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Missed Signals? A Reply to Mike Bullock and Laurence A. Lyons

ABSTRACT

This response to Mike Bullock and Laurence A. Lyons' recent debate article on British wireless communication in the First World War makes use of new and under-utilised British, Australian, Canadian and American archival sources in order to counter their claim that the British high command failed to modernise its communications system when it could have. In so doing, it reveals how the inherent flaws in their argument and methodology oversimplifies the nature of the communication difficulties experienced by the armies of the era and, in particular, distorts our understanding of the complexities of the British army's communications system.

Introduction

Mike Bullock and Laurence A. Lyons' recent debate article regarding the British army's use of wireless communication during the First World War follows on from a previous exchange between the authors and myself.¹ Apparently unhappy with comments I made in two articles and an earlier review of their 2010 book *Missed Signals on the Western Front*, Bullock and Lyons felt it necessary to publish, in effect, an article-length version of their book's main arguments.² Given the potential significance of this subject to our understanding of the British army and, in particular, its willingness to learn and ability to adapt and innovate,³ the inherent flaws in their argument and methodology cannot be left unchallenged. Therefore, the first part of this riposte will provide counterarguments to the judgements made in their article. Since the core line of argument advanced in their article and the methodology they employed are symptomatic of their work as a whole, the second part of this retort will offer a more detailed assessment of their book than was possible in a standard review.

Debate Article

In their recent debate article, Bullock and Lyons attempt to show how the British army during the First World War 'failed to modernise its communication system when it could have'. They point to the demonstration in February 1916 of a prototype wireless-telephone set by a group of Royal Flying Corps (RFC) engineers, under the leadership of Major Charles Prince, as an opportunity squandered. Reiterating one of their book's chief contentions, they maintain that it was the 'significant institutional bias', or 'lack

¹ Mike Bullock and Laurence A. Lyons, 'Response to Dr Brian N. Hall's Articles on British Wireless in the First World War', *War in History* 23 (2016), pp.230-50; 'Letters to the Editor', *Journal of Military History* 78 (2014), pp.1208-13.

² Brian N. Hall, 'Technological Adaptation in a Global Conflict: The British Army and Communications beyond the Western Front, 1914-1918', *Journal of Military History* 78 (2014), pp.37-71; Brian N. Hall, 'The British Army and Wireless Communication, 1896-1918', *War in History* 19 (2012), pp.290-321; Brian N. Hall, 'Review of *Missed Signals on the Western Front*', *Journal of the Society for Army Historical Research* 90 (2012), pp.75-6; Mike Bullock and Laurence A. Lyons, *Missed Signals on the Western Front: How the Slow Adoption of Wireless Restricted British Strategy and Operations in World War I* (Jefferson, N.C.: McFarland & Company, 2010).

³ Robert T. Foley, 'Dumb Donkeys or Cunning Foxes? Learning in the British and German Armies during the Great War', *International Affairs* 90 (2014), pp.279-98; Aimée Fox-Godden, "'Putting Knowledge in Power": Learning and Innovation in the British Army of the First World War' (PhD thesis, University of Birmingham, 2015).

of vision and will', of the high command that prevented British forces from being equipped with the most modern continuous wave (CW) wireless-telegraph and wireless-telephone sets. To support this, they make four additional claims which I shall examine each in turn: first, that in my earlier work, I failed to explain adequately the importance of the innovation of CW wireless; second, that in contrast to the British army, both the pre-war Royal Navy and the US navy adopted wireless early and exploited its full potential; third, that the design, production and employment of the tank proves that the British army could also have developed a practical and reliable wireless-telephone set within a similar timeframe in 1916; and, fourth, unlike the British, upon entering the war the US army immediately equipped its troops with modern CW wireless technology.⁴

The first of these claims, that my previous work fails to recognise the significance of the shift from spark to CW wireless technology that took place during this period,⁵ can quickly be dismissed because it is simply not true. Both my articles they refer to make explicit references to the development of such technology, how it was employed by the British army during the First World War and how it influenced military operations.⁶ Indeed, as my previous work has argued, and this article will further highlight, the ability of the British to exploit CW wireless in 1918 was an extraordinary achievement, certainly when compared to their opponents. However, given the nature of the fighting on the Western Front, the finite resources available and the technical shortcomings of the CW wireless sets at the time, there were limits as to how effective this technology could be. Yes, the shift from spark to CW is a breakthrough development in the history of radio. But as this article will demonstrate, the nascent CW technology at the time did not, and in the case of wireless-telephony could not as yet, provide a panacea to the army's communication problems.

With regards to the second component of Bullock and Lyons' argument, that the pre-war navies of Britain and the US displayed a greater willingness to embrace wireless than the British army must be regarded as axiomatic. Unlike the British army, which already possessed the electric telegraph and was beginning to make use of the telephone, at the beginning of the twentieth century neither the Royal Navy nor the US navy possessed electronic, long-distance 'real-time' means of communication. It is therefore unsurprising that they both produced early innovations in the field of naval wireless,⁷ with the Admiralty becoming one of the Marconi Company's best customers.⁸ Moreover, the principal characteristics of the wireless technology at the time meant that its use was far more conducive to military operations at sea than on land. The disappointing results of the British army's experiments with wireless during the Boer War (1899-1902), for instance, was predominantly due to the temperamental

⁴ Bullock and Lyons, 'Response', pp.230-50.

⁵ Ibid., pp.233, 249.

⁶ Hall, 'British Army', pp.299-300, 306-14, 319; Hall, 'Technological Adaptation', pp.47. See also: Brian N. Hall, 'The Development of Tank Communications in the British Expeditionary Force, 1916-1918', in Alaric Searle (ed.), *Genesis, Employment, Aftermath: First World War Tanks and the New Warfare, 1900-1945* (Solihull: Helion & Company, 2015), pp.156-9.

⁷ However, the US Navy did not begin using wireless on its ships until 1912. See Daniel R. Headrick, *The Invisible Weapon: Telecommunications and International Politics 1851-1945* (Oxford: Oxford University Press, 1991), p.126.

⁸ Hall, 'British Army', 292-3. For additional context, see Nicholas Lambert, 'Transformation and Technology in the Fisher Era: The Impact of the Communications Revolution', *Journal of Strategic Studies* 27 (2004), pp.272-97.

nature of the primitive, cumbersome technology used and the unfavourable geographical and meteorological conditions that prevailed.⁹ Even by 1914, no army, least of all the British, possessed wireless equipment that was simple in operation, secure and ‘rapid in movement, erection and dismantling’.¹⁰ No portable man-carried set for army purposes would exist until well into the First World War, and even these were handicapped by the constraints imposed by the unique battlefield environment which existed on the Western Front; an unfavourable force-to-space ratio, lack of open flanks for manoeuvre, and the overwhelming concentration of enemy artillery fire.¹¹

