

# The Nervous Flyer: Nerves, Flying and the First World War<sup>1</sup>

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## ABSTRACT

This is not an article about 'shell-shock'. It explores the military medical response to nervous disorders in the Royal Flying Corps. The First World War exposed the propensity of pilots to the nervous and psychological rigours of aerial warfare, but their unique experiences have been overlooked in favour of 'trauma' in infantrymen. This represents a critical lacuna in the historiography of military medicine, for flying personnel were studied apart from 'shell-shocked' soldiers. This article will show that flyers were believed to be medically different, and what set them apart from men in the trenches was their unique employment. The war necessitated, and provided the conditions for, the study of the medical problems of flying, including the significant nervous strains. Medical officers quickly established that flying not only affected bodily functions, but also 'wore down' the nerves that regulated psychological responses. This article will therefore present the medical view. It will study the research of air-minded medical officers and the conclusions reached on the nervous disorders of flying personnel.

## Introduction

Few events in British history have resonated as profoundly as the First World War (1914-18). Tales of the Somme and Passchendaele are popularly recounted with regret, pity, and above all, sadness – especially in the last four

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years.<sup>2</sup> But soaring above the mud and mass casualties was the ‘heroic’ pilot of the Royal Flying Corps (RFC). Duelling in the clouds, he was the last vestige of chivalry, the sheer embodiment of valour and athleticism, and the very best that the public school had to offer.<sup>3</sup> It is not difficult to understand that combat in the air, in machines at the forefront of technology, appeared more captivating than the daily slog of trench warfare, and the clean, handsome, and brave aviator was easy to glamorise. The ‘cavalry of the clouds’ were popularly regarded as ‘supermen’, possessing ‘nerves of steel’, and superiority of body and mind.<sup>4</sup> As these clichés have become embedded in the national memory of the air war, the human dimension is often overlooked or reduced to the experiences of the ‘aces’.<sup>5</sup> This article will therefore strip back the veneers of pageantry, masculinity, and elitism to examine flyers for what they actually were: men who were physically and mentally vulnerable to the rigours of the air war.

Pilots of the RFC frequently complained of ‘nerves’ during the First World War. ‘Nerves’ was a medical term and a linguistic trope simultaneously, with distinct yet inter-related meanings. On the one hand, the nerves were a physical part of the human body – bundles of fibres that produced bodily functions, namely the internal and external senses, and the involuntary action of the muscles. These somatic nerves could experience shattering physiological

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<sup>2</sup> This is very much reflected in the titles of recent trade histories. E.g. Alexandra Churchill, Andrew Holmes and Jonathan Dyer, *Passchendaele: 103 Days in Hell* (London: Helion, 2017).

<sup>3</sup> This perspective has shaped certain scholarly accounts. E.g. Michael Collins, ‘A fear of flying: diagnosing traumatic neurosis among British aviators of the Great War’, *First World War Studies*, Vol. 6, Iss. 2 (2015), pp. 187-202.

<sup>4</sup> Views with an enduring impact. E.g. Martin Francis, *The Flyer: British Culture and the Royal Air Force*, (Oxford: Oxford University Press, 2011); Mark Wells, *Courage and Air Warfare: The Allied Air Experience of the Second World War*, (London: Frank Cass, 1995).

<sup>5</sup> A notable exception: Maryam Philpott, *Air and Sea Power in WWI: Combat and Experience in the Royal Flying Corps and Royal Navy*, (London: I.B. Tauris, 2013). The most famous fighter aces, Mick Mannock and Albert Ball, are often remembered for their psychological state. E.g. Adrian Smith, *Mick Mannock, Fighter Pilot: Myth, Life and Politics*, (Basingstoke: Palgrave, 2001); Walter Briscoe and H. Russell Stannard, *Britain’s Forgotten Fighter Ace: Captain Albert Ball VC*, (Amberley: Amberley Publishing, 2014).

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changes, which led to physical and psychological collapse.<sup>6</sup> The resulting 'nervous disorders' were therefore understood as diseases of bodily function, of which psychological manifestations were the product. Such conditions were well-known to the army for the service had negotiated their effects in the wars of the nineteenth century. During the Napoleonic Wars (1803-15), for instance, medical officers dealt with the problems of 'windage' and associated cerebro-spinal shock. Characterised by twitching and partial paralysis, this disorder was not unlike the first cases of 'shell-shock' in the First World War.<sup>7</sup> But the medical study of the nerves was not an exact science. Neither military nor civilian doctors could decide upon a formal definition, and its imprecision was therefore conducive to its adoption by laymen. Nerves ultimately came to characterise an emotion experienced in times of heightened tension. The official history of *The War in the Air* described flying as a 'nervous business' and for many, it was.<sup>8</sup> Perhaps the most famous 'nervous' pilot was Major Edward 'Mick' Mannock who expressed fear that his nerves were 'getting the better of him'.<sup>9</sup> Nerves were widespread in the Corps with at least 3,149 personnel receiving treatment for nervous disorders. This figure may appear negligible, but it represented 13 per cent of all RFC casualties seen by medical boards.<sup>10</sup> But historically and historiographically, the nervous conditions of flyers have been overshadowed by the proliferation of mental disturbances in infantry soldiers.

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<sup>6</sup> See Oppenheim's seminal study: Janet Oppenheim, *Shattered Nerves: Doctors, Patients, and Depression in Victorian England*, (Oxford: Oxford University Press, 1991).

<sup>7</sup> Edgar Jones and Simon Wessely, 'The origins of British military psychiatry before the First World War', *War and Society*, Vol. 19, Iss. 2 (2001), p. 91.

<sup>8</sup> Walter Raleigh, *The War in the Air: Being the Story of the Part Played in the Great War by the Royal Air Force*, vol. 1, (Oxford: Clarendon Press, 1922), p. 253.

<sup>9</sup> Mannock discussed nerves frequently in his diary: Frederick Oughton, *The Personal Diary of 'Mick' Mannock, VC, DSO (2 bars), MC (1 bar), Royal Flying Corps and Royal Air Force*, (London: Neville Spearman Ltd., 1966).

<sup>10</sup> Statistical information on nervous disorders in RFC personnel is based upon the examination and manual quantification of the RFC Medical Board Record Cards curated by the RAF Museum, London (hereafter RAFM). This collection is currently uncatalogued.

