in running order at the end of October 1918, with 125 in workshops and 286 salvaged: 492 had been written off.⁸⁰ The number of machines in running order is surprising, particularly

⁷⁷ Ibid; National Archives, MUN4/2802, Churchill also included his views on Maclean's report in a minute to the Tank Board, 3 October 1918.

⁷⁸ National Archives, MUN4/5191, Tank Corps in the Field to DSD(Tanks) War Office, 22 October 1918.

⁷⁹ National Maritime Museum, d'Eyncourt papers, DEY 57, minutes of Eleventh Meeting of Tank Board, 24 October 1918, Item 12, 'Engines required at Woolwich for Instructional Purposes'.

⁸⁰ National Archives, MUN4/902, Tanks, Position in the Field, Heavy Fighting Machines.

in the light of comments by Elles that “On the 5th Nov. 1918 all I could put in the field was one composite company out of 18 battalions!”.⁸¹ Either the passage of time had warped Elles’s recollections or he was referring to a particular Mark of tank, or the statistics are unreliable.

Maclean’s report gave monthly estimates of tank output to 30 April 1919. He compared his estimates to those of Moore and to the revisions produced only a few weeks earlier by Perry. It seems likely Churchill would have been in possession of Perry’s revised estimates when writing to Lloyd George and these, together with Moore’s “assurance”, may have represented the basis of his comment that they would realise “the full programme which I promised you at the beginning of the year”.⁸² Moore considered some 4,334 tanks could be produced between 1 September 1918, and 30 April 1919. Perry’s forecast was 4,370. However, Maclean’s estimate was only 2,320.⁸³

Methodologies underlying earlier estimates by Stern, Moore and Perry were not recorded. However, Maclean’s report related production estimates to stocks of main components, time required by companies to assemble tanks from individual components and an assessment of whether component deliveries were rising, static or falling. He concluded it to be an “elementary deduction” that estimates by both Moore and Perry for September were unachievable, simply because insufficient components were available within the timescale required for assembly by 30 September. Furthermore, bearing in mind monthly deliveries of all main components were static or falling, predictions by Moore and Perry, that production would rise from October onwards, were “unduly and considerably optimistic”.⁸⁴

Maclean next dealt with components by type of tank, bringing to light results he described as “astonishing”.⁸⁵ He found no complete set of components existed for the Mark V**, 900 of which had been ordered eleven months earlier. The position was the same for 450 Medium B and C tanks ordered at the same time. Despite an order in

⁸¹ National Archives, CAB45/200, Elles to Edmonds, 4 September 1934. A company at that stage of the war comprised four sections each of four tanks.

⁸² Martin Gilbert, *The Churchill Documents, vol. 8, War and Aftermath, December 1916-June 1919*, (London, C and T Publications, 2019), Churchill to Lloyd George, 10 August 1918, pp. 370-371.

⁸³ National Archives, MUN4/1374, J. B. Maclean, ‘Report on Condition of Mechanical Warfare Department at August 1918’, p. 1.

⁸⁴ *Ibid*, p. 2.

⁸⁵ *Ibid*, p. 3.

□

March for 1500 hulls for tank assembly at Chateauroux, there were no hulls or other components in existence to facilitate that assembly.⁸⁶ Maclean considered sets of components “should be coming through not later than five months from date of order”.⁸⁷

Having demolished the credibility of Moore and Perry, Maclean turned to the main underlying criteria governing output. Maclean’s list of relevant elements of production included efficient works management, adequate labour, materials and machining capacity, production of fixed working drawings, continuity of orders and satisfactory financial arrangements with contractors. In explaining how these factors could result in low levels of production, Maclean gave examples of such matters being handled satisfactorily in other Ministry Departments.⁸⁸

So far as works management was concerned, Maclean identified two “glaring cases” where bad management was letting the Ministry down.⁸⁹ Two firms had been allowed to undertake their own machining of armour plate when their machining capacity was inadequate for the quantity of work contracted. In consequence some 5,000 tons of armour plate was “lying around the country” unused. Maclean was aware that every other Ministry Department used Outside Production Officers to prevent such problems. This type of post had not been created in the MWD.⁹⁰ Maclean judged that works to increase production capacity to the required level would take some months.

It should be noted that Addison considered labour questions to be the most difficult issues at the Ministry, “Nothing else during the whole period of the war in my experience was comparable in its abundance of perplexity and anxiety.”⁹¹ Various comments by Stern and Churchill provide support for Addison’s view. However, none provide statistical or methodological justification for their conclusions. Maclean on the other hand advanced explanations for labour difficulties which showed it was a factor not totally beyond the control of the Ministry, since performance in resolving elements

⁸⁶ Ibid, pp. 3-4. Though it does not materially affect the point Maclean was making, it appears he may have been given an incorrect date for the order of Mark V** and Medium B and C tanks. It is likely that the original order was for Mark V and Medium A but was subsequently converted to later models.

⁸⁷ Ibid, pp. 3-4.

⁸⁸ Ibid, pp. 4-5.

⁸⁹ Ibid.

⁹⁰ Ibid.

⁹¹ Christopher Addison, *Politics from Within: Including some Records of a Great National Effort* (London, H. Jenkins, 1924), p.176.

of supply influenced movement of the workforce. His explanation for labour shortages exhibited a greater understanding of the response of the British workforce to the complex web of controls that developed during the war. In essence, Maclean attributed much of the labour difficulty to the fact that workers would be inclined to leave if they could see levels of materials dropping. In this way he was placing the responsibility for a declining workforce on the Ministry itself for not ensuring proper steps were taken to keep up supplies. "Without material the men are either paid off or leave immediately".⁹²

Maclean found the only problems with the supply of **armour plate** were those attributable to lack of **machining facilities**. This was known to his predecessors in February, but was not resolved:

we have investigated the facilities of the Country in respect of the Machining and erection facilities available for that portion of the Tank Production....for which our Government has assumed responsibility....When considering the proposed extension of the Allied programme and the existing commitment of 1500 Tanks, we desire to draw your attention to the fact that the production and machining facilities for armour plate in this country are distinctly limited.⁹³

There is no evidence of Moore being asked for greater precision on this issue. Maclean's report some seven months later showed that measures had not been undertaken by Moore and Duckham to increase machining capacity to the level required.

Stampings, castings and forgings for engines and transmissions involved inefficient procedures imposed on the Department in April 1918 by the Controller of Stampings. The introduction of an elaborate procedure had created delays in placing fresh orders, resulting in a hand-to-mouth supply. Without adequate reserves of materials, the effect on production and labour had been detrimental. Maclean pointed out that with low stocks, the workforce would keep the output low. If stocks became exhausted, workers would "drift to other centres or industries". He quoted an example of labour for tank processes on the Clyde being seriously reduced by the voluntary departure of men to the shipyards.⁹⁴ In addition to increasing machining capacity, Maclean found it necessary to take steps to extend buildings at four of the largest and best engine

⁹² National Archives, MUN4/1374, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 5.

⁹³ Churchill Archives Cambridge, CHAR15/86, Moore to Duckham, 21 February 1918.

⁹⁴ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 7.

makers and to install new plant to increase capacity for producing transmission gears.⁹⁵

Maclean accepted that national stamping and die sinking capacity was insufficient in 1918 to meet all government demands and the introduction of controls was necessary. Management's task should therefore have been identification of the most efficient working practice within a controlled system. The new procedure for stampings was elaborate and prone to result in inefficient production: orders could be delayed by a month.⁹⁶ Rather than challenging the form of the incoming requirements with the Director of Stampings, Moore appears simply to have distributed instructions to put the system into effect.⁹⁷ This lack of initiative and recognition of priorities is similar to the behaviour Jellicoe found so unacceptable at Dogger Bank: its impact on tank production would appear to have been significant.⁹⁸ The only mitigating factor for Moore was that, as a sailor, he might be excused a lack of familiarity with industrial issues on land. The responsibility might therefore justifiably be placed on Churchill, who appointed him. The problem was resolved shortly after Maclean took charge:

Since taking over the Department I have been able to make new arrangements with the Controller of Stampings whereby the procedure is much simplified (see appendix "B"). I cannot suggest that the Control should be eliminated entirely, because it is clear that stamping and die sinking capacity is not sufficient at present to meet all Government demands.⁹⁹

Delay caused by the introduction of controls over stampings illustrates most clearly the errors of politicians in appointing personnel lacking familiarity with industrial issues to manage tank supply and to frame and execute working procedures. Maclean was able to find a satisfactory way of working within a new control system imposed on industry by the rigours of war. Maclean's explanation of the consequences of the new

⁹⁵ Ibid, pp. 7-8.

⁹⁶ Ibid, pp. 5-6. Die sinking is a process used to machine or create a specific size or shaped cavity or opening in steel blocks.

⁹⁷ Aircraft production also suffered delays caused by stampings supply problems, though the timing of shortages does not appear to correspond to that for tanks, see Ministry of Munitions, *History of the Ministry of Munitions, The Supply of Munitions, Vol. XII, part I, Aircraft* (London, HMSO, 1922), pp. 78-79 and 119-121. It is recorded that the supply of engines did "seriously hamper" aircraft engine production in the last six months of the war, but does not associate this with stampings problems, see pp. 169-177.

⁹⁸ National Archives, MUN4/1374, J. B. Maclean, Appendix B to 'Report on Condition of Mechanical Warfare Department at August 1918', Office Instruction No. 18A by A. G. H. W. Moore.

⁹⁹ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', pp. 6-7 and Appendix B.

system for tank construction demonstrate that a poorly drafted system of control could have broad effects on the engineering industry nationally:

as much as four weeks could be taken to get continual re-allocation of stamping resources before supply was assured. The Engine and Gear Makers unite in condemning this system, and it cannot be mere coincidence that the stamping supply became irregular and “hand-to-mouth” as from the institution of control. In fact the situation became so grave that a detailed protest against a continuation of this system of control was forwarded to the Controller of Castings and Forgings on 26 July”.¹⁰⁰

Maclean also found problems that prevented achievement of the full potential from the inadequate limited capacity available. Firstly, drawings for all tanks were in a state of flux, with a variety of bodies responsible for preparation. Prolonged discussion with GHQ on design details led to delays and abortive work. Standard designs were not available or complete and accurate preliminary drawings were not available early enough to meet the programme. Some 1,755 alterations had been sent to contractors between February and July 1918. By the time he had completed his report, Maclean had already prohibited alterations to drawings, other than for those containing errors due to inadequate checking.¹⁰¹

The History recognised the problems caused by the overloading of the drawing office but painted this as resulting from pressure of work under the strong demands for production. It failed to mention the change introduced by Maclean, to accept only alterations due to errors, and does not quote figures which Maclean used to show how alterations to designs notified to contractors had mushroomed, rising from 50-60/month in January/February 1918 to an average of over 400/month in April/July.¹⁰²

Maclean endorsed the views earlier expressed by Stern and Moore that the small number of tanks ordered and time between orders seriously affected supply and that there was “a distinct ratio as between total order given and maximum periodic output, which is fixed by commercial considerations.” Maclean did not specify the length of the period over which producers would seek to spread their output under a particular order, but *The History* defines this as twenty weeks.¹⁰³ Maclean also found the practice of the Contracts Department in authorising the issue of “letters to proceed”, with a

¹⁰⁰ Ibid, p. 6.

¹⁰¹ Ibid, pp. 8-9.

¹⁰² Ibid, p. 9.

¹⁰³ Ministry of Munitions, *History*, vol. XII, part III, p. 33.

statement that **prices** would be settled later, represented a source of friction.¹⁰⁴. Churchill's request that contract delays be avoided appears to have generated no enthusiasm for revised, pragmatic action by accountants.¹⁰⁵

Maclean's report and *The History* shed light on the key issue of enhancement to tank specification. He identified continuous orders over an extended period as having "a splendid effect in arousing enthusiasm" and enabling "the material supply to be maintained much more easily".¹⁰⁶ *The History* did not pick up on these comments, but did state that the spreading of orders over a large number of firms could not be put into effect while the number of tanks on order remained limited "since the manufacturers required to spread their output under any order over twenty weeks".¹⁰⁷

The key words in this section of Maclean's report are "commercial considerations". This suggests that **finance** was a major factor in the response to proposed modifications to models in line with military aspirations. Although financial matters are not mentioned in meetings between the War Office and Ministry, the occasional surfacing of the issue does suggest it was more significant than acknowledged by the Ministry. It has been shown that after a lengthy period of inconclusive negotiations over the price of the Mark V in 1917, the Ministry's Finance Department backed down, probably to prevent differences with the MWD reaching Churchill for a decision. Disagreement or conflict between the two Departments also seems to have been close to the surface late in 1918, Seely commenting:

There is a new adverse factor in Tank production, namely the insistence on negotiations of cost by Sir John Mann and his department. This may be, and possibly is, good electioneering, but it is bad for production. If you want a thing badly and want it in a hurry, in ordinary life you have to pay more for it – generally a great deal more..... It is so with these tanks and their engines".¹⁰⁸

Seely revealed to Churchill his views on the state of industry generally, "If you want to get greatly increased production of tanks, I am sure you must renew confidence with contractors as well as workmen. I am quite sure you have not got that confidence

¹⁰⁴ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', pp. 7-8.

¹⁰⁵ Churchill Archives Cambridge, CHAR 15/86, Mann to Masterton-Smith, 15 February 1918.

¹⁰⁶ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', pp. 7-8..

¹⁰⁷ Ministry of Munitions, *History*, vol. XII, part III, p. 33.

¹⁰⁸ Churchill Archives Cambridge, CHAR 15/87, Seely to Churchill, 9 October 1918, pp. 2-3.

now.” He referred to unspecified measures adopted at the Admiralty with contractors early in 1916 and suggested something similar might be done. He saw the problem as a general one, “The difficulty is not so much with Dudley Docker (Metropolitan) as with the many other and smaller contractors. I am seeing Garnsey tomorrow on this subject, as also on the difficulty that has arisen with Ricardo”.¹⁰⁹ Seely advanced a line of argument relevant to the efficient supply of components for tanks not contained in the section on tanks within *The History*, yet it must have been significant bearing in mind the number of firms securing work through contracts. Seely estimated there were 6,000 contracts material to the production of tanks: the estimate of the number of contractors and sub-contractors given by *The History* is 4,000.¹¹⁰ These figures are probably compatible since some firms would have won a number of contracts.¹¹¹

Seely’s later comments supported Maclean’s statement that “The methods adopted by the Contracts Department have produced a chorus of protests from Contractors”. Unless the Controller of Mechanical Warfare could receive some discretionary power with regard to contracts and prices, he saw “no great hope of removing this difficulty”.¹¹² Both Seely and Maclean were in effect seeking restoration of some of the independent powers removed from Stern by Addison early in 1917.

Problems over financial arrangements and drawing office procedures had been identified in a report obtained by Addison in May 1917. Relations between Stern and Addison were disharmonious and measures taken or envisaged by Addison shortly before his departure from Munitions appear to have been designed with a view to clipping Stern’s wings rather than simply achieving more consistent procedures within the Ministry. It is hard to believe that Churchill, Montagu or Lloyd George would have surrendered the independent powers for tank contracts to be negotiated direct by the MWD with Metropolitan and other contractors, yet Addison did so in May 1917. He had further restrictions in mind, but it would appear his plans were frustrated by reference of the matter to Lloyd George, with whom Stern was friendly socially.¹¹³ When coupled to Maclean’s report and Seely’s adverse comments, the 1917 report to

¹⁰⁹ Ibid. Handwritten addition to the typed letter, p. 3.

¹¹⁰ Ibid, p 2.

¹¹¹ Ibid; Ministry of Munitions, *History*, vol. XII, part III, p. 78.

¹¹² Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, ‘Report on Condition of Mechanical Warfare Department at August 1918’, p. 10.

¹¹³ Addison, *Politics from Within*, Chapter XVII, Political Events, 1916, January to July, passim.

Addison completes a substantial body of critical comment on the finance of MWD supply.¹¹⁴

Macleane's criticisms of estimates of tank output, his assessment of MWD management and judgment of the consequences for the immediate future represented a **condemnation** of the work of the MWD over the preceding two and a half years. The issues he raised would have affected the supply of tanks throughout that period. Bearing in mind the political capital Churchill had invested in alternative means of waging offensives on the Western Front, the leaking of Maclean's report would have caused acute embarrassment. Churchill had failed to recognise organisational problems and in 1917 had appointed a new, unqualified Controller to replace his equally unqualified predecessor.

During the time necessary to increase capacity to meet military operational requirements, a period of low productivity was unavoidable. It was likely that only 800-900 tanks could be constructed in the remaining four months of 1918.¹¹⁵ Moreover, Maclean emphasised the degree of incompetence or **wilful suppression** by senior managers of the true state of the production process. He twice remarked that previous output estimates were prepared without consultation with the department's supply officers, notwithstanding their request to participate in the exercise.¹¹⁶ In so doing Maclean was setting a timer that, many years later, upon the release of appropriate documents into the public domain, would expose the myth Churchill sought to establish in *The World Crisis* that "once the whole organisation was in motion it never required change" and "here were gathered the finest business brains of the country working with might and main and with disinterested loyalty for the common cause".¹¹⁷

Macleane had identified weaknesses that could not be explained by impersonal external considerations, such as availability of materials and labour, but involved management practices and preservation of reputations and positions.¹¹⁸ Clearly some within the Ministry did not work exclusively for "the common cause". Maclean was also

¹¹⁴ Churchill Archives Cambridge, CHAR 15/88, report to Addison by Lieutenants-Colonel Rickard and Holbrook, 1 June 1917.

¹¹⁵ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 1.

¹¹⁶ Ibid, p. 4.

¹¹⁷ Winston Churchill, *The World Crisis 1911-1918* (London, Free Press, 2005), p. 722.

¹¹⁸ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', pp. 2 and 4.

critical of the practice of the production workforce in prolonging employment at the expense of speed of output. Neither group could claim to be “working with disinterested loyalty”, though conclusions on the extent of this problem within the management of the Ministry are limited by the somewhat unique circumstances of the MWD consequent on the nature of its establishment in February 1916.

Arguably, Churchill’s remarks to Cabinet in 1917 indicate how inefficient procedures for the MWD may have been remained throughout much of his spell at Munitions:

It is indispensable that persons near the heads of very large organisations should not be smothered by detail, or consume themselves in ordinary day-to-day business, but that they should have the opportunity to take wide and general views, and to search resolutely and anxiously amid the incident of business for the dominant truths”.¹¹⁹

Churchill painted only a partial picture. Unless senior managers had a degree of knowledge of detail and an understanding of relationships between issues and the implications of changes, they could not manage effectively. For example, Moore had known of problems with Medium A gearboxes but lacked the knowledge, ability and drive to rectify the position. Elles described this gearbox as:

a beast, perhaps something can be done, though it looks to me as if the only remedy here is a large supply of spare gearboxes. The matter is rather serious now, as we found after some 8-10 miles running the 3rd gear keeps slipping out, so that the unfortunate driver is deprived of the use of one of his two already busy hands.¹²⁰

It is not known whether the Medium A and Medium C gearboxes were constructed to a similar design, but Moore should have taken measures to ensure that the construction of gearboxes for later models received special treatment. Yet seven months later Maclean found it necessary to take steps to remedy serious problems with the Medium C gearbox.¹²¹ Similarly, in 1917, Stern had been aware of the need to improve the transmission system of the Mark IV but lacked the detailed knowledge and management skills required to quickly select a suitable new system for Mark V.¹²²

¹¹⁹ National Archives, CAB24/23/79, Winston Churchill, 18 August 1917, General Memorandum 21 - Organisation of Munitions Council.

¹²⁰ National Archives, WO158/816, Elles to General (assumed to be Capper), 18 February 1918.

¹²¹ National Maritime Museum, d’Eyncourt Papers, DEY57, minutes of Fourth Meeting of Tank Board, 5 September 1918, Item 3, Tank Production Position.

¹²² National Archives, MUN4/5219, Speakman to Stern, 11 December 1916, Progress Report on preparation of alternative transmission systems; Stern, *Tanks*, appendix II, Programme of Tank Display at Oldbury on 3 March 1917. Stern avoids mentioning in his book that Wilson’s epicyclic was the outstanding system at the Oldbury trials.

It is difficult to identify flaws in Maclean's approach. He justified his conclusions with facts and understanding of the approach of the industrial worker. In reality, the detection of faults in some departmental working practices and reports did not require the services of an exceptional sleuth. Errors in short-term output forecasts should have been obvious to anyone in a management position. Similarly, little expertise would have been required to reveal the unreliability of medium-term projections by Moore and Perry bearing in mind the state of component supply and the lack of the necessary infrastructure to deliver the number of engines and gearboxes required.

The "successful" **muzzling of the Supply Officers**, whose involvement would have exposed true supply prospects, represented perhaps the most discreditable practice unearthed by Maclean. In *The World Crisis*, Churchill does not consider these aspects of the Ministry's history. This cannot have been because he was unaware of the seriousness of the issues, underlined with apparently naive sincerity by Seely, that by 1919 there would be a shortfall of almost 2000 tanks: "such an extraordinary miscalculation reflects gravely on those who were responsible early this year".¹²³ Prominent among those responsible, albeit indirectly, was Churchill, who, as Maclean was demonstrating, was in charge but had not checked the work of those whom he had appointed and who had accepted figures that lacked sound foundations. Equally serious was the fact that those aware the Minister was being fed inflated figures had been barred from contributing to the exercise. Maclean's report makes it clear that there existed at a relatively senior level within the MWD a number of individuals intent upon providing a false picture of the efficiency of the department.