By contrast, the wireless tests conducted by the Royal Navy during the same period were more successful, due in no small measure to the fact that seawater ‘has a higher specific conductivity than the land’ which significantly enhanced the performance of wireless signals when sent over sea.¹² Furthermore, unlike the army, size and power was not an issue for the navy. Ships not only had the space to accommodate the bulky sets, their engines could also generate the large supply of electricity needed to power the equipment.¹³ In addition, as Captain Henry Jackson observed in 1897, ‘though the necessity of raising insulated wires in the air has increased the difficulty of adapting it to military purposes on shore, it has rendered the system easily adaptable for ship work, as the masts of the ship readily lend themselves to the temporary or permanent fitting of these wires’.¹⁴ Finally, the loss of ‘directionality’ in the early Marconi apparatus, in which signals were radiated in all directions at once, thus decreasing security, gave it an ‘all round’ facility that, while off-putting to the army, was particularly advantageous for naval use.¹⁵

Therefore, contrary to Bullock and Lyons’ assessment, the feelings of doubt, suspicion and scepticism that many British officers harboured towards wireless were, in many respects, quite rational and pragmatic responses to the dangers of pursuing new and temperamental technology which, prior to the First World War, offered the army few practical advantages over existing means of communication. Crucially, this military cultural mind-set towards emerging technology should not be viewed as a uniquely British phenomenon. Markus Pöhlmann, for example, argues persuasively that the ‘non-invention’ of the tank in Germany owed less to a conservative military

⁹ Lieut.-Colonel A.G.T. Cusins, ‘Development of Army Wireless During the War’, *Journal of the Institution of Electric Engineers* 59 (1921), p.763; Brian A. Austin, ‘Wireless in the Boer War’, *International Conference on 100 Years of Radio, IEE Conference Publication No. 411* (1995), p.47.

¹⁰ ‘Final Report of the Committee on Wireless Telegraphy’, 3 September 1913, WO32/8879, The National Archives (TNA), Kew. For German army wireless equipment in 1914, see Major Paul W. Evans, ‘Strategic Signal Communication: A Study of Signal Communication as Applied to Large Field Forces, Based Upon the Operations of the German Signal Corps During the March on Paris in 1914’, *Signal Corps Bulletin* 82 (1935), pp.34-6.

¹¹ SS. 148. *Forward Inter-Communication in Battle* (March 1917), p.22; Captain B.F.J. Schonland, ‘W/T. R.E.: An Account of the Work and Development of Field Wireless Sets with the Armies in France’, *The Wireless World* 7 (1919), p.178.

¹² ‘Report by the Engineer-in-Chief of the General Post Office on Recent Experiments with the So-called Wireless Telegraphy’, 29 October 1897, ADM116/523, TNA.

¹³ ‘Report of 25th July 1899 (N.S. 4301), from Captain H.B. Jackson, H.M.S. “Juno”, to Vice-Admiral Sir Compton E. Domvile, Commanding B Fleet (Naval Manoeuvres)’, ADM116/523, TNA.

¹⁴ ‘Report of 31st March 1897 (G. 1935), from Captain Jackson, H.M.S. “Defiance”, to the Commander-in-Chief, Devonport’, ADM116/523, TNA.

¹⁵ ‘Remarks on Captain Jackson’s Wireless Telegraphy Report, 30th December 1900’, 15 January 1901, ADM116/595, TNA. For additional context, see A.J.L. Blond, ‘Technology and Tradition: Wireless Telegraphy in the Royal Navy, 1895-1920’ (PhD thesis, University of Lancaster, 1993), pp.43-4.

organisation ‘motivated by ignorance, romantic technophobia or domestic concerns’, than by ‘a rather pragmatic estimation of the technical possibilities for mechanization’. Pöhlmann’s conclusion, that prior to 1914 ‘the dominant future war image – offensive, mobile warfare – provided no place for the slow and technically unreliable tank’, can equally be applied in the case of the British army’s attitude vis-à-vis the bulky, fragile and vulnerable nature of the wireless sets then available.¹⁶ Indeed, it was also partly for reasons concerning its unsuitability for the envisaged future campaigns of mobility and manoeuvre that the British army gave a rather lukewarm reception to the telephone.¹⁷ Thus, genuine concerns regarding compatibility, technical reliability and security governed the British army’s outlook towards wireless during the late nineteenth and early twentieth centuries.

The third component of Bullock and Lyons’ argument – that the design and production process of the tank in 1916 offers a model that Prince’s wireless-telephone set could so easily have replicated had the high command not been so backward-looking – is undermined by a reluctance to engage with the available archival sources and modern scholarship. They use just two sources, one of which is very dated.¹⁸ The emerging consensus amongst historians is that the genesis of the tank was not quite so simple a process as they imply, nor did it owe its existence to the ‘championing’ of any one, or even two, prominent individuals.¹⁹ More importantly for this debate, however, is the timescale given by Bullock and Lyons for the tank to move from ‘proof of concept’, the demonstration in June 1915, to its first employment in combat in September 1916, a total of 15 months. And yet for CW wireless-telephony, we are told, the demonstration in February 1916, when Prince and his fellow engineers accomplished ‘proof of concept’, should have begun a series of steps in which the engineers ‘could have’ and ‘would have’ overcome all sorts of technical difficulties, leading to battalion-level usage within just four months (1 July 1916). In light of the tank comparison, I would have to disagree with their claim that ‘this is not a far-fetched sequence of events or time frame’.²⁰

Fundamentally, the claims made by Bullock and Lyons that ‘no one in a position of authority [in the Royal Engineers or the British army] understood the promise of CW and directed that resources be applied to develop it’, and that consequently the development of CW wireless ‘did not proceed on [a] fast track, or indeed on a slow track’, are questionable in light of the available archival evidence.²¹ An account by Prince and his associate Major Robert Orme reveals that shortly after their demonstration in 1916 ‘an urgent demand for wireless telephony’ for air-to-air use arose

¹⁶ Markus Pöhlmann, ‘Images of War, Armament and Mechanization in Imperial Germany, 1880-1914’, in *Genesis*, pp.15, 29.

¹⁷ Brian N. Hall, ‘The “Life-Blood” of Command? The British Army, Communications and the Telephone, 1877-1914’, *War & Society* 27 (October 2008), pp.43-65.

¹⁸ J.F.C. Fuller, *Tanks in the Great War 1914-1918* (New York: E.P. Dutton and Company, 1920); Guy Hartcup, *The War of Invention: Scientific Developments, 1914-18* (London: Brassey’s, 1988).

¹⁹ J.P. Harris, *Men, Ideas and Tanks: British Military Thought and Armoured Forces, 1903-1939* (Manchester: Manchester University Press, 1995), pp.4-78; David J. Childs, *A Peripheral Weapon? The Production and Employment of British Tanks in the First World War* (Westport, CT.: Greenwood Press, 1999), pp.2-4; Christopher Brynley Hammond, ‘The Theory and Practice of Tank Co-operation with Other Arms on the Western Front During the First World War’ (PhD thesis, University of Birmingham, 2005), pp.14-18.

²⁰ Bullock and Lyons, ‘Response’, pp.235-7.