'Shell-shock' has become the 'signature' disorder of the First World War.<sup>11</sup> It is often situated within a 'genealogy of trauma'; marked out as the moment in history from where there was a gradual recognition of the psychological toll of modern warfare.<sup>12</sup> This awkward syndrome has attracted significant scholarly attention and we now have a rich historiography that examines this complex diagnosis from every conceivable angle.<sup>13</sup> 'Traumatised' infantrymen are at the centre of accounts and their experiences have been examined extensively, often to the exclusion of others. Within the many psychological studies, the flyer is conspicuously absent; there are only two major exceptions. Military historian Allan D. English set the psychological care of flyers within a broader genealogy, beginning in the First World War and ending in the establishment of 'lack of moral fibre' policy in 1940.<sup>14</sup> In doing so, he implied

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<sup>11</sup> Richard Holmes, *Tommy: The British Soldier on the Western Front, 1914-1918*, (London: Harper Perennial, 2005), p. 485.

<sup>12</sup> Loughran criticises this approach, for it removes this diagnosis from its time and place: Tracey Loughran, *Shell-Shock and Medical Culture in First World War Britain*, (Cambridge: Cambridge University Press, 2016), pp. 1-25. For the 'genealogy of trauma', see: Ben Shephard, *A War of Nerves: Soldiers and Psychiatrists, 1914-1994*, (London: Pimlico, 2002); Edgar Jones and Simon Wessely, *Shell Shock to PTSD: Military Psychiatry from 1900 to the Gulf War*, (Hove: Psychology Press, 2005); Hans Binneveld, *From Shellshock to Combat Stress: A Comparative History of Military Psychiatry*, (Amsterdam: Amsterdam University Press, 2014).

<sup>13</sup> Accounts engage with the incidence and treatment of this condition; medical culture; the paradigmatic shift from functional to psychological understandings, issues of gender, masculinity, and ideals of heroism; and notions of class, discipline, and societal impact. For a representative sample, see: Eric Leed, *No Man's Land: Combat and Identity in World War I*, (Cambridge: Cambridge University Press, 1979); Elaine Showalter, *The Female Malady: Women, Madness and English Culture, 1830-1980*, (London: Virago, 1987); Joanna Bourke, *Dismembering the Male: Men's Bodies, Britain and the Great War*, (London: Reaktion Books, 1996); Anthony Babington, *Shell Shock: A History of Changing Attitudes to War Neurosis*, (Barnsley: Pen and Sword, 2003); Peter Barham, *Forgotten Lunatics of the Great War*, (New Haven: Yale University Press, 2004).

<sup>14</sup> For lack of moral fibre in the Second World War, see: John McCarthy, 'Aircrew and 'Lack of Moral Fibre' in the Second World War', *War and Society*, Vol. 2, Iss. 2 (1984), pp. 87-101; Allan English, *The Cream of the Crop: Canadian Aircrew, 1939-1945*, (Montreal: McGill University Press, 1996), ch.4; Wells, *Courage and Air Warfare*, ch.8; Sydney Brandon, 'LMF in Bomber Command: Diagnosis or Denouncement?', German Berrios and Hugh Freeman (eds.), *150 Years of British Psychiatry: The Aftermath*, vol.II, [www.bjmh.org.uk](http://www.bjmh.org.uk)

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that ‘clinical aviation psychology’ served a predominantly disciplinary function.<sup>15</sup> He examined neurological and physiological studies into the nature of ‘psychological’ casualties, and criticised doctors for their focus on physical causes, rather than emotional.<sup>16</sup> But English did not recognise that ‘psychobiological’ understandings of breakdown were the mainstream, which accounted for bodily conceptions, and sadly, he failed to engage with the occupation of flying itself, which provided a clear rationale for their focus.<sup>17</sup> Most recently, Michael Collins, an historian of culture and technology, extended this disciplinary view in ‘A fear of flying: diagnosing traumatic neurosis in aviators of the Great War’; an article that neither engages with a ‘fear of flying’ nor the diagnosis of ‘traumatic neurosis’. As this article will show, traumatic neuroses were not commonly diagnosed in flying personnel. Instead, he presents a study of masculinity in the RFC, in which he argues that the War Office and military medical professionals perceived ‘psychological breakdown’ as a failure in moral character. His study, however, is based upon limited medical evidence, and he fails to engage with major contemporary studies that significantly challenge his thesis.<sup>18</sup> This article will examine these important official sources.

As notions of psychological ‘trauma’ and ‘shell-shock’ have become firmly embedded in the scholarly psyche, it is important to stress from the outset that this is not a study of ‘shell-shock’ or ‘trauma’ in flyers. To frame the ‘nervous flyer’ in such terms would be ahistorical for matters of ‘shell-shock’

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(London: Gaskell, 1991), pp. 119-29; Edgar Jones, ‘LMF: The Use of Psychiatric Stigma in the Royal Air Force during the Second World War’, *Journal of Military History*, Vol. 70, Iss. 2 (2006), pp. 439-58; Lynsey Shaw Cobden, ‘Neuropsychiatry in the Management of Aerial Warfare: The Royal Air Force Neuropsychiatric Division in the Second World War’, (DPhil thesis, University of Oxford, 2015), ch.5.

<sup>15</sup> There was no science of ‘clinical aviation psychology’ in Britain during the First or Second World Wars. This would imply that Freudian psychology heavily informed the work of Royal Air Force specialists, which was not the case: Shaw Cobden, ‘Neuropsychiatry and the Management of Aerial Warfare’, ch.2.

<sup>16</sup> Allan English, ‘A Predisposition to Cowardice? Aviation Psychology and the Genesis of ‘Lack of Moral Fibre’, *War and Society*, Vol. 13, Iss. 1 (1995), pp. 15-34.

<sup>17</sup> E.g. Mark Jackson, *The Age of Stress: Science and the Search for Stability*, (Oxford: Oxford University Press, 2013), chs.1-3.

<sup>18</sup> Collins, ‘A fear of flying’, pp. 187-202.

and 'fear' were not discussed by doctors officially sanctioned to research flyers' conditions. While the RFC was part of the same 'shell-shocked' army, the diagnosis of this indeterminate syndrome was not common, accounting for only 2.5 per cent of RFC casualties.<sup>19</sup> Instead, medical officers believed that mental collapse was occasioned by unique circumstances. In medical terms, flyers were 'different' and what set them apart from traumatised soldiers was their peculiar employment. This article will show that the war necessitated, and provided the conditions for, the study of the unique medical problems of flying, including the significant nervous strains. Medical officers quickly established that flying not only affected bodily functions, but also 'wore down' the nerves that regulated psychological responses. This article will therefore present the medical view. It will study the research of air-minded medical officers and the conclusions reached on the nervous disorders of flying personnel. First, it is essential to situate the subject within the broader history of medicine and military aviation, for a lack of pre-war medical knowledge presented significant challenges to wartime medical officers.