Short-term forecasts should be more accurate than those for 12 months ahead, but no reason is seen to criticise Maclean's approach for the period to July 1919. His estimates for the remaining three-month period of the war, August to October, proved to be close to the actual production level.¹²⁴ In September 1918 home tank production was declining and averaged only some twenty-seven/week, twenty of which were Mark V*.¹²⁵ Chateauroux had secured neither the buildings nor component parts necessary to provide the heavy tanks upon which America and France were relying

¹²³ Churchill Archives Cambridge, CHAR 15/92, Seely to Churchill, 9 October 1918.

¹²⁴ National Archives, MUN4/5172, Weekly Output Statistics for September and October 1918.

¹²⁵ Ibid.

for 1919 offensives.¹²⁶ The importance attached by France to the role of heavy tanks is apparent from the request for allocation to their army of the full planned output of 1500 Mark VIII from Chateauroux.¹²⁷

In order to limit delays and secure the rapid supply of components, Maclean sought to reassure suppliers of fair treatment:

I have been able to consult with the Assistant Financial Secretary, and am able to give you official assurance that fair and reasonable prices will be paid for all work done on the Tank Hulls....The urgency of the Anglo-American Programme becomes of increasing importance as time goes along, and I am glad to have Mr. West's assurance that everything will be done to facilitate delivery.¹²⁸

Churchill must have been conscious that, notwithstanding his strategic vision, he possessed neither the practical knowledge of Maclean nor, perhaps, the management qualities or intuition of Seely, either of which might have enabled him to construct a more adequate supply system to underpin his strategy. Churchill's management system at Munitions had been explained to Weir in May 1918, when Weir was seeking the reorganisation of the Ministry's Aircraft department in a way Churchill believed would place an excessive burden on himself as Minister:

The function would be much too direct for that of a Minister. It would also be contrary to the whole organisation of the Ministry of Munitions, which is based throughout on the principle of the delegation by the Minister to the Members of his Council of definite spheres of supervision.¹²⁹

Churchill had placed excessive faith in the men of push-and-go. As he confessed to Clementine, to make matters worse, he had not dismissed "that foolish Colonel Stern", who, unsurprisingly, proved equally adept at failing in France as he had in England.¹³⁰ In the case of Chateauroux, it was again Seely who instigated measures to accelerate progress.¹³¹

¹²⁶ National Archives, MUN4/6400, Agreement between Britain and America, 22 January 1918. Provision was made for the first 600 tanks to be taken by America, thereafter, under clause three, further supply would be allocated by agreement between France, Britain and America.

¹²⁷ National Archives, MUN4/2790, War Office to MM, 13 May 1918.

¹²⁸ National Archives, MUN4/5191, Maclean to Wests Gas Improvement Co., Ltd., Albion Iron Works, Manchester, 10 October 1918.

¹²⁹ Churchill Archives Cambridge, CHAR15/163, Churchill to Weir, 7 May 1918.

¹³⁰ Gilbert, *Churchill, Companion Volume IV*, Churchill to Clementine, 15 August 1918, pp. 374-375.

¹³¹ National Archives, MUN 4/4979, Seely to Stern, 26 August 1918; National Maritime Museum, d'Eyncourt Papers, DEY57, minutes of Second Meeting of Tank Board, 31 [sic] August 1918. There is some confusion over the date of the second meeting of the Tank Board, seemingly caused by a typo. and visit to Lincoln "It was decided that...as the Committee were visiting Lincoln next Thursday no formal meeting of the Board should be held next week, but that the Committee should have a

Churchill's lack of management ability, particularly through misplaced trust in others, was at the root of his dilemma. It can be seen that Churchill's weaknesses, later identified by Jacob, were apparent during his earlier experiences in government. Moore's inter-personal skills may have been superior to those of Stern, but his appointment to a key position was ill-judged. His successor highlighted the fact that Moore's knowledge and grasp of the essentials of industrial production and engineering details rendered him no more effective than Stern.¹³² Notwithstanding previous experience of the supply of naval armament, he was equally incapable of running his Department effectively and establishing a system that would have provided an opportunity to produce tanks in the numbers and within the timescale Churchill sought.¹³³ This applied not just to 1918, but also to 1919, when Churchill anticipated the climax to the war with the launching of a force against the enemy in greatly enlarged numbers of armoured and other cross-country vehicles.¹³⁴

The timing of the Armistice prevented full confirmation of Maclean's forecast of output. Forecasts by Moore, Perry and Maclean may be compared to actual production only for the last full two months of the war. The figures are not directly comparable since forecasts are by calendar months and output by complete weeks. However, comparing the forecasts for September and October, Moore 518, Perry 438 and Maclean 317, with Layton's recorded output of 298 for the nine weeks ending 7 November (an extra 2 days), it can be seen that Maclean was quite accurate, with the others grossly optimistic.¹³⁵ Maclean did subsequently increase the number of tanks he considered might be supplied by March 1919:

It was decided that Colonel Fuller....should report early to the Minister what offer might be made to supply America with heavy tanks by 1st December

discussion either on the train or in Messrs. Foster's Board Room at Lincoln". The minutes of the fourth meeting confirmed that as no decisions were taken at Lincoln and all items discussed were on the agenda for the Fourth Meeting, no formal minutes of the Third Meeting would be circulated. It seems likely that the Second Meeting was held on 21 or 22 August.

¹³² J. P. Harris, *Men, Ideas and Tanks: British Military Thought and Armoured Forces, 1903-1939*, (Manchester, Manchester University Press, 1995), pp. 160-161; Ministry of Munitions, *History*, vol. XII, p. 56.

¹³³ National Archives, MUN 5/211/1940/37, memorandum from Moore to Duckham, 27 February 1918 and notes of meeting.

¹³⁴ National Archives, CAB 24/4/51 minutes of War Cabinet, 8 March 1918, CAB 24/45, memorandum by Henry Wilson, War Cabinet, 19 March 1918, and Winston Churchill, *The World Crisis: The Aftermath*, (London, Butterworth, 1929), p. 481.

¹³⁵ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 1; National Archives, MUN 4/5168, Weekly Output Statistics for September and October 1918.

1918. In making enquiry into this these points to be borne in mind:- (a) That Mr. Maclean hoped to produce 400 tanks in excess of his programme before February 28th 1919.¹³⁶

In many respects, Lloyd George had reason to be pleased with Churchill's efforts since his return to government. Most munitions were flowing freely. He was proving a valuable confidant and sounding board, undertaking additional duties with his customary energy.¹³⁷ However, Lloyd George was aware Churchill had not mastered tank production difficulties. His compliments to Churchill ignore the point.¹³⁸ However, it is clear from the fact that he called a special meeting to consider low production and that by relating Churchill's defence of labour shortage to the actual dates of War Office actions and conscription initiatives, he realised Churchill was floundering.¹³⁹ He appeared to favour d'Eyncourt's proposal to bring back Stern, but accepted the proposals for further reorganisation by Churchill and Seely in somewhat lukewarm fashion, but with veiled though firm advice which would surely have assured the end of Moore's role as Controller had he not, seemingly, already resigned.¹⁴⁰

Some of the figures in the preceding paragraphs incorporate the anticipated outcome of efforts by the British and American governments to provide an additional joint source of heavy tanks, largely with the objective of supplying American forces. The Mechanical Warfare (Overseas and Allies) Department was set up in November 1917 to put into effect a partnership between Britain and America for the production of at least 1500 tanks in a factory to be erected at Chateauroux. Initially, Britain, through Stern as Controller MWOAD, was responsible for the delivery of all material other than armament and equipment.¹⁴¹ *The History* outlines problems in the supply of adequate 6-pounder guns and track links in meeting the obligations. It also deals in a less specific way with factors identified by Maclean as responsible for low home output of tanks.¹⁴² However, Maclean's report suggested that difficulties went further than admitted by *The History*, since none of the hulls and other components for the model

¹³⁶ Churchill Archive Centre, CHAR15/87, report of 'Conference on Tanks' with American representative Stettinius, 17 October 1918.

¹³⁷ Toye, *Rivals for Greatness*, pp. 181-188.

¹³⁸ David Lloyd George, *War Memoirs of David Lloyd George* (London, Odhams, 1938), p. 1887; National Archives, CAB 24/5/20, minutes of Prime Minister's Meeting on Tanks, 8 August 1918, notably observations of Lloyd George.

¹³⁹ National Archives, CAB/24/5/20, War Cabinet, minutes of Prime Minister's Meeting on Tanks, 8 August 1918, pp. 4-6.

¹⁴⁰ *Ibid.*, p. 7.

¹⁴¹ Ministry of Munitions, *History*, vol. XII, p. 57.

¹⁴² *Ibid.*, pp. 65-66.

to be erected in France had been produced by Maclean's August components survey. Initially, it had been forecast that delivery would commence March/April 1918, and the order would be completed by October, but output from Chateauroux had not commenced by the Armistice.¹⁴³

Churchill's comments to Clementine showed a more candid approach than he had displayed at the Prime Minister's Tank meeting the previous week, "Chateauroux for wh [sic] I was let in by that foolish Colonel Stern is a fair way to become an international scandal. I cannot secure either the labour or the organisation necessary for its completion". His private letter also revealed his true view that "the Tanks are badly wanted" and showed an ignorance of preparations for assembling the 1500 tanks at Chateauroux, since he believed "the material for the Tanks is nearly ready".¹⁴⁴

Seely sought to limit the adverse consequences of failure at Chateauroux by changing the management of the project.¹⁴⁵ He offered the prospect of commencement of production in the autumn, subject to satisfactory receipt of American components and engines. In the event, the British effort in erecting the buildings and preparing to supply its agreed share of components improved considerably.¹⁴⁶ It was reported that the site was ready to commence assembly in November and provision of the British share of components would commence the same month, with maximum volumes from March to May and completion of the order in June, 1919.¹⁴⁷ However, delays in American contributions were confirmed firstly by a cable from Perry which described the American effort to be in a "hopeless" condition and secondly by reports to the Tank Board, which foreshadowed delivery of minimal sets of American components commencing in December, with no supply in bulk before May, 1919.¹⁴⁸ Although Perry did later admit that his criticism of American

¹⁴³ Ibid, p. 70.

¹⁴⁴ Gilbert, *Winston S. Churchill, Companion, vol. IV, part I*, Churchill to Clementine, 17 August 1918, pp. 375-376.

¹⁴⁵ National Archives, CAB 24/5/20, Appendix A to War Cabinet minutes of 8 August 1918.

¹⁴⁶ Churchill Archives Cambridge, CHAR 15/91, minutes of Twelfth Meeting of Tank Board, 31 October 1918.

¹⁴⁷ Ibid.

¹⁴⁸ National Archives, MUN4/4979, Perry to MM, 1 October 1918; Ministry of Munitions, *History, vol. XII*, p. 67; Churchill Archives Cambridge, CHAR 15/91, minutes of Tenth and Twelfth Meetings of Tank Board, 17 October and 7 November 1918.

preparations was over-stated, these reports cast considerable doubt over the number of tanks the scheme could have contributed to construction totals by summer 1919.¹⁴⁹

Churchill's reaction to Maclean's report was neither logical nor charitable. He should have appreciated that some of the criticisms had been touched upon at his meeting with producers in June but, initially, he ignored Maclean's assessment of industrial factors and the underlying reasoning. Seely's response to Churchill revealed that he rather than Churchill was responsible for the appointment of Maclean. Observing Churchill's inclination to turn his guns on the messenger, Seely pleaded for the new team to be given a chance. He stated that, on arrival at Munitions, "instinct told me something was radically wrong with tank production", "I begged you to get a new production man and give him a free hand". He considered Maclean's report vindicated his assessment of pending failure and that the choice of Maclean "to try and retrieve the situation was a wise one".¹⁵⁰

Inevitably, organisation of the MWD does not portray Churchill favourably. Furthermore, notwithstanding unrelieved failure to achieve production forecasts from mid-1917 to mid-1918 and the falling off of production in the summer of 1918 to about a third of that forecast, Churchill does not appear to have modified the strategy he advocated.¹⁵¹ In June, Churchill "informed" Harington that working "on present lines and existing programmes, we should have produced by April 1 1919, 3,629 tanks of the Mark V and later varieties of heavy and medium."¹⁵² He continued by adding 975 from Chateauroux. In September from his chateau at Verchocq, he informed Lloyd George that output was "about half" what he expected, but that the Tank Corps should be raised not from 18,000 to 50,000 men, as had already been agreed, but to 100,000.¹⁵³

It is therefore not difficult to imagine Churchill's dismay when a copy of Maclean's report arrived on his desk shortly after despatch of his upbeat letter to Lloyd George:

¹⁴⁹ Churchill Archives Cambridge, CHAR 15/92, cable from Perry, reported to Tank Board Meeting, 3 October 1918.

¹⁵⁰ Churchill Archives Cambridge, CHAR 15/87, Seely to Churchill, 9 October 1918.

¹⁵¹ National Archives, MUN 5/211/1940/37, report by Moore to Duckham and minutes of Committee 57-Tanks, both dated 27 February 1917, forecast 1157 tanks to be produced in three months August/October 1918. MUN 4/5168, actual deliveries are shown by Layton to have been 420.

¹⁵² Churchill, *World Crisis, 1911-1918*, p. 1345.

¹⁵³ Gilbert, *Churchill, Companion vol. IV, part I*, Churchill to Lloyd George, 9 September 1918, pp. 387-391.

four new circumstances which will tend to make the tank an invaluable weapon next year. Here they are: (1) Greatly increased numbers. They will be able to afford to have a considerable proportion knocked out in each battle and yet have enough left at every point to secure success....¹⁵⁴

Churchill had maintained his advocacy of a large-scale tank offensive in 1919 notwithstanding disappointingly low spring/summer production at home and advice that Chateauroux was in a sorry state.¹⁵⁵ The last remaining prop to his envisaged upturn in home production had been removed. He had also been promised a high and rapid rate of supply of the Newton Tractor, a small cross-country vehicle, preparations for the manufacture of which were being undertaken in America and Britain: these also were not expected to achieve production targets.¹⁵⁶

The role of the tractor was quite separate from that of light/medium tanks. It was neither armoured nor armed, though it has been suggested that arrangements were being made for the addition of a machine-gun cupola.¹⁵⁷ The purpose of the Newton was to facilitate rapid exploitation by Allied forces in conjunction with Heavy and Light armour. A number of machines were supplied by manufacturers though not until after the Armistice.¹⁵⁸ Only three were retained by the army.¹⁵⁹ No reference is made in official correspondence, or specification, to armament by machine-guns.¹⁶⁰

Although the above comments represent a criticism of Churchill's management of the Ministry over the preceding year, they should not be taken as criticism of his response to the potentially difficult situation revealed by Seely and Maclean. The wisdom of his early recognition of armour had been vindicated at Cambrai, Hamel, Soissons and Amiens and it would have been inappropriate for him to have sown seeds of doubt and relax the pressure on GHQ and the Army Council to build up the Tank Corps. Provided Maclean and Seely could deliver the "realistic" levels of production that Maclean considered possible, and supply to Allies could be limited, it would remain likely that by April 1919 the BEF might put into the field at least three

¹⁵⁴ Ibid. Churchill's other points to Lloyd George were smoke devices, night operations and improved training with infantry.

¹⁵⁵ National Archives, MUN 4/5172, Weekly Output Reports; Gilbert, *Churchill, Companion, vol. IV, part I*, Churchill to Clementine, 17 August 1918, pp. 375-376.

¹⁵⁶ National Archives, MUN4/3467, note by Earl, 19 December 1918.

¹⁵⁷ National Archives, MUN5/211, undated report by Director of Traction, MM; David Fletcher, *The British Tanks 1915-19* (Marlborough, Crowood, 2001), p. 120. See photograph 50.

¹⁵⁸ National Archives, MUN4/3467, Masterton Smith to DMRS, 27 November 1918.

¹⁵⁹ Ibid, Perry to War Office, 15 April 1919.

¹⁶⁰ National Archives, MUN5/211, Perry to Page, 19 August 1918, response to proposed specification; MUN4/3467, War Office to MM, 14 August 1918, with attached specification for Newton Tractor.

times the number of tanks as had hitherto been deployed in any single action. A further 2000 were likely to become available by July.

Nevertheless, Churchill's decisions and actions had succeeded in placing the Ministry and army he served in a considerably less advantageous or flexible position than would have been possible under more competent management. As he made his defensive response, that limited manpower meant the army would continue to have more tanks than it could handle, his argument was in the process of being dismantled by losses at Amiens. Churchill was correct to identify tank crew shortages and vulnerability as limiting factors in the number of machines that could be put into the field, but he placed insufficient importance on the time taken to manufacture or repair new or damaged tanks. Following the losses in action at Amiens from 8 to 11 August, even "obsolete" Mark IVs became prized possessions.¹⁶¹

It was shown in the preceding chapter that the army had not been well served either in terms of the enhancement of the heavy fighting tank or the design and production of an efficient medium/light tank. As the German defence against tanks improved, the need for protection of the slow-moving and slow-maneuvring machines and the need to take full advantage of disruption and shock to German defenders were paramount. The cooperation of infantry and ground-attack aircraft and rapid exploitation of any temporary loss of defensive organisation were essential if tanks were to be used to best effect and incidents such as Flesquières were to be avoided.¹⁶² Communication was key, as illustrated during the battle of Cambrai. However, flaws in the integration of forces and avoidable delay could result in loss of momentum, as at Flesquières and could cause or contribute to the loss of numerous tanks. Rapid progress and correct timing in the use of aircraft, artillery and infantry were necessary to reduce risk from German artillery.¹⁶³ Problems existed in communications between individual

¹⁶¹ National Archives, MUN 4/2779, War Office to MM, 31 August 1918.

¹⁶² Third Supplement to the London Gazette of 1 March 1918, Haig Despatch of 20 February 1918 to Derby, 4 March 1918, p. 2719; Sheffield, *The Chief*, p. 252, Sheffield hints that Haig may have personalised the actions of three batteries of German artillery, mostly trained in anti-tank drill, in order to emphasise the need for tank/infantry cooperation; Basil Liddell Hart, *The Tanks, The History of the Royal Tank Regiment and its Predecessors Heavy Branch Machine-Gun Corps, Tank Corps and Royal Tank Corps, vol. 1, 1914-1939* (London, Cassell, 1959), pp. 140-145, Liddell Hart's analysis of subsequent comment by Elles and others suggests that of the sixteen tanks put out of action at Flesquières, the location of wrecks suggest Unteroffizier Kruger, thought to have been the "lone gunner", could have accounted for five at the most.

¹⁶³ Bryan Cooper, *The Ironclads of Cambrai: The First Great Tank Battle* (Barnsley, Pen and Sword, 2010), pp. 114-120; Robert Woolcombe, *The First Tank Battle: Cambrai 1917* (London, Morrison and Gibb, 1967), pp. 101-113.

tanks, between tanks and infantry and between tanks and higher command.¹⁶⁴ The limited visibility and level of noise within tanks accentuated their communication problems, though they were better able to carry heavier communication equipment, such as the Aldis Lamp, than were other arms. By late 1917, army communications had improved, but technology was in its infancy, for longer distances the pigeon often remained as king.

The new technologies of telegraph, telephone and wireless, were fragile, insecure and cumbersome. Runners and dispatch riders were physically vulnerable. Opportunities for visual signalling were inevitably limited in a war largely conducted in trenches and shell holes. The pigeon was not suitable to mobile operations and struggled in extreme meteorological conditions. Yet all these 'means' had their place. When available in sufficient numbers, pigeons particularly proved their worth during offensive operations, as advancing troops advanced beyond their cable networks. In such circumstances, they were not a mere supplementary method of communications; they were the principle means by which the firing line communicated rearward.¹⁶⁵

Over short distances the waving of shovels with attached equipment was a frequently used method of communication between infantry and tanks:

The infantry was to follow on either side of the roads...and was not to attempt to occupy the objectives until the tanks signalled that all was clear, or that they wanted help. The signal in either case was a shovel waved out of the manhole in the roof.¹⁶⁶

Hall also places the importance of lights, waved implements, pigeons, wireless tanks and other developing systems in context. His conclusion is similar to that of Phillips:

although the BEF did achieve a properly organised system of communications for tanks by the end of the war, the limitations of the communications technology at the time, together with the inadequacies of the tanks themselves, continued to impose profound restrictions on the tactical and operational effectiveness of tanks in battle.¹⁶⁷

In the more mobile phase of the war in 1918, communications options were reduced since the relocation of homing pigeons as their lofts were moved forward required a

¹⁶⁴ Brian N Hall, 'The Development of Tank Communications in the British Expeditionary Force, 1916-1918', in *Genesis, Employment, Aftermath: First World War Tanks and the New Warfare 1900-1945*, ed. by Alaric Searle, (Solihull, Helion, 2015), p. 143.