²¹ *Ibid.*, p.237.

from within the army which led the War Office to set up the Signals Experimental Establishment in September, under the command of a Royal Engineers officer Colonel Arthur Bagnold.²² At the same time, the British Expeditionary Force's (BEF's) Central Wireless School, under the leadership of another Royal Engineers officer Lieutenant-Colonel Lyster Blandy,²³ stepped up research, design and testing of new CW wireless technology, including the latest French and Marconi/Round valves.²⁴ Demonstrations of prototype CW wireless sets were carried out, including that which occurred at the RFC aerodrome at Fienvillers on 10 November with the Commander-in-Chief of the BEF, Sir Douglas Haig, looking on. In his diary entry that day, Haig noted: 'The progress in wireless is... quite wonderful. We can now telephone between two machines in the air'.²⁵ Thus, the primary sources indicate quite clearly that British experiments with CW technology, and wireless-telephony in particular, were not shelved in the aftermath of the aforementioned demonstration in early 1916, but were channelled specifically into developing and perfecting sets for the purpose of inter-aeroplane communication. Given that the RFC was an integral part of the British army, it is difficult to uphold the accusation that the high command suffered from institutional bias or inertia towards CW wireless.

Bullock and Lyons also apportion too much blame on the high command for the time it took to deploy the CW wireless equipment. Firstly, the manufacturing resources required for mass-producing CW wireless sets in Britain were extremely constrained due to the pressures of wartime demands. Bullock and Lyons do make reference to this point when explaining the disparity between the numbers of US and British CW wireless sets produced, but they underestimate how significant the problem was. The manufacture of valves was particularly problematic for the British. According to Captain Henry Round, a Marconi engineer who worked alongside Prince, during the early years of the war the production of valves 'required special men. Even then it was a terrible process. Again and again we lost the knack of making good tubes, owing to some slight change in the materials used in their manufacture. A thorough investigation was impossible, as all hands were out on the stations. On several occasions we were down to our last dozen tubes'.²⁶ Although valve production did improve later in the war, there were still manufacturing difficulties that continued to limit valve, and thus CW wireless set, production. Evidence of one such problem comes courtesy of a secret MI5 report, written shortly after the war, detailing the agency's wartime monitoring of 'aliens' who had been employed on war-related work.²⁷ According to the report, one of

²² 'History of R.F.C. Wireless from the Outbreak of War (Personal Account by Majors Orme and Prince)', n.d. [c. 1919], pp.7-8, AIR1/733/183/1, TNA; Cusins, 'Development', pp.766-7; W.B.B., 'Memoir: Colonel A.H. Bagnold', *The Royal Engineers Journal* 58 (1944), pp.131-32.

²³ In June 1917 Blandy was appointed Chief Experimental Officer of the Signals Experimental Establishment, a post he held until April 1918 when he was given command of the Wireless Experimental Establishment of the newly-formed Royal Air Force (RAF). See 'Personalities in the Wireless World', *The Wireless World* 7 (1919), p.180; 'Colonel/Air Commodore L.F. Blandy, CB, DSO', *The Royal Engineers Journal* 78 (1964), p.340.

²⁴ 'Report of Experimental Work at Central Wireless School, G.H.Q., for Week Ending 17th September, 1916. No. 16. Continuous Wave Transmission and Reception', 21 September 1916, AIR1/864/204/5/503, TNA.

²⁵ Sir Douglas Haig Diary, 10 November 1916, WO256/14, TNA.

²⁶ Captain H.J. Round, 'Direction and Position Finding', *Journal of the Institution of Electrical Engineers* 58 (1920), p.233.

²⁷ 'Aliens' referred to foreigners living in Great Britain at the time. See David Cesarani, 'An Alien Concept? The Continuity of Anti-Alienism in British Society before 1940', in David Cesarani and

the few places where the employment of ‘aliens’ was considered ‘of national importance’ was glass-blowing. It cited the case of four Dutch glass-blowers who in 1918 were prevented from boarding a ship at Liverpool bound for South Africa. Working with the Ministry of Munitions, MI5 refused the Dutch workers permission to leave on account of ‘the scarcity of glass-blowers of every sort in the United Kingdom’.²⁸ Given that the valves of the era were encased in spherical or tubular glass bulbs, it can be deduced that the shortage of skilled glass-blowers would have had a detrimental impact upon the production and deployment of CW wireless sets.²⁹ Indeed, the inability of supply to meet demand forced the British in the spring of 1918 to begin making arrangements to use the much larger wireless manufacturing resources of the US.³⁰

The second key explanation for why it took until 1917 for CW sets to reach frontline units was because the ongoing limitations associated with the technology, such as mutual interference, jamming, power supply, range and transportability, militated against the sets’ use as reliable, safe and efficient means of communication. Not only do reports acknowledge the difficulties these issues caused when attempting to utilise CW wireless-telephony for aeroplanes and tanks,³¹ but some of Prince’s fellow engineers cast doubt after the war as to the suitability of the technology for use within the infantry and artillery. Although recognising the importance of wireless-telephony between aircraft, for example, Major Tom Vincent Smith stated that ‘there was obviously a lot of spade work to be done before we could apply wireless telephony to anything like practical use in the line’. He further noted:

It was most inadvisable to show an article like a wireless telephone to the Higher Command, who imagined that one had only to have a telephone without wires in order to solve all communication difficulties; whereas, of course, it was our duty to modify their enthusiasm considerably, otherwise they were inclined to ask us to do all sorts of impossible things.³²

Smith’s comments are revealing, for they suggest that not only were the engineers well aware of the limitations of the early CW wireless-telephones for battlefield use but, more importantly, that rather than being resistant to new communications technology, the high command was perhaps too eager to exploit it; an argument that chimes well

Tony Kushner (eds.), *The Internment of Aliens in Twentieth Century Britain* (London: Frank Cass, 1993), pp.25-52.

²⁸ ‘Report on the A. Branch of M.I.5. Aliens Employed on War Service’, 1921, pp.47, 55, KV1/13, TNA. I am grateful to James Bruce for drawing my attention to this source. For additional context, see Chris Northcott, *MI5 at War 1909-1918: How MI5 Foiled the Spies of the Kaiser in the First World War* (Ticehurst: Tattered Flag Press, 2015), pp.208-11.

²⁹ Keith R. Thrower, ‘Technical Factors Affecting CW Radio Communication in WW1’, 17 March 2014, <http://blogs.mhs.ox.ac.uk/innovatingincombat/files/2013/03/Technical-factors-affecting-CW-radio-communication-in-WW1.pdf> (Accessed 14 October 2016).

³⁰ ‘Manufacture of W/T Apparatus, its Inspection at Manufacturers Works and Fitting into Aircraft, by Major W.J. Polyblank’, 1919, AIR1/2217/209/33/6, TNA.

³¹ ‘Resume of W/T Work in Progress in R.A.F. B.E.F. France as at November 11th, 1918, by Lt. Col. Childs, R.A.F.’, AIR1/2217/209/33/6; ‘History of Tank and Aeroplane Co-operation’, 31 January 1919, AIR1/1671/204/109/26, TNA.