### **Medicine and Military Aviation**

The First World War constituted a watershed in the history of military medicine. For the first time, casualties and deaths from bodily wounds vastly outstripped those from disease and starvation. The army recognised that the application of medical science to military problems was vital, for preventive and curative medicine sustained manpower economy, morale, and operational efficiency. Managerial reforms in the medical services allowed for the better observation of men and morale, and sophisticated arrangements for casualties reduced wastage.<sup>20</sup> Specialist medicine was at the heart of provisions, as expert knowledge guaranteed rational and efficient treatment, and effected returns to duty.<sup>21</sup> The conditions of war were also conducive to specialty development, as it provided large groups of patients, facilities, and the resources to support specialisation – the fields of cardiology, surgery, and psychiatry were notable

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<sup>19</sup> RAFM, RFC Medical Board Record Cards.

<sup>20</sup> Mark Harrison, *The Medical War: British Military Medicine in the First World War*, (Oxford: Oxford University Press, 2010), p. 7.

<sup>21</sup> Roger Cooter, *Surgery and Society in Peace and War: Orthopaedics and the Organization of Modern Medicine*, (Basingstoke: Palgrave Macmillan, 1993), p. 123.

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beneficiaries.<sup>22</sup> The First World War, argued Harrison, was therefore a ‘medical war’, with medicine touching and informing many aspects of military life, and ultimately contributing to Allied victory.<sup>23</sup>

In 1914, however, the Royal Army Medical Corps (RAMC) went to war with virtually no appreciation of the medical problems of flying. There was no formal science of ‘aviation medicine’ in Britain, and the first medical textbooks were based entirely upon wartime experiences.<sup>24</sup> Tentative groundwork had been laid in the nineteenth century, with physiologists, mountaineers, and balloonists offering their observations on the dual hazards of altitude and hypoxia (oxygen deprivation).<sup>25</sup> But there was relatively little scientific interest in either Europe or America, and this did not change, even after the birth of powered flight.<sup>26</sup> Flying was a gentlemanly pursuit, akin to hunting, horse-riding, or motorcar racing, which limited the pool of scientific subjects. What is more, the altitudes reached by early aircraft could be measured in hundreds of feet, which was not remotely close to the heights where hypoxia was experienced. Even when the importance of the aeroplane was recognised by the government, doctors did not envisage their role in the development of aeronautics. In 1909, for instance, a physician commented, ‘The science of aeroplaning has apparently but little to do with medical matters...’.<sup>27</sup> Consequently, no physical standards were laid down for aviation, and no medical examination was required for

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<sup>22</sup> E.g. Joel Howell, ‘Soldier’s Heart: The Redefinition of Heart Disease and Specialty Formation in Early Twentieth Century Britain’, *Medical History*, Vol. 29, Iss. 5 (1985), pp. 34-52; John Laffin, *Combat Surgeons*, (Stroud: Sutton Publishing, 1999); Martin Stone, ‘Shell shock and the psychologists’, in William Bynum, Roy Porter, and Michael Shepherd (eds.), *The Anatomy of Madness: Essays in the History of Psychiatry*, vol. II, (London: Tavistock Publications, 1985).

<sup>23</sup> Harrison, *The Medical War*.

<sup>24</sup> E.g. Henry Graeme Anderson, *The Medical and Surgical Aspects of Aviation*, (Oxford: Oxford Medical Publications, 1919).

<sup>25</sup> E.g. Paul Bert, *La Pression Barométrique*, (Paris: Masson et Cie, 1878); Henry Coxwell, *My Life and Balloon Experiences*, (London: W.H. Allen, 1889). For a scholarly study of mountaineering, see: Vanessa Heggie, ‘Experimental Physiology, Everest and oxygen: from the ghastly kitchens to the gasping lung’, *British Journal for the History of Science*, Vol. 46, Iss. 1 (2013), pp. 123-147,

<sup>26</sup> Tom Gibson and Mike Harrison, *Into Thin Air: A History of Aviation Medicine in the RAF*, (London: Robert Hale, 1984), p. 25.

<sup>27</sup> ‘The Aero Club of the United Kingdom’, *The Lancet*, 6 November 1909, p. 1368.

licensing, which was the function of the Royal Aero Club. It is important to bear in mind, however, that they were acting as a private organisation and not on behalf of the government.<sup>28</sup>

This lack of formal medical interest opened the matter to enthusiasts, who offered their embryonic musings. In *Flight* magazine, English aeronaut F.I. Wilbur admonished pilots to exercise ‘principles of common sense’, to prevent the ‘discomforts, dangers and tragedies of the past’. He highlighted the research of balloonists and mountaineers, including their use of garlic as a restorative, blood-letting to relieve congestion, and the use of laxatives to improve circulation.<sup>29</sup> This was shortly followed by ‘Some Notes on the Medical Aspects of Aviation’, in which an English surgeon surveyed the physiology of altitude to identify the most suitable men for flying. He extolled the importance of a careful medical examination, with reference to the physique, as well as the quality of the blood, respiration, vision, brain and ears.<sup>30</sup> This piece, however, was written by a surgeon, not a physiologist, and would have received a critical reception from the orthodox medical profession.

Less still was known about the psychological impact of flying, and the reasons for this are not far to seek. Flying was a hobby, albeit a dangerous one, and if men became fearful or ill they could simply give it up. The sport, argued Hamel and Turner, did not require an ‘uncommon degree of courage, or strength of nerve’; it could be undertaken by ‘quite ordinary men’ and even women – though ‘it was scarcely a suitable sport for women’ for they were not particularly good at it. Fear, they believed, was a quality observed in the best aviators, as it was quite normal to have ‘a very wholesome dread of the many causes of disaster’.<sup>31</sup> These amateur accounts, whilst engaging with medical matters, would have made no lasting impression on the medical profession.

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<sup>28</sup> Douglas Robinson, *The Dangerous Sky: A History of Aviation Medicine*, (Henley-on-Thames: Foulis & Co, 1973), p. 61.