¹⁶⁵ Gervase Phillips, 'Pigeons in the Trenches: Animals, Communications Technologies and the British Expeditionary Force, 1914-1918', *British Journal for Military History*, v. 4, issue 3, (July 2018), pp. 60-80 (p. 63) –

¹⁶⁶ Douglas Gordon Browne, *The Tank in Action* (Edinburgh, W. Blackwood and Sons, 1920), pp. 197; Hall, *Tank Communications*, p. 139.

¹⁶⁷ *Ibid*, p. 161.

training period.¹⁶⁸ The alternative tactic of leaving lofts in rear areas increased delivery time, a tactic which led to Butler, at that time GOC, III Corps, describing such delayed messages “as absolutely valueless”.¹⁶⁹ At the same time the equipping of a few tanks for communications represented a significant advance.

Tanks and artillery were not the only changing and challenging technological problems for the German Army. As the war progressed, German units became increasingly anxious about the effect of Allied air power.¹⁷⁰ However, the Allies did not always utilise their advantages in materiel to the full. At Flesquières, aircraft that attacked German artillery units early in the morning had not returned when the ground attack was taking place. This was the time their presence was needed as tanks appeared silhouetted on the ridge on their approach to the village. The tanks provided an easy target for well-trained German artillery.¹⁷¹ All arms tactics were far from perfected in 1917, indeed the necessary preparations had not been undertaken as ground attack aircraft remained unarmoured and pilots therefore did not relish the prospect of flying into a storm of small arms fire from their far-from-defenceless prey. More aircraft were lost to ground fire at Amiens on 8 August than to German aircraft.¹⁷² Planners should have heeded the advice of Swinton, prepared in February 1916:

The weapon by which the tanks are most likely to be put out of action are the enemy's guns. The only means by which we can at the earlier stages of an attack reduce the activity of the enemy's guns are by our own artillery fire or by dropping bombs on them from the air.¹⁷³

¹⁶⁸ Pippa Elliott, 'How to train a Homing Pigeon', https://www.wikihow.com/Train-a-Homing-Pigeon#qa_headline, accessed 6 April 2020, (Elliott quotes six weeks, though this may be the ideal rather than minimum period since Phillips states “It generally took the birds from a week to a fortnight to settle to a new location”, Phillips, *Pigeons in the Trenches*, p. 72); SS123: *Notes on the Use of Homing Pigeons*, August 1916, p. 4; Hall, *Tank Communications*, pp. 158-159.

¹⁶⁹ Imperial War Museum, 69/10/1, Butler Papers, 'Report on Operations of III Corps from July 1918 to 1 October 1918' quoted in Hall, *Tank Communications*, p. 159.

¹⁷⁰ Alexander Watson, *Enduring the Great War: Combat, Morale and Collapse in the German and British Armies, 1914–1918* (Cambridge, Cambridge University Press, 2008), pp. 189-190.

¹⁷¹ Christie Campbell, *Band of Brigands: The Extraordinary Story of the First Men in Tanks* (London Harper Perennial, 2008), pp. 339-349; Woolcombe, *First Tank Battle*, pp. 104-106, “It was an immensely strong position. Fuller had suggested that tanks ought not to assault it frontally, but this had not been conceded” - weather conditions did not assist efforts to neutralise or destroy defences, but the main fault appears to have been failure to recognise its importance as a defensive position and therefore insufficient priority for integration of appropriate measures in the attack.

¹⁷² Peter Simkins, *Air Fighting 1914-1918*, (London, Imperial War Museum, 1978), pp. 62 and 69-73; Simon Coningham, *Battle of Amiens: Air-Ground Cooperation and Implications for Imperial Policing*, in Gary Sheffield and Peter Gray (ed.), *Changing War: The British Army, The One Hundred Days Campaign and The Birth of The Royal Air Force* (London, Bloomsbury, 2013), p. 214.

¹⁷³ Liddell Hart Centre for Military Archives, Fuller Papers, notes on the Employment of “Tanks”, E. D. Swinton, February 1916.

Swinton did not mention strafing since, at the time, no British aircraft was fitted with an interrupter. It was not until the autumn of 1916 that the Sopwith 1½ Strutter became “the first British aircraft to reach France equipped with a machine gun synchronized to fire forward”.¹⁷⁴ In 1918, as Wilson’s Mark V added worthwhile enhancements in reliability and flexibility to the tactical use of tanks, and other arms raised their game, it required an enhanced level of generalship to take advantage of opportunities at the Front. The contribution of Monash is identified by both Sheffield and Mead as significant in the emergence of the battlefield maestro.¹⁷⁵ Monash argued:

A perfected modern battle plan is like nothing so much as a score for an orchestral composition, where the various arms and units are the instruments, and the tasks they perform are their respective musical phrases. Each individual unit must make its entry precisely at the proper moment and play its phrase in the general harmony.¹⁷⁶

This was a fine analogy, though musicians did not face the communications problems of military units and the analogy is therefore limited in its application. Furthermore, whereas extrovert musicians might relish the conductor’s cue to exhibit their talents, military units could be more reticent, mindful of the consequences of pushing themselves forward. Pilots were not at all keen to stir up the wasp’s nest of small arms groundfire in their slow-moving aircraft.¹⁷⁷ Infantry, mindful of vulnerability to counterattack prior to the forward movement of artillery, might station tanks in forward defensive positions. Tank crews were well aware of their vulnerability in such positions:

Imagine our poor tanks crawling along the brow of a slope for an indefinite period, in full daylight, in full view of the enemy’s gunners! It seemed to us as if we were to be deliberately offered up as a sacrifice to appease the anger of certain infantry commanders.¹⁷⁸

¹⁷⁴ Simkins, *Air Fighting*, p. 37.

¹⁷⁵ Gary Mead, *The Good Soldier: The Biography of Douglas Haig* (London, 2014), p. 339; Gary Sheffield, *Forgotten Victory, The First World War: Myths and Realities* (London, Headline, 2001), p. 236.

¹⁷⁶ John Monash, *The Australian Victories in France in 1918* (London, Hutchinson, 1920), p. 56.

¹⁷⁷ Jonathan Boff, ‘Combined Arms during the Hundred Days Campaign, August-November 1918’, *War in History*, 17(4), pp. 459-478 (p. 464).

¹⁷⁸ Bryn Hammond, ‘After Amiens’: Technology and Tactics in the British Expeditionary Force during the Advance to Victory, August-November 1918 in *Changing War: The British Army, The Hundred Days Campaign and The Birth of The Royal Air Force, 1918*, ed. by Gary Sheffield and Peter Gray (London, Bloomsbury, 2015), pp. 60-62.

Maestros were therefore particularly important to the welfare of tanks which might, ill-advisedly, be asked to lead the advance into territory that had not been risk-assessed for camouflaged anti-tank defences, or to patrol forward of captured positions during consolidation, unsupported.¹⁷⁹ The debacle at Flesquières was not unique. Following experiences in the French counter-attack in July and experience at Amiens, the German Army recognised more fully the value of siting field guns in forward positions.¹⁸⁰ Thereafter, losses of tanks to such defences represented a major threat and explained the high rate of tank casualties during much of the Hundred Days.¹⁸¹ Following experiences at Amiens, Elles was prominent in the quest for improved coordination of air support for offensive operations.¹⁸² Efforts were reasonably successful.¹⁸³ However, results tended to be better at the commencement of a battle than in the later stages when coordination became more difficult to organise and ground attack became more costly for aircraft to execute.¹⁸⁴

Both infantry and tanks sought protection. The maestro's role was not an easy one. Just before Amiens, Haig had been impressed by training tactics for attacks led by tanks.¹⁸⁵ Nevertheless, the low speed of tanks rendered zigzags of limited value and it was not always possible to provide air cover or a rolling shrapnel barrage. Too late did the army appreciate the value of advice by Churchill and Swinton and seek to provide additional protection for tanks in exposed locations by the attachment of devices to generate smoke.¹⁸⁶ The value of smoke had become more widely appreciated after Ypres and various measures were subsequently adopted by the Tank Corps, but the first references that have been identified of action to remedy this shortcoming at source, through the Ministry and manufacturers, are in the Tank Corps

¹⁷⁹ Ibid, pp. 62-63.

¹⁸⁰ Fuller, *Tanks*, pp. 262-263; James E. Edmonds, *Military Operations France and Belgium, 1918*, vol. V (London, Naval and Military Press, 1993), p. 577.

¹⁸¹ Nick Lloyd, *Hundred Days: The End of the Great War* (London, Viking, 2013), pp. 73 and 80.

¹⁸² Walter Alexander Rayleigh and Henry Albert Jones, *The War in the Air: Being the Story of the Part played by The Royal Air Force* (Oxford, Clarendon Press, 1922), pp. 464-467; Bryn Hammond, 'After Amiens': Technology and Tactics in the British Expeditionary Force during the Advance to Victory, August-November 1918 in *Changing War: The British Army, the Hundred Days Campaign and the Birth of the Royal Air Force, 1918* (London, Bloomsbury, 2015) ed. by Gary Sheffield and Peter Gray, pp. 61-62.

¹⁸³ Raleigh and Jones, *War in the Air*, pp. 463-464.

¹⁸⁴ Ibid, p. 464.

¹⁸⁵ Sheffield and Bourne (eds.), *Haig: War Diaries*, 31 July 1918, p. 436; Lloyd, *Hundred Days: End of the Great War*, p. 53.

¹⁸⁶ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915, attached as Annex A to Churchill's Statement to the Royal Commission on Awards to Inventors; Swinton, *Eyewitness*, 'Notes on the Employment of "Tanks"- note 43', February 1916, pp. 198-214.

“Tank Notes” for 10 August 1918 in which it was stated “It has been decided that all fighting types of tanks will be fitted with Commander Brock’s Smoke Generating device”.¹⁸⁷ The War Office sought the provision of smoke generating equipment on new tanks on 13 June 1918, though by 22 August the necessary drawings had not been completed.¹⁸⁸ According to a hand-written note on a reminder, the Ministry was to take no action until the Tank Board had considered the request.¹⁸⁹ Unbeknown to the writer, the Tank Board had already considered the matter:

General Elles reported that smoke had been used with great success by Tanks, but that the device took up room. The question was raised as to whether or not a simple device could be produced for projecting smoke in front of the Tanks.¹⁹⁰

Admiral Bacon had been experimenting with smoke grenades. The Tank Board arranged for him to send a man to France with samples for testing.¹⁹¹ No record of the results of trials of the grenades appears to have been reported to the Tank Board, but an effective, acid-based solution via tank exhaust systems was agreed in November.¹⁹² Some forty-six months after Churchill first made the suggestion, the army had recognised the benefit and secured the agreement of the Ministry to a means of generating smoke. Hostilities would end three days later, an unfortunate illustration of failure to foresee tactical consequences and to respond in timely fashion to innovative suggestions.

Elles had identified early in 1917 that Mark I-IV tanks “will not do what we want”, with 90% of casualties resulting from bellying or from stopping “to swing or turn”.¹⁹³ Despite initial statements that a radically improved machine would be delivered around August 1917, it was a further six months before output of the Mark V commenced.¹⁹⁴ Owing to the combination of conditions at the front and the timing of deliveries, the army was not in a position to test the Mark V in action until July. The operation, a relatively small attack to secure tactically advantageous ground at Hamel, was highly

¹⁸⁷ National Archives, MUN4/4175, 10 August 1918.

¹⁸⁸ National Archives, MUN4/2799, War Office to MM, 22 August 1918.

¹⁸⁹ National Archives, MUN4/2792, War Office to MM, 7 September 1918.

¹⁹⁰ National Maritime Museum, d'Eyncourt Papers, DEY57, minutes of Fourth Meeting of Tank Board, 5 September 1917.

¹⁹¹ National Archives, MUN4/2792, Masterton Smith to War Office, 14 September 1918.

¹⁹² National Archives, MUN4/5206, Allen to Maclean, 8 November 1918.

¹⁹³ National Archives, WO158/814, Elles to Anley, 23 April 1917.

¹⁹⁴ National Archives, MUN4/375, Weekly Review of Output, January-May 1918.

successful.¹⁹⁵ This was encouraging both to units that had been unimpressed by the performance of tanks in spring 1917 and to GHQ whose analysis of the battle detected a lowering of the level of performance of the enemy.¹⁹⁶ Buoyed by the results at Hamel and by the impression that enemy morale and capability were diminishing, Allied forces prepared to take the offensive.¹⁹⁷ In the remainder of July armoured assistance was provided to French forces, with the main British effort early in August.¹⁹⁸ Operations conducted under French command on 23 July achieved their objectives but revealed difficulties in joint working. Some crews experienced difficulty in distinguishing French from German troops and fourteen of the thirty-five Mark V tanks participating were knocked out.¹⁹⁹ Losses included six that were struck by shells during a period when their advance was delayed owing to problems with the rate of advance of the French creeping barrage and an inability to locate the French infantry whom they were supporting.²⁰⁰ Notwithstanding these problems, Allied actions in July magnified effects on the morale of German forces following their failure in the Spring Offensives.²⁰¹

Assisted by early morning mist, the organisation and execution of the Amiens offensive on 8 August demonstrated that the army had made considerable progress in the planning and conduct of operations. Furthermore, the offensive confirmed the limited resolve of parts of the German Army observed at Hamel.²⁰² While many units retained the capability and level of resistance of earlier periods in the war, others, deprived of adequate artillery support by the deployment of units further back, therefore less likely to be overrun by tank-based attacks, appeared more than willing to surrender, particularly when confronted by the threat of tanks. Hammond considers some large-scale surrenders to have been the consequence of weak forward units feeling deserted. If Hammond is correct, the tank was securing benefits without the

¹⁹⁵ James E. Edmonds, *History of the Great War, Military Operations France and Belgium, 1918, vol. III* (London, Macmillan, 1939), pp. 197-208.

¹⁹⁶ Jonathan Boff, *Winning and Losing on the Western Front: The British Third Army and the Defeat of Germany in 1918* (Cambridge, Cambridge University Press, 2012), pp. 107-109.

¹⁹⁷ Sheffield, *The Chief*, p. 294.

¹⁹⁸ *Ibid*, pp. 311-320.

¹⁹⁹ Edmonds, *History of the Great War, Military Operations France and Belgium, 1918, volume III*, pp. 317-318.

²⁰⁰ Clough and Amabel Williams-Ellis, *The Tank Corps* (New York, George H Doran, 1919), p. 284.

²⁰¹ Martin Kitchen, *The German Offensives of 1918* (Stroud, Tempus, 2005), pp. 256-259.

²⁰² Alexander Watson, *Enduring the Great War: Combat, Morale and Collapse in the German and British Armies, 1914-1918* (Cambridge, 2008), pp. 184-231.

need for intense fighting. Churchill flew to France in the afternoon of 8 August at the conclusion of the Prime Minister's meeting on Tanks and noted this situation.²⁰³ He recorded "I do not think there can have been much slaughter, as the enemy seems to have yielded very readily."²⁰⁴ Yet other German units proved to be difficult and determined adversaries, particularly when aided by thoughtless British offensive tactics:

It [the tank] is as yet mechanically imperfect, and the tactical handling of the tank is in course of evolution....As to the tactical handling of tanks, I am persuaded that we cannot sit down and allow the tank people to dictate the tactical use of the tank, except in so far as its mechanical capabilities are concerned....At Parvillers, tank after tank went up against an impossible situation and [was] lost to the use of the attacking infantry. This was magnificent but it was not war.²⁰⁵

Churchill must have reappraised the situation, since only four weeks later he reported to the War Cabinet:

No doubt it is right to exploit to the full the present favourable situation, and we need not exclude the possibility of results being achieved of a very far-reaching character. On the assumption, however, that these results are not decisive....we ought now to have reached definite conclusions as to the character of next year's campaign".²⁰⁶

Churchill continued by considering the pros and cons of trying for "a decisive victory next year as the Chief of Staff advises" or "reserving the climax of the war till 1920."²⁰⁷

On 21 August, Haig had noted Churchill's lack of confidence of victory in 1918:

I told him we ought to do our utmost to get a decision this autumn. We are engaged in a 'wearing-out battle' and are outlasting the Enemy. If we have a period of quiet he will recover, and the 'wearing-out process' must be recommenced.²⁰⁸

The Battle of Amiens was a key event both for GHQ and the Ministry. So far as GHQ was concerned, Amiens would continue the 1918 attrition of the German Army that Ludendorff had initiated by launching the Spring Offensives. Staff efforts to withhold

²⁰³ Gilbert, *Churchill*, vol. IV, pp. 131-132.

²⁰⁴ Ibid, Churchill to Clementine, 10 August 1918, pp. 368-370; Edmonds, *Military Operations, France and Belgium, 1918*, vol. III, p. 89, so far as Churchill's perception of 'slaughter' is concerned, he does not define 'much', but such figures as are available suggest there were 27,000 German casualties on 8 August, the number of prisoners within this figure being some 15,000.

²⁰⁵ National Archives of Canada, Griebach Papers, MG30, E15, vol. 5, File 14, p. 5, quoted in Shane B Schreiber, *Shock Army of the British Empire: The Canadian Corps in the Last 100 Days of the Great War* (Westport, Praeger, 1997), p. 57.

²⁰⁶ National Archives, CAB 24/63/26, Churchill to War Cabinet, 5 September 1918.

²⁰⁷ Ibid.

²⁰⁸ Sheffield and Bourne (eds.), *Haig: War Diaries*, 21 August 1918, pp. 447-448.

from the enemy the location of the offensive were elaborate and effective.²⁰⁹ To the Tank Corps this was the opportunity they had long sought, namely a concentration of tanks possessing greater mobility than early models and taking place on ground not suffering from excessive bombardment or extensive accumulations of mud. Preston records “Thanks to a dry summer and to the fact that it had been very little shelled, the ground was hard and provided good “going” both for tanks and cavalry.”²¹⁰ The night of 7/8 August was fine and a ground mist formed.²¹¹ The mist was to play an important role in the battle, in some areas seemingly either unnerving forward German units or, through poor disposition of artillery, rendering their positions impossible to defend.²¹² However, the emergence of the sun in mid-morning appears to have marked the commencement of a more determined defence against which gung-ho tactics could render tanks extremely vulnerable.²¹³ Hart concludes:

The tank like the infantry and the artillery, was not a stand-alone weapon and had clear weaknesses as well as strengths. It could not operate alone and when bereft of the right kind of support it was all but useless.²¹⁴

When the concept of the tank was endorsed by Churchill in January 1915, he had envisaged operations at night or under cover of smoke, yet in the ensuing years these means of protecting tanks from direct artillery fire had neither been sought by the army nor examined by the Ministry. In 1918 the Tank Corps became interested in such techniques. A trial night raid was undertaken near Bucquoy. From this it was concluded that “The raid showed the possibility of manoeuvring Tanks in the dark through the enemy’s lines, and also the great security to personnel afforded by a Tank during the night”.²¹⁵

For some time the army had seen the Mark IV as “obsolete” and unwanted:

The Conference considered what was to happen to the Mark 4 Tanks of which there are 400 now available, and which it was recognised are of no value for big operations. Mr. Churchill suggested that they should be

²⁰⁹ Edmonds, *Military Operations, France and Belgium, 1918, vol. III*, pp. 17 and 36-37.

²¹⁰ Lt.-Colonel T. Preston, ‘The Cavalry in France, August-November, 1918’, *The Cavalry Journal*, vol. XXIV, pp. 167-182, (p. 169).

²¹¹ *Ibid*, p. 40; Robert Ward, Weather Controls over the Fighting during the Summer of 1918, *The Scientific Monthly*, vol. VII, no. 4 (October 1918), pp. 289-298.

²¹² Edmonds, *Military Operations, France and Belgium, 1918, vol. IV*, p. 515; Heinz Guderian, *Achtung-Panzer!: The Development of Tank Warfare* (London Cassell Military, 1999), pp. 114-115.

²¹³ Liddell Hart, *The Tanks*, pp. 178-179.

²¹⁴ Peter Hart, *1918: A Very British Victory* (Chatham, Weidenfeld and Nicolson, 2008), p. 326.

²¹⁵ Liddell Hart Centre for Military Archives, Fuller Papers, 1/16, Report on Raid carried out by the 187 Infantry Bde. and the 10th Tank Battalion on the night of June 22/23rd (1918).

withdrawn behind the Army areas and be used for raids for deceiving the enemy as “dummies”, and for use in training but deprecated their being broken up, as we gained nothing by this and they might yet play some part.²¹⁶

To a degree Churchill would be proved right. Following the extent of Mark V losses at Amiens, Mark IVs regained value.²¹⁷

Owing to Churchill’s objective of extracting the maximum possible personal benefit from his association with the design and construction of tanks, his observations about early development are suspect. This is well illustrated by his misleading response to a draft of the Official History:

Once the idea of a land battleship was mooted, I turned to Tennyson d’Eyncourt, and appealed to him to give his full aid, as a result of which I appointed the Landship Committee in February 1915. D’Eyncourt’s Committee designed the mother tank in spite of the military obstructions you mention.²¹⁸

The Landships Committee did not design any vehicle. Much of the scholarship fails to recognise the extent Churchill endeavoured to distort events and switch the credit for designing the first tank from Tritton and Wilson to his Landships Committee. Likewise, Churchill’s efforts to conceal the limited production of tanks during his stewardship of the Ministry are also not fully appreciated. Beiriger does not recognise Churchill’s tactics and raises no questions about his ability to repair and produce tanks on “an unprecedented scale for 1919”.²¹⁹ Beiriger also quotes from Dewar who envisaged the despatch to the front of large numbers of Mark VIII tanks by early spring 1919.²²⁰ Having regard to the time taken to assemble, test and deliver tanks, the state of the Chateauroux venture on both sides of the Atlantic, the limitations revealed by Maclean’s survey and the time required for his development programme to come to fruition, it seems unlikely that any Mark VIII would have reached the front by March

²¹⁶ National Archives, MUN5/394, minutes of ‘Conference on Tank Policy of the Future’, 26 June 1918. For attitude of army to Mark IV, see also MUN 5/210, minutes of ‘Conference on Tanks’ held at GHQ, 10 June 1918, MUN 5/211, Capper to War Office, 25 August 1917, WO158/859, Elles to War Office, 7 October 1917 and WO158/818, minutes of conference at War Office on Tank Policy, 28 September 1917.