³² Major C.E. Prince, ‘Wireless Telephony on Aeroplanes: Discussion’, *Journal of the Institution of Electrical Engineers* 58 (1920), pp.387-8. Smith was RFC wireless technical advisor, GHQ (March-December 1916). ‘Services of Major T.V. Smith, M.C., R.F.C., “Wireless”, Feb. 1915-December 1917’, n.d., AIR1/725/97/1, TNA; J.S.H., ‘Major Tom Vincent Smith. M.C., R.A.F.’, *Journal of the Institution of Electrical Engineers* 68 (1927), pp.1022-23.

with current academic wisdom on the BEF. Studies of Haig's attitude towards poison gas and tanks, for example, criticise him for being too enthusiastic, rather than unreceptive, towards these new and untried technologies.³³

The fourth, and final, strand of Bullock and Lyons' argument – that, unlike the British, 'as soon as it became a belligerent the US Army equipped its forces with modern wireless communications' – is rather misleading and requires qualification.³⁴ That the US *produced* more CW wireless sets during the war than the British is not in doubt. However, this in itself is not proof that the US army was better at recognising the potential of CW wireless than the British high command; rather, it was to a large extent indicative of the greater CW wireless manufacturing resources of the US. Moreover, as was outlined earlier, the British and French had already recognised the potential of CW wireless before the US had entered the war. At the same time Bullock and Lyons argue the US army was equipping its forces with modern CW wireless technology, so too were the British and French, but they were simply unable to produce CW sets in the same quantity as the Americans.³⁵

That the US army upon entering the war *equipped* its forces with modern CW wireless communications, particularly the most modern wireless-telephony sets, requires clarification. Historians would be hard-pressed to find any evidence that shows that the American Expeditionary Force (AEF) was employing a sophisticated, modern CW wireless-based command and control system in 1918. Behind the authors' statistics on CW wireless-telephone sets produced, the fact remains that none of this equipment actually reached frontline American units in time for it to be employed in combat. In fact, Bullock and Lyons' defeat their own argument by citing the judgement of the US Army Signal Corps official historian.³⁶ But their use of quotation is extremely selective, bordering on a sleight of hand. The relevant quote is reproduced in full, emphasising the sections omitted by Bullock and Lyons:

Despite the conscientious efforts by government and industry, the limited duration of America's involvement in the war left little time for the development and application of new technology, *and the United States relied chiefly on Allied radio equipment*. Nevertheless, the Signal Corps made some breakthroughs, especially in airborne radiotelephony, an achievement on which General Squier placed great emphasis. Not only would radio allow the pilot and his observer to communicate more easily between themselves (instead of using hand signals) as well as with the ground, it would also make voice commanded squadrons possible. An aero squadron based at Camp Vail made nearly one hundred flights per week to test new equipment. In a public demonstration held in early 1918, President and Mrs. Wilson talked with a pilot flying over the White House. While some aerial radiotelephone apparatus arrived in France by the fall of 1918, it did not see use in combat. *The Signal Corps also experimented with land-based radiotelephone equipment, but it did not attain notable success prior to the Armistice.*³⁷

³³ J.P. Harris, *Douglas Haig and the First World War* (Cambridge: Cambridge University Press, 2008), pp.197-8; Gary Sheffield, *The Chief: Douglas Haig and the British Army* (London: Aurum Press, 2011), pp.369-72.

³⁴ Bullock and Lyons, 'Response', p.231.

³⁵ On the greater CW wireless manufacturing resources of the US, see Peter J. Hugill, *Global Communications since 1844: Geopolitics and Technology* (Baltimore: The John Hopkins University Press, 1999), pp.152-3.

³⁶ Bullock and Lyons, 'Response', p.242.

³⁷ Rebecca R. Raines, *Getting the Message Through: A Branch History of the US Army Signal Corps* (Washington, D.C.: Centre of Military History, US Army, 1999), p.172.

Both the US Chief Signal Officer's official 1919 report and the official history of the US Army Signal Corps during the Second World War also testify to the fact that the First World War came to an end before the army could establish a modern CW wireless-based communications system.³⁸

These conclusions mirror the judgements made by current historians on the AEF's role and performance during the war. For instance, in the most recent examination, David Woodward makes no mention of a superior CW wireless-based communications system being employed by the AEF for the simple fact that such a system never materialised. Indeed, Woodward describes the AEF as 'a beggar army', dependent upon its British and French allies for much of its transportation and weaponry,³⁹ a view shared by another recent historian of the AEF Mark Grotelueschen.⁴⁰ In much the same way, the communication system developed by the AEF also owed a great deal to the assistance afforded by its allies – a fact overlooked by Bullock and Lyons. According to the Director of the AEF's Signal School:

Few of the [American] Officers, even the Signal Corps Officers themselves, were sufficiently familiar with the conditions [of modern war]. It was therefore recognised that in the scheme of military education Signal Schools should be organised where the functions of Signal troops would be taught utilising the services, not only of the few of our own officers who had been able to familiarise themselves with conditions by serving with the British or French, but also utilising the services of especially well-informed British and French instructors, who were cheerfully supplied us by our Allies.⁴¹

Since American signal training relied upon British and French instructors, it should come as no surprise that US Signal Corps doctrine also mirrored its allies', with British and French communication manuals reproduced almost verbatim and disseminated widely.⁴² This also meant that, for much of its involvement as a belligerent, the AEF relied principally upon British and French equipment, including signalling lamps, telephones and wireless.⁴³

³⁸ *Report of the Chief Signal Officer to the Secretary of War* (Washington, D.C.: Government Printing Office, 1919), p.306; Dulaney Terrett, *The Signal Corps: The Emergency* (Washington, D.C.: Centre of Military History, United States Army, 1956), pp.16-18.

³⁹ David R. Woodward, *The American Army and the First World War* (Cambridge: Cambridge University Press, 2014), p.378.

⁴⁰ Mark E. Grotelueschen, *The AEF Way of War: The American Army and Combat in World War I* (Cambridge: Cambridge University Press, 2007), pp.40-1. This includes those US divisions that trained and fought exclusively as part of the BEF. See Mitchell A. Yockelson, *Borrowed Soldiers: Americans under British Command, 1918* (Oklahoma: University of Oklahoma Press, 2008).

⁴¹ 'Final Report by Director of the Army Signal Schools American Expeditionary Forces Conducted at Langres (Haute Marne) France from December 1st, 1917 to January 31st, 1919', Box 1, NM-91, Entry 402, RG120, National Archives and Records Administration (NARA), Maryland.

⁴² Both *Forward Intercommunication in Battle* (Washington, D.C., May 1917) and *Inter-communication in the Field* (Washington, D.C., May 1918) were literal translations of the British army's manuals of the same name, *SS. 148* (March 1917) and *SS. 191* (November 1917), with even the sections on communications in the Royal Artillery and RFC included.

⁴³ *Report of the Chief Signal Officer*, pp.303-11. In May 1918, the British also gave the AEF 600 carrier pigeons and nine mobile lofts. See 'Letter from Officer in Charge, AEF Homing Pigeon Service to Chief Signal Officer, AEF Headquarters Services of Supply', 1 June 1918, Box 1795, NM-91, Entry 406, RG120, NARA.