<sup>29</sup> F.I. Wilbur, ‘Aviation and Common Sense’, *Flight*, 6 May 1911, pp. 399-400.

<sup>30</sup> J. Eldrick Alder, ‘Some Notes on the Medical Aspects of Aviation’, in Gustav Hamel and Charles Turner, *Flying: Some Practical Experiences*, (London: Longman, Green & Co., 1914), ch.XX.

<sup>31</sup> Hamel and Turner, *Flying*, pp. 1-3.

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They were, after all, written by staunch advocates of the development of aeronautics and published in the popular press.

As there was no formal recognition of medical differences between men in the air and on the ground, there were no special arrangements for the care of RFC personnel. Treatment was therefore administered along the same lines as other army units.<sup>32</sup> In 1912, medical officers of the RAMC were attached to the army and naval flying schools, and these two gentlemen were the first medical men to fly.<sup>33</sup> These doctors were concerned primarily with the safety of flyers, and the provision of general medical care and assistance. Under their command was medical orderlies – privates of the RAMC – who were responsible for the administration of first aid, and the transfer of casualties to the nearest civilian or military hospitals.<sup>34</sup> It was not their responsibility to research the medical problems of flyers, but an air-minded medical officer of the Naval Wing made some preliminary observations.<sup>35</sup> In an article on safety and flying, Staff-Surgeon H.V. Wells hypothesised that flying affected pulse and blood-pressure, but he was frustrated by his ‘most unsatisfactory’ results.<sup>36</sup> While his work was inconclusive, he was the first medical officer in Britain to make comments on the physiology of flight, rather than altitude.<sup>37</sup> Sadly, the RFC lost this far-sighted medical officer to the Royal Naval Air Service in 1914.

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<sup>32</sup> There are no official medical sources covering the precursors to the RFC that would allow for comparative analysis.

<sup>33</sup> ‘The Services’, *The Lancet*, 14 December 1912, p. 1676. Due to a lack of official sources, it is unclear if additional medical officers were attached to squadrons or aerodromes.

<sup>34</sup> The National Archives (TNA), AIR 49/389, Early Medical Organisation for RFC units, n.d.

<sup>35</sup> This may be due to the progressive naval focus on research and development. See: Christina Goulter, ‘The Royal Naval Air Service: A Very Modern Force’, in Sebastian Cox and Peter Gray (eds.), *Air Power History: Turning Points from Kitty Hawk to Kosovo*, (London: Frank Cass, 2002), pp. 51-65; Michael Paris, *Winged Warfare: Literature and Theory of Aerial Warfare in Britain, 1859-1917*, (Manchester: Manchester University Press, 1992), p. 185.

<sup>36</sup> Written in 1913 but not published until 1915: Hardy Wells, ‘The Flying Service, From a Medical Point of View’, *Journal of the Royal Naval Medical Services* (1915), pp. 55-60.

<sup>37</sup> Gibson and Harrison, *Into Thin Air*, p. 26.

The RAMC therefore entered the First World War with embryonic medical knowledge. Pilots took to the skies in open cockpits, with only their overcoats, gloves, and leather helmets affording protection against the elements. The war, however, threw medical men out of their 'lonely furrow to plough afresh a new soil', which led to the frank recognition of the unique medical problems of flyers.<sup>38</sup>

### **The war**

In August 1914, more than half of Britain's 900 qualified civilian pilots were in the air services.<sup>39</sup> Enticed by a heady mixture of romanticism, militarism, and the technology of flight, thousands more wanted to join them.<sup>40</sup> But the virtues of willingness and a fervent desire to become a pilot did not guarantee acceptance to the Corps. The RFC set exacting standards of entry, particularly as its functions became increasingly specialised. However, it is unnecessary to replicate the story of pilot selection here, for this article is concerned with medical matters, and not the social, educational, and leadership qualities sought by selection boards. Even considerations of 'temperament' are tangential, for it was mainly considered in terms of aptitude and leadership, which were not the concerns of medical officers.<sup>41</sup> Flyers were medically selected along the same lines as other army personnel, for it was not yet realised that they would face unique medical challenges in the air.<sup>42</sup> There were no attempts to screen any army personnel for predisposition to mental disorders, as the sheer scale of the coming psychological trauma was unprecedented – a major lesson of the war.<sup>43</sup> Indeed, the incidence of mental and nervous disorders caught the

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<sup>38</sup> Anderson, *The Medical and Surgical Aspects of Aviation*, p. vii.

<sup>39</sup> David Edgerton, *England and the Aeroplane: Militarism, Modernity and Machines*, (London: Penguin, 2013), p. 36.

<sup>40</sup> Hugh Cecil, *The Work and Training of the Royal Flying Corps*, (London: The Illustrated London News, 1918), p. 3.

<sup>41</sup> E.g. T.S. Rippon and E.G. Manuel, 'Report on the Essential Characteristics of Successful and Unsuccessful Aviators with Special Reference to Temperament', *The Lancet*, 28 September 1918, pp. 411-415.

<sup>42</sup> For the evolution of the army medical examination: William Macpherson, *History of the Great War Based on Official Documents, Medical Services: General History*, vol. I, (London: His Majesty's Stationery Office, 1921), ch.VII.

<sup>43</sup> The United States Army was the only armed force to consider the matter, based on their observations of allied experience: James Capshaw, *Psychologists on the March*:  
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RAMC off-guard, and they were unprepared to deal with the deluge of casualties reporting to casualty clearing stations.

From the early months of the war, the problem of 'shell-shock' dominated the work of RAMC specialists. This ill-defined condition was difficult to treat, as there was no accepted definition. Patients, typically infantry soldiers, presented to medical officers with a variety of confounding symptoms, seemingly with no organic origin. Many of them were deaf or mute; others were agitated and jumpy. Some complained of fatigue, disturbed sleep, palpitations, and tremor, but the most acute cases were paralysed or unconscious. Medical specialists, confused by the vast array of physical signs and symptoms, clung to pre-war modes of thought and looked for bodily causes. 'Shell-shock' was therefore conceived initially as a form of invisible cerebral trauma, caused by the violent forces of compression and decompression, usually from an exploding shell.<sup>44</sup> But doubts were soon expressed over its supposed organic origin, with some doctors arguing that the symptoms were psychological in nature – most famously, psychologist Charles Myers.<sup>45</sup> Flyers, however, operated above the 'traumatised trenches', scouting and reporting on artillery fire. 'Shell-shock' was considered to be a battlefield wound, ultimately an infantry problem. It is therefore not surprising, that the RFC did not feature in discussions of the syndrome. Indeed, there was little discussion of any medical matters, due to the field medical organisation.