²¹⁷ National Archives, MUN 4/2801, Requirements to Maclean reporting War Office letter of 28 August 1918, notifying need to keep all Mark IV tanks and giving statement of numbers of operational tanks at the Front; National Maritime Museum, d’Eyncourt Papers, DEY57, minutes of Fourth Meeting of Tank Board, Item 17, Retention of Mark IV Tanks in France, 5 September 1918.

²¹⁸ National Archives, CAB45/200, Churchill to Edmonds, 26 January 1938.

²¹⁹ Eugene Edward Beiriger, *Churchill, Munitions and Mechanical Warfare* (New York, Peter Lang, 1997), pp. 165-166.

²²⁰ G. A. B. Dewar, *The Great Munition Feat* (London, Constable, 1921), p. 5.

1919, other than perhaps some 150 under special contract in Glasgow.²²¹ Just one Mark VIII was produced in the final quarter of 1918.²²²

It is surprising there has been so little criticism of Churchill's performance at Munitions. Setting aside contemporaries with axes to grind, there are few critics of Churchill's spell as Minister. Beiriger does blandly state that Churchill's reorganisation of the MWD in October 1917, adversely affected output.²²³ However, Beiriger did not attempt to justify this view and would appear to have fallen into the trap of assuming there to have been a simple relationship between relevant issues when relationships were complex. Notably, Beiriger makes no reference to Maclean's report. Perhaps he saw the issues raised by Maclean as unrelated to the subject of his work, i.e. the politics of supply and strategy, though some analysis of supply difficulties would have served a useful purpose to balance his excessive praise for Churchill.

Beiriger is not alone: scholarship generally fails to address the points raised by Maclean or comments only superficially on limited issues. Only Prior and Childs have commented meaningfully on Maclean's report. Prior shows clearly that he appreciated the validity of many of the criticisms raised by Maclean.²²⁴ However, as the title of his book suggests, Prior's objective was to take Churchill to task over the validity of his approach in *The World Crisis* as a whole. This he does effectively but he does not identify the full significance of Maclean's report, which is not considered in conjunction with other documents. No reference is made to the correspondence between Seely and Churchill early in October 1918 or to the fact that Churchill makes no mention of Maclean or his report in books or correspondence. By restricting his target to what Churchill wrote and excluding consideration of what he did not mention, Prior does not identify the full significance of problems identified by Maclean's. Nevertheless, his book, shows a balanced picture of the factors material to the low rate of tank production.

²²¹ National Archives, MUN4/5194, Anglo-American Commission to MM, 12 November 1918 and Munitions in Scotland to MM, 2 November 1918, concerning necessary modifications to Mark VIII tanks by North British Locomotive Company and MUN4/4979, the state of American preparations is illustrated by Lt. Robertson's cables from the US, notably Robertson to Tozer, Seely, Layton et al, 7 October 1918.

²²² Trinity College, Cambridge, Box 35/4, Review of Munitions Output, 1914-1918; National Archives, MUN4/5188, a further five were delivered by 11 January 1919.

²²³ Beiriger, *Churchill, Munitions and Mechanical Warfare*, p. 165.

²²⁴ Robin Prior, *Churchill's World Crisis as History* (London, Biddles, 1983), pp. 246-248.

Both in his thesis at Glasgow University and in his book, Childs leaves the reader in no doubt about the limitations of the Ministry's efforts to produce tanks, but he does not seek to analyse available evidence to assess responsibility for faulty management. Rather, he explains the problems as being rooted in the limitations of Stern and the on-going conflict between the Ministry and War Office for control of tank design and production.²²⁵ Notably, Childs fails to follow through with an examination of Maclean's findings or what those findings reveal about Churchill as a manager, about the general efficiency of the MWD or the consequences for the army, particularly had the war extended into 1919. Instead, he makes a number of claims that are not referenced.²²⁶

The significance of faults in the tank supply system revealed by Maclean are not therefore addressed adequately. Similarly, possible consequences for military operations, during the war or its envisaged extension into 1919, are not considered. There is no reason to conclude that organisational shortcomings arrived with Churchill and Moore. They seem likely to have existed throughout the life of the MWD. Matters would appear to have taken a wrong turn at the outset, under Lloyd George in February 1916, when membership of the Tank Supply Committee was determined. The selection for membership of this Committee was to a substantial degree based on retaining the services of those who had served on the Admiralty Committee, yet that Committee had no meaningful involvement in the design and construction of the first tank, which had been undertaken by Tritton and Wilson in Lincoln. Furthermore, most members of the Committee do not appear to have possessed any special skills in industrial production, a basic requirement as the project moved from the completion of a prototype to production in bulk. Wilson became a member of the Committee, but was not in an influential position, being subordinate to Stern who had no background

²²⁵ David J. Childs, *A Peripheral Weapon?: The Production and Employment of British Tanks in the First World War* (Westport, Greenwood Press, 1999), pp. 24-27.

²²⁶ *Ibid*, for example, p. 32, Childs attributes a qualification to the order for 1,000 tanks in 1916, namely "on the proviso they could be supplied with sufficient spares". No reference is given to support this claim, but most significantly it is not included in the letter from Butler to Elles, 22 September 1916 or the note of the meeting on 19 and 20 September 1916 at which the order was made. Stern acknowledged that there was an obligation to provide spares, but in view of the problem of defining the parts and quantity of spares and in the light of subsequent difficulties with rollers, it seems most unlikely any comment by army representatives would have accurately reflected subsequent requirements. Similarly, it is stated, p. 50, "The Medium "C" "Hornet" came into production at the very end of the war". However, the general consensus is that no Hornets were produced until after the war, see for example Glanfield, *Devil's Chariots*, Appendix IV, National Archives, MUN4/902, Numbers of Tanks in the Field; Fletcher, *British Tanks*, pp. 38-40. Fletcher states thirty-six Hornets were at various stages of construction at the end of the war: these were completed and a further 14 were built. It is understood four took part in the victory parade in 1919.

in engineering or manufacturing.²²⁷ *The History* described the immediate work of this Committee as “the speedy construction of the hundred tanks for which the formal War Office demand had been received”: it failed to mention that the supply was only sufficiently speedy to enable half the first order to participate in the conflict at Flers, did not explain that the order was extended, firstly in April then again in July and did not mention that Stern had forecast the completion of the first 150 tanks by July.²²⁸ Achievements in 1916 did not auger well for the following years.

And so it proved. For two years, output estimates were not simply wrong but were normally substantially overestimated. As the importance of supply issues increased during the summer of 1918, Percival Perry, Moore’s deputy, provided revised estimates.²²⁹ Perry maintained the pretence of unachievable forecasts that Maclean, Moore’s successor, would expose as completely unrealistic. The gulf between Perry’s forecasts and those of Maclean increased monthly to January 1919 by which time Perry considered some 720/month might be constructed. Maclean’s estimate for January 1919 was 228.²³⁰ *The History* failed to criticise Perry for this but it is notable that Seely moved Perry from his role as Deputy DCMWD to a specific, limited role obtaining tractors from America.²³¹ Maclean’s revelation that Supply Officers had been excluded from the estimates exercise, represented perhaps clear evidence of the lack of ability or integrity of certain managers.²³²

These weaknesses are not widely reflected in the scholarship, which fails to challenge adequately the concluding picture presented by *The History*. This was

²²⁷ Stern, *Tanks 1914-1918*, pp. 85-86, The membership of the Tank Committee became less significant from July 1916 when, Stern claims to have been frustrated by issues raised by the Tank Supply Committee, and successfully relegated it to a toothless role as an *Advisory Committee*, “About this time I found it very difficult to work with a Committee, some of whom wished every point referred to them....the powers and duties of the Committee were transferred to me”. It may be no coincidence that this change occurred at the time Stern overruled Wilson’s order for strengthened tail units. The change was approved by Montagu, whose spell as Minister commenced on 12 July: clearly the change regularised Stern’s managerial dominance over engineering elements on the Committee.

²²⁸ Ministry of Munitions, *History*, vol. XII, pp. 34-35.

²²⁹ National Archives, MUN4/1374, Maclean, ‘Report on Condition of Mechanical Warfare Department, p. 1.

²³⁰ Churchill Archive Centre, CHAR15/87, report of ‘Conference on Tanks’ attended by Churchill, Seely, Fuller, Stern and Maclean with American representative Stettinius, 17 October 1918 - although Maclean “hoped to produce 400 tanks in excess of his programme before February 1919”, it cannot be ascertained whether this possible addition was conceded whilst Churchill held a pistol to his head or whether he genuinely believed such an increase was achievable.

²³¹ National Archives, MUN5/211, minutes of Meeting of Council Committee on the Production of Tanks, 1 August 1918.

²³² Ministry of Munitions, *History*, vol. XII, part III, passim.

falsely simplistic, comprising successful war-time efforts embroidered by the prediction that, had the war continued, there would have been a rosy future, “A complex and entirely novel engine of war had been created in a single year....Manufacture in thousands was undertaken during the next two years [1916-1917] under enormous difficulties”.²³³ *The History* stressed the shortages of labour, materials and manufacturing capacity, but omitted any reference to matters which could have been handled more satisfactorily, concluding its review of the section on tanks by the observation that “over 2500 machines had been made and issued, the original tank had been developed and improved with experience, and there was a clear prospect of still more successful production upon an enormously increased scale”.²³⁴ The facts paint an entirely different picture, with limited and falling production in Britain, problems in commencing production at Chateauroux and, belatedly, somewhat desperate efforts by a new team in the last three months of the war to undertake measures to facilitate increased output for operations in 1919.²³⁵

The absence of debate and explanation for the issues raised in Maclean’s report represents a weakness in the assessment of preparations for armoured warfare. Even Glanfield fails to mention that Maclean produced a report critical of the handling of various issues by the Ministry. He fails to identify and answer some of the issues covered by Maclean and deals only superficially with others. In particular, Glanfield ignores Maclean’s point that considerable responsibility for the problems of manufacturers in securing adequate labour was due to failure to ensure an adequate supply of components.²³⁶

The files show a detailed monitoring of tank output, particularly under Churchill’s leadership of the Ministry.²³⁷ However, considerably less is said about steps taken to forestall delays caused by shortages of particular components. For example, in February 1918 there was a problem with the supply of gearboxes for Mark V/V*.²³⁸ On

²³³ Ibid, *part III*, p. 78.

²³⁴ Ibid. The figure for output of tanks can vary slightly according to the particular record and definition of “output”. The figures published in the History of the Ministry, vol. XII, do not justify the use of the description “manufactured in thousands”, the figure given by *The History* for the years 1916 and 17 in Appendix VI, p. 93, being only 1260.

²³⁵ National Archives, MUN5/211, 7 March 1918, Ministry of Munitions Tank Programme 1918 (February 1 to March 31, 1919).

²³⁶ Churchill Archives Cambridge, CHAR15/87, J. B. Maclean, ‘Report on Condition of Mechanical Warfare Department at August 1918’, p. 5.

²³⁷ Churchill Archives Cambridge, CHAR 89 and CHAR 15/88 passim.

²³⁸ National Archives, MUN5/211, ‘Conference on Tanks Programme’, 11 February 1918.

11 February, following enquiries, Perry estimated that deliveries of Mark V gearboxes would commence in about three weeks and would increase to 65/week, sufficient for the Minister's programme of 700 tanks between April and July.²³⁹ In August, Maclean found the available plant to be insufficient to meet the production programme and demands for Mark V variants. As this was not anticipated to exceed sixty-five/week, it would appear that Perry had not checked the source of his information.

In August, Maclean found the monthly production of gearboxes to be only 177 and falling. He recorded that, prior to his appointment as Controller, an eleventh-hour effort had been set on foot to remedy the shortage of capacity for transmission gears. The effort would appear to have been ineffective as well as late, since Maclean recorded he "had to order large quantities of new plant to cope even with the amended (reduced) figures I have now put forward".²⁴⁰ It would appear from the number of references to gearbox shortages, that this component posed general problems for the Ministry. It seems surprising that in some instances no single firm was responsible for the construction of the gearbox as a whole. On 5 September Maclean reported that the gearbox for the Medium C needed to be redesigned and "he had an expert on the work at present".²⁴¹ At the Board's next meeting Maclean discounted the possibility of this gearbox being available "in any numbers" before January.²⁴² Maclean also informed the Board that, owing to "the possibility of gearbox trouble with the Mark V** Tank, Metropolitan were to revert to producing Mark V tanks "in about two months time".²⁴³ All Medium C were to be equipped with the new gearbox by March.

The vision, enterprise and skill of a number of individuals had provided weapons that eventually contributed to success in France and in other theatres. Yet the obstacles that had been encountered both within its own ranks and within political and naval circles had deprived Expeditionary Forces of the degree of benefit they might have enjoyed by the earlier and more efficient production of armoured vehicles.

²³⁹ Ibid.

²⁴⁰ Churchill College Archives, CHAR15/87, J. B. Maclean, 'Report on Condition of Mechanical Warfare Department at August 1918', p. 8.

²⁴¹ National Maritime Museum, d'Eyncourt Papers, DEY57, minutes of Fourth Meeting of Tank Board, 5 September 1918, Item 3, 'Tank Production Position'.

²⁴² National Maritime Museum, d'Eyncourt Papers, DEY57, minutes of Fifth Meeting of Tank Board, 12 September 1918, Item 3, 'Mark VIII Tank' (sic).

²⁴³ Ibid. It seems likely that the potential shortage of gearboxes represented a convenient face-saving reason for reverting to the Mark V – in reality the army did not want further production of the unpopular Mark V*, preferring instead to obtain additional deliveries of the more efficient Mark V.

Maclean's report highlighted management shortcomings. After listing the problems of inadequate machining facilities for armour plate and inadequate output of engines and transmission gears, Maclean had lamented that, "As I turn from one important component to another I find the same conditions prevailing."²⁴⁴ The nature of the errors showed the lack of an adequate system of checks by senior management. Errors were occurring such as the ordering of oversized ball bearings for the Whippet, without a check on the availability of that particular size, and the incorrect specification of jigs for the Mark VIII.²⁴⁵

It has been shown that delays affecting tank invention and production were present during each stage of the war. Churchill's tenure of the Ministry is no exception. Notwithstanding his drive and willingness to embrace change, Churchill failed to stamp his presence on the management of tank supply. Although he could not have conducted detailed supervision over his Ministry as a whole, tanks had a special significance for Churchill's strategy and he should have been aware from a range of sources, particularly Layton's monitoring, that all was not well with supply. His appointment of Seely in July 1918 might be interpreted as a willingness to consider change, but by then Churchill had been Minister for a full year. Army dissatisfaction should have led to an earlier, closer examination of performance. Bearing in mind military aspirations and his own support for armoured warfare, it was quite inappropriate for Churchill to tolerate such a lengthy period of failure to achieve results needed for his advocated military policy. Had the war been lost, undoubtedly there would have been in-depth studies of all relevant issues. In the event, victory spared Churchill and others from close scrutiny that would have revealed limitations in the standard of their efforts. However, despite favourable, chance events and Churchill's best journalistic labours to hide the truth, indefinite subterfuge was not possible. Notwithstanding Churchill's efforts, too many documents existed to prevent the surfacing of uncomfortable facts. Even Churchill was not fully in command of history.²⁴⁶

²⁴⁴ Churchill College Archives, CHAR 15/88 passim.

²⁴⁵ Ibid, pp. 5-6 and Appendix B; Ministry of Munitions, *History, vol. XII, Tanks*, pp. 59-60.

²⁴⁶ David Reynolds, *In Command of History: Churchill Fighting and Writing the Second World War* (London, Allen Lane, 2004), p. 527.

CONCLUSION

The preceding chapters have shown that, despite significant problems, by the end of the war armoured vehicles had become useful components in British military operations:

Since the opening of our offensive on 8th August, tanks have been employed in every battle, and the importance of the part played by them in breaking the resistance of the German infantry can scarcely be exaggerated. The whole scheme of the attack of 8th August was dependent upon tanks, and ever since that date on numberless occasions the success of our infantry has been powerfully assisted or confirmed by their timely arrival.¹

It is standard courteous practice for a C-in-C to recognise the contribution of all branches of his command in formal Despatches. For a balanced assessment of Haig's view of the value and role of tanks it is therefore advisable to supplement observations relating to a particular sector of the conflict with wider assessments. Haig's Final Despatch provides an opportunity to undertake such a check. The Despatch summarises the relative roles of different arms.² Tellingly, Haig stresses the interdependency of the specialised arms and the requirement that they should work to assist the infantry, who alone can occupy ground. He makes specific mention of the role of tanks for large-scale attacks such as Amiens:

As an instance of the interdependence of artillery and tanks, we may take the actions fought east of Amiens....A very large number of tanks were employed in these operations, and they carried out tasks in the most brilliant manner. Yet a scrutiny of the artillery ammunition returns....discloses the fact that in no action of similar dimensions had the expenditure of ammunition been so great. Immense as the influence of mechanical devices may be, they cannot by themselves decide a campaign.

The length of Haig's explanation of the role of artillery shows that he considers this to have been the bedrock of his army's success. Yet account needs to be taken of the fact that there were certain key differences between the Allies and the Central Powers. The lack of a meaningful number of tanks within the ranks of the Central Powers represented one such difference which limited the tactical options open to enemy forces and provided Haig and Petain with powerful second blows following initial artillery bombardments. In assessing the significances of changes in military affairs,

¹ John Herbert Boraston (ed.), *Sir Douglas Haig's Despatches, December 1915-April 1919* (London, J. M. Dent and Sons, 1919), Seventh Despatch, Advance to Victory, p. 302.

² *Ibid*, The Final Despatch, Part 2, Features of the War, para. 15, pp. 328-330.

Jonathan Bailey emphasises the changes that developed during the First World War, the indirect fire revolution with artillery, aircraft and radio communication providing the means of locating, relaying information and dominating enemy forces.³ The importance of this combination of forces and services and their impact on warfare is beyond question, but a feature they share is their inability to occupy ground. Following the impressive, dominating role of artillery at the commencement of a major set-piece battle such as Amiens and their continuing efforts to provide a protective umbrella, it was still necessary for the infantry, supported by tanks and cavalry to move forward to tackle any remaining effective enemy forces, or perhaps simply to accept their surrender. This was the stage at which the value of the tank was felt, a reassuring and demoralising asset capable of extending the momentum provided by the initial artillery strike. At Amiens, the two blows by artillery then tanks reduced defensive capabilities thereby paving the way for penetration by cavalry, armoured cars and Whippets. It was unfortunate that progress was constrained by the deployment of so few armoured cars, the reliability of which limited the scope of progression, and Medium tanks which lacked speed and were not allocated a role of exploitation.⁴ This may have been frustrating for Fuller, but the somewhat cautious approach to the handling of the Whippets may well have been the correct tactical decision at Amiens.

Most significantly, tanks proved vulnerable when exposed to effective defensive measures by the German Army, a “fantastically good army tactically”.⁵ Tanks were far from the all-conquering indestructible chariots envisaged for the war of 1914/1915 by

³ Jonathan Bailey, *The Birth of the Modern Style of Warfare*, *Defence Viewpoints from the UK Defence Forum*, <https://www.defenceviewpoints.co.uk/military-operations/the-birth-of-the-modern-style-of-warfare-in-the-great-war>, accessed 14 June 2021.

⁴ Tank Encyclopedia, WWI, British Empire, Tanks, Armored Cars, Austin Armoured Car outlines main characteristics of Austin models constructed 1914-1918 and modification carried out in Russia (notably thicker armour plate), see https://tanks-encyclopedia.com/ww1/gb/Austin_Armoured_Car.php, accessed 25 January 2021 (BEF priorities required Rolls Royce to concentrate on engine production by 1916, capacity did not therefore exist for the company to manufacture armoured cars for much of the war). Arguably, the problem of lack of quality of other makes was due to the failure of government to impose an adequate checks on manufacturers' products, thus throughout the war the construction of Austin armoured cars was of an unsatisfactory standard; for further details of weaknesses of Austin Armoured Cars see Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918; David Fletcher, *War Cars: British Armoured Cars in the First World War* (London, HMSO, 1987), pp. 45-52 and National Archives, WO95/116, War Diary of 17 (Armoured Car) Tank Battalion, operations 10-15 June 1918 and recommendations of commanding officer, Lt.-Colonel E. J. Carter following operations on 27 August 1918.