All of this leads to two inescapable conclusions. First, that although Bullock and Lyons are correct to assert that George Squier was instrumental in championing the Signal Corps' agenda, particularly with regards to wireless development, without the technical assistance, training, doctrine and equipment acquired from the British and French, no AEF signal unit would have reached the high state of maturity and efficiency that some British and French units attained by the end of the war.⁴⁴ On the whole, however, it was the judgement of the official historian that 'the United States began and completed its role in the 1917-1918 war without reaching a development in... combat communications... comparable to that of France or Great Britain'.⁴⁵

Secondly, if the Americans, with all the technical, doctrinal and material support of their allies, could not furnish their forces with modern CW wireless-telephones within the 17-month period between 'proof of concept' (June 1917) and the armistice (November 1918), why should the British be denigrated for failing to do so within the four month period between the February 1916 test and the opening day of the Battle of the Somme? Although the US did undoubtedly out-produce the British when it came to CW wireless sets, the US army did not immediately equip its troops with the most modern wireless-telephone communications, as Bullock and Lyons would have us believe, and the inclusion of any developments after 11 November 1918 is both inadmissible and irrelevant to a debate concerning the wartime application of wireless.⁴⁶

Book

Having provided counterarguments and clarification to the judgements in their debate article, it is now necessary to turn attention to Bullock and Lyons' book, *Missed Signals on the Western Front*, and provide further justification for my original contention that it offers little in the way of fresh information or new interpretation. Three issues in particular will be highlighted: first, the authors' dependence upon secondary sources instead of solid archival research; second, the authors' tendency to focus upon technology to the detriment of other, more important, factors; and, third, the book's reliance upon dubious counterfactuals. Before these points can be explored, however, some additional context is needed.

Given that tenuous communications lay at the heart of the British army's difficulties in conducting successful operations on the Western Front, it is surprising that *Missed Signals on the Western Front* represents the only book-length study on the subject since Raymond Priestley's 1921 work *The Signal Service in the European War of 1914 to 1918 (France)*.⁴⁷ One of the main reasons for this is that Priestley's dry and rather complex work has acted as a deterrent to historians. As the late Paddy Griffith opined, although 'revealing and informative', it is 'positively the most impenetrable book ever written on the war'.⁴⁸ Thus, as Bullock and Lyons state in the preface, the first purpose of their book is to explore 'all of the aspects of British signals in the war, which Priestley

⁴⁴ For a similar judgement with regards to the AEF's use of artillery, see Mark E. Grotelueschen, *Doctrine Under Trial: American Artillery Employment in World War I* (Wesport, C.T.: Greenwood Press, 2001), p.143.

⁴⁵ Terrett, *Signal Corps*, p.16.

⁴⁶ Bullock and Lyons, 'Response', pp.243-44.

⁴⁷ Raymond E. Priestley, *Work of the Royal Engineers in the European War, 1914-19: The Signal Service (France)* (Chatham: W. & J. Mackay, 1921).

⁴⁸ Paddy Griffith, *Battle Tactics of the Western Front: The British Army's Art of Attack 1916-18* (New Haven: Yale University Press, 1994), p.266.

attempted to do’, but ‘in a clearer and more understandable narrative’. The second, and main, objective of the book, however, is to demonstrate that not only did the high command fail to exploit the full potential of wireless technology, but that had it done so, ‘from the summer of 1916 onwards, the military objectives of the British army on the Western Front could have been reached more quickly and at a far less cost in lives’, and thus ‘the whole complexion of the war would have changed’.⁴⁹ That the authors succeed in writing a much easier and understandable account than Priestley’s is not in doubt, nor have I ever called into question their scientific expertise. It is their inability to provide a well-researched, balanced and credible assessment of the influence of communications on British military operations that I take issue with.

Firstly, an historian is only as good as his or her sources. The most important recent studies of the British army and the First World War have been underpinned by the kind of meticulous and painstaking archival detective work that the academic community has come to expect of its military historians.⁵⁰ Although it makes some use of unpublished official records,⁵¹ *Missed Signals on the Western Front* relies often upon Priestley for its source material. For example, 17 of the 25 footnotes in chapter 9, which examines communications in 1918, cite Priestley as the principal source. Bullock and Lyons defend this methodology, arguing ‘its appearance with great frequency as a source in the footnotes is not only unavoidable but absolutely essential’, claiming ‘it is the only significant and contemporary source available’.⁵² This is questionable, in light of the wealth of primary material, such as unit war diaries, private and official military and government correspondence, files and memoranda, contained within public and private archives across the English-speaking world. Indeed, due to the erratic preservation of documents in UK archives relating to the BEF’s communications system, there are notable gaps in the records which can nonetheless be filled by making use of copies held in the Australian and Canadian archives.⁵³ The files of the AEF held at the National Archives and Records Administration also contain detailed reports and correspondence relating to the inner-workings of the BEF’s communications system which, as I have already shown, the Americans studied and copied to good effect in 1917-18.⁵⁴ Bullock and Lyons do not make use of these non-UK archives, depending instead upon a limited selection of British archival material, dated regimental histories and secondary sources. In fact, chapter 11, which examines the BEF’s command and control system, does not make use of any archival sources, relying instead upon the judgements of historians such as Tim Travers and Martin van Creveld.⁵⁵

This is not to say that Priestley cannot be a useful source. He is particularly valuable, for instance, in terms of mapping the compositional changes that occurred within army,

⁴⁹ Bullock and Lyons, *Missed Signals*, pp.1-2, 194.

⁵⁰ 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); Jim Beach, *Haig’s Intelligence: GHQ and the German Army, 1916-1918* (Cambridge: Cambridge University Press, 2013).

⁵¹ Some use is made of unpublished official records held at the UK National Archives and private papers from the Imperial War Museum, London, the Royal Corps of Signals Library and Museum, Blandford, and the Royal Engineers Museum, Chatham.

⁵² Bullock and Lyons, *Missed Signals*, p.5.

⁵³ Records of the Australian Imperial Force, AWM4/25/27, Australian War Memorial, Canberra; Records of the Canadian Expeditionary Force, RG9, Library and Archives Canada, Ottawa.

⁵⁴ Records of the American Expeditionary Force, RG120, National Archives and Records Administration, Maryland.

⁵⁵ Bullock and Lyons, *Missed Signals*, pp.150-66.

corps and divisional signal companies as the war progressed.⁵⁶ Nevertheless, despite being the standard starting point for historians wishing to learn more about British military communications during the First World War, Priestley's account contains neither references nor a bibliography. Consequently, details pertaining to individual units, signal companies, key commanders and signal officers are more often than not conspicuously absent. Given that it was published only three years after the war ended, the desire to maintain a degree of anonymity can be forgiven. However, military historical writing based upon this aged regimental history approach will no longer suffice. Wide-ranging and detailed archival research is required in order to provide serious analysis. Bullock and Lyons do manage to provide some answers, but because the archival sources have not been properly examined, their reliance upon Priestley leads to an all-too-familiar narrative.

For example, during the examination of the fighting on the Somme in 1916, the reader is informed that casualties to battalion signallers 'were often as high as 50 percent in a single action', but the reference to Priestley sheds no further light on exactly which battalions or which actions.⁵⁷ Likewise, during the March 1918 retreat we are told 'one division established 5 HQs within 5 miles over 6 days while another had 14 HQs within 16 miles over 3 days!' Again, the reference to Priestley does not help clarify exactly which divisions are being referred to.⁵⁸ Finally, when archival sources are deployed, they are used rather sparingly. The authors inform the reader that the role played by communications during the Battle of Cambrai in 1917 is 'comprehensively covered in the war diaries and reports of some of the major participants'.⁵⁹ Yet the only account of communications during the fighting that the authors draw upon comes from the war diary of the 51st Division Signal Company. This hardly seems comprehensive given that 14 infantry and 5 cavalry divisions, not to mention the Tank Corps, were engaged in the Cambrai fighting between 20 November and 7 December.⁶⁰

Two further examples illustrate how the authors' lack of engagement with archival sources undermines their methodology. First, when discussing the pre-war evolution of British army signals, Bullock and Lyons make reference to two important War Office committees that met in 1906 and 1911. Citing Priestley as their only source, the footnote declares that 'there is no other record of this committee or that of the 1911 committee'.⁶¹ A search at the National Archives in Kew, however, reveals the relevant files pertaining to these committees.⁶² The second example, and one that they repeat in their debate article, is the accusation that in 1915 'poor communications had not been identified [by the British army] as a key cause of battlefield failure and high casualties'. Bullock and Lyons reinforce their argument with the observation that remedying the communication difficulties 'was not a high priority in 1915'.⁶³ An examination of the archival record, however, casts doubt upon these judgements. The role played by tenuous

⁵⁶ See, for example, Priestley, *Royal Engineers*, appendices I-IV.