The first RFC units on the Western Front had limited access to medical care and no formal supervision. Pilots had to seek attention from the nearest RAMC medical officer, who received the sick and injured at his inspection room and occasionally at the unit itself.<sup>46</sup> At the aerodrome, medical accommodation was limited to a single bell tent, which was superintended by a medical orderly – an RAMC private. This individual cared for the sick and injured but had neither

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*Science, Practice, and Professional Identity in America, 1929-1969* (Cambridge: Cambridge University Press, 1999). For the lessons of the war: TNA, WO 32/4748, Report of the War Office Committee of Enquiry into "Shell-Shock", 1922, pp. 160-189.

<sup>44</sup> Frederick Mott, 'The Lettsomian Lectures on the Effects of High Explosives upon the Central Nervous System', *The Lancet*, 11 March 1916, pp. 545-53.

<sup>45</sup> E.g. Charles Myers, 'A Contribution to the Study of Shell Shock', *The Lancet*, 13 February 1915.

<sup>46</sup> TNA, AIR 49/389, Early medical organisation for RFC units, n.d.

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prescribing powers nor the permission to administer morphia. From October 1915, the Corps was reorganised on a brigade basis and an RAMC major was attached to RFC headquarters to direct the care provided to units. Medical officers were posted to brigade headquarters and were responsible for the supervision of the five to ten squadrons in their section. If a casualty required lengthy treatment, they were transferred from unit sick quarters to the British Red Cross hospital at Étaples. Routine cases were typically given first aid by the medical orderly and transferred by tender to the nearest military hospital.<sup>47</sup> The opportunities of medical officers to study or monitor the nervous strains or long-term effects of flying were therefore limited, but this position of ignorance was not sustainable.

With successive improvements in artillery and aerial technology, the nerves of pilots were exposed to great physical strain. The aeroplane transformed from a machine of reconnaissance to an offensive weapon, and flying was gradually carried out to greater and greater heights. In the early years of the war, flying at high altitude was very much the exception, with scout pilots flying below 15,000 feet. At this height, the deleterious effects of flying were minimal, except for cold.<sup>48</sup> But the advantage conferred in combat by high altitude flying was recognised by pilots, and this became the norm on offensive patrols.<sup>49</sup> Alas pilots were, by nature, terrestrial creatures, who were ill-prepared for the physiological rigours of high altitudes. The lack of medical knowledge became increasingly problematic, as pilots had to adapt to this new mode of warfare. Considerations of the medical problems of flying were therefore brought to the table and discussed, albeit on a piecemeal basis. On 1 January 1916, for instance, *The Lancet* published a speculative piece on the nervous effects of flying. A doctor, who was likely a military medical officer, observed that flyers were suffering from 'some intangible disease', which for a lack of medical knowledge was put down to the effects of 'neurasthenia' – a nervous condition

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<sup>47</sup> For a detailed description, see: Samuel Rexford-Welch, *Official History of the Second World War, The Royal Air Force Medical Services: Administration*, vol. I (London: His Majesty's Stationery Office, 1954), p. 2.

<sup>48</sup> TNA, FD 4/53, 'Report on the Medical Aspects of High Flying', 23 March 1918.

<sup>49</sup> Gibson and Harrison, *Into Thin Air*, p. 35.

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characterised by fatigue, lassitude, and mental strain.<sup>50</sup> Neurasthenia has been framed as a mere constituent of ‘shell-shock’ – a diagnosis befitting of an infantry officer and gentleman – but this doctor had established that the German medical profession had offered an explanation unique to flying.<sup>51</sup> They attributed this form of ‘flying sickness’ to differences in air pressure and temperature, which led to headache, pounding ears, and breathing difficulties. A flyer overcome by these symptoms eventually suffered a ‘complete mental and physical collapse’. Applying this knowledge to British experience, the doctor attributed the development of neurasthenia to improvements in ‘anti-aircraft guns and gunnery’. Such developments necessitated reconnaissance and offensive patrols at altitudes above 10,000-15,000 feet.<sup>52</sup> This conception reflected the dominant somatic orientation of pre-war psychological medicine, where the body was usually the first port of call in clinical investigations.<sup>53</sup> It was therefore hypothesised that it was the effects of altitude and hypoxia that led to nervous collapse, and such opinions were at the heart of subsequent medical investigations. Nevertheless, it was not until the summer of 1916 that the matter was seriously considered.

### **The nervous pilot**

The Battle of the Somme (1 July–18 November 1916) threw the problem of nervous disorders into sharp focus. The offensive revealed the immense opportunities of air power but also exposed the significant challenges faced by the RAMC.<sup>54</sup> At the organisational level, medical support for the flying corps was woefully inadequate, as brigades did not have their entitled medical officer.<sup>55</sup> Casualties from nervous disorders increased at an ‘alarming rate’ and threatened the prosecution of the air war. Pilots who had been sent home for

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<sup>50</sup> ‘Annotations: The Influence of Altitude on the Nervous System’, *The Lancet*, 1 January 1916, pp. 35-36.

<sup>51</sup> E.g. Leed, *No Man’s Land*, pp. 163-64; Showalter, *The Female Malady*, p. 175.

<sup>52</sup> ‘Annotations: The Influence of Altitude on the Nervous System’, p. 36.

<sup>53</sup> Tracey Loughran, ‘Hysteria and neurasthenia in pre-1914 British medical discourse and in histories of shell-shock’, *History of Psychiatry*, Vol. 19, Iss. 1 (2008), p. 29

<sup>54</sup> For discussions of air power and the Somme, see, for instance: Peter Dye, *The Bridge to Airpower: Logistic Support for Royal Flying Corps Operations on the Western Front, 1914-18*, (Annapolis: Naval Institute Press, 2015), ch.4.