⁵ Western Front Association Lecture, Gary Sheffield, *Douglas Haig: The 'Accidental Victor' of World War One?*, 13 June 2013, observations by John Bourne during question session, <https://www.youtube.com/watch?v=K3jRcdQMkWc>, accessed 20 May 2020.

Churchill and early enthusiasts. In common with other arms and weapons they had weaknesses which necessitated appropriate conditions for deployment and usage.⁶ It was to protect his limited numbers of tanks that Lawrence deemed it prudent to constrain the scope of their utilisation to limited types of operations and Elles sought measures to track down and eliminate or neutralise their would-be predators.⁷ Furthermore, British tanks were insufficiently mobile for rapid concentration that might prove necessary in a war to which movement had been restored. In consequence, unable on all occasions to keep up with the battle, they became more difficult to use.⁸ This was less of a problem with armoured cars, but there were few armoured cars on the Western Front.

In this chapter it is proposed to summarise the main findings from the research, to comment on the significance of those findings for numbers and sophistication of armoured vehicles and to assess Churchill's contribution in a period of rapid technological and tactical change underpinning military operations. From the outset to the final months of the war, the supply of armoured vehicles to British forces suffered from a lack of vision and poor management of production. This had consequences - qualitative, numerical and chronological.

Scholarship recognises that in February 1915 military personnel and politicians failed to accept and develop the potential of tracked vehicles to address problems of entrenched conditions. What does not appear to have been appreciated is the element of prejudice and misrepresentation underpinning the rejection of the Holt system. Colonel Holden, the War Office mechanical transport "expert", utilised his influence to pigeon-hole the development of a tracked solution to the conundrum of Western Front entrenchment. Among senior staff, there was a considerable element of support for the

⁶ Giffard Le Quesne Martel, *In the Wake of the Tank: The First Fifteen Years of Mechanization in the British Army* (London, Sifton Praed, 1931), pp. 34-36; Peter Hart, *1918: A Very British Victory* (Chatham, Weidenfeld and Nicolson, 2008), p. 344; National Archives of Canada, Griebach Papers, MG30, E15, vol. 5, File 14, p. 5, quoted in Shane B Schreiber, *Shock Army of the British Empire: The Canadian Corps in the Last 100 Days of the Great War* (Westport, Praeger, 1997), p. 57.

⁷ National Archives, WO158/832, Lawrence to all armies (OA109), 1 September 1918, and WO95/99, 1st Tank Brigade, Order No. 37, 19 August 1918; Henry Albert Jones, *The War in the Air: Being the Story of the Part played in the Great War by the Royal Air Force* (Oxford, Oxford Clarendon Press, 1937), pp. 464-493.

⁸ J. P. Harris, *Men, Ideas and Tanks: British Military Thought and Armoured Forces, 1903-1939* (Manchester, Manchester University Press, 1995), pp. 185-186; Peter Simkins, Somme Reprise: Reflections on the Fighting for Albert and Bapaume, August 1918, in *Look to your Front: Studies in the First World War by the British Commission for Military History*, ed. by Brian Bond (Staplehurst, Spellmount, 1999), pp. 147-159, (p. 158).

development of a vehicle more powerful than the Holt tractor. Nevertheless, seemingly owing to a misplaced sense of professional pride, Holden oversaw the testing of the Holt tractor through inappropriate trials then declined to respond helpfully to “a request” by senior officers for assistance in devising measures for exploring the concept further. His inactivity in response to assistance sought by the MGO represented a form of misconduct, but the lack of firm management qualities by senior officers and a lack of vision and determination at a senior political level enabled the ADMT not only to avoid criticism or pressure, but to bring army examination of tracked fighting vehicles to a conclusion.

Through his low opinion of senior army personnel, recognition of innovative ideas and appreciation that armoured vehicles offered a potential key to unlock stalemate on the Western Front, Churchill was neither surprised by the lack of War Office interest nor slow to form his own “Committee of experts” to develop the concept.⁹ It is likely he also saw personal political advantage, the opportunity to put his own stamp on the solution to a national military problem. Accordingly, Churchill had already established his Landships Committee before trials of the Holt had been undertaken.

Unfortunately, Churchill lacked judgment, managerial ability and a sound appreciation of military tactics. He bestowed chairmanship of the Landships Committee to an individual lacking the drive, belief and commitment required for success. Mechanically, d'Eyncourt's Landship Committee achieved nothing.¹⁰ It was not until the project was passed to a private company that progress was made.¹¹ The scholarship fails to recognise d'Eyncourt's character defects. Glanfield refers to him as “the dependable d'Eyncourt”.¹² He was certainly not that. D'Eyncourt was saved by the efforts of Sueter and Stern from the stigma of presiding over and retaining an ineffective team. By good fortune, he received undeserved laurels through a purely hierarchical relationship with the designers and builders of a successful new weapon, the credit for which belonged entirely to the skill of the designers. He demonstrated his gratitude in September 1916 by successful underhand measures to deprive the

⁹ National Archives, MUN5/394, Churchill to Asquith, 5 January 1915 and Statement to Royal Commission on Awards to Inventors, 1 September 1919, paras. 16-17 and 21-22.

¹⁰ See photograph 34.

¹¹ See photographs 36 and 37.

¹² John Glanfield, *The Devil's Chariots: The Birth and Secret Battles of the First Tanks* (Stroud, Sutton Publishing, 2006), p. 215.

designers of appropriate national acclaim.¹³ His later attempt, before the Royal Commission, to claim recognition for aspects of inventive work and accompanying financial benefits was unsuccessful. D'Eyncourt claimed £100,000 for "the control and approval of all design and construction of the first tank". This was rejected by the Commission, though, for reasons that are not entirely clear, they did award him £1,000.¹⁴ Tritton countered d'Eyncourt's financial claim by stating that he "contributed nothing to the tank's design" and "never approved his (Tritton's) drawings in any meaningful sense, though it was standard naval practice to do so, and gave no expert criticism or assistance when shown drawings."¹⁵

In August 1915, freed from the shackles of poor management by the Landships Committee, it might have been anticipated that the supply of tanks would have flourished. That was not the case. Despite the engineering progress by Tritton and Wilson and the organisation of Swinton, no attempt was made by the Landships Committee or Army Council to ensure the project proceeded at the maximum possible speed, with the object of providing the new machines for the coming offensives in 1916. It was not the War Office but Haig who in February and April 1916 attempted to link tank progress to the rapidly approaching Somme offensives. In February Haig informed the War Office "these tanks can be usefully employed in offensive operations".¹⁶ He understood "that 30-40 at least could be supplied by May".¹⁷ Haig's mention of supply by May appears to reflect the false schedule outlined by d'Eyncourt to Kitchener in January 1916. In April, his diary recorded "I was told (by Swinton) that 150 would be provided by the 31 July. I said that was too late. 50 were urgently required for 1 June."¹⁸ Haig's order and comments were themselves too late. Such demands should have been made by the Army Council in 1915.

¹³ National Maritime Museum, DEY42, d'Eyncourt to Tudor, 18 September 1916.

¹⁴ National Archives, MUN5/394, d'Eyncourt response to Commission standard claim form, question 3, "Particulars of invention, design, drawing or process in question".

¹⁵ National Archives, MUN5/211, Tritton Counter Statement to Royal Commission.

¹⁶ National Archives, WO158/833, 9 February 1916, Haig handwritten response to cipher cablegram 12959.

¹⁷ Ibid.

¹⁸ Gary Sheffield and John Bourne (eds.), *Douglas Haig: War Diaries and Letters 1914-1918* (London, Weidenfeld and Nicolson, 2005), 14 April 1916, p. 184; Ernest D. Swinton, *Eyewitness: Being Personal Reminiscences of Certain Phases of the Great War including the Genesis of the Tank* (London, Hodder and Stoughton, 1932), p. 234; National Archives, WO158/833, Swinton to Butler, 26 April 1916.

Perhaps most significantly, the tentacles of d'Eyncourt's irresolute management stretched even further back. In July 1915 when appointing Fosters to construct an experimental landship, he had not updated the company on the role of the machines. Tritton and Wilson's understanding therefore remained founded on earlier ideas for trench-taking machines that would enjoy a brief fifty-mile life.¹⁹ However, after GHQ became involved in the project in June 1915, the role was changed. Infantry-carrying capability was dropped in favour of maximising armament and reducing size. Upon the transfer of design and construction to Fosters, d'Eyncourt neglected to appraise Fosters of the changed role for the proposed machine, which would no longer be required simply to break through enemy's defences but would need to perform an on-going and structurally more demanding role as machine-gun destroyer. In consequence, the track was not redesigned for a more extensive mileage.²⁰ It had been d'Eyncourt's intention that Fosters would construct one "half" of Crompton's articulated machine as a prototype, but the design was not sufficiently advanced. Neither d'Eyncourt nor Crompton saw fit to update the engineers' understanding of the purpose of the machine.²¹ The consequence of this management failure was that the first tanks were built to an inappropriate specification. Furthermore, the implications of training were not taken into account in determining the mileage to be travelled.²² The failure of many of the tanks during the Battle of Flers and preparations for that battle was therefore entirely predictable. As the three Army Corps awaited Z-Hour on 15 September they were unaware that their success depended to a certain degree on whether they were supported by older tanks from C Company, or newer tanks from D Company or GHQ's reserve pool.

Management of tank manufacture was a problem from the date Churchill formed the Landships Committee in February 1915 until the appointment in August 1918 of a capable manager and Tank Board. During this period, the value of the technical creativity of engineers was undermined by poor management. As ill-prepared tank crews arrived in France in August 1916 for action some three weeks later, they faced

¹⁹ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

²⁰ National Archives, Royal Commission on Awards to Inventors, 21 October 1919, cross-examination of Tritton by Gray, answers to question 2817-2833.

²¹ National Archives, ADM116/1339, Crompton to Tritton, 5 August 1915.

²² National Archives, Royal Commission on Awards to Inventors, 21 October 1919, examination of Wilson by Russell, answer to question 3102.

not only the handicaps of shellfire, treacherous ground conditions and an unnecessary and unreliable climbing/steering tail unit, but tracks that, for approximately half the machines, were well past their use-by date. Poor management caused or accentuated the adverse effects of each of these disadvantages. The scholarship has not noted the most serious of these disadvantages, the avoidable specification problem. It has therefore neither taken the “dependable d’Eyncourt” to task for failure to apply reasonable professional standards nor has it acknowledged the level of recognition due to Wilson and Tritton.

Furthermore, in addition to these initial errors, Ministers were guilty of placing tank production under unskilled management from February 1916 to August 1918. It is not possible to provide reliable estimates of the consequences of mismanagement but it is reasonable to conclude that the opportunity to provide a greater number of more reliable tanks at an earlier date was missed as was the opportunity to secure more efficient, more effective and better protected tanks. Considering the level of daily casualties and daily financial cost of the war, it can be seen that the consequences could have been substantial.²³

To a degree, the failure to extract maximum benefits from engineering abilities represented a characteristic of British society, which did not rank engineers sufficiently highly to secure their integration into determination of policy. Discussions between the army as users and the Ministry as suppliers failed to include those most aware of possible engineering and production difficulties. It was not until June 1918 that Churchill, faced by sharply declining production, saw fit to arrange a meeting with tank producers and not until August 1918 that Seely persuaded Churchill and Lloyd George to appoint Maclean, a man who understood the nuts and bolts of production, to manage the Ministry’s Supply Department. Maclean succeeded those who, perhaps from a higher social plane, had hitherto occupied the position but, though well-intentioned, had not ensured the best possible output. Indeed, the report prepared by Maclean demonstrated basic deficiencies in the infrastructure and techniques required to produce the number of tanks sought plus an unwillingness by personnel within the

²³ War Office, *Statistics of the Military Effort of the British Empire in the Great War* (London, HMSO, 1922), p. 237, records British Empire military deaths just over 900,000, a figure since increased to nearly 1.25 million from other sources; Spartacus Educational, <https://spartacus-educational.com/FWWcosts.htm>, accessed 06 December 2020, estimates the cost to Britain alone as approximately £35 billion.

Ministry to allow shortcomings to be revealed. It is not possible to quantify the shortfall, but poor management undoubtedly deprived the army of a proportion of the output of tanks that should have been supplied. Furthermore, closer involvement of the design engineers and manufacturers would have provided a firmer base for decisions on the upgrade of tank models.

The consequences of management weaknesses were that fewer tanks were available for use at all stages of the war from 1916 to the Armistice and that those available were of inferior design compared to the standard that was possible given an earlier start and utilisation of best engineering advice. In addition to numerical consequences and mechanical capability, the tank was not user-friendly. It lacked a sprung suspension system, was prone to bullet splash and was poorly ventilated, resulting in crews suffering danger to sight, debilitating working temperatures and dangerous levels of carbon monoxide. "As a working environment the inside of a Mark V tank was simply atrocious"²⁴.

The view for any member of crew was confined to what could be picked up through pin-holes or through the sights of their guns. As the tank came under small arms fire, bullet splash penetrated....often causing temporary blindness....noise was deafening whenever the engine ran, and speech next to impossible, and when under small arms fire it was like an inferno.²⁵

Endurance of such conditions for a short journey across no-man's-land might have been acceptable but they could not be endured for long hours without operational penalty. Following prolonged exposure to hazardous conditions within tanks, it was not unknown for personnel to be taken by stretcher from the machine to a dressing station.²⁶ Nevertheless, it was only late in the war that these problems attracted appropriate attention, despite the consequences of fighting in such conditions having been apparent since Flers.²⁷ It was short-sighted in the extreme to disregard the health and fighting-fitness of the limited, specialised crew:

²⁴ Hart: *1918: A Very British Victory* (Chatham, Viking, 2008), p. 326.

²⁵ Captain Gerald Brooks, 15th Battalion, Tank Corps, in Hart, 1918, pp. 327-328.

²⁶ W.H.L. Watson, *With the Tanks 1916-1918: Memoirs of a British Tank Commander in the Great War* (Barnsley, Pen and Sword, 2014), pp. 204-205.

²⁷ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Elles by Solicitor-General, answer to question 3300 reveals Elles view that "the reason why they [tanks] could not go to a large extent on the second and succeeding days [of Flers] was more a question of exhaustion of personnel as much as anything else". The position remained unsatisfactory, see National Archives, MUN4/5207, Elles to Tank Board, 22 October 1918, "We require to reach finality on this question at the earliest moment."

The men were often nauseous, felt faint, suffered blinding headaches and were thoroughly deafened by the relentless noise. Lieutenant Mould's men alternated between tasks....pushing themselves to the extreme limits of human physical endurance....As they rested there was an unpleasant scene. Many officers did not appreciate that just a few hours fighting in a tank made a man unfit for duty for several days afterwards.²⁸

Private Charles Rowland recalled that the "scene" was caused when:

Captain Gilmour came up to congratulate us and asked if he (sic) would take the 'bus' down into the valley....After a heated argument, Mould told him straight, 'We are not going another bloody inch: my crew are absolutely exhausted being in nearly ten to twelve hours and we are not capable of doing any more.'²⁹

The design of a tank involved compromise between different capabilities and speed of production. Pressures for output did not encourage modifications to improve working conditions for crew. Compartmentalisation of duties did not assist the achievement of balanced decisions on design. This is well illustrated by modifications to the Mark V, recognised as their best model by the Tank Corps, but the performance of which was downgraded by elongation to enable crossing of wider trenches. Wilson had warned against this change. In the late summer/autumn of 1918, the Tank Corps and infantry to be transported to their objectives, would have been relieved that the army was in the process of halting production of the cumbersome, unpopular Mark V* in favour of an upgraded Mark V.³⁰

Tanks were far from a war-winning machines.³¹ However, they should be seen on a sliding scale of usefulness rather than in terms of the extremes of dominance or uselessness. Had the tank been developed sooner, it might have progressed further during the conflict, both mechanically and tactically. From a more advanced position on its development curve, it might then have played a more effective role. Within the limited timeframe of the First World War, it is unlikely the end product would have been transformed. Nevertheless, useful strides might have been made, enhancing longevity, safety and the effectiveness of machine, crew and passengers by improvements to ventilation, communications, smoke producing defensive capability, buoyancy and,

²⁸ Hart, 1918, p. 335.

²⁹ Private Charles Rowland, 14th Battalion, Tank Corps, in Hart, 1918, pp. 335-336.

³⁰ National Archives, MUN4/1591, Wilson to Maclean, 31 October 1918 and National Maritime Museum, DEY57, minutes of Tenth Meeting of Tank Board, 17 October 1918, which record Maclean's explanation that the upgraded Mark V, "for purpose of office convenience was now to be known as Mark X".

³¹ Tim Travers, 'Could the tanks of 1918 have been War-Winners for the British Expeditionary Force?', *Journal of Contemporary History*, July 1992, vol. 27 Issue 3, pp. 389-406 (pp. 402-403).

through managerial efficiency, greater numbers.³² As the war came to an end, diminution of most of these handicaps lay tantalisingly close.³³

Scholarship tends to concentrate on the iconic heavy, tracked machine. This is understandable in view of its imposing presence and armament, its psychological effect on the enemy, its deployment on the main wartime Front and veneration by press and public.³⁴ The army allocated little priority to armoured cars, yet they possessed advantages which, in terms of tactical potential might have provided a more valuable complementary asset to heavy tanks than was secured from lighter tanks. Such armoured cars as were used on the Western Front were largely donated by the navy, Canada and a Russian, pre-Bolshevik order, delivery which was withheld and redirected to British forces. Rather than placing its eggs mostly in one basket by planning for exploitation by lighter, faster tanks, the BEF might have been better advised to have sought a substantial element of less technologically challenging wheeled vehicles. The tactical advantages of armoured cars became increasingly apparent as the prospects of a more mobile conflict were raised following experiences at Cambrai and the Spring Offensives.³⁵ In January 1918 an order for armoured cars was placed by the Army Council, though it would not appear to have been allocated high priority and it is not clear whether the vehicles were for

³² National Archives, MUN4/4979, undated paper on Water Obstacles and Means of Negotiating these with Tanks; Fletcher, *War Cars*, pp. 176-178: as Allied forces advanced towards Germany, thoughts extended to the problems of crossing different types of water obstacles, photograph 51 shows trials using a Mark IX at Hendon Reservoir on Armistice Day (apparently all went well until the engine failed). For narrow, steep-sided water obstacles, the Inglis bridge was extended, adapted and strengthened by Major Inglis to take the weight of a tank (see photograph 52).

³³ National Archives, for ventilation see MUN4/1591, Wilson to Maclean, 31 October 1918 - for smoke, see MUN4/5206, Allen for DDSD (Tanks, WO) to Maclean, 8 November 1918 – for communications see Walter Alexander Raleigh and Henry Albert Jones, *The War in the Air: Being the Story of the Part played by The Royal Air Force* (Oxford Clarendon Press, 1937), pp. 464-465.

³⁴ See, for example, 'The Trench Dreadnought...Huns Terrified at the Apparition' *Daily Express*, 18 September 1916; 'The 'Tanks, German Protest to the Red Cross', *Sunday Times*, 24 September 1916; 'Why not show a Tank on the Horse Guards Parade- Show the Tanks! – All Britain eager to see them', *Daily Express*, 22 September 1916. See photographs 27-29.

³⁵ Juliette Champagne and John Matthews, Raymond Brutinel and the Genesis of Modern Mechanized Warfare in Adriana A. Davies and Jeff Keshen (ed.), *The Frontier of Patriotism: Alberta and the First World War* (Calgary, University of Calgary Press, 2016), pp. 24-25; Cameron Pulsifer, Canada's First Armoured Unit: Raymond Brutinel and the Canadian Motor Machine Gun Brigades of the First World War, *Canadian Military History*, vol. 10. 1, Article 5, p. 54 – Brutinel commented on 7 November that "Since the beginning of the war of movement the armoured cars have been of real value, and in addition to the great service they rendered during the German offensive of March-April they have been successfully employed in every battle fought by the Canadian Corps this year. They are in constant demand from the Divisions and Infantry Brigades", <http://scholars.wlu.ca/cmh/vol10/iss1/5>, accessed 20 December 2019; Brigadier-General Sir James Edmonds, *Military Operations France and Belgium, 1918, vol. II* (London, Macmillan, 1937), p. 23.

delivery to the BEF or to other fronts. Haig's appreciation of the value of armoured cars on the Western Front appears to have been sparked by the demonstration of their utility during the Spring Offensives.³⁶ Haig's support assisted Brutinel in securing a second CMMG Brigade and in all probability was the determining factor in the diversion of part of Russia's third Austin order to the Western Front rather than Mesopotamia.³⁷ It was just four weeks before the Armistice that the Army Council sought priority for the BEF when it informed the Ministry of "the urgent need of the British Forces operating in France for Armoured Cars."³⁸

In certain respects, the problems of the armoured car mirrored those of the tank. The navy had liaised diligently with the manufacturer to produce the Rolls Royce turreted-type, but the Army Council and Ministry of Munitions appear to have neglected the design of Austin and other armoured cars. Although ordered by Russia, the Austin's design should have been of concern to Britain since Russia was an ally. No evidence has been found of any War Office or Ministry participation in the design of armoured cars. It is revealing to compare the criticisms of those tasked with the maintenance of Austin armoured cars in France in 1918 with those using Rolls-Royce armoured cars in more challenging conditions in Arabia. Third Army concluded that Austin armoured cars were constantly breaking down and that their operational use was constrained through fear of mechanical unreliability.³⁹ On the other hand, following a broken element in the suspension of his Rolls-Royce, Lawrence wrote:

Though we had been driving in these [Rolls-Royce] for eighteen months, not upon the polished roads of their makers' intentions, but across country of the vilest, at speed, day or night, carrying a ton of goods and four or five men up, yet this was our first structural accident in the team of nine.⁴⁰

³⁶ "Amiens will not fall into German Hands: How the Canadians saved the City from Advance Guard", , *Daily Mirror*, 4 April 1918; Juliette Champagne and John Matthews, Raymond Brutinel and the Genesis of Modern Mechanized Warfare in *The Frontier of Patriotism: Alberta and the First World War* ed. by Adriana A. Davies and Jeff Keshen, (Calgary, 2016), pp. 24-25.