⁵⁷ Bullock and Lyons, *Missed Signals*, p.70; Priestley, *Royal Engineers*, pp.145-6.

⁵⁸ *Ibid.*, p.118; *ibid.*, p.266.

⁵⁹ *Ibid.*, p.100.

⁶⁰ Bryn Hammond, *Cambrai 1917: The Myth of the First Great Tank Battle* (London: Weidenfeld and Nicolson, 2008), pp.447-53.

⁶¹ Bullock and Lyons, *Missed Signals*, p.26, fn. 4.

⁶² 'Report of the Committee Appointed to Inquire into the Organisation of the Corps of Royal Engineers together with Evidence and Appendices, 1906', WO32/6805; 'Report of the Inter-Departmental Committee on Postal and Telegraph Services, 1911', WO32/11396, TNA.

⁶³ Bullock and Lyons, *Missed Signals*, p.60; Bullock and Lyons, 'Response', p.237.

communications in contributing to the failure of the BEF's first major offensive of 1915, the Battle of Neuve Chapelle in March, for example, was not lost on the high command,⁶⁴ especially not Haig, then GOC First Army, nor his IV Corps commander Lieutenant-General Sir Henry Rawlinson.⁶⁵ Furthermore, if establishing a secure and efficient communications system was not a major priority for the army in 1915, how do Bullock and Lyons explain the establishment of the Carrier Pigeon Service in June,⁶⁶ the initial experiments with portable wireless sets during the summer,⁶⁷ and the increase of the standardised depth of frontline buried cable routes from 2 feet 6 inches to 5 feet by the end of the year?⁶⁸

Bullock and Lyons are also inclined to view the BEF's communications system largely via the prism of technology. Indeed, one could argue that the focus upon technology has been the dominant tendency amongst what little has been written on the subject.⁶⁹ In the context of more recent academic debates, however, there has been growing scepticism surrounding arguments of technological determinism in war and of methodological approaches that privilege technological factors over cultural, doctrinal and organisational issues.⁷⁰ This is not to deny the importance of technology when examining British military communications during the First World War, rather that Bullock and Lyons' fixation with technology, CW wireless in particular, makes for a rather distorted and unbalanced assessment of the BEF's communications system, at the expense of other, arguably more important, issues.

Crucially, it is the way in which new technology is harnessed and what effect it has upon warfare that matters most, rather than the technology itself. Military history is replete with examples of new, supposedly 'game-changing', technologies which did not on their own prove decisive.⁷¹ What matters is the manner in which new technology is integrated within existing military structures and, crucially, to what extent military thinking and organisation adapts in order to exploit the full potential of new hardware.⁷² Had the BEF employed wireless-telephones from 1916 onwards, Bullock and Lyons

⁶⁴ 'Report on Action at Neuve Chapelle', 22 March 1915, WO158/258; 'Control of Fire during the Operations 10th-16th March 1915', n.d., First Army War Diary, WO95/154, TNA. For additional context, see Robin Prior and Trevor Wilson, *Command on the Western Front: The Military Career of Sir Henry Rawlinson, 1914-1918* (Oxford: Blackwell, 1992), pp.44-73.

⁶⁵ Haig Diary, 11 March 1915, WO256/3, TNA; Rawlinson Diary, 10 March 1915, General Lord Rawlinson Papers, RWLN1/1, Churchill Archives Centre (CAC), Cambridge.

⁶⁶ 'Organisation of a Carrier Pigeon Service for the Armies in France', 28 August 1915, RE Carrier Pigeon Service War Diary, WO95/123, TNA.

⁶⁷ Hall, 'British Army', p.298.

⁶⁸ 'Director of Army Signals. Circular Memorandum No. 47', 24 July 1915, Maps and Papers Relating to the Service of Signal Companies of 2nd and 20th Division During the Great War, Imperial War Museum (IWM); Brigadier-General J.E. Edmonds, *Military Operations, France and Belgium, 1916*, Vol. 1 (London: HMSO, 1932), p.69.

⁶⁹ See, for example, Bill Rawling, 'Communications in the Canadian Corps, 1915-1918: Wartime Technological Progress Revisited', *Canadian Military History* 3 (1994), pp.6-21.

⁷⁰ Jeremy Black, *Rethinking Military History* (London: Routledge, 2006), pp.104-24; Matthew Hughes, 'Technology, Science and War', in Matthew Hughes and William J. Philpott (eds.), *Palgrave Advances in Modern Military History* (London: Palgrave Macmillan, 2006), pp.231-57; Hew Strachan, *The Direction of War: Contemporary Strategy in Historical Perspective* (Cambridge: Cambridge University Press, 2014), pp.166-92.

⁷¹ George Raudzens, 'War-Winning Weapons: The Measurement of Technological Determinism in Military History', *Journal of Military History* 54 (1990), pp.403-34.

⁷² Williamson Murray, *Military Adaptation in War: With Fear of Change* (Cambridge: Cambridge University Press, 2011).

maintain, ‘instead of basing plans on the stationary and highly vulnerable telephone system, as happened on the Somme, the staff planners would have been freed to implement what made sense militarily. Operations would have been based on achieving mission objectives instead of being designed around the layout of the fixed communication system’.⁷³ But this would have entailed a radical overhaul of the British army’s command philosophy – a crucial issue that Bullock and Lyons do not explore in any significant detail.⁷⁴ In short, finding a solution to the intractable problems caused by tenuous communications required more than simply adding new technology to the equation.

Another factor that has a profound influence on how successful technology performs in war is the way in which an adversary responds to counter new developments. In war, the introduction of a new, supposedly decisive, technology by one side invariably forces an opponent to develop effective countermeasures. With both sides entering into a cycle of copying, countering and checking new technologies, any advantages tend to be fleeting.⁷⁵ Part of the reason why tanks were not war-winners for the British during the First World War, for example, was because the Germans countered them by developing better anti-tank weapons and defences.⁷⁶ With regards to wireless telephones, in light of what the Germans had been doing throughout the war, it seems reasonable to assume that they would have responded by implementing countermeasures such as jamming British wireless signals.⁷⁷ Bullock and Lyons acknowledge this potential scenario, but argue that German attempts to jam CW signals would have amounted to little because ‘talented engineers on the British side would have found a way to get around it’.⁷⁸ Such wishful thinking not only ignores the difficulties that enemy and friendly jamming did actually have upon British CW wireless signals in 1918 but, more significantly, underestimates the impact that this countermeasure would have had upon wireless telephones.⁷⁹ Indeed, Henry Round acknowledged after the war that had Prince’s wireless telephone sets been employed within the RFC, ‘the immediate answer of the enemy... would have been to fit their fighting flights with... jamming outfits. Our own flights... would have been at once at a disadvantage and I could see no immediate technical answer to their jamming’.⁸⁰

⁷³ Bullock and Lyons, *Missed Signals*, p.13.