<sup>55</sup> TNA, CAB 103/583, Genesis of Aviation Medicine in the Royal Flying Corps and Royal Air Force, 1914-1918.

a rest were not returning to France in anticipated numbers, and those who did exhibited 'less powers of endurance'.<sup>56</sup> 'Nervous flyers' were among the 16,000 casualties evacuated for neuropsychiatric treatment, which put the RFC in a precarious position, considering physical casualties. Over the course of the battle, an estimated 308 pilots were killed, injured, or missing; a startling figure when it is compared against the 426 pilots available on the first day.<sup>57</sup> The use of inexperienced flyers to maintain a constant air offensive contributed greatly to the overall casualty rate.<sup>58</sup> In the battle for control of the air, the Corps was always on the attack and pilots flew continuous sorties for at least six hours a day, for weeks at a time.<sup>59</sup> While they had a comparatively better lot than the infantry, the pace of air operations was physically and mentally exhausting, which accounted for increased nervous casualties. However, medical supervision was inadequate and it was therefore down to the squadron commander to determine when a pilot required a rest. The problem of medical arrangements was frankly recognised but the way ahead was unclear. The medical officer attached to RFC headquarters, Major James Birley, was caught off-guard by the scale of the problem and confessed to a 'profound ignorance' of the conditions before him. Nevertheless, this experienced nerve specialist resolved to accumulate knowledge on the medical problems of flying.<sup>60</sup> This attitude was echoed by members of the Air Board, who provided their wholehearted support to any initiative that would improve the efficiency and safety of pilots.<sup>61</sup> Their patronage, however, was not entirely altruistic. The Corps was under intense political and judicial scrutiny due to perceived

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<sup>56</sup> James Birley, 'Goulstonian Lectures on The Principles of Medical Science as Applied to Military Aviation: Lecture I', *The Lancet*, 29 May 1920, p. 1148.

<sup>57</sup> More pilots were available in the intervening months: TNA, AIR 2/124, RFC technical statistics regarding the Battle of the Somme, 22 November 1916.

<sup>58</sup> Thomas Bradbeer, 'The British Air Campaign During the Battle of the Somme April-November, 1916: A Pyrrhic Victory', (PhD thesis, University of Kansas, 2011), p. 323.

<sup>59</sup> Cecil Lewis, *Sagittarius Rising*, (New York: Harcourt, Brace & Company, 1936), p.137. For a scholarly study of control of the air, see: James Pugh, *The Royal Flying Corps, the Western Front and Control of the Air, 1914-1918*, (London: Routledge, 2017), ch.4.

<sup>60</sup> Birley, 'Goulstonian Lectures, Lecture I', p. 1148.

<sup>61</sup> TNA, CAB 103/583, Genesis of Aviation Medicine.

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problems with leadership and administration, including the nature and incidence of casualties, which may account for their support.<sup>62</sup>

In early 1917, the Air Board consented to the formation of a specialist research committee to investigate the medical problems of flyers. RAMC medical officers with interests in physiology and nervous disorders collaborated with staff from the government's Medical Research Committee (later Council). Together, they considered means of managing the deleterious effects of altitude and hypoxia.<sup>63</sup> Writing for the committee, renowned physiologist Lieutenant-Colonel Martin Flack summarised the prevailing medical view:

Modern flying, by its complex and nerve-trying evolutions in a rarefied atmosphere imposes a great strain upon the aviator, especially at high altitudes. In consequence breakdown is frequent, the patients being found to suffer from gradual loss of power to fly high, associated in addition to frequent psychological manifestations...<sup>64</sup>

Flyers were therefore medically different. The rigours of altitude and hypoxia were at the heart of the manifold physiological problems, including nervous disorders. By examining these unique factors, the nervous strain of flying would be revealed and could be reduced by medical intervention.

Between 1917 and 1920, approximately 23,518 casualties were examined by specially-formed RFC Medical Boards, of which 3,149 personnel were diagnosed with a nervous or mental disorder. Certain personnel were examined on more than one occasion, meaning that 3,283 separate diagnoses were recorded. Medical board records show that psychological disorders were not commonly diagnosed— only eight per cent of casualties were designated as such. Anxiety, for instance, was observed in only four cases, insanity in two, and hysteria in only one. 'Shell-shock', the scourge of the trenches, was diagnosed in 88 patients, the majority of whom returned to duty.<sup>65</sup> However, in many of these cases the disorder was considered the product of previous

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<sup>62</sup> For an account of the judicial and political enquiries, see: Pugh, *The Royal Flying Corps*, ch.4.

<sup>63</sup> TNA, AIR 49/389, Formation of Special Medical Boards.

<sup>64</sup> TNA, FD 4/53, 'Tests for Flying Efficiency and Flying Strain', July 1917.

<sup>65</sup> RAFM, RFC Medical Board Record Cards.

military service, rather than any traumatic experience in the RFC.<sup>66</sup> In October 1917, for instance, a young officer of No. 11 Squadron RFC was admitted to hospital in a 'mentally-depressed, restless, and unhappy' condition. The doctor established that the pilot was 'seized with a strong impulse to cut his [own] throat' and feared that he would be unable to resist. It transpired that the officer had served with the Royal Field Artillery and was 'under fire' for three years before joining the RFC. The medical officer attributed his 'purely psychoneurotic' symptoms to shell fire and recommended a period of rest.<sup>67</sup> The Air Board Research Committee (Medical) conducted no formal psychological studies, and even if they had, the low incidence of such disorders would have had a limited impact on the conservation of manpower.<sup>68</sup>

Conditions of the nerves, on the other hand, were common in RFC casualties – affecting 92 per cent of cases. Neurasthenia, and its allied condition 'nervous debility', dominated this category, claiming 2,454 casualties – over two-thirds of all nervous and mental cases.<sup>69</sup> From the late nineteenth century, neurasthenia became one of the most recognised nervous disorders in British psychological medicine. The work of neurologist George Miller Beard presented a clinical and diagnostic profile for the condition and gave the sundry symptoms of nerves an organic basis.<sup>70</sup> But it was an ill-defined disorder with doctors assigning different physical causes and symptoms to the exhaustion of 'nervous force'. Despite this, they were united in the belief that man possessed limited nervous energy, which could be depleted through overexertion. British

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<sup>66</sup> Medical case notes held in the Ministry of Health series at TNA are a 'representative sample'. It is not clear what criteria was applied to the selection of sources. Consequently, only tentative conclusions can be reached on the character of diagnosis in the RFC, if based entirely upon these sources.

<sup>67</sup> TNA, MH 106/2202, War Office Representative Medical Case Sheets, 2/Lt B.B., Mental, October 1917.

<sup>68</sup> Committee discussions on psychological matters were limited to studies of flying aptitude: TNA, FD 4/53, 'Temperament and Service Flying', c.1920; 'Appendix on Wind-up', 1918.

<sup>69</sup> RAFM, RFC Medical Board Record Cards.