³⁷ Bryan Perrett, *British Armoured Car Operations in World War One* (Barnsley, Pen and Sword, 2016), p. 105.

³⁸ National Archives, MUN4/3454, War Office to MM, 12 October 1918.

³⁹ Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918), passim.

⁴⁰ James Stejskal, *Masters of Mayhem: Lawrence of Arabia and the British Military Mission to the Hejaz* (Oxford, Casemate, 2018), p. 166.

In the event the BEF would suffer, since the last production run of Austins was diverted for British use and proved to be exceptionally unreliable. Notes by 17th Armoured Car (Tank) Battalion are strongly critical:

The chassis on which the Body is mounted is too light to carry the weight on good roads, and is most unsuitable for fighting under War conditions. It is not a sound proposition to strengthen the present Chassis, because if one detail was strengthened, a fresh weakness would develop at another point. The chief replacements have been. Axles both front and rear. Springs, Dowel Bolts. Clutches. Dumb Irons and Steering Gears.⁴¹

The severe weakness was a handicap in operations:

The Cars of this Battalion were so unreliable that it was rarely possible to get more than 50% of those that started into action to return without mechanical breakdown....knowing the weakness of their cars prevented many opportunities from being fully exploited because of the risk of mechanical breakdown in the enemy's lines.⁴²

Lloyd George's "Too Late" speech in December 1915 had been correct in two key respects.⁴³ So far as armoured vehicles were concerned, by the time of his speech there were already a number of participants from whom a greater or more rapid contribution might have been expected. Such management failings would continue, with others demonstrating a lack of urgency or judgment throughout the remainder of the war. On the other hand, there were some whose contributions had been greater or had been delivered more expeditiously than might reasonably have been anticipated.⁴⁴

Actions or delay by those who were "Too Late" could act as a brake on progress. That was the case with the tank, the project for which should, logically, have been given top priority to ensure delivery to the expanding BEF in the best possible condition for approaching 1916 offensives. What should have been a carefully monitored priority development programme, was delayed, firstly, by a lack of foresight and personal or professional interests, then left to proceed at its own pace. The design engineers pulled out all the stops to provide a workable, though of necessity, somewhat crude

⁴¹ Imperial War Museum, Doc. 10086, War Experience and Practical Notes of the 17th Armoured Car (Tank) Battalion in France from April to November 1918, p. 2. A dumb Iron is a rigid connecting piece between the frame of an automotive vehicle and the spring shackle.

⁴² Ibid, p. 6, from May to September, with an average use of 12 of the 16 cars, there were 164 axle breakdowns alone; cf. details of praise and reliability record of Rolls Royce in Peter Pugh, *Rolls Royce, The Magic of a Name: The First Forty Years of Britain's most Prestigious Company* (London, Icon Books, 2015), pp. 90-92.

⁴³ Hansard, HoC debates, statement by Mr. Lloyd George, 20 December 1915, 96-165.

⁴⁴ David Lloyd George, *Memoirs of David Lloyd George* (London, Odhams, 1938), p. 381.

machine.⁴⁵ By contrast, earlier in the year, the professional pride and misrepresentation of Holden and the self-interest and inertia of d'Eyncourt had resulted in significant delays. Additionally, even after GHQ had accepted the potential of the landship to break the deadlock on the Western Front, an ineffective Army Council did little more than observe, allowing the Naval Committee and Swinton to make the running, unsupervised and unpressurised.

The lack of recognition of benefits and the need for urgency by politicians and the War Office ensured that the tank arrived late to the 1916 battlefields. Furthermore, owing to understandable shortcomings, expected in new technologically complicated machines, but also to inexcusable faulty and lacklustre management by the Heads of the Naval and Landships Committees, the tank was not only late but also incorrectly prepared. Spencer Jones identifies the significance of 1 July 1916, "That battle would define Britain's experience throughout 1916 and I would argue for, in the historical memory, it still defines much of what we think about Britain in the First World War".⁴⁶

This memory resulted from an unprecedented day of disaster for Britain. Trafalgar and Waterloo are celebrated by London edifices, but 1 July cast such a funereal cloak over the war that there is no celebration of the eventual outcome that the nation's efforts did so much to secure. Effectively, 1 July 1916 was a major factor in robbing the BEF of appropriate recognition of its "victory" in 1918.⁴⁷ Churchill's prediction for Britain and Germany, "neither side would find in a war with the other a prize worth fighting for", duly came to pass, at least in the short/medium term.⁴⁸ It would be far-fetched to contemplate that the first handful of tanks might have turned the Somme into the black day of the German Army, but it is not inconceivable that, on part of the battlefield, a larger force of more reliable machine-gun destroyers might have adjusted

⁴⁵ National Archives, T173/776, Royal Commission on Awards to Inventors, 21 October 1919, examination of Tritton by Russell, answers to questions 2605-2626 and 2637-2703 and cross-examination of Wilson by Gray, answers to questions 3134-3143.

⁴⁶ Spencer Jones, Western Front Association Podcast on his book, *At all Costs: The British Army on the Western Front 1916*, <https://www.westernfrontassociation.com/the-latest-wwi-podcast/ep-84-the-british-army-on-the-western-front-in-1916-dr-spencer-jones/>, accessed 29 April 2020.

⁴⁷ Gary Sheffield, *Hello to all that*, Western Front Association lecture, <https://www.youtube.com/watch?v=y8BgQLhRpuA>, accessed 29 April 2020.

⁴⁸ John H Maurer (ed.), *Churchill and Strategic Dilemmas before the World Wars: Essays in Honor of Michael I Handel* (Portland, Routledge, 2003), pp. 44-45; Robert Rhodes James, *Winston S. Churchill: His Complete Speeches 1897-1963, vol. II*, (New York, Chelsea House Publishers, 1974), speech at Swansea, 14 August 1908, *Government Policy and the Foreign Situation*, p. 1085.

the balance of advantage and bequeathed a less doleful assessment of the battle or of the war generally.

There had been adequate time to develop armoured cars before 1914 and tanks before September 1916. Haig instantly recognised the potential of the tank, not simply after 15 September, but upon reading Churchill's "*Variants*" shortly after becoming Commander-in-Chief.⁴⁹ However, recognition of potential was needed before the arrival of circumstances rendering it fairly obvious. Haig had spent some time in 1907-1909 writing and supervising the preparation of Field Service Regulations. He was aware well before 1914 that war with Germany was likely.⁵⁰ German firepower, quantity of trained manpower and Anglophobia were known to British politicians and military leaders. Even Grierson, formerly pro-German, became convinced that war was likely.⁵¹ That was the time to have appreciated the advantages of protection and mobility of firepower. Whereas it might have required prior acceptance of Bloch's prediction of stalemate to secure the visualisation of tracked armoured vehicles as advantageous, the same requirement did not apply to armoured cars which should have been seen as a logical evolutionary step in the development of warfare. Badsey puts his finger on the issue, stating, "It is both noteworthy and disappointing that there was no major advocate of motorised troops among the British Army's senior officers in the period 1908–1914, which must be considered a blind-spot in military thinking".⁵² It was not necessarily an abundance of mobile troops that was required, but mobile firepower.⁵³ Furthermore, armoured cars were potentially valuable in many locations, particularly in the NWFP, Egypt and Mesopotamia, as well as in mobile warfare in Europe.⁵⁴

⁴⁹ National Archives, CAB42/7/3, 'Variants of the Offensive', Winston Churchill, 3 December 1915, produced as CID Paper attributed to Churchill with comments by Cavan, 7 January 1916. According to Swinton, (*Eyewitness*, p. 189) Haig read Churchill's paper on Christmas Day 1915 and early in January sent Elles to London "to ascertain what progress had been made in the matter of machines for attacking trenches".

⁵⁰ Gary Sheffield, *The Chief: Douglas Haig and the British Army* (London, Aurum Press, 2011), pp. 58-59.

⁵¹ D.S. Macdiarmid, *The Life of Lieutenant-General Sir James Moncrieff Grierson* (London, Constable, 1923), pp. 115, 130-134. Grierson was a former DMO and GOC-in-C Eastern Command. Commander of 2 Corps, he died on the way to his command in France in August 1914.

⁵² Stephen Badsey, *Doctrine and Reform in the British Cavalry 1880–1918* (London, Routledge, 2008), pp. 236.

⁵³ Some of the clues missed by military planners are itemised at Appendix 1.

⁵⁴ T R Moreman, *The Army in India and the Development of Frontier Warfare 1849-1947* (London, Macmillan, 1998), p. 128, quoting from Brigadier-General Montagu, Report on Mechanical Transport and Armoured Cars in India (Simla 1917), p. 12 and Notes on Armoured Cars (Simla, 1915), p. 4, "Armoured cars had demonstrated their versatility in India during the First World War, when their

In the event, the need for armoured vehicles was not appreciated and the consequences of continental commitments were not given due consideration. Many improvements to military capability were secured but those improvements did not render the BEF fit for participation in the heavyweight division.⁵⁵ Even after six months' experience of war, the combination of military ineffectiveness and the prejudice and lack of vision by Holden combined to secure the relegation of Swinton's valuable assessment of the tactical problem, and a possible solution, to longer-term storage. In that location, Swinton's assessment joined the papers of de Mole, H G Wells and others, who had in their different ways, by accident or intent, pointed to a change in the nature of land warfare that would be wrought by automotive technology.⁵⁶

Once given responsibilities for aspects of land warfare, the navy rapidly developed armoured cars and, in response to changing conditions, their thoughts soon graduated from wheels to tracked systems.⁵⁷ It is difficult to avoid the conclusion that the army did not attract recruits of sufficient calibre to secure desirable innovative change, though such a conclusion needs to be tempered by recognition that in many of its duties the navy also exhibited a lack of thorough innovative planning.⁵⁸

David Edgerton advances the theory of opposition between the order and progress of civil influences in society against the romanticism of the military. He draws support for this theory from George Orwell's identification of the "key oppositions running through H. G. Wells's work".⁵⁹ Edgerton notes the significant developments of aircraft and the atomic bomb in support of his theory of civil-led warfare in the 20th century. So far as the army is concerned, Edgerton considers the military to have been backward

mobility, firepower and relative invulnerability to rifle fire had made them ideal in the NWFP for reconnaissance, patrolling, the pursuit of raiding gangs, escort duties and the support of beleaguered outposts in areas where roads or open ground existed; Fletcher, *War Cars*, pp. 74-80; T. A. Heathcote, *The Afghan Wars 1839-1919* (London, Osprey, 1980), pp. 176-177; Perrett, *British Armoured Car Operations*, pp. 103-116; E Bartholomew, *Early Armoured Cars* (Princes Risborough, Shire, 1988), pp. 28-29.

⁵⁵ Hew Strachan, *The British Army, Its General Staff, and the Continental Commitment, 1904-1914*, in *The British General Staff: Reform and Innovation, 1890-1939*, ed. by David French and Brian Holden Reid (London, Routledge, 2014) [2002], p. 66.

⁵⁶ National Archives, T173/34B, Recommendations to the Treasury by the Royal Commission on Awards to Inventors, 17 November 1919, describing de Mole's proposals as a "brilliant invention" for a tank that was dismissed by the War Office in 1912; Fletcher, *The British Tanks*, pp. 15-16.

⁵⁷ Murray Sueter, *The Evolution of the Tank: A Record of Royal Naval Air Service Caterpillar Experiments* (London, Hutchinson, 1937), pp. 29 and 46-50.

⁵⁸ Arthur Marder, *From the Dreadnought to Scapa Flow: The Royal Navy in the Fisher Era, vol. I: The Road to War 1904-1914* (Barnsley, Seaforth Publishing, 2013), pp. 395-435, naval weaknesses included elements of gunnery technique, quality of torpedoes, shells and mines and tactical training.

⁵⁹ David Edgerton *The Shock of the Old: Technology and Global History since 1900* (London, Profile, 2008), pp. 139-141.

when compared to civil influences, “the great innovations in arms in the twentieth century were in essentially *civilian* technologies applied to war, and that they transformed twentieth-century war”.⁶⁰ When examining the early development of armoured vehicles, Edgerton has a point, though, adopting the wider, alternative meaning of “military”, i.e. all armed forces, his theory carries less weight since elements of naval innovation and invention need to be taken into account.

The outcome of the social or educational straitjacket was that Britain was condemned to commence the war, long and widely recognised to be just over the horizon, with weapons familiar to participants in former conflicts. The definition of “innovation” can vary, but, in essence, it involves the introduction of something new, an idea, method or device. So far as wheeled vehicles were concerned, the combination of armoured protection, firepower and the internal combustion engine was a novel idea around the turn of the century but was not pursued by the British Army.

Armoured trains had been used both on rail and road during the Boer War but the scholarship does not take the service to task for failing to experiment with or develop armoured cars between 1902 and 1914. The consequences were particularly damaging bearing in mind the increasing possibility from about 1904 that it would be called upon to face large, well-armed German forces. Recent work on this period makes no reference to armoured vehicles.⁶¹ Nevertheless, some would look back later and conclude that failure to develop armoured vehicles was a mistake.⁶² Undoubtedly, judged against the attributes of armoured cars, the army was guilty of dismissing an innovative development. Tactical advantages from the use of such vehicles would have been invaluable to the BEF during the early months of the war when conditions were mobile.⁶³ So far as tracked vehicles are concerned, these would have provided an additional dimension to the offensive when the war became entrenched, but proposals for such machines were dismissed before the war and experimentation was rejected

⁶⁰ Ibid, pp. 138-139.

⁶¹ Spencer Jones, *From Boer War to World War: Tactical Reform of the British Army, 1902-1914* (Norman, University of Oklahoma Press, 2012). The tactical reforms described proved valuable to the cavalry in 1914, but there is no mention of the threat or benefit of armoured vehicles. German cavalry was alerted to the value of armoured cars very shortly after the outbreak of war.

⁶² National Archives, WO32/11357, DSD to President, Reorganisation Committee, 18 June 1919 and CAB/24/89/6, Churchill memorandum to War Cabinet, ‘Proposed Provision of Armoured Cars’, 25 July 1919.

⁶³ National Archives, WO32/11357, Director of Staff Duties to President, Reorganisation Committee, 18 June 1919.

early in 1915. The army had the navy to thank for the supply of armoured vehicles that commenced in 1915 for cars and 1916 for tanks.

In respect of armoured vehicles, claims that the Army Council embraced innovation cannot therefore be accepted without qualification. There was no early welcome for the opportunity to use automotive technology to participate in fighting and thereby to enhance military capability. Fox concludes that:

The army was not an insular organisation, nor was it averse to change or new knowledge. It could not afford such attitudes when fighting a war against a rival military-industrial system. Chemical warfare, military mining, signals technology, and inland water transport all resulted from the army's decision to listen to outsiders, whether civilians or individuals from allied nations.⁶⁴

These points are valid, but elements of learning connected to the innovative technology of AFVs are not analysed. With the benefit of hindsight, the application of a more innovative stance towards the use of vehicles can be seen as a missed opportunity. In the light of change in foreign policy, this can be seen as particularly unfortunate. Similarly, some opportunities for innovation in other areas were not fully grasped, most significantly in amending artillery practice and techniques.⁶⁵ Suggestions before the war by members of the Garrison Artillery that allowance should be calculated for the effect of climatic conditions on the fall of shot were derided by their Field Artillery colleagues:

The RFA was renowned for its unscientific approach....By comparison the Royal Garrison Artillery approach was relatively scientific. By 1914, it was firing from cover....on calculated data. It shot from maps and corrected for weather before firing.⁶⁶

Following trials in North Wales of horses versus caterpillar tractors for hauling guns, the conclusion to reject mechanical tracked drive was based on the assessment that horsed guns “were on every occasion in action a long time before the gun drawn by

⁶⁴ Aimée Fox, *Learning to Fight: Military Innovation and Change in the British Army, 1914–1918*, (Cambridge, Cambridge University Press, 2018), passim, the form of innovation considered is not nailed down, isolated comments are made about technological innovation, but it is not considered in any detail.

⁶⁵ Timothy Bowman and Mark Connelly, *The Edwardian Army: Manning, Training, and Deploying the British Army, 1902-1914* (Oxford, Oxford University Press, 2012), pp. 79-85.

⁶⁶ Jonathan B. A. Bailey, ‘British Artillery in the Great War’ in *British Fighting Methods in the Great War*, ed. by Paddy Griffith (London, Frank Cass, 1996), Bailey points out that at a lecture in May 1914 Captain Hill, RGA, was met with hoots of laughter by a largely RFA audience when predicting the RFA would be making meteorological corrections within two months of the start of a war.

the tractor”.⁶⁷ The misfortune for the nation was that such limited vision resulted in heavy penalties in the foothills of eventual military learning experiences.

Lest it should be argued that the use of aircraft shows matters in a different light, it should be borne in mind that aircraft were initially military eyes and ears and for some time lacked any means of joining the battle as “weapons”. In 1916 Hankey’s suggestion that aircraft should be used aggressively in conjunction with tanks, was dismissed by Major-General David Henderson, at that time “aeronautics specialist” on the Army Council, as impractical.⁶⁸

Bourne commends the army’s system of senior appointments towards the end of the war, “you could characterise the entire system as gradually evolving, putting square pegs in square holes and round pegs in round holes”.⁶⁹ He acknowledges that some units remained less efficient than others, “Even in the 100 days there are some divisions that are more cutting edge and up-to-date state of the art”.⁷⁰ His analysis is supported by Boff.⁷¹ Generally, British forces were capable and innovative by the Hundred Days.⁷² This had not been the case in earlier years.⁷³ This is confirmed by experiences with tanks, such as Pulteney’s misuse of tanks at High Wood, excessive faith in mechanical reliability at Flers and a lack of caution which would appear to have characterised the action at Flesquières and had not been eliminated by the Hundred

⁶⁷ National Archives, WO107/283, Annual Report of War Office Mechanical Transport Committee, 1910-1911. It was not just the British Army that under-valued mechanical assistance in the ground conditions likely to be experienced, see photograph 53.

⁶⁸ Swinton, *Eyewitness*, p. 235.

⁶⁹ John Bourne, *Hiring and Firing on the Western Front*, Western Front Association Lecture, 7 April 2011, <https://www.youtube.com/watch?v=qSOHzMjobvs>, accessed 30 April 2018.

⁷⁰ John Bourne, *The BEF: The 'Final Verdict'*, Western Front Association Lecture, 6 December 2019, <https://www.youtube.com/watch?v=IU7f-TVyJFE>, accessed 1 May 2020.

⁷¹ Jonathon Boff, *The British Army and the End of the First World War*, Society for Army Historical Research Lecture at the National Army Museum, 1 May 2019, https://www.youtube.com/watch?v=RIZV9J_EXmc, accessed 10 May 2020.

⁷² John Bourne, *Hiring and Firing on the Western Front*, Western Front Association Lecture, 7 April 2011, <https://www.youtube.com/watch?v=qSOHzMjobvs>, accessed 30 April 2018.

⁷³ Sheffield and Bourne, *Douglas Haig: War Diaries*, for example, replacement of Willcocks as GOC Indian Corps, September 1915, p. 142 and replacement of many senior members of Haig’s HQ Staff early in 1918, p. 368.

Days.⁷⁴ Murray was found even more wanting by events at First Gaza, when he failed to use his tanks.⁷⁵

The British Army did, to a large degree, successfully adapt to make good use of new technologies and of civilian expertise. By the manner of their utilisation of the equipment at their disposal, some did become the “battlefield maestros” described by Monash. Furthermore, it could be argued that some units progressed beyond the stage of innovation into the realms of invention as evidenced by alterations by Tank Corps engineers to aspects of the design of AFVs or the weapons or equipment they carried.⁷⁶ However, this does not justify the claim that the nettle of innovation was fully grasped. Rather, so far as an important ingredient of 20th century military progress is concerned, the army was slow off the mark, at first ignoring armoured vehicles, then needing a helping hand from a small group of “enthusiasts” and a burgeoning casualty list, to accept the benefit of mechanical assistance.