⁷⁴ Tim Travers, *The Killing Ground: The British Army, the Western Front and the Emergence of Modern War 1900-1918* (London: Unwin Hyman, 1987), pp.85-126; Martin Samuels, *Command or Control? Command, Training and Tactics in the British and German Armies, 1888-1918* (London: Frank Cass, 1995), pp.34-60, 94-123.

⁷⁵ Black, *Rethinking*, p.110; Hughes, ‘Technology’, p.232.

⁷⁶ Jim Beach, ‘Scouting for Brigands: British Tank Corps Reconnaissance and Intelligence, 1916-1918’, in *Genesis*, pp.127-33.

⁷⁷ Cusins, ‘Development’, p.769; ‘Communications of XIXth Corps During Operations March 21st-April 4th, 1918’, n.d., XIX Corps Signal Company War Diary, WO95/970, TNA.

⁷⁸ Bullock and Lyons, *Missed Signals*, p.180.

⁷⁹ Although CW signals were less susceptible to jamming than spark wireless signals, they were not totally immune. See ‘Signals Fourth Australian Divisional Artillery. Lessons Learned from Communications during Operations Commencing 8/8/18’, 21 August 1918, AWM4/22/14/30, AWM; 1 Australian Division Signal Company War Diary, 29 September 1918, WO95/3198, ‘Resume of W/T Work’, AIR1/2217/209/33/6, TNA.

⁸⁰ Quoted in Prince, ‘Wireless Telephony’, pp.384-5.

Ultimately, as one prominent historian of strategy has so eloquently put it, ‘better golf clubs help the game only of good golfers’.⁸¹ The success of technology in war depends upon the critical human factor: who these people are, how well led, well-motivated and well trained they are, and how effectively they are organised. With the exception of snippets of biographical information on some of the top engineers associated with CW wireless, *Missed Signals on the Western Front* tells us very little about the officers and men who were ultimately placed in charge of the technology on the battlefield. This includes not only the personnel of the Signal Service, whose task it was to provide and maintain the BEF’s communications system, but also the commanders and staff officers who acted as the system’s main consumers. Thus, as important as technology was, it was but one element within the confines of a much larger and intricate communications system which also involved the key elements of personnel, doctrine and organisation, and the integral processes of staff work and command. A more holistic approach, examining the interaction of all these factors, is required in order to understand fully the BEF’s communications system and its influence upon operations.⁸²

The third, and final, key theme in Bullock and Lyons’ work is their embracing of counterfactual history. This is a subject that divides scholarly opinion, with those at one end of the spectrum, such as Richard Evans, arguing that counterfactual approaches lack academic rigor, are ‘crudely simplistic and desperately unsophisticated’,⁸³ and those at the opposite end, such as Niall Ferguson, who have endeavoured to lend historical respectability to the counterfactual genre.⁸⁴ The important point made by those who support the latter view is that counterfactuals can only be a useful tool for understanding the past if historians adhere to a number of prerequisites, including: demonstrating a clear understanding of the historical context in which the counterfactual takes place; displaying a firm grasp of the relevant primary sources and historiography; an ability to deploy good supporting evidence from these sources in order to lend credibility to their counterfactual assertions; a due modesty on the part of the historian as to what is and what is not plausible; and, consistency in the form of a ‘minimum rewrite rule’.⁸⁵

Although *Missed Signals on the Western Front* contains three counterfactual chapters which attempt to show how much more successful and less costly the battles of the Somme (1916), Third Ypres and Cambrai (1917), and the German spring offensive and Allied Hundred Days’ campaign (1918) would have been had the BEF employed proficient, man-portable wireless-telephone sets, the authors devote just one chapter to an examination of how wireless was actually employed. The Somme counterfactual contains no less than 24 consecutive ‘Ibid.’ references to a single secondary source,

⁸¹ Colin S. Gray, *Weapons for Strategic Effect: How Important is Technology?* Occasional Paper No. 21 (Maxwell Air Force Base, Centre for Strategy and Technology Air War College, January 2001), p.36.

⁸² See this author’s forthcoming *Communications and British Operations on the Western Front, 1914-1918* (Cambridge: Cambridge University Press).

⁸³ Richard J. Evans, “‘What If’ is a Waste of Time”, *The Guardian*, 13 March 2014, <http://www.theguardian.com/books/2014/mar/13/counterfactual-history-what-if-waste-of-time> [Accessed 29 April 2016]. For a fuller critique, see Richard J. Evans, *Altered Pasts: Counterfactuals in History* (London: Little, Brown, 2014).

⁸⁴ Niall Ferguson (ed.), *Virtual History: Alternatives and Counterfactuals* (London: Picador, 1997), esp. pp.1-90.

⁸⁵ Richard N. Lebow, ‘Counterfactual Thought Experiments: A Necessary Teaching Tool’, *The History Teacher* 40 (2007), pp.153-76.

while Leon Wolff's very dated *In Flanders Fields* [1959] is the principal source of inspiration for the Third Ypres counterfactual.⁸⁶ These weaknesses are compounded by a number of factual errors.⁸⁷

Further undermining the integrity of these chapters is the fact that each concludes with a very similar set of sweeping statements about how wireless-telephones 'could have' and 'would have' restored command and control to the battlefield 'with nothing but positive results'.⁸⁸ Such judgements fail to take into account a whole range of other factors that had an equal, if not more important, bearing upon the conduct of the BEF's operations. For example, the authors confidently assert that during the summer and autumn of 1918 the use of wireless telephones would have enabled the Allies to turn the German retreat into a rout because 'Allied units would have had in hand the means to communicate under mobile conditions and to ensure that their advance stayed close on the heels of the retreating German Army. The faster they moved the more rapidly the Germans would have had to move, losing any semblance of cohesion and control'.⁸⁹ Such an interpretation ignores the immense and growing logistic challenges that the British and their allies faced as their advance continued, a factor that recent studies have been at pains to stress.⁹⁰

The other key factor that Bullock and Lyons underestimate is wireless security. The interception of enemy wireless signals, as well as the protection of one's own, became an important preoccupation of both sides during the war.⁹¹ Bullock and Lyons argue that concerns regarding the interception of wireless signals were 'a convenient excuse for the Army's lack of interest'.⁹² Again, the historical evidence does not fully support their assertion. As one signal officer noted after the war, 'the Germans possessed a very complete system of intercepting stations, with a staff of expert deciphers'.⁹³ German direction finding methods could also pinpoint the location of transmitting British wireless sets and supply the artillery with the necessary coordinates. During the closing stages of the Third Ypres campaign, for instance, the Canadian Corps' wireless directing station was repeatedly destroyed; it being 'very evident that the enemy was ranging the station by means of a compass set. Whenever the station began sending, the enemy started to shell'.⁹⁴ Rather than a 'convenient excuse', the concerns some British officers had towards wireless insecurity were genuine and, in many respects,

⁸⁶ Bullock and Lyons, *Missed Signals*, pp.76-86, 107-14.