<sup>70</sup> George Miller Beard, *American Nervousness, Its Causes and Consequences* (New York: Putnam, 1881). See also: *A Practical Treatise on Nervous Exhaustion (Neurasthenia): Its Symptoms, Nature, Sequences, Treatment* (New York: E.B. Treat and Cooper Union, 1894).

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doctors embraced the classification, as it confirmed long-standing medical convictions: shock, overwork, and mental strain could result in nervous breakdowns with psychological manifestations.<sup>71</sup> Wartime flying presented the optimum conditions for the development of neurasthenia. In January 1918, a second lieutenant was admitted to hospital suffering from the after-effects of a crash. After his physical wounds had healed, he was keen to fly in France, but his colonel judged him temporarily unfit for service. The pilot complained of fatigue, headaches, poor concentration, memory loss, disturbed sleep, and anxiety. The shock occasioned by his injuries, rather than the crash itself, was severe enough to deplete his 'nervous energy', causing neurasthenic symptoms.<sup>72</sup> However, the Air Board Research Committee (Medical) believed that flying itself uniquely taxed the nerves. As one researcher noted: 'flying takes a man into an element for which he was not specifically designed for by nature'.<sup>73</sup> The committee hypothesised that the development of nervous disorders were the products of the unique operational conditions. Researchers therefore concerned themselves with the identification of the peculiar nervous strains.

In their studies of altitude and hypoxia, the committee uncovered a host of nervous stresses commonly encountered at high altitudes. Inevitably, the effects of hypoxia were observed above 12,000 feet. This resulted in breathing difficulties, which were exacerbated by any physical exertion. Muscular weakness was common, though mainly in observers, who complained of the physically exhausting nature of photography and gunnery. The impact of high flying on judgement and perception affected all airmen but often went unnoticed. On one occasion, a Bristol Fighter pilot waved cheerily to five enemy aircraft at 18,000 feet, much to the horror of his observer. This inefficiency, however, was rarely remarked upon by pilots due to the dulling of their perception. More dangerous still was fainting or falling asleep in the air. Certain pilots partially lost consciousness at high altitudes, but were still able to land safely with verbal instructions from their observer. Upon landing, most

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<sup>71</sup> Oppenheim, *Shattered Nerves*, p. 96.

<sup>72</sup> TNA, MH 106/2202, War Office Representative Medical Case Sheets, 2/Lt F.L.C.K, Neurasthenia, January 1918.

<sup>73</sup> Dudley Corbett, 'Flying Fatigue and Efficiency', 3 August 1917, reprinted in United States War Department, *Air Service Medical*, (Washington D.C.: Government Printing Office, 1919), p. 115.

flyers faced a new set of debilitating symptoms, including frontal headache and shortness of breath.<sup>74</sup> There was, however, a particularly deleterious after-effect of high flying; one that was known to contribute to the development of nervous disorders in non-flying men.

Fatigue was the most universal complaint of pilots. Major Birley attributed its occurrence to the bombardment of the senses by the constant stream of stimuli in the air, many of which were of a peculiar character.<sup>75</sup> Flyers were observed to stagger from aircraft to make their meticulous reports, which were often a source of conflict as no-one could agree upon what had occurred. Overwhelming tiredness led to frayed tempers and depressed spirits, and the idea uppermost in minds was to lie down and sleep. The repetition of this work over any length of time led to the deterioration of mental and physical wellbeing, inefficiency in the air, and ultimately the shortening of the active service period.<sup>76</sup> A researcher acutely aware of the effects of fatigue was Captain Dudley Corbett. As officer-in-charge of RFC patients at the 24<sup>th</sup> General Hospital, Étaples, he diagnosed fatigue in 40 per cent of his 2,000 patients.<sup>77</sup> Indeed, fatigue was so common that he termed the state 'flying fatigue'. He made the following observations:

A man begins to notice that he is beginning to feel generally tired, and that he has lost some of his original keenness. His sleep does not refresh him. He gets occasional headaches. Later he does not get off to sleep quite so well as he did, or he may get off fairly soon, and yet wake up early in the morning. He may lose his appetite...His sleep may be troubled with dreams of flying and fighting, and nightmares of all kinds. He may notice that he is getting irritable, and that he cannot stand the society of his friends...He probably feels quite fit and keen in the air

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<sup>74</sup> TNA, FD 4/53, 'Report on the Medical Aspects of High Flying'.

<sup>75</sup> Ibid.

<sup>76</sup> James Birley, 'Goulstonian Lectures on The Principles of Science as Applied to Military Aviation, Lecture II, War Flying at High Altitudes', *The Lancet*, 5 June 1920, p. 1205.

<sup>77</sup> Birley, 'Goulstonian Lectures, Lecture I', p. 1148. For a discussion of medical research on fatigue in the early twentieth century, see: Jackson, *The Age of Stress*, ch. I.

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but has to force himself to go up. After landing, he may be shaky and feel utterly exhausted.<sup>78</sup>

In July 1917, many of these signs were observed in a neurasthenic pilot. Upon admission to hospital, the officer was in 'an intensely nervous condition', exhibiting loss of muscular control and facial twitching. He complained of insomnia, dreams of aeroplane crashes, and a dependency to sleeping draughts. This officer was still under treatment nine months later, showing that fatigue had long-term debilitating effects.<sup>79</sup> Corbett explained that the strain of flying at the peak of operations gave rise to this disorder. Pilots were constantly at stand-by and were subjected to 'short and irregular hours of sleep'. There were no fixed days or periods of rest due to the constancy of the air war, and this exacerbated the problem.<sup>80</sup> Birley also recognised the nervous effects of fatigue and recommended the monitoring of flying hours to reduce the incidence of nervous disorders. During the winter months, the frequency of nervous breakdowns was lower than in the summer, for high flying was often impossible due to adverse weather conditions.<sup>81</sup>

While the committee could not change the pace or character of the air war, they were optimistic that the nervous strain of flying could be mitigated. It was widely held that a supply of oxygen in the aircraft would reduce the effects of fatigue. Field experiments were conducted at Brooklands Aerodrome to establish if the use of oxygen would increase mental alertness and muscular vigour at altitude, and abolish lethargy on the ground. Lieutenant-Colonels Martin Flack and Charles Heald monitored the performance of flyers on short sorties, with and without oxygen, and established that supply abolished fatigue at low altitudes and delayed its onset in longer flights. The results convinced them that the administration of oxygen would result in fewer nervous breakdowns, success in air combat, favourable returns to duty, and the increased use of flying skills.<sup>82</sup> But the committee was also aware that pilots

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<sup>78</sup> Corbett, 'Flying Fatigue and Efficiency', p. 115.