Furthermore, in mid-1915 when the potential value of armour began its journey of acceptance in military minds, senior officers should have thrown their full weight behind the efforts of the Landships Committee, design engineers and Swinton to secure early manufacture, training of operatives and the appearance of tanks in 1916’s “Big Push”. The entire team needed to join the maul to force the ball over the line, but it was left to the “enthusiasts” to do so on their own. Although they eventually succeeded, they were unable to advance at the pace required to enable tanks to make an earlier battlefield debut. The opportunity to bequeath a less morose war memory had passed without any serious attempt to prepare the nation’s “secret weapon” for use on 1 July 1916, a key moment in British history.

Delays in design and manufacture had a significant continuing effect on the value of tanks during the war. The exact consequences are a matter of speculation, but it is logical to conclude that the earlier appearance of tanks in 1916 would have had some beneficial results. In the event, the autumnal debut of the tank had adverse

⁷⁴ James E. Edmonds, *Military Operations France and Belgium, 1918, vol. IV* (London, HMSO, 1947), p. 124 - seven out of eight tanks were put out of action by anti-tank gunfire when “working ahead of the infantry” – this was nine months after a similar tactical débâcle at Flesquières; Imperial War Museum, Montgomery-Massingberd Papers, Ferting to Montgomery, 29 October 1924, Ferting confirms loss of 6-8 tanks to a single German gun ‘a mile N.W. of Nauray at about 3 p.m. and compares incident to Flesquières, witness later salvaged “magnetos etc. from them”.

⁷⁵ Tank Museum, Tank Journal, vol. 1-3, “*Tanks in Palestine*”, p. 104.

⁷⁶ National Archives, MUN4/5207, Elles to Tank Board, 22 October 1918 and MUN4/4175, ‘Weekly Tank Notes No. 1’, 10 August 1918.

consequences for 1917, since by the time the army and Ministry had absorbed the lessons from the Somme, there proved to be insufficient time to implement changes and deliver improved tanks for participation in the Arras offensives. The Mark IV appeared in large numbers shortly after the Battles of Arras and a substantial force was assembled for use at Ypres. Unfortunately, this coincided with a prolonged period of wet weather on ground lacking intact or efficient drainage and the machines were of limited value.⁷⁷

In terms of the national “grand picture”, armoured vehicles can be seen to have been confronted by an obstacle course. Firstly, they faced a failure by the Army Council to recognise their value in possible future scenarios of continental warfare or Empire policing. Secondly, they needed to overcome the failure in London and at GHQ to identify or to act upon a clearer view of their value provided by events in the initial stages of the war. Thirdly, upon the eventual recognition of their value, tanks encountered a production timescale that seemed intent upon restricting supply when their services were most needed. Having overcome these initial obstacles, both tanks and armoured cars found further substantial obstacles in the form of unskilled management of production.

In the light of this catalogue of misfortune or failure, it is no surprise that Churchill’s historical writings do not mention Maclean. In reality, Maclean’s report, completed some two months before the Armistice, revealed the consequences of appointing inexperienced individuals to key industrial positions. Effectively Lloyd George and Churchill had placed square pegs into round holes. A banker and a sailor had run the MWD for two and a half years. Maclean identified many aspects of MWD procedures that, lacking knowledgeable supervision, were inefficient.

Churchill’s initial involvement with the development of the tank had coincided with a difficult period in his political career. In 1915, following demotion to the Duchy and subsequent resignation from government, he was at a low ebb in political circles and general public esteem. The tank represented an iconic but hybrid creature capable of assisting his progress but, if handled badly, a threat to his career. It is to be anticipated that politicians will seek to gild the lily, to write a version of events unduly favourable

⁷⁷ National Archives, CAB45/200, Elles to Edmonds, 4 September 1934.

to their legacy.⁷⁸ Notwithstanding this, and allowance for the fact that the stakes were high, Churchill's treatment of those who played important roles in the development of the tank, crossed the line of reasonable or understandable distortion: it was not a matter that should have given him any sense of pride.

The scholarship fails to recognise the level of Churchill's deceit and its duration. It commenced on his return to government in 1917, continued through the remainder of the war, extended to his appearance before the Royal Commission, into the writing of *The World Crisis* and then into attempts to influence the authors of the *Official History*.⁷⁹ Twenty years after the war, in disregard of the findings of the Royal Commission, Churchill was still falsely claiming he had directed work on caterpillar tractors in September/October 1914 and that the Landships Committee had designed the *Mother* tank.⁸⁰ His object throughout was the direction of credit for the tank to his protégé, d'Eyncourt, as opposed to those who deserved to have been lauded as national heroes. His falsified version of events reflected, more beneficially than justified, upon himself, exaggerated claims maintained throughout his life to burnish his own reputation: "For my part, I consider that it will be found much better by all Parties to leave the past to history, especially as I propose to write that history myself".⁸¹ This quotation, often misrepresented, more directly, as "History will be kind to me, for I intend to write it", represents a fine example of Churchill's opportunistic use of his literary talents to protect and burnish his reputation and legacy.

Although he did not correctly foresee the initial tactical roles of tanks, Churchill was aware of their potential and, alone among senior politicians, backed his horse to the hilt, innovatively, since he used money entrusted to his Department for other more routine, naval purposes.⁸² For this reason Churchill thoroughly deserves a place on the podium. Notwithstanding this, his reputation is tarnished by his shameful treatment of those who had first foreseen the need for tanks, had designed them and supervised their construction. It is perhaps fair to say that Churchill's achievements in delivering large quantities of most munitions, in recognising the value of mechanical warfare and

⁷⁸ David Reynolds, *In Command of History: Churchill Fighting and Writing the Second World War* (London, Allen Lane, 2004), pp. xxi-xxvi.

⁷⁹ National Archives, CAB45/200, Churchill to Edmonds, 26 January 1938.

⁸⁰ *Ibid*, paras. 6-8.

⁸¹ Fred R. Shapiro and Joseph Epstein, *The Yale Book of Quotations* (New Haven, Yale University Press, 2006), p. 154.

⁸² National Archives, T173/776, Royal Commission on Awards to Inventors, 7 October 1919, examination of Churchill by the Attorney-General, answers to questions 48-52.

in establishing the Committee that, indirectly, gave rise to the combination of Tritton and Wilson, have taken the eye from his weaknesses and unchivalrous behaviour.

Elements of the scholarship lean toward the view of the tank as icing on the all-arms cake rather than an essential ingredient for victory. This view appears to attach insufficient weight to the opinions of many in the lower ranks, but also of Rawlinson, Haig and many senior German generals.⁸³ The indelible impression from this research is that of a sense of missed opportunity, a more generous layer of icing. Some, whether in khaki or civvies failed to show the qualities that would have enabled the nation to realise a greater element of the potential of armoured vehicles, wheeled and tracked. For tracked AFVs, the relatively damp squib of 15 September was not inevitable. The opportunity existed for a larger number of more reliable and better protected machines to make a greater impact when first used, but it was not grasped. The technological innovation was present, but the organisational receptivity and adaptation were not and in any event the means to create and maintain an effective breakthrough did not exist. The advantages of the defence in deploying reinforcements would surely soon have contained any threatened breakthrough.

General Sir John Shea identifies the explanation for the legacy of the missed opportunity of more substantial achievements by armoured vehicles at all stages of the war, though particularly on 1 July 1916:

I would like to emphasise how to study history. The real value is not a remembrance of dates or numbers or details, but first and foremost the study of human nature. For successful war depends on a knowledge of human nature and how to handle it.⁸⁴

The contribution of armoured vehicles in the First World War resulted from and was limited by the calibre of those most closely involved. The commendable efforts of Tritton, Wilson and Swinton achieved a great deal. To a degree, their work was secured through the vision of Churchill, but he failed to recognise, most tellingly, the weaknesses and limitations of d'Eyncourt and Moore. Furthermore, the general standard of ability of those in senior military positions and political office, particularly in

⁸³ Boraston, *Haig's Despatches*, The Final Despatch, para. 15, pp. 329-330; Erich von Ludendorff, *My War Memories* (London, Hutchinson, 1919), pp. 679-680; General Sir Henry Rawlinson, Special Order, 16 August 1918, reproduced in J. F. C. Fuller, *Tanks in the Great War 1914-1918* (New York, E. P. Dutton and Company, 1920), p. 227.

⁸⁴ Fox, *Learning to Fight*, p. 240, quoting from LHCMA, Shea Papers, 6/3a, 'The Study of Military History as Exemplified by the Palestine Campaign 1917-18', n.d.

the years before 1914, ensured that the potential of armoured vehicles was not more appreciated sooner. Fortunately, Germany also failed to develop fighting vehicles for military operations during this period, otherwise, it is difficult to see how the limited resources of the BEF could have resisted early offensives. Such a view is of course based on the assumption that it was in Britain's long-term interest to succeed militarily. In the light of events over the ensuing century, that assumption is not beyond challenge.

Appendices

Appendix A – Extract from David Fletcher, “War Cars” showing Research by Charles Messenger on British use of armoured cars during and after the First World War.

Appendix B - Tanks by Age, Unit and Outcome on 15 September 1916

Corps	Division	Army No.	Coy No.	Commander	Outcome
Res.Army	2 Can	701	C5	Clarke	Ditched/Steering
Res.Army	2 Can	503	C4	Campbell	Track
Res.Army	2 Can	504	C6	Allen	OK
III	47 Div	705	C23	Henderson	Track/Ditched
XIV	6 Div	705	C19	Holford-Walker	Tail Unit
XIV	Guards	507	D	Hiscocks	Ditched
XIV	Guards	508	C18	Smith	Ditched
XIV	56 Div	509	C14	Arnold	Ditched
XIV	56 Div	510	C16	Purdy	Arty. Strike (FF)
III	50 Div	511	D25	Colle	OK - Petrol
III	47 Div	512	D21	Sharp	Ditched
XIV	Guards	512	L	Cole	Track
XIV	6 Div	513	F	Murphy	Track
XIV	Guards	714	G	Bates	Ditched/Track
XV	14 Div	516	D4(New)	Storey	Ditched
XV	NZ	719	D12	Nixon	OK then Arty. Strike
Res.Army	2 Can	721	C5	Inglis	OK
Res.Army	2 Can	721	C1	Wheeler	Ditched
XV	NZ	720	D8	Bown	Arty. Strike
XIV	Guards	722	E	Arnaud	Ditched
Res.Army	2 Can	522	C2	Bluemel	Track
XIV	56Div	523	C13	Dashwood	Track
XIV	6Div	523	C20	MacPherson	Engine
III	15Div	528	D23	Mann	Arty. Strike
XV	14Div	728	D3	Head	OK then Arty. Strike
XIV	6Div	533	C22	Henriques	AP Rounds
XV	14Div	534	D14	Court	Locked Sponson
XV	NZ	535	D10	Darby	Arty. Strike
XV	14Div	537	D15	Bagshaw	Arty. Strike
XV	14Div	538	D16	Arnold	OK
XV	14Div	539	D2	Bell	Ditched
XV	14Div	540	D5	Blowers	Ditched/Arty Strike
XIV	6Div	740	C21	Vincent	Ditched
XIV	Guards	741	C15	Tull	Tail/Engine
XV	14Div	742	D7	Enoch	Tail/Ditched
XV	14Div	743	D18	Bond	OK
III	15Div	744	D20	Drader	OK
III	15Div	745	D22	Robinson	Ditched
XV	14Div	546	D9	Huffham	Locked Sponson

XIV	Guards	746	B	Clarke	OK/Petrol/Ditched
XV	NZ	547	D11	Pearsall	OK
XV	41Div	747	D6	Legge	OK/ Arty. Strike
III	47Div	548	D13	Sampson	OK/Ditched/Arty. Strike
III	50Div	751	D24	Stones	Arty. Strike
XV	14Div	753	D19	Sellick	Ditched
XIV	Guards	554	K	Ambrose	Tail/Engine
XV	14Div	759	D17	Hastie	OK/Tail/Engine
XIV	Guards	760	H (C7)	Elliot	OK
XV	14Div	765	D1	Mortimore	OK/Arty. Strike (FF)

This appendix lists tanks deployed on 15 September 1916 by age of machines (judged by their Army delivery numbers) It illustrates:

1. In the final column (highlighted), the presence of track problems only in the older machines in the upper half of the list.
2. In the fourth column (highlighted), replacement machines drawn by members of C Company, primarily owing to track problems (Their war diary shows only one replacement machine drawn by D Company – not track related).
3. The greater loss of machines to artillery strikes by D Company is likely to reflect the fact that their greater mechanical reliability led to longer spells of participation in the battle.
4. It is not difficult to visualise a much greater rate of success on 15 September had the machines been fitted with more durable track units and the more robust tail units that Wilson had ordered but which Stern cancelled. Additionally, bearing in mind the known risk of artillery fire, special measures to suppress enemy fire and restrict observation by enemy OPs might have yielded a substantial benefit.
5. For some machines a combination of experiences is indicated.

More details of the outcome for the machines is given in Appendix C.

Appendix C – Summary, by Company, of Outcome for Tanks on 15 September 1916

1. Two tanks from C Company and twelve from D Company were destroyed or put out of action by artillery or small arms fire. Four machines from D Company were hit following relatively successful action. Greater loss from artillery strikes would be expected for machines participating longer in the battle. It is difficult to categorise certain tanks, since they may have ditched because of tail damage and may have been destroyed by artillery if ditched in sight of enemy OPs or located by air OPs. Two machines were damaged primarily by small arms fire rather than shellfire, causing loss of all periscopes/prisms and/or penetration by AP rounds. The AS suffered heavy losses in their first use of tanks on the Chemin des Dames in April 1917 – their measures to suppress artillery fire in their second action in May 1917 were particularly effective.
2. Three tanks from C Company and one from D Company are recorded as suffering tail damage, Seven tanks from C Company ditched, eight from D Company. It is likely that the replacement of the weak tail units as arranged by Wilson but cancelled by Stern would have reduced these figures.
3. Two tanks from C Company suffered non-track or tail-unit mechanical problems. A further tank suffered engine failure but this occurred late in the day and was attributable to steering damage. The tank was Hastie's D17, reported famously to have "been seen marching through the High Street of Flers followed by large numbers of infantry".¹ The problem with his engine was explained by the way in which it was used to steer the tank consequent upon damage to the tail unit.
4. Seven tanks appeared to suffer track failure – all older tanks from C Company.
5. Four tanks from each Company suffered no major faults, including two that locked sponsons. Three of these, 1 from D Company and two from C Company (in replacement machines) retired through low petrol levels.

¹ National Archives, WO158/325, Fourth Army Daily Reports, September 1916 to 15 October 1917; Chris McCarthy, *The Somme: The Day-by-Day Account* (London, Arms and Armour, 1995) p. 104.

Appendix D – Operations involving Tanks – 8 August to Armistice

Bearing in mind the temptation, when lecturing, to simplify or exaggerate for effect, tank actions identified in the OH have been checked to confirm claims of success for tanks in the Hundred Days. It is difficult to categorise such actions which vary from unqualified success to complete failure. To further complicate matters, the degree to which tanks deserve credit for the outcome of individual actions also varies – in many cases their contribution is worthy of acknowledgment by the Official History, but there are also a number of instances of tanks being knocked out early in the offensive but the offensive nevertheless succeeding.

It would appear there are only five instances of failed offensive actions when tanks were involved, thus there is a high level of support for Professor Bourne's claim:-

Vol. IV

p.241 At the Battle of Albert on 24 August, at the left of 47 Div., an attack supported by three tanks on two strongpoints failed when two tanks were disabled and the guns of the third jammed. Rawlinson called off the attack that was to have been made by III Corps and the Australian Corps.

p.277 On 25 August, after initially making good progress 1st Grenadier Guards lost two of three supporting tanks when the mist cleared. Under machine-gun fire from front and both flanks, they were required to retire. Other Guards units also encountered problems. The OH raises the possibility of problems of communications security/confusion being the cause of strong opposition.¹

p.328 An attack by 9th Brigade of the 3rd Canadian Division was heavily shelled resulting in all eight supporting tanks being knocked out or incapacitated. Attempts to advance with artillery support alone were unsuccessful.

Vol. V

p.106 American 27 Div. at the Battle of St. Quentin Canal. Of first 34 tanks, twelve received direct hits and seven ditched – others (five?) fell foul of an old British minefield – as did four of a further six machines deployed later. The Americans suffered problems owing to failure to “mop-up” and unwise, unsupported infantry advances beyond objectives.

¹ James E. Edmonds, *Military Operations France and Belgium, 1918, vol. IV* (London, HMSO, 1947), p. 277.

p.117 110th and 62nd Brigades of 21 Div., 29 September. Each Brigade supported by 2 tanks. One tank failed to reach the start point and another was knocked out in Gonnelleu. In light of difficulties and poor progress by adjoining units, the attack was called off.

Three of these five failures involved the use of very small numbers of tanks – unwise given the high probability of loss from enemy artillery or mechanical failure. The American case involved a large number of tanks, but inexperience may have played a role in the failure of the offensive. Perhaps the most significant factors to flow from the examination are ones related to the justification for and degree of compliance with Lawrence's instructions of 1 September in which he sought to limit tank actions.²

The proper use of the tank is not the reduction of the outpost line of the defence, but the breaking of the organised line of resistance- by surprise. A success of this kind can be usefully exploited by pushing tanks through with supporting infantry. All available tanks should be reserved with this object in view.³

Despite heavy tank losses, limited attention appears to have been paid to Lawrence's tactical aspirations:

The units and formations of the Tank Corps have been so organized in order to facilitate their handling (offensive battles) both tactically and administratively. This organization has been frequently departed from in order to meet local conditions. Although at times this may be unavoidable, it should be borne in mind that such a departure from the normal organization must result in a loss of fighting efficiency.⁴

Observance of the parsimonious approach envisaged by Lawrence would appear to have been somewhat relaxed by those responsible for deployment decisions on the mobile front. As a result many tank actions involved only small numbers of tanks during the advance between initial assaults by Fourth and Third Armies in August to the date of the Armistice. Bearing in mind the unreliability of tanks, vulnerability to field artillery deployed in camouflaged forward locations, the small number available,

² James E. Edmonds, *Military Operations France and Belgium, 1918, vol. IV* (London, HMSO, 1947), p. 384.

³ National Archives, WO158/832, Lawrence to all armies, 1 September 1918, para. 6.

⁴ Edmonds, *Military Operations France and Belgium, 1918, vol. IV*, p. 384.

the difficulty in their transportation across the Front and the concern of commanders to limit the inevitably high level of casualties, some continued use beyond that sought by Lawrence was perhaps inevitable. British losses during the Hundred Days, were some 66,475 killed, 279,861 wounded and 37,738 missing/prisoners.⁵

⁵ War Office, *Statistics of the Military Effort of the British Empire in the Great War* (London, HMSO, 1922), pp. 269-271.

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ADM

AIR

CAB

MUN

PREM

T

WO

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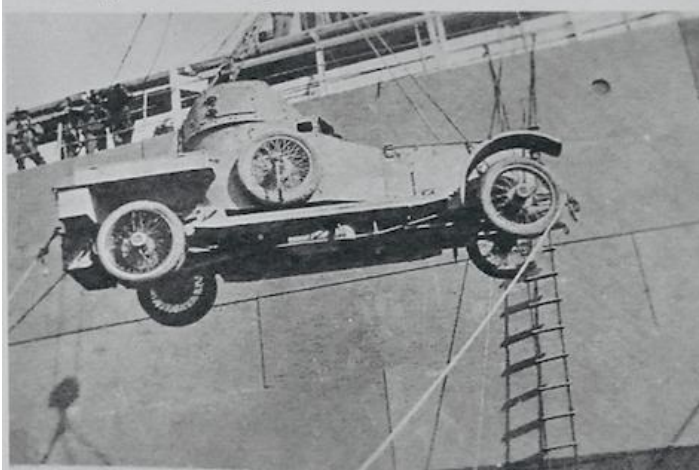
1. First Armoured Cars in Kohat Pass, NWFP, May 1915. (National Archives)

165 This photograph was taken to record the first visit by armoured cars to the Kohat Pass. The tall officer with his hands behind his back, near the centre car, is Major-General L.C. Dunsterforce, later to command Dunsterforce. The date is May 1915.