⁸⁷ The Somme counterfactual, for instance, states that it was the British XII Corps, consisting of the 18th and 39th Divisions, which attacked along the far south of the British line on 1 July, whereas it was in fact XIII Corps, comprising the 18th and 30th Divisions. See *Ibid.*, p.79.

⁸⁸ *Ibid.*, pp.86, 111.

⁸⁹ *Ibid.*, p.149.

⁹⁰ Ian M. Brown, *British Logistics on the Western Front 1914-1919* (Westport, CT.: Praeger, 1998), pp.200-40; Boff, *Winning and Losing*, pp.80-91.

⁹¹ John Ferris (ed.), *The British Army and Signals Intelligence during the First World War* (Stroud: Alan Sutton, 1992); Beach, *Haig's Intelligence*, pp.155-67.

⁹² Bullock and Lyons, *Missed Signals*, p.172.

⁹³ Schonland, 'W/T. R.E.', p.453. The BEF also experienced similar problems with regards to frontline telephone interception. See Graeme Gooday, 'Combative Patenting: Military Entrepreneurship in First World War Telecommunications', *Studies in History and Philosophy of Science* 44 (2013), pp.247-58.

⁹⁴ 'General Report on Wireless Telegraph Communication in the Canadian Corps, Feb. 1915-Dec. 1918', 16 April 1919, RG9-III-D-3, Vol. 5058, Folder 968, LAC.

understandable, hence one of the main reasons why security procedures, such as encryption, were often vigorously enforced.⁹⁵

But at least wireless-telegraphy messages could be encrypted. The technology for ‘scrambling’ wireless-telephony would not be available until the 1930s, and even by the end of the Second World War it was still too cumbersome to be employed on the battlefield.⁹⁶ Theoretically, a paper-based encryption method, such as the Anglo-American SLIDEX system of 1944-45, could have been employed. But not only would the time taken to encrypt and decrypt the messages have undermined the speed advantage of the voice link, such methods were also very insecure.⁹⁷ Thus, not only would the BEF’s wireless-telephone sets have been prone to enemy jamming, the conversations that took place via this medium would also have been highly vulnerable to enemy interception. Bullock and Lyons dismiss the significance of this issue, stating that ‘if the enemy gathered such information but was unable to react to it in a timely way, the negative consequences [would have been] minimal’.⁹⁸ The experiences of the British army in the Second World War, however, do not support this judgement. According to the most authoritative study yet, wireless-telephone insecurity remained a considerable problem throughout the war and undoubtedly contributed to some of the army’s most notable setbacks in the Western Desert, the Italian campaign and in Northwest Europe.⁹⁹

Overall, although their work has some merits, it would seem that Bullock and Lyons push their line of argument too far, beyond the available evidence and contrary to the findings of recent academic studies. Simon Godfrey has shown that it took until the 1944 campaign in Northwest Europe before the British army finally possessed wireless-telephones of reliable effective capability. But even then, he argues, armour-infantry communication remained problematic, while infantry wireless communication below battalion level continued to be unreliable until the end of the Second World War.¹⁰⁰ To argue that the nascent CW wireless technology of the First World War ‘could have’ and ‘would have’ enabled the British army to do what its counterpart over 25 years later could only just about manage is difficult to sustain. Whatever the *potential* of CW wireless-telephony, its *capability* in 1914-18 was limited.

Conclusion

The work of Bullock and Lyons essentially paints the history of British army wireless during the era of the First World War as a struggle between innovative, forward-thinking engineers on the one hand and an ignorant, reactionary military organisation

⁹⁵ This point is further reinforced by the SIGINT successes of the BEF which provided ‘very reliable but low-level information [on the German army] that was a significant augmentation of the other frontline [intelligence] sources’. Beach, *Haig’s Intelligence*, p.167.

⁹⁶ Major-General R.F.H. Nalder, *The History of British Army Signals in the Second World War* (London: Royal Signals Institution, 1953), pp.163-68.

⁹⁷ John Ferris, ‘The British “Enigma”: Britain, Signals Security and Cipher Machines, 1906-1953’, in Robert Ferris (ed.), *Intelligence and Strategy: Selected Essays* (London: Routledge, 2005), pp.157-68.

⁹⁸ Bullock and Lyons, *Missed Signals*, p.178.

⁹⁹ Simon Godfrey, *British Army Communications in the Second World War: Lifting the Fog of Battle* (London: Bloomsbury, 2013), pp.213-27.

¹⁰⁰ *Ibid.*, pp.223-7. See also: David French, *Raising Churchill’s Army: The British Army and the War against Germany 1919-1945* (Oxford: Oxford University Press, 2001), pp.165-7, 270-1; John Buckley, *Monty’s Men: The British Army and the Liberation of Europe* (London: Yale University Press, 2014), pp.78-9, 227.

on the other. Nothing could be further from the truth. Although there were undoubtedly individuals who did not take to wireless, the British high command was, for the most part, remarkably open to innovation. Haig's attitude towards wireless, for instance, was as encouraging as could reasonably have been expected given the technology's limitations in the early twentieth century. That the BEF decided to channel its efforts into the development of CW wireless-telephony mainly for inter-aeroplane communication does not make the high command 'institutionally biased'.

The notion of a lost opportunity for the BEF to have conducted its operations in a more successful and less costly manner is also dangerously misleading and simplistic. Wireless, even CW wireless, suffered from a number of inherent problems that made its use within the unique battlefield environment on the Western Front highly problematic. Its vulnerability to jamming, interception and damage from enemy fire was clearly demonstrated during the final months of the war. And yet the ability of the British to exploit CW wireless during the last year of the war, especially with regards to counter-battery, RAF and tank communications, was a remarkable achievement, certainly in comparison to the German army who did not employ such technology. Indeed, a Canadian Corps intelligence report in August 1918 put the state of the BEF's wireless technology a year ahead of the German army's.¹⁰¹ Evidence to support this judgement comes in the form of a captured German document, dated 1 June 1918, in which the high command admitted to having 'not so far been successful in constructing a continuous wave wireless apparatus', and therefore ordering German troops to 'salve further enemy wireless apparatus' from the wreckage of aircraft.¹⁰² Although the BEF's ability to develop and employ wireless might not have been perfect, it was, in the end, better than that of its opponent and just as successful as its American ally.

Thus, it is not necessarily that Bullock and Lyons' conclusion, that 'the British army did not modernize its communication system when it could have', is 'a harsh judgement'.¹⁰³ Rather, it is that their conclusion is fundamentally wrong. In light of the constraints imposed by the unique characteristics of the Western Front, the limitations of the technology at the time and the finite resources available, it is difficult to see how much more 'modern' the BEF's communications system could have been.

¹⁰¹ 'Wireless Intelligence Summary, German Field Stations, August 10th to August 16th (inclusive)', August 1918, RG9-III-D-3, Vol. 5004, Folder 687, LAC.

¹⁰² 'Translation of a German Document', 1 June 1918, AIR1/2217/209/33/6, TNA.

¹⁰³ Bullock and Lyons, 'Response', p.249.