<sup>79</sup> He was discharged from the service, as permanently unfit. TNA, MH 106/2202, War Office Representative Medical Case Sheets, 2/Lt F.P.B, Neurasthenia, April 1918.

<sup>80</sup> Corbett, 'Flying Fatigue and Efficiency', p. 115.

<sup>81</sup> TNA, FD 4/53, 'Report on the Medical Aspects of High Flying'.

<sup>82</sup> TNA, FD 4/53, 'Report on the Value of Oxygen to Aviators at Relatively Low Altitudes', July 1917.

took the extreme view that 'no man commits suicide with his hat on' and balked at any suggestion that they would engage the enemy whilst wearing a mask.<sup>83</sup> Therefore, the prevention of nervous breakdown had to be achieved by careful observation. Flack proposed the monitoring of physical and mental staleness through a simple 'manometer' test. He tested his device on pilots who breathed through a U-shaped tube that measured their lung capacity and expiratory force, whilst they supported a column of mercury. Pilots who could not withstand the physical strain of this test were recommended for a rest.<sup>84</sup>

The research committee was optimistic regarding the prognosis of nervous cases and their future war contributions. As the nerves of pilots were merely tired from the cumulative effects of strain, only rest was required to return them to their former efficiency. This rest was commonly given by the granting of leave or a period of home service. During the rest, it was common for pilots to undertake instructor duties but Birley cautioned that their low mood could 'infect' impressionable pupils.<sup>85</sup> The medical treatment of nerves had rest at its heart, for its benefits were well-known, even to pilots. The 'rest cure' was a long-established treatment, introduced in the nineteenth century by neurologist Silas Weir Mitchell. In neurasthenic patients, rest provided a physical and moral boost by removing the individual from the nervous strains of their environment.<sup>86</sup> Indeed, a medical officer caring for a neurasthenic patient at the front recommended his removal to a convalescence home by the sea, for the military hospital environment was not conducive to relaxation.<sup>87</sup> Two RFC hospitals were established in London for this purpose.<sup>88</sup> Medical case notes show that the rest cure was considered successful, as

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<sup>83</sup> Birley, 'Goulstonian Lectures, Lecture II', p. 1205.

<sup>84</sup> Martin Flack, 'Applied Physiology of Aviation', reprinted in Anderson, *The Medical and Surgical Aspects of Aviation*, pp. 41-58. See also: TNA, FD 4/53, 'Tests for Flying Efficiency and Flying Strain.'

<sup>85</sup> TNA, FD 4/53, 'Temperament and Service Flying'.

<sup>86</sup> Silas Weir Mitchell, 'The Treatment by Rest, Seclusion, etc. in Relation to Psychotherapy', *The Journal of the American Association*, 20 June 1908, pp.2033-2037.

<sup>87</sup> TNA, MH 106/2202, War Office Representative Medical Case Sheets, Lt J.B., Neurasthenia, December 1917.

<sup>88</sup> TNA, AIR 49/389, Special RFC Hospitals.

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recuperating patients felt ‘much better’ and reported improved sleep quality.<sup>89</sup> This was also reflected in disposal statistics. One third of nervous cases seen by RFC Medical Boards were returned to full flying duties, and 42 per cent to ground work, showing that nervous disorders were temporary afflictions that could be cured by the short-term removal from flying duties. Only 15 per cent of casualties were discharged, which set the Corps apart from other army units.<sup>90</sup> Infantry soldiers were often discharged upon diagnosis – though as the war went on, few were evacuated beyond the regimental aid post.<sup>91</sup> These figures are only indicative, however, as the disposal of 309 cases was not recorded.<sup>92</sup> It is possible that they were still under treatment or appeal boards, or in the care of civilian authorities. For the most part, the statistics were favourable and showed that flyers were able to render effective future service, unlike ‘traumatised’ soldiers.

### Conclusion

By the end of the First World War, there was a developing body of knowledge on the unique medical problems of flying. The work of the Air Board Research Committee (Medical) convinced military medical officers that ‘aviation presents new physiological and pathological problems which require special study and which can only be dealt with by a specially-trained body of medical men’.<sup>93</sup> There was an emerging science of ‘aviation medicine’ and this justified the establishment of a medical branch to support the Independent Air Force in 1918. Today, we understand the psychological effects of warfare as a form of post-traumatic stress, and we may dismiss the committee’s research as antiquated and ill-informed. But the conceptions of air-minded medical officers were the products of their time and place, and with no evidence to the contrary, they attributed the development of nervous disorders to the physiological strains of flying. The available sources indicate that the management of casualties was effective, and that psychological disorders were

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<sup>89</sup> E.g. TNA, MH 106/2202, War Office Representative Medical Case Sheets, Lt, M.V.B, Neurasthenia, n.d.

<sup>90</sup> RAFM, RFC Medical Board Record Cards.

<sup>91</sup> Harrison, *The Medical War*, pp. 114-15.

<sup>92</sup> RAFM, RFC Medical Board Record Cards.

<sup>93</sup> TNA, AIR 2/87, Report on the formation of a medical service for the air force, November 1917.

rarely observed. Notions of 'trauma' were not discussed by officially sanctioned researchers, setting pilots apart from 'shell-shocked' soldiers.

It is hoped that this article will promote a new direction in scholarly enquiry. This short introductory study of the RFC has demonstrated that the medical experience of war was not uniform. There is a tendency to view the army as a collective, but it was in fact a collection of different arms, corps, and regiments. Even the RFC was not a homogeneous unit, with squadrons performing diverse operational roles and developing their own tribal cultures. Sadly, insufficient medical materials prevent the examination of nervous disorders by unit type or squadron. Nevertheless, the wider military historiography would benefit from other medical studies that engage with the experiences of individual units, if source material allows. For example, this article has not engaged with the medical experience of the Royal Naval Air Service, as the culture and practice of naval medicine was entirely different. There is certainly scope for a comparable study of the medical problems of naval aviators. Likewise, there are materials that would allow for the examination of nervous strain from the pilot's perspective. The medical history of the British flying services is waiting to be explored and offers many opportunities to examine its unique and significant role in the development of air power in the twentieth century.

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