2. S. W. Africa – Terrain/Port Problems, Landing via Raft. (National Archives)

51 A Rolls-Royce is swung down from the deck of a transport during the landings at Walvis Bay, German South West Africa.



3. Early RNAS Open Rolls Royce Armoured Car (Imperial War Museum – Q57194)

28 A Rolls-Royce armoured car of the RNAS surrounded by an admiring group of army officers.



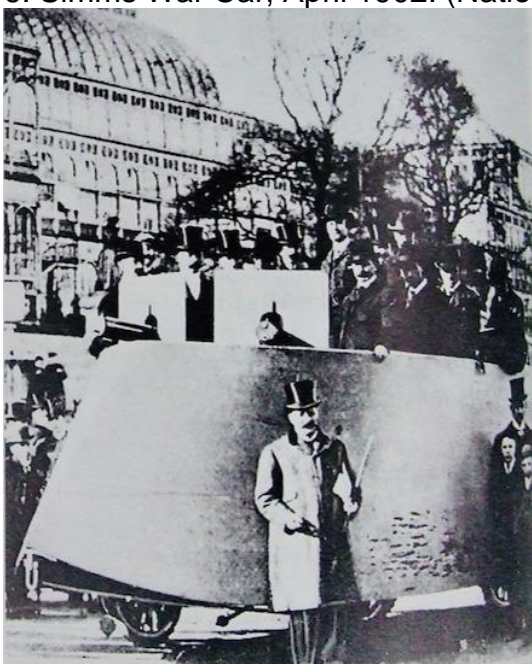
4. Early Open-topped Belgian Armoured Car, 1917 (Imperial War Museum – Q2955)



5. RNAS Seabrook Armoured Car (MUN5/394, National Archives).



6. Simms War Car, April 1902. (National Archives).



7. Steam Road Train Trials, Leeds 1903. (By kind permission of the Tank Museum)



8. Armoured Fowler, c. 1900. (By kind permission of the Tank Museum)

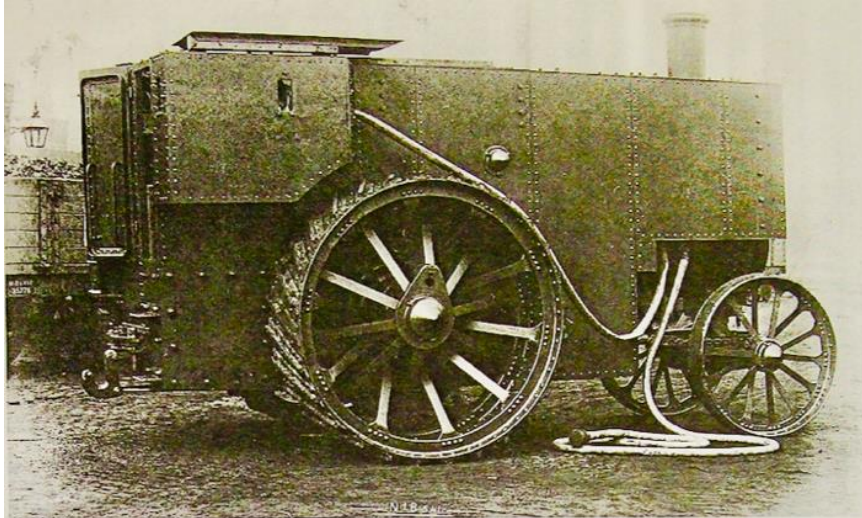


Figure 8. Offside view of the engine with the waterlifting gear fitted. The cover over the opposite end of the flywheel can be discerned in this view. RAC Tank Museum Collection.

9. French CGV 1902 (Bartholomew, "Early Armoured Cars").



10. Automitrailleuse Peugeot 1914/1915 ((Imperial War Museum – Q69472)



11. Renault Model 1915. (Imperial War Museum – Q378)



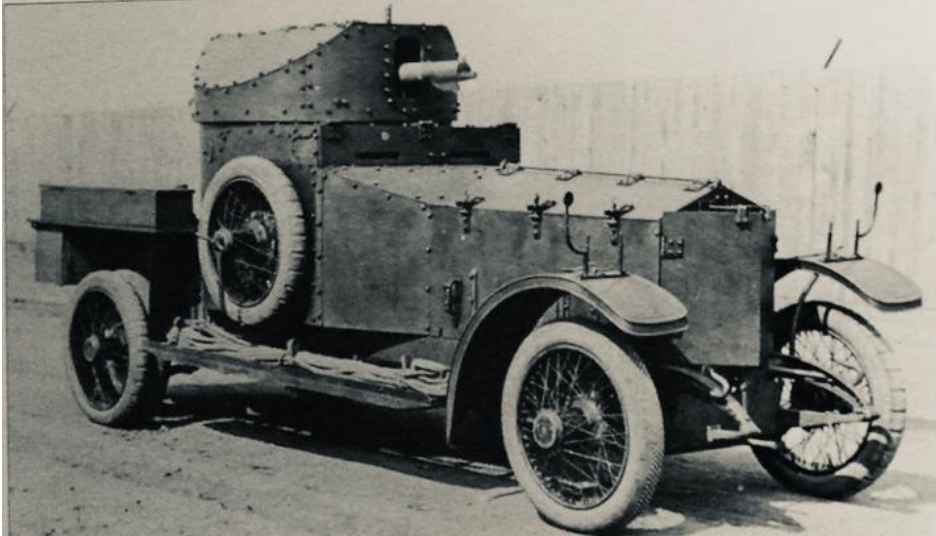
12. WO Experimental Autocarrier, 1915 (Bartholomew, "Early Armoured Cars").



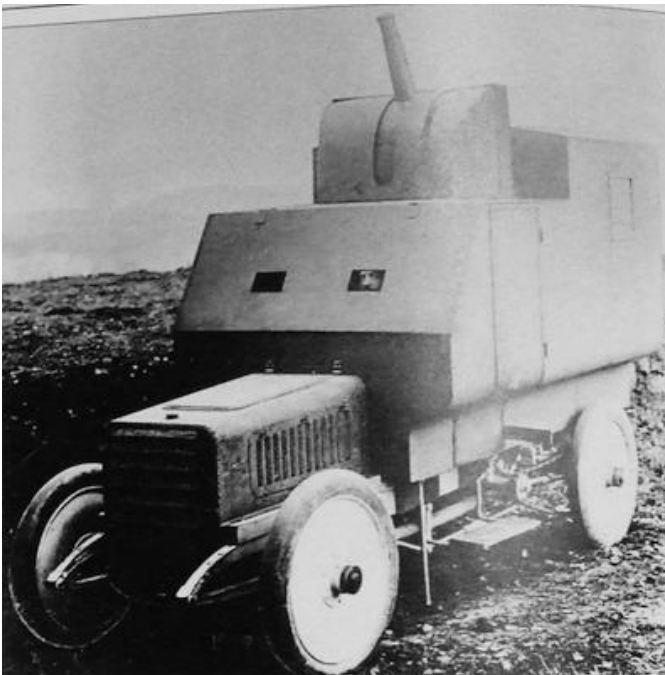
13. AEC Experimental B-type, WO 1915. (National Archives).



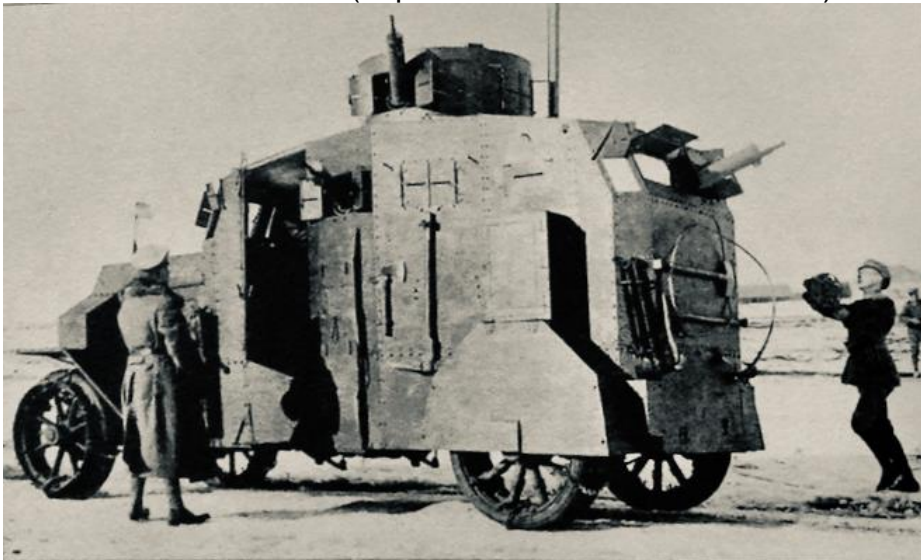
14. RNAS Rolls Royce 1915. (Imperial War Museum – Q14632)



15. Erhardt Balloon Buster 1914.



16. Erhardt E-V/4 1915. (Imperial War Museum – Q23751)



17. Westmorland and Cumberland Isotta-Fraschini. (National Archives).



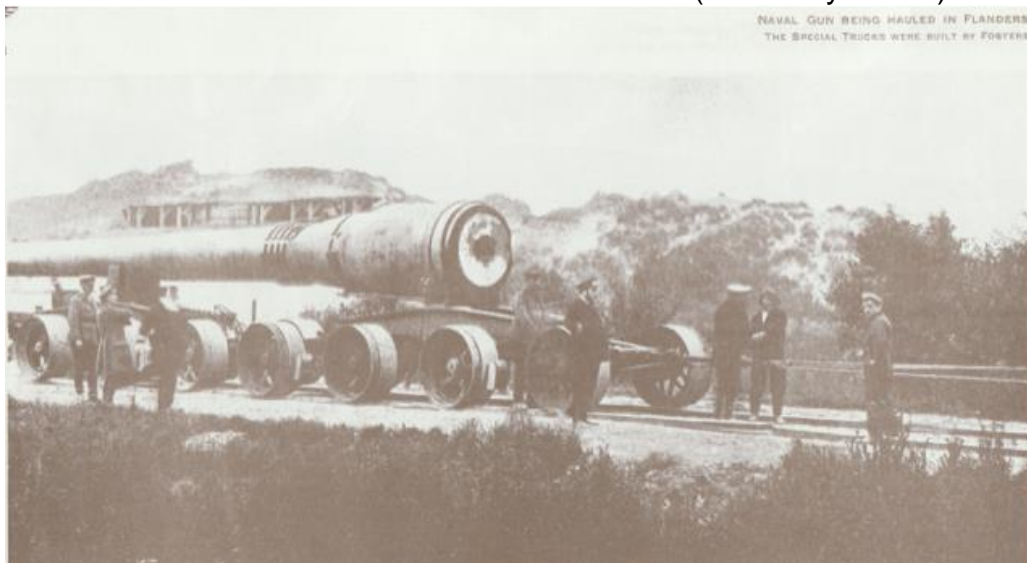
18. W. Ralston Cartoon of Future Warfare. (By kind permission of the Tank Museum).



19. Hornsby Caterpillar 1908.



20. Section of Bacon's 15-inch Gun in Flanders. (Rolls Royce Ltd.).



21. Wheeled 15-inch Convoy leaving Lincoln for Embarkation. (Rolls Royce Ltd.).



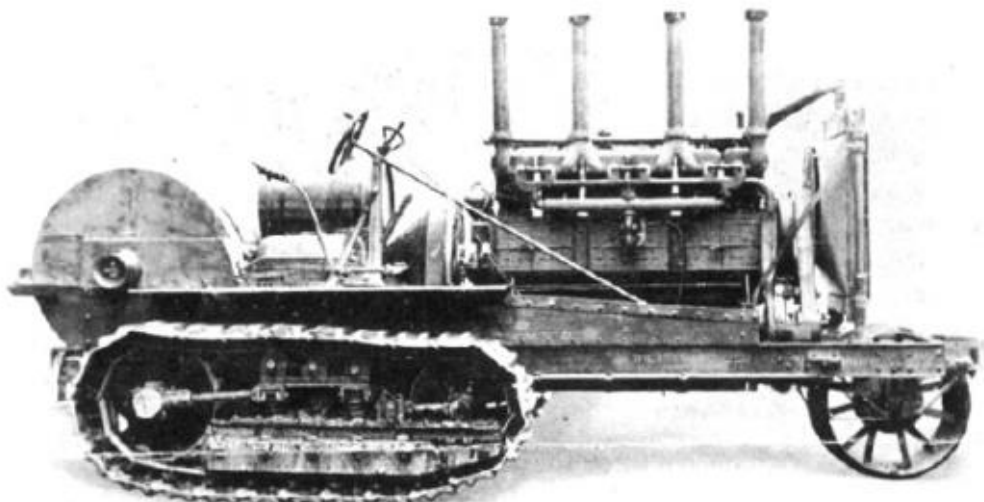
22. Foster's Wheeled Tractor on Test, December 1914. (Rolls Royce Ltd.).



23. Tritton Trench-Crosser, 1915 (By kind permission of The Crowood Press Ltd).



24. Holt Tractor, Type tested, Shoeburyness, 1915. (By kind permission of The Crowood Press Ltd.).



25. Tank "Chartreuse", ditched 15 September 1916. (Pidgeon – The Tanks at Flers.)



26. Tank "Crème de Menthe", 15 September 1916. (Pidgeon – The Tanks at Flanders.)



27. Tank "Julian" at Glasgow.

'Julian', the Tank which Glasgow Welcomed



28. "Tank Bank" Advertisement and Event at Birmingham.



29. Tank Bank Event at Luton.



30. Tank Money Box Selection (By kind permission of the Tank Museum).



31. Brutinel, Partially Armoured Autocar, CMMG Brigade. (National Archives).

One of the armoured Autocars of the 1st Canadian Motor Machine Gun Brigade in France, now equipped with Vickers machine guns.



32. Brutinel Autocar, Victory Parade, Mons, 11 November 1918. (National Archives).

One of the Machine Gun Brigades' Autocars in the victory parade held by Canadian troops in the Belgian town of Mons on the afternoon of 11 November 1918. This may be the car that is currently in the collection of the CWM. Note the Lewis Gun that had by then been added to the top of the front glacis plate.



33. Brutinel Autocar – 1918 Spring Offensives casualty. (National Archives).

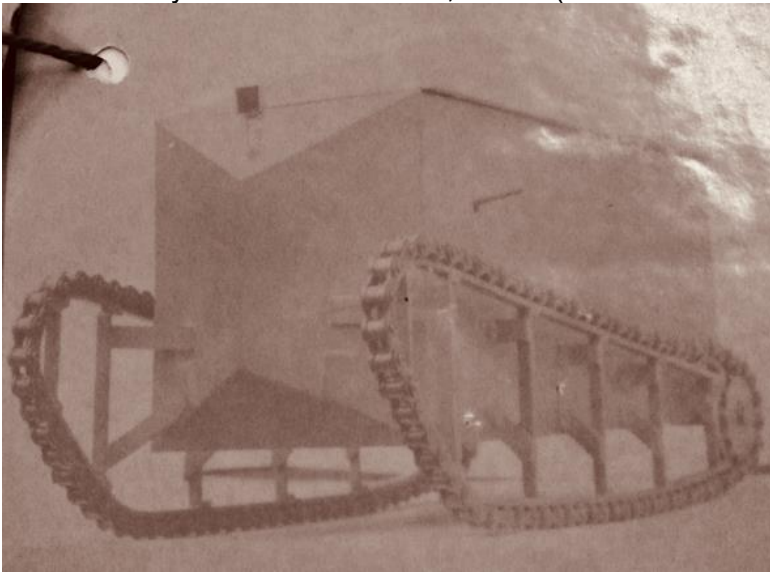
158 Used as static machine gun posts in an attempt to stem the flood of stormtroopers the cost to the Autocars and their crews was very high indeed.



34. Crompton's Articulated Machine, Summer 1915. (MUN5/394, National Archives).



35. Model by Nesbitt or MacFie, 1915. (National Archives).



36. "Mother" at Hatfield Park. (By kind permission of the Crowood Press Ltd.).



37. "Mother" - trial at Lincoln, January 1916.



38. St. Chamond inadequate track. (By kind permission of Osprey Publishing).



39. Schneider, ditched in narrow trench. (By kind permission of Osprey Publishing).



The nose of the Schneider was shaped like a ship's bow in the vain hope that this would assist in freeing the tank once it made contact with a trench wall. As seen here during the initial training at Marly-le-Roi in 1916, the propulsive power of the vehicle was often insufficient to free its mass in soft ground. (NARA)

40. Little Willie, 1915. (By kind permission of Crowood Press Ltd).



41. Four-Wheel Drive Austro-Daimler, 1904. (Bartholomew, "Early Armoured Cars").

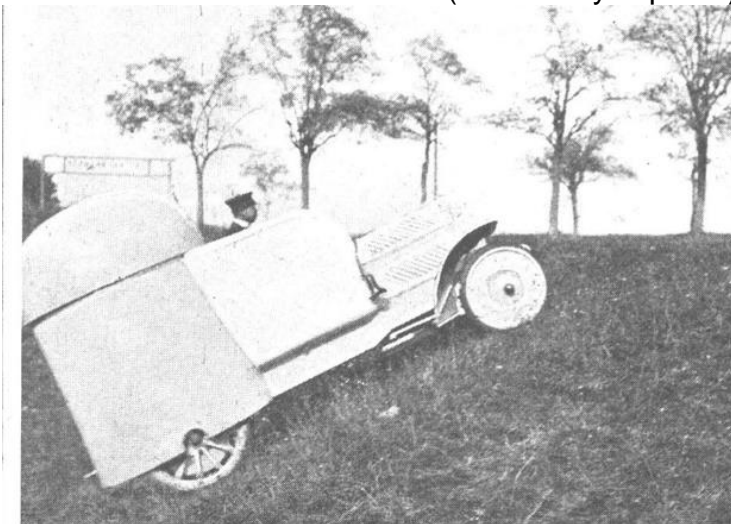


42. French trials of Panzerautomobile. (Tank Encyclopedia).

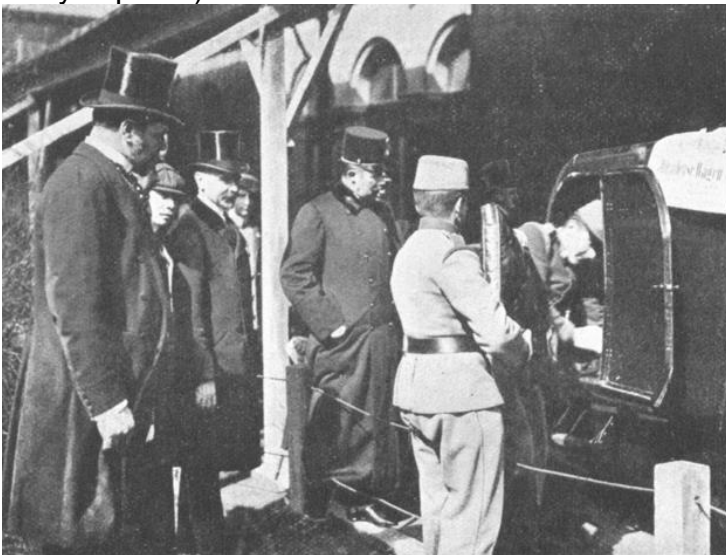


The Panzerautomobil during trials in France. Source: Biblio Verlag

43 Trials of Panzerautomobile. (Tank Encyclopedia).



44. Inspection of Panzerautomobile by Archduke Ferdinand. (Tank Encyclopedia).



The vehicle being inspected by Archduke Franz Ferdinand (standing in the middle) on March 18, 1906. Photo: Sport und Salon

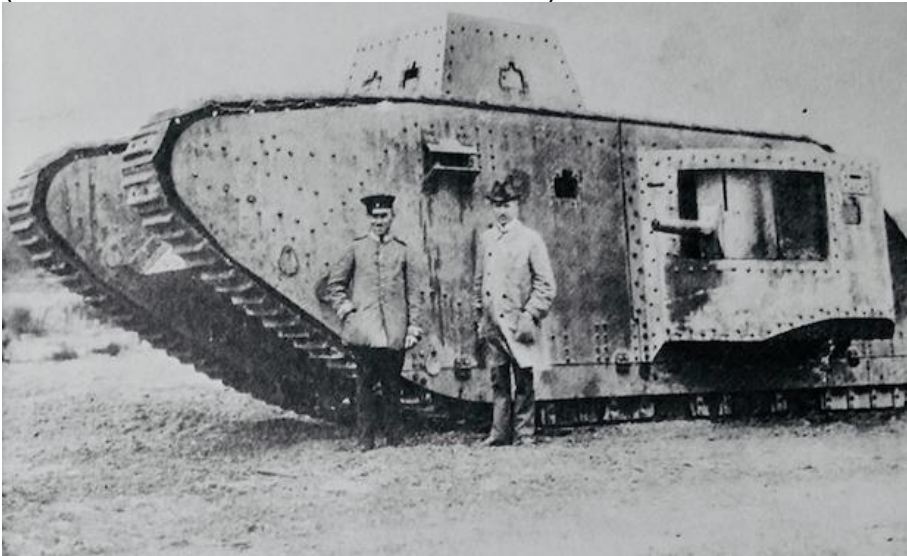
45. Bremer Marien Wagen Überpanzert (Chamberlain and Ellis, Arms and Armour).



46. LKII - June 1918, none built by Armistice (Bartholomew - First World War Tanks)



47.
(Bartholomew - First World War Tanks).



48. Mark IV with Unditching Beam Deployed. (Imperial War Museum – Q11655)



49. Road-Transportable Light Renault FT (By kind permission of Osprey Publishing).



50. Newton Tractor, 1918. (By kind permission of Crowood Press Ltd).



51. Crossing Water (Flotation) 1918. (By kind permission of Crowood Press Ltd).



52. Crossing Water - Inglis Bridge, 1918 (By kind permission of Crowood Press Ltd).



53. Speed into Action – German 7.62cm. Infanteriegeschütz (Strong and Marble, Artillery in the Great War, Pen and Sword).



German stormtroopers dragging a 7.62cm *Infanteriegeschütz* L16 in action – a battery of six of these was attached to most stormtrooper battalions in 1918. (Pen & Sword Collection)

54 “Where’s that Blinking Kaiser” Money Box. (Imperial War Museum - EPH3797.